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RESEARCH METHODS FOR SUSTAINABLE DEVELOPMENT

MASUDEM

MASTER STUDIES IN SUSTAINABLE DEVELOPMENT AND MANAGEMENT

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CONTENT

INTRODUCTION

This study text is designed to serve as a comprehensive guide for researchers and scholars embarking on studies within the realm of sustainable development. Through a structured exploration of research paradigms, ethical considerations, and practical methodologies, this text equips readers with the tools necessary to conduct rigorous and impactful research in this vital field. This study text comprises 12 chapters.

Chapter 1 Introduction to the Research Methodology: The groundwork for comprehending research methodology within the context of sustainable development is outlined. From defining research paradigms to examining scientific thinking and ethical practices, this chapter provides a holistic overview essential for navigating the complexities of sustainable development research.

Chapter 2 Identified Research Focus on Sustainable Development: This chapter explores the core principles of sustainability, analyzes the Sustainable Development Goals (SDGs) established by the United Nations, and presents real-world case studies illustrating effective sustainable development endeavors.

Chapter 3 Research Paradigms and Stages: Expanding on the foundational ideas from the previous chapters, Chapter 3 describes the various research paradigms and stages essential for conducting meaningful research. From qualitative and quantitative methods to data collection techniques, this chapter equips researchers with the foundational knowledge needed to formulate robust research methodologies.

Chapter 4 Stages of Conducting Research: This chapter provides a detailed roadmap for the stages of conducting research, from identifying management dilemmas to formulating research questions and conducting literature reviews. This chapter offers practical insights into the essential components of the research process.

Chapter 5 Theory and Conceptual Framework: This chapter outlines the theoretical foundations of social science and their relevance to research in sustainable development. It explores the process of hypothesis development and the identification of research variables, offering insight into the theoretical frameworks necessary for crafting impactful research projects.

Chapter 6 Data Collection for Qualitative Research Methods I: this chapter explores the foundational aspects of data collection through observational techniques, methodological considerations for effective observation, and the different types of observations used in research settings.

Chapter 7 Data Collection for Qualitative Research Methods II: this chapter extends the exploration of qualitative research methods by focusing on interviews. The process of interview development is explained; for example, design and protocol of interviews, the various types of interviews employed in research, and the nuanced aspects of conducting effective interviews to gather rich and meaningful data.

Chapter 8 Questionnaire Methods: the questionnaire design used in quantitative research is described. The steps involved in constructing and conducting questionnaires, identify common sources of errors, and discuss the importance of selecting appropriate measurement scales to ensure data accuracy and reliability.

Chapter 9 Measurement: this chapter explore different scales of measurement, illustrate examples of measurements related to Sustainable Development Goals (SDGs) using each scale, and engage in discussions to deepen our understanding of measurement concepts.

Chapter 10 Quality of Research: this chapter outlines the critical importance of maintaining high research quality standards, particularly in sustainability studies. The autjors identify the need for rigorous research practices, discuss key aspects of research quality, and highlight strategies for ensuring the integrity and validity of research findings.

Chapter 11 Quantitative Data Analysis: the authors cover essential topics such as data preparation, descriptive statistics, correlation analysis, multiple regression, and hypothesis testing, providing readers with the analytical tools necessary for interpreting quantitative data effectively.

Chapter 12 Qualitative Data Analysis: finally, in Chapter 12, the authors explore different forms of qualitative data, compare qualitative and quantitative analysis approaches, and discuss methodologies for analyzing qualitative data. Practical guidance is provided on preparing qualitative data, selecting appropriate analysis tools, and setting up frameworks for analysis.

"Research Methodology for Sustainable Development" offers a comprehensive toolkit for researchers committed to advancing knowledge in this critical field. By integrating theoretical foundations with practical methodologies, this book empowers researchers to undertake rigorous and impactful studies aimed at addressing the complex challenges of sustainable development.

CHAPTER 1: INTRODUCTION TO THE RESEARCH METHODOLOGY

The Introduction to the research methodology chapter gives you a broad and general overview of research methodology: what is considered research in the modern age, such as paradigm, paradigm change, scientific thinking, positivism and normative thinking. You will also get to know differences between research methods and research methodology, the importance of ethics, ethics committees and its relation to research. One important and key aspects of understanding research methodology (for example, when you read a scientific article) are what a research protocol is, what steps you can take when setting up a new research from ground up and how it all defers from writing a scientific report. You will find questions for discussions, suggested reading and references at the end of the chapter. By the end of the chapter you will get an insight to what research is and what research mthodology is. It is an introduction to the following chapters that will give a deeper understanding to different research methods and methodologies.

In the chapter of Introduction to research methodology you will get to know research design, scientific thinking and you'll also read about research ethics, research protocol and what are the chapters of a scientific article. You'll get to know how scientists are thinking in the most recent era of the history of science, how researchers are approaching getting to know new information in the currently ruling paradigm and time.

1.1 Research paradigm

In this section you'll read about what a paradigm is and what it means when paradigm is changing in science that will prepare you to read about the different research designs later in the chapter that can be applied in the currently ruling paradigm that is accepted by most, but not all scientists.

Galloway and Mahayni (1977, p. 64.) cites Kuhn what paradigm and paradigm change are in a nutshell: "Specifically, he ('Kuhn') suggests that major changes in scientific thought are generated periodically when existing theories (paradigms) are recognized as being inadequate to explain the anomalies which manifest themselves randomly in the course of normal scientific investigation." Let's have a closer look at what paradigm and paradigm change are based on Kuhn's suggestion.

Paradigm

Paradigm is an existing theory that describes best scientific evidence at a specific time point in history and is widely accepted and supported by the scientific community. Paradigm consists of all scientific methodologies and methods of a certain time period that can be best used for scientific description of research findings. It is important to highlight that if there is a paradigm then it does not mean there are no other ones existing at the same time. However, scientific evidence and the professional opinion of the scientific community are on the agreement that one paradigm is the ruling one at a certain time and other paradigms or efforts to explain evidence is not as useful or strong as the one that was proclaimed a paradigm of the time.

Paradigm change

Paradigm change was suggested by Kuhn (1962) (Galloway, Mahayni, 1977; van Haaften, 2007). According to Kuhn, a paradigm cannot stand the test of time. It cannot be accepted and the best explanation for scientific evidence until the end of time. There will be new and emerging ways of explaining evidence and one of them may be better than the previously proclaimed paradigm. When this happens, then there will be more and more evidence showing that the new prospective paradigm is a better framework to use for science. It is called paradigm change.

1.2 Scientific thinking

In the Scientific thinking section you'll have a closer look at what it means to conduct research in the currently ruling scientific paradigm which is positivism. **Positivism** is aiming at describing with numbers and exact facts as much as possible. It has its own way of approaching how to prepare a scientific research. In positivism everything is logical and can be described with numbers that are the results of using mathematical tools.

1. When you are interested in an area you'd like to investigate with scientific methods, then you might find yourself in the situation where you are asking yourself: "it would be so interesting to see what is behind the Moon! How could we see from Earth what is behind the moon?". This is called a **research question**. A research question is stated in a question format with a question mark '?' in the end.

2. A good research question asks something that we do not know the answer for. This area of knowledge is unexplored. We can call this a *scientific gap* that you'd like to fill by answering a question.

3. When it comes to moving forward in your research then you need to turn your question into a **hypothesis**. Hypothesis is an expected outcome of your research.It is a presumption based on limited knowledge on a subject. Staying with the example of seeing the moon you could state my hypothesis like this: "The Moon can be seen from the Earth with a bigger telescope than what humanity has now". In my hypothesis I am stating that I think a telescope bigger in size will help me to see the Moon from the Earth because a bigger telescope helped me in the past to see objects that were further in distance.

4. Before you can be ready to start writing your research protocol there is one more step you need to do to define your scientific gap as closely as possible: you need to turn your hypothesis into a null hypothesis. **Null hypothesis** is an expression of the hypothesis in a form that is statistically measurable. For example, the telescope hypothesis can be: "Both with the bigger and the smaller telescope I can see an equal distance." This statement says that I cannot see the Moon from the Earth with either one of my telescopes. If I find in my measurements that I can see with the bigger telescope the Moon from the Earth, then the null hypothesis is not true and the hypothesis is true. If I find in my measurement that I cannot see with the bigger telescope, then the null hypothesis is true and the hypothesis is not true. I need to move on to another hypothesis where I am looking at another aspect of the telescope. For example the width of the telescope lens is a more precise question than the size of the telescope because there are several angles from which a telescope can be bigger: width, length, weight.

Furthermore, you can find different ways of scientific thinking in literature that are not the ruling paradign of our or a certain time period. Such a scientific thinking framwork is normative thinking where the question is not how the world looks like and how we can turn our observations to desciptions but rather how the world shall look like and what would be ideal.

You can read a step by step guide to „Steps of starting a new research" toward the end of the chapter.

1.3 Research ethics

Ethics is a way of expressing morals in a form of rules or guidelines what is morally acceptable and not acceptable to a certain group of people, area of the world, scientific domain or profession. Research has its own ethical principles. When it comes to deciding if a researcher intends to conduct a research, sometimes these ethical principles are challenged and there is a need for outside

perspective to make sure we are not crossing any boundaries or harming anything or anyone in the process of a research.

Review Board or Ethics Committee

Most scientific institutions or communities have their own guidelines when it comes to research protocol and ethical guidelines. The review boards or ethics committees write and review these guidelines regularly as well as they are responsible for reviewing research requests and ensuring that researchers keep these guidelines. There can be several boards or committees you may need to reach out to depending on the research you would like to carry out. There can be institutional review boards or ethics committees, for example at universities. You may need to have a look if there is a national or statewide institution or committee you would need to seek out. There can be international organisations where you need to apply for a research permit. There can be boards or committees related to a professional community and there can be an umbrella organisation that also has a review board or ethics committee. For example, lawyers, doctors, psychologists may have a professional community in a form of chambers. As a first step, reach out to the respective board or committee to see if you need to apply for research approval or not, and what may be the steps you need to take in order to be able to start your research ethically and lawfully.

Conflict of interest

One way to eliminate ethical concerns from a research process is paying attention if you have a **conflict of interest (COI)** when preparing or conducting a research. There are two types of conflict of interest: conflict of interest within an organisation and an outside entity that poses a conflict of interest.

Conflict of interest _**within an organisation**_ is when you need to report on any relationship that you may have within the organisation. E.g. close friendship, partnership, marriage, family relations or any other project you are involved that might affect your judgment carrying out a research ethically. For example, you have a grant from one faculty to research the negative effects of smartphone use and you have another grant from a different faulty to develop and application for smartphone users.

Conflict of interest because an _**outside entity**_ involves parties or matters that are related to organisations or people outside of the organisation where you work.

Conflict of interest can occur when a person has more than one interest related to one aim. For example, a researcher is involved in the investigation in a new area, however, they are also involved in a profitable company that would like to use the findings for curing a disease as soon as possible. Review boards and ethics committees are responsible for creating guidelines on how they handle conflict of interest procedures and they also need to carry out the procedures. For example, every new research faculty member needs to fill out the conflict of interest form and hand it in to the committee who evaluate if there is a conflict of interest and if there are any necessary steps to take.

Kohlberg's stages of moral development (1975)

Kohlberg researched the development of human morality. He created a model to describe the development of human morality. He identified 3 levels (preconventional, conventional and postconventional) and he identified 2 stages on each level resulting in 6 stages in the span of a human's lifetime. Kohlberg was critisized for not linking ethical constructs, regulations and societal rules to morality development and what happens then the two do not overlap or a person does not respect these boundaries.

**Level I. Preconventional**

In this developmental stage children think dually about the world: everything is true or false, black or white, sweet or sour. Children use these labels make sense of the world around them and they act as a reaction to these labels. They either feel rewarded or punished by their environment.

Stage 1. Obedience and punishment

Physical consequences of actions orient the behaviour of a human being. Children would like to avoid punishment and are seeking rewards. For example, they would like to avoid being hungry and would like to eat as many candies as they can.

Stage 2. Individualism and exchange

Human beings in this stage are seeing relational exchanges as a market: when it is good for me then I participate; when it is not I will not participate. For example, if I get an apple from you, I will also give you an apple.

Level II. Conventional morality

Societal rules and expectations are the ruling principle that lead human behaviour and moral decision making processes. People in this stage are relying on what is acceptable and what is not acceptable in a certain population: in your school, workplace, family, your neighbourhood, your country, your religious circle - you can mention here any population that is important to the individual. Any salient identity where they feel like they belong to this group, what is an important identity building community.

Stage 3. Interpersonal accord and conformity

For example, teenagers go through this stage and their peers become an important reference point and their parents not the most important reference point anymore. They may think like this: "I am doing something it because everybody else does it."

Stage 4. Maintaining the social order

Individuals in this stage are relying on authority and rules for guiding their actions. They would like to follow rules and maintain the status quo.

Level III. Postconventional

Moral reasoning and creating a just society is in the focus of this level. People would like to define moral values,guidelines and principles.

Stage 5. Social contract and individual rights

Individuals not only pay attention to what is lawfully right or wrong but they create their own inner compass they rely on when navigating morality in the world.

Stage 6. Universal principles

In this stage you might think about not only rules that you need to follow. For example, wash your teeth twice a day for cleanliness can be a simple rule that you have to follow. In this stage you also think about the universal morality behind it: you need and want to brush your teeth twice a day because you'd like to have longevity in your health and this is one important aspect of staying healthy as long as possible during your lifetime. You also encourage others, especially your children to follow this principle.

Table1.1. Kohlber's stages of moral development

Level of moral development	Stage of moral development
I.Preconventional	1. Obedience and punishment
	2. Individualism and exchange
II. Conventional	3. Interpersonal accord and conformity
	4. Maintaining the social order
III. Postconventional	5. Social contract and individual rights
	6. Universal principles

1.4 Research design

Research Protocol

When it comes to preparing research and measurements there are several things we need to take into consideration. After we read the literature on the field, and we came up with a research question that we turned into a hypothesis, then we need to start preparing for how we will have a research methodology that can result in desired outcomes. We need to write a research protocol that will guide our research process. In this section you will read about the most common research protocol sections. The Institutional Review Board of University of New Mexico suggests the following chapters to write for your research protocol:

Table1.2. Chapters for research protocol

Chapter of protocol	Section of protocol
Framework of the research	Basic information Background information Tools used Project location Anticipated duration Resources
Participants	Inclusion and exclusion criteria Recruitment and screening procedures Enrollment Compensation Complaints Withdrawal and voluntariness Informed consent Confidentiality
Potential benefits and harms	Potential benefits Potential harms and how to minimize it Unanticipated problems or adverse events
About data	Data collection procedures Data management procedures and confidentiality - secure storing Data analysis and statistical consideration

Let's have a look at each protocol chapter one by one. What do you need to be involved in each chapter and why is it important to think about these aspects before you start collecting data and writing a scientific report.

Framework of the research

The framework of the research points out information related to the whole research projects, such as name of researchers, hypothesis, theoretical background information, tools used, project location, anticipated duration and resources.

Basic information

You need to provide basic information of your research in this section:

- A title for your research

- The time when you write the research protocol and update this date each time you make modifications (we can call this version)

- Individuals' names who carry out the research or who supervises them. Are there non researchers involved in the project, for example students, organisations where you'll recruit participants

-       Do you have a sponsor or funding resource

Background Information

Here you can list the reasons why you chose this topic and why you'd like to conduct the research. What is the literature you read? What is the research gap you found? What are the solutions you are looking for in your research and hope in your result? What are your scientific questions or hypotheses? All in all, you need to provide a short overview to the review board or ethics committee and give convincing reasoning why they would need to approve your protocol.

Tools used

You need to provide a list of tools you will use and the description of the tools. You also need to give a reason for why you chose specific tools and how they are the best ones to use for your research. Tools can be as simple as a test that can be carried out by a paper and a pen or they can be surveys. Tools can be more complex like medical devices, such as an MRI (Magnetic resonance imaging) to take images of a brain before and after a research. You may also want to use mediations and you also need to list them under the tools section of your protocol. Last but not least, most researchers use a computer and a software to analyze their data that you need to list.

Project location

You need to write down where the research will take place. There are a number of things you need to think about. You need to list all the locations where your research will take place:

-       location of the data collection
-       location of the data analysis
-       where you'll write your report and where all researchers will reside at this time
-       location of data storing
-       transportation of data if needed

If you collect data in a country or institution and you will analyze your data in another country or institution then you need to include all locations in your protocol. Most importantly, you need to seek out all local ethics committees or review boards on the institutional and/or national level where your research will take place. You need to read their guidelines. If you are unsure if you can or cannot carry out your research without an approved protocol then it is best to ask for a consultation. The consultation may result in you needing to apply for approval on each location and follow their procedures and application forms.

Anticipated duration

You need to write down what is the anticipated end date for your research based on your research methodology and methods. This is a good way to track your future progress. There may be changes in your research because your findings are hard to understand with the knowledge you cultivated at the time of writing your protocol.You need more time to analyze data or read additional literature.There may be outside factors prolonging data collection, e.g. you have less participants per week than anticipated. In case you need more time to carry out your research, then you need to ask for a change in your protocol by explaining what has changed and how.

Resources

You need to list every resource that supports the success of the project. Namely, what are the financial or other resources available and how you will ensure availability of resources for the whole duration of the research. Here are some examples you can list here: your employer, a foundation, fellowship, grants, prospective grants that are not open yet and you'd like to apply for, leadership members, technical tools already in your possession.

Participants

You need to write about the participants of the research. Participants can be human beings or non-human entities you'd like to observe or modify in your research. There are several crucial aspects when it comes to involving participants in your research in order to ensure no harm: participant inclusion and exclusion criteria, recruitment and screening procedures, enrollment, compensation,

complaints, withdrawal and voluntariness, informed consent and confidentiality. Let's have a closer look at each of them!

Participant inclusion and exclusion criteria

- <u>Inclusion criteria</u>

In the inclusion criteria you need to specify who are the participants you would like to involve in your research. For example, if you would like to involve adults over the age of 18 and people who are not underage and they do not have a legal guardian then you need to write it in the inclusion criteria section.

- <u>Exclusion criteria</u>

In the exclusion criteria you need to specify who are the people or entities you would not like to involve in your research. For example, if you would like to involve adults over the age of 18, then you need to specify that children under the age of 18 or people with a legal guardian cannot participate in the research.

Inclusion and exclusion criteria can be used for entities as well. For example, you'd like to have data on the pollution of cities with more than 10.000 residents but not exceeding 30.000 residents.You'd like to compare them based on how polluted the air is in the area. In this case you include cities with residents between 10.000 - 30.000 and exclude cities with less than 10.000 residents or with more than 30.000 residents.

You can also research certain animals. For example, the nesting behavior of female birds around a certain lake that seems to be ecologically important. You would like to see what they need for successful nesting so that the population of birds does not become extinct in the area. In this case you are including all breeds of female birds in the 1 kilometer radius measured from the outskirt of the lake. You are excluding female birds who are outside of the 1 kilometer radius and all animals outside of this radius. You are also excluding male birds within the 1 kilometer radius and all other animals, such as mammals, fish, bugs and you also exclude plants and humans.

Recruitment and screening procedures

The recruitment and screening procedures are ensuring that the inclusion and exclusion criteria are met. Recruitment of participants includes all channels of participant outreach as well as the marketing materials you will use in your research. The screening procedures ensure that you screen all participants who would like to participate in your research and make sure they meet the inclusion criteria. If they are in the exclusion criteria, then you need to deny their participation. If you are not looking for having human involvement in your research then you still need to pay attention to recruitment and screening. For example, if you would like to observe birds in a 1 kilometer radius from a lake and you might want to compare your results with another lake on another continent. On another continent they may use other measurements, like feet or miles. In this case, first you need to convert your criteria and screen the incoming data that your collaborating researchers send you.

Enrollment

You need to provide an estimated minimum number of participants, subjects or entities that would be assessed and what would be a sufficient amount to carry out your research. The criteria of enrollment is important because researchers need to avoid the unnecessary number of participants and thusavoiding any unnecessary harm, even if the harm would simply be having 30 minutes of an adult person's day. We would like to avoid the unnecessary exposure to research if our research does not need more than 30 participants.

Compensation

In the compensation section you need to write about any form of compensation participants will receive after they participated in the full duration of the research. Compensation is a form of motivation so that participants would be interested in entering the research or not leave before the end of the research time. The compensation cannot be too big. If the compensation is too big then it

may change the person's behaviour from natural to confirming to the idea they have about the expectations of the researchers.

Motivation can be intrinsic motivation and extrinsic motivation. Intrinsic motivation is when someone would like to do something for the activity itself. In research an intrinsic motivation can be when a doctor asks a cancer patient to give access to their health record to analyze them in order to make further improvement for future patients. The patient is not asked to do any additional medical procedures, however, they could help other patients by participating in the research. Extrinsic motivation is when someone does an activity because they can get or reach something. Any form of compensation for research participation is extrinsic motivation.

There are many examples of compensation and you can tailor it to your specific research. You can give a small money prize or a small discount. You can give a prize that may be fun or useful to your target audience (for example a hat or a book)You can provide an analysis of the data paired up with a one time consultation. For example, you can offer a consultation based on your findings to each city who takes part in the air pollution research.

Complaints

You need to describe procedures how you will handle complaints of participants or non participants about your research. You need to specify where and how somebody can make a complaint and what are the standard procedures: who will be involved in addressing the complaints and in what timeframe, in what form. You may also want to list institutions that are outside of the research institutions, which are independent organisations for complaint procedures and can make professional judgment about the research complaint (e.g. the ethics committee of the respective country). You may also need to think about complaints that come from non participants, e.g. from neighbouring houses of the research facility.

Withdrawal and voluntariness

Research participation needs to be voluntary. One way to ensure voluntariness is to specify how participants can withdraw their participation. You need to specify that participants can withdraw at any time point and they can withdraw also after they finished their participation. You can write in the informed consent form (see below) how they can withdraw, do they need a written withdrawal or is a verbal one enough. You also need to specify in the withdrawal, voluntariness and the data management section how you will handle the obtained data: do you delete it right away, do you collect withdrawals and you delete data all at once in the beginning of data analysis.

Two important elements of ensuring voluntariness is that you state in the informed consent form that participation is voluntary. You need to explain it verbally at the time of data gathering. You need to let participants know that withdrawing from the research does not have any consequences, especially negative consequences to them or anybody else, or the research.

Informed consent

You need to specify the process of when, where and how you will gain informed consent from your participants. You may not need a written signature of each participant if the research is minimal risk. This is called waiver of consent. You need to ask the opinion of the respective review board or ethics committee and read the document if your research is eligible for waiver of signature.

Confidentiality

You need to specify how you keep confidentiality in your research. What this means is how you are ensuring that no individual data is released or analysed as well as the identity of each participant or institution is **concealed**. You need to give specific reasons why you'd want to reveal the identity of a participant and why it is necessary or beneficial. For example, you'd like to present data and you want to list the organisation. However, there are two females in the organisation compared to the 1000 male employees. If you disclose gender or sexual orientation to your research and what the female identified participants think of a certain topic then their identity is no longer concealed because it is easy to know who they are. You may choose to publish the name of the organisation but

not disclose the opinions based on sexual orienation or you can publish the data without the name of the organisaton and choose to highlight opinions based on gender. You cannot publish both the name of the organisation and opinions based on gender or sexual orientation because you'd **breach of confidentiality**.

You may need to think about **further aspects** of confidentiality. You need to write about them both at the confidentiality section and their respectivesection as well: identity of participants, data management, you may need to delete certain data - how and when you you delete data, data analysis plan and aggregated form data reporting, unanticipated or adverse problems. E.g. you lose the hard drive or your passport is leaked and the identity of participants can be revealed). You need to think about all these aspects and provide information on how you will handle each of them when it comes to confidentiality.

Potential benefits and harms

You need to think about all the potential benefits and harms you may create with your research. You need to think about the individual level of benefit and harm as well ason the community and societal level of benefit and harm.

Potential benefits

You need to list potential benefits that can be individual and community level benefits. What are the positive outcomes for the individual who is participating in the research? What are the benefits for the community or area where the research takes place and what may be the benefit for the society if the research is being carried out.

Potential harms

You need to give a list of all potential harms that can surface during or after your research and how you minimize them by having preparatory, preventitive steps or what steps you will take if a harm surfaces during or after your research. For example, you inform participants what is about to happen to minimize surprise and stress. You can provide contact information who they can reach out to if they feel stressed after the research. Another example would be when you are working with dangerous materials in a chemistry laboratory and one of the materials gets out of the research room to the corridor of the building or to the street. What are the procedures you take, who are the people and organisations you notify (e.g. hospital). How do you clean up the area and ensure it is clean again.

Unanticipated problems or adverse events

You need to give a description of procedures what you will do if an unanticipated problem or adverse event takes place during or after your research. For exmaple, your data collecting software stops recording data in the middle of the session. Do you ask the participant to start from the beginning or the research design is set up in a way that you cannot record data twice from the same person, hence you need to delete this specific answer.

About data

The aim of preparing a research proposal and creating a research design is to collect data that describes a phenomenon. You need to think about different aspects of data and list it in your research protocol to ensure you are choosing the proper methods and methodology. You need to write about your data collection procedures, data management procedures and confidentiality as well as data storing, and last but not least your data analysis plan and statistical considerations.

Data collection procedure

You need to provide details on the procedure of data collection. What type of data will you collect and what is the best way to collect it? For example, are you collecting qualitative data with open ended questions or quantitative data with surveys (you can read about quantiative and qualitative methods, and their differences in detail in Chapter 3.). How is the chosen data collection method the best option to capture what you are looking for? How often will you collect data and how frequently? Do you collect data once or at two time points, and do you repeat it yearly? In what format

will you collect and store you data? Will you collect it on the computer by asking participants to write words or with pen and paper. Do you use audio recording and the transcripts of the record?

You may need to have additional description of data collection and approval for data collection if you would like to collect sensitive or protected health information, and also when you would like to analyze educational records.

Data management procedures and confidentiality

You need to provide a detailed description on how you will manage your data. You need to describe how you collect data and where (e.g. with which software) and how you will store it. You need to think about the whole lifecycle of the data: from the time you collect data to the time you de-identify your data or destroy it as well as where you store, how you transport and analyze it. Who will be the people accessing this data? You can see this section as how you can securely store and handle your data at any time point and how long you will hold onto it.

Data analysis and statistical considerations

You need to create a prospective data analysis plan on how you'd like to analyze your data after you finished data collection. For example, how many participants you need, how do you handle missing data, what statistical test you'd like to use, what data visualization would be best. This plan may change over time, however, this plan gives a perspective to the review board or ethics committee for what reason you are starting your research and you do not take advantage of your data collection.

Research methodology or research methods?

You might have noticed the words research methodology and research methods in this chapter. These two terms are interrelated but not interchangeable. They are two aspects of your research but the terms cannot replace each other.

Research methodology is a chosen methodology, framework that you choose to apply for your whole research. In many cases, the research design will indicate your chosen research methodology or to the contrary, first you choose a research methodology that determines your research design. Examples of research methodology qualitative or quantitative research methodology. You can also think about research methodology on a higher level: are you choosing a positivism lead research paradigm where you rely on data collection to describe the phenomena of the world that surrounds us or do you choose a different route? Research methodology is an approach, a framework to research and a way of thinking that shapes your research from the moment you start thinking about the preparation of your research until you explain your findings in the discussion as well as where and in what form you'd like to publish your results.

Research methods are the different ways or methods you use in a chosen research methodology framework. Research methods can be described as the little bricks and tasks that are directly originated from your chosen research methodology. For example, you chose qualitative research methodology and you would like to get to know the Tulip nation. One research method you can follow is that you recruit a Tulip person from the Tulip nation from each societal group (whatever the major groups may be) and you ask the same 5 questions from each person: what is your name? How old are you? What is your favourite food? What is your most famous dish in Tulip land? And what is the most common dessert in Tulip land?

We have similar expressions in other areas of science. You can find similar terminology when you read about learning methodology and learning methods or teaching methodology and teaching methods. Learning methodology is the way of learning and learning methods are the specific practices that support an ideal learning situation and methodology. Teaching methodology is the science and way of teaching and teaching methods are the specific tasks you use in a classroom for example to teach kids a nwe alnguage.

Methodologies are the underlying construct and methods are the specific ways to carry out a methodological framework (Graph1.).
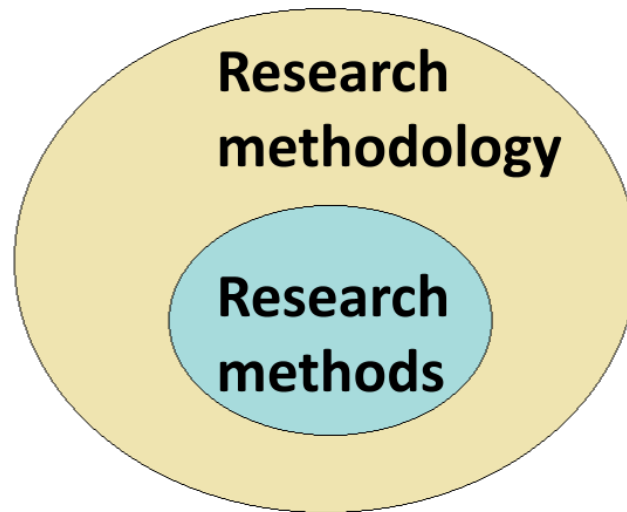
Figure 1.1 The relationship between research methodology and research methods.

Writing a scientific report

In this section you will read about important aspects of scientific paper writing. What is replicability and how can you ensure replicability of a research? Why is it important to write the result section first? What are the chapters of a scientific paper?

Writing the results chapter of a scientific article

Writing a scientific paper may have a different timeline than the sequence of events you took to conduct your research. Conducting research starts with reading current scientific articles, preparing your research question, preparing your methodology and methods and then you collect your data. When it comes to writing a scientific article it is advised to start with the results. The result chapter of a scientific paper contains facts that are direct results of your data collection. In the results you don't write about literature, explanations or suggestions. Writing the results chapters first lets you focus on the facts and what are the results of the data collection. You can see your data without the impact or bias of the literature or other researchers' opinion. In some research protocols researchers decide that one researcher reads literature to prepare the research question and cooperates with certain colleagues on preparing the research methodology and methods. An independent researcher will collect and report the data independently from the other researcher. With a research designwhen researchers are working independently on parts of a research project you can ensure to keep facts as objectiveas possible. There are research designs where researchers taking part in the data collection and people who report the findings are blind to the research design. E.g. the data collector and reporter are two different researchers and only either of them or none of them know which participant is in which group . This is an even more strict way to ensure results are not impacted by what a researcher would like to see as a result. All in all, reporting the results first helps to ensure impartiality of data.

Replicability

An important aspect for making a decision whether or not a research results can be trusted and we can draw conclusions that describe the reality is to have the same results from different or independent sources. In order to ensure we are comparing two results and we make a judgment if they are the same results or different results we need to make preparations: we need to follow the same methods, involve the same participants, tools and procedure. This way we can replicate the same

circumstances for the research and see if our results are the same or different. The process of ensuring our results are comparable is replicability. Replicability means that if a researcher reads your scientific article on the other side of the world and creates the same research design, meaning they replicate the research then they will have a high probability the research results will be the same, hence they can be compared. If the results are the same then the research findings are proven again. If the results are different then you need to do additional literature reading and find possible explanations why they are different as well as find other factors explaining your results.

Chapters of a scientific report

In this next section you will read about the structure of a scientific article: introduction and literature review, methods (participants, tools and procedure), results, discussion and conclusion, acknowledgements, references, glossary, abbreviation and appendix (Table 3.).

1. *Introduction and literature review*

The first chapter of a scientific report is an ***introduction*** to the topic you'll dig deeper in your research paper. You can start by stating the current state of affairs, the biggest question related to the field or a new area to discover. Then you can explain in a paragraph why you chose this specific topic, why it is relevant and why it might be interesting to read.

After the introduction you need to introduce the ***literature review*** related to your research. First, you need to start with a broad perspective and with the relevant history. Then, you need to review all related and current literature and findings on the field. You need to end the literature review with your ***research question*** and turn it into a ***hypothesis*** that you'll investigate in your research.

We can visualize the literature review as a ***funnel***: the top of the funnel is wide and the bottom is narrow (Picture 1.). In this wide top of the funnel you need to include everything relevant to your research topic - this will be the beginning of your literature review, this will be a broad perspective on the topic and related historical research and facts. The funnel is getting thinner and this where you need to include every current and relevant literature related to your specific research. The bottom of the funnel is the thinnest because here you need to focus on your research question. The hypothesis will be coming out of the end of your funnel as a result of your introduction and literature review.
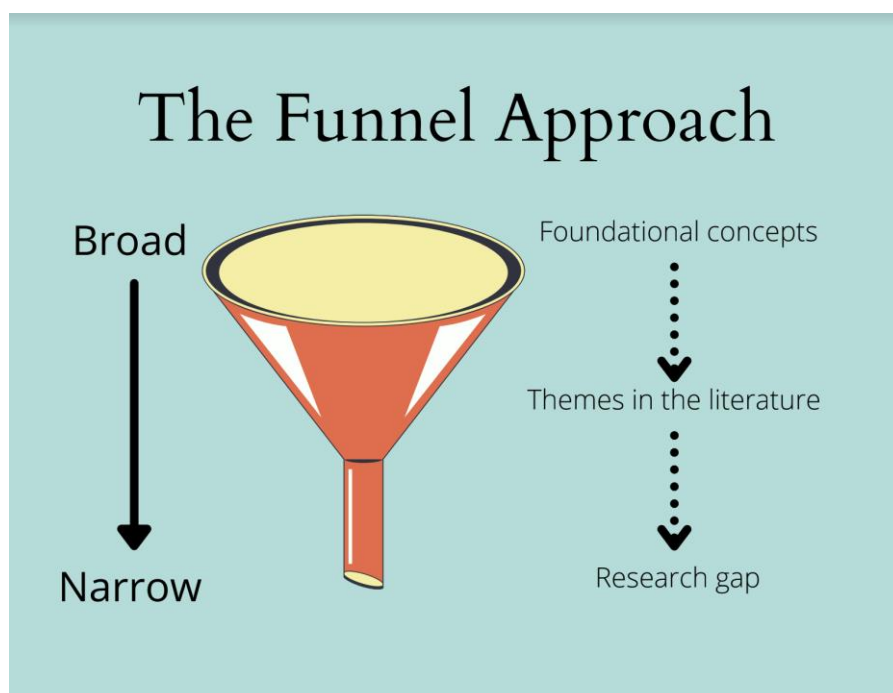
Figure 1.2. The funnel approach to literature review.

2.   Methods

In the methods section you will describe the methods you chose for your research. Namely, the participants you involve in your research, tools you use and the procedure you followed. The detailed description of the methods will make sure that your research is replicable so that other researchers can follow your methods and most likely will have the same results.

a.   Participants.

You need to report how and why you choose a certain population or demographic for your research and give descriptive statistics of who they are.

b.   Tools

You need to describe the tools you used for your research. Tools are highly variable depending on which field you are in. For example, sociologists may use surveys, biologists may collect biomarkers, chemists may need a laboratory for certain particles or economists may need certain softwares, statistical analysis tools or visualization aids.

c.   Procedure

The procedure is the chain of events in your research. How and when did each step of the research take place and why did you choose them.

3.   Results

Typically, you want to start by writing down your findings. The result section of research is focusing solely on the facts of the finding. Linking results to literature, professional opinion, future perspective or any suggestions based on the results is not part of the results chapter of your paper. Results can be numbers of people reacting in a specific way, number of sunny hours in the desert or the financial balance in each month of the research.

4.   Discussion

In the discussion of a research article you are putting your research results in perspective: you find links between the literature review and results. You interpret the results based on the literature you wrote in the beginning of your paper or you do additional reading if the research results warrant it. You can also discuss **future implications** of your research and **practical suggestions** on your field. You can also write one or a couple of paragraphs long **conclusions** where you highlight the essence of your findings and discussions as well as how it relates to existing practices and how it broadens the perspective on your area of domain.

5.   Acknowledgements

In the acknowledgements part of your article you can choose to thank certain people and there are personals or entities that you are obligated to involve. As for who you'd like to thank, you can involve as many people or entities as you'd like. However, when it comes to funding for research, cooperating research partners or institutions who supported your data collection with a letter or institutions who gave you a grant then you can be obligated to write their names, the organisation's name, the time span of your cooperation, the amoung of money allocated for your research and certain eligibility numbers. You need to get informed about these before you submit your research paper for publishing.

6.   References

You need to refer to every author, article, book or any resource that you used in your literature review, during preparation for methods and methodology, and the tools you use. If you read something or include somebody's idea you need to refer to them accordingly. In the references you need to list everyone in alphabetical order by the first author's name. Referring to every source of information ensures that you do not plagiarise. Plagiarism happens when someone does not write a research finding themselves but they use other people's work without giving them praise for their work. They seem to appear as if they wrote a research finding when in fact they copied somebody else's work.

7.   Glossary and abbreviation

8. Glossary and abbreviations are an optional part of a scientific article. Typically, they are used when you write a longer body of text (like a book chapter or thesis) or you work on the field that uses many abbreviations in their day to day work but you'd like a broader audience to understand your work. For example, you are a biologist who collaborates with psychologists and you publish in a non-biology paper about hormones. You decide to include abbreviations about the specific hormones and parts of the nervous system so that you do not need to write thei full name each time, yet non biologist readers also understand your findings. You can choose to write an abbreviations for any articles but it is not compulsory in every scientific paper.

9. **Appendix**

Additional materials that would be too long in the body of the paper. For example, a table that is one full page long. It is relevant and important but would be too long in the methods or results. Appendix is an optional part of a research paper.

Table 1.3. Chapters of a scientific article.

Chapter	Content
Introduction	Introduction: current state of affairs on the field, relevance of your research Literature review - start with broad perspective - end with the research question and hypothesis Usually you want to read literature before you start designing your research and have additional reading before you write your discussion
Methods	Ensuring replicability by a detailed description: - Participants - Tools - Procedure
Results	Measurements and findings Usually you want to start writing your research papers by writing your results
Discussion	Explanation of results embedded in literature from the literature review and additional readings
Conclusion	You can sum up your finding and discussion in a short paragraph You can also write about future perspectives or practical implication of your research shortly
Acknowledgements	Supervisors and co-workers Institutions and organizations Grant providers or financial endorsement
References	Literature used Ensuring you are not plagiarizing
Glossary and abbreviations	List of concepts used and their short description Abbreviations for commonly used short terms of expressions in your paper, such as CS = computer science
Appendix	Additional materials that would be too long in the body of the paper. For example a table that is one full page long. Is relevant and important but would be too long in the methods or results

Summary

In this chapter of Introduction to research methodology you read about what is the difference between a research protocol and scientific paper chapters. Before starting any research you need to get to know the ruling trends and current research of the area. You can get to know this by reading scientific articles, taking classes at a university or going to a conference. In the next section you can read an overview of how you can conduct a research from ground up. You can read in more detail about each section in this chapter and in this course. You can read more in detail about

- What a research protocol is and what may be important chapters of it
- What research methodologies are used nowadays
- What is the difference between research methodology and methods
- Why are review boards and ethics committees important
- What are the steps of carrying out a research
- How to write a scientific article

Steps of starting a new research

1. Getting to know the current state of affairs on the field
   a. Reading articles
   b. Taking classes at a university
   c. Attending a conference
   d. Reaching out to our network
2. Research protocol
   a. Writing about the scientific, literature background
   b. Specifying the research question and creating a hypothesis
   c. Having a look at formatting expectations of the respective board or committee
   d. Preparing needed documents, for example:
      i. Marketing materials for recruitment
      ii. Signing conflict of interest documents
      iii. How you will guarantee confidentiality and voluntariness
      iv. Data management plan and data protection
      v. Methodology used and why you chose it
         e.g. Qualitative or quantitative methodology
      vi. Method: participants, tools, procedures
      vii. Investigators in the research and their roles
      viii. Timeline of your research
3. Permission of the respective review board of ethics committee, for example:
   a. National board
   b. Institutional board
   c. Ethics committee
4. Delivery of methods based on the research protocol
   a. Recruiting participants and/or purchase needed tools
   b. Collecting data
   c. Analyzing data
5. Writing a scientific report
   a. Having a look at the expected formatting of your report
   b. Writing the results section
   c. Reading the literature review you prepared for your research protocol

d.   Finalizing your methods section if you needed to diverge from your plans in the research protocol or the circumstances changed that impacted your methods

e.   Writing the discussion in which you link your factual results and your literature review

f.   Do additional reading to explain gaps or new findings

g.   Submit your report

h.   Change your report based on feedback and peer review

This chapter on research methodology and methods is a general introduction to scientific thinking and delivery of research. Thus, it can be applied to any field of research including business and sustainability development. In this section we'd like to show you some examples of business and sustainability development where these research principles were applied successfully.

n important mediating factor in the success of a sustainability development is convincing colleagues and organisations that the changes made towards sustainability and investing in the future is useful and that they not only say they accept these new principles but they also change their attitudes and their behaviours. There are great surveys to explore if organisations are carrying out not only sustainability development but we are creating lasting change in people's attitudes and behaviour.

For example, the scale of knowledge, attitudes and practices related to sustainability in university students is a good example for measuring change in behaviour (Salas-Zapata, Cardona-Arias, 2021).

To gain a comprehensive overview of sustainability knowledge and attitudes we recommend reading Zwlickle and Jones's (2018) handbook on research related to sustainability and social science.

Another important aspect is to convince stakeholders and leadership to allocate financial resources for sustainability development and research as well as human resources, time resources, material resources (e.g. computer, a room, software, etc.). We recommend reading an evaluation instrument for stakeholders working with sustainable development (Gericke, Pauw, Berglund, Olsson, 2018, 2019) in order to provide sufficient reasoning for the need of sustainability development research.

Discussion questions

1.   . Please think of a research area or topic that could be measured by a hypothesis and think about a research topic that could not be measured by a hypothesis!

a.   Write a research question about the research topic that you picked and can be measured with a hypothesis!

b.   Turn this research question into a hypothesis.

c.   Turn this hypothesis into a null hypothesis.

2.   Read the levels and stages of Kohlberg's stages of moral development. Write an example of how people would behave in the following situation according to each level and stage: you see a fellow researcher deleting data that would contradict their hypothesis. How would a person behave on each moral developmental level and stage?

3.   Scientific writing: You would like to measure how much water 6 people drink in July and in December. 3 people do not have regular physical exercise in their life and 3 people go on a 30 minute run 3 times a week. Write down/discuss the Methods section in your paper. Which aspect of the research would be written in the participants, tools and procedure part?

4.   Participants. You would like to investigate how trees are changing as the altitude is changing in the Himalaja. Read the participants chapter of the research protocol and write about each point that needs to be specified in your research: participant inclusion and exclusion criteria, recruitment and screening procedures, enrollment, compensation, complaints, withdrawal and voluntariness, informed consent and confidentiality.

5.	Read the chapter on research methodology and methods. Pay special attention to the universal principles of research preparation and delivery. Think about your field of studies: what is an interesting research gap you could explore as your thesis topic? Write at least 2 paragraphs on what this research interest is, why you chose it and what would be a research step you can start tomorrow?

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CHAPTER 2: IDENTIFIED RESEARCH FOCUS ON SUSTAINABLE DEVELOPMENT

In today's world, the concept of sustainable development has gained significant traction, emerging as a crucial framework for addressing the complex and interconnected challenges we face. Sustainable development, characterized by the pursuit of economic growth while maintaining environmental integrity and social equity, necessitates a comprehensive understanding of the issues at hand and the formulation of effective solutions. Research plays a pivotal role in this endeavor, providing insights into the causes, consequences, and potential solutions to sustainable development challenges. This chapter explores into the realm of research in sustainable development, guiding readers through the process of identifying and conducting research in this dynamic and multifaceted field.

The chapter commences by establishing a solid foundation of key concepts, ensuring a shared understanding of the terminology and principles that underpin sustainable development research. Next, it explores the vast scope of research in sustainable development, encompassing environmental, social, and economic dimensions. This is followed by a detailed discussion on identifying research in sustainable development and real-world examples that showcase successful sustainable development research papers. The chapter concludes by explaining how to measure sustainability in various aspects including different metrics and indicators used to measure sustainability and track progress.

2.1 Introduction to Sustainable Development

Sustainable development is a holistic approach to meeting the needs of the present without compromising the ability of future generations to meet their own needs. It encompasses a balance between economic, social, and environmental considerations, aiming to create a resilient and equitable society while preserving the planet's natural resources. The concept emerged as a response to the recognition that traditional models of development often led to environmental degradation, social inequality, and economic instability. Sustainable development, as defined by the 1987 Brundtland Report, is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." At its core, sustainable development encompasses a holistic approach that integrates environmental, social, and economic dimensions.

The roots of sustainable development can be traced back to the early 1970s, when concerns about environmental degradation and the depletion of natural resources began to gain prominence. The 1972 United Nations Conference on the Human Environment, held in Stockholm, Sweden, marked a pivotal moment in the evolution of environmental discourse, bringing together representatives from 113 countries to address the pressing environmental challenges facing the planet.

In 1980, the International Union for Conservation of Nature (IUCN) published the World Conservation Strategy, which introduced the term "sustainable development" as a global priority. The strategy recognized the interdependency between human development and environmental well-being, emphasizing the need to balance economic growth with environmental protection.

The concept of sustainable development gained further momentum in 1987 with the publication of the Brundtland Report, titled "Our Common Future." Commissioned by the World Commission on Environment and Development, the report provided a comprehensive assessment of the global environmental situation and outlined a framework for achieving sustainable development. The report's definition of sustainable development resonated widely and became a cornerstone of international environmental policy.

The 1992 United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, marked a significant milestone in the pursuit of sustainable development. Held in Rio de Janeiro, Brazil, the conference brought together over 170 heads of state and government, representing the vast majority of the world's population. The Earth Summit resulted in the adoption of a number of landmark agreements, including the Agenda 21, a comprehensive action plan for sustainable development into the 21st century, and the Rio Declaration on Environment and Development, which reaffirmed the principles of sustainable development and established principles for international environmental governance.

In the years following the Earth Summit, sustainable development has remained at the forefront of international environmental policy. The 2000 Millennium Summit, held in New York City, resulted in the adoption of the Millennium Development Goals (MDGs), a set of eight time-bound targets aimed at reducing poverty and addressing other pressing global issues. The MDGs, which were succeeded by the Sustainable Development Goals (SDGs) in 2015, have played a crucial role in mobilizing global efforts towards sustainable development.

Today, sustainable development remains a critical framework for addressing the complex and interconnected challenges we face, from climate change and biodiversity loss to poverty and inequality. The concept continues to evolve and adapt to the ever-changing global landscape, offering a pathway towards a more sustainable and equitable future for all.

The significance of sustainable development lies in its transformative potential to address the interconnected challenges facing humanity, striking a balance between economic prosperity, social well-being, and environmental health. Several key aspects underscore the importance of sustainable development:

1. **Environmental Preservation:** Sustainable development recognizes the finite nature of the Earth's resources and seeks to ensure their responsible use. By promoting sustainable practices, it aims to prevent environmental degradation, biodiversity loss, and the depletion of natural resources, fostering the long-term health of ecosystems.

2. **Social Equity and Inclusivity:** A core principle of sustainable development is the pursuit of social justice. It emphasizes the fair distribution of resources, opportunities, and benefits, aiming to alleviate poverty, reduce inequality, and enhance the quality of life for all. In doing so, it contributes to creating more just and inclusive societies.

3. **Economic Resilience:** Sustainable development encourages economic growth that is not only financially viable but also socially and environmentally responsible. By promoting sustainable business practices, it seeks to create resilient economies that can withstand shocks while fostering innovation and responsible entrepreneurship.

4. **Global Collaboration:** The challenges addressed by sustainable development, such as climate change and poverty, transcend national borders. Sustainable development encourages international cooperation and collaboration to address global issues collectively. It recognizes the interconnectedness of nations and promotes a shared responsibility for the well-being of the planet.

5. **Long-Term Perspective:** By focusing on the needs of the present without compromising the ability of future generations to meet their own needs, sustainable development emphasizes a long-term perspective. This forward-thinking approach is essential for addressing issues like climate change, where the impacts may be felt most significantly by future generations.

6. **Policy and Governance:** Sustainable development provides a framework for the development of effective policies and governance structures. It encourages governments, businesses, and communities to adopt practices that consider the triple bottom line—economic, social, and environmental factors—leading to more comprehensive and integrated decision-making.

7. **Health and Well-being:** A sustainable development approach recognizes the intrinsic connection between environmental health and human well-being. Clean air, water, and a healthy

environment are fundamental to the health of communities. Sustainable development seeks to create conditions that support physical and mental well-being.

8. **Innovation and Technology:** Sustainable development encourages the development and adoption of innovative technologies that can address challenges in energy, agriculture, transportation, and more. Embracing sustainable technologies can lead to more efficient resource use and reduced environmental impact.

9. **Cultural and Ethical Considerations:** Sustainable development respects cultural diversity and incorporates ethical considerations into decision-making. It acknowledges that different communities may have unique relationships with their environments and seeks to integrate these perspectives into sustainable practices.

2.2 Key Principles of Sustainability: environment, equity, and economy

Sustainable development is often conceptualized through three interconnected pillars, representing the key dimensions that need to be balanced for a holistic and enduring approach to societal progress. These three pillars are commonly known as the Triple Bottom Line or the three E's: Economy, Equity, and Environment.

1. **Economy:**
- *Objective:* To ensure economic development that is financially viable and contributes to the overall well-being of society.
- *Key Focus Areas:* Sustainable economic practices, responsible business conduct, poverty alleviation, job creation, and fostering innovation.
- *Rationale:* Economic sustainability emphasizes the need for businesses and economic systems to operate efficiently, generate wealth, and promote prosperity without compromising the long-term health of the economy or exploiting resources unsustainably.

2. **Equity:**
- *Objective: To promote social equity, justice, and the well-being of individuals and communities.*
- *Key Focus Areas: Education, healthcare, poverty reduction, gender equality, social inclusion, and community development.*
- *Rationale: The social pillar emphasizes that sustainable development must prioritize the needs and* rights of all individuals, fostering inclusive societies where people have access to basic services, are treated fairly, and can participate in decision-making processes.

3. **Environment:**
- *Objective: To safeguard the health and resilience of ecosystems, biodiversity, and the overall environment.*
- *Key Focus Areas: Conservation, sustainable resource management, pollution control, climate action, and ecosystem restoration.*
- *Rationale: The environmental pillar highlights the importance of maintaining the health of the planet, acknowledging that human well-being is intricately connected to the health of ecosystems. Sustainable* development must ensure that human activities do not deplete natural resources or harm the environment irreversibly.

These three pillars are interdependent, meaning that actions in one area can have cascading effects on the others. For example, unsustainable economic practices may lead to social inequalities or environmental degradation. Likewise, a healthy environment is essential for supporting social well-being, and a stable society is crucial for economic growth.

2.3 Sustainable Development Goals (SDGs): Explain the United Nations Sustainable Development Goals and their role in guiding research efforts.

The United Nations Sustainable Development Goals (SDGs) are a set of 17 interconnected global goals adopted by all United Nations Member States in 2015 as part of the 2030 Agenda for Sustainable Development. These goals are designed to address a wide range of pressing challenges, encompassing economic, social, and environmental dimensions, with the overarching aim of creating a more sustainable and equitable world.

The 17 Sustainable Development Goals are as follows:

1. No Poverty
2. Zero Hunger
3. Good Health and Well-being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation, and Infrastructure
10. Reduced Inequality
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace, Justice, and Strong Institutions
17. Partnerships for the Goals

These goals are not only a shared global vision for a better future but also serve as a universal call to action. They recognize the interconnectedness of global challenges and the need for collaborative efforts to achieve sustainable development. The SDGs emphasize leaving no one behind, addressing inequalities, and integrating economic, social, and environmental considerations into development strategies.

The role of the SDGs in guiding research efforts is crucial in several ways:

1. **Setting Priorities:** The SDGs help prioritize research areas by identifying key challenges that need urgent attention. Researchers can align their work with specific goals to contribute meaningfully to global sustainability objectives.

2. **Interdisciplinary Collaboration:** The SDGs require an interdisciplinary approach, encouraging researchers from diverse fields to work together. This collaboration helps address complex, interconnected issues that cut across traditional academic boundaries.

3. **Monitoring and Evaluation:** The SDGs provide a framework for measuring progress toward sustainability. Research efforts can contribute by developing methodologies, indicators, and tools to monitor and evaluate the impact of policies and interventions related to the goals.

4. **Policy Influence:** Research aligned with the SDGs can have a direct impact on policy development. By generating evidence-based insights, researchers can inform decision-makers and contribute to the formulation of effective policies that promote sustainable development.

5. **Global Connectivity:** The SDGs provide a common language and framework for researchers around the world. This global connectivity fosters knowledge exchange, collaboration, and the sharing of best practices to address common challenges.

6. **Local Implementation:** While the SDGs are global in scope, their implementation often occurs at the local level. Research can play a vital role in understanding local contexts, tailoring solutions, and facilitating community engagement to achieve sustainable development objectives.

In summary, the United Nations Sustainable Development Goals serve as a roadmap for global sustainability, and researchers play a crucial role in advancing these goals through their work. By aligning research efforts with the SDGs, scholars contribute to a collective effort to build a more just, equitable, and sustainable future

2.4 The Scope of Research in Sustainable Development

Sustainable development encompasses a wide range of interconnected issues, encompassing environmental, social, and economic dimensions. Research in sustainable development seeks to address these complex challenges by providing insights into the causes, consequences, and potential solutions. The scope of research in sustainable development is vast and ever-evolving, encompassing a diverse array of topics and approaches.

Environment Issues

Environmental concerns lie at the heart of sustainable development. Research in this area focuses on understanding and addressing the impacts of human activities on the natural world. Topics of interest include:

- Climate change: Research investigates the causes, impacts, and mitigation strategies for climate change, including greenhouse gas emissions reduction, renewable energy development, and adaptation to climate change impacts.
- Biodiversity loss: Research examines the drivers of biodiversity loss, such as habitat destruction, pollution, and overexploitation, and explores conservation strategies to protect endangered species and ecosystems.
- Pollution: Research investigates the sources, impacts, and control of various types of pollution, including air pollution, water pollution, and soil contamination.
- Natural resource management: Research explores sustainable practices for managing natural resources, such as forests, fisheries, and water resources, to ensure their long-term viability.

Equity Issues

Sustainable development also encompasses equity dimensions, recognizing that human well-being is essential for achieving a sustainable future. Research in this area focuses on addressing social inequalities and promoting social justice. Topics of interest include:

- Poverty reduction: Research investigates the causes and consequences of poverty and develops strategies for alleviating poverty and improving livelihoods.
- Health: Research examines the environmental and social determinants of health, including access to healthcare, sanitation, and nutrition.
- Education: Research explores the role of education in promoting sustainable development, including environmental education, sustainability literacy, and skills development.
- Social justice: Research investigates issues of inequality and discrimination based on factors such as gender, race, ethnicity, and social class, and develops strategies for promoting social inclusion and equity.

Economys Issues

Economic considerations are also integral to sustainable development. Research in this area focuses on developing economic models and approaches that align with environmental and equity goals. Topics of interest include:

- Sustainable economic growth: Research explores the potential for economic growth without compromising environmental integrity or social equity.

- Sustainable consumption and production: Research investigates patterns of consumption and production, identifying opportunities for reducing resource consumption, minimizing waste, and promoting sustainable practices.

- Green economy: Research examines the transition to a green economy, characterized by low-carbon, resource-efficient, and socially inclusive economic activities.

- Economic instruments: Research explores the use of economic instruments, such as environmental taxes, subsidies, and market-based mechanisms, to promote sustainable development.

The scope of research in sustainable development is continuously expanding as new challenges emerge and our understanding of complex systems deepens. Interdisciplinary and transdisciplinary approaches are becoming increasingly important in addressing sustainable development issues, bringing together researchers from diverse fields to tackle complex problems and develop holistic solutions.

2.5 Case Studies: real-world examples and case studies that showcase successful sustainable development research projects

Research in sustainable development spans a wide range of disciplines and addresses diverse challenges. Here are a few examples of research topics within the realm of sustainable development:

1. **Renewable Energy Technologies:**

- Research on the development and improvement of renewable energy sources such as solar, wind, hydro, and geothermal energy.

- Investigation into energy storage technologies to enhance the reliability and efficiency of renewable energy systems.

Examples:

Østergaard, P. A., Duic, N., Noorollahi, Y., Mikulcic, H., & Kalogirou, S. (2020). Sustainable development using renewable energy technology. *Renewable energy*, *146*, 2430-2437.

Hao, L. N., Umar, M., Khan, Z., & Ali, W. (2021). Green growth and low carbon emission in G7 countries: how critical the network of environmental taxes, renewable energy and human capital is?. *Science of the Total Environment*, *752*, 141853.

2. **Circular Economy Practices:**

- Studies on circular economy models that aim to minimize waste, promote recycling, and design products with a focus on reuse and longevity.

- Research on sustainable supply chains to reduce the environmental impact of manufacturing and distribution processes.

Examples:

Suárez-Eiroa, B., Fernández, E., Méndez-Martínez, G., & Soto-Oñate, D. (2019). Operational principles of circular economy for sustainable development: Linking theory and practice. *Journal of cleaner production*, *214*, 952-961.

Dantas, T. E. T., de-Souza, E. D., Destro, I. R., Hammes, G., Rodriguez, C. M. T., & Soares, S. R. (2021). How the combination of Circular Economy and Industry 4.0 can contribute towards achieving the Sustainable Development Goals. *Sustainable Production and Consumption*, *26*, 213-227.

3. **Social Equity and Inclusion:**

- Research on gender equality and social inclusion in various contexts, exploring the intersectionality of social identities.

- Investigations into community-based development approaches that empower marginalized populations and promote social justice.

Examples:

Yang, L., & Zhang, Y. (2020). Digital financial inclusion and sustainable growth of small and micro enterprises—evidence based on China's new third board market listed companies. *Sustainability, 12*(9), 3733.

Cisneros-Montemayor, A. M., Moreno-Báez, M., Voyer, M., Allison, E. H., Cheung, W. W., Hessing-Lewis, M., ... & Ota, Y. (2019). Social equity and benefits as the nexus of a transformative Blue Economy: A sectoral review of implications. *Marine Policy, 109*, 103702.

4. **Innovations in Sustainable Technologies:**

- Studies on the development of innovative technologies with reduced environmental impact.

- Research on green technologies, such as eco-friendly materials, energy-efficient devices, and sustainable transportation solutions.

Examples:

Silvestre, B. S., & Ţîrcă, D. M. (2019). Innovations for sustainable development: Moving toward a sustainable future. *Journal of cleaner production*, *208*, 325-332.

Hysa, E., Kruja, A., Rehman, N. U., & Laurenti, R. (2020). Circular economy innovation and environmental sustainability impact on economic growth: An integrated model for sustainable development. *Sustainability*, *12*(12), 4831.

2.6 Measuring Sustainability: Explore different metrics and indicators used to measure sustainability and track progress.

Measuring sustainability involves the systematic assessment of environment, equity, and economic factors to gauge the impact of human activities and initiatives on the overall well-being of the planet. Various metrics and indicators serve as valuable tools in this assessment process, offering quantifiable measures to track progress and inform decision-making. These indicators span multiple dimensions, reflecting the interconnected nature of sustainability.

Table 2.1 Assessment factors

Environment	Carbon Footprint	Measures the total greenhouse gas emissions, often expressed in CO2 equivalents, associated with human activities, products, or organizations.
	Biodiversity Index	Quantifies the diversity of plant and animal species in a given ecosystem, offering insights into the health of natural environments.
Equity	*Human Development Index (HDI)*	Assesses a country's average achievements in three basic dimensions of human development—health, education, and income.
	Gender Equality Index	Evaluates gender-based disparities in various aspects, including education, employment, and political representation.
Economy	*Gross Domestic Product (GDP)*	Measures the total economic output of a country, but it does not account for equity and environmental factors, leading to the development of alternative indicators like Gross National Happiness (GNH).
	Inclusive Wealth Index	Evaluates a nation's wealth by considering not only traditional economic assets but also natural and human capital.

Energy and Resource Efficiency Metrics	Energy Efficiency Ratio	Assesses the efficiency of energy use in a system or process, providing insights into how effectively energy resources are utilized.
	Water Use Efficiency	Measures the amount of water used to produce a unit of goods or services, helping to identify opportunities for conservation.
Corporate Sustainability Metrics	Sustainability Reporting	Involves the disclosure of a company's equity, environment, and economic performance through annual reports or sustainability reports.
	Triple Bottom Line (TBL)	Evaluates a company's success based on its economic, equity, and environmental performance, emphasizing a holistic approach to business.
Community Well-being Metrics	Quality of Life Indicators	Include factors such as access to education, healthcare, cultural opportunities, and social cohesion, providing a comprehensive view of community well-being.
	Livability Index	Rates the quality of life in cities based on factors like safety, healthcare, and environmental quality.
Supply Chain Sustainability Metrics	Life Cycle Assessment (LCA)	Analyzes the environmental impact of a product or service throughout its entire life cycle, from raw material extraction to disposal.
	Supply Chain Transparency	Measures the extent to which companies disclose information about their supply chains, including equity and environmental practices

Each of the 17 SDGs is associated with specific targets, and there are numerous indicators used to measure progress toward achieving these targets. The indicators help track and assess the impact of policies, programs, and initiatives related to the SDGs. Some examples of indicators for some key SDGs are listed below.

Table 2.2 Indicators for key SDGs

Key SDGs	Indicator
Goal 1: No Poverty	Proportion of the population living below the national poverty line.
Goal 2: Zero Hunger	Prevalence of undernourishment; proportion of population with adequate access to food.
Goal 3: Good Health and Well-being	Maternal mortality ratio; under-5 mortality rate; life expectancy at birth.
Goal 4: Quality Education	Net enrollment ratio in primary education; literacy rate; proportion of children completing primary education.
Goal 5: Gender Equality	Gender wage gap; proportion of seats held by women in national parliament; prevalence of female genital mutilation.
Goal 7: Affordable and Clean Energy	Proportion of the population with access to electricity; share of renewable energy in the total energy consumption.
Goal 13: Climate Action	Greenhouse gas emissions; proportion of the population living in areas covered by a warning system for natural disasters.
Goal 16: Peace, Justice, and Strong Institutions	Homicide rate; proportion of the population subjected to physical, psychological, or sexual violence.
Goal 17: Partnerships for the Goals	Official development assistance (ODA); the proportion of government revenue from taxes.

There are more specific indicators associated with each target under each goal and the choice of indicators can vary depending on the country, region, or context, and it is essential to consider local circumstances and priorities when measuring progress toward the SDGs. National statistical offices and international organizations play a crucial role in collecting and reporting data on these indicators to monitor and evaluate progress globally.

Summary

Sustainable development, a multifaceted concept encompassing environment, equity, and economic dimensions, has emerged as a critical framework for addressing the complex challenges facing humanity. Research plays a pivotal role in identifying and understanding these issues, developing solutions, and informing policy decisions. This chapter provides an introduction to sustainable development, examples of research in sustainable development, and some measurements and indicators in sustainable development goals. The following chapters of the textbook will explain further on a variety of research approaches, including quantitative, qualitative, and mixed methods, to gain insights into the causes, consequences, and potential solutions to sustainable development challenges. In addition, it will provide explanation on data collection and analysis in sustainable development research.

Discussion questions

1. What are the key challenges to conducting research in sustainable development?
2. What is the role of transdisciplinary research in addressing sustainable development challenges?
3. **How do the different types of sustainability metrics and indicators capture the multifaceted nature of sustainability?**
4. **What are the challenges of selecting and using appropriate sustainability metrics and indicators? (**Discuss the factors to consider when choosing metrics and indicators, such as relevance, measurability, and data availability.)
5. **What are the limitations of relying solely on quantitative metrics to measure sustainability?**
6. **How can sustainability metrics and indicators be used to inform decision-making and drive progress towards sustainable development? (**Discuss how these metrics can be used to track progress, identify areas for improvement, and set ambitious sustainability goals.)

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CHAPTER 3: RESEARCH PARADIGMS AND STAGES

In this chapter, we will review the main scientific paradigms that influence the choice of research paradigm in a research project, which are the two main frameworks of scientific cognition, i.e. the scientific method and the methodology of hermeneutics. We also deal with the different forms of logical inference in scientific cognition, reviewing what induction and deduction are. We also clarify the concepts of primary and secondary data in scientific investigations. We look at qualitative and quantitative paradigms and their main stages, as well as mixed methods.

Qualitative and quantitative methods are discussed in more detail in later chapters.

Scientific research makes a major contribution to sustainable development. Choosing the right research framework is essential for scientific work to create a sustainable social and economic environment. This chapter introduces the basic concepts of scientific research.

3.1 Qualitative, Quantitative and Mixed methods

Paradigms in social sciences research

Before choosing the right research paradigm and design - qualitative, quantitative and mixed - it is important to be clear about the framework within we view the world. To understand the research paradigm you will read a brief overview of the philosophical background of research. The approach we take to understanding the world will help us to choose the right research methodology. To do this, we will review the main scientific paradigms. A paradigm is a world view, a framework of perspectives that we use to understand the world around us. Two areas of philosophy, help us to distinguish and grasp different perspectives: ontology and epistemology. **Ontology** deals with the fundamental questions of existence, e.g. What is the fundamental nature of reality?, while **epistemology** deals with the theoretical questions of the methods of knowing the world, the set of rules for the process of knowing, the relationship between the researcher and the subject being researched (fundamental question: Do we know, and if we know, how can we gain knowledge about reality?) (Brancati, 2018; Jupp, 2006; Scotland, 2012).

Scientific paradigms and related philosophical concepts

In the social sciences, such as education, psychology, political science, sociology, economics, we distinguish between two main overarching philosophical systems of view: the positivist paradigm (which developed in Europe in the 19th century) and the non-positivist/interpretivist paradigm approach. The **positivist paradigm** is a natural scientific ideal according to which society is governed by general and deterministic laws just as much as the physical world. According to this view, the main task of the social sciences is to identify, describe and systematise facts objectively and free of any theoretical speculation (Szokolszky, 2020). The positivist approach is thus based on the natural scientific view that science should understand the world not through abstract concepts but through empirical investigations. According to positivist thinking, human behaviour can be studied in the same objective way as natural phenomena, which leads to the conclusion that human and social phenomena can be objectively explained and predicted. According to the **non-positivist/interpretivist paradigm**, human behaviour cannot be described objectively and should be studied in a different way than natural phenomena, with an emphasis on individual experiences (Brancati, 2018; Hornyacsek, 2014).

Positivist research mainly uses quantitative research methodology, while non-positivist research uses qualitative research, which helps to understand individual perspectives and realities.

The positivist - and later post-positivist – approach has its limitations, namely that not all phenomena can be explained, described and examined objectively. In recent decades the former positivist approach has been increasingly replaced by an interpretivist or constructivist approach in many human sciences. According to **constructivism**, phenomena cannot be interpreted objectively or

subjectively, but must and can be interpreted in the given situation. This paradigm shift is also observed in ecological economics in order to understand the phenomena of the discipline as best as possible (Tacconi, 1998).

The two main approaches are compared in Table 3.1 along the main questions of ontology and epistemology, indicating which approach is closer to which research paradigm.

Table 3.1 Comparison between positivism and interpretivism in the view of the two philosophical field (Based on Brancati, 2018

Philosophical field and its main question	Answers to the philosophical questions	
	Positivism	Non-positivism/Interpretivism
Ontology What is existence?	There is an objective truth and reality in the world, which is independent from the observer.	The world is based on the subjective interpretation of the individual. There is no one truth. There are different truths and their interpretations. The meanings of phenomena are socially constructed. There can be different interpretations of the same phenomenon.
Epistemology How can we know the reality?	The world is objectively knowable. It is possible to do objective research.	The world cannot be known by objective means. It is possible to know the reality of the individual.
Most used research methodology	Quantitative research methodology	Qualitative research methodology

It is also worth mentioning the **pragmatism paradigm** in addition to the classic paradigm classification above. This approach emphasises that knowledge can be achieved through mixed methods of cognition: it is important to use both qualitative and quantitative methods to understand a problem (Rahi, 2017).

Scientific thinking

There are two main ways of understanding science: the methodology of hermeneutics and the scientific method approach. Hermeneutics originally meant the interpretation of ancient texts, mainly religious texts. Its name derives from the Greek mythological Hermes who mediated between the Gods and mortals on Earth. Hermeneutics, the art of interpretation, also seeks to mediate between the author who created in the past and the reader who reads later. In a broader sense, hermeneutics is a philosophical-methodological movement that interprets human behaviour through the methodology of hermeneutics. The assumptions of **the methodology of hermeneutics** are that reality is ambiguous and contextualised, and the researcher interacts with the object of cognition. With this approach, we create research that describes the individual in the context of culture, the environment and seeks to understand the world of the human being who would like to create meaning and make sense of the world. It stresses the importance of understanding explanations that take shape in the process of understanding. Hermeneutics in research is based on observation, investigation and interpretation. It aims at understanding theories about people and society, and is based on understanding and the search for explanations behind things and phenomena. It is fundamentally focused on finding answers to the why certain phenomena is in a way and how they work. During the research process hermeneutics changes methods and direction flexibly according to the situation under investigation and puts the researcher at the centre of the process. Consequently, analysis is subjective and results are usually not reproducible. Although, a basic assumption associated with the methodology of hermeneutics is that there may explanations that seem to be definitive, a given thing or phenomenon may have multiple explanations depending on the perspective, attributes, time or source taken into

account. For example, the analysis of the information obtained in the process also employs hermeneutic cognition through observation when observing a group of people. The behaviour of the group members can be analysed by the researchers using their own subjective interpretations, and the results of the observation are unique and less repeatable.

The **scientific method** is a methodological view based on the natural sciences. It uses procedures that decompose phenomena into different variables that are suitable for establishing general laws and causal explanations. Information is obtained through measurements, observations, experiments and proof procedures. The results of these methods are systematised, their research procedures are structured and transparent, and this way they can be repeated at any time, thus studies on the same research topic can be easily compared. Its methods include quantitative research. Examples include experiments and tests in chemistry and physics, which can always be repeated and quantified and described by formulas, and questionnaire surveys in the social sciences (Hornyacsek, 2014; Szokolszky, 2020).

The logic of cognition

We make different logical conclusions in the process of understanding how the world works. The most common of these forms of inference are induction and deduction. In both cases, we start from so-called **premises**, i.e. assumptions. Premises form the basis of a line of thought, and then arrive at a **conclusion**, i.e. a conclusion about the object that is the focus of the thought.

In the application of **induction**, we observe a limited number of empirical facts. We start from the specific towards the general, i.e. we reach general conclusions on the basis of individual experiences by drawing conclusions from the observed facts, defining regularities, and then from these we establish general statements, theories. We confirm or reject our prior assumptions on the basis of individual observed facts. General theorems or axioms are formulated on the basis of scientific observations and measurements in the process of induction. An example of inductive reasoning is when we formulate the rule that all birds have wings from the experience that there are birds that have wings. Logical reasoning: 1. This bird has wings, 2. other birds also have wings, thus 3. all birds have wings.

In **deduction** we follow a logical path in the opposite direction compared to the way of thinking in induction. We start from the general and move towards the specific. Our starting points are statements whose truth is undoubted or at least widely accepted - these are called **axioms** in philosophy. Deduction is the process of identifying the laws of the particular from general laws and testing their validity in practice. Solid premises also guarantee the truth of the conclusion in the course of logical deduction. The logic of deduction is applied when starting from the premise that all birds have two legs. We immediately deduce that the newly discovered new species has two legs. Logical reasoning: 1. All birds have two legs, 2. the newly discovered species is a bird, 3. the newly discovered bird has two legs (Szokolszky, 2020).

Both ways of thought process can be used in a particular research project.
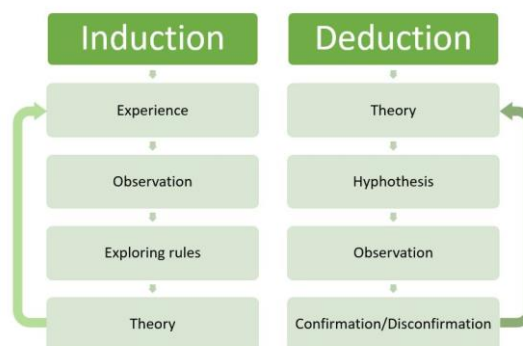
Figure 3.1 The thought process of induction and deduction in research.

An example of the use of induction in research is when we find that many young children can say a few words before the age of one, and we use this to make specific observations to establish the rule that children say their first words by the age of 12 months. Based on our experience, we can establish a rule of thumb and draw a general conclusion that all children say their first word by the age of 12 months. These regularities can then be checked and corrected by experience and research.

We use the logic of deduction in research when we investigate a research problem and we formulate a hypothesis based on a review of the literature, which we reject or confirm based on research.

Induction's strength is its openness to new knowledge and its main weakness is the risk of misgeneralisation. The strength of deduction is that existing laws and knowledge help us to understand a phenomenon, we can rely on them. The main weakness of deduction is that if the premise is false, the whole argument is false. Both processes of logic are associated with characteristic errors of reasoning. More broadly speaking, induction and deduction are, the basic strategies of scientific thinking and both are intertwined in research (Szokolszky, 2020).

3.2 Data collection

Data sources

In our research we collect information and data from primary and secondary sources. The data collected are called primary and secondary data. **Primary data** is the information that we collect ourselves about the phenomenon under study. When we use data collected by others, perhaps for other research purposes, we call it secondary data that is called data from a **secondary source**.

It usually makes sense to start a research project by looking at the secondary data. Secondary data is information obtained from a literature review prior to the research, from descriptions in books, research papers, articles and publications related to the subject. By reviewing secondary data, we will decide how relevant they are to the research we are planning, and how useful each of their contents is from our point of view. This is the literature search stage. Some research does not require primary data and research questions can be answered by examining and using of secondary sources. It is important to be critical about the source of the secondary data, i.e. the question of whether the secondary data are reliable. For example, some data in corporate publications are for customers and are not scientifically rigorous, they do not contain all the data relevant to the topic and may therefore contain biased information. In addition, it is important that the reliability of sources can be verified through appropriate citations. (Ghauri, Grønhaug, 2011).

Secondary data can be useful in the following research areas:
- Deepening of knowledge in the research area
- Formulating a problem related to the phenomenon to be studied, creating the research question
- Choosing the method of your research
- Answering research questions or partially solving the research problem
- Being able to compare our findings with secondary data, e.g. systematic review

The advantages of using secondary data are that it saves time and money. Scientific articles and textbooks have undergone appropriate peer review and can be considered as a trusted source of data. Secondary data also facilitates data collection from other cultures because they contain information written in the language we use. However, a drawback of secondary data is that it is not designed to answer the problem we are researching, thus, it does not necessarily fit the problem we are investigating. It is important that our research topic determines which secondary data we consider when conducting research, and we should keep in mind that we should not to adapt our research to the available secondary data (Ghauri, Grønhaug, 2011).

We collect the primary data ourselves adjusted to the research problem. The different main primary sources are illustrated in Figure 3.2. The primary sources can be divided into three main groups: experimental data, data obtained through monitoring and communication. Monitoring data collection methods include different observation methods, while communication data collection methods include different interview and survey methods (Ghauri, Grønhaug, 2011; Cooper and Schindler, 2014).
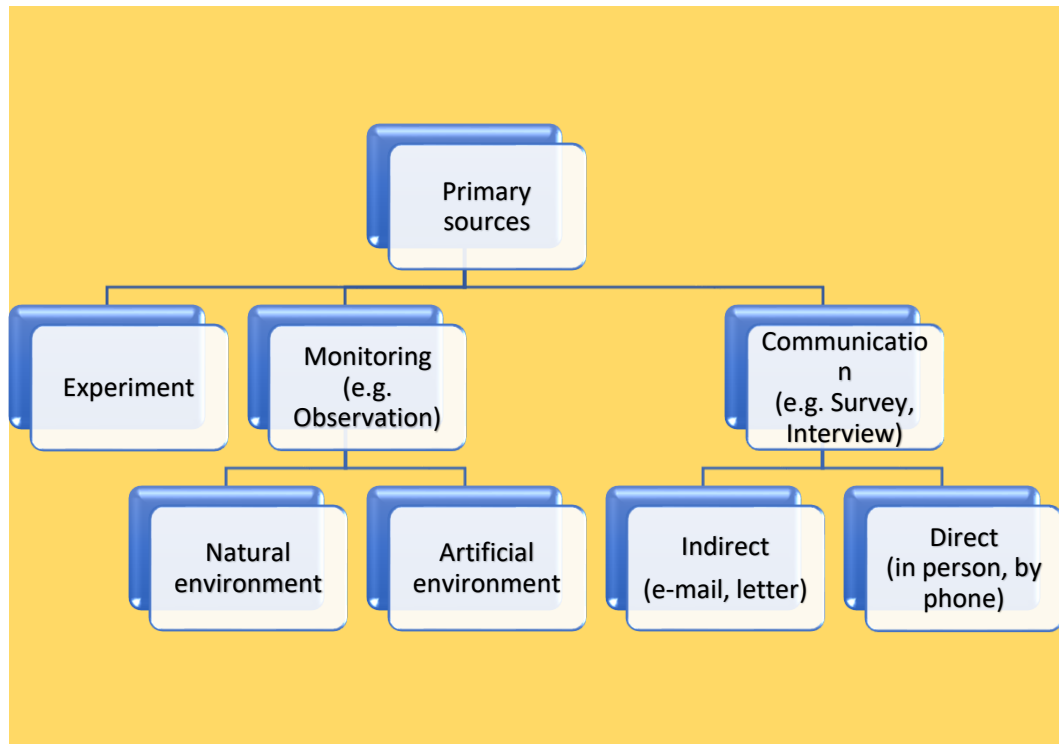
Figure 3.2 Main types of primary sources (based on Ghauri, Grønhaug, 2011; Cooper and Schindler, 2014)

The advantage of primary data is that it is more relevant to our own research topic. In addition, some information cannot be obtained solely from primary sources. For example, data on education and income for a specific target group. There are questions that we cannot answer with accuracy from secondary sources without personal, direct contact. For example, the attitude towards a new product before its launch needs to be primary data because it is important to assess consumer attitudes, impressions and experiences.

The disadvantage of primary data is that they are costly to collect - both in terms of material and human resources, as well as they take a long time to collect. Access to primary data can be also difficult. For example, members of a target group for a new product may not want to cooperate in the study. Additionally, the quality of the information is highly dependent on the ability of the research participants to respond and the quality of the information they have. It is also important to bear in mind that the choice of appropriate research methods, instruments and data processing will determine the reliability of the research., Many unexpected factors can influence or act as barriers to data collection when working with primary sources.

Table 3.2 Types of primary data (based on Ghauri, Grønhaug, 2011)

Primary data	Example
1. Status data	Demographic data
2. Psychological and lifestyle data	Personality and behaviour data
3. Attitudes and opinions	Evaluation, judgement on a given topic
4. Awareness and knowledge	Knowledge of the product
5. Intentions	The intention to buy a product
6. Motivation	The reasons for buying a product

3.3 Research methodology

There are two different methodological approaches in data collection which we call research methodology. These are qualitative and quantitative methodology, and we can use a third one, the mixed research design, which is the combination of the qualitative and quantitative methodology. These research methodologies are based on different paradigms, philosophical approaches to science, which can be related to those discussed in the chapter "Paradigms in science research in the social sciences".

Geertz (2001) is a cultural anthropologist and distinguishes between dense and sparse descriptions of behaviour depending on how richly the behaviour is captured. The distinction captures well the qualitative and qualitative ways of studying behaviour. While a dense description can be carried out using qualitative methods, it also describes the studied behaviour in its context, in its environment, describes from several perspectives. A sparse description can be carried out using quantitative methods: it observes and examines a few characteristics of the behaviour, taken out of context. Both paradigms have their place, depending on the purpose of the research, the prior information available on the topic, and the researcher's approach.

Qualitative research methodology
What is the qualitative research methodology?
Qualitative studies explore and interpret phenomena, and use deductive reasoning to produce theoretical findings. Quantitative research is able to show how certain phenomena are and how they are distributed in the population as a result of the exploration of previous qualitative research on a representative sample. Qualitative methods provide an understanding of the problem thanks to a holistic approach. Phenomena are interpreted in context and not as an isolated phenomena. According to the holistic approach, the system itself would change if certain factors were taken out of the system, and so would the observed phenomenon, which is why it is important to take contextuality into account.

When examining student drop-outs at university level, it is important to explore, through individual cases, the reasons that can lead to student drop-out. Case studies and interviews, which will be presented later, may be appropriate methodological choices for this purpose.

Indications for and characteristics of qualitative research
The use of qualitative methodology is common when we do not have a good understanding of the phenomenon and we want to investigate it. Therefore, want to conduct exploratory research. Qualitative research is a good choice in the following examples: we want to get to know a new subculture in society better, to find out about their habits and particular phenomena, or we want to launch a new product and it is important to map the attitudes of the target consumer audience. Another common indication is when a phenomenon cannot be studied on its own, out of context, or needs to be studied in its natural context. E.g. we want to study the habits of the customers of a particular store in order to gain more information for the appropriate placement of goods on the shelving system. It is worthwhile to study it in the context of the particular environment and the

customers of that store. We can also use qualitative research when mapping the norms of a work group: an investigator observes the interactions of individuals in the natural environment, i.e. in their daily work interactions with co-workers. In these examples the uniqueness of the situation is an important factor. The study must be specific to the individuals or phenomena being studied, and representativeness is less important.

However, there are research questions that cannot be answered by quantitative data, but can be answered by a detailed description of the phenomena. Often these characteristics are not easily quantifiable. If they are, they lose some of the information content, resulting in poorer information.

Qualitative methods collect qualitative data as opposed to quantitative data. They investigate a phenomenon not by quantifying it, but by describing its qualitative characteristics. Qualitative methods seek to answer the questions "Why?" and "How?" and are thus close to the approach of hermeneutics. Their logic is mostly inductive reasoning. It is an exploratory, less structured research method that is based on small sample size. Qualitative data is usually generated in narrative form, such as an interview transcript or diary entry. The qualitative research method is based on written, verbal, and visual content, and collects and analyses information from these sources (Brancati, 2018; Kiss, 2003; Szokolszky, 2020).

In qualitative methodology, research with a smaller number of items is also allowed. The analysis allows for in-depth research, revealing the circumstances and related factors in each case. The researcher also works with the subjective experiences he or she has had during the in-depth exploration and takes these into account when recording and analysing the data. For example, when observing in a group, the observer often interacts with the people observed or participates in the phenomena observed. Valuable data for research can be obtained from these interactions. It is important to mention the need for self-reflexivity from the researcher. Researchers to be aware of the effects of their own subjective experience and to respond to these with appropriate self-reflexivity when recording and analysing the data.

We tend to use open questions when asking questions in qualitative methods, and the research itself is often an open-ended inquiry, typically without a specific hypothesis. The lack of hypothesis implies that the process of qualitative research is not predetermined, and that the inquiry may evolve during the research process on the basis of the experience and information gained in the process. This is due to the fact that in the process of qualitative research data collection and data analysis are inseparable. There can be parallel processes that affect each other, thus shaping the course of the research.

Reflective subjectivity, credibility and triangulation are general quality assurances of qualitative methods to enhance reliability. **Reflective subjectivity** means that the researcher must take into account and consciously engage with his or her own feelings and thoughts during the research. This self-analytical attitude and awareness of processes helps the researcher to take into account the influence of his/her own personality, values, assumptions in the process of collecting data and to record these. **Credibility** means integrity in the handling of research data and analysis, as well as the consistent, sound, accurate use of procedures and conclusions. **Triangulation** means that the researcher tries to confirm information from several angles. For example, by collecting data from several sources or by using several different methods in the study.

Single-case studies vs. multiple-case studies in qualitative researches

A qualitative study might consist of a case study. For example, when examining the consumption habits of customers in one of a chain of stores, or one of a subculture's consumption behaviour. This study design is called a **single-case study design**. However, the subject of observation may be more than one case or group related the same research topic, in which case we speak of a **multiple-case study design**. Choosing a research design is dependent largely on the time and human resources available for the study and the availability of the population. In addition, it is an important factor to which extent we aim to make new discoveries with our research. A single-case study design

is much more cost and time efficient compared to a multiple-case study design. Additionally, the resources devoted to a single case ensure that we can work in sufficient depth when examining the selected case, thus giving the researcher a better understanding of the case, so that he or she is more likely to discover a new factor on which we can base a novel hypothesis. In a multiple-case study design we can compare different study cases and providing a better understanding of the study problem by reviewing the similarities and differences between the cases. Studies involving multiple cases tend to have stronger reliability (Gustafsson, 2017).

Stages of qualitative research

While the different qualitative research methods all have specific steps in the process of inquiry, they are all characterised by the following steps as defined by Szokolszky (2020):

1.   *Orientation planning, ethical licence*

The first step in research is to choose a research topic and develop a research question, and to examine its relevance. The research topic is often a question that arose during quantitative research. For example, an increased drop-out rate in a school progress data analysis and questionnaire survey may raise the question of what factors lead to a student dropping out, and the questionnaire method does not always provide sufficient depth of information to answer this question. It is worthwhile to visit the underlying factors that apply to specific individual cases by interviews. The research objective here could be to explore how to support students during their studies in order to avoid early school leaving. A good qualitative question is open-ended, relevant to the purpose of the research and elicits a subjective response.

We need to decide on the research method after defining the research question. The research method is largely determined by the purpose of the research and it is also dependent on who and how we want to involve in the study (participants). We then need to obtain ethical approval for the research from the relevant decision-making body. It is usually the ethics committee in the institution. For example, in the case of research carried out as part of a university project.

2.   *Data collection*

The type of data collection is defined by each method. The **raw data** is a direct result of the data collection. In qualitative research the raw data is usually narrative material, such as stories told, interview transcripts, descriptions of phenomena, but can also be visual and audio material recorded during the research, such as video recordings, photographs, drawings. The raw data is complemented by the researcher's own notes, recollections and memos. Accurately documented notes, recollections and memos can provide important additional information for interpreting certain phenomena. In addition, it is important to keep a **research diary**, which contains the important steps of the study and plays an important role in recording and justifying decisions and new steps taken during the research. The research diary does not have a predefined format in qualitative research, but is developed according to the researcher and the method used.

It is advisable to collect data electronically rather than in paper format in sustainability research in order to save material for the research, because the data analysis is unelectronic format.

3.   *Data management*

Unlike quantitative data, qualitative data is not organised into a predefined structure. Data management is about storing the data collected and making it searchable. Since there is no predefined format for the generation of data, information can be generated from a wide variety of data records. The preparation of data for analysis usually involves the first processing of raw data, **transcription**. During this process, visual and audio material and notes are recorded in a machine transcript, which contains the so-called **transcribed data**.

4.   *Data processing and data analysis - data reduction, coding, data visualisation*

Data reduction and coding are used in the processing of the data to ensure that the content of the data is structured. **Data reduction** is the process of summarising the content of the data. Researchers highlight categories into which they classify the data, based on multiple readings. Then

they group categories together. Categories are usually labelled by **coding**. A code is an abbreviation for a category or concept, which is a recurring thematic thread of the phenomenon. Coding is used to condense the data. It is important not to be quantitatively selective when it comes to categories. If only one content element belongs to a category, it must also be indicated.

The categorisation and coding process starts at the beginning of the research. When the first information is recorded then we start processing the data. Information obtained later can modify and expand the categories created at the beginning of data processing. Reflexivity and flexibility are important throughout the data processing. The categories are developed by the researchers themselves, reflecting a hermeneutic approach and the shared meaning-making of the researcher and the phenomenon being researched.

Coding is a multi-level process. After the first categories have been highlighted, the categories are grouped together and the relationships between them are highlighted. This is how a hierarchical category system is formed from the data. Coding should ensure that the data is also searchable. In addition, some way of visualising the data is also needed. For example, a graphical representation of the code system or a table.

5. *Conclusion*

The research question is answered by exploring the relationships and patterns in the data. It is important to explore and interpret the process of the study and all its information in detail in order to answer the research question. The data must be assembled into a coherent system with explanatory power for the research question.

6. *Preparing the research report*

A research report is required to show the qualitative research to the scientific community. The structural framework and tone of this report is different from the quantitative one and is less constrained. It may be more personal in tone, as the research topic itself is often based on a personal professional experience or problem, which is important to mention when justifying the choice of topic. If the research deals with a topic of practical relevance, it is worth mentioning the practical implications of the research.

Most common qualitative methods

The most commonly used qualitative methods in the social sciences and their brief definitions are (Jupp, 2006; Szokolszky, 2020):

- **Observation**: Scientific observation is a research question driven by guided direct observation to better understand a phenomenon.

- **Interview**: A systematic data collection method in which information or opinions are gathered by asking questions related to the research topic. The researcher and respondent engage in a guided dialogue, either face-to-face or online.

- **Focus group**: A data collection method using a group interview on a specific topic. The survey is usually recorded by audiovisual means. A focus group usually consists of six to eight participants, with a moderator conducting the interviews.

- **Case study**: In-depth study of one or more examples of a (social) phenomenon using multiple data sources. The subject may be a person, event, social activity, group, organisation or institution.

- **Source analysis**: Secondary analysis of diaries, letters, autobiographies, newspapers, photographs, documentaries, etc.

Strengths and weaknesses of qualitative research methods

The following is a summary of the strengths and weaknesses of qualitative research methods, based on the summary by Johnson and Onwuegbuzie (2004):

Strengths:

- Theory by inductive reasoning, hypothesis formation.

- The data obtained in the research are based on the meaning categories of the subjects which can be explained in the research.
- Investigation of complex phenomena.
- The possibility of studying individual cases.
- Obtaining qualitative, in-depth information when examining a small sample size.
- It helps to understand the individual, personal experience of phenomena.
- Opportunity to collect data in a natural setting.
- Contextualisation, which helps to describe a phenomenon in detail.
- Suitable for studying dynamic processes, e.g. when changes occur in the system.
- It provides a flexible, adaptable research framework to respond to changes and new information.
- Illustrative presentation of individual cases.

Weaknesses:
- Difficulty to generalise - it is usually not possible to extend the findings to other populations or environments.
- Less suitable for hypothesis testing.
- Not suitable for quantitative predictions.
- Greater subjectivity in both data collection and data analysis.
- Time consuming to collect and analyse data.
- Less likely to be considered credible by users of research results.

Quantitative research methodology

What is a quantitative research methods?

The quantitative method is research involving the collection and processing of data in numerical form. Numerical data are usually time periods, scores, number or duration of events, ratings or scales. Quantitative data can be collected in controlled or natural settings, in laboratories or in field studies. Numerical data can be obtained directly as a result of a data collection process or by quantifying non-numerical data, such as the result of a content analysis (Jupp, 2006).

Quantitative research usually follows qualitative exploration. Quantitative tools can prove the phenomena revealed by qualitative methods and provide data on a larger sample representative of the population.

For example, in order to ensure sustainable university operations, we also use online self-completion questionnaires to investigate student attrition in a particular university faculty in the student population. This provides a large sample size, which can be representative of the population, and the resulting data set can be used to test the hypotheses that have been formulated.

Indication and characteristics of quantitative research

Quantitative methods carry the characteristics of the scientific method's approach to scientific cognition, such as exactness and quantification. These methods are based on data in numeric form and are usually processed using statistical methods. Quantitative methods are used to answer the questions "How many times?", "When?", "What?", "What?", "How much?". The method is linked to the positivist epistemology that there is a real world that can be known by objective means. Scientific methods belong to the category of quantitative methods, which generally use the idea of deduction in cognition (Brancati, 2018; Kiss, 2003)

According to Szokolszky (2020), quantitative methods are characterised by an analytical approach. They work with predefined variables. Quantitative methods try to keep the variables under control and filter out unwanted factors., Hypothesis(es) are developed in preparation for the research. The hypothesis relate to the relationships between the variables in the study. The aim of the statistical tests is to confirm these hypotheses and to provide information on the relationship between the variables. The aim of these studies is to generalise the findings to a certain population Thus, is

important to aim for the largest possible number of items. A central element of quantitative studies is the use of measurement and statistical analysis, which are used to process large numbers of items.

The researcher is an external observer during quantitative studies. There is an asymmetrical relationship between the research participants and the researcher in the research process. The framework of research reports is fixed and the tone is impersonal because it is usual in empirical studies. In qualitative research the researcher asks the questions and gives the instructions for the study, and the participants answer the questions and carry out the requested activity.

The quantitative methodology is used when a topic has already been well explored and we want to investigate certain phenomena and obtain representative results on the research question. An important feature of the phenomena studied in quantitative research is that they can be studied in isolation, independently of their context and their natural environment. For example, when we want to assess the level of satisfaction with a product in a particular social group then we can do so without qualitative methods. We can use quantitative tools, as opposed to the situation when we are investigating the reasons and background factors behind satisfaction with a product where qualitative tools can provide more detailed and in-depth answers to.

Stages of quantitative research

The steps of qualitative research are based on the scientific method which is rooted in a positivist approach. The **scientific method** has six basic stages (Brancati, 2018), illustrated in Figure 3.3.
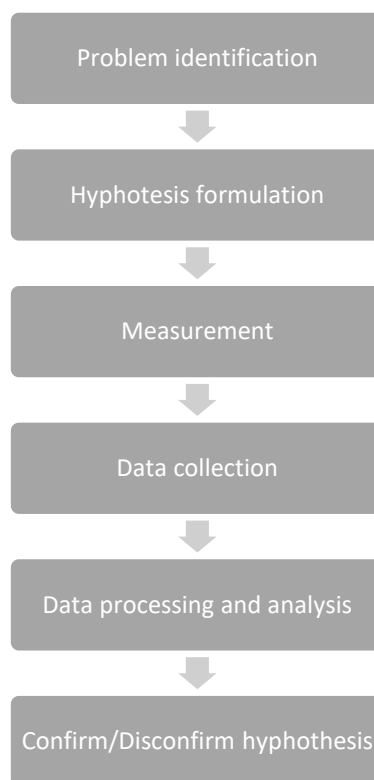
Figure 3.3 Stages of the scientific researches (based on Brancati, 2018)

An overview of the stages of the scientific method, following Bruscati (2018) and Khaldi (2017):
1.   *Problem identification*
Determining the focus of the research, choosing a problem to be analysed, and selecting a research question to fit the problem. This stage also includes a review of the existing scientific knowledge and research results on the issue.
2.   *Hypothesis formulation*
The problem in question can be explained by creating hypothesis.

3.   *Measurement*

Developing appropriate methods to test the hypothesis, i.e. defining the research framework, research tools.

4.   *Data collection*

Collect relevant data in the shortlist using the methods defined and developed in the previous step.

5.   *Data processing and analysis*

Formatting and processing the collected data for analysis, and conducting analyses along the hypotheses to extract information.

6.   *Confirm/disconfirm hypothesis*

We test the hypothesis(es) that we set up in Step 2. I.e. accept or reject them on the basis of the results. This step may be accompanied by the preparation of a scientific publication, which provides information on the results of the research to the scientific community. Importantly, the acceptance or refutation of the hypothesis also has important informational value and is therefore a scientific result to be published. The framework of the research report, is fixed: it is an empirical report.

Most common quantitative methods

The most commonly used quantitative methods in the social sciences and their brief definitions are:

-    **Survey**: A survey is a data collection method in which data are collected from individuals in a sample in order to construct quantitative characteristics that describe the sample well and that can be used to describe a larger population (Brancati 2018). The most common form of survey is a questionnaire survey.

-    **Experiment**: In an experiment the researcher investigates how one (or more) variables manipulated by the experimenter in controlled conditions. I.e. shaped in a targeted and systematic way how one variable affect another variable (or other variables) (Szokolszky, 2020).

Strengths and weaknesses of quantitative research methods

Strengths and weaknesses of quantitative research methods based on the summary by Johnson and Onwuegbuzie (2004):

Strengths:

-    Testing and validating theories and hypotheses.
-    Generalisability to a given population using a representative study sample.
-    Comparability between quantitative studies with the same research topic.
-    A more credible assessment of causality by controlling for confounders.
-    Accurate quantitative, numerical data can be obtained.
-    It can be used to make quantitative predictions.
-    It is suitable for studies with a large sample size.
-    Relatively quick data collection in many cases (e.g. questionnaires).
-    Greater objectivity, less influence of the researcher.
-    Qualitative methodology can provide greater credibility for the research client.

Weaknesses:

-    in quantitative research, categories pre-constructed by the researchers do not always match the mindset of the participants
-    confirmation bias: the researcher focuses on testing hypotheses and therefore misses phenomena that may be important elements of the research topic
-    may lead to general and abstract results on the issue under study

Comparison of qualitative and quantitative strategies

A summary table comparing qualitative and quantitative methods (Table 3.3) helps to give an overview of the two strands in terms of the main aspects of the research.

Table 3.3 Qualitative and quantitative strategy (based on Basias&Pollalis, 2018; Szokolszky, 2020)

	Qualitative strategy	Quantitative strategy
Target	Understanding the phenomenon in its natural context	Hypothesis testing, broad generalisation, prediction
Philosophy of science link	Non-positivism/Interpretivism, Constructivism	Positivism
The relationship to the phenomenon	Holistic, presence of first and second person perspectives, qualitative data, partial generalisation, search for specific patterns	Analytical approach, third person perspective, measurement, numerical data, statistical processing
Attitude person conducting the research towards participants	Self-reflexive observer who also works with subjective experience	Objective external observer
Research process	It is not all fixed in advance, it can evolve as you go	Plan-based, fixed in advance
Sample size	A smaller number of elements (below 10) is acceptable	Larger (min. 30 people), aiming for representativeness
Common tools	- Observation - Interview - Focus group - Case study - Source analysis	- Survey - Experiment
Question form	Open questions	Closed questions
Publication style	More informal content and form, more personal style allowed	Bound content and form, impersonal style
Data format	Usually text or spoken words that are converted into text	Numeric data (quantified) usually obtained by questionnaires
Application	- The subject of research is difficult to quantify - The research area is relatively unexplored - The context is essential - When it is important to examine the phenomenon in its natural context - When it is a question of capturing unique or partially valid characteristics and contexts	- The subject of research is well quantifiable - The research area has been explored - The context is not relevant - When it is not important to study the phenomenon in its natural context - A broad generalisation is sought

Both qualitative and quantitative methodologies have their own most commonly used methods. However, both methods are able to take their own approach and use the different methods and shape them in their own image for the purpose of data collection. The qualitative and quantitative research methods are presented in Table 3.4.

Table 3.4 Differences between using the same methods in a quantitative and a qualitative strategy (Szokolszky, 2020)

Method	Qualitative Methodology	Quantitative Methodology
Observation	Contextualised observation of the phenomenon with varying degrees of involvement of the observer.	Structured observation based on predefined categories.
Enquiry	Open discussion (different forms of qualitative interview).	Pre-defined, structured series of questions and tasks (test, questionnaire, survey interview).
Experiment	Observing behaviour in a purposefully induced situation (field experiment).	Examination of the effect of a systematically manipulated independent variable on the dependent variable (laboratory experiment).
Document analysis	Qualitative text and visual material analysis, category extraction.	Quantitative content analysis based on prior categories.
Case study	Qualitative methods dominate, important role.	Quantitative measurements dominate, rare application.

Mixed research methods

Mixed methods are the use of quantitative and qualitative methods together within the same research to answer a research question (Jupp, 2006). The most common case of mixed methods is when qualitative research is used to explore and develop a hypothesis on a topic. For example using a focus group or observation, followed by hypothesis testing using quantitative methodology. Less frequently, a quantitative research is complemented by a qualitative methodology, in-depth on the topic and supported by more detailed descriptions.

In recent decades, the mixed research design have been increasingly used to examine research questions from as many angles as possible. It is important to distinguish mixed methods research from multimethods research. While in mixed methods research we use different qualitative and quantitative methodologies, in **multimethods research** we use different methods to answer the same research question following the same methodological approach and paradigm I.e. we use several qualitative methods (e.g. observation and interview) or several quantitative methods (e.g. questionnaire survey and experiment) (Király, Dén-Nagy, Géring and Nagy, 2014).

One of the first summaries of the theoretical conceptual framework of mixed methods was produced by Greene, Caracelli and Graham (1989), in which they identified five different purposes of mixed methods by analysing 57 empirical studies. Since then, different types of mixed methods have been classified in various ways (e.g. Branchati, 2018; Szokolszky, 2020). Based on the work of Caracelli and Graham (1989) and Branchati (2018), we can talk about the following types of mixed methods research:

- *Triangulation*: Triangulation means using several methods to investigate a research question. Using this method, we can check that the results from different methods point in the same direction. It makes the research more nuanced and informative, and enhances the reliability and credibility of the study.

- *Complementarity/Gap-filling:* The use of several research methods can in some cases complement each other. One method may provide more detailed or in-depth information while another provides less.
- *Development*: This type of mixed method is when the results of one method help to design and develop a study using another method. In most cases, a quantitative exploratory pretest is used to develop the appropriate hypotheses for a qualitative survey on a large sample.
- *Expansion* (Caracelli and Graham, 1989) */ Concatenation (Branchati, 2018)*: Methodological diversity can broaden the researcher's focus on the research question under investigation, allowing flexibility to examine it from multiple angles.
- *Interpretation*: In mixed methods, one method explains and/or interprets the other method. For example, a qualitative method is used to interpret results found in quantitative research that contradict theoretical background.

Strengths and weaknesses of mixed methods in research

Strengths and weaknesses of mixed methods (Johnson and Onwuegbuzie, 2004):
Strengths:
- Quantitative data can be interpreted with qualitative information, while quantitative data can be refined with qualitative data.
- It has the advantages of both qualitative and quantitative research.
- It is a more complex research framework in which both hypothesis generation and hypothesis testing can be carried out within a single research study.
- A broader research perspective and responsiveness by using both types of approaches.
- The strengths of some methods may compensate for the weaknesses of others.
- It promotes a better understanding of a research topic, which in turn strengthens the theoretical and practical use of that topic.
- A higher level of generalisability.
Weaknesses:
- It requires a higher level of effort, both in terms of time and money.
- The researcher must be familiar with both qualitative and quantitative research paradigms and methods.
- The use of mixed methods often requires a research team.
- Unanswered questions in the application of the method - e.g. interpretation of contradictory results.

Summary

To choose the right research paradigm, it is important to understand the philosophy of science behind each paradigm. The two main paradigms of science are positivism and non-positivism/interpretivism. The positivist paradigm states that the world can be known objectively by empirical means. the non-positivist/interpretivist paradigm says that the world cannot be known objectively but can only be interpreted in conjunction with human perception, and that phenomena cannot be studied without being influenced by it. There are the two major scientific methodologies linked to these two paradigms: scientific method associated with positivism and the methodology of hermeneutics associated with non-positivism.

There are two main modes of drawing logical conclusions in scientific thinking: induction moves from the particular to the general and deduction moves from general laws to conclusions about particular phenomena.

In data collection we can work with two types of data: we can work with primary data which we collect ourselves, and secondary data which comes from previous research and data sources. We use different research methodologies for each data type. The qualitative research methodology follows the non-positivist tradition, while the quantitative research methodology follows the positivist approach. Mixed research design uses the both methodologies together to answer a research question. Each research paradigm has its strengths and weaknesses, which should be taken into account when choosing a research method. The main qualitative data collection methods are observation, interview, focus group, case study. Some examples of quantitative instruments are survey and experiment are the most commonly used methods.

Discussion questions

1. What would epistemological researchers criticise about the positivist view of science ?
2. Which research methods are close to the non-positivist scientific paradigm and why?
3. What is the difference between induction and deduction in scientific thinking?
4. How does the hermeneutic approach differ from the scientific method?
5. What are the main qualitative data collection methods?
6. What factors might induce the choice of a qualitative research strategy?
7. What specific examples of the quantitative method can you give?
8. When is it more appropriate to use qualitative research methods instead of quantitative ones?

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CHAPTER 4: STAGES OF CONDUCTING RESEARCH

Rapid change has led to the emergence of environmental complexity. Two major issues are technological advancement and environmental sustainability which create problems to organizations. As a result, organizations have no other choices but to face and tackle these changes. To help management make the right decisions, systematic research is necessary. However, not all emerging problems can be or shall be investigated. This chapter outlines the stages of conducting research.

Given that environmental complexity sometimes present new phenomenon, research shall also anticipate the use of either the mainstream deductive or emerging inductive methodologies. If the former follows the flow of theoretical review and down to testable hypothesis, the former anticipate for 'sensitizing concepts' (Fick, 2009). Consequently, the stages might also be slightly different.

Environmental sustainability is an emerging issue and demands for good research for example is to investigate the issue, evaluate the effectiveness, and identify ways to improve it. Given the high expectation on the impact, good research must therefore follow a systematic and well-structured process. It must also respect universal ethical standards despites its feasibility and benefits for the audiences.
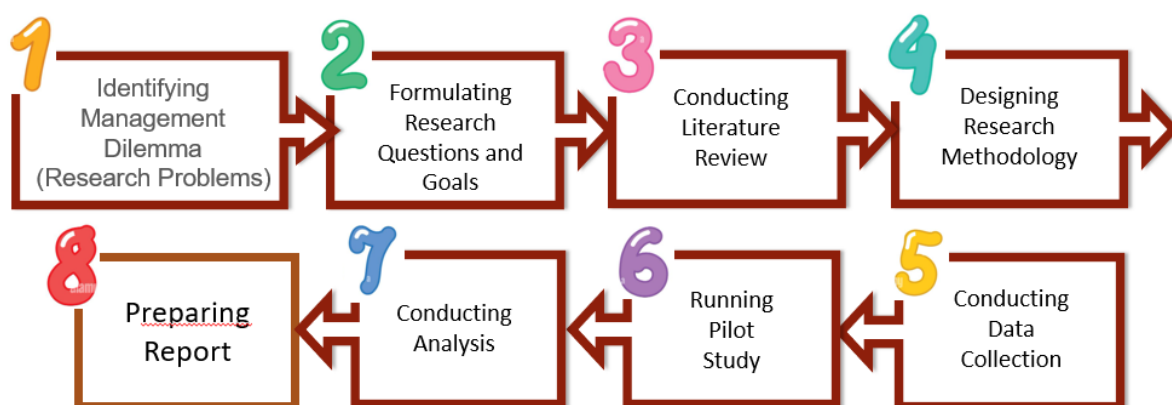
Figure 4.1. Research stages

This chapter will explore stages of conducting research in a systematic way. As seen on Figure 4.1, the process starts with identifying management dilemma. After screening and sorting the dilemma, management questions are constructed. Based on these preliminary questions, research questions and goals can be formulated. In order to respond to the questions, research must review literatures and followed up with systematic research methodology. This will allow for data collection process. If necessary, research shall be preceded with a pilot study. After adjusting the instruments, the real data collection is carried out. Once the data is complete as planned, data begins to be processed and then analysed. Finally, report writing takes place. This chapter will elaborate stage 1,2, and 3, while the rest of the stages will be discussed in detail on the subsequent chapters.

4.1 Identifying management dilemma

In businesses, leaders are faced with continuously complex and dilemmatic situation that demand effective decisions. Such situation often overwhelms leaders leading to the difficulty even in

selecting problems that have the highest priority, both in the short- and long-run. It is therefore important to first identify the management dilemma.

Research management dilemma is a crucial first step that needs to be identified. Management dilemma triggers the need for the leaders to make a decision. Dilemma entails a challenging situation where alternative solution or decision has its own risk or perhaps several goals that need to be achieved with only limited resources. Why management dilemma is important?

Schindler (2019) offers a systematic process to which is called the management-research question hierarchy (see Figure 1). The following explains how management dilemma led to the research questions formulation and finally decision making.

1.   Management Dilemma

Two relevant questions are:

a.   What symptoms cause management concern?

Symptoms are more observable, obvious and straightforward. However, symptoms are usually not the fundamental problems. Yet, amongst many symptoms, which one(s) that deserve further attention. It is important to note, however, that symptoms may be positive or negative.

Example: In the sustainability context, symptoms that may emerge are consistent failure in launching environmentally-friendly product, high workplace accident, and decrease of the health level of surrounding community.

b.   What environmental stimuli raise management interest?

After symptoms are identified at the initial stage, the next quest is to explore the presence of environmental stimuli that trigger the interest.

Example: The failure in launching environmentally-friendly product may set an alarm that financial cost starts to way outweigh the sales even there has been a considerable time frame that newly launched products are taking roots and make some profits.

Figure 4.2 The Management-Research Question Hierarchy
Source: Schindler (2019)

2.   Management Queston

Once dilemma has been identified and priority issues have been selected, the next process is formulating management questions. Two questions emerge:

a.   How can management eliminate the negative symptoms?

As reminded, the number and variance of dilemma may be not easy to group and select. Of course, organizations are keen to solve at least existing problems. If the symptoms are negative in

nature, then it may require a more thorough analysis in order to seek possibility to improve the situation.

Example: One global FMCG company has admitted its innovation in liquid soap meets customers' resistance. The new product was actually more efficient as it requires only a few drops of soap to wash 5-7 kgs clothing. Employees were disgruntling as they were unfamiliar with the systems. As a matter of fact, the company has limited chance to promote the product and hence lost potential income.

b.   How can management fully capitalize on an opportunity?

Opportunities can be identified if management is able to identify and ask the right questions. Most of the times opportunities are covert by threats. When a researcher attempts to identify opportunities by approaching the management, they may not automatically have the answers. If they do, they may capture the wrong opportunity (for example too simple, far beyond management control). As a result, a researcher must be able explore the data and or stimulate preliminary discussion with the management if opportunities are not readily available, let alone capitalized.

There are four types of possible research questions, namely evaluation of solution, control, troubleshooting and choice of purpose or objectives. Each one of these lead to unique management questions. Table 4.1. displays how each category if to be applied in sustainability research area.

Table 1. Types of Management Questions

Categories	General Questions	Sample Management Questions
Evaluation of solutions (choices between concrete actions to solve problems or take advantage of opportunities)	How can we achieve the objectives we have set?	Should we reposition brand X as a sustainable product from its current electronic appliances positioning?
		How can we improve our environmentally friendly operations for product repairs and servicing?
Choice of purpose (choice of objectives)	What do we want to achieve?	What goals should XYZ try to achieve in its next round of negotiation on the terms and condition of joint sustainable marketing campaign?
		What goals should we set for HR Division to shift from conventional to green HR in the next 5 years?
Trouble shooting (diagnosing ways of organization is falling to meet its goals)	Why is our (blank) program not meeting its goals?	Why engagement with our stakeholders do not meet the new sustainability initiatives target?
		Why department have the lowest budget utilization for sustainability project?
Control (monitoring or diagnosing ways an organization is falling to meet its goals)	How well is our (blank) program meeting its goals?	What is out sustainability return on investment?

Source: Adapted from Schindler (2019)

Sustainability is a broad issue that affect people and planet within and outside the workplace. Consequently, the potential dilemma might be countless. Researchers in this field shall be careful in identifying dilemma which later is feasible to be investigated.

Before moving to the next section of formulating research questions, polish this first skill by undertaking Exercise 1 below.

Exercise 1.

Read Case 4.1. and identify the following questions:

1.   Identify the issues depicted in the case?

2.   What parties are involved in the case?
3.   Any party can be held responsible and why?
4.   What are the fundamental problems?

Case 4.1
Delhi Pollution: Cloud of toxic air, uncertainty hangs over
(Singh, 2023)

The severe pollution in Delhi has led to the prohibition of construction activities, causing many labourers to worry about losing their income during the festival season. Many labourers from distant states like Bihar and Uttar Pradesh are unsure whether to return to their villages or wait for an improvement in air quality. They have specialized skills in construction work but are struggling to find employment in alternative sectors. The lack of crop insurance and vulnerability of agriculture due to shifting weather patterns also affect their livelihoods. Returning home seems to be the only option for many of them.

Read more at:
http://timesofindia.indiatimes.com/articleshow/104957555.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

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4.3 Formulating research questions

Once the researcher completes identifying the specific management questions, the next stage is formulating research questions. In doing so, one screening question needs to be addressed: "**What does the manager need to know to choose the best alternative from the available courses of action?**"

To begin with, if organizations are the subject of research, the researchers must ask whether their strategies are translated into key performance indicators (KPI) or objective key results (OKR). If they do have, are the achievement of KPIs or OKRs are continuously monitored and the missed targets are identified. This screening question puts the research in a better position as the potential research questions have attracted management attention.

This process does not stop here, however. Researchers' curiosity is an important individual skill so that research questions can be sound, tactical and address the real problems. The next phase is exploring the possible research questions. Researchers can exploit numerous data sources. A word of caution, however, given that exploration is highly unstructured research and increasingly documented digitally, researchers must have a clear guidance if not to be overwhelmed (Schindler, 2019).

CORE CONCEPT

Research Questions
the hypothesis that best states the objective of the research; the question that focuses the researcher's attention (Schindler, 2019).

Research question is a critical step in conceptualizing the research design. Fick (2009) outlines fundamental issues concerning research questions:

1. Research questions should be examined critically as to their origins (what has led to the actual research question?).
2. Research questions should check the soundness of your research design and
3. the appropriateness of methods using various reference points.
4. Research questions should be well aligned with collecting and interpreting data method.
5. Research questions should consider the scope of findings generalizations.

Research questions are quite distinct between deductive and inductive methodology. Some samples of research questions are as follows:

- Does environmental felt-responsibility mediate the influence of green HRM on organizational citizenship behaviour-environment? (Lu et al., 2022)

Gap: the roles of environmentally felt-responsibility are lacking research

- How employer practices affect the economic mobility of workers?

Gap: Very limited investigation of how exposure to certain practices affects growth in earnings, wealth, or occupational status over time. (Kelly et al., 2023).

In a more general questions are suggested by Lofland and Lofland (1984):

- What type is it?
- What is its structure?
- How frequent is it?
- What are the causes?
- What are its processes?
- What are its consequences?
- What are people's strategies?

4.4 Conducting literature review

There are some similarities and differences in using literatures in quantitative and qualitative research. In the deductive mode of inquiry, literature review that contains established theories is used to closely navigate problems, research questions and hypothesis development. With this tradition, theories are to be tested empirically. Meanwhile, in the inductive mode of inquiry, 'synthesizing concepts' are used to approach the study.

Several forms of literature on a study are (Fick, 2009):

1. Theoretical literature about the topic of the study

Theories have different functions for quantitative and qualitative research. In a quantitative study, the existing literature about the issue of the study will derive hypotheses development, and later to be tested empirically. In qualitative, knowledge and insights from the literature will not dictate the direction, but rather treated as context knowledge and trigger some valuable meanings for further exploration.

Several stimulating questions are as follows (p.49):

a. What is already known about this issue in particular, or the area in general?
b. Which theories are used and discussed in this area?
c. What concepts are used or disputed about?
d. What are the theoretical or methodological debates or controversies in this field?
e. What are still open questions?
f. What has not yet been studied?

2.	Empirical literature about earlier research in the field of the study or similar fields

Undertaking a strong and fundamental research requires the ability to correctly identify the research gaps. One way of doing it is by exploring empirical literature of previous research. Previous research can reflect at least some notions for example, similar topic, similar situation, similar organization. A careful examination on the existing literature will allow researchers to be more data and context sensitive.

Adopting from previous scholar, Fick (2009) emphasises the benefit of undertaking this step properly (p.51):

Concepts from the literature can be a source for making comparisons in data you have collected.

a.	To be familiar with the relevant literature can enhance sensitivity to subtle nuances in data.

b.	Published descriptive materials can give accurate descriptions of reality helpful for understanding your own material.

c.	Existing philosophical and theoretical knowledge can inspire you and give you an orientation in the field and material.

d.	The literature can be a secondary source of data—for example, quotations from interviews in articles may complement your own materials.

e.	The literature can be used beforehand to formulate questions that help you as a springboard in early interviews and observations.

f.	The literature may stimulate questions while you analyse your material.

g.	Areas for theoretical sampling (see Chapter 11) can be suggested by the literature.

h.	The literature can be used for confirming findings or can be overcome by your findings.

3.	Theoretical and empirical literature to contextualize, compare, and generalize your findings.

Another challenge in undertaking research is when data has been analysed dan findings are formulated. In quantitative studies, if hypothesis is supported, theoretical adoption and exercise merely needs more in-depth analysis. Theoretical and empirical literatures are useful to make meaning on the findings. There is no reason for the researchers to overly concern finding one or more hypotheses are not supported. Meanwhile, in qualitative studies, theoretical (in addition to methodological, and empirical literatures) will assist researchers to see what the materials to offer in a wider context, how to carry out the research and how to mitigate any risk.

4.5 A brief on research methodology, data collection, analysis and report writing

Research methodology

Designing a research project comprises of three stages: research design, sampling design, and instrument development & pilot testing (Schindler, 2019). Research design is associated with the blueprint for tackling research objectives and providing some answers to the management dilemma. A various methods, techniques, procedures and protocols may be selected depend on the research questions. Another step is sampling design. The purpose of this activity is to identify the target population, determine whether a sample or census is desired, and how the samples are collected. A sample is a group of cases, participants, events, or records that constitute a portion of the target population (Schindler, 2019). In a quantitative census is also common place. It is where every single participant, event, or item is invited to the research. Meanwhile, in the qualitative method, sampling can be multifaceted (see Table 4.2).

Table 4.2. Sampling Decision in the Qualitative Research Process

Stage in research	Sampling methods
While collecting data	Case sampling Sampling groups of cases
While interpretating data	Material sampling Sampling within the material
While presenting the findings	Presentational sampling

Source: Fick (2009, p.115)

Conducting Data Collection

Data collection is an important milestone in a research project. Types of data are secondary and primary data. If secondary data is to be used, researchers must muddle through various data sources. They also have to deal with the missing data, distant from research purpose, and relying on the data owners. Despite these deficiencies, secondary data is usually impersonal, available publicly, and dealing directly with the data (no need for other people's interpretation).

Primary data can be powerful, yet also painstaking in collection. Primary data is considered powerful, because it is collected to answer our specific research questions. The challenge then rests in the research instrument. If it is not valid or reliable, then the quality of the data deteriorates.

Data collection

Methods: Experiments, observation studies, online surveys, focus groups, photo ethnographic studies, even research gaming, are just a few of the methods used today.

Trend: A combination of more than one method to answer the research question (s).

Prepare the Data

• Most data must be edited prior to analysis to ensure consistency across respondents, objects, or events and to locate and address errors and omissions.

• Data preparation processes address recording errors, improve legibility, and clarify unclear or unexpected responses.

• Processes for data preparation include more than code assignment to variables.

• A researcher may include summarization of data to located out-of-range answers and missing data.

• Data are edited to ensure consistency across cases and to locate omissions.

Further explanation on data collection in quantitative and qualitative tradition will be explained in the subsequent chapters.

Running Pilot Study

Conducting research is sometimes problematic, especially when we fail to recognize the weaknesses of the design and research instrument. A researcher may fall into complacency and too confident about their design and instrument. However, there are many cases that after massive data collections are completed, instrument testing results do not turn out as expected. In quantitative method, the validity and reliability tests fail. Qualitative may also suffer from failure in validity and reliability, for instance interview or observation protocols fail to capture the investigated phenomenon. The impact of such situation is researcher may need to revise the instruments and re-do the data collection.

In order to avoid, this chapter recommends researchers to undertake a pilot test. The purpose is to test the weaknesses in the research design and the measurement instrument and protocols. It is also meant to provide proxy data for selection of a probability sample.

Conducting Analysis

Once data is collected, research commences the analysis steps. Managers need information and insights, not raw data, to make appropriate business decisions (Schindler, 2019):

♦ Researchers generate information and insights by analyzing data after its collection.

♦ Data analysis is the editing, reducing, summarizing, looking for patterns, and applying statistical techniques to data.

♦ During data analysis, researchers whittle down reams of statistical information to discover findings (key patterns in the data).

♦ Insights result when a researcher interprets the findings in light of the manager's research questions.

♦ Increasingly, managers are asking research specialists to make recommendations (data supported actions the manager should take) based on their interpretation of the data.

Preparing Report

Report writing is the final step in a research project. In business research, the purpose is for the researcher to report and transmit the findings, insights, and any recommendations to the managers. In order to present a research report that could resonate the findings well and reach the target audiences properly, Schindler (2019) recommends the following points:

♦ The researcher adjusts the style and organization of the report according to the target audience, the occasion, and the purpose of the research.

o The report should be manager-friendly and avoid technical jargon.

o Reports should be developed from the manager's or information user's perspective.

♦ The researcher must accurately assess the manager's needs throughout the research process and incorporate this understanding into the final product, the research report.

♦ To avoid having the research report shelved with no action taken, the researcher should strive for:

o Insightful adaptation of the information to the client's needs.

o Careful choice of words in crafting interpretations, conclusions, and recommendations.

Summary

This chapter provides stages of conducting research which comprises several activities:

1. Identifying management dilemma
2. Formulating research questions and goals
3. Conducting literature review
4. Designing research methodology
5. Conducting data collection
6. Running pilot study
7. Conducting analysis
8. Preparing report

Students shall follow this step by step research procedures in order to have a rigourous research and make sound report.

Each of the step is provided with examples which can stimulate individual exercise.

Discussion questions

1. How do you start a scientific research?
2. How to objectively identify management dilemma if you happen to be the owner or work at the respective organization?
3. To what extent is literature review considered sufficient?
4. Why pilot study is necessary? What risks a researh may face in the absence of this study?

5.   How to ensure that our report fit with standard academic writing?

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CHAPTER 5: THEORY AND CONCEPTUAL FRAMEWORK

In today's complex and interconnected world, achieving the Sustainable Development Goals (SDGs) requires a comprehensive understanding of the underlying challenges and potential solutions. Theories from various disciplines provide valuable frameworks for analyzing and addressing these challenges. This chapter delves into a selection of relevant theories, exploring their applicability to the SDGs and highlighting their contributions to sustainable development efforts.

The SDGs encompass a wide range of interconnected issues, encompassing environmental, social, and economic dimensions. Theories such as social capital theory, ecological modernization theory, and common pool resource theory provide insights into the complex interactions between human societies and natural systems, highlighting the importance of equity, collaboration, and sustainable resource management. Understanding these theories is crucial for developing research projects in sustainable development.

5.1 Theories in social science and application to sustainability development

Sustainable development research draws upon a wide range of theories from various disciplines to address the complex and interconnected challenges of achieving environmental, social, and economic sustainability. Some key theories that are frequently employed in sustainable development research are:

1. ***Ecological Modernization Theory:*** This theory suggests that environmental protection and economic growth can be achieved simultaneously through technological innovation and industrial upgrading. It emphasizes the role of technology in decoupling economic growth from environmental degradation.

2. ***Sustainable Livelihoods Approach:*** This approach focuses on the capabilities and assets of individuals and communities to achieve a sustainable livelihood. It emphasizes the importance of empowering people to improve their wellbeing and manage their natural resources sustainably.

3. ***Common Pool Resource (CPR) Theory:*** This theory examines the governance and management of shared resources, such as forests, fisheries, and water resources. It explores how institutional arrangements and user behavior can influence the sustainable use of common pool resources.

4. ***Ecosystem Services Theory:*** This theory highlights the benefits that humans derive from natural ecosystems, such as water purification, climate regulation, and food provision. It emphasizes the importance of valuing and conserving ecosystem services for sustainable development.

5. ***Capacity Building Theory:*** This theory focuses on enhancing the skills, knowledge, and resources of individuals, communities, and organizations to achieve sustainable development goals. It emphasizes the importance of capacity building for effective implementation of sustainable development initiatives.

6. ***Social-Ecological Systems (SES) Theory:*** This theory emphasizes the interrelationships between social and ecological systems. It recognizes that human societies and natural ecosystems are interconnected and interdependent, and that sustainable development requires a holistic approach that integrates social and ecological considerations.

7.	***Transition Management Theory:*** This theory focuses on the process of transitioning towards sustainable systems. It emphasizes the importance of multi-level governance, stakeholder engagement, and adaptive management to navigate complex transitions.

8.	***Degrowth Theory:*** This theory challenges the notion of perpetual economic growth and advocates for a more sustainable and equitable economic system. It suggests that a reduction in material consumption and a shift towards non-material values are necessary for achieving sustainability.

9.	***Environmental Justice Theory:*** This theory addresses the unequal distribution of environmental burdens and benefits, particularly on marginalized communities. It emphasizes the importance of recognizing and addressing environmental injustices for achieving sustainable development.

10.	***Resilience Theory:*** This theory focuses on the ability of systems to absorb, recover, and adapt to change. It is increasingly being applied in sustainable development research to understand and build resilience in the face of climate change, social-ecological shocks, and other uncertainties.

11.	***Social Capital Theory:*** This theory examines the role of social networks, relationships, and connections in promoting individual and community well-being. It emphasizes the importance of social bonds, trust, and cooperation in achieving shared goals and overcoming challenges.

12.	***Efficiency Wage Theory:*** This theory suggests that paying workers above the market wage can boost productivity and profitability. Higher wages motivate workers to exert greater effort, reduce turnover, and attract more qualified talent. This increased productivity offsets the cost of higher wages, leading to overall financial benefits for employers.

These theories provide a framework for understanding and addressing sustainable development challenges from various perspectives. They offer insights into the complex interactions between human societies and natural systems, the importance of equity and justice, and the need for transformative change towards a more sustainable future. (See Appendix 5.1: Resources to learn more about each theory)

Example 1: Social Capital Theory

Social capital theory is a sociological framework that examines the role of social relationships and networks in promoting individual and community well-being. Key Elements of Social Capital Theory are:

**1.	Trust:** Trust is a fundamental element of social capital. Strong relationships are built on trust, and higher levels of trust within a community contribute to the development of social capital.

**2.	Reciprocity:** Social capital involves reciprocal relationships where individuals exchange resources, support, and favors. This mutual exchange strengthens social ties and builds trust.

**3.	Norms and Social Cohesion:** Shared norms, values, and a sense of social cohesion contribute to the development of social capital. Common understanding and agreement on behavioral norms enhance cooperation.

**4.	Information Flow:** Social capital facilitates the flow of information within social networks. This can be crucial for accessing opportunities, resources, and knowledge.

Social capital theory suggests that human relationships and networks can have a significant impact on a variety of outcomes, including economic growth, individual well-being, and social cohesion. The theory posits that strong social networks can create a sense of trust and reciprocity among individuals, which can lead to increased cooperation, knowledge sharing, and collective action. This can, in turn, lead to improved economic performance, reduced crime rates, and increased civic engagement. Social Capital Theory can be represented by the following figure.
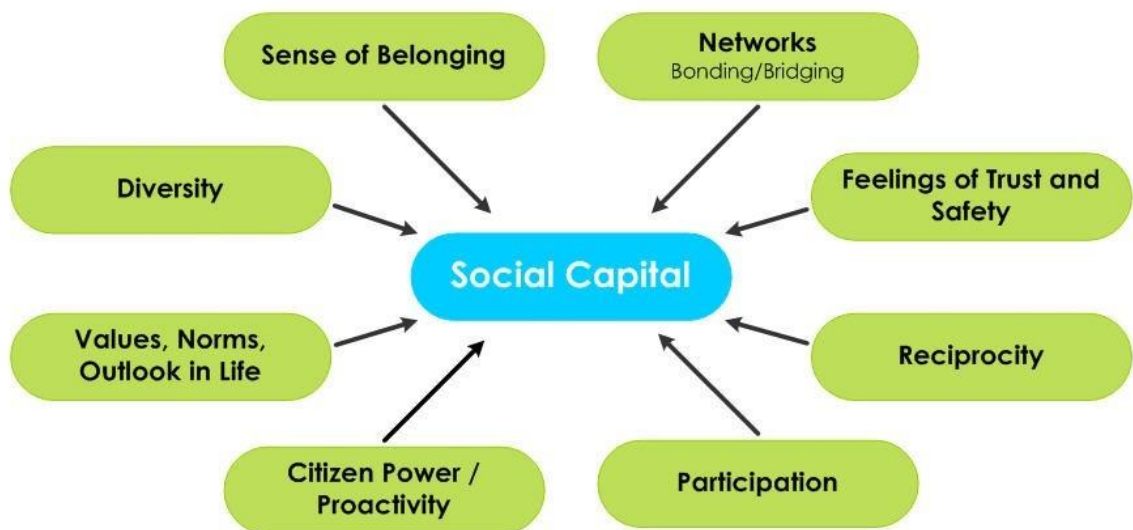
Figure 5.1. Social capital theory

Applications of social capital theory include:

1. **Community Resilience:** Communities with high levels of social capital are often more resilient in the face of challenges. Strong social networks enable collective responses to crises.

2. **Economic Development:** Social capital contributes to economic development by fostering trust and cooperation, essential for successful business transactions and entrepreneurship.

3. **Health and Well-being:** Individuals with robust social capital tend to experience better health outcomes. Social support networks can provide emotional and practical assistance during times of illness or stress.

Social capital theory suggests that social capital, defined as the networks of relationships among people who live and work in a particular society, can provide a range of benefits, including:

1. **Improved access to resources and opportunities:** Social ties can connect individuals to valuable resources, such as jobs, education, and financial support. These connections can help individuals overcome barriers and achieve their goals.

2. **Enhanced social cohesion and trust:** Social capital fosters a sense of belonging, shared values, and mutual trust within communities. This can lead to increased cooperation, collaboration, and collective action.

3. **Promotion of social norms and values:** Social networks can reinforce positive norms and values, such as honesty, cooperation, and respect for others. These norms can contribute to a more harmonious and productive society.

4. **Facilitated collective action and problem-solving:** Social capital can enable communities to organize and work together to address common challenges and achieve shared goals. This collective action can lead to improved outcomes for individuals and communities as a whole.

5. **Reduced social isolation and vulnerability:** Social connections can help individuals cope with stress, adversity, and isolation. Strong social ties can provide emotional support, practical assistance, and a sense of belonging, which can contribute to resilience and well-being.

Social capital theory has been applied to a wide range of research areas, including:

1. **Public health:** Social capital has been linked to improved health outcomes, such as reduced mortality rates and increased access to healthcare.

2. **Education:** Social capital has been shown to promote academic achievement, school engagement, and positive student behavior.

3.   **Economic development:** Social capital can contribute to economic growth and innovation by facilitating entrepreneurship, attracting investment, and fostering collaboration.

4.   **Community development:** Social capital is essential for successful community development initiatives, as it enables communities to identify and address their needs, mobilize resources, and work together effectively.

5.   **Environmental sustainability:** Social capital can play a role in promoting sustainable environmental practices by encouraging collective action, fostering stewardship of natural resources, and promoting responsible consumption patterns.

Social capital theory is a dynamic and evolving field, and research continues to explore the multifaceted relationships between social connections, individual well-being, and community resilience. Understanding and harnessing the power of social capital can contribute to the development of more equitable, sustainable, and thriving societies.
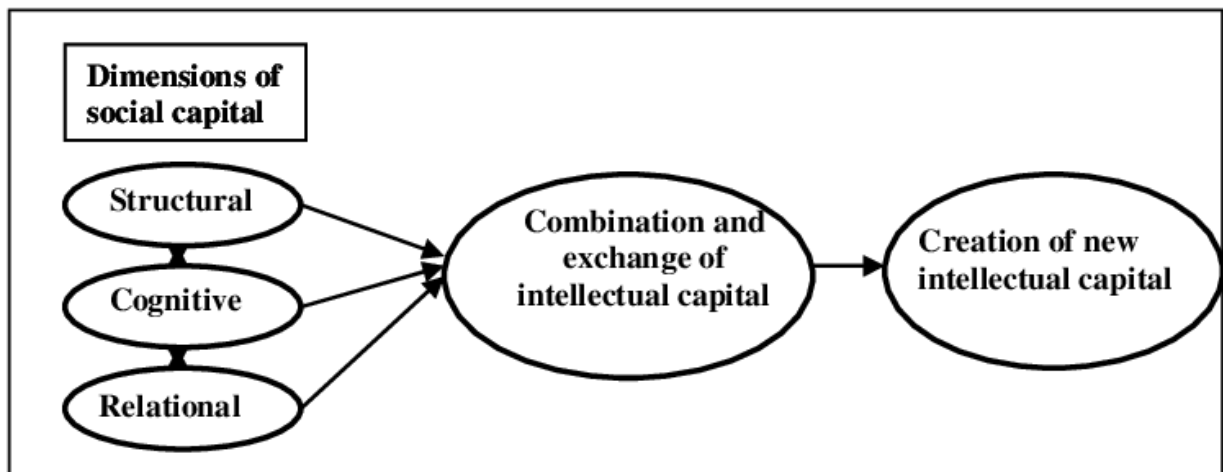
Figure 5.2 An example of research framework based on Social capital

Source: Isabelle, Diane & Heslop, Louise. (2014). The role of social capital in international scientific collaborations: Evidence from a multi-country survey. International Journal of Technology and Globalisation. 7. 259-287. 10.1504/IJTG.2014.066617.

Social capital theory is closely related to the Sustainable Development Goals (SDGs) in several ways. The principles of social capital contribute to the achievement of various SDGs by fostering collaboration, inclusivity, and community engagement. Here's how social capital theory aligns with the SDGs:

SDG 1 - No Poverty:

Social capital can help create support networks and community resources that empower individuals and families to overcome poverty. Strong social ties often lead to better access to economic opportunities and assistance.

SDG 3 - Good Health and Well-being:

Social capital is linked to better health outcomes. Supportive communities can provide emotional and practical assistance during times of illness, contributing to improved well-being.

SDG 4 - Quality Education:

Social capital within communities can enhance educational opportunities. Networks of support and mentorship can positively impact access to education and educational outcomes.

SDG 5 - Gender Equality:

Social capital can play a role in challenging traditional gender norms and promoting equality. Supportive networks may empower individuals to advocate for gender equality and women's rights.

SDG 8 - Decent Work and Economic Growth:

Social capital contributes to economic development by fostering trust and cooperation. Networking and collaboration within communities can lead to increased entrepreneurship and employment opportunities.

SDG 10 - Reduced Inequalities:

Social capital can help bridge social divides by fostering connections between different groups. Communities with strong social ties are often more inclusive, reducing social inequalities.

SDG 11 - Sustainable Cities and Communities:

Social capital contributes to community resilience and cohesion, supporting sustainable urban development. Strong social networks can enhance community engagement and participation.

SDG 16 - Peace, Justice, and Strong Institutions:

Social capital can strengthen community bonds, contributing to social cohesion and reducing conflict. Trust and cooperation within communities are essential for building strong and just institutions.

SDG 17 - Partnerships for the Goals:

Social capital is foundational for building effective partnerships. Trustworthy relationships within and between communities, businesses, and governments are crucial for collaborative efforts to achieve the SDGs.

In summary, social capital theory provides a lens through which to understand the importance of social relationships, trust, and collaboration in achieving sustainable development. The principles of social capital align with the cross-cutting themes of inclusivity, resilience, and community engagement that are integral to the SDGs. Recognizing and leveraging social capital can contribute significantly to the success of sustainable development initiatives worldwide.

Example 2: Efficiency Wage Theory

An example of a theory related to SDG 8, which aims to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all, is the Efficiency Wage Theory.

The Efficiency Wage Theory suggests that paying higher-than-market wages to employees can lead to increased productivity and overall economic efficiency. The theory proposes that when workers are paid more than the market equilibrium wage, they may be more motivated, satisfied, and committed to their work. This higher level of commitment can result in improved job performance, reduced turnover, and enhanced workplace morale.

Key Concepts:

- Worker Productivity: Higher wages can motivate workers to be more productive, as they may feel a greater sense of loyalty and responsibility to their employer.

- Reduced Turnover: When wages are above the market rate, employees are less likely to leave their jobs in search of higher-paying alternatives. This leads to lower turnover costs for employers.

- Quality of Job Applicants: Higher wages can attract more skilled and qualified workers, contributing to a more skilled and efficient workforce.

- Employee Health and Morale: Well-compensated employees may experience better physical and mental health, resulting in reduced absenteeism and improved overall morale.

- Firm Reputation: Companies known for paying above-average wages may attract positive attention, fostering a reputation as socially responsible employers.

The key elements of efficiency wage theory are as follows:

- Shirking: Efficiency wage theory posits that workers who are paid lower wages are more likely to shirk their responsibilities, as they may be tempted to engage in activities that are not directly related to their job duties. This can lead to lower productivity and increased costs for the firm.

- Labor turnover: Higher wages can reduce labor turnover, as workers are more likely to stay with a firm that pays them well. This can save the firm money on recruitment and training costs, as well as reduce the disruption caused by frequent employee turnover.
- Selection: Higher wages can attract more qualified and motivated workers, as they signal to potential employees that the firm values its workforce. This can lead to a more productive and efficient workforce.
- Sociological factors: Efficiency wage theory also considers sociological factors, such as fairness and reciprocity. Workers who are paid higher wages may be more motivated to work hard and cooperate with their colleagues, as they feel that they are being treated fairly.

Efficiency wage theory has been used to explain a variety of phenomena, such as the existence of wage premiums in certain industries and the persistence of unemployment in developing countries. However, the theory has also been criticized for its lack of empirical support and its reliance on assumptions that may not always be realistic. The efficiency wage theory can be illustrated using a diagram in figure 5.3 where Q1 represents a lower level of employment or productivity, Q2 represents a higher level of employment or productivity, and the movement from Q1 to Q2 indicates an increase in employment or productivity levels. W1 represents a lower wage rate, W2 represents a higher wage rate, and the movement from W1 to W2 indicates an increase in wage rate. MRP refers to the additional revenue generated by employing one more unit of a factor of production, like labor or capital. It can be calculated by multiplying the marginal product of the factor by the price of the output. D represents demand and it refers to the quantity of a good or service. MC stands for marginal cost, which is the cost of producing one additional unit of a good or service. And 'L' represents labor considered as a factor of production used in the production of goods and services. The theory suggests that paying higher wages (moving from W1 to W2) can lead to various efficiency gains such as increased productivity, lower turnover, and higher work effort.
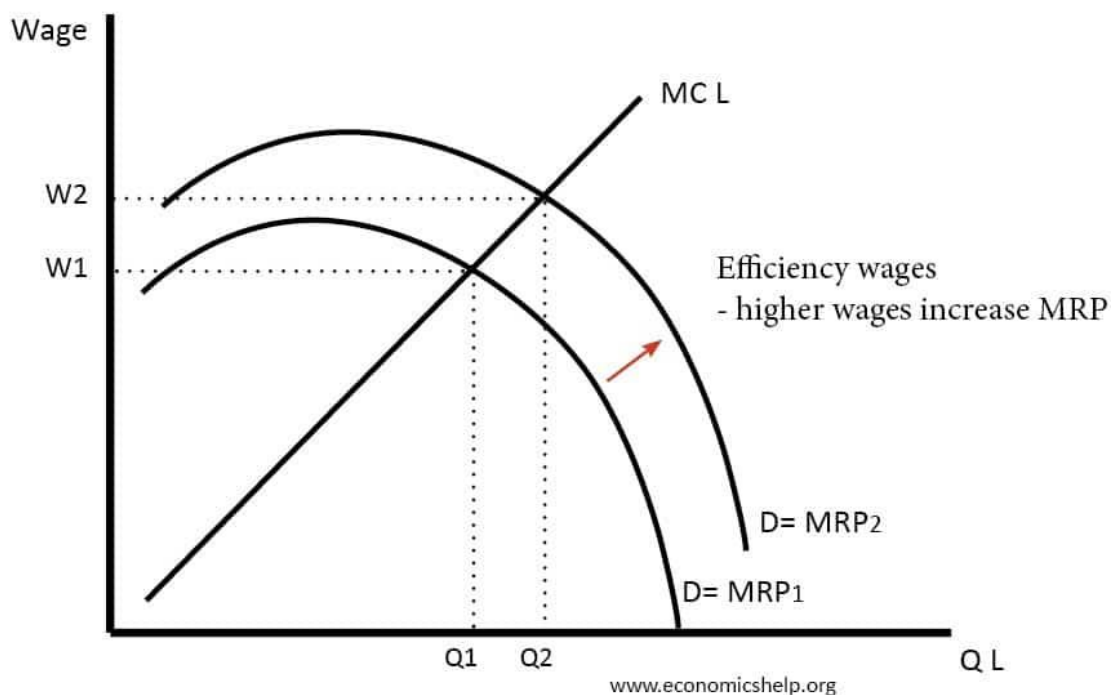
Figure 5.3. Efficiency wage theory
Source: https://www.economicshelp.org/blog/glossary/efficiency-wage-theory/

Figure 5.4 illustrates an example of conceptual framework based on the Efficient wage theory where higher unfunded mandated benefits and higher wages relative to worker productivity leads to

higher relative labor costs and consequently leads to lower incentives for FDI and exports. On the other hand, the positive impacts on macroeconomics can be stimulated by higher freedom of association, lower gender discrimination, and lower child labor.
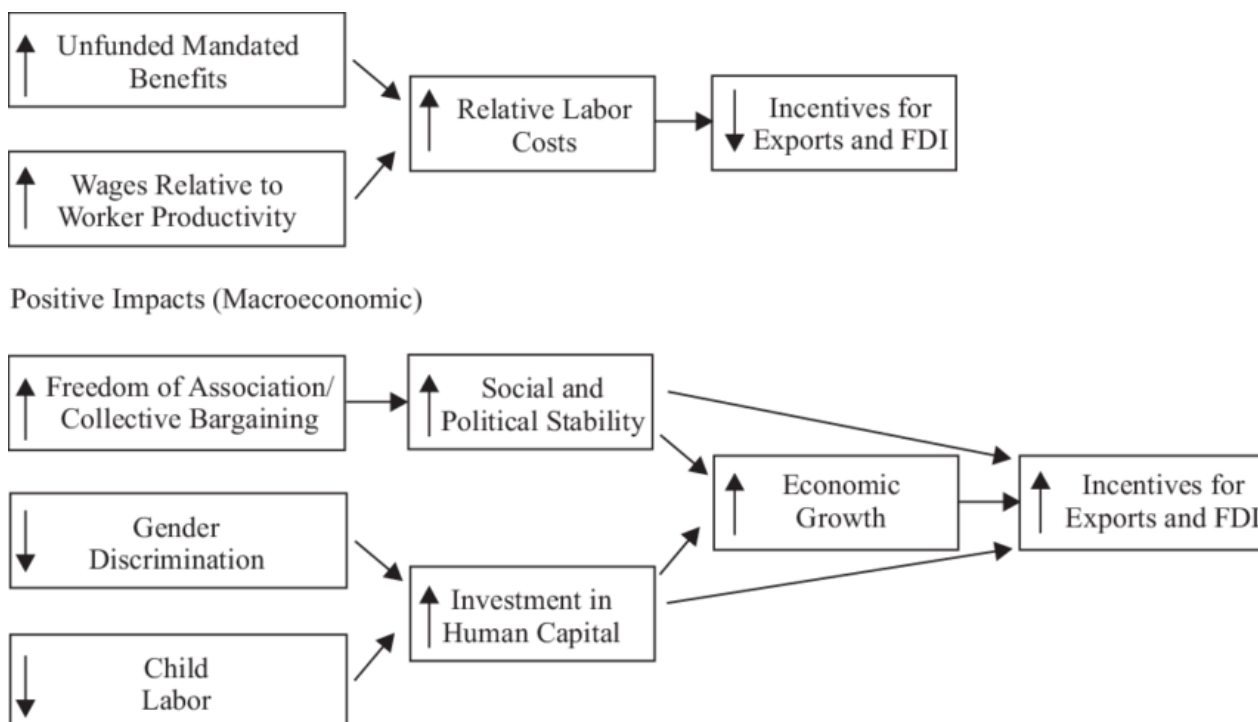
Figure 5.4. An example of conceptual framework based on the Efficient wage theory.

Source: Rodgers, Yana & Berik, Gunseli. (2006). Asia's Race to Capture Post-MFA Markets: A Snapshot of Labor Standards, Compliance, and Impacts on Competitiveness. Asian development review. 23. 55-86. 10.7282/t3-7kyb-da07.

Application to SDG 8: Efficiency Wage Theory aligns with SDG 8 by addressing the goal's objectives related to full and productive employment, sustainable economic growth, and decent work. By paying wages that exceed the market equilibrium, employers can contribute to a more inclusive and sustainable economy, supporting the well-being of workers and fostering a positive work environment.

It's important to note that the Efficiency Wage Theory is just one of many theories related to labor markets and economic development, and its application may vary across different contexts and industries.

5.2 Hypothesis Development

In the realm of scientific inquiry, hypothesis development stands as a foundational step, guiding researchers in their quest for understanding and knowledge. A hypothesis serves as a testable proposition that seeks to explain a phenomenon or predict a relationship between variables.

A hypothesis acts as a compass, providing direction to the scientific investigation. It frames the research question, offering a clear and testable proposition that guides the collection and analysis of data. Through hypothesis development, researchers articulate their expectations and set the stage for uncovering patterns, relationships, or causality in their studies.

Formulating a Hypothesis

Null Hypothesis (H0): The null hypothesis represents the default assumption that there is no significant effect, relationship, or difference. It serves as a baseline for comparison in statistical analysis.

Alternative Hypothesis (H1): The alternative hypothesis contradicts the null hypothesis, suggesting the presence of a significant effect, relationship, or difference. It is what researchers aim to support with their evidence.

Operationalizing Variables: To test a hypothesis, researchers must operationalize variables, defining them in measurable and observable terms. This clarity ensures precision in data collection and analysis.

Directional vs. Non-Directional Hypotheses: Hypotheses can be directional, predicting the specific nature of a relationship (e.g., "A positively influences B"), or non-directional, merely suggesting a relationship without specifying its nature.

Steps in Hypothesis Development

Hypothesis development is a critical aspect of the scientific method, guiding researchers in formulating testable propositions that can be investigated and analyzed. The key steps in hypothesis development are as followed:

1.   Identify the Research Problem: Clearly define the research problem or question that you want to address. This sets the foundation for the hypothesis.

2.   Review Existing Literature: Conduct a thorough review of existing literature related to the research problem. This helps you understand the current state of knowledge, identify gaps, and build a foundation for your hypothesis.

3.   Specify the Research Objectives: Clearly outline the objectives of your research. What do you aim to achieve or investigate? The research objectives provide direction for hypothesis development.

4.   Define Variables: Identify and define the key variables involved in your research. Variables are the measurable elements that you will manipulate, measure, or observe in your study.

5.   Formulate the Null Hypothesis (H0): The null hypothesis represents the default assumption of no effect, no relationship, or no difference. It serves as a baseline for comparison. For example, if testing the impact of a new drug, the null hypothesis might state that the drug has no effect compared to a placebo.

6.   Formulate the Alternative Hypothesis (H1): The alternative hypothesis contradicts the null hypothesis and proposes a specific effect, relationship, or difference. It is what the researcher aims to support with evidence. Using the drug example, the alternative hypothesis might state that the new drug has a significant effect compared to a placebo.

7.   Choose the Level of Significance (α): Select the level of significance, denoted as α, which represents the probability of rejecting the null hypothesis when it is true. Commonly used values for α are 0.05 or 0.01.

8.   Select the Statistical Test: Based on the research design and nature of the variables, choose an appropriate statistical test for hypothesis testing. Different tests are used for different types of data and research questions.

9.   Operationalize Variables: Clearly define and describe how you will measure or manipulate each variable. This operationalization ensures that the variables are observable and can be used in data collection.

10.   Design the Study: Develop a detailed research design and methodology, outlining how data will be collected, analyzed, and interpreted. Ensure that the study design aligns with the chosen statistical test.

11.   Collect and Analyze Data: Implement the study design, collect data, and perform the selected statistical analysis. The analysis will determine whether the evidence supports the null hypothesis or favors the alternative hypothesis.

12.   Draw Conclusions and Refine: Based on the results, draw conclusions about the hypothesis. If the null hypothesis is rejected, it suggests support for the alternative hypothesis. If inconclusive, consider refining the hypothesis or conducting further research.

13.   Communicate Findings: Share the findings through research reports, articles, or presentations. Clearly communicate the results, conclusions, and implications of the study.

14.   Iterate and Build on Knowledge: Recognize that hypothesis development is an iterative process. Refine hypotheses based on new evidence and contribute to the ongoing development of knowledge in the field.

Consider an example of a hypothesis related to one of the Sustainable Development Goals (SDGs). For this illustration, we'll focus on SDG 2, which aims to "End hunger, achieve food security and improved nutrition, and promote sustainable agriculture."

Research Question: What is the impact of implementing sustainable agricultural practices on food security in a specific region?

Hypothesis:

- **Null Hypothesis (H0):** There is no significant difference in food security between communities practicing conventional agriculture and those adopting sustainable agricultural practices in the selected region.

- **Alternative Hypothesis (H1):** Communities that adopt sustainable agricultural practices demonstrate a significant improvement in food security compared to those practicing conventional agriculture in the selected region.

Explanation:

- In this example, the research question addresses the broader goal of promoting sustainable agriculture and improving food security.

- The null hypothesis suggests that there is no difference, emphasizing the default assumption for statistical testing.

- The alternative hypothesis posits a specific relationship, asserting that adopting sustainable agricultural practices leads to a significant improvement in food security.

Operationalization:

- Define measurable indicators for food security (e.g., access to nutritious food, reduced malnutrition rates, food availability).

- Operationalize sustainable agricultural practices, specifying practices such as crop diversification, agroecological methods, and reduced use of chemical inputs.

Study Design:

- Implement a comparative study, collecting data from communities practicing conventional agriculture and those adopting sustainable practices.

- Utilize surveys, interviews, and relevant data sources to assess food security indicators.

Expected Outcomes:

- If the statistical analysis rejects the null hypothesis, it would provide evidence supporting the idea that sustainable agricultural practices positively impact food security.

- If inconclusive, further research and refinement of the hypothesis may be necessary.

This example illustrates how a hypothesis can be formulated to investigate the impact of specific actions related to an SDG. The hypothesis serves as a guide for research design, data collection, and analysis, contributing to the broader understanding of sustainable development goals.

5.3 Population, sampling design and sampling procedures

Understanding the concepts of population and sampling is fundamental to ensuring the validity and generalizability of study findings. This section delves into the intricacies of defining populations, selecting appropriate samples, and the implications of these decisions on research outcomes.

1. Defining the Population:

a. *Concept of Population:* - The population in research refers to the entire group that is the subject of the study. This could be a broad category, such as "all adults in a city," or more narrowly defined, like "students in a particular school."

b. *Target Population vs. Accessible Population:* - The target population is the group to which the researcher intends to generalize the study's findings. The accessible population is the group that is realistically available for study, often due to logistical constraints.

2. Types of Sampling:

a. *Probability Sampling:* - In probability sampling, each member of the population has a known and equal chance of being selected. Common methods include simple random sampling, stratified random sampling, and systematic sampling.

b. *Non-Probability Sampling:* - Non-probability sampling methods do not provide every member of the population an equal chance of being included. Examples include convenience sampling, purposive sampling, and snowball sampling.

3. Simple Random Sampling:

a. *Procedure:* - Every individual in the population has an equal chance of being selected. This is often achieved through random number generators or drawing names from a hat.

b. *Applicability:* - Suitable when the population is relatively homogenous and when each member has an equal chance of representing the entire group.

4. Stratified Random Sampling:

a. *Procedure:* - The population is divided into subgroups (strata) based on certain characteristics, and random samples are then taken from each stratum.

b. *Applicability:* - Effective when the population is heterogeneous, and the researcher wants to ensure representation from different subgroups.

5. Convenience Sampling:

a. *Procedure:* - Participants are chosen based on their availability and accessibility to the researcher, rather than through a random process.

b. *Applicability:* - Often used in exploratory research or when time and resources are limited, but it may lead to a less representative sample.

6. Sample Size Considerations:

a. *Power Analysis:* - Conducting a power analysis helps determine the appropriate sample size required to detect a significant effect if it exists.

b. *Margin of Error:* - The margin of error indicates the precision of the study findings. A larger sample size generally results in a smaller margin of error.

7. Implications for Generalizability:

a. *External Validity:* - The generalizability of study findings to the larger population depends on the representativeness of the sample. A well-defined population and a thoughtfully chosen sample enhance external validity.

b. *Trade-offs in Sampling:* - Researchers must navigate trade-offs between the ideal sample size, resources available, and the desired level of precision. Striking a balance is crucial.

In conclusion, population and sampling decisions play a pivotal role in shaping the trajectory and outcomes of a research study. Researchers must carefully consider the characteristics of the

population, choose appropriate sampling methods, and be mindful of the implications for the study's generalizability. This foundational understanding lays the groundwork for robust and insightful research design.

5.4 Research variables

Research variables are fundamental in the field of research and are essential for understanding the relationships between variables in a study.

Independent Variable (IV):

- **Definition:** The independent variable is the factor that researchers manipulate or change in a study, and it is hypothesized to be the cause or predictor influencing the dependent variable.

- **Example:** In a study examining the impact of community empowerment programs (independent variable) on access to clean water (dependent variable) in rural areas (SDG 6 - Clean Water and Sanitation), the community empowerment programs are the independent variable.

Dependent Variable (DV):

- **Definition:** The dependent variable is the observed and measured outcome that is influenced by changes in the independent variable.

- **Example:** In the same study related to community empowerment and access to clean water, the availability of clean water is the dependent variable, aligning with the SDG 6 goal.

Mediating Variable:

- **Definition:** A mediating variable is an intermediary factor that helps explain the process through which the independent variable affects the dependent variable.

- **Example:** In a study exploring the impact of gender equality programs (independent variable) on economic development (dependent variable) in a community (SDG 5 - Gender Equality and SDG 8 - Decent Work and Economic Growth), women's empowerment and participation in the workforce could act as mediating variables.

Moderating Variable:

- **Definition:** A moderating variable is a factor that influences the strength or direction of the relationship between the independent and dependent variables under specific conditions.

- **Example:** In a study investigating the effectiveness of renewable energy initiatives (independent variable) on reducing carbon emissions (dependent variable) across different countries (SDG 7 - Affordable and Clean Energy and SDG 13 - Climate Action), the level of government support for sustainable policies could act as a moderating variable. In a study examining the relationship between stress (independent variable) and job performance (dependent variable), the presence of social support could act as a moderating variable. Social support may strengthen the negative impact of stress on job performance for some individuals but not for others.

Understanding these concepts is crucial for researchers and policymakers working on SDGs, providing insights into the relationships, mechanisms, and contextual factors influencing sustainable development outcomes.

Summary

The Sustainable Development Goals (SDGs) represent a global commitment to achieving a more sustainable, equitable, and prosperous future for all. Understanding the theoretical foundations of sustainable development is essential for navigating the complex challenges and developing effective solutions. This chapter has explored a selection of relevant theories, highlighting their contributions to various aspects of the SDGs.

Social capital theory emphasizes the importance of social networks, trust, and cooperation in promoting individual and community well-being. It highlights the role of social capital in achieving the SDGs by fostering inclusive participation, empowering marginalized groups, and strengthening communities.

Efficiency wage theory suggests that paying workers above the market wage can boost productivity and profitability. This theory highlights the importance of human capital and the long-term benefits of investing in workers. By paying higher wages, employers can attract and retain more qualified workers, reduce turnover, and foster a more motivated and productive workforce. This, in turn, can lead to increased output, improved quality, and lower production costs. Efficiency wage theory has implications for achieving the SDGs by promoting decent work and economic growth, reducing poverty and inequality, and enhancing worker well-being.

While this chapter has focused on a select group of theories, it is important to recognize that numerous other theoretical frameworks contribute to our understanding of sustainable development. These include theories from fields such as economics, sociology, psychology, and political science. Each theory offers unique perspectives and insights that can inform our efforts to achieve the SDGs. By drawing upon a diverse range of theoretical perspectives, research in sustainable development can be developed in a more comprehensive and effective approaches.

Steps in conducting research in sustainable development include selecting related theories, designing research framework, developing hypothesis, defining population, specifying sample, and identifying relevant research variables comprising the *independent variable:* the manipulated variable, presumed to cause an effect, *dependent variable:* the observed and measured variable, the outcome of interest, *mediating variable*: an intermediate variable that explains the process between the independent and dependent variables, and *moderating variable:* a factor that influences the strength or direction of the relationship between the independent and dependent variables under certain conditions.

Discussion questions

1.   How can we effectively integrate theoretical insights from various disciplines into practical strategies for achieving the SDGs?

2.   What are the challenges of applying theoretical concepts to real-world sustainable development problems?

3.   How can we bridge the gap between theoretical knowledge and practical implementation in the field of sustainable development?

4.   Select other theories and discuss how they can be applied to research in sustainable development.

5.   How can researchers formulate clear, measurable, and testable hypotheses in sustainable development research?

6.   What are the different types of hypotheses that can be used in sustainable development research, and how are they appropriate for different types of research questions?

7.   What are the potential sources of bias in hypothesis development, and how can researchers avoid these biases?

8.   What is the difference between a population and a sample in sustainable development research?

9.   How can researchers define the appropriate population for their study, considering factors such as geographic scope, time period, and target audience?

10.   What are the different types of sampling methods that can be used in sustainable development research, and how are they appropriate for different research designs?

11.   What are the potential sources of sampling bias, and how can researchers minimize these biases to ensure a representative sample?

12.   What are the different types of variables that can be used in sustainable development research, and how are they classified?

13.   How can researchers identify and define the key variables relevant to their research question?

14.   What are the challenges of measuring and operationalizing variables in sustainable development research, particularly those involving social, economic, and environmental factors?

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Chapter 6: DATA COLLECTION FOR QUALITATIVE RESEARCH METHODS I

In this chapter we will look in more detail at observation as an important qualitative research method. We will answer questions such as what observation technique is and what types it is, what is participant and non-participant observation, what is covert and overt observation, what is the process of observation or how do we process information from observation.

6.1 Observational technique

Observation, as defined by Szokolszky (2020), is the purposeful detection of phenomena in a natural environment. In quantitative methodology has a structured form and is based on the examination of pre-defined categories. In qualitative methodology observation is the main research method, and it is the observation of a phenomena in context with varying degrees of involvement of the observer. This latter type of observation is also known as natural observation and it will be the focus of this chapter.

Observation is a means of obtaining information about behaviour and phenomena, where the person doing the research does not influence events consciously tot he best of their abilities. Its main advantage is that it is preferably carried out in the natural environment of the person or people who are being studied. It also has the advantage of allowing a more accurate interpretation and understanding of the behaviour, attitudes and situations of the subjects. The data obtained can be more in-depth and accurate, and can also provide much more novel information than information obtained by other methods, as it eliminates the problem of the subject being unable or unwilling to provide the data requested. The disadvantage of observation is that it is difficult for the observer to convert the observed phenomena and events into scientifically useful information. Therefor, the extent to which generalisable conclusions and rules can be drawn from an observation is an important question, and we need to be critical of the validity and reliability of an observation. However, observation is an excellent way of exploring a research topic and preparing hypotheses just like other qualitative tools (Alves da Costa, 2020; Ghauri, Grønhaug, 2011).

Observations can be carried out on the field, i.e. in the **natural environment** of the subject, or in the laboratory, i.e. in an **artificial environment**. The latter may have the advantage of giving the researcher more control over the observation by allowing him to filter out distractions and thus making the process more efficient and less time-consuming. The disadvantage of the artificial environment is that it can eliminate information from the study that is contained in observations in the natural environment.

Observation is classified based on the observer. If the observer participates in the observed processes and phenomena in the field then it is called **participant observation.** If they are an external observer and do not participate in the processes then it is called **non-participant observation**. Observation can also be defined whether they reveal the conduct of the investigation to the observed (**overt observation**) or does not do so (**covert observation**).

In terms of tools, you can do the observation in person, but you can also use machines. An example of a machine is when cameras are installed in a shop to monitor shopping habits and then analysing the footage to draw conclusions about customers' behaviour. Thanks to today's technologies, observation does not necessarily require the actual personal involvement of the researcher. In many cases, the possibilities of online space and video observations can be sufficient to

better understand a research problem. Of course, they cannot provide such a deep, detailed insight into a medium or a situation, but that is not the purpose of all research.

Sustainability considerations may also play a role in the choice of means and location of observation. For example, it may be important to decide whether the observation should take place in a natural or artificial environment. It is worth considering the creation of an artificial environment for the observation at the research site in cases where conducting the observation on the field in a natural environment would require too much environmental stress and financial expenditure - e.g. transport, accommodation, catering. This may not always be compatible with the research objectives and interests - e.g. the observation of an ethnic group in a natural environment is not feasible for anthropologists and ethnographers anywhere else but in the field. However, there are, research topics that do not require field observation to observe a phenomenon, thus sustainability considerations can be taken into account. In addition to the location of the observation, the choice of tools can also be influenced by sustainability considerations. For example, the observation of consumer behaviour in a shop can often be done efficiently using video cameras, without the need for the observers to travel to the site.

6.2 Methodological considerations for the use of observation

The observational method is excellent for hypothesis generation. It is less suitable for hypothesis testing, both because of the potentially distorting effects of researcher participation in modifying the behaviour of the subjects and because the method is essentially based on single cases, i.e. it is not representative. In addition, the observation data are not without subjectivity and occasionally are non-transparent. For this reason, according to some authors (Ghauri, Grønhaug, 2011), the studies often are non-replicable, which is an important criterion in scientific hypothesis testing. Observation can therefore be seen primarily as an exploratory method when seeking to better understand a research problem. Therefore the observation is very useful for inductive reasoning, as it allows us to investigate a problem in depth and candidly. Participant observation leads to a more in-depth investigation than non-participant observation, as the researcher can examine a range of information and reactions in the subject's environment that would not be visible from the outside. The natural environment helps the subject to tend to forget that an investigation is taking place, and therefore his or her behaviour returns to normal. In a non-natural test environment, there is little observed of behaviour reverting to the natural, as subjects are not assisted by their own environment in eliciting patterns of habitual behaviour and are reminded that they are in a test situation (Ghauri, Grønhaug, 2011).

In some cases, observation is used to collect quantitative data and is therefore used as a quantitative tool. In this case, it can also be used for hypothesis testing.

According to Mills, Durepos, and Wiebe (2010), when choosing observation as a research method, the following should be particularly considered in terms of the reliability of the study:

- *Observer effect:* the risk that the observer will have an effect on the observed and they will modify their behaviour or actions. This effect is relevant in the case of overt observation, where subjects are aware that they are being observed and may therefore change their behaviour. This is called the Hawthorne effect. This phenomenon is more pronounced in the first period of observation, especially in the case of non-participant observation, after which the subjects usually return to their normal behaviour. The information gained in the first period is not usually taken into account in case of observations over a long period of time, and is considered a wash-out period (Alves da Costa, 2020).

- *The question of objectivity:* this question arises in relation to the researcher's ability to remain objective. Objectivity when collecting and analysing data on the observed environment that is

not overly dominated by his or her own values and interpretations. In some cases of participant observation personal interpretation can help to get a deeper and more accurate understanding of the situation and can therefore be considered part of the process, i.e. subjective interpretation of the situation can be used. The investigator can enhance the reliability of the study by using rigorous and systematic sampling, field notes, and data analysis.

- *Selectivity*: observation can never gather all the information, because the observer is also unconsciously selecting information. In order to avoid unconscious selecting of information it is useful to collect as many aspects of the situation under observation as possible. It can be informative if several people are making the observation and compare the information obtained during the observation. In addition, it is worthwhile to continue the observation in good time until new information related to the research question can be obtained. Observation should be continued until theoretical saturation. Theoretical saturation is when the observers can no longer gather new information relevant to understanding the situation. This can take from days to months, depending on the subject of the observation. For example, in the case of a shopping habit observation, it may be enough to observe the behaviour of customers for a week. Whereas in the case of an overt participant observation in a social institution a long period of time is needed to reach a sufficient level of trust, and the substantive observation can only follow after trust was gained (Cooper, J., Lewis, R., Urquhart, C., 2004).

- *The question of interpretation:* in the process of recording and analysing research findings, it is often the researcher's interpretation that is dominant, as opposed to the participants' interpretation. To avoid this, it is usual to include the accounts of the so-called insiders (participants) and outsiders (researchers), which can be compared to form a common interpretation of the situation. In this context, the cultural context is always of paramount importance when interpreting observed situations. The way in which a particular behaviour, gesture or situation is interpreted in a given culture is not neutral from the point of view of observation. For example, in an observation, a long eye contact in response to a certain situation may be a sign of interest and attention in one culture, while in another it may be a sign of rivalry and aggression.

However, from a reliability point of view, it is important how well the behavioural categories identified throughout the observation describe an abstract concept - e.g. whether brand loyalty is reflected by behavioural patterns such as buying the brand, recommending it to others, avoiding a similar category of product, and so on. Qualitative observation methods generally contribute to a better description and understanding of abstract concepts, and therefore their reliability in this respect is good.

Another favourable feature of observation is *ecological validity*. Ecological validity refers to the extent to which the research results can be generalised to natural conditions. Any observation that examines the phenomenon in its natural setting, approaches the events as a natural whole and describes them in context, and thus has a high ecological validity. The less natural the environment, and the more structured the phenomena are examined, the more this reliability decreases (Szokolszky, 2020).

Taking into account the methodological considerations above, the observation method is therefore well suited for cases where the study focuses on directly observable phenomena, such as behaviour, reaction to a stimulus, observation of customer behaviour in a shop environment. In a study where natural environment is indispensable must take place on the field. Different customers behave differently in a shop, and their actions are influenced by several external and internal factors. We are talking about a complex situation, so the exploratory nature of the study is important to explore and understand the reasons for their behaviour. The method can also be used to test hypotheses about behaviour, but it is important to take into account the limitations of validity when examining the results of the study.

The indicators and main advantages and disadvantages of observation are summarised in Table 6.1.

Table 6.1 Applicability, advantages and disadvantages of observation (Szokolszky, 2020)

Applicability/Indicators	For a research problem that: - Directly addresses observable behaviour - The natural context is important - Complex, variable, or unique behaviour - Explorative - Exploratory-descriptive - Aims to support a hypothesis about behaviour
Advantages	- In-depth, detailed, contextual description and understanding - Openness to emerging issues - Ecological validity
Disadvantages	- Time-intensive - Limited generalisability - Situational - motives, antecedents, emotions not always observable

A special case of observation

The method of observation can be unstructured or structured, also known as systematic. In **unstructured observation**, the person(s) observed are not examined according to a predefined plan and categorisation system. Information is collected on the basis of criteria related to the subject and the objectives of the study, thus this method belongs to the qualitative research methods. In contrast, in **structured observation**, the observer carries out the observation according to a specific set of aspects, observing predefined rules and categories. The purpose and result of this structured approach is that all observers obtain the same results under almost identical conditions. Structured observation can be classified as a quantitative tool because structure, repeatability and the conversion of observations into quantitative data. Data collected through structured observations can be easily compared due to the structured nature of the data. In structured observation, four factors related to the temporal dimension have important informational value: the duration of the observed behaviour, frequency, the temporal distribution of its occurrence (e.g. within a day), and the pattern in which it emerges as a consequence of other behaviours. In addition, the quality (e.g. intensity) of the behaviour is also an important indicator (Stausberg & Engler, 2011).

The disadvantage of structured observation is that it is time-consuming and often misses information that is relevant to the research. The criteria have to be defined and measured before the study, thus it is less useful for obtaining new information and is more likely to yield quantitative information.

General procedure for observation

The steps of the observation are illustrated in Figure 6.3 (Ghauri and Grønhaug, 2011).

1.   First of all, the case of the observation must be selected. The **selection of the appropriate case** will be influenced by the availability of the target population. The selected case often cannot be representative due to the characteristics of observation, and often uses a single-case study design to better understand and explore a particular problem or issue. It is required to select a representative case if it is possible where the purpose of the research is to test a theory. For example, when looking at environmental awareness attitudes and habits, which play an important role in sustainability, we need to define the population we want to study within a given society.

2.   The second step of observation is **acquiring permission** to observe the person or group. The researcher(s) guarantees that the researcher has access to the person or group under

investigation. At this point, the investigator(s) will be provided with a letter of introduction, which will provide information about the general purpose of the research, the duration of the observation, the organisation commissioning the research and the sources of the research. In this document, the researchers explain the details of the procedure and assure the participants of confidentiality and anonymity, i.e. that the information obtained will be used anonymously and only for the purposes of the research.

If, as in the previous example, we want to study environmental awareness among university students, we will need to ask for research ethics permission. We then need to inform the students that observation is taking place in the institution and what the framework is.

3.   The activities defined as the third step (Figure 6.3) are **rapport building, behaviour observation and record observation**, are not sequential but also parallel activities.

In the case of overt observation, it is necessary to build rapport with the study group or person. This often takes a longer time in the process. The researcher needs to be sensitive to the observed person or group's own customs, traditions, language, cultural specificities and to demonstrate the ability to keep information confidential.

When observing behaviour and recording what is observed, it is important to remember that everything that is observed should be recorded. This means that there may be information that does not appear to be relevant to the subject of the research during the observation, but it is important to record this data and events because they may have important information value in later analysis of the observation. The researcher should not ignore or be selective in recording information. In addition to the facts, the observer also writes down his/her own impressions, understandings and thoughts during the observation, because these will help the researcher in the analysis of the observed data. This can be particularly important when the observation and analysis are not carried out by the same person. Ideally, the observation should continue until some new information can be extracted from the situation observed.
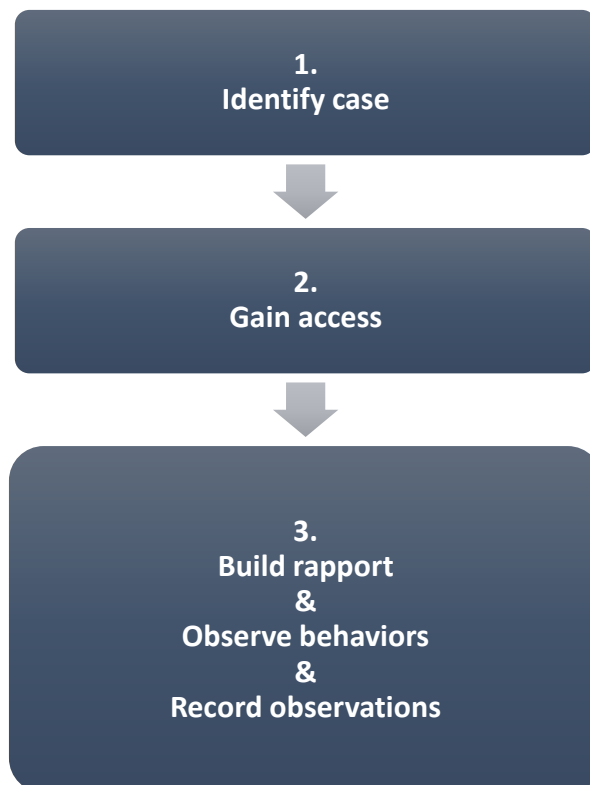
Figure 6.1.Steps in observation (based on Ghauri, Grønhaug, 2011)

Once the observation has been completed, the **data can be processed**. During the analysis, it is important to determine the categories under which you want to group the observed information. For example, when observing the communication of a group, the observation categories can be different types of events, interactions, reactions, attitudes, grouped according to different levels of communication into verbal, non-verbal categories, and so on. After coding the data according to categories, systematic patterns and recurring themes are identified, and then these patterns are interpreted and, depending on the purpose of the research, even explained.

Recording and processing the observation

We can use different **recording techniques** (Szokolszky, 2020) during the observation process:

- **Video and audio recording**: the situation observed can be viewed back by making a video recording, which can be a great help when analysing. The camera is stationary, so the observation is always made from the same angle. You can place several cameras, which has the disadvantage that the more visible the observation devices are, the more they can affect the nature of the observed phenomena. The disadvantage of this method is that the analysis of the images and sound is a time-consuming task and requires the development of specific methodological criteria.

- **Note-taking**: the purpose of the note-taking is also to record the situation observed as fully as possible, including non-verbal and verbal information and the investigator's own thoughts and comments on the situation. In case of a full record, everything is written down; in case of a partial record, typical examples of situations observed are noted. The disadvantage of this method is that it requires very fast writing skills.

- **Observation diary, field notes**: the typical recording method for fieldwork is diary-keeping. At set intervals - for example daily - the observed events are summarised in narrative form. This can be assisted by preliminary observations, but it is important that the framework is open to recording all events.

Field notes need to be recorded (behaviour or events) as quickly as possible after they have occurred, preferably as detailed and as accurately as possible.

Steps for processing information recorded during observation:

- **Transcription, clarification**: in the case of recorded audio and visual material, the recordings must be transcribed. A transcription policy must be drawn up, transcription staff must be trained and the reliability of the transcription must be checked.

The information recorded in the field transcript should be clarified so that it is easy to read and understand. This should be done continuously during the fieldwork.

- **Data reduction**: data reduction is the process of condensing the data by extracting the parts that are considered relevant, forming categories and coding phenomena that belong to the same behavioural category with the same code (e.g.: comforting and hugging - EM code meaning: empathy)

- **Data management, data visualisation**: we will put the reduced data into a manageable, transparent and searchable format.

- **Analysis**: analysing the prepared data according to certain criteria defined by the objectives of the research, such as: trends, typical cases and exceptions, identifying correlations, putting them into a theoretical framework, comparing them with previous known results, illustrating them with examples, etc.

6.3 Types of observation

Observation can be categorised according to the participation and activity of the observer (participant and non-participant) and the information given to of the observed person(s) (overt and covert), which can be divided into four types of observation (Figure 6.2).

	Overt	Covert
Participant	participant and overt	participant and covert
Non-participant	non-participant and overt	non-participant and covert

Figure 6.2 Types of observation (based on Ghauri, Grønhaug, 2011)

Participant and non-participant observation

Participant observation

In participant observation - or active participant observation - the researcher becomes part of the observed situation and thus an active participant. The researcher becomes part of the daily life of the observed group, including their habits and activities (Ghauri, Grønhaug, 2011).

The advantage of the participant observation method is that interaction with the people or groups being observed gives the observer additional information that he or she would not experience as an outside observer. Such situations might include observing the emotional impact of what is happening in a particular situation, or as a member of a religious minority group, experiencing the accepting or rejecting attitudes of outsiders. Participant observation can provide deeper information by involving the researcher in the community's interactions with the majority society. For example, in order to record the reactions of a majority society toward a religious minority when using public transport, walking in public places, shopping (i.e. one with distinctive features that are visible to the outside observer).

One of the disadvantages is the involvement in the lives of the people observed can compromise the objectivity of the investigator. For example, in a prison study experiencing the everyday problems of prisoners makes the observer empathise deeply with them, causing him to overlook some information and attach greater importance to others. Moreover, the danger of the study and the risks of participation must be taken into account and may be an important consideration when choosing the type of study. In some situations participant observation may provide the investigator with information - e.g. about a crime - which may raise ethical dilemmas and in some cases may have a strong influence on the outcome and success of the investigation through their decisions and behaviour.

An example of participant observation is when we study the communication of a work group in a company In order to carry out this research, the person conducting the study becomes part of the life of the work group, participates in their work, gets involved in their processes, and has personal contact with the members of the group.

Non-participant observation

The non-participant - or passive observation - is where researchers observe and record the behaviour of the object of observation without interacting with it in any way. This type of observation can be carried out to study people's communication in public places, such as a restaurant, or even on the Internet, e.g. in chat rooms (Ghauri, Grønhaug, 2011).

The advantage of non-participant observation is that it has a low probability of significantly changing the behaviour of the object of observation, because the researcher does not interact with

the subjects. In addition, it is important that the observed environment is left in its natural state and is not modified by the personal presence of the observer, so that it can adequately represent the natural environment of the object of observation.

The disadvantage of the method is that by not interacting with the subject of the observation, the person doing the observation may in some cases obtain less information, because certain activities and information can only be observed if the observer is also a participant. If the observer does not become part of the everyday life of the group being observed then it is difficult to capture the experience of external reactions. He or she will not be able to observe the experiences and reactions from other members of society. For example, the observer become part of the group by wearing the costume of a subculture or ethnic group and can experience the reaction of other members of the society when walking down the street(Ghauri, Grønhaug, 2011).

An example of a non-participant observation situation is when a study of communication in a company working group is carried out with the investigator observing from the outside the communication processes, but not participating in them.

Covert and Overt Observation

Observation can be carried out in two ways: there are observations when people observed know that the observation is taking place and there are observations when people observed do not know that the observation is taking place. When participants know the observation is taking place then it is called overt observation. When the participants do not know the observation is taking place then it is called covert observation. In the next two sub-chapters you will be reading about each of these observation techniques: which is best used for what type of research and why, what are the ethical implications of each and what type of data we may get from these research methods.

Overt observation

Overt observation is when the observer is known for the observed participants and they know they will be observed at a certain place and time. Participants are notified before the observation starts and they know who will observe them.

One of the most famous overt observation examples is the **prison experiment** of Zimbardo, Haney, Banks, and Jaffe in 1971 (Haney, C., Banks, W., C., Jaffe, D, 1971; Haney, C., Banks, W. C., & Zimbardo, P., 1973; Zimbardo P., Haney, C., Banks, W., C., Jaffe, D., 1971). Zimbardo and his colleagues recruited volunteers to take part in an experiment where they will be randomly assigned to play a role of a prisoner or a prison guard in an environment that was built like a prison at Stanford University.

Zimbardo and his colleagues did not have a time point where they wanted to finish the experiment. They did not have situations discussed that would warrant an emergency ending of the experiment at any point. Zimbardo and his colleagues became participants themselves, they dressed similarly and they covered their faces with the same materials as the participants: they experienced the same situation and they got physically closer to the situation and experiences of the observation situation. Zimbardo and his colleagues were criticized for not stopping the observation earlier and the participants became part of embarrassing, humiliating and situations where participants felt they cannot step out of the situation. Zimbardo and his colleagues were rightfully criticized for this aspect of the research: they let humans embarrass and humiliate each other violating the criteria of voluntariness to participate in research and respecting each other or preparing before the observation how to address negative consequences.

With all this being said, the research community could learn from these mistakes. Research protocols, institutional review boards and ethical guidelines were improved or created that were results of a discussion following the prison experiment. For example, ethics committees and review boards have stricter rules for anticipated risks or benefits when reading a research protocol and approving an informed consent form.

Zimbardo Maslach and Haney (1999) wrote about the lessons they learned and here is a highlight on page 12 about what they'd urge psychological researchers to use their findings for

enriching and developing the world and not to do research for research itself: "Lesson 9. It is necessary for psychological researchers who are concerned about the utility of their findings and the practical application of their methods or conclusions to go beyond the role constraints of academic researcher to become advocates for social change."

They also write on page 14 if the Stanford Prison Experiment was ethical or not (Zimbardo, P., Maslach, C., & Haney, C. (1999): "Was the SPE study unethical? No and Yes. No, because it followed the guidelines of the Human Subjects Research Review Board that reviewed it and approved it (see Zimbardo, 1973). Yes, it was unethical because people suffered and others were allowed to inflict pain and humiliation on their fellows over an extended period of time."

Last but not least they count the positive consequences that relates to their urge to psychological researchers to use their findings in real life to better the world and society: "Influenced federal lawmakers to change a law so that juveniles jailed in pretrial detention (as was the case in our study) would not be housed with adult prisoners because of the anticipated violence against them" (page 15.). We invite you to read the references about Zimbardo's research and think to write a page on Discussion question 6 and 7 on page 18 - write your notes until you finish reading this chapter about observation and add ideas or questions that you can add to your list.

There are other research design **examples** that use overt observation and they need less preparation, less resources and are far more safe compared to the early work of Zimbardo and his colleagues. Overt observation can be also when it comes to observing animals for developmental studies, migration patterns of birds or how they behave in their own community. For example, overt observation is commonly used in researching **human development at an early age**. The experiment setting is for example a room with only certain objects available, e.g. a chair for the parent, a play mattress for the 1 year old baby and a basket with specific toys. Researchers inform the parent ahead of time they will observe the baby for 30 minutes, they will be in the room and take notes, or do a video recording.

Covert observation

Covert observation is when the observer is concealed and participants do not know about the observation process taking place before or during the observation. This means that the study is aiming at observing people who do not know that they are being observed. Covert observation is beneficial to use when we are assuming the observed person might change their behaviour because they know they are being observed. There is no rule that fits all types of research and researchers need to decide if or when covert observation may be applicable or not. When researchers think covert observation is reasonable they need to apply for the local ethics committee or institutional/national level review board to have an objective perspective on whether their research interest indicates a covert observation and they are taking the necessary ethical steps to create an environment where participants do not experience any harm in the process. Covert observation can also be seen as a way of misinforming research participants.

Covert observation is widely used in **anthropology studies, in cultural anthropology** studies specifically. Anthropologists and cultural anthropologists research the development of human beings, societies and cultures. When it comes to exploring newly discovered communities, phenomenon or trend then researchers need to think about how remote the area and community is. If a community is remote or far away physically and/or in mentality compared to the researchers then researchers need to take into consideration the **level of trust** toward them. If a community does not trust a researcher or someone new, someone who is on the outside of the group then the researcher first needs to gain the trust of the community. One way to gain the trust of a community is **joining the community**. Researchers can become a part of the community and be concealed researchers and carry out covert observational research. If a researcher is not successful in gaining the trust of a community that can result in the community staying closed and not showing their everyday life.

Jane Goodall (Figure 6.3, source https://janegoodall.org/) has been researching and supporting communities with her research and observations for decades, especially related to chimpanzees who are the closest animal relatives of the homo sapiens. Jane Goodall used the observational research method where she became part of the chimpanzee community. Her research using observation method got humanity as a whole closer to understand our closest relatives and the evolution of homo sapiens as well as the ways chimpanzee communicate, process information cognitively, how intelligent they are, that they have feelings and how they care for their families, just to name a few of the aspects of her groundbreaking work.

Figure 6.3 Jane Goodall during her observational research with chimpanzees

Another example of covert observation is used when it comes to exploring **criminal groups**. Policemen, detectives or investigators may also choose the covert observation method. By choosing the covert observation research method they are ensuring their safety as well as creating a trusting relationship with the people or community who commit the crime. Trust is highly important when an investigator is trying to uncover a crime because the criminal is living in a situation where they would not like to be caught. The example of policeman or detectives may not be research related but it is a great example for the necessity and usefulness of covert observation.

A covert observation research example is when we would like to get to know the **number or physical movement patterns of certain communities and phenomena**. We are not interested in observing or getting to know certain people, or a specific group. We are rather interested in a phenomenon and we would like to observe it. A phenomenon like this would be the **migration of birds** from summer to winter living space. We could use the number of birds migrating as an indicator for the timing of their migration and their preferred route, and if they change over the years or decades. We can provide valuable information for city or road planning in the area to preserve nature. Another example for observing a phenomenon would be observing the number of people taking the underground at a certain stop at a certain time and comparing the numbers between weekend and weekday **commuters on the underground**. We can use this information to optimize the number of vehicles at a certain time or the frequency of underground fares. We could also use this information to provide to businesses at what time they could have more customers at what location. In both examples, the migration of birds and the commuters on the underground we saw that researchers would like to explore the number of the entities or a pattern in their behaviour. We are not interested in getting to know one bird's or one specific person's day. For this reason, we do not need to inform participants one by one, ask for their signature or talk to them after the observation. Researchers in this case may want to consider putting out a poster at the entrance of the subway to let people know they are working for the city planning department, for what reason they do their work and what they do, until when. Researchers may also post it on the website of the transportation office. It might be

also beneficial to let the community of people know about the bird migration observation. This way, tenants or regular commuters in the area are aware and not concerned about people observing the area who are usually not in the community doing something that does not look like an everyday activity. People can be reassured that they are not being observed but the birds are where they live.

All in all, covert observation is a great resource when it is needed and used for the benefit of humanity and academia. We need to pay attention to specific details even more when it comes to covert observation. We may want to be more cautious compared to overt research, for example when we think about the informed consent process. In the next section you'll read about the informed consent form and how to prepare for either overt or covert observation research.

Aspects to consider when preparing for overt and covert observation

Minimizing the presence of a researcher

The presence of the researcher can be impacting how either the baby or the parent behaves, or any participant for that matter. There are ways to minimize the presence of the researcher and yet collect the information needed with observation.

**Observation mirrors** can be installed between two rooms (Figure 6.4). Observation mirrors are mirrors on one side and a see through glass window on the other side. On the mirror side the research or observed situation takes place and the researcher observers are on the see through window side. In our example it is the baby with a parent and certain toys present are on the mirror side. Participants of the research see themselves, they do not see the other room and they know they are being observed by researchers from the other side of the mirror. The other side of the observation mirror is a see through glass where researchers sit and observe people in the other room.

Pfigure 6.4 An example of an observation mirror

Another way to minimize the presence of a research observer is when they do a _**video recording**_ of something they'd like to observe and they can watch it later as many times as needed and show it to other researchers to reach the most objective reporting on the observation.

Both the observation mirror and recording a video eliminate the presence of the researcher, however, participants know and are aware they are being observed at a certain time. In some cases researchers use a combination of the above mentioned observation techniques: the observer may be in the room and make a video recording as well or they are not in the room and make a video recording, or they are behind an observation mirror and have a video recording of the research session.

Frontloading information

Being aware somebody is being observed does not necessarily mean them know what is being observed. There are three categories when it comes to what participants know about the **research purpose**: full transparency, partial information or misinformation.

Transparency is when researchers tell everything to the participant about the research: what will happen, what is the aim of the research, what are they observing, who is observing, how do they take notes, how will be environment or the task look like, how long the observation will last or any other important aspect of the research. Participants are informed by the researchers also verbally, they can read the informed consent form, ask questions about it and then sign it.

Partial information situation is where researchers leave out information before the observation because they anticipate that it would change the behaviour of the participants or they would like to manipulate behaviour by not disclosing certain information. For example, researchers are interested in the stress signs after 2 minutes in a certain situation and they do not inform the participants that they are taking notes on stress signs. Researchers inform participants that they will observe certain reactions while they are in the observation, however, they do not let them know what these reactions are related to stress and that they are interested in seeing these reactions after 2 minutes. In this case, researchers need to inform participants after the observation took place and also create space for further questions and if needed restoration.

Misinformation is when researchers inform participants about something, however, they are observing something else. They may inform participants that they will be in a room with 3 other people and fill out a questionnaire, however, participants are not told that there will be loud noises coming from the other room that mimic a big fight between people and participants do not know that the observation starts at 2 minutes not at the beginning. Researchers are interested in the stress reaction of the participants and not the answers they give on the questionnaire they fill out. In this case, researchers need to inform participants after the observation is over. Similarly to when they gave partial information the need to create space for further questions and restoration.

Both partial information and misinformation is a great observation method used for experiments. Experiment is a research method that uses a new element introduced in a situation and researchers would like to observe or measure the change that was induced by this new element. For example, researchers are observing four 1 year old babies in four different rooms or in the same room one after the other without knowing what the other babies were doing in the same room. All babies have the same developmental background and family history. One baby eats food from their own culture and another baby eats food that is from another culture. One baby does not eat anything and the fourth baby drinks water. Researchers would like to observe the reaction of each baby as well as they are collecting biomarkers, like body temperature.

Informed consent form

You might ask the question: how is it possible that people are not harmed yet they do not have every information when they consent to being part of a research or even being misinformed? You ask this question rightfully so and it is good, if not imperative to ask this question when preparing any research but especially research that involves misinformation or any human or living organism. You can use the **informed consent form** tailored to each situation in a way that everybody is informed about everything at some point of research and there is no harm in partial information or misinformation.

Informed consent forms are prepared before the research is conducted and need to be approved by the local, institutional, regional or national ethics committee or review board. The form needs to inform participants and participants need to consent that they will take part in the research after reading the informed consent form. Here are some general guidelines to consider when writing an informed consent form for observation (Institutional Review Board, University of New Mexico):

- *General description of the project* in a way that is understandable by the participant, it is adjusted to their language and socio-economic status, demographic (e.g. their age).

- *Requirements of the research.* What does the participant need to do in the research? Do they need to fill out a survey, sit in a room with different coloured light bulbs, do they eat something, do they need to have an MRI scan.

- *The most important risks and benefits of the research.* Are there any kind of risk, mental or physical stimulation that might be harmful or the consequences cannot be foreseen with a 100 % percent probability (e.g. testing a new medication). Are there any kind of benefits to a research for the participant such as meeting new people that might broaden their views or attitudes to a new demographic or a phenomenon (e.g. global warming).

- *Alternatives for participating, if appropriate.* For example, is there a chance to participate online if the circumstances of a participant change due to any reason e.g. change in physical condition (a diagnosis or persisting illness) or moving to another country and you'd like to keep the same participant over a longer period of time in a research (e.g. 5 years).

- *Time commitment of the participant:* how many hours, on which days the research will take place; what is the duration of the whole research; how frequently they need to meet the researchers and if they need to meet more than once; is there more than one session during a meeting related to the research.

We need to pay special attention to the informed consent and process when it comes to **underage children or participants with a legal guardian**. Researchers need to prepare the needed informed consent in two formats: one format that is tailored to the legal guardian or parent and one that is tailored to the underage child or person with a legal guardian. We also need to verbally confirm with the underage child or participant with a legal guardian in a way that they understand what it means to participate in an observational research and ask if they have any questions. The verbal confirmation and communication also needs to be tailored to the participants' needs and level of understanding for verbal cues.

Further aspects of overt and covert observation

Realistic or unexpected situations in observation. You can ensure that the participants in the research react as if they would in real life by using realistic situations or unexpected situations in an observational research.

Using a ***realistic situation framework in observation research*** can create realistic reactions - it is more important as people age and their frontal lobes fully develop. A person with a fully developed frontal lobe can have control over their actions. Here is an example how to have realistic situations in an observation: a company would like to hire you as a consultant to create one-on-one interviews with people they'd like to hire and they'd like to know how the applicants react when an order is very big and the order arrives 5 minutes before the shop closes. You have never worked in this environment and you do not know the work conditions, expectations, yet, you'd like to give a realistic description about the reaction of applicants. One way to have a perspective on a realistic reaction and what may be the expectation of the workplace is to make interviews with the leader/s of the group about what is the ideal reaction of an employee, what are some realistic reactions that were desired and what reactions are realistic but not accepted at that specific workplace. You can also talk to coworkers about realistic reactions, feelings and behaviours they displayed over time or they saw from their coworker. If you have access to employees who left the workplace or were fired, you could also ask them. You can compile a list of realistic reactions that were mentioned the most and you can make notes when you are observing these.

Using ***unexpected situations*** can also ensure that participants react as if they were acting in their day-to-day life without any observers. For example, we'd like to see the biomarkers of a person and we create a situation where the door or window is being "accidentally" slammed by the wind. If we tell the participant that the door or window will be slammed, they know when it will happen and they may also visually see it. Without telling them the exact time point or even the fact of the wind, we have a higher chance to observe the biomarkers or the behavioural stress reaction of people.

However, we need to be cognizant of how much stress we want to put our participants through because we cannot cause any permanent, irreversible changes or harm in their life. We need to ensure a physical or mental restoration after the observation. For example, we cannot observe how quickly human skin burns when contacting electrical fire or observe how quickly different organs would freeze when immersed into ice water. These findings can be the results of quasi experiments but not a research experiment. We can conduct a research observing how close humans need to be to fire where they feel warmth or see how quickly they feel pain from cold when they put their hands into ice water - but we cannot ask them to burn their skin or immerse their whole body into ice water until freezing.

Incentives. Incentives can be a good way to catch the attention of people when we are recruiting for observation research or when we'd like to ensure they stay engaged or stay for the whole duration of the observational research. The incentives need to be not too big because otherwise they can alter the motivation and behaviour of participants. For example, we can offer that participants will have the chance to win a mug or that they'd have a 10 % voucher for buying one T-shirt. However, offering a week-long holiday at the Bahamas may result in participants trying to act in a way they think we are looking for in order to win a free holiday. We also want to consider what is motivating for a certain demographic: winning a university hat for a freshman student is something very interesting but less interesting to someone who just retired from being a hairdresser. For the retired hairdresser it may be more motivating to offer a voucher for a free hair or nail appointment.

Summary of the overt and covert observation

All in all, observation is a great research design that can be used in a variety of ways and be applied to different kinds of research questions. There are two research methods for which observation can be very well used: one is when we'd like to get to know information without interfering how something or somebody would behave, without any outside effect or when we'd like to conduct an experiment. In the following table (Table 6.2) you can read about important aspects when it come to preparing for an overt or a covert observational research. We highlighted the following aspects: participant recruitment, informed consent, frontloading information, research protocol, ethical perspective, and incentives.

Table 6.2. Aspects of preparing observational research

	Overt observation	Covert observation
Participant recruitment	You can recruit any number of participants from anywhere	You want to consider recruiting participants in a way that the concealed nature of the research is protected
Informed consent	You need to inform participants about the observation. You can choose transparency, partial information or misinformation.	You are obligated to inform participants after the observation took place unless it is not considered harmful (e.g. the number of people taking the bus at a particular time and place)
Frontloading information	You need to conscious of what information you choose to give participants before the observation	You do not inform (frontload) the information: who is the observer and the observation is taking place.
Research protocol	You need to write a research protocol and have it accepted by the respective ethics or review board.	You need to write a research protocol and have it accepted by the respective ethics or review board. You need to add sections on how to ensure the voluntariness, informed consent and restoration.
Ethical perspective	You need to decide what type of information frontloading you use and consider the ethical perspective of them.	You need to think about the possible risks of the covert aspect of the research in a way that is does not harm any participant in the moment or retrospectively.
Incentives	You can use incentives to recruit people. The incentives cannot be too big because they can alter behaviour.	It is hard to use incentives because you'd like to conceal the observation.

Summary

Observation is an important qualitative tool in the social sciences. It can be used to carry out exploratory research to formulate hypotheses and in some cases to test hypotheses. Qualitative observations are unstructured, i.e. the aspects of observation are not rigidly fixed in advance. Structured observation is a specific observation method for quantitative instruments, whereby observations are made on the basis of predefined criteria, thus obtaining quantitative data from the study. Observation can be participant or non-participant depending on the involvement of the researcher, and covert or overt depending on the information given to the person(s) being observed. The information observed can be recorded through visual and audio material, written records, memos and diaries. First, we do clarification and transcription and then from the recorded information, we use data reduction to create categories to describe the observed phenomenon. The reduced data are then sorted to facilitate analysis, made transparent and then analysed according to the research objectives.

Discussion questions

1. What factors should be taken into account during the observation for reliability?
2. What is the Hawthorne-effect and how can it be avoided?
3. What is the difference between participant and non-participant observation?
4. What examples can you give of participant and non-participant observation?
5. What are the main steps in the analysis of data recorded during an observation?
6. What would you change about Zimbardo, Haney, Banks and Jaffe's experiment based on what you read about observation in this chapter?
7. Which observation type would you choose today to replicate Zimbardo, Haney, Banks and Jaffe's prison experiment?
8. You'd like to observe your family member cooking in the kitchen and write down what is happening because you would like to replicate the recipe in your own home. Let's say this is a demonstration or trial of your newly gained knowledge on observation. Which observation design or method would you use and why? Once you choose an observation type, then write the informed consent form to your family member you'd like to tell them verbally about the observation and then give them to read and sign in 1 page maximum.
9. Read the table (Table 6.3) in the summary about overt and covert observation. What other aspects of observational research you find important to think about and prepare when you want to conduct an overt or a covert observation?
10. Read the table (Table 6.3) in the summary about overt and covert observation. What are the aspects that are similar in both overt and covert observation methods and what are different?

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CHAPTER 7: DATA COLLECTION FOR QUALITATIVE RESEARCH METHODS II

This chapter is about interviewing in scientific research, the typical research purpose of interviews as a qualitative data collection method, and the general protocol for conducting an interview. Other important practical issues include what questions to use during the interview and how to help the interviewees to cooperate as effectively as possible during the interview. The different types of interviews and the characteristics of each type of interview will be discussed.

Within interview types, we will focus specifically on focus groups and review the characteristics of successful moderation.

7.1 Interview

The interview is a qualitative information gathering method that uses questions to obtain information from individuals during a guided conversation at a meeting with a specific purpose. The interview usually involves two people, the **interviewer**, who is usually the researcher, and the **interviewee**, from whom we obtain answers to the questions asked and from whom we expect information related to the research question. There is an exception when there is more than one interviewee: the focus group. In some cases, a group interview may be conducted. In which case the interviewer is called the **moderator**. During the interviews not only factual information is recorded, but also the less observable mental processes of the individual, such as his/her thinking, feelings, attitudes, and any non-verbal information in addition to the verbal information. Questions may include open-ended and close-ended questions. For **open-ended questions**, the interviewee is free to answer the question in his/her own words, at a length decided by the interviewee. In case of **close-ended questions** he/she can either answer yes/no to the question asked or choose from predefined answer options (Brancati, 2018; Cooper and Schindler, 2014; Jupp, 2006).

7.2 Interview design and protocol of interview

Interviews are most often used for hypothesis building. The exploratory nature of the method and the use of open-ended questions allow theories to be formed through the interview. The interview method helps to gain a deeper insight into the interviewee's thinking, opinions, perspectives, perceptions, beliefs and attitudes that influence their behaviour. The semi-structured and unstructured interview formats are best suited to this exploratory process. Semi-structured interview is an interview format in which the interviewer freely uses predetermined, typically open-ended questions and their order to suit the interviewee during the interview. Unstructured interview is a form of interview in which the interviewer does not use pre-designed questions, but adapts to the interviewee by asking spontaneous questions to help gather information. A more detailed discussion of these types can be found later in this chapter, under the discussion of interview types.

The interview method is not suitable for hypothesis testing but it is excellent for hypothesis building. The structured interview can be an exception and can be used for hypothesis testing. In general, the interview method has low representativeness, objectivity and comparability. Non-random sampling techniques are usually used for interview sampling, such as convenience sampling or snowball sampling. A disadvantage of representativeness is that the number of items is not sufficient to adequately represent a given population. The subjective nature of the interview is reinforced by the fact that prior knowledge and expectations of the interviewer greatly influence both the process of

data collection and the interpretation and processing of the data. The low degree of comparability also stems from the specificity of the interviewing method, since in unstructured and semi-structured interviews the questions and their order depend to a large extent on the interview process and the interaction between interviewer and interviewee. The difficulty of comparability may also arise from differences in the content of the interviews. In addition, it is important to note that there are no clear-cut and established rules for evaluating interview data.

The interview can be conducted **face-to-face/in-person, via phone, or online**. In-person interviews have the advantage of being more visible from non-verbal cues, as opposed to online and especially telephone interviews. On the other hand, interviews conducted via phone offer an important opportunity to overcome geographical distances and can be more sustainable because a lot of energy and resources can be saved by avoiding travelling to distant interview locations. The online or telephone calls interview provides a more spontaneous response and allows us to respond more directly with new questions to deepen and interpret the information compared to e-mail interviews. This also implies that in-person and on-call interviews are better suited to the use of open-ended questions, and are therefore more suitable for less structured interviews. The use of close-ended, structured questions is more effective when obtaining information by email, (Bruncati, 2018; Szokolszky, 2020).

In business interviews interviewees receive some form of compensation for participating in the interview. E Compensation can be financial or product benefits, which are intended to increase the interviewee's willingness to engage in the interview and their motivation during the process (Cooper and Schindler, 2014).

The number of interviews to be conducted in a survey is greatly influenced by the topic and purpose of the interview and they also affects the type of interview. Generally speaking, qualitative methodology suggests that it is worthwhile to conduct new interviews as long as the new interviews bring new aspects to the study.

In terms of content, the interview can be on any topic where conversation is the most appropriate method of obtaining information. In addition to the content of the interview, it is also important what the interviewee wants to communicate about him/herself and how he/she communicates it. The message the interviewee would like to give is also important for the analysis. Possible contradictions are not interpreted. Evidence finding might question the truthfulness of the interview, but adds to the specificity of the report generation. Responses are interpreted in relation to the situation. I.e. in a time and place bound way. The interviewee and the interviewer constantly interpret each other's communication and behaviour, thus creating an unique, shared construction of meaning. It is important to keep in mind the local, subjective nature of responses. This constructivist approach is particularly important to be aware of in terms of analysis (Szokolszky, 2020).

A limitation of the method is that in some cases interviewees do not share the factors that influence their behaviour. It is true in different data collection methods, such as surveys and focus group. On the one hand, the interviewees themselves may not know the background to some of their behaviour. The motives that influenced their actions, and there may be information requested during the interview that is too personal, confidential, possibly dangerous or may reflect badly on the interviewee. In order to share the most credible information from the interviewee, it is important that the interviewer can create the right atmosphere at the beginning of the interview and maintain this throughout the process (building rapport). A skilled interviewer is able to create a sufficiently open, non-judgmental atmosphere in which the interviewee feels comfortable to share their thoughts with the interviewer on the more sensitive issues (Bruncati, 2018; Szokolszky, 2020).

The steps of the interview

The interview process consists of five main steps, following Bruncati (2018). The flowchart is illustrated in Figure 7.1.

Figure 7.1 The interview process (Brancati, 2018)

1. The first step is to *define the target group* you want to work with. This depends on the research question and the topic of the interview. For example, the mass of potential candidates is everyone who consumes the brand in a research on the image of a market brand in the minds of consumers. A certain number of individuals from this target group should be included in the research. As an example, when investigating soft skills as essential skills for achieving the sustainability goals, we set out in a research project to interview students on a master's degree course at our university to find out what their experiences are of the soft skills needed for their profession, how they use them and how they can be developed, based on their study and work experiences.

2. The second step is to *define the design of the interview*, which consists of four main elements:

1) Structure of the interview
- Unstructured
- Semi-structured
- Structured
2) Format of the question
- Open-ended
- Close-ended
3) Wording and order of the questions
4) Interview mode
- in-person
- telephone
- online (e.g. video phone, e-mail)

After identifying these four factors, we return to working with the people in the study.

In the previous example of soft skills research, we opted for a semi-structured online interview using both open-ended and closed-ended questions, as we found this to be the most appropriate to achieve our research objectives.

3.   The next step is to *recruit interview participants*. Researchers can interview everyone from a smaller target group. Different sampling tools are used to select participants from a larger target group. It is important to choose the appropriate sampling design if the interview is to be used to test a hypothesis (see Chapter 4 for types of sampling design). When constructing a hypothesis with a larger target population, it is often sufficient to include additional people in the interview until new information can be gathered about the research question.

4.   After the preparations, the *interviews can start*. The less structured an interview is, the less it is common to outsource the interviewing process. Unstructured and semi-structured interviews are usually conducted by the researchers themselves. In the case of a larger number of interviewees, assistants are used to conduct the interviews. This is usually the case for structured interviews.

At the beginning of the interview, it is important that the interviewee agrees to the research by signing a consent form informing them of the data handling guidelines, such as the confidentiality of the data and its anonymous use. Notes are taken during the interview to record the answers and other information given. In addition, we may also record the interview by audio or video with the interviewee's consent. By making an audio or video recording more attention can be given to recording information from other sources, such as non-verbal information, rather than just the spoken information, and is also allows the interviewee to be more involved in the communication. In the case of semi-structured and unstructured interviews there more time to formulate appropriate follow-up questions if we have the camera or voice recorder taping. Some people may feel self-conscious about making a video during the interview and their responses may be affected. A recording device placed in a less visible location may be more suitable for recording the process. The presence of the device does not constantly remind the interviewee of the situation being observed if they are out of site.

The interviewer's attire is an important part of a successful interview. The interviewer's attire should make the interviewee feel comfortable. The dress should not reinforce the interviewee's feeling of being studied and observed. It is advised to match our dress to the interviewee's expected attire. Avoid not only dressing too formally, but also too casually because this may suggest disrespect towards the interviewee (Brancati, 2018).

5.   After the interview is completed then we start the post-interview follow-up and data analysis. It is important to provide the interviewee with the contact details of the interviewer so that he or she can contact him or her with any questions later. The recorded interview should be stored in a secure place so that it cannot be accessed by unauthorised persons.

Data analysis involves extracting data from the raw material that is relevant to the research question. The methodology for data analysis is similar to that used in Chapter 6 for data processing of observation techniques.

Basic rules for interviewing

The interviewer's preparation and behaviour during the interview process have a profound impact on the research process and the information obtained. However, other factors are also essential in the interview process. The following points are giving an overview of the conditions that are essential for successful interviewing (Hornyacsek, 2014):

1.   It is important to find the right interviewee(s) for the interview topic. For example, in an interview about journalism practice approaching the head of a particular newspaper would dictate adherence to hierarchy, but a colleague who is involved in everyday journalism can provide credible, up-to-date practical information.

2.   The interviewee should be informed in advance of the reason for the interview, its purpose and the subject in which he or she is being asked to participate.

3.   As mentioned above, the interviewer should be able to create a relaxed, accepting atmosphere in which the interviewee is able and willing to express himself/herself honestly throughout the process.

4.   The interviewer should be adequately prepared and knowledgeable about the interview topic.

5.   Empathy, which the interviewer is able to bring to the service of the interview during the process.

6.   Good communication skills to assist the interviewee and the research process during the interview.

7.   Preferably avoid using jargon when conducting the interview.

8.   Avoid subjective expressions in the interviewer's communication. An interview may not be effective if the interviewee feels that a question is suggestive or that he or she is being judged by some of the answers.

9.   Attention should be paid to the interviewee's cultural, religious, social, and salient background and the resulting sensitivity. The interviewer must be aware of the boundaries of the interviewee's personal space, and this must not be violated.

10.   The interviewee must be assured of his/her anonymity and of the protection of his/her personal data.

Types of questions and their indications used during the interview

In a qualitative interview, there can be pre-written questions that are used throughout the process. However, it is important to use certain types of questions at certain points in the interview process to assist the progress and to help elicit the right information. Szokolszky (2020) distinguishes the following types of questions based on the work of Kvale 2005:

-       *Introductory question*: they help interviewees get used to the situation.

-       *Direct question*: To introduce a new idea or point of view by asking directly.

-       *Indirect open-ended question*: To obtain information about the interviewee's feelings or thoughts.

-       *Clarifying question*: Aims to clarify what the interviewee has to say.

-       *Follow-up question*: Helping the interviewee to expand or detail his/her previous answer. This can be done by asking a question or by verbal cues (e.g. nodding in encouragement, waiting in silence).

-       *Guiding question*: To steer the interviewee in a different direction for the purpose of the interview or to stop the interviewer directly or indirectly, in a tactful style, if he/she has started a topic that is not relevant to the purpose of the interview.

Examples of the types of questions used in the interviews are summarised in Table 7.1.

Table 7.1 The types of interview question (based on Szokolszky, 2020)

Types of interview questions	Examples
Introductory question	"Can you tell us about a time when..."
	"Please tell us about a time when..."
Direct question	"How do you think other people see it?"
	"Do you train on weekends?"
Indirect open-ended question	"How does it feel for you?"
	"What are the benefits of having this habit?"
Clarifying question	"Are you saying that...?"
	"Do I understand well that you are saying that...?"
Follow-up question	"Can you explain this?"
	"Can you give me an example?"
Guiding question	"This is an interesting topic, but I would like to raise a new question. What do you think, ...?"

In addition to question, various additional communication tools can be used to assist the interviewee during the process of interview. These are the most commonly used communication tools (Géring, Király and Fűzi, 2019):

- *Active listening*: concentrated, quiet attentive waiting to encourage the interviewee to continue.

- *Vocal cues*: a non-verbal message to the interviewee that we are listening (e.g. "Hm.") They are indicated by vocalization, which is a slightly stronger encouragement to continue than active listening.

- *Non-verbal gestures*: eye, head, hand and eye movements that assist the interviewee during the conversation.

- *Confirm comment*: Verbal indication of the interviewer's attention to the interviewee.

- *Echoing*: Repeating back part of what the interviewee said in order to make sure that what was said was understood correctly.

- *Paraphrasing, reflection*: similar to echoing. Repeating the information given by the interviewee and adding an interpretation formula to check the correct interpretation of the information (e.g. "So if I understand correctly...").

- *Question rephrasing*: rewording a previously asked question to emphasise something different.

7.3 Interview types

Different types of interviews can be distinguished according to how structured they are, their methodological features and their content. Based on the degree of structure, the interview can be structured, semi-structured and unstructured. From a methodological-content perspective, we can distinguish between in-depth interview, narrative interview, life history interview, thematic qualitative interview, group interview and focus group interview types. Although the types included in the methodological-content grouping often overlap and are not clearly reflected in practice (Szokolszky, 2020).

Interview types by formality

The most common typology of the interview is based on the structuredness and formality of the interview in terms of the preparation of questions and the interview process (Brancati, 2018).

1. Structure interview

The structured interview is based on a pre-designed set of questions and is the least flexible of the three main types of interview. The interviewer walks each participant through a predetermined set of questions and asks questions in a specific order. Changing the order of the questions would affect the answers because the sequence of the questions determines how the questions follow each other. The questions typically include close-ended questions. During the interview, the interviewer uses a detailed **interview guide**, which contains pre-defined questions, order of questions, and instructions on how to ask the questions.

The answers given by different interviewees are highly comparable in a structured interview thanks to the structured nature of the interview. I.e. the fixed questions and their identical order (Brancati, 2018, Cooper and Schindler, 2014). These features make the unstructured interview type the most suitable for hypothesis testing.

2. Semi-structure interview

Similar to the structured interview, the interviewer also uses an interview guide in a semi-structured interview, but it is not necessary to ask the same questions to all interviewees. The interviewer can change the wording or even omit questions, adapting to the interview situation and

interviewee. The types of questions are more open-ended. These types of interviews often start with a few specific questions related to the research topic, after which the interviewer follows the interviewee's train of thought with questions.

Thanks to this flexibility, more in-depth and detailed information can be obtained during the process. Better quality information can be obtained by allowing the interviewer to ask clarifying questions in response to certain questions. The interview can tailor the questions and their order to the interviewee. The information obtained is relatively comparable between interviews with different individuals despite the flexibility provided by semi-structured interviews. (Brancati, 2018, Cooper and Schindler, 2014). This type of interview can be used well in hypothesis building.

3.   Unstructured interview

In an unstructured interview, the interviewer does not use pre-designed questions, nor does he or she predetermine the order of topics. Each interview is personalised to the interviewee and adapted to him or her. The interviewer's open-ended questions are improvised and adapted to the interviewee, staying within the given context and research topic. This type of interview is also often used in participant observation, when researchers are present as participants in the daily life of a community and initiate a conversation with the observed persons.

The unstructured and highly flexible nature of the procedure makes it almost impossible to compare the information obtained during the unstructured interview (Brancati, 2018, Cooper and Schindler, 2014). This type of interview is an excellent tool for hypothesis building due to its deep, exploratory nature, where detailed primary data are obtained through open-ended questions.

The characteristics of the types of interview structure are summarised in Table 7.2.

Table 7.2 Summary table based on the structure of the interview.

	Structure of the interview		
	Structured	**Semi-structured**	**Unstructured**
Typical question type	close-ended	open-ended	open-ended
Typical objective of the interview	hypothesis testing	hypothesis building	hypothesis building
Specificities of data analysis	- higher level of comparability - a higher level of objectivity - relatively fast data acquisition - faster and easier data analysis	- lower level of comparability - a lower level of objectivity - faster data acquisition - faster and easier data analysis	- incomparability - higher level of subjectivity - longer duration of data collection - lengthy data analysis
Interview guide use	yes	yes	no
Flexibility of data collection	low	medium	high
Depth of data collected	low	medium	high

Interview types in terms of methodology and content

In addition to the structural-formal classification of the interview, the methodological-content categorisation is divided into several types of methods based on professional tradition. The following types are often used in social science research. You will read a brief description, drawing on the work of Szokolszky (2020) and Cooper and Schindler (2014). These types are not always found in practice in

a clear and distinct form. The purpose and topic of the research is determining the choice of the interview type.

1. Individual deep interview

An interviewing technique aimed at understanding the personality and mindset of an individual often involvs intimate, personal issues. In-depth interviews usually last 1-2 hours, during which it is particularly important to find the right atmosphere and tone of voice between interviewer and interviewee. The in-depth interview is very sensitive to the circumstances of the interview and the relationship between interviewer and interviewee. The word "deep" indicates the intimacy and detail of the topics covered, but also the length of the process. The success of the interview also depends to a large extent on finding the right interviewee, who must be verbal and able to self-reflect both at the level of the individual and their wider environment and culture, and who must be motivated to remain engaged throughout the lengthy interview process.

In this type of interview, unstructured interviews are typically used in the majority of social sciences, but semi-structured interviews can also be used, for example by selecting a specific topic and related questions. In the business world, however, structured interviews are also used in in-depth interviews, and the motivation of the interviewee may be increased by financial compensation, which is usually necessary to achieve a sufficient number of items due to the lower voluntary response rate resulting from the length of the interviews. In the case of business research, it is common for the interviewee to receive preliminary materials on a particular topic area online or by post prior to the interview in order to study them before the interview.

A good example of an individual deep interview in the world of marketing is when manufacturers want to launch a new product, and in order to improve the consumer experience, they test the product with the help of the interviewee to see if it has the right features and if the advertising and image of the product fits in well with this.

2. Narrative interview

Narrative interview is a type of interview that focuses on experiences and stories related to the interviewee's life. The focus is on the narrative itself. The genre was created in recognition of the fact that human memory is characterised by narrative structure. A narrative structure is a story that has a beginning, an end and a conclusion. Therefore, the interview with a narrative structure is the most appropriate way to recall events from the past. The narrative is an element of many interviews, but the narrative interview puts it at the centre. It is important that the interviewee sets the structure of the narrative during the interview, which should not be interrupted by the interviewer. The interviewer asks the participant clarifying questions after each narrative.

3. Life history interview

Life story interview is a type of narrative interview, which belongs to the group of oral history interviews. In oral history interviews, historical events and processes are explored through personal experiences and individual life stories. In a narrative interview, the interviewee himself structures the narrative of his life story, which includes both individual and collective-cultural meanings, past events and present perspectives. The interview may cover the individual's whole life or part of their life. This method is very sensitive to the circumstances in which the interview is conducted. The interviewer follows the participant's storytelling almost from the background, and his or her questions are only intended to stimulate the storytelling.

4. Thematic qualitative interview

An interview focusing on data collected on views, experiences and attitudes on a specific, non-personal topic. Its tone is personal, direct and usually semi-structured, shorter and more focused than an in-depth interview. A significant proportion of qualitative interviews take this form. An example of this is the research in the field of marketing research, where interviews are conducted by researchers focusing on the consumption habits and lived experiences of certain products in order to explore the attitudes and habits of the interviewee on the topic.

5.   Group interview

In a group interview, several people are interviewed, often by more than one interviewer. Importantly, the interviewer asks the questions and the interviewees respond to his or her questions, with the aim of revealing more information than in individual interviews conducted separately.

According to the number of participants, we can talk about *dyad* (2 people), *triad* (3 people), *minigroup* (2-6 people) and *supergroup* (up to 20 people) interviews. For studies with 2-3 participants, the arrangement may be justified if the topic is intimate or involves. For example, spouses or other groups of two or three people. When using a supergroup, the aim is to collect as much and as varied information as possible in a shorter time. For example when collecting ideas about advertising a product.

In terms of composition, the group can be heterogeneous or homogeneous, focusing on certain properties and characteristics. In addition, there are group interviews to which individuals with specific expertise in a topic (*experts*) are invited or individuals with knowledge of the topic but no expertise (*nonexperts*) are selected.

The number of groups will be influenced by the scope of the questions, the number of different types of target groups to be investigated, the number of new ideas and insights expected, the level of detail of the information to be extracted, the heterogeneity of the groups. It can be said that the level of quantitative and qualitative expectations in these questions increases with the number of groups to be included in the study (Cooper and Schindler, 2014).

In group interviews, the interview moderator has to coordinate the interview process, manage the different group processes, control the more dominant individuals and help the more withdrawn ones to express themselves. In homogeneous groups, participants often quickly become attuned to each other, but in heterogeneous groups this often needs to be facilitated by the moderator.

A special type of group interview is the focus group. It is discussed in more detail in a separate subsection because this method is particularly popular in the business sector and nowadays in Sustainability Assessments (Swartling, 2007, Rau and Fahy, 2013).

Focus group

A focus group is a group interview in which a moderator conducts the interview on a specific topic. What makes it different from other types of group interviews is that the interaction in the research is not only between the participants and the interviewer/moderator, but also between the group members themselves, which is an essential element of the method (Barbee, 2013; Jupp, 2006). By allowing interaction, researchers can observe how participants explore a topic, thus learning not only about their thinking, but also why they think the way they do about a particular topic. Optimally, participants can stimulate each other through their experiences and emotions, and thus gain additional insights through the group dynamics. If the group atmosphere is informal then spontaneous comments can often provide unexpected information to support the research (Kiss, 2003).

What should we use focus groups for and what should we not?

Focus groups are excellent for hypothesis building and theory building, but less suitable for hypothesis testing. The hypothesis-building features of the method are the open-ended questions, the additional information that comes from the group process, which helps us to better understand the cognition, attitudes and emotions of the participants that drive human functioning. The fact that the group participants do not provide a representative sample of a population and their responses are not comparable prevents the moderator from asking the same questions to all focus groups. The semi-structured interview nature od the focus group works against hypothesis testing. In addition, the participants' responses are subjective, which also makes their comparability difficult to interpret (Brancati, 2018).

Specific areas of potential use of the method include (Cooper and Schindler, 2014):

-        Examining issues concerning social norms, where the arguments and debates that emerge from the participants' discussions on the topic carry information that a one-on-one interview is often unable to reveal.

-        Gathering general background information on a topic or product.

-        Gathering new ideas on a topic or product during a planned activity.

-        Creating quantitative research questions using an exploratory method.

-        Interpreting quantitative research results.

-        Exploring the potential of an area.

-        Identifying problems in a given area.

In terms of the composition of the group, a homogeneous focus group can also be a good way to explore topics that are taboo in society and therefore not openly discussed in a heterogeneous group. Open joint discussion in homogeneous groups is facilitated by the fact that the participants have similar experiences or share the same beliefs on a topic. Focus groups are also a useful method when participants share a common interest, world view or experience, and it is often easier to have a smooth discussion on the research topic between participants and to gather information in a less structured interview situation. Interactions between participants often result in lively exchanges and constructive debate, which provide information about experiences and opinions that would be difficult to observe in other research situations. It is worth mentioning that the discussion is an important goal of the focus group to make the interaction between participants as smooth as possible, less moderator-intensive and full of information and perspectives. However, focus groups are neither suitable for obtaining deeper individual information, nor for understanding the context of thinking and behaviour (Jupp, 2006).

Focus group research can be a good tool for research questions where interaction between individuals is important. In these questions, the method helps researchers understand how group dynamics affect individual perceptions, decisions, information processing and decision-making. Because of this applicability, it is also widely used in marketing and policy (Brancati, 2018).

It is important to emphasize that during the focus group the participants are not subjected to unexpected impulses, as they are not in a spontaneous, natural situation during the process, therefore it is not appropriate to use this method to directly investigate spontaneous reactions (Kiss, 2003). For example, the method is not suitable for investigating spontaneous responses to stimuli in advertising films and promotional campaign videos, but it is suitable for discussing opinions and thoughts about the video material.

The advantage of this method is that a large amount of information can be obtained in a relatively short period of time and at a relatively low cost - apart from the cost of renting or setting up professional, purpose-built sites. It is important to bear in mind that, in addition to the moderator, the group itself has a great influence on the information that emerges during the focus group. The size and composition of the group, the personalities and mood of the members, the group roles that emerge all influence the process, as do the physical characteristics and geographical location of the venue. In addition, the moderator and the participants, as well as the sympathy between participants, have a strong influence on group dynamics (Ghauri and Grønhaug, 2010).

The framework of the focus group

Leading the group - the moderator

The process is led by a moderator who sits with the group participants in the discussion. It is recommended to hold a test group before the process. The facilitator can try to run the session with the necessary questions and guidance. Participants can be replaced after the test group, for example by colleagues. The moderator could be a person specially trained for this task, who has more experience in this role, instead of the researchers. The moderator's role is to frame the proceedings, keep the focus on the topic, and respond to the participants, ask new questions, and facilitate the process. In addition, it is important to be able to listen to the individual participants and the dynamics

between them. For example, the moderator can elicit the views of quieter participants without pressure, or to control a dominant participant without offending that person, or to prevent a potential conflict. The moderator creates an accepting, open, safe, non-judgmental atmosphere for the group that encourages members to express themselves freely.

The moderator has a key role to play in the focus group study. Swartling (2007) highlights the key characteristics of the moderator outlined by Krueger (1994) that greatly influence the success of the focus group discussion (Figure 7.1):

- The moderator should be familiar with group processes and group dynamics, and should be able to manage the group in a light, non-obtrusive way.

- Good communication skills are necessary to ensure precise and clear wording, avoiding misunderstandings.

- The facilitator should feel comfortable with the process.

- It is important to show a genuine interest in people, conveying respect.

- It is necessary to show curiosity and interest in the research topic and the participants. The lack of curiosity and interest, and the presence of indifference or cynicism are quickly noticed by the group and can hinder the process. It is important to express the curiosity of the group and its members, and the fact that they are in possession of information that only they can provide during the research, as it is their personal opinion and thoughts.

- A good moderator is committed to multiple realities that can be expressed through openness and acceptance of other perspectives and ideas in the process.

- Friendliness and a sense of humour usually help them to lead.

- The facilitator must also be a good listener, taking a back seat to the participants' expressions. It is important that the group is the focus, not the facilitator.

- They do not evaluate or rate. They do not express their own opinion. They do not give personal information about themselves - unless this is planned in advance in some cases in the group facilitation. E.g. share personal information for an intimate topic in order to allow the group to dissolve and open up more quickly.

- They will listen calmly to any expression of disagreement, even if it is unpleasant to hear.
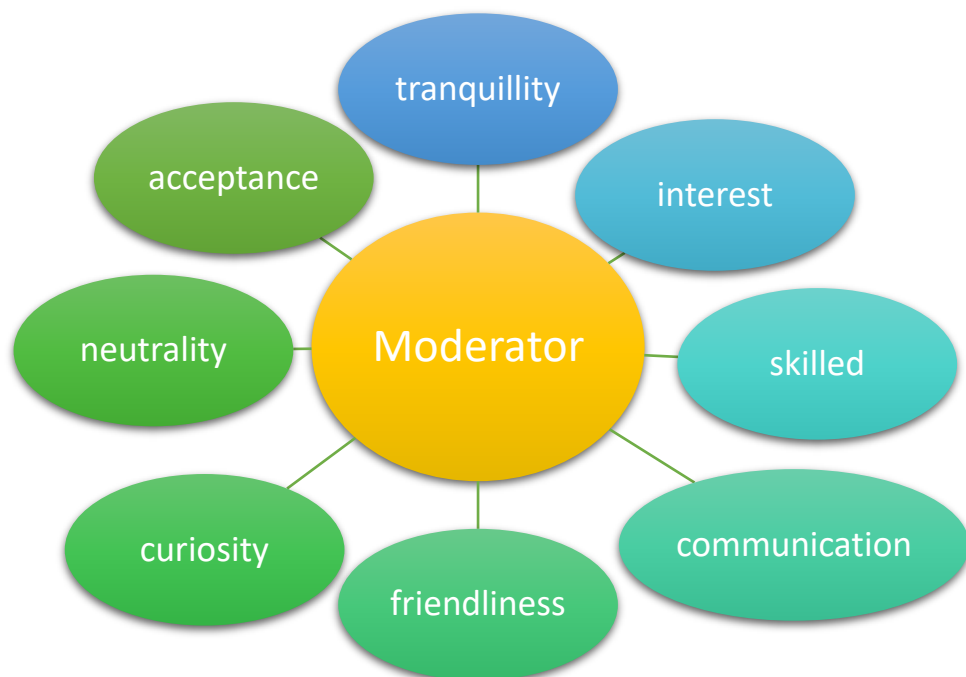

Figure 7.1 Key characteristics of a good moderator

The moderator should take several aspects of the focus group process into account when leading the group. As defined by Krueger (1994), the moderator should pay attention to the following questions while also following up on the information presented in the group (Vicsek, 2006):

- How solvent are the group participants? If they are not relaxed enough, what can be done to help?
- Can I ask more questions to help you better understand what the contributor has said?
- Did the participants talk about all the areas that are relevant to the research, or do I need to ask more questions to help explore a topic?
- How much time do you have? Is there time to elaborate further on the current issue? Do we need to skip certain questions because of time?
- Which other participants need to be interviewed on the topic and which need to be held back?
- Is the discussion useful for the research or should we move on to another topic?
- Is it necessary to remove a participant from the group situation?
- Which parts of the discussion should be noted for future reference?

For some focus groups, there can be two moderators in the group. In this case, one moderator is usually a specialist in the focus group method, while the other represents the researcher or the researcher himself (Brancati, 2018).

In addition to the moderator, an assistant moderator is often employed to set up the room, prepare the technical equipment, prepare drinks for the participants and welcome them. The main task of the assistant is to take notes during the process. The main focus of the note-taking is the written recording of emphatic quotes, group dynamics, interactions, metacommunication. Notes are now mainly recorded electronically in the spirit of sustainable thinking. It is also important to record the seating arrangements of the group participants, which can also provide researchers with important information for analysis. It is important to inform the assistant during the preparation of the study what aspect of note-taking is expected of him/her. After each focus group session, the moderator can review the findings with the assistant moderator, and it may be useful to read through the material after the process has been analysed to make his or her own suggestions to help the research. This is good example of triangulation.

Participants

A focus group with a moderator usually involves between 6 and 12 people. With fewer than 6 participants, the chances of someone in the group dominating the conversation are greatly increased, while with groups of more than 12 people, it is not certain that everyone can be fully engaged in the conversation. The exact number of participants is determined by the complexity of the research question. In the case of a more complex research question, it is advisable to plan for a smaller number of participants in order to explore the topic properly. Since experience shows that groups of strangers have more relevant expressions at the individual and group level, the group is usually composed of people who do not know each other and are unlikely to meet again in the future (Szokolszky, 2020).

The method of selecting participants is strongly influenced by the research question and the purpose of the research, depending on the importance of the representativeness of the group. In addition homogeneous groups are desirable in individual studies (Brancati, 2018).

Duration

A focus group is usually 1-3 hours long, which is long enough for the participants to develop some kind of rapport and for the moderator to help the researchers explore a topic in depth. For more focused, simple issues 1 hour is sufficient, while for more complex issues approximately 2 hours is appropriate. For sessions longer than 2 hours, the quality of participants' responses can be significantly reduced (Brancati, 2018). For longer focus groups, techniques that elicit deeper feelings, knowledge

and motivations from group members can help maintain participant engagement and thus quality (Cooper and Schindler, 2014).

Spatial location

When positioning the group members on the spot, it is important that all participants sit in a circle - usually around a table - during the interview so that each person can see everyone. Being able to see each other helps communication between participants, it helps the conversation to flow more smoothly and to make eye contact. If some members cannot see each other, there may be more frequent breakdowns in communication, such as cutting into each other's words, misinterpretation. This can be avoided with the right arrangement.

Figure 7.2 During the focus group, participants and the moderator sit in a circle around the table[1]

Structure of the focus group interview

The method usually employs a semi-structured group interview arrangement in order to keep the research topic in focus, but to allow participants to respond spontaneously throughout the process (Brancati, 2018). The semi-structured structure provides flexibility for the interviewer to talk freely with the interviewee along the lines of the questions that arise. In light of the information revealed during the interview, the interviewer is free to ask clarifying questions, explanatory questions, off-topic, and leading questions. This structure allows the questions and main themes to be explored in sufficient depth, but also provides the opportunity to interrupt the direction of the interview carefully, if participants are not talking about the interest to the research or they talk in too much detail.

Location and technical equipment

The focus group is often held in a purpose-built studio, where the study is conducted according to a predefined scenario. As focus groups are a popular method of marketing, the script and framework for the marketing research often needs to be agreed with the client in advance. An observation mirror is often used on site (see Chapter 6) where the researcher or client can follow the process without

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[1] Created with Microsoft Bring (https://www.bing.com/images/create).

disturbing the participants, and if necessary give some instructions to the moderator during the process (Figure 7.3).

Figure 7.3 Researchers sit behind the observation mirror and take notes during observing the focus group. [2]

The site must have the means to record the proceedings, usually with video and audio recording equipment and microphones. The recording solution is important so that the whole session can be replayed, described and analysed after the focus group has finished (Kiss, 2003). Video recording of the process is also important so that the moderator can follow the process with the participants with full attention and not have to divide his attention by taking notes.

Thanks to modern telecommunication technologies, the focus group method can also be carried out online. For example, video-conferencing can reduce the financial costs of the research, such as venue hire and travel, and is also important from a sustainability perspective. Video-conferencing allows us to record the process, but much information may be lost or less useful. Group dynamics are more difficult to develop in the online space and there may be a greater perceived distance between the moderator and the participants during the process. Nevertheless, focus groups conducted in an online space may in some cases be appropriate for exploring research questions in an appropriate way. For example, when the topic is less deep, requiring less in-depth connections between group members.

Who should do the data analysis?

Focus group data analysis follows the data analysis methodology of qualitative data collection methods (see Chapter 12), which was also briefly discussed in Chapter 6 related to observation. However, it is important to discuss some considerations related to data analysis (Vicsek, 2006):

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[2] Created with Microsoft Bring (https://www.bing.com/images/create).

An adequate skilled focus group moderator will usually conduct the data analysis. They may have an assistant moderator. The moderator and assistant moderator are most familiar with the group. This can be practical because they know the atmosphere in the group, the personal expressions of individuals, so it is an energy-saving solution to ask them to analyse the data.

The analysis may vary depending on the subject of the research, the extent to which in-depth knowledge of the field is required for. In basic research, the topic typically requires specific expertise, although in focus groups the researchers themselves often act as moderators. If the researcher does not act as moderator, but a deeper knowledge of the research subject is required and the moderator or assistant moderator may not have this knowledge, then they leave the data analysis process to the expert researchers. In this case, the use of an observation mirror can be advantageous, because the researchers can follow the events live from behind it and, researchers can also observe the group processes. If the researcher has to carry out the data analysis, the moderator is often asked to provide a preliminary, raw data analysis. In some cases the researcher and the moderator talk through the events in detail, and the expert then continues to process the information. If there were several moderators working on the focus group study with several groups, it is advisable to ask each moderator for a preliminary, raw analysis, which is summarised by one of them or by the researcher.

On the field of market research and marketing focus groups are the preferred method. The groups are led by a professional moderator who has the necessary skills to analyse the topics of the market research and can easily obtain additional information on the specific topic of the research, e.g. a specific product.

In larger studies it needs to be decided which person will analyse the data. It is worth taking into account how many groups they have moderated, how many groups they have interviewed, how well versed they are in analysis, how deep they are in the research topic, the importance of specific background knowledge in the research for the analysis, the financial resources available for the analysis - paying a more experienced, skilled analyst in the market sector is not affordable for all research - and the speed with which the results of the analysis are needed.

Summary

An interview is a qualitative form of data collection in which the interviewer - in a group situation, a moderator - collects data by talking to the interviewee and asking questions. The purpose of the interview is to collect data that informs about the interviewee's attitudes, habits, thoughts, beliefs, opinions. The questions asked during the interview are usually open-ended questions so that the interviewee can answer them freely. The purpose of the interview is usually to explore a topic in order to formulate a theory or hypothesis.

The interview can be unstructured, semi-structured and structured according to its formality and structure. While unstructured and semi-structured interviews are tools for hypothesis building using open-ended questions, structured interviews are also suitable for hypothesis testing using close-ended questions.

From a methodological and content point of view, the interview is divided into several types, which in practice are less clearly defined. Among the types of these divisions we find several types of interview. The individual deep interview focuses on a single interviewee to extract deep data about the research topic. The narrative interview focuses on the individual's narrative about his or her life. The life history interview focuses on the individual's entire life story. The thematic qualitative interview explores the individual's attitudes, opinions and experiences on a particular topic. In the group interview the moderator engages several participants in a group discussion on the research topic.

The focus group is a special version of the group interview, which is often used in market research and Sustainability Assessments. Interactions not only take place between the moderator and the participants, but the participants also interact with each other, which leads to an increase in

information during the research. The focus group usually consists of a group of 6-12 participants and lasts 1-3 hours. The key role in the process is played by the moderator, who must be able to create the right atmosphere, gently guide the group while keeping the research topic in mind, listen to the individual members and keep the group within the framework. The process is usually recorded by video camera, and often live observation is carried out by the researchers organising the study or by the market sponsors using an observation mirror. The analysis of the data obtained during the focus group is usually carried out by the researchers in the case of basic research, and often by the moderator himself in the case of studies that do not require in-depth knowledge of the research topic.

Discussion questions

1. What is the difference between an interviewer and a moderator?
2. Why are unstructured and semi-structured interviews suitable for hypothesis building?
3. How can you ensure the interviewee's is paying attention during the interview?
4. In terms of structure, which interview type would you choose for a narrative interview?
5. Do you find close-ended questions suitable for conducting an individual in-depth interview? Please explain your answer.
6. You are preparing the repositioning of a product on the market. Which type of interview would you choose for this purpose?
7. You need to create evaluation of the materials prepared for a new image campaign for an existing brand on the market. which interview type would you choose in terms of methodology and content? Why?
8. Would you use close-ended questions in a focus group study? Please give explanation for your answer.
9. What factors should the moderator pay attention to when conducting a focus group?

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CHAPTER 8: QUESTIONNAIRE METHODS

Survey research using questionnaire involves posing the same question to multiple respondents, measuring variables, and statistically analyzing associations among variables. The process includes developing hypotheses, choosing the survey type, writing questions, planning data recording, selecting a target population, conducting interviews, and performing statistical analysis. Errors can occur in respondent selection, response to questions, and survey administration. Constructing a questionnaire requires defining research questions and creating measurement questions while avoiding pitfalls like jargon and leading questions. Selecting a measurement scale involves considering various factors. A good questionnaire is evaluated based on validity, reliability, and practicality. Validity ensures the test measures its intended purpose, reliability focuses on accuracy and precision, and practicality considers factors like economy and interpretability.

In survey research, the same question asked to many respondent, measure variable with the question, and then test multiple hypotheses simultaneously by statistically analyze associations among the variables to identify causal relationships.

In survey, researcher anticipate possible alternative explanation and measure them with other survey questions (i.e. control variables). Then, statistically examine their effects to rule out alternative explanations. Surveys are sometimes called correlational because the researchers do not control and manipulate conditions as in an experiment. In survey research, we use control variables to statistically approximate an experimenter's physical controls on confounding variables.

8.1 Step in Conducting Questionnaire

Survey is probably the best method available to the social researcher who is interested in collecting original data for describing a population too large to observe directly. (Furthermore) survey may be used for descriptive, explanatory, and exploratory purposed." (Babbie, 2013: 229). Questionnaire surveys are generally designed to obtain large quantities of data, usually in numerical form.

Table 8.1 Main steps in conducting questionaire

Step 1	• Develop hypotheses. • Decide on type of survey (form, mail, interview, telephone). • Write survey questions. • Decide on response categories. • Design layout.
Step 2	• Plan how to record data. • Pilot test survey instrument.
Step 3	• Decide on target population. • Get sampling frame. • Decide on sample size. • Select sample.
Step 4	• Locate respondents. • Conduct interviews. • Carefully record data.
Step 5	• Enter data into computers. • Recheck all data. • Perform statistical analysis on data
Step 6	• Describe methods and findings in research report. • Present findings to others for critique and evaluation.

- The process of developing a model is called conceptualization. Conceptualization involves three tasks:

(1) identifying the variables and constructs for your research,

(2) specifying relationships and hypotheses, and

(3) preparing a diagram (conceptual model) that visually represents the theoretical basis of the relationships you will examine.

- Variables are the observable and measurable characteristics in a conceptual model. An independent variable is a measurable characteristic that influences or explains the dependent variable. A dependent variable is the variable you are trying to understand, explain, or predict.

- Construct is several questions or statements are used in combination to represent a characteristic or concept

- Hypothesis is an unproven supposition or proposition that tentatively explains certain facts or phenomena

8.2 Erorr Source

Error is the difference between obtained values and "true values." It occurs when survey data (obtained values) do not accurately reflect the actual behaviors, beliefs, and understandings of respondents in a population that a survey researcher seeks to understand (true values).

1. **Errors in selecting the respondent**

a. Sampling errors (e.g., using a nonprobability sampling method)

b. Coverage errors (e.g., a poor sampling frame omits certain groups of people)

c. Nonresponse errors at the level of a sampled unit (e.g., a respondent refuses to answer)

2. **Errors in responding to survey questions**

a. Nonresponse errors specific to a survey item (e.g., certain questions are skipped or ignored)

b. Measurement errors caused by respondent (e.g., respondent does not listen carefully)

c. Measurement errors caused by interviewers (e.g., interviewer is sloppy in reading questions or recording answers)

3. **Survey administration errors**

a. Postsurvey errors (e.g., mistakes in cleaning data or transferring data into an electronic form)

b. Mode effects (e.g., differences due to survey method: by mail, in person, over the Internet)

c. Comparability errors (e.g., different survey organizations, nations, or time periods yield different data for the same respondents on the same issues).

Source errors also from condition that cannot be controlled

a. The Respondent Respondents may also suffer from temporary factors like fatigue, boredom, anxiety, hunger, impatience, or general variations in mood or other distractions; these limit the ability to respond accurately and fully. Designing measurement scales that engage the participant for the duration of the measurement is crucial

b. Situational Factors Any condition that places a strain on the interview or measurement session can have serious effects on the interviewer-respondent rapport. If another person is present, that person can distort responses by joining in, by distracting, or by merely being there. If the respondents believe anonymity is not ensured, they may be reluctant to express certain feelings.

8.3 Construct Questionnaire

A research question best states the objective of the business research study. Incorrectly defining the research question is the fundamental weakness in the business research process. Measurement questions are the actual questions that researchers use to collect data in a study. They could become questions on a survey or elements on an observation checklist. Measurement questions should be outlined by the completion of the project planning activities but usually await pilot testing for refinement.

Two types of measurement questions are common in business research:

• Predesigned, pretested questions are questions that have been formulated and tested previously by other researchers, are recorded in the literature, and may be applied literally or be adapted for the project at hand.

• Custom-designed questions is formulated specifically for the project at hand—are the collective insights from all the activities in the business research process completed to this point, particularly insights from exploration. Later, during the pilot testing phase of the research process, these custom-designed questions will be refined.

Table 8.2 Ten things to avoid when creating questionnaire

Things to Avoid	Meaning	Not Good Example
Jargon, slang, abbreviations	People inside a profession or members of a distinct subculture may be familiar and comfortable with the jargon or slang terms but only confuse outsiders. Also, avoid using abbreviations and acronyms. The same ones often have many meanings.	people who are homeless talk about a *snowbird,* and snowboarders talk about *goofy foot*.
Vagueness	Ambiguity and vagueness plague most question writers. It is very easy to make implicit assumptions that can confuse respondents.	Do you jog regularly? Yes _____ No _____ "
Emotional language and prestige bias	Words have implicit connotative as well as explicit denotative meanings	What do you think about paying murderous terrorists who threaten to steal the freedoms of peace-loving people?"
Double-barreled questions	A double-barreled question consists of two or more questions mixed together.	"Does your employer offer pension and health insurance benefits?"
Leading questions	A leading (or loaded) question is one that leads the respondent to one response over another by its wording.	"You don't smoke, do you?"
Beyond respondent capabilities	Issues Asking something that respondents do not know creates confusion, frustration, and inaccurate responses.	How did you feel about your brother when you were 6 years old?"
False premises	If you begin a question with a premise with which respondents disagree and offer choices regarding it, respondents may become frustrated and not know how to answer.	"Will you be paying by cash or credit card?" I hesitated a second and then realized that it was a ploy to get me to purchase the now optional snack that I did not want.
Distant future intentions	Respondents give more reliable answers to specific, concrete, and relevant questions than to questions about things remote from immediate experiences.	Suppose a new grocery store opened down the road. Would you shop at it?"

Things to Avoid	Meaning	Not Good Example
Double negatives	Double negatives in ordinary language are grammatically incorrect and confusing.	"Do you agree or disagree that students should not be required to take a comprehensive exam to graduate?" This is confusing. To disagree is a double negative; it is to *disagree* with *not* doingsomething. You always want to keep questions simple and straightforward.
Unbalanced response categories.	Make response categories or choices mutually exclusive, exhaustive, and balanced. *Mutually exclusive* means that the response categories do not overlap. It is easy to fix overlapping categories that are numerical ranges	Are you satisfied with your job, or are there things you do not like about it?"

8.4 Selecting a Measurement Scale

Selecting and constructing a measurement scale requires the consideration of several factors that influence the reliability, validity, and practicality of the scale such as Research objectives, Response types, Data properties, Number of dimensions, Balanced or unbalanced, Forced or unforced choices, Number of scale points, and Rater errors.

Questionnaire not only represent variable measured but also needed to be evaluate in statistical approach. There are three major criteria for evaluating a measurement tool: validity, reliability, and practicality.

• Validity is the extent to which a test measures what we actually wish to measure.

• Reliability has to do with the accuracy and precision of a measurement procedure.

• Practicality is concerned with a wide range of factors of economy, convenience, and interpretability.

Being valid and reliable means that the respondents should quickly grasp each question's meaning as you intended, answer completely and honestly, and believe that their answers are meaningful.

Table 8.3 Validity Measure

Types	What is Measure	Methods
Content	Degree to which the content of the items adequately represents the universe of all relevant items under study.	• Judgmental • Panel evaluation with content validity ratio
Criterion-Related	Degree to which the predictor is adequate in capturing the relevant aspects of the criterion.	• Correlation
Concurrent	Description of the present; criterion data are available at the same time as predictor scores.	
Predictive	Prediction of the future; criterion data are measured after the passage of time.	
Construct	Answers the question, "What accounts for the variance in the measure?"; attempts to identify the underlying construct(s) being measured and determine how well the test represents it (them).	• Judgmental • Correlation of proposed test with established one • Convergent-discriminant techniques • Factor analysis • Multitrait-multimethod analysis

Practicality

• Economy, Some trade-off usually occurs between the ideal research project and the budget. The choice of data collection method is also often dictated by economic factors.

• Convenience, the convenience test if it is easy to administer. A questionnaire or a measurement scale with a set of detailed but clear instructions, with examples, is easier to complete correctly than one that lacks these features.

• Interpretability, This aspect of practicality is relevant when persons other than the test designers must interpret the results.

Table 8.4 Reliability

Type	Coefficient	What is measured	Methods
Test–Retest	Stability	Reliability of a test or instrument inferred from examinee scores; same test is administered twice to same subjects over an interval of less than six months.	Correlation
Parallel Forms	Equivalence	Degree to which alternative forms of the same measure produce same or similar results; administered simultaneously or with a delay. Interrater estimates of the similarity of judges' observations or scores.	Correlation
Split-Half, KR20, Cronbach's Alpha	Internal consistency	Degree to which instrument items are homogeneous and reflect the same underlying construct(s).	Specialized correlational formulas

Summary

Survey research involves asking standardized questions to multiple respondents, measuring variables, and analyzing associations. The process includes developing hypotheses, selecting survey types, writing questions, planning data recording, choosing target populations, conducting interviews, and performing statistical analysis. Errors in respondent selection, response, and survey administration can occur. Constructing questionnaires involves conceptualization, defining variables and hypotheses. A good questionnaire is evaluated for validity, reliability, and practicality. Steps include developing a conceptual model, selecting measurement scales, and assessing questionnaire quality based on key criteria. Validity measures if the test serves its purpose, reliability evaluates accuracy, and practicality considers factors like economy and interpretability.

Discussion Question

1.   In the process of conducting a survey, what role do hypotheses play, and why is it crucial to carefully plan and execute each step, from developing questions to performing statistical analyses?

2.   Discuss the types of errors that can occur in the survey process, particularly those related to selecting respondents, responding to survey questions, and administration errors. How can these errors affect the accuracy of survey data?

3.   Why is it essential for researchers to avoid pitfalls like double-barreled questions, leading questions, and vague language when constructing a questionnaire? How do these issues impact the validity and reliability of the collected data?

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CHAPTER 9: MEASUREMENT

Sustainable development is a complex and multifaceted concept that encompasses a wide range of economic, social, and environmental dimensions. To effectively pursue sustainable development goals, it is crucial to have a robust understanding of these dimensions and the ability to measure progress towards achieving them. Measurement provides the foundation for sustainable development research, enabling researchers to assess the current state of affairs, evaluate the effectiveness of policies and interventions, and identify areas for further action.

The measurement of sustainable development is not without its challenges. The diverse and interconnected nature of the subject matter makes it difficult to develop comprehensive and universally applicable indicators. Additionally, the lack of reliable and consistent data across different regions and contexts further complicates the measurement process. Despite these challenges, measurement remains an essential tool for guiding sustainable development research and informing policy decisions.

This chapter explores the scales of measurement including nominal, ordinal, interval, and ratio. It discusses the applications of using each scale associated with conducting research in sustainable development. By understanding the principles and practices of measurement, researchers can develop a deeper understanding of research in sustainable development and contribute to the advancement of knowledge in this critical field.

Quantitative data analysis plays a fundamental role in various fields, including social sciences, natural sciences, and engineering. It provides a systematic approach to examining numerical information to identify patterns, trends, and relationships that inform decision-making, promote innovation, and improve the lives of people around the world. A critical aspect of quantitative data analysis is the selection of appropriate measurement scales. These scales determine the nature and limitations of the data and the statistical methods that can be applied to analyze it effectively.

Measurement is the process of assigning numerical values or labels to observed phenomena for the purpose of quantifying and describing them. It involves the systematic assignment of numbers to represent certain characteristics or attributes of objects, events, or people. Key Points in measurement are as followings:

- **Quantification:** Measurement involves converting qualitative observations into quantitative data, allowing for numerical representation and analysis.
- **Precision:** A well-designed measurement process aims for accuracy and precision to ensure that the assigned numerical values accurately reflect the characteristics being measured.
- **Standardization:** Measurement often involves the use of standardized instruments, scales, or procedures to enhance consistency and comparability across different observations or contexts.
- **Units:** Measurements are typically associated with units of measurement, providing a standardized reference for the numerical values assigned.
- **Reliability and Validity:** Reliable measurements yield consistent results over time and under different conditions, while valid measurements accurately capture the intended characteristics.

9.1 Scales of Measurement

Scales of measurement categorize variables based on the nature and characteristics of the data. There are four primary types of scales: Nominal scale, Ordinal scale, Interval scale, and Ratio scale.

Nominal Scale:

Nominal scales represent the simplest level of measurement. They are used to categorize data into mutually exclusive groups or classes that have no inherent order or meaning. The primary purpose of nominal scales is to classify or label entities based on distinct characteristics. For instance, consider the variable "gender." This variable can be measured using a nominal scale, with categories such as "male," "female," and "non-binary." Similarly, religious affiliation can be measured using a nominal scale with categories such as "Christianity," "Islam," "Hinduism," and "No Religion."

Characteristics of Nominal Scales:

• Data is categorical in nature, representing distinct categories or groups.

• The categories are mutually exclusive, meaning that an entity can only belong to one category at a time.

• The categories have no inherent order or meaning, indicating that they are not ranked or hierarchically organized.

• Statistical operations are limited to frequency counts and the mode, which is the most frequently occurring category.

Applications of Nominal Scales:

• Demographic characteristics such as gender, race, and ethnicity

• Classification of entities based on specific attributes (e.g., product type, animal species, disease category)

• Surveys and questionnaires to gather categorical data

• Grouping variables for analysis and comparison

Ordinal Scale:

Ordinal scales represent a more advanced level of measurement compared to nominal scales. They introduce a sense of order or ranking among the categories. This means that the categories can be arranged in a meaningful sequence, indicating a higher or lower level of some attribute. Ordinal scales provide a relative indication of the position or standing within a set of categories. An example of an ordinal scale is educational attainment, which can be measured using categories such as "primary," "secondary," "tertiary," and "postgraduate." Similarly, satisfaction levels can be measured using an ordinal scale with categories such as "very dissatisfied," "dissatisfied," "neutral," "satisfied," and "very satisfied."

Characteristics of Ordinal Scales:

• Data is categorical in nature, but the categories have an inherent order.

• Categories can be ranked or compared, indicating a higher or lower level of the attribute being measured.

• Statistical operations are limited to measures of central tendency (median) and dispersion (quartiles) due to the absence of equal intervals between categories.

Applications of Ordinal Scales:

• Likert scales to measure attitudes, opinions, and perceptions

• Surveys and questionnaires to assess subjective experiences and preferences

• Ranking and scoring systems to evaluate performance or outcomes

• Measuring ordinal variables such as pain intensity, customer satisfaction, and severity of symptoms

Interval Scale:

Interval scales represent a more sophisticated level of measurement compared to nominal and ordinal scales. They possess equal intervals between the values on the scale. This means that the difference between any two values on the interval scale is consistent and has the same meaning throughout the scale. Interval scales provide a precise indication of the magnitude of the differences between values. An example of an interval scale is temperature in Celsius or Fahrenheit. Other examples include academic grades (A/B/C/D/F) and IQ scores.

Characteristics of Interval Scales:

- Data is numerical, with equal intervals between values.
- Differences between values have meaning, and the magnitude of differences can be directly compared.
- Statistical operations include measures of central tendency (mean, median, mode), dispersion (standard deviation, variance), and correlation.

Applications of Interval Scales:

- Measuring physical quantities such as temperature distance, and time
- Assessing psychological traits such as intelligence, personality, and aptitude
- Evaluating performance on standardized tests, academic grades, and scales of measurement
- Analyzing variables with equal intervals and a consistent unit of measurement

Ratio Scale:

Ratio scales represent the highest level of measurement, possessing all the characteristics of interval scales and additionally having a true zero point. This means that the absence of the attribute being measured is meaningful, and the ratio between any two values on the scale is also meaningful. Ratio scales provide the most precise and informative type of measurement, allowing for meaningful comparisons, calculations of ratios, and proportions. An example of a ratio scale is age, where zero represents the absence of life. Another example is weight. Weight is a ratio scale. This means that it has all the characteristics of an interval scale, plus it has a true zero point. The true zero point of weight is the absence of weight, which is meaningful because it represents the complete absence of any mass or substance. This allows for meaningful comparisons and calculations involving weight. For example, we can say that a person who weighs 100 pounds is twice as heavy as a person who weighs 50 pounds. We can also calculate the ratio of weight to height to determine body mass index (BMI).

Characteristics of Ratio Scales:

- Data is numerical, with equal intervals between values.
- Differences between values have meaning, and the magnitude of differences can be directly compared.
- Statistical operations include measures of central tendency (mean, median, mode), dispersion (standard deviation, variance), and correlation.
- Possesses a true zero point, indicating the complete absence of the attribute being measured.
- Ratios between values have meaning, allowing for meaningful comparisons and calculations.

Applications of Ratio Scales:

- Measuring physical quantities such as age, length, weight, volume, and income
- Assessing economic variables such as income, GDP, and unemployment rate
- Analyzing demographic data such as population size, birth rate, and death rate
- Evaluating scientific and engineering measurements that require precise and meaningful comparisons

Although interval scale and ratio scale have similar characteristics, they are different. Here is a table summarizing the characteristics of interval and ratio scales:

Table 9.1 Interval scale and ratio scale

Characteristic	Interval Scale	Ratio Scale
Data type	Numerical	Numerical
Equal intervals	Yes	Yes
True zero point	No	Yes
Meaningful comparisons of differences	Yes	Yes
Meaningful ratios	No	Yes

The choice of scale influences the type of statistical analysis that can be performed on the data. Nominal and ordinal scales are often associated with qualitative or categorical data, while interval and ratio scales are used for quantitative data. Each scale provides different levels of information and constraints, and researchers should carefully select the appropriate scale based on the nature of the variables being measured.

9.2 Example of measurements related to Sustainable Development Goals (SDGs) using each scale

Nominal Scale:
- Type of renewable energy: solar, wind, hydro, geothermal, biomass
- Mode of transportation: car, bus, train, bicycle, walking
- Type of waste: food scraps, paper, plastic, metal, glass
- Access to sanitation: adequate, inadequate
- Type of ecosystem: forest, grassland, wetland, desert, tundra
- Type of pollution: air, water, soil
- Type of climate change impact: sea level rise, extreme weather events, drought, wildfire
- Type of sustainability policy: carbon tax, cap-and-trade, renewable energy subsidy, energy efficiency standard

It can be observed from the above examples that the nominal scales can be used to measure a wide variety of variables related to sustainable development. The key is to make sure that the values of the variable are truly categorical and have no inherent order or meaning.

Ordinal Scale:
- Level of Human Development Index (HDI) categories: low, medium, high, very high
- Level of poverty: low, medium, high
- Severity of drought: mild, moderate, severe, extreme
- Level of biodiversity: low, medium, high
- Quality of water: poor, fair, good, excellent
- Forest cover: sparse, moderate, dense
- Air quality: unhealthy, unhealthy for sensitive groups, moderate, good
- Energy efficiency: low, medium, high
- Sustainable development performance: low, medium, high
- Level of climate change vulnerability: low, moderate, high
- Adoption of sustainable practices: low, medium, high
- Level of community engagement in sustainable development: low, medium, high

These are just a few examples, and there are many other ordinal scales that can be used to measure variables related to sustainable development. The key is to make sure that the variable has a natural order, and that the values of the variable are meaningful in terms of that order.

Interval Scale:

Quantifying temperature changes in degrees Celsius for climate monitoring by measuring the average annual temperature change for each country in degrees Celsius. Here, the differences between temperature values are meaningful, but 0°C does not represent the absence of temperature. More examples include measuring:

- Trade balance: the difference between a country's exports and imports. Negative values indicate a trade deficit, where imports exceed exports.
- Inflation rate: the change in price levels over time. Negative inflation, known as deflation, can indicate an economic slowdown or recession.
- Debt-to-GDP ratio: the total debt (public and private) as a percentage of GDP. High values can raise concerns about financial sustainability, and the ratio can become negative if debts exceed GDP.
- Net forest area change: the annual net loss or gain in forest area. Negative values indicate deforestation and forest degradation.
- Biodiversity loss: measured by various metrics like species extinction rates or declines in population sizes. Negative values indicate biodiversity loss.
- Greenhouse gas emissions: measured in tons of CO_2 equivalent per year. Negative values can be achieved through carbon capture and storage technologies.
- Happiness index: measures subjective well-being on a scale. While typically positive, negative values could reflect widespread dissatisfaction or major crises.
- Change in inequality: Measured by metrics like the Gini coefficient. Negative values might indicate decreasing income inequality within a specific period.

Interval scales are useful for measuring variables that have a natural order and that can be meaningfully compared to each other. However, it is important to remember that the intervals between values on an interval scale are not necessarily equal. For example, the difference between 20 degrees Celsius and 30 degrees Celsius is not the same as the difference between 50 degrees Celsius and 60 degrees Celsius.

Ratio Scale:

Measuring the percentage of the population with access to clean drinking water by determining the percentage of a country's population with access to clean drinking water is a ratio scale measurement. Here, a value of 0% would indicate the absence of access, and ratios between percentages are meaningful. More examples are to measure:
- Population density: people per square kilometer
- Poverty gap: difference between the average income of the poor and the poverty line
- Energy intensity: energy consumption per unit of GDP
- Carbon footprint: metric tons of CO_2 equivalent per person per year
- Water footprint: liters of water per person per year
- Ecological footprint: hectares of land required to support a person's lifestyle
- Human Development Index (HDI): a dimensionless index that measures a country's achievements in human development
- Rainfall: millimeters or inches
- CO_2 emissions: metric tons per year
- GDP per capita: US dollars per person per year
- Life expectancy: years
- Poverty rate: percentage of population below the poverty line
- Unemployment rate: percentage of the labor force that is unemployed
- Access to sanitation: percentage of the population with access to adequate sanitation

Ratio scales are the most precise and powerful type of measurement scale. They have a true zero point, and the intervals between values are equal. This means that ratio scales can be used to make meaningful comparisons and to calculate meaningful statistics, such as means, standard deviations, and correlations.

These examples illustrate how different scales of measurement can be applied to various aspects of the SDGs. Depending on the research question and the nature of the variables being examined, researchers can choose the most appropriate scale for their analysis, considering the level of information and statistical operations required.

Summary

The selection of appropriate measurement scales is a critical aspect of quantitative data analysis. Scales provide the foundation for analyzing data meaningfully, drawing inferences, and making informed decisions. This chapter explored the four main scales of measurement: nominal, ordinal, interval, and ratio scales.

- Nominal scales represent the simplest level of measurement, classifying data into mutually exclusive categories with no inherent order.
- Ordinal scales introduce a sense of order among categories, allowing for ranking or sequencing.
- Interval scales possess equal intervals between values, enabling comparisons of differences in magnitude.
- Ratio scales combine the characteristics of interval scales with a true zero point, allowing for meaningful ratios and calculations.

Each scale has its strengths and limitations, and the choice of scale depends on the nature of the data and the research question being addressed. Understanding the characteristics and limitations of different scales is essential for conducting rigorous and ethical quantitative data analysis.

Discussion questions

1. What are the four levels of measurement, and what are their defining characteristics?
2. Provide examples of variables that can be measured using each level of measurement.
3. What level of measurement is appropriate for each of the following variables?
4. What are some of the advantages and disadvantages of using each level of measurement?
5. How can you determine the appropriate level of measurement to use for a particular variable?
6. How can researchers ensure that their measurement scales are reliable and valid?
7. How do measurement scales influence the statistical methods that can be used to analyze data?
8. Discuss the role of measurement scales in communicating research findings.
9. How can researchers adapt measurement scales to different cultural contexts?
10. What are the emerging trends and future directions in measurement scale development?

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CHAPTER 10: QUALITY OF RESEARCH

Research quality, in the context of sustainability studies, hinges on key principles such as validity, and reliability. Validity ensures that studies accurately measure sustainability-related variables, such as environmental impact or social equity. For instance, a study on the sustainability of a renewable energy project must validly capture its environmental benefits. Reliability becomes crucial for consistent measurements over time, aiding in the assessment of the long-term sustainability impact of interventions. Ethical considerations, tied closely to sustainability, involve ensuring the well-being of present and future generations, aligning with the core principles of sustainable development.

In addition, transparency in reporting methods and sharing data aligns with sustainability's collaborative ethos. Open science practices contribute to a collective understanding of sustainable solutions and allow for scrutiny and improvement. Furthermore, the impact of research on sustainability is paramount. Quality research not only contributes to the academic discourse but also has practical implications for sustainable practices and policies. It guides decision-making by offering evidence-based insights, fostering a more sustainable and resilient future. In summary, the integration of these key research concepts within the context of sustainability enhances the credibility and applicability of findings, promoting a more sustainable and equitable world.

10.1. Need for quality of research in sustainability studies

Discussing the quality of research is crucial for several reasons (e.g., Schindler, 2019, Newman, 2013). Firstly, it ensures the credibility and reliability of scientific knowledge. High-quality research, characterized by rigorous methodologies and robust analyses, fosters confidence in the accuracy and validity of research findings. This, in turn, establishes a foundation for informed decision-making by policymakers, practitioners, and the public.

Secondly, conversations about research quality contribute to the continuous improvement of scientific practices. Through peer review and open discussions, researchers can identify and rectify methodological shortcomings, enhancing the overall integrity of the scientific process. Additionally, emphasizing research quality helps mitigate the spread of misinformation and reinforces the public's trust in scientific endeavors. Ultimately, these discussions uphold the standards of intellectual rigor, ethical conduct, and transparency that are essential for the advancement of knowledge and its positive impact on society.

In the realm of sustainability research, the emphasis on research quality is paramount. Robust and credible research is crucial for addressing complex and interdisciplinary challenges inherent in sustainability issues, such as climate change and social inequality. It provides a foundation for developing effective, evidence-based solutions that contribute to informed decision-making by policymakers and practitioners. The interdisciplinary nature of sustainability research necessitates collaboration across diverse fields, making research quality essential for integrating varied perspectives and data sources. Moreover, high-quality research ensures ethical considerations are addressed, promotes resource efficiency, and contributes to global collaboration for sustainable solutions. Ultimately, in the pursuit of sustainable development goals, the credibility and reliability of research findings play a pivotal role in shaping policies, practices, and public awareness for a more sustainable and resilient future.

10.2. Aspects of research quality

The quality of research is a multifaceted concept encompassing various key aspects. These aspects collectively contribute to the credibility, reliability, and validity of research findings. Together, these aspects play a crucial role in establishing the trustworthiness, dependability, and accuracy of research findings. This holistic perspective is essential for ensuring that research contributes meaningfully to the body of knowledge within a specific field, fostering credibility and advancing the understanding of complex phenomena. Additionally, the quality of research is not a singular attribute or isolated aspect but rather a comprehensive characteristic that permeates the entire research process. It applies from the initial conceptualization of the study to the dissemination of findings, meaning the aspects of quality covers all research stages as discussed earlier in Chapter 4. Each aspect plays a critical role in upholding the scientific rigor and integrity of the research process. Table 10.1 elaborates research quality in each aspect of research stage.

Table 10.1 Aspects of quality in each research stage

Research stage	Aspect of quality of the research
Research design and conceptualization	The quality of research begins with the formulation of a well-defined research question or hypothesis. A carefully crafted research design, grounded in sound theoretical concepts, sets the stage for a robust study.
Literature review	A comprehensive literature review not only informs the research design but also demonstrates the researcher's commitment to building upon existing knowledge. This critical examination of prior work establishes the context and rationale for the study.
Methodological choice	The methodology encompasses the specific methods and techniques used to gather and analyze data. This includes selecting appropriate data collection methods, determining the sampling strategy, and ensuring that the chosen methodologies align with the research objectives. Additionally, transparency in reporting methods, data, and results enhances the replicability of the study.
Data analysis	Proper data analysis involves applying appropriate statistical or qualitative techniques. The accuracy and rigor of the analysis contribute to the overall reliability of the study's results. Researchers need to use methods that align with their research questions and data types.
Reporting	The quality of research is communicated through clear and coherent reporting of findings. A well-structured and transparent presentation of results ensures that others can understand, critique, and build upon the research

Source: Author's reflection from various sources

In the context of sustainability study, the topic of sustainability often deals with complex and interconnected issues. A well-designed study begins with a clear understanding of the specific sustainability challenges being addressed, ensuring that the research is contextually relevant. With regards to literature and methodological aspect, sustainability is inherently interdisciplinary and sustainability literature often spans various disciplines. A comprehensive literature review is essential

for synthesizing insights from diverse fields and building a holistic understanding of the sustainability challenge under investigation. In term of methodological choices should reflect this, integrating diverse methods to capture the environmental, social, and economic dimensions of sustainability issues comprehensively. Data collection in sustainability research often involves multiple stakeholders. Quality data collection requires engaging with diverse communities, ensuring that the perspectives of various groups are considered in the research process. Lastly, clear reporting in sustainability studies is not only about academic rigor but also about effectively communicating findings to diverse audiences, including policymakers, businesses, and communities. Clarity aids in translating research into actionable insights.

Validity aspect in the sustainability research

One element of quality of research is validity. Validity refers to the accuracy and soundness of the research's measurement and inferences. According to previous scholars (e.g., Newman, 2013; Schindler, 2021), validity is a crucial aspect of research methodology, and it refers to the extent to which a study measures what it claims to measure. In other words, validity assesses whether the research accurately captures the phenomenon or concept it intends to investigate.

From the literature, there are several types of validity (see: Newman 2013, Schindler, 2021), namely face validity, content validity, and construct validity. Each will be elaborated briefly in the following subsection.

Face validity. This validity involves a subjective assessment of whether a measurement "looks like" be able to measure what it claims to measure. This validity is more about appearance and surface-level assessment. Face validity is a preliminary and subjective form of validation. While it can provide an initial indication of whether a measurement tool appears to measure what it claims to measure. However, it is not a suitable for more rigorous forms of validity testing. In the context of sustainability research, applying face validity can be important for gaining initial insights into how well a measurement tool aligns with the perceived meaning of sustainability. Indeed, face validity dan be useful starting point in the development of measurement instruments for sustainability research.

Content validity. This is a type of validity that assesses whether a measurement instrument adequately covers the full range of the construct or concept it aims to measure (Newman, 2013). In other words, it evaluates whether the items or questions within the instrument represent the entire content domain of the construct. For sustainability research, content validity is crucial to ensure that the measurement tools effectively capture the multidimensional nature of sustainability. For instance, we need to clearly define the key constructs related to sustainability that we aim to measure in the study, which may include environmental, social, and economic dimensions. In doing so, we need to conduct a thorough literature review to understand the various aspects and dimensions of sustainability as defined in existing research. In developing the instrument, we may need to incorporate multiple indicators to measure each dimension of sustainability. For example, to measure environmental sustainability which may include indicators related to biodiversity, energy use, waste management, and other relevant factors.

Construct validity. This type of validity assesses the extent to which a measurement tool accurately measures the underlying theoretical construct or concepts it claims to measure. The construct validity is a higher-order concept that encompasses both criterion-related validity and discriminant validity (Schindler, 2019). It involves providing evidence that the measurement instrument is capturing the intended construct. *Criterion-related validity* is a specific aspect of construct validity. It involves demonstrating that the scores obtained from a measurement tool are related to external criteria in a manner consistent with the theoretical framework. This type validity evaluates how well one measure predicts an outcome based on another criterion. It can be divided into concurrent validity (measuring at the same time) and predictive validity (predicting future performance). *Discriminant validity* is another specific aspect of construct validity. It focuses on demonstrating that the measurement tool is not capturing irrelevant variance from other constructs,

thus ensuring the uniqueness of the intended construct. Discriminant validity assesses the degree to which measures of different constructs are not strongly correlated. It aims to ensure that a measurement tool is distinct from other constructs it is not supposed to measure.

In sustainability research, establishing construct validity, criterion-related validity, and discriminant validity is crucial for ensuring that the measurement instruments accurately and meaningfully capture the multidimensional nature of sustainability. In practical, when establishing construct validity in sustainability research, we need to clearly define the key constructs or dimensions of sustainability which may include environmental sustainability, social equity, economic viability, and other relevant dimensions. For the criterion-related validity, if we measure environmental sustainability, a criterion might be the reduction of carbon emission. Furthermore, to assess discriminant validity, we can examine the correlation between sustainability construct and other construct that should be conceptually distinct. For instance, measurement of environmental sustainability should be not strongly correlated to measures of economic viability.

Ensuring validity is essential because if a study lacks validity, the results and conclusions drawn from it may not accurately represent the phenomena under investigation. Researchers use various strategies and methods to establish and enhance the validity of their studies, such as careful instrument design, pilot testing, and statistical analyses. Valid research is a cornerstone of building a reliable and credible body of knowledge in any field including sustainability management.

Reliability aspect in the sustainability research

Reliability in research refers to the consistency, stability, and dependability of measurement instruments or procedures (Schindler, 2021. It is the extent to which a particular method, technique, or tool produces consistent and repeatable results under similar conditions. In other words, a reliable research instrument or procedure should yield the same or very similar results when applied repeatedly to the same sample or population.

Reliability is an essential consideration in sustainability research, as it ensures that the data and measurements obtained are consistent and dependable. In sustainability research, where the subject matter is often complex and multifaceted, maintaining reliable measurement tools is crucial for drawing meaningful conclusions and making informed decisions. Additionally, it is crucial for producing trustworthy and meaningful results.

Sustainability research often involves collecting data sources such as surveys, observations, as well as using various environmental indicators such as air and water quality, biodiversity, and energy consumption. Reliability ensures that data collection methods are consistent over time and across different settings, providing a stable foundation for analysis. Moreover, sustainability research often involves longitudinal studies to assess changes and trends over time. Reliability is critical in longitudinal research to ensure that measurements taken at different points in time are comparable and reflect real changes rather than measurement inconsistencies. In other words, in sustainability research, various types of reliability can be considered depending on the nature of the research, the type of data collected, and the measurement instruments used.

From the literature of research methodology, there are some common types of reliability that may be relevant in sustainability research, namely: *test-retest reliability*, *internal consistency reliability*, *inter-rater reliability*, *parallel-form reliability*, *split-half reliability*, *intra-observer reliability*, and *consistency in data sources*. Each will be briefly explained in the following subsections.

Table 10.2 Type of reliability in sustainability research

Type	Descriptions	Application
Test-retest reliability	The consistency of measurements over time. It involves administering the same test or measurement instrument to the same group of participants on two different occasions and then correlating the results.	Test-retest reliability can be relevant for assessing the stability of measurements over time, especially when studying changes in environmental conditions or community perceptions
Internal consistency reliability	How well the items within a measurement instrument are correlated. Common measures include Cronbach's alpha.	Using scales or questionnaires to measure constructs like environmental awareness, social equity, or economic impact. It ensures that the items in a scale are consistently measuring the same underlying construct.
Inter-rater reliability	The consistency between different raters or observers when they independently evaluate the same set of data or performance.	Ensures that different assessors provide consistent evaluations.
Parallel-forms reliability	Involves using two different but equivalent forms of a test or instrument and checking the consistency of scores obtained from both forms.	This type is relevant when using different versions of a survey or measurement instrument to assess the same construct in different contexts or populations.
Split-half reliability	Assessing the consistency of scores between the halve by dividing a measurement instrument into two halves.	To evaluate the internal consistency of a scale or questionnaire, ensuring that the items in each half consistently measure the same construct.
Intra-observer reliability	Assesses the consistency of measurements taken by the same observer over multiple observations	Involving repeated observations of environmental conditions or community behaviors, intra-observer reliability ensures that the same observer consistently records data.
Consistency in data sources	Ensuring consistency in data sources involves using reliable and standardized data from reputable sources.	Especially when using secondary data, researchers need to ensure that the data obtained from various sources are reliable and consistent for valid comparisons and analyses

Source: various research methodology books (e.g., Newman, 2013, Schindler, 2019)

Applying these types of reliability in sustainability research helps ensure the trustworthiness and dependability of data and measurements, contributing to the overall quality of the research findings and their potential impact on sustainability initiatives. In conclusion, the quality of sustainability research hinges on the careful consideration and application of both validity and reliability. Valid measurements ensure that the research captures the true complexities of sustainability, while reliability ensures consistency in data collection and analysis. By prioritizing both validity and reliability, sustainability researchers contribute to a more robust and impactful body of

knowledge, supporting the ongoing efforts to address environmental, social, and economic challenges and advance sustainable practices globally.

Summary

In conclusion, ensuring the quality of sustainability research requires a nuanced approach that balances validity and reliability. Researchers must navigate the complexity of sustainability issues by employing rigorous methodologies that capture the multifaceted nature of these challenges. By ensuring that research findings accurately reflect the complexities of sustainability and are consistent and replicable, researchers can enhance the credibility and trustworthiness of their work.

Moving forward, continued emphasis on methodological rigor, transparency, and interdisciplinary collaboration will be essential for advancing sustainability research. By addressing validity and reliability issues, researchers can contribute meaningful insights to the field of sustainability and drive positive change towards a more sustainable future.

Discussion questions

1. How did the researchers ensure the validity of their findings in this sustainability study?
2. To what extent were the measurement tools used in this research reliable in capturing sustainability-related data?
3. What steps were taken to address potential threats to the validity of the findings, such as biases or confounding variables?
4. How do the researchers justify the reliability of their data collection methods in the context of sustainability research?
5. Were there any limitations in terms of the validity of the findings, and if so, how were these limitations addressed or acknowledged?
6. How did the researchers ensure the reliability of their data analysis process, particularly in handling complex sustainability issues?
7. Did the study employ any strategies to enhance the validity of the findings, such as triangulation of data sources or member-checking?
8. How do the researchers discuss the reliability of their findings in the broader context of sustainability research?
9. Were there any challenges or considerations specific to ensuring validity and reliability in the context of sustainability research?
10. What recommendations would the researchers provide for future studies aiming to improve the validity and reliability of sustainability research findings?

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CHAPTER 11: QUANTITATIVE DATA ANALYSIS

In the pursuit of sustainable development, quantitative data analysis plays an indispensable role in unraveling the intricacies of complex social, economic, and environmental phenomena. By systematically examining numerical information, researchers gain valuable insights into the patterns, trends, and relationships that underpin sustainable development challenges and opportunities. This chapter delves into the realm of quantitative data analysis, equipping researchers with the tools and techniques to transform raw data into meaningful knowledge.

Quantitative data analysis encompasses a diverse array of statistical methods, each tailored to address specific research questions and uncover hidden patterns within datasets. From descriptive statistics that provide a snapshot of central tendencies and variability to inferential statistics that allow for generalizations from sample data to the broader population, quantitative techniques offer a powerful lens through which to examine sustainable development issues.

This chapter introduces the fundamental concepts and techniques of quantitative data analysis, guiding researchers through the process of data preparation, exploratory data analysis, hypothesis testing, and regression modeling. It emphasizes the importance of selecting appropriate statistical methods aligned with the research design and data characteristics, ensuring that the analysis is both rigorous and insightful.

As researchers embark on their quantitative data analysis journey, they must remain mindful of the ethical considerations involved in data handling and interpretation. Ensuring data confidentiality, avoiding data manipulation, and acknowledging limitations in the data are paramount to maintaining the integrity of the research process and upholding the ethical standards of sustainable development research.

By mastering the principles and techniques of quantitative data analysis, researchers can unlock the power of numbers to illuminate the intricacies of sustainable development. Through careful data preparation, thoughtful statistical analysis, and rigorous interpretation, researchers can contribute to a deeper understanding of the challenges and opportunities that lie ahead in the quest for a sustainable future.

11.1 Data Preparation in Quantitative Data Analysis

Data preparation is a crucial phase in quantitative data analysis that involves organizing, cleaning, and transforming raw data into a format suitable for statistical analysis. This process ensures that the data are accurate, complete, and ready for application of statistical techniques. Here are key steps involved in data preparation for quantitative analysis:

Data Cleaning:

Identify and address missing data, outliers, and errors in the dataset. This may involve imputing missing values, correcting errors, or excluding extreme outliers to enhance the quality of the data.

Variable Coding and Recoding:

Assign numerical codes to categorical variables to make them compatible with statistical analyses. Recoding may also involve collapsing categories or creating new variables to simplify analysis.

Data Transformation:

Apply transformations to variables if needed. Common transformations include log transformations, square root transformations, or standardization to meet the assumptions of statistical tests or improve the distributional characteristics of the data.

Variable Selection:

Choose the relevant variables for analysis based on the research question and objectives. This may involve excluding unnecessary variables to streamline the analysis and focus on key relationships.

Creation of Composite Variables:

Create composite variables or indices by combining several related variables into a single variable. This can simplify the analysis and capture broader constructs.

Handling Categorical Data:

Convert categorical variables into a suitable format for analysis. This may involve creating dummy variables, which are binary variables representing different categories.

Data Coding and Labeling:

Ensure that all variables are appropriately labeled with clear and descriptive names. Coding should be consistent and well-documented for ease of interpretation.

Data Exploration:

Conduct exploratory data analysis to gain insights into the distribution of variables, relationships between variables, and potential patterns in the data. This step can guide decisions about appropriate statistical methods.

Dealing with Multicollinearity:

Assess and address multicollinearity issues if multiple variables are highly correlated. This may involve excluding redundant variables or using techniques like principal component analysis.

Data Checking:

Verify that the data have been entered accurately and consistently. Perform checks for outliers, inconsistencies, and unusual patterns to ensure the reliability of the dataset.

Data Documentation:

Document the data preparation steps, including any changes made to the original dataset. A well-documented dataset enhances transparency and reproducibility of the analysis.

Data Partitioning (if applicable):

If conducting predictive modeling, partition the data into training and testing sets to evaluate the model's performance on unseen data.

Data preparation is an iterative and interactive process that significantly influences the validity and reliability of quantitative analyses. It sets the foundation for meaningful interpretations and insights from the data, supporting informed decision-making and research outcomes.

11.2 Descriptive statistics

Descriptive statistics is a branch of quantitative data analysis that involves summarizing, organizing, and presenting data in a meaningful way. These statistics provide a concise overview of the main features of a dataset, offering insights into its central tendency, dispersion, and shape. Descriptive statistics are fundamental for understanding the basic characteristics of a dataset before more advanced analyses are performed. Key measures of descriptive statistics include:

- **Measures of Central Tendency:**
  - **Mean:** The arithmetic average of a set of values. It is calculated by adding all values and dividing by the number of observations.
  - **Median:** The middle value in a sorted dataset. If the dataset has an even number of observations, the median is the average of the two middle values.
  - **Mode:** The most frequently occurring value(s) in a dataset.
- **Measures of Dispersion (Variability):**
  - **Range:** The difference between the maximum and minimum values in a dataset.
  - **Variance:** A measure of how spread out the values are from the mean. It is calculated by averaging the squared differences between each value and the mean.

o **Standard Deviation:** The square root of the variance. It provides a measure of the average distance between each data point and the mean.

- **Measures of Shape and Distribution:**

o **Skewness:** A measure of the asymmetry of the distribution. Positive skewness indicates a right-skewed distribution, while negative skewness indicates a left-skewed distribution.

o **Kurtosis:** A measure of the peakedness or flatness of a distribution. High kurtosis indicates a more peaked distribution, while low kurtosis indicates a flatter distribution.

- **Frequency Distributions:**

o **Histograms:** A graphical representation of the distribution of a dataset, displaying the frequency of values within specified intervals (bins).

o **Frequency Tables:** A tabular representation of the number of occurrences of each value in a dataset.

- **Percentiles and Quartiles:**

o **Percentiles:** Values below which a given percentage of observations fall. The median is the 50th percentile.

o **Quartiles:** Values that divide a dataset into four equal parts. There are three quartiles in total, labeled Q1, Q2, and Q3.

▪ Q1: Lower quartile, also known as the 25th percentile. This value represents the point where 25% of the data falls below it and 75% falls above it.

▪ Q2: Median, also known as the 50th percentile. This value represents the point where half of the data falls below it and half falls above it. It is essentially the "middle" value of the dataset.

▪ Q3: Upper quartile, also known as the 75th percentile. This value represents the point where 75% of the data falls below it and 25% falls above it.

An Example

Consider an example of descriptive statistics related to one of the Sustainable Development Goals (SDGs), specifically SDG 3, which aims to "Ensure healthy lives and promote well-being for all at all ages." The following example will be used to illustrate the calculation for each descriptive statistic.
Table 11.1 Child Mortality rates in different countries based on UNICEF Data (2021)

Region	Country	Under-5 Mortality Rate (per 1,000 live births)
Asia	Japan	3.2
Asia	Singapore	3.9
Asia	South Korea	4
Asia	Mongolia	22
Europe	Finland	3.4
Europe	Iceland	3.5
Europe	Norway	4.1
Europe	Sweden	4.2

source: *https://data.unicef.org/resources/levels-and-trends-in-child-mortality/*

Descriptive Statistics on Child Mortality Rates

- **Mean Child Mortality Rate:**

o **Formula:** Sum of child mortality rates across different countries divided by the number of countries.

o **Calculation:**

For Asia (3.2 + 3.9 + 4.0 + 22.0) / 4 = 33.1 / 4 = 8.275

For Europe (3.4 + 3.5 + 4.1 + 4.2) / 4 = 15.2 / 4 = 3.8

o **Interpretation:** The average rate of deaths among children under five years old across the four selected countries in Asia is equal to 8.275 while the average rate of deaths among children under five years old across the four selected countries in Europe is equal to 3.8. It can be interpreted that Europe has a lower child mortality rate compared to Asia. However, it's important to remember the limitations of comparing means from small, non-representative sets of countries. Analyzing broader data and considering various factors are crucial for drawing meaningful conclusions. To obtain more realistic interpretation, we can search for more data of child mortality rates in several countries in different regions of the world to compare the mean child mortality rate in different regions.

- **Median Child Mortality Rate:**
o **Formula:** Arranging child mortality rates in ascending order and identifying the middle value.

o **Calculation:**
For Asia, arrange the rates in ascending order:
Japan: 3.2
Singapore: 3.9
South Korea: 4.0
Mongolia: 22.0
Since we have an even number of values (4), the median is the average of the 2 middle values:
Median = (3.9 + 4.0) / 2 = 7.9 / 2 = 3.95
For Europe, arrange the rates in ascending order:
Finland: 3.4
Iceland: 3.5
Norway: 4.1
Sweden: 4.2
Since we have an even number of values (4), the median is the average of the 2 middle values:
Median = (3.5 + 4.1) / 2 = 7.6 / 2 = 3.8

o **Interpretation:** The median child mortality rate represents the middle point of the distribution and is less sensitive to extreme values, providing insights into the central tendency. Based on the example above, the median in Europe is slightly lower than that in Asia, indicating lower overall child mortality in these specific European countries compared to the chosen Asian countries. However, it's important to remember the limitations of comparing medians from small, non-representative sets of countries. Analyzing broader data and considering various factors are crucial for drawing meaningful conclusions.

- **Mode of Child Mortality Rates:**
o **Formula:** Identifying the child mortality rate that occurs most frequently.
o **Calculation**: Unfortunately, calculating the mode of child mortality rates for Asian and European countries based on the table provided isn't possible. The mode refers to the most frequent value in a dataset, but the table only shows data for four specific countries, and each has a unique rate. There isn't a single value that appears multiple times, thus preventing the determination of a mode. If you have data for a larger set of Asian countries, with potentially recurring child mortality rates, then calculating the mode would be feasible. However, with only four individual data points, determining the mode isn't applicable.

o **Interpretation:** The mode indicates the most common child mortality rate across the countries.

- **Range of Child Mortality Rates:**
o **Formula:** Subtracting the minimum child mortality rate from the maximum child mortality rate.

o **Calculation**:

For Asia: 3.2 (Japan) - 22.0 (Mongolia) = 18.8

For Europe: 3.4 (Finland) - 4.2 (Netherlands) = 0.8

o **Interpretation:** The range provides the spread or variability in child mortality rates, indicating the difference between the highest and lowest values. The range for Asia is much wider than the range in Europe which means that there are more variations in the child mortality rate in Asian countries. However, interpreting this result requires caution because there is an outlier influence in this case. Mongolia's high rate (22.0) significantly impacts the East Asia & Pacific range, potentially inflating it and may not reflecting the situation in other countries within the region.

- **Standard Deviation of Child Mortality Rates:**
o **Formula:** A measure of the average deviation of child mortality rates from the mean.
o **Calculation**:

For Asia,

1. Calculate the mean: (3.2 + 3.9 + 4.0 + 22.0) / 4 = 33.1 / 4 = 8.275
2. Calculate the squared deviations from the mean:
- Japan: $(3.2 - 8.275)^2 = 27.055625$
- Singapore: $(3.9 - 8.275)^2 = 18.490625$
- South Korea: $(4.0 - 8.275)^2 = 18.490625$
- Mongolia: $(22.0 - 8.275)^2 = 178.490625$

3. Calculate the variance: Sum the squared deviations and divide by the number of data points minus 1:

(27.055625 + 18.490625 + 18.490625 + 178.490625) / (4 - 1) = 242.5275 / 3 = 80.8425

4. Calculate the standard deviation: the square root of the variance: $\sqrt{80.8425} \approx 8.99$

For Europe,

1. Calculate the mean: (3.4 + 3.5 + 4.1 + 4.2) / 4 = 15.2 / 4 = 3.8
2. Calculate the squared deviations from the mean:
- Finland: $(3.4 - 3.8)^2 = 0.16$
- Iceland: $(3.5 - 3.8)^2 = 0.09$
- Norway: $(4.1 - 3.8)^2 = 0.09$
- Sweden: $(4.2 - 3.8)^2 = 0.16$

3. Calculate the variance: Sum the squared deviations and divide by the number of data points minus 1: (0.16 + 0.09 + 0.09 + 0.16) / (4 - 1) = 0.5 / 3 = 0.1667

4. Calculate the standard deviation: the square root of the variance: $\sqrt{0.1667} \approx 0.41$

o **Interpretation:** A higher standard deviation suggests greater variability in child mortality rates among the countries. The larger standard deviation in Asia (8.991) compared to Europe (0.41) suggests potentially greater variability in child mortality rates across the four Asian countries compared to the four European countries. This could indicate diverse socioeconomic development levels, healthcare access disparities, and other factors influencing child health within the Asian region. However, crucial caveats apply: First, this interpretation only applies to the specific four countries chosen, not necessarily broader Asian or European regions. Second, Mongolia's high rate significantly impacts the Asian SD, potentially exaggerating the variability. And third, analyzing individual country trends, data distribution, and potential factors within each region is essential for a more accurate picture.

- **Skewness of Child Mortality Rates:**
o **Formula:** A measure of the asymmetry of the distribution of child mortality rates.
o **Calculation**: Using the SKEW function in MS Excel by typing =SKEW(select the data range).

For Asia, type =SKEW(select data range of Asia) = 1.99

For Europe, type =SKEW(select data range of Europe) = 0.00

o   **Interpretation:** Positive skewness indicates a distribution where higher child mortality rates are less frequent, while negative skewness suggests higher rates are more common. Asia has a larger magnitude (absolute value further from 0) which indicates a stronger deviation from a symmetrical distribution whereas Europe has smaller magnitude (closer to 0) suggests a distribution closer to symmetry. Moreover, Asia has a positive skewness (>0) which indicates a "right-skewed" distribution with a longer tail on the right side. This means there are more values towards the lower end of the range and fewer extreme values on the higher end. (Negative skewness (<0) would indicate a "left-skewed" distribution with a longer tail on the left side. This means there are more values towards the higher end of the range and fewer extreme values on the lower end.) Whereas Europe has a skewness of 0 which indicates a perfectly symmetrical distribution with equal tails on both sides.

- **Percentiles of Child Mortality Rates:**
o   **Formula:** Identifying values below which a given percentage of countries fall.
o   **Calculation**: more data is needed to calculate the percentiles, however, calculating percentile in Excel can be done by using the PERCENTILE function (for continuous data):
  ▪   Enter your data in a single column.
  ▪   In another cell, type the formula =PERCENTILE(range, percentile), where:
  - range is the cell range containing your data.
  - percentile is the desired percentile value (e.g., 0.75 for the 75th percentile).
  ▪   Press Enter. The cell will display the calculated percentile value.
o   **Interpretation:** For example, the 25th percentile may represent the child mortality rate below which 25% of countries have rates.

- **Correlation between Child Mortality Rates and Healthcare Spending:**
o   **Formula:** Using a correlation coefficient to measure the strength and direction of the linear relationship between child mortality rates and healthcare spending across countries. Pearson correlation coefficient (r) measures the linear relationship between two continuous variables.

$r = \Sigma(x - \bar{x})(y - \bar{y}) / \sqrt{\Sigma(x - \bar{x})^2 \, \Sigma(y - \bar{y})^2}$

where:
  ▪   r: is the correlation coefficient (values range from -1 to 1)
  ▪ Σ: represents the summation operator
  ▪   x: is a value of the first variable
  ▪ $\bar{y}$: is the mean of the first variable
  ▪   y: is a value of the second variable
  ▪ $\bar{y}$: is the mean of the second variable

o   **Calculation:** Using the CORREL function in MS Excel
  ▪   Enter your data in two separate columns (e.g., columns A and B).
  ▪   In an empty cell, type the formula =CORREL(range1, range2), where:
  - range1 is the cell range containing the data for the first variable.
  - range2 is the cell range containing the data for the second variable.
  ▪   Press Enter. The cell will display the Pearson correlation coefficient between the two variables
o   **Interpretation:** If we collect two data sets which are the 'healthcare spending' and the 'child mortality rate' from different countries A positive correlation would suggest that higher healthcare spending is associated with lower child mortality rates, while a negative correlation would imply the opposite.

These descriptive statistics provide a snapshot of the distribution, central tendency, and variability of child mortality rates across different countries, offering insights into the health-related aspects of SDG 3. Researchers and policymakers can use these statistics to identify patterns, prioritize interventions, and monitor progress toward achieving the goal of ensuring healthy lives for all.

11.2 Correlation

Correlation is a statistical measure that quantifies the strength and direction of a linear relationship between two quantitative variables. The correlation coefficient, often denoted by "r," ranges from -1 to 1:

- **Positive Correlation (r > 0):** As one variable increases, the other tends to increase.
- **Negative Correlation (r < 0):** As one variable increases, the other tends to decrease.
- **No Correlation (r = 0):** There is no discernible linear relationship between the variables.

The correlation coefficient is a valuable tool for understanding the association between two variables, but it does not imply causation. Even if two variables are strongly correlated, it does not necessarily mean that one causes the other; other factors may be involved.

Examples Related to SDGs

Let's consider an example related to Sustainable Development Goals (SDGs):

Example: Correlation between Education and Economic Growth (SDG 4 and SDG 8):

Variables:

- o **Average Years of Education (in years)**
- o **Gross Domestic Product (GDP) per capita (in dollars)**

Hypothesis: There is a positive correlation between the average years of education in a country and its GDP per capita.

Data Analysis: After collecting data from various countries, the correlation coefficient (r) is calculated.

- If $r>0$: It suggests a positive correlation, indicating that as the average years of education increase, the GDP per capita tends to increase.
- If $r<0$: It suggests a negative correlation, indicating that as the average years of education increase, the GDP per capita tends to decrease.
- If $r≈0$: It suggests no significant correlation between average years of education and GDP per capita.

Interpretation: A positive correlation would imply that investing in education is associated with higher economic growth, aligning with SDG 4 (Quality Education) and SDG 8 (Decent Work and Economic Growth). Policymakers can use this information to prioritize educational initiatives that contribute to economic development.

It's important to note that correlation does not imply causation. While a correlation may suggest a relationship, further research is needed to understand the underlying mechanisms and potential causal factors.

11.3 Multiple regression

Multiple regression analysis is a statistical method used to examine the relationship between a dependent variable and two or more independent variables. It extends the simple linear regression model, which involves predicting a dependent variable based on a single independent variable, to a more complex scenario with multiple predictors.

In the context of multiple regression:

- **Dependent Variable (Y):** The variable we want to predict or explain.
- **Independent Variables (X_1, X_2, ..., X_k):** The variables used to predict the dependent variable. There can be multiple independent variables.

The multiple regression equation takes the form:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k + \varepsilon$

where:

- Y is the dependent variable,
- X_1, X_2, ..., X_k are the independent variables,
- β_0 is the intercept (the value of Y when all X's are zero),
- β_1, β_2, ..., β_k are the regression coefficients (indicating the change in Y for a one-unit change in the corresponding X),
- ε is the error term (captures unobserved factors affecting Y).

Key Concepts in multiple regression:

- **Coefficient Interpretation:**

The coefficients (β_1, β_2, ..., β_k) represent the estimated change in the dependent variable for a one-unit change in the corresponding independent variable, holding other variables constant.

- **Multiple R-squared (R^2):**

The multiple R-squared value indicates the proportion of variance in the dependent variable that is explained by the independent variables. It ranges from 0 to 1, with higher values indicating a better fit of the model to the data.

- **Adjusted R-squared:**

Adjusted R-squared considers the number of independent variables in the model, providing a more accurate measure of model fit when comparing models with different numbers of predictors.

- **Assumptions:**

Multiple regression assumes linearity, independence of errors, homoscedasticity (constant variance of errors), and normality of errors.

Example Related to SDGs:

Let's consider an example of applying multiple regression related to Sustainable Development Goals (SDGs):

Example: Multiple Regression Analysis on Factors Influencing Clean Water Access (SDG 6):

Independent Variables:

- Percentage of Urban Population
- Investment in Water Infrastructure (in dollars)
- Education Level (average years of education)

Dependent Variable:

- Percentage of Population with Access to Clean Water

Hypothesis:

There is a multiple linear relationship between the percentage of the urban population, investment in water infrastructure, education level, and the percentage of the population with access to clean water.

Data Analysis:

Collect data from various countries and conduct a multiple regression analysis to estimate the coefficients for each independent variable and assess the overall model fit.

Clean Water Access = β_0 + β_1 (Urban Population) + β_2 (Water Infrastructure) + β_3 (Education Level) + ε

Interpretation:

β_1, β_2, β_3: Interpret the coefficients to understand the impact of each independent variable on the percentage of the population with access to clean water.

Multiple R-squared: Assess the overall fit of the model.

This analysis can help policymakers identify factors that significantly contribute to clean water access, informing targeted interventions aligned with SDG 6.

Let's consider another example of multiple regression analysis related to SDG 8, which aims to "Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all."

Example: Multiple Regression Analysis on Factors Influencing Unemployment Rates (SDG 8)

Independent Variables:

- Gross Domestic Product (GDP) Growth Rate
- Education Attainment Index
- Government Spending on Employment Programs (in dollars)

Dependent Variable:

- Unemployment Rate

Hypothesis:

There is a multiple linear relationship between the GDP growth rate, education attainment index, government spending on employment programs, and the unemployment rate.

Data Analysis:

Collect data from various countries and conduct a multiple regression analysis to estimate the coefficients for each independent variable and assess the overall model fit.

Unemployment Rate = $\beta_0 + \beta_1$ (GDP Growth Rate) + β_2 (Education Attainment) + β_3 (Government Spending) + ε

Interpretation:

$\beta_1, \beta_2, \beta_3$: Interpret the coefficients to understand the impact of each independent variable on the unemployment rate.

Multiple R-squared: Assess the overall fit of the model.

Potential Interpretations:

- A positive coefficient for GDP growth rate may indicate that higher economic growth is associated with lower unemployment rates.
- A negative coefficient for education attainment may suggest that higher levels of education are associated with lower unemployment rates.
- A negative coefficient for government spending on employment programs may imply that increased investment in such programs is associated with lower unemployment rates.

This analysis can provide insights for policymakers working towards the goals of SDG 8, helping them understand the factors influencing unemployment rates and guiding the development of strategies to promote sustained and inclusive economic growth and decent work for all.

A real-world example of simple linear regression.

SDG Goal: SDG 4 - Quality Education

Problem: We want to assess the relationship between access to clean water (measured by percentage of households with access to clean water) and student attendance rates in primary schools in a developing country.

Rational: There are several compelling reasons why we might want to assess the relationship between access to clean water and student attendance rates in primary schools in developing countries:

Potential benefits for student attendance:

- Reduced waterborne illnesses: Lack of access to clean water can lead to various waterborne diseases like diarrhea, which can cause students to miss school due to illness or recovery time. Improved access to clean water can reduce the occurrence of these illnesses, potentially leading to higher attendance rates.

- Improved hygiene practices: Having clean water readily available at school allows students to practice better hygiene, contributing to a healthier and cleaner learning environment. This can indirectly improve attendance by reducing the spread of illnesses within the school community.

- Reduced time spent collecting water: In many developing countries, children, especially girls, are responsible for fetching water for their families. This can take up a significant amount of time that could be spent on attending school, contributing to lower attendance rates. Improved access to clean water closer to home can free up students' time for education.

- Increased focus and cognitive ability: Dehydration can negatively impact children's cognitive function and focus. Having access to clean water at school can ensure proper hydration, potentially leading to improved concentration and learning ability, which could indirectly improve attendance by motivating students and making school more engaging.

Additional justifications:

- Understanding the impact of development interventions: Analyzing this relationship can help evaluate the effectiveness of programs aimed at improving access to clean water on educational outcomes, providing valuable insights for policymakers and development agencies.

- Prioritizing resource allocation: Identifying the link between water access and attendance can help policymakers prioritize scarce resources towards interventions that offer the most significant impact on education in underprivileged areas.

- Raising awareness and advocacy: Highlighting the link between water and education can raise awareness about the importance of clean water access for children's development and well-being, potentially leading to increased advocacy and funding for clean water initiatives.

It's important to note that this is a complex relationship, and other factors like poverty, cultural norms, and school infrastructure can also influence attendance rates. However, studying this connection can provide valuable insights for improving both water access and educational outcomes in developing countries.

Variables:

- Independent variable (X): Percentage of households with access to clean water in a village.

- Dependent variable (Y): Average student attendance rate in the primary school of the same village.

Model: We can use a simple linear regression model of the form:

$Y = a + b * X + \varepsilon$

where:

- Y: Average student attendance rate
- X: Percentage of households with access to clean water
- a: Intercept (expected attendance rate when water access is 0%)
- b: Slope (change in attendance rate for a 1% increase in water access)
- ε: Error term (accounts for other factors influencing attendance)

Analysis:

1. Collect data: Gather data on both variables for a representative sample of villages in the country. Collect data from the following sources:

   a. Access to drinking water - UNICEF DATA: https://data.unicef.org/topic/water-and-sanitation/drinking-water/

   b. School enrollment, primary (% net) - Least developed countries: UN classification | Data (worldbank.org): https://data.worldbank.org/indicator/SE.PRM.NENR?locations=XL

2. Perform regression analysis: Use statistical software (e.g., Excel, R) to estimate the values of a and b in the model.

3. Interpret results:

o   The intercept (a) indicates the expected average attendance rate if there were no households with access to clean water.

o   The slope (b) indicates the average increase in attendance rate for each 1% increase in the percentage of households with access to clean water.

o   A positive and statistically significant slope (b) suggests a positive relationship between water access and attendance.

Implications:

●   If the analysis shows a positive relationship, improving access to clean water could be a strategy to increase student attendance, contributing to SDG 4.

●   Further investigation can explore the mechanisms behind this relationship (e.g., improved health, reduced absenteeism due to water-related illnesses).

Limitations:

●   This is a simplified example, and other factors besides water access likely influence student attendance.

●   The model assumes a linear relationship, which may not be perfectly accurate in reality.

●   Ecological fallacy: conclusions about individual students cannot be drawn from village-level data.

Conclusion:

Simple linear regression can be a useful tool to explore relationships between variables related to SDGs. However, it is crucial to interpret results cautiously and consider limitations to avoid drawing misleading conclusions.

11.4 Hypothesis testing

Hypothesis testing is a statistical method used to make inferences about population parameters based on a sample of data. It involves formulating a hypothesis about the population, collecting data, and using statistical methods to determine whether there is enough evidence to reject the null hypothesis in favor of an alternative hypothesis. The key components of hypothesis testing include:

●   **Null Hypothesis ($H0$):** A statement that there is no significant effect, no difference, or no relationship in the population. It is typically a statement of equality or no change.

●   **Alternative Hypothesis ($H1$ or Ha):** A statement that contradicts the null hypothesis and suggests the presence of a significant effect, difference, or relationship in the population.

●   **Significance Level (α):** The predetermined level of significance (commonly set at 0.05) that represents the probability of rejecting the null hypothesis when it is true.

●   **Test Statistic:** A calculated statistic from the sample data that is used to determine whether to reject the null hypothesis.

●   **P-value:** The probability of obtaining a test statistic as extreme as, or more extreme than, the one observed, assuming the null hypothesis is true. A smaller p-value suggests stronger evidence against the null hypothesis.

●   **Decision Rule:** Compare the p-value to the significance level. If the p-value is less than or equal to the significance level, reject the null hypothesis. If the p-value is greater than the significance level, do not reject the null hypothesis.

Examples Related to SDGs:

Example 1: Hypothesis Testing for Clean Water Access (SDG 6)

Null Hypothesis ($H0$): There is no significant difference in the percentage of the population with access to clean water between urban and rural areas.

Alternative Hypothesis (*H*1): There is a significant difference in the percentage of the population with access to clean water between urban and rural areas.

Data Analysis:

- Collect data on clean water access in urban and rural areas.
- Use a t-test or analysis of variance (ANOVA) to compare the means of the two groups.
- Calculate the p-value.

Decision Rule:

- If p-value ≤ 0.05, reject the null hypothesis.
- If p-value > 0.05, do not reject the null hypothesis.

Example 2: Hypothesis Testing for Economic Growth and Employment (SDG 8)

Null Hypothesis (*H*0): There is no significant correlation between the GDP growth rate and the employment rate.

Alternative Hypothesis (*H*1): There is a significant correlation between the GDP growth rate and the employment rate.

Data Analysis:

- Collect data on GDP growth rates and employment rates.
- Use correlation analysis to examine the relationship.
- Calculate the p-value.

Decision Rule:

- If p-value ≤ 0.05, reject the null hypothesis.
- If p-value > 0.05, do not reject the null hypothesis.

Summary

Quantitative data analysis is a powerful tool for understanding and addressing the complex challenges of sustainable development. By using statistical methods to analyze large datasets, researchers can identify patterns, trends, and relationships that can inform policy decisions, promote innovation, and improve the lives of people around the world.

Key elements of quantitative data analysis in sustainable development research include:

- Data collection: Gathering data from a variety of sources, including surveys, experiments, and administrative records.
- Data preparation: Cleaning and organizing data to ensure its accuracy and consistency.
- Exploratory data analysis: Summarizing and visualizing data to identify patterns, trends, and anomalies.
- Statistical modeling: Using statistical methods to test hypotheses, make predictions, and draw inferences from data.
- Interpretation and communication: Presenting findings in a clear, concise, and understandable way to inform decision-making.

Quantitative data analysis has been used to address a wide range of sustainable development issues, including:

- Climate change: Analyzing climate models, predicting impacts, and evaluating mitigation and adaptation strategies.
- Energy: Assessing energy consumption, exploring renewable energy sources, and evaluating energy efficiency policies.
- Water: Monitoring water resources, assessing water quality, and developing sustainable water management strategies.
- Agriculture: Optimizing agricultural practices, improving food security, and reducing environmental impacts of agriculture.

- Poverty: Identifying causes and consequences of poverty, evaluating poverty reduction programs, and measuring progress towards poverty eradication.

Quantitative data analysis is an essential tool for sustainable development research, providing valuable insights into the complex challenges and opportunities that lie ahead in the quest for a sustainable future. By harnessing the power of data and statistics, researchers can contribute to evidence-based decision-making, promote innovation, and improve the well-being of people around the world.

Discussion Questions

1. What are the key challenges of quantitative data analysis in sustainable development research?
2. How can researchers ensure that their quantitative data analyses are rigorous, transparent, and replicable?
3. What are the ethical considerations involved in quantitative data analysis for sustainable development research?
4. How can researchers effectively communicate their quantitative data analysis findings to policymakers, practitioners, and the public?
5. What are the most promising emerging quantitative data analysis methods for sustainable development research?
6. How can quantitative data analysis be used to inform and evaluate sustainable development policies and interventions?
7. How can quantitative data analysis be used to track progress towards sustainable development goals at the local, national, and global levels?
8. What are the limitations of quantitative data analysis in addressing the complex challenges of sustainable development?
9. How can quantitative data analysis be used to bridge the gap between science and practice in sustainable development?
10. What level of measurement is appropriate for each of the following variables?
a. Goal 1: No Poverty - Percentage of population living below the national poverty line
b. Goal 2: Zero Hunger - Prevalence of undernourishment (percentage of population)
c. Goal 3: Good Health and Well-being - Life expectancy at birth
d. Goal 4: Quality Education - Completion rate of primary school
11. Identify measurement for the remaining goals and classify the measurement type.
12. Provide an example of performing the hypothesis testing related to SDGs.

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CHAPTER 12: QUALITATIVE DATA ANALYSIS

In this chapter, we will touch on several key concepts in qualitative data analysis, which revolve around understanding the complexity and nuances of data beyond numerical measures. This approach focuses on thematic exploration, the significance of context, and the interpretative nature of data, emphasizing depth over breadth. It leverages a set of methods like thematic analysis, content analysis, and the Gioia Method to extract patterns and meanings within textual, observational, or symbolic data. The process is iterative, requiring meticulous coding, categorization, and synthesis to draw insightful conclusions that reflect the multifaceted dimensions of the studied phenomena.

12.1 Forms of Qualitative Data

Making sense of qualitative data begins with a deep appreciation of its multifaceted nature. Unlike quantitative data, which is often numeric and structured, qualitative data encompasses a rich collection of audio recording, video footage, images, archival materials, textual extracts, and various reports. Each of these sources brings with it a unique narrative and contextual depth that cannot be captured through numbers alone.

This diversity of data types in qualitative research is not merely a collection of words, images, or sounds but a mosaic of human experiences, perceptions, and realities. Audio recordings and video footage, for instance, provide the content of what is said or shown and the nuances of tone, emotion, and environment. Textual extracts and archives offer historical depth and cultural context, revealing layers of meaning that extend beyond the surface. Images, whether photographs or illustrations, capture moments and perspectives that are often left unspoken. Reports and other documents provide structured insights into specific issues or events, contributing to a broader understanding of the subject matter.

In organizing these varied forms of data, the qualitative researcher engages in the art of assembly, where the goal is not to force uniformity but to embrace the inherent diversity and richness. This process is foundational for the subsequent task of analysis and interpretation, where the aim is to weave these disparate threads into a coherent narrative that illuminates the research question. Analyzing qualitative data, therefore, requires an approach that is as flexible and dynamic as the data itself. It demands a sensitivity to the subtleties of human expression and an openness to the layers of meaning that unfold within the data. This is the art and science of qualitative research, where the researcher becomes both a storyteller and a scholar, piecing together the human experience in a way that is both informative and reflective.

In the field of qualitative research, data presents itself in various forms, each with its unique insights and challenges. To collect, organize, and analyze data effectively, it is essential to comprehend these forms. Let's explore some of the crucial types of qualitative data:

1. **Interviews and Focus Groups.** These are fundamental tools in qualitative research. Interviews, whether structured, semi-structured, or unstructured, provide in-depth insights into individuals' perspectives, experiences, and motivations. Focus groups, on the other hand, leverage group dynamics to explore collective views and how individuals interact with and influence each other's opinions.

2. **Observations and Field Notes.** Observational data, often recorded as field notes, are invaluable for understanding behaviors, interactions, and environments in their natural settings. This can range from participant observation, where the researcher is actively engaged, to non-participant observation, where they are a detached observer.

3. **Textual and Document Analysis.** This encompasses a broad range of written materials such as books, articles, letters, emails, social media posts, and organizational documents. Analyzing

these texts involves interpreting the language, content, and context, providing insights into cultural, historical, or institutional narratives.

4. **Visual Data.** Photographs, videos, and other visual media are powerful forms of qualitative data. They capture non-verbal cues, settings, and events in ways that text cannot, offering a rich source for analysis of social dynamics, cultural practices, and individual expressions.

5. **Audio Recordings.** Beyond their use in capturing interviews and focus groups, audio recordings can be used to document environments, such as natural sounds or community interactions, providing an auditory dimension to the data.

6. **Artifacts and Physical Objects.** Objects related to the study topic, such as tools, artworks, clothing, or architecture, can be sources of qualitative data. They offer insights into cultural practices, historical contexts, and personal narratives.

7. **Diaries and Personal Reflections.** Personal diaries, journals, or reflective notes provide a window into individuals' inner thoughts, feelings, and reflections over time, offering a deeply personal perspective.

8. **Digital Data.** With the advent of digital technologies, qualitative data now includes digital footprints such as website interactions, digital communications, and online community engagements, which provide insights into modern behaviors and social trends.

Different types of qualitative data require specific methods for collection and analysis that are customized to their unique characteristics. The strength of qualitative research lies in its capacity to blend these distinct types of data, creglasating a comprehensive understanding of the research subject.

12.2 Qualitative vs. Quantitative Analysis

Before we go deeper into qualitative data analysis, it becomes necessary to understand how it fundamentally differs from its quantitative counterpart. These differences are not merely in the types of data each handles but extend to the core of their respective methodologies, philosophies, and analytical approaches. To elucidate these distinctions, it is helpful to juxtapose qualitative and quantitative methods side by side. Such a comparison not only highlights the unique characteristics of each approach but also sheds light on how these inherent differences influence the respective data analysis methods. Table 10.1 below presents a concise comparison, clarifying why and how qualitative data analysis demands a distinct approach compared to quantitative data. This understanding is crucial for researchers to effectively navigate and leverage the strengths of each method in their scholarly work.

Table 12.1 Contrasts between Qualitative and Quantitative Methods

Aspect	Qualitative Methods	Quantitative Methods	Impact on Data Analysis
Nature of Data	Descriptive, narrative, non-numerical.	Numeric, structured, often based on closed-ended questions.	Qualitative analysis involves interpreting themes, narratives, and meanings, while quantitative analysis involves statistical operations and numerical comparisons.
Approach to Inquiry	Inductive, building theories from data.	Deductive, testing predefined hypotheses.	Qualitative analysis is exploratory, often evolving during the research, whereas quantitative analysis is confirmatory, following a predefined plan.

Aspect	Qualitative Methods	Quantitative Methods	Impact on Data Analysis
Role of Researcher	Integral, subjective, often part of the research context.	Detached, objective, external to the data.	Qualitative analysis is influenced by the researcher's interpretations and context, while quantitative analysis aims for objectivity and reproducibility.
Data Analysis Techniques	Thematic analysis, content analysis, narrative analysis.	Statistical analysis, mathematical models, hypothesis testing.	Qualitative data is analyzed for patterns in themes and narratives, while quantitative data is analyzed for statistical patterns and relationships.
Outcomes and Generalization	Rich, context-specific insights, less generalizable.	Broad, generalizable findings, applicable to larger populations.	Qualitative analysis produces detailed, contextual findings, while quantitative analysis aims for generalizable results that can be extrapolated.
Objective vs. Subjective	Embraces subjectivity to gain deeper insights.	Strives for objectivity and minimizes researcher bias.	Qualitative analysis is inherently interpretive, reflecting the researcher's perspective, whereas quantitative analysis seeks to minimize interpretation in favor of statistical evidence.
Measurement Focus	Understanding the essence and complexity of the subject.	Measuring and quantifying aspects of the subject.	Qualitative analysis focuses on understanding the quality and depth of data, while quantitative analysis focuses on measuring and counting aspects of the data.

Source: Author's own reflection based on various sources.

12.3 Analyzing Qualitative Data

Get Your Qualitative Data Ready

As we move towards the critical phase of analyzing qualitative data, it is important to acknowledge the foundational step of preparing the data for this process. Getting your qualitative data ready is much more than just a preliminary task; it is a crucial stage that sets the tone for the entire analysis. This preparation involves organizing, thoroughly familiarizing, and carefully considering ethical standards. By doing so, we ensure that the data is not only accessible and comprehensible but also handled with the utmost integrity. Properly prepared data allows researchers to engage deeply with the material, facilitates the identification of meaningful patterns and themes, and ensures that the analysis is grounded in the authentic realities captured during data collection. The following steps outline how qualitative data can be effectively prepared, organized, and refined, providing a solid foundation for a rigorous and insightful analysis. This groundwork is essential for uncovering the rich, nuanced insights that qualitative research aims to deliver.

Organizing the data. The initial and critical step in analyzing qualitative data is its organization, a process that shapes the entire course of analysis. Chaotic as it may seem in the beginning, this stage involves more than just arranging the data; it requires a systematic approach to ensure that every piece of collected information is easily accessible and meaningfully categorized. This includes precisely

transcribing interviews, organizing field notes chronologically or thematically, and labeling audio and video recordings for easy retrieval. Photographs, documents, and digital communications must also be sorted and clearly labeled, often in alignment with the research questions and objectives. Such organization is vital in managing the often voluminous and diverse data. Proper organization of the data is akin to laying out all the pieces of a puzzle before assembly; it allows the researcher to see the complete picture and approach the analysis with clarity and purpose.

Data cleaning and verification. Following the organization of qualitative data, the next pivotal step is data cleaning and verification, a process that underpins the integrity and reliability of the analysis. This phase is centered around carefully reviewing the data to ensure its accuracy. For instance, when dealing with transcribed interviews, it is imperative to cross-check the transcripts against the original audio or video recordings. This verification ensures that the nuances of verbal communication, such as tone, emphasis, and pauses, which can be crucial for interpretation, are accurately captured. Similarly, field notes must be scrutinized for clarity and completeness, confirming that they provide a detailed and faithful account of the observations made. This review process also extends to other collected materials, such as documents, photographs, or digital data, where the focus is on ensuring that no crucial information has been omitted or misrepresented. The goal of this verification is not just to check for errors or gaps but to ensure that the data, in its entirety, is an accurate and comprehensive reflection of the phenomena under study.

Data familiarization. After the essential steps of organizing and verifying the qualitative data, researchers move on to the phase of data familiarization. This stage is integral to the analytical process as it involves a deep immersion into the data through multiple readings or viewings, allowing researchers to absorb the nuances, tone, and subtleties embedded within. It is a process of intimately acquainting oneself with the content, where researchers sift through interviews, field notes, visual data, and other materials to grasp the depth and breadth of the information collected. This comprehensive engagement aids in identifying initial themes, patterns, and standout features that begin to sketch the contours of the analysis. During this rich exploration, preliminary themes and concepts emerge, laying the groundwork for the next critical step: developing a coding scheme.

Developing a coding scheme. The development of a coding scheme is a crucial yet intricate task that directly influences the depth and clarity of the analysis. This process, emerging from a thorough familiarization with the data, involves identifying and categorizing patterns, themes, and concepts intrinsic to the data. As described by Saldaña (2015), coding is both an analytical and creative exercise, where researchers distill complex data into manageable codes that capture the essence of the information. These codes, which are constantly refined and revisited throughout the analysis, act as pivotal tools in dissecting the data and uncovering underlying narratives (Braun & Clarke, 2006). The iterative nature of coding, as emphasized by Gioia et al. (2013), allows for the organic development of themes, ensuring the analysis remains flexible and responsive to the evolving understanding of the data. This process not only structures the vast array of qualitative data but also aids in maintaining coherence with the broader research objectives, ultimately leading to a richer, more nuanced comprehension of the study's subject matter.

Choose Your Tools for Data Management

The selection of tools for data management and analysis is critical in qualitative research, with options ranging from basic manual methods to advanced software solutions. For smaller-scale projects or preliminary stages of data organization, researchers might find familiar tools like Microsoft Excel sufficient. Excel can be used for basic coding, sorting, and categorizing data, offering a simple and accessible platform for researchers who are just beginning to structure their data.

However, as the volume and complexity of qualitative data increase, the limitations of simpler tools like Excel become apparent. Larger datasets, especially those that include a variety of data types such as text, audio, video, and images, often require more sophisticated and specialized software for effective management and analysis. This is where advanced qualitative data analysis software like

NVivo, ATLAS.ti, and MaxQDA become invaluable. These tools are specifically designed to handle the intricacies of qualitative data, providing robust functionalities for coding, thematic analysis, and theory building.

MaxQDA, for example, stands out for its user-friendly interface and comprehensive capabilities in managing diverse data types, from textual to multimedia. It supports researchers in efficiently organizing, coding, and analyzing large volumes of data, facilitating the development of in-depth insights and themes. With features such as text searching, thematic coding, and visual data representation, MaxQDA enhances the analytical depth and facilitates a more nuanced understanding of the data. NVivo and ATLAS.ti perform more or less similarly, depending on the researcher's preference.

The decision between simpler tools like Excel and more advanced software should be based on the nature of the data, the scale of the project, and the researcher's familiarity with the tool. While Excel might be adequate for initial stages or smaller projects, larger and more complex studies will benefit from the advanced features offered by specialized qualitative data analysis software. The chosen method or software must not only streamline the analytical process but also align with the research objectives and the methodological approach of the researcher, ensuring a rigorous and comprehensive analysis.

Setting Up a Framework for Analysis

In the final preparatory stage of qualitative data analysis, establishing a structured framework for analysis is essential. This framework guides the analytical process, ensuring that it remains focused, systematic, and aligned with the study's theoretical and methodological underpinnings. The selection of an appropriate analytical framework depends on several factors, including the nature of the data, the research questions, and the theoretical orientation of the study.

Popular frameworks include thematic analysis, a widely used method for identifying, analyzing, and reporting patterns (themes) within data, as outlined by Braun & Clarke (2006). Thematic analysis is valued for its flexibility and applicability across various qualitative methodologies. Content analysis, on the other hand, as described by Krippendorff (2018), is a systematic approach used to quantify and analyze the presence, meanings, and relationships of certain words, themes, or concepts within qualitative data. Grounded theory methodology, developed by Glaser and Strauss (1967), is another pivotal framework that involves developing a theory through systematic data gathering and analysis, particularly suited for exploratory research. Narrative analysis, as proposed by Riessman (2008), focuses on how people make and use stories to interpret the world, making it particularly useful for studies that aim to understand personal experiences and storytelling.

The choice of a particular framework or a combination of methods should be carefully considered, as it deeply impacts how data is interpreted and the conclusions drawn. This structured approach provides a clear path for analysis and ensures that the process is replicable and that the findings are credible. In qualitative research, where the data is often complex and multi-layered, a well-defined analytical framework is indispensable for carving out meaningful and coherent insights from the rich tapestry of qualitative data. In the following section, we outline three approaches for qualitative data analysis among the extant frameworks: the Gioa Method, thematic analysis, and content analysis.

The Gioia Method

One of the prominent methodologies in qualitative data analysis is the Gioia Method (Gioia et al., 2013), named after its developer, Dennis Gioia. This method has gained recognition for its systematic approach to qualitative analysis, particularly in organizational and management research. The Gioia Methodology is distinguished by its structured approach to data analysis, which facilitates the development of grounded theory and the creation of data structure diagrams. This method involves three key stages: First-Order Analysis, Second-Order Analysis, and Theoretical Aggregation.

First-Order Analysis: This stage focuses on the categorization of data based on the terms and descriptions used by the participants themselves. Here, the researcher remains close to the data, using the participants' own language to label categories. This step is crucial for preserving the authenticity of the participants' perspectives and ensuring that their voices are accurately represented.

Second-Order Analysis: In this phase, the researcher begins to interpret and reframe the first-order categories into more abstract, researcher-driven themes. This process of abstraction involves moving away from the participants' verbatim descriptions to more theoretical constructs. It's a critical step in bridging the gap between raw data and theoretical understanding.

Theoretical Aggregation: The final stage involves further abstraction, where the second-order themes are synthesized into broader theoretical dimensions. This level of analysis aids in developing a grounded theory that explains the phenomena under study. The output is often a visual data structure that clearly illustrates the relationship between the data (first-order categories), the emergent themes (second-order), and the overarching theoretical dimensions.

The Gioia Method is particularly effective in studies where developing a deep, theory-driven understanding of complex phenomena is the goal. It is widely used in management and organizational studies, where researchers seek to uncover underlying mechanisms and theoretical implications from qualitative data. The method's strength lies in its systematic approach to data organization and analysis, making it possible to derive meaningful, theory-based insights from extensive qualitative datasets.

Thematic Analysis

Thematic Analysis is a widely used method in qualitative research for identifying, analyzing, and reporting patterns (themes) within data. It is versatile and can be applied across various research fields and data types. Thematic analysis also involves a process of coding the data and identifying themes or patterns that emerge from these codes. This method is not tied to any specific theoretical framework, making it adaptable to various research paradigms. Below are the stages researchers may follow when adopting a thematic analysis.

1. **Familiarization with the Data.** This initial stage involves immersion in the data through repeated reading, listening, or viewing, allowing researchers to identify potential patterns and ideas.

2. **Generating Initial Codes.** Researchers systematically code the data, segmenting it into meaningful units that represent specific aspects of the data relevant to the research question.

3. **Searching for Themes.** Codes are then grouped into potential themes. This involves analyzing the codes and considering how they combine to form overarching themes that capture the essence of the data.

4. **Reviewing Themes.** Identified themes are reviewed and refined, ensuring they accurately represent the data and are coherent and distinct from one another.

5. **Defining and Naming Themes.** Each theme is clearly defined and named. This step involves a detailed analysis of each theme and determining what aspect of the data each theme captures.

6. **Producing the Report.** The final stage involves weaving the analytic narrative around the themes, contextualizing them in relation to the research question, and supporting them with relevant data extracts.

Thematic analysis is useful for researchers seeking to explore the perspectives and experiences of their participants. It is applicable in studies where the goal is to provide a rich, detailed, yet complex account of data. Due to its flexibility, it is suitable for both small-scale studies and larger research projects.

Content Analysis

Content Analysis is a systematic and objective means of describing and quantifying phenomena in qualitative data. It is especially prevalent in the analysis of textual material, ranging from interview transcripts to media content. Content Analysis involves the systematic coding and categorizing of text

to identify patterns, themes, and meanings. It can be both qualitative and quantitative, depending on whether the focus is on the interpretation of content or the quantification of specific elements.

1. **Preparation.** The first step is to define the material to be analyzed and the context of the study. This includes selecting a sample of text or media content relevant to the research question.

2. **Defining Units of Analysis.** Researchers decide on the units of analysis, which could be words, phrases, sentences, or themes. This decision is crucial as it determines how the content will be broken down and analyzed.

3. **Developing Categories and Coding Scheme.** Based on the research question and theoretical framework, categories are developed to code the data. This involves creating a systematic coding scheme that can be applied to all data uniformly.

4. **Coding the Data.** The selected material is then coded according to the predefined categories. This process can be manual or automated, depending on the volume of data and available resources.

5. **Analyzing the Data.** The coded data is analyzed to identify patterns, frequencies, and relationships between categories. This can involve statistical analysis in quantitative content analysis or a more interpretative approach in qualitative content analysis.

6. **Interpreting the Results.** The final step is to interpret the results in the context of the research question, drawing conclusions about the patterns and themes identified in the data.

Content Analysis is versatile and can be used in various research fields, including media studies, sociology, psychology, marketing, and sustainability. It is particularly useful for studies aiming to quantify the prevalence of certain themes or concepts within a body of text or to compare patterns across different types of content.

The Role of Context in Interpretation and Analysis

Understanding the role of context in qualitative research is essential, as it shapes and enriches every aspect of data collection, interpretation, and analysis. Context is not merely the backdrop or setting in which data is gathered; it is a complex amalgamation of cultural, social, historical, and situational factors that are inextricably linked to the phenomena under study. Clifford Geertz's (1973) seminal work, "The Interpretation of Cultures," highlights that context is an integral part of the phenomena being researched. It provides vital cues and insights that are essential for a deep and nuanced understanding of the data, allowing researchers to uncover the layers of meaning embedded within.

Jacques Derrida's deconstructionist approach further accentuates the significance of context in understanding text, or in this case, qualitative data. Derrida (1978) argued that the meaning of a text (or data) is not fixed and can only be fully understood by considering the various contexts in which it is situated. He posited that every text is a product of numerous and diverse contexts, and its interpretation is continually evolving. This perspective underscores the fluidity of meaning and the importance of considering multiple viewpoints and contexts in qualitative research.

Qualitative data interpretation is greatly improved by having a thorough understanding of the context in which the data exists. As Emmel (2013) emphasizes, being cognizant of the specific conditions and environments of data collection ensures that the data is not only relevant but also rich in its contextual representation. This context is not a static background element but a dynamic and multifaceted aspect of the research that actively shapes the meaning and implications of the data. Interpreting qualitative data is like constructing a complex tapestry, where each thread represents a unique aspect of the context. In this light, Patton (2015) emphasizes that context helps researchers comprehend the subtleties and implicit meanings in the data, which might be overlooked if the data is considered in isolation. Interpretation process is constantly evolving, recognizing that contexts are not static but fluid and overlapping, which shapes the phenomena being investigated.

The cultural and social contexts in which data is embedded are particularly influential. As researchers delve into the narratives and experiences shared by participants, they navigate through a

complex interplay of cultural norms, social dynamics, and linguistic nuances. This intricate web of cultural and social factors is eloquently discussed in Geertz (1973), where he argues that understanding these contexts is crucial for decoding the symbols and meanings within a society. In qualitative research, this means interpreting data not in isolation but as a reflection of the larger cultural and social tapestry it is part of.

Similarly, the historical context provides a lens through which current data can be viewed. The work of historians and social researchers often underscores how past events and historical narratives shape present realities. Understanding the history of a community or social group, as emphasized by historians like Vansina (1985), can offer profound insights into current phenomena, revealing patterns and themes that might otherwise be overlooked.

The situational and temporal contexts also play a crucial role. The specific circumstances of data collection—such as the location, time, and current events—can influence both what is shared by participants and how it is interpreted. For instance, an interview conducted in a participant's home may yield different insights than one conducted in a more formal setting. Likewise, the temporal context, as discussed in Adam (2005), can have a profound influence on data. Changes over time in societal norms or in the life of a community can alter the way data is interpreted, making the consideration of temporal shifts essential for accurate analysis.

Finally, the interpersonal dynamics between the researcher and participant must be considered. The relationship established, the level of trust, and the rapport built all contribute to the depth and honesty of the data collected. As Morrow (2005) suggested, the researcher-participant interaction is a critical context that shapes the data-gathering process and, subsequently, its interpretation.

In qualitative research, the application of context is not just an additional layer of analysis; it is central to the interpretive process. It demands sensitivity, awareness, and a deep understanding of the multifaceted environments in which data exists. By weaving together these diverse contextual threads, researchers can uncover richer, more nuanced insights and provide a more comprehensive and authentic representation of the phenomena under study.

12.4 Practicing Qualitative Data Analysis: An Example

To provide a practical example of how qualitative data analysis is conducted, we have developed a hypothetical research project below. Please note that this illustration is not comprehensive and may appear overly simplified, but it is intended to give you an understanding of the analysis process. As a note, we also leave out a theoretical lens in this example in order to keep it short and simple.

Case Study: Sustainable Business Practices on SMEs

1. Research Project Overview

The hypothetical research project focuses on sustainability management in the business sector. It aims to explore how small to medium-sized enterprises (SMEs) integrate sustainable practices into their operations.

Research Questions

1.   How do SMEs perceive and implement sustainable business practices?
2.   What challenges do SMEs face in adopting sustainable practices?
3.   How do sustainable practices impact the overall business performance of SMEs?

Research Objectives

1.   To identify the common sustainable practices among SMEs in a specific industry.
2.   To understand the perceptions of SME owners/managers regarding sustainability.
3.   To analyze the challenges and benefits associated with the adoption of sustainable practices.

4.   To provide insights into how sustainability can be effectively integrated into SME business strategies.

2. Data Collection

Methods Employed

- Semi-Structured Interviews: Conducted with SME owners and managers in various industries to understand their perspectives on sustainability practices.
- Observations: Visits to selected SMEs to observe the implementation of sustainable practices in their operations.
- Document Analysis: Review of company documents such as sustainability reports, internal policies, and strategy documents to gauge the formal commitment to sustainability.

Participant Selection

- A diverse sample of SMEs across different industries, including manufacturing, retail, and service sectors.
- Criteria for selection include company size, geographical location, and known engagement in sustainability initiatives.

Data Collection Tools

- Digital voice recorders for interviews.
- Structured observation checklists to document on-site practices.
- Access to relevant company documents, either physical or digital.

3. Data Organization

Transcription of Interviews

- All interviews are transcribed verbatim.
- Transcripts are checked against recordings for accuracy.
- Non-verbal cues like pauses and emphasis are noted for deeper contextual analysis.

Categorization and Sorting

- Field notes from observations are organized according to different sustainability practices observed.
- Company documents are sorted by type (e.g., sustainability reports, policies) and relevance to research questions.

Digital Data Management

- Use of qualitative data analysis software (like NVivo) to store and manage transcripts, field notes, and documents.
- Data is labeled and organized into folders for each SME, ensuring easy retrieval during analysis.

4. Coding and Analysis

Quotes and Corresponding Codes

Quote from Interview:

- "We try to minimize waste in our production process as much as possible. It's not just about cost savings; it's about our responsibility to the environment."
  o   Code: Waste Minimization; Environmental Responsibility
- "Our employees are encouraged to carpool or use public transportation. We even have incentives for those who choose greener commuting options."
  o   Code: Employee Green Initiatives; Commuting Practices
- "It's challenging to source materials that are both eco-friendly and cost-effective, but we are committed to it."
  o   Code: Sourcing Challenges; Eco-friendly Materials

Quote from Observation Notes:

- "Noticed several recycling bins in the workspace, clearly labeled for different types of waste."
  - Code: Recycling Practices; Workspace Sustainability
- "The office uses LED lighting and motion sensors to reduce electricity usage."
  - Code: Energy-efficient Lighting; Electricity Conservation
- "Employees actively participate in monthly local community clean-up programs."
  - Community Engagement; Environmental Activities

Quote from Company Document:

- "Our sustainability strategy is focused on reducing energy consumption by 20% over the next five years."
  - Code: Energy Conservation Goals; Long-term Sustainability Planning
- "Our product packaging is now 100% biodegradable, aligning with our commitment to reduce plastic waste."
  - Code: Sustainable Packaging; Plastic Waste Reduction

Thematic Development

From the coding, several overarching themes emerge:

- Environmental Practices: Encompassing waste minimization, recycling practices, and energy-efficient initiatives. This theme reflects how SMEs integrate practical environmental actions into daily operations.
- Sustainability Strategy and Goals: Including long-term planning for energy conservation and biodegradable packaging, indicating a strategic approach to sustainability.
- Employee Involvement and Challenges: Covering green commuting incentives and challenges in sourcing eco-friendly materials, highlighting the role of employees in sustainability and the practical challenges faced.

Analytical Reflection

- These themes collectively answer the primary research question by illustrating how SMEs perceive and implement sustainable practices. They reveal a commitment to environmental responsibility, integrated at both strategic and operational levels.
- The challenges theme, particularly in sourcing and cost-management, provides insight into the secondary research question regarding obstacles in adopting sustainable practices.
- Reflecting on these themes, it becomes evident that SMEs view sustainability as a multi-faceted approach, involving not just business operations but also employee engagement and community involvement. This broad approach underscores a holistic understanding of sustainability in the business context.
- The themes also suggest a positive impact of sustainability on business performance, aligning with ecological responsibility and long-term business viability.

5. Applying the Gioia Method to Analyze the Data

Implementation of the Gioia Method

- First-Order Analysis: Analyzing the data based on participants' perspectives.
  - From the interviews, observation notes, and documents, terms like "waste minimization," "energy-efficient lighting," and "sustainable packaging" are identified, reflecting the direct language of the SME participants.
- Second-Order Analysis: Translating these terms into more abstract, theoretical themes.
  - "Waste minimization" and "energy-efficient lighting" are categorized under a broader theme of "Operational Sustainability."
  - "Sustainable packaging" is conceptualized as part of "Strategic Environmental Initiatives."

- Theoretical Aggregation: Developing overarching dimensions that encapsulate the identified themes.

    o Themes like "Operational Sustainability" and "Strategic Environmental Initiatives" are aggregated under a larger dimension of "SME Sustainability Frameworks," reflecting the strategies and practices employed by SMEs in sustainability management.

Reflection on the Gioia Method Application

- The Gioia Method provides a structured approach to dissecting the rich qualitative data, enabling a clear trajectory from specific participant language to broader theoretical insights. This approach helps in uncovering not just the practical aspects of sustainability in SMEs but also how these practices are embedded in their strategic and operational frameworks.

- By employing this method, the study reveals a nuanced understanding of sustainability in the SME context, demonstrating how these businesses integrate environmental responsibility into their core business models.

- Applying the Gioia Method offers a systematic pathway from concrete data to abstract theory, providing a deep and comprehensive understanding of sustainability practices in SMEs.

Findings and Interpretation

Key Findings

- Operational Sustainability Practices:

    o SMEs are actively implementing practical sustainability measures such as waste minimization and energy-efficient lighting.

    o These practices are often driven by a sense of environmental responsibility and cost considerations.

- Strategic Commitment to Environmental Initiatives:

    o Many SMEs have long-term strategies in place, like reducing energy consumption and switching to sustainable packaging.

    o These strategic initiatives indicate a deeper commitment to sustainability, beyond just operational changes.

- Employee Involvement and Organizational Challenges:

    o Employee engagement in sustainable practices, such as green commuting, is prevalent.

    o Challenges in sourcing eco-friendly materials and balancing cost with sustainability efforts are significant concerns for SMEs.

Interpretation

- The findings reveal a holistic approach to sustainability among SMEs, encompassing both day-to-day operations and long-term strategic planning.

- The emphasis on employee involvement and facing sourcing challenges reflects a realistic view of sustainability integration, highlighting both the successes and hurdles.

- SMEs' sustainability practices are not just responses to external pressures but are driven by intrinsic values and ethical considerations.

Implications

- These findings suggest that sustainability in SMEs is becoming an integral part of business culture and strategy, rather than an optional add-on.

- The study provides insights for policymakers and business leaders on supporting SMEs in their sustainability journey, especially in overcoming sourcing and cost challenges.

- For future research, these findings open avenues to explore the impact of sustainability practices on SMEs' long-term business performance and competitiveness.

Summary

In this chapter, we have explored the landscape of qualitative data analysis. We began by acknowledging that qualitative data can take many forms, each with its own significance. We emphasized that qualitative analysis explores the essence of data rather than simply quantifying it. We also discussed the concept of trustworthiness, which includes credibility, transferability, dependability, and confirmability. These factors ensure that qualitative research is both rigorous and authentic, and not just reliable and valid.

Through the process of analyzing qualitative data, we presented that it is not a straightforward journey but an iterative process that require meticulous attention and care. Starting from organizing and familiarizing ourselves with the data to developing coding schemes and thematic frameworks, every step demands a deliberate and thoughtful approach. We highlighted the importance of context in qualitative analysis. The richness of qualitative research emerges within the intricate fabric of contexts, which includes cultural, social, historical, and situational aspects. This context is not just a setting for our data but also a lens that deeply enriches our understanding and interpretation.

As we conclude, qualitative data analysis is a nuanced and complex process, demanding both skill and sensitivity. It is a journey that requires us to be as much artists as scientists, weaving together narratives that reveal the deeper meaning of the social reality.

To summarize, below is the list of key learning points from the module:

- Diverse Forms of Data:
  o The chapter begins by exploring the variety of qualitative data sources, such as interviews, observations, and documents, emphasizing their unique contributions to research insights.
- Qualitative vs Quantitative Analysis:
  o It contrasts qualitative and quantitative approaches, highlighting their differing methodologies, roles of the researcher, and data analysis techniques.
  o Key differences include the nature of data (narrative vs numeric), approach to inquiry (inductive vs deductive), and outcomes (rich, context-specific insights vs broad generalizations).
- Analytical Approaches:
  o Explores the Gioia Method, thematic analysis, and content analysis.
  o Each method is presented with its unique processes and applications.
- The Role of Context:
  o Highlights the influence of cultural, social, historical, and situational contexts on data collection and interpretation.
  o Stressing the fluidity of meaning and the importance of multiple viewpoints.
- Tools and Frameworks for Analysis:
  o Discusses the selection of tools like NVivo, ATLAS.ti, MaxQDA, or simpler options like Excel.
  o Guidance on tool selection based on the nature of the data and research objectives.

Discussion Questions

1. How do different forms of qualitative data (like interviews, field notes, and visual data) contribute uniquely to the richness of research findings?
2. In what ways do qualitative and quantitative methodologies differ in their approach to data analysis, and how do these differences impact the interpretation of research findings?
3. How does the context (cultural, social, historical) of data collection influence the interpretation and analysis of qualitative data?

4.	Discuss the advantages and limitations of various qualitative data analysis methods such as the Gioia Method, thematic analysis, and content analysis. In what types of research would each method be most effectively utilized?

5.	What other analytical tools can be used for qualitative research?

6.	Reflect on the ethical implications of data handling in qualitative research, especially when dealing with sensitive or personal information. How would you ensure your trustworthiness?

7.	What factors should researchers consider when choosing between manual methods and software like NVivo, ATLAS.ti, or MaxQDA for data analysis?

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Suggested Readings

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GLOSSARY

Alternative Hypothesis (H1/Ha): A statement opposing the null hypothesis, suggesting the presence of a significant effect, difference, or relationship between variables in a population.

Biodiversity Index: A measure of the diversity of plant and animal species in a given ecosystem.

Capacity Building Theory: A theory that emphasizes the importance of enhancing skills, knowledge, and resources to achieve sustainable development goals.

Carbon Footprint: The total greenhouse gas emissions, often expressed in CO_2 equivalents, associated with human activities, products, or organizations.

Central Tendency: Measures (like mean, median, and mode) indicating the typical value in a dataset.

Central Tendency: Measures that represent the "typical" value in a dataset, such as the mean, median, and mode. These measures provide an overview of the central location of data points.

Circular Economy: An economic model that aims to minimize waste and promote recycling and reuse.

Close-ended question: A type of question where there is a choice of predetermined answer options or a simple multiple-choice question.

Common Pool Resource (CPR) Theory: A theory that examines the governance and management of shared resources, such as forests, fisheries, and water resources.

Conflict of Interest. Conflict of interest can occur when a person has more than one interest related to one aim. For example, in research a researcher is involved in the investigation in a new area, however, they are also involved in a profitable company that would like to use the research findings for curing a disease as soon as possible.

Constructivist approach: according to constructivism, phenomena can be interpreted in the given situation. The meaning of the phenomenon is constructed in the given situation.

Correlation: A measure of the linear relationship between two variables.

Covert observation: When people observed do not know that the observation is taking place.

Data Coding and Labeling: Assigning clear and descriptive names and coding schemes to variables for consistent and efficient data management and analysis.

Data Partitioning: Dividing data into distinct subsets for training and testing purposes, particularly relevant when building and validating predictive models.

Data Transformation: Applying mathematical functions to modify the scale or distribution of data to meet the assumptions of specific statistical models or improve analysis.

Deduction: a form of logical thinking and a method of cognition, in which general laws are deduced to conclusions about specific cases.

Degrowth Theory: A theory that challenges the notion of perpetual economic growth and advocates for a more sustainable and equitable economic system.

Dispersion: Measures (like standard deviation and variance) indicating the spread of data around the central tendency.

Ecological Modernization Theory: A theory that suggests environmental protection and economic growth can be achieved simultaneously through technological innovation and industrial upgrading.

Ecosystem Services Theory: A theory that highlights the benefits humans derive from natural ecosystems, such as water purification, climate regulation, and food provision.

Efficiency Wage Theory: A theory that suggests that paying workers above the market wage can lead to increased productivity and profitability, enhancing economic efficiency.

Environmental Justice Theory: A theory that addresses the unequal distribution of environmental burdens and benefits, particularly on marginalized communities.

Focus group: A focus group is a group interview in which there is interaction between the moderator and the participants as well as between the participants themselves during the process. It typically involves 6-12 participants.

Green Economy: An economy that is low-carbon, resource-efficient, and socially inclusive.

Gross Domestic Product (GDP): A measure of the total economic output of a country.

Hermeneutics: Originally meant the explanation of ancient texts, specifically religious texts. In a broader sense, a philosophical-methodological approach to the study of human behaviour, which assumes that reality is embedded in an ambiguous context and that the researcher interacts with the object of cognition.

Human Development Index (HDI): A measure of a country's average achievements in three basic dimensions of human development—health, education, and income.

Hypothesis. Hypothesis a proposition formulated for empirical testing; a tentative descriptive statement that describes the relationship between two or more variables. Hypothesis is an expected outcome of your research. In other words, it is a presumption based on limited knowledge on a subject.

Hypothesis: A testable proposition that specifies the expected relationship between two or more variables. Synonyms: Research Question, Prediction

Inclusive Wealth Index: A measure of a nation's wealth that considers not only traditional economic assets but also natural and human capital.

Induction: a form of logical thinking and a method of cognition in which general conclusions are drawn from particular experiences.

Informed consent form: Informed consent forms are written documents that are given to the research participants about the research and they can read information about the research they are taking part in. They are given written desciption of what they are giving consent to. Different ways of informed consent forms are needed when there is transparency, partial information, misinformation and in overt or covert observation.

Interview: An interview is a form of data collection in which information and opinions are obtained by asking questions, typically in a face-to-face conversation.

Interviewee: The person who answers the interview. This is a person from whom information is sought on the research topic.

Interviewer: The person who acts as the interviewer during the interview and conducts the assessment process.

Life Cycle Assessment (LCA): An analysis of the environmental impact of a product or service throughout its entire life cycle, from raw material extraction to disposal.

Measurement: Assigning numerical values or labels to observed phenomena for quantification and description.

Measures of Dispersion: Metrics that indicate how spread out data points are from the central tendency. Examples include range, variance, and standard deviation.

Millennium Development Goals (MDGs): A set of eight time-bound targets adopted by the United Nations in 2000 aimed at reducing poverty and addressing other pressing global issues.

Multicollinearity: Situations where independent variables are highly correlated, which can affect the accuracy and interpretability of statistical models.

Negative Correlation: A negative relationship between two variables where an increase in one variable is associated with a decrease in the other.

No Correlation: There is no linear relationship between two variables, and changes in one do not predict changes in the other.

Non-participant observation: The person conducting the observation does not interact directly with the observed person or group, is an external observer of the observed phenomenon.

Null Hypothesis (H0): A statement claiming that there is no significant effect, difference, or relationship between variables in a population.

Null hypothesis. Null hypothesis (H0) is an assumption that no difference exists between the sample parameter and the population statistic. It is an expression of the hypothesis in a form that is statistically measurable.

Observation mirror. Observation mirror is a mirror that is a mirror side and a see-through window on the other side. We can call it aone way mirror, too. They are used in observation to minimize the effect of the observing researchers. Another example to minimize the presence of a researcher during observation is doing a video recording.

Observation: Observation is a research method used when researchers would like to describe something that they can see.

Open-ended question: A type of question for which there is no predefined answer option. The interviewee is free to answer in his or her own words.

Overt observation: Observations when people observed know about the observation is taking place

Paradigm change. Kuhn says paradigm change is one special way of conceptual change (e.g., Kuhn, 1974, p. 249). Kuhn suggests that when there is a paradigm then there can be another paradigm afterwards that becomes the new ruling, widely accepted paradigm of the time. The way paradigms follow each other is called paradigm change.

Paradigm. "Periodically when existing theories (paradigms) are recognized as being inadequate to explain the anomalies which manifest themselves randomly in the course of normal scientific investigation." (Galloway, Mahayni, 1977, p. 64.)

Participant observation: the person making the observation has direct contact with the observed person or group, and is a participant in the observed phenomenon.

Population: The entire group of individuals or objects that a researcher is interested in studying. Synonyms: Target Population, Universe

Positive Correlation: A positive relationship between two variables where an increase in one variable is associated with an increase in the other.

Positivism. Positivism is aiming at describing phenomena with numbers and exact facts as much as possible and thus has its own way of approaching how to prepare a scientific research. In positivism everything is logical and can be described as numbers that are the results of using mathematical tools.

Positivist approach: a philosophy of science that focuses on understanding the world through empirical means. Positivism is a view that focuses on the positivist view of the world.

P-value: The probability of obtaining a test statistic as extreme as, or more extreme than, the observed value, assuming the null hypothesis is true. A smaller p-value indicates stronger evidence against the null hypothesis.

Qualitative research: qualitative research involves researchers exploring and interpreting phenomena, seeking to understand the problem through interpreting them in their context rather than in themselves. Qualitative research usually works with a small sample size.

Quantitative research: quantitative research involves the collection and processing of data in a numerical form, usually on a large sample size, and aims at being representative of the population.

Research question. A research question is stated in a question format with a question mark '?' in the end. A good research question asks something that we do not know the answer for yet. This

area of knowledge is unexplored, we can call this a ***scientific gap*** that you'd like to fill by answering a research question.

Resilience Theory: A theory that focuses on the ability of systems to absorb, recover, and adapt to change, increasingly relevant in the face of climate change and other uncertainties.

Sample: A subset of the population selected for study. Synonyms: Research Sample, Subgroup

Scale of Measurement: A classification system for variables based on data characteristics.

Semi-structured interview: An interview format in which the interviewer freely uses predetermined, typically open-ended questions and their order to suit the interviewee during the interview.

Significance Level (α): The predetermined probability of rejecting the null hypothesis when it is true, typically set at 0.05.

Social Capital Theory: A theory that examines the role of social networks, relationships, and connections in promoting individual and community well-being.

Social Equity: The fair and just distribution of resources, opportunities, and benefits among all members of society.

Social Inclusion: The process of ensuring that all individuals and groups are able to participate fully in society.

Social-Ecological Systems (SES) Theory: A theory that recognizes the interconnectedness and interdependence of social and ecological systems, requiring a holistic approach for sustainability.

Structured interview: A type of interview in which the interviewer works with a predetermined set of questions with a predetermined wording and order in which they ask the interviewee.

Sustainable Development Goals (SDGs): A set of 17 interconnected global goals adopted by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development.

Sustainable Livelihoods Approach: An approach that focuses on empowering individuals and communities to achieve a sustainable livelihood through their capabilities and assets.

Test Statistic: A calculated statistical value based on the sample data used to determine whether to reject the null hypothesis.

Transition Management Theory: A theory that focuses on navigating complex transitions towards sustainable systems through multi-level governance, stakeholder engagement, and adaptive management.

Triple Bottom Line (TBL): A framework for evaluating the performance of a company based on its economic, social, and environmental performance.

Unstructures interview: A form of interview in which the interviewer does not use pre-designed questions, but adapts to the interviewee by asking spontaneous questions to help gather information.

Variable Coding and Recoding: Assigning numerical codes to categorical data to make it compatible with quantitative analysis. Recoding may involve collapsing categories or creating new ones.

APPENDIX

Appendix 5.1: Resources to learn more about each theory

Ecological Modernization Theory	Dias, R. C., Seixas, P. C., & Lobner, N. (2021). Sustainable development and ecological modernization: Boundary discourses between "strong" and "weak" approaches. *Journal of Sustainable Development*, *13*(4), 268-278. [Repositório da Universidade de Lisboa: Sustainable Development and Ecological Modernization: Boundary Discourses between "Strong" and "Weak" Approaches (utl.pt)](#) Weber, H., & Weber, M. (2020). When means of implementation meet Ecological Modernization Theory: A critical frame for thinking about the Sustainable Development Goals initiative. *World Development*, *136*, 105129. [When means of implementation meet Ecological Modernization Theory: A critical frame for thinking about the Sustainable Development Goals initiative - ScienceDirect](#)
Sustainable Livelihoods Approach	Brocklesby, M. A., & Fisher, E. (2003). Community development in sustainable livelihoods approaches–an introduction. *Community development journal*, *38*(3), 185-198. [Community development in sustainable livelihoods approaches – an introduction	Community Development Journal	Oxford Academic (oup.com)](#) Farrington, J., Ramasut, T., & Walker, J. (2002). Sustainable livelihoods approaches in urban areas: general lessons, with illustrations. *Overseas Development Insitute, London*. [slurc.org/uploads/1/0/9/7/109761391/sustainable_livelihoods_aproaches_in_urban_areas-.pdf](#)
Common Pool Resource (CPR) Theory	Sanderson, M., Allen, P., Moran, V., McDermott, I., & Osipovic, D. (2020). Agreeing the allocation of scarce resources in the English NHS: Ostrom, common pool resources and the role of the state. *Social Science & Medicine*, *250*, 112888. [Agreeing the allocation of scarce resources in the English NHS: Ostrom, common pool resources and the role of the state - ScienceDirect](#) Alipour, H., & Arefipour, T. (2020). Rethinking potentials of Co-management for sustainable common pool resources (CPR) and tourism: The case of a Mediterranean island. *Ocean & Coastal Management*, *183*, 104993. [Rethinking potentials of Co-management for sustainable common pool resources (CPR) and tourism: The case of a Mediterranean island - ScienceDirect](#)
Ecosystem Services Theory	Hawken, S., Rahmat, H., Sepasgozar, S. M., & Zhang, K. (2021). The SDGs, ecosystem services and cities: a network analysis of current research innovation for implementing urban sustainability. *Sustainability*, *13*(24), 14057. [Sustainability	Free Full-Text	The SDGs, Ecosystem Services and Cities: A Network Analysis of Current Research Innovation for Implementing Urban Sustainability (mdpi.com)](#) Qiu, H., Hu, B., & Zhang, Z. (2021). Impacts of land use change on ecosystem service value based on SDGs report--Taking Guangxi as an example. *Ecological Indicators*, *133*, 108366. [Impacts of land use change on ecosystem service value based on SDGs report--Taking Guangxi as an example - ScienceDirect](#)
Capacity Building Theory	Bloomfield, G., Bucht, K., Martínez-Hernández, J. C., Ramírez-Soto, A. F., Sheseña-Hernández, I., Lucio-Palacio, C. R., & Ruelas Inzunza, E. (2018). Capacity building to advance the United Nations sustainable development goals: An overview of tools and approaches related to sustainable land management. *Journal of sustainable forestry*, *37*(2), 157-177. [Capacity building to advance the United Nations sustainable development goals: An overview of tools and approaches related to sustainable land management: Journal of Sustainable Forestry: Vol 37, No 2 (tandfonline.com)](#) Brandt, L., Schober, B., Somoza, V., & Spiel, C. (2018). Capacity Building for Sustainable Development: Coherent Concepts of Universities' Third Mission as a Parameter. *Developmental Science and Sustainable Development Goals for Children and Youth*, 391-406. [Capacity Building for Sustainable Development: Coherent Concepts of Universities' Third Mission as a Parameter	SpringerLink](#)
Social-Ecological	Selomane, O., Reyers, B., Biggs, R., & Hamann, M. (2019). Harnessing insights from social-ecological systems research for monitoring sustainable development. *Sustainability*, *11*(4), 1190.

Systems (SES) Theory	Sustainability | Free Full-Text | Harnessing Insights from Social-Ecological Systems Research for Monitoring Sustainable Development (mdpi.com) Reyers, B., & Selig, E. R. (2020). Global targets that reveal the social–ecological interdependencies of sustainable development. *Nature Ecology & Evolution*, *4*(8), 1011-1019. Global targets that reveal the social–ecological interdependencies of sustainable development | Nature Ecology & Evolution
Transition Management Theory	Loorbach, D. (2010). Transition management for sustainable development: a prescriptive, complexity-based governance framework. *Governance*, *23*(1), 161-183. Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework - LOORBACH - 2010 - Governance - Wiley Online Library Grin, J., Rotmans, J., & Schot, J. (2010). *Transitions to sustainable development: new directions in the study of long term transformative change*. Routledge. Transitions to Sustainable Development: New Directions in the Study of Long ... - John Grin, Jan Rotmans, Johan Schot - Google Books Köhler, J., Geels, F. W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., ... & Wells, P. (2019). An agenda for sustainability transitions research: State of the art and future directions. *Environmental innovation and societal transitions*, *31*, 1-32. An agenda for sustainability transitions research: State of the art and future directions - ScienceDirect
Degrowth Theory	Belmonte-Ureña, L. J., Plaza-Úbeda, J. A., Vazquez-Brust, D., & Yakovleva, N. (2021). Circular economy, degrowth and green growth as pathways for research on sustainable development goals: A global analysis and future agenda. *Ecological Economics*, *185*, 107050. Circular economy, degrowth and green growth as pathways for research on sustainable development goals: A global analysis and future agenda - ScienceDirect Robra, B., & Heikkurinen, P. (2020). Degrowth and the sustainable development goals. In *Decent work and economic growth* (pp. 253-262). Cham: Springer International Publishing. Degrowth and the Sustainable Development Goals | SpringerLink
Environmental Justice Theory	Gellers, J. C., & Cheatham, T. J. (2018). Sustainable Development Goals and environmental justice: Realization through disaggregation. *Wis. Int'l LJ*, *36*, 276. Sustainable Development Goals and Environmental Justice: Realization through Disaggregation 36 Wisconsin International Law Journal 2018-2019 (heinonline.org) Menton, M., Larrea, C., Latorre, S., Martinez-Alier, J., Peck, M., Temper, L., & Walter, M. (2020). Environmental justice and the SDGs: from synergies to gaps and contradictions. *Sustainability Science*, *15*, 1621-1636. Environmental justice and the SDGs: from synergies to gaps and contradictions | Sustainability Science (springer.com)
Resilience Theory	Liebenberg, L., & Scherman, V. (2021). Resilience and the Sustainable Development Goals (SDGs): Promoting child and youth resilience and related mental health outcomes. *Journal of Psychology in Africa*, *31*(5), 455-463. Resilience and the Sustainable Development Goals (SDGs): Promoting child and youth resilience and related mental health outcomes: Journal of Psychology in Africa: Vol 31, No 5 (tandfonline.com) Acuti, D., Bellucci, M., & Manetti, G. (2020). Company disclosures concerning the resilience of cities from the Sustainable Development Goals (SDGs) perspective. *Cities*, *99*, 102608. Company disclosures concerning the resilience of cities from the Sustainable Development Goals (SDGs) perspective - ScienceDirect
Social Capital Theory	Kim, D., & Lim, U. (2017). Social enterprise as a catalyst for sustainable local and regional development. *Sustainability*, *9*(8), 1427. Sustainability | Free Full-Text | Social Enterprise as a Catalyst for Sustainable Local and Regional Development (mdpi.com) Affandi, R. A., Permana, A., Yani, Y. M., & Mursitama, T. N. (2020). Implementing SDG to village level by integrating social capital theory and value chain:(case of village tourism Pentingsari in Yogyakarta, Indonesia). *J ASEAN Stud*, *7*(2), 122-137. Implementing-SDG-to-Village-Level-by-Integrating-Social-Capital-Theory-and-Value-Chain-Case-of-Village-Tourism-Pentingsari-in-Yogyakarta-Indonesia.pdf (researchgate.net)

Efficiency Wage Theory	Katz, L. F. (1986). Efficiency wage theories: A partial evaluation. *NBER macroeconomics annual*, *1*, 235-276. Efficiency Wage Theories: A Partial Evaluation (uchicago.edu) Mair, S., Druckman, A., & Jackson, T. (2019). Higher wages for sustainable development? Employment and carbon effects of paying a living wage in global apparel supply chains. *Ecological Economics*, *159*, 11-23. Higher Wages for Sustainable Development? Employment and Carbon Effects of Paying a Living Wage in Global Apparel Supply Chains (sciencedirectassets.com)