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| IU International University |
| Applied Research |
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Learning Objectives

This **Applied Research** course provides you with the key concepts and methods of applied empirical research. Alongside this, you will gain in-depth knowledge on how to evaluate the quality, as well as the limitations, of different empirical research approaches. To begin, the essential theoretical foundations of empirical research and the primary process steps of empirical research projects are presented. This allows you to also become sensitized to the relevant ethical and legal challenges. As the course advances in deeper detail, it covers the application of key qualitative and quantitative research methods, discussing each respective method’s primary goals and decision areas, their strengths and weaknesses, and practical recommendations for application. This course provides you with the knowledge to develop an empirical study for an applied problem in your field or professional environment, as well as critically evaluate the quality of the empirical findings and their validity.

# Unit 1 – Fundamentals of Empirical Research

Study Goals

On completion of this unit, you will be able to ...

... evaluate the type and quality of empirical research, as well as concrete empirical research results, using relevant criteria.

... identify appropriate data and research methods to empirically address a specific problem or research question.

... name and critically compare the process steps, as well as the potentials, goals, and limitations of various quantitative and qualitative research methods.

... recognize and consider the underlying ethical and legal issues relevant to conducting empirical research.

... design an empirical investigation, independently and guided by theory, to adequately address a specific application-oriented research problem.

# 1. Fundamentals of Empirical Research

### Introduction

What do PISA studies, Corona dashboards, and statistics on unemployment figures have in common? They are based on scientific findings. But what exactly is science? How does science differ from everyday activities and which goals does it pursue?

The following unit provides an overview of these questions and illustrates the relevance of science to practical application. Many inventions of our time would not exist without science. For this reason, it is particularly worthwhile to take a closer look at this term and its background.

## 1.1 Goals and Underlying Approaches of Empirical Research

Science is a complex phenomenon that is difficult to explain in a few sentences. Philosophers have been debating over what characterizes science for many years (Eisend & Kuß, 2017, p. 2).

The philosopher Immanuel Kant (1724–1804) wrote: “Knowledge, as science, must be arranged according to a method. For science is a whole of knowledge as a system and not merely an aggregate of separate cognitions (knowledge). It therefore requires a systematic knowledge, that is, a knowledge formulated according to considered rules” (Jäsche, 1800, p. 216).

In some definitions, science is equated with the search for truth; in others, the focus is on gaining knowledge through rational, understandable, and explanatory methods (Rost, 1966, p. 26).

As a basic principle, science is characterized by the following three aspects (Eisend & Kuß, 2017, pp. 1–3):

* The focus of science is the generation of knowledge.
* Scientific assertions must be substantiated.
* Science is based on a system with an argumentative structure.

### Differentiation Between the Terms Science and Everyday Knowledge

There is a distinct difference between science and everyday knowledge. While the focus in both cases is on gaining knowledge, it is respectively accessed in different ways.

People’s personal experiences and perceptions form the basis for everyday knowledge. Everyday knowledge helps people orient and adapt themselves more easily in the world. Typical subjects in this context are the weather, diseases, or feelings. Compared to everyday knowledge, science involves assumptions and assertions that are verified before they are presented in the form of universally valid rules. This verification is carried out by means of **methods**. Specific criteria, such as objectivity or intersubjectivity, must be met and will be discussed in greater detail further into the course (Perrez, 1991, pp. 227–230).

The figure below (Kromrey et al., 2016, p. 23) provides an overview of the differences between science and everyday experience.

Comparison of Scientific Experience and Everyday Experience

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Automatisch generierte Beschreibung

Source: Kromrey et al., 2016, p. 23.

### Functions and Tasks of Science

Science is designed to produce provable results. Among other things, such results can serve as justification for social action. Alongside this, they can also be used as decision-making aids, for example, by policymakers (Kromrey et al., 2016, p. 16). Science is intended to contribute to progress.

### The Goals of Science

Science is a fact-based structure that ...

* ... pursues the most objective possible description and classification of phenomena within the real world.
* ... strives to create universally valid rules to explain events and predict categories of events (Kromrey et al., 2016, p. 22).

The epistemic goal of science is illustrated in the figure below (Eisend & Kuß, 2017, p. 14):

The Goals of Science

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Source: Eisend & Kuß, 2017, p. 14.

As indicated in the figure above, the epistemic goal is based on the following epistemological assumptions (Eisend & Kuß, 2017, pp. 13–14):

* *Minimal empiricism*: Assertions are obtained and verified using empirical methods.
* *Minimal realism*: To speak of truth, the empirical facts should be objectively and correctly represented. All decisions should be factually and methodically based.
* *Logic in the broad sense*: Precise definitions, assertions, and arguments are necessary to arrive at a verisimilitude (closeness to the truth).
* *Objectivity and intersubjectivity*: Assertions and results must be free from the observer’s opinions, attitudes, and values.
* *Fallibilism and critical stance*: Findings should always be critically questioned in order to come closer to the truth by confronting them.

When considering the figure above, the individual assumptions are related to each other as follows (Eisend & Kuß, 2017, p. 14):

* A: Critically questioning results leads to a more intense approach to the truth.
* B: Empirical methods allow a theory to be verified in reality.
* C: Closeness to the truth can only be created through objectivity, in which individual opinions, attitudes, and values are eliminated. In addition, methods must be adequately applied and results carefully documented.
* D: Precision is the basis for valid results. Precise definitions are necessary to establish agreement between theoretical presumption and observations.

#### The relationship between empiricism and theory

The relationship between empiricism and theory is a subject of lively discussion in science. Essentially, there are two approaches: One group of scientists classifies empirical work as a path to a theory, while the other considers a theoretical reflection as the basis for empirical work. Accordingly, the groups mentioned here see themselves as empiricists or theorists (Humme, 2015, p. 7).

#### Definition of the term *empiricism*

In empiricism, experiences regarding facts are collected, systematically classified, and applied to a specific subject area. The procedure is documented and is intersubjectively understandable (Brosius et al., 2016, p. 3).

#### Definition of the term *theory*

The term theory generally means that a system is formed based on concepts and definitions, as well as assertions, to classify, explain, and predict knowledge regarding facts in specific subject areas. If the term theory is examined with a scientific attitude, then the formed system is also intersubjectively verifiable. The assertions are methodically obtained and exist in an uncontradictory relationship (Kraus, 2022, p. 5).

Both empirical research and theory formulation are necessary cornerstones in gaining knowledge in science. In theory formulation, three scientific methods of inference play an essential role: inductive, deductive, and abductive (Eisend & Kuß, 2017, p. 60).

These practices are explained below:

#### Deductive procedure

During deduction, conclusions are drawn from the general to the specific (Döring & Bortz, 2016, p. 35). In the case of a deductive procedure, a theory is first sought that could provide possible answers to a research question or could provide explanatory approaches for the phenomena under investigation. Hypotheses are derived from theories. They serve as provisional answers to be empirically tested. If a hypothesis is indeed true, the theory is confirmed. If it is not, the hypothesis is discarded and subsequently revised and reexamined as necessary (Wichmann, 2020, 27ff.).

Since the deductive procedure can be linked to existing theories that have already been verified, it is more efficient than the inductive procedure described below. The disadvantage, however, is that it is unlikely for completely new perspectives that offer a different perspective on the matter to emerge (Eisend & Kuß, 2017, p. 99).

#### Inductive procedure

During induction, conclusions are drawn from the specific to the general (Döring & Bortz, 2016, p. 35). Knowledge is gained from experience and specific individual observations. The more often something is observed, the more likely it is to be true. This procedure is often used in practice. Individual observations lead to a theory or to further development of already existing theories. In contrast to the deductive procedure, data collection is the first step and the work of theory formulation follows thereafter (Wichmann, 2020, p. 30).

Induction has an advantage over the deductive approach because it is significantly more open. Results are reached based on the respective data or experiences and are therefore not so strongly influenced by previous ideas (Eisend & Kuß, 2017, p. 99). The disadvantage, however, is that theories developed in this way initially appear to be isolated (Eisend & Kuß, 2017, p. 99).

#### Abductive procedure

Abductive reasoning, which has received little attention in literature thus far, should also be noted here for the sake of completeness. Abduction involves inferences from observations in relation to their (presumed) causes (Eisend & Kuß, 2017, p.99). As a further distinction, selective abduction refers to a set of already known hypotheses, while creative abduction allows an entirely new, plausible hypothesis to be developed. In contrast to deductive and inductive logic, the abductive procedure takes underlying meanings, motives, and intentions into account (Wichmann, 2020, p. 31).

The figure below presents an overview of the scientific methods of inference:

Induction, Deduction, and Abduction Summary

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Source: Eisend & Kuß, 2017, p. 99.

#### Empirical testing of theories – the selection of appropriate methods

Quantitative or qualitative methods can be applied to empirically test theories. In principle, a mix of methods is also possible. According to Wichmann (2019, p. 7), the division into quantitative and qualitative approaches arose from the debate, among other things, as to whether the natural and social sciences can use the same methods of obtaining knowledge.

The distinction between quantitative and qualitative research approaches is based on fundamentally different ways of thinking and conceptions of the human being. The figure below illustrates the differences between the two approaches with regard to the conception of the human being:

Comparison of Quantitative and Qualitative Approaches

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Source: Schumann, 2018, p. 148.

Quantitative approaches are based on the natural sciences. They assume that a separate range of methods to study people is not required. The principles – standardized procedures, quantification, frequency and distribution of occurrences, accuracy, delimitation of cause-effect relationships, establishment of universally valid laws, and objectivity, as well as the possibility of controlling conditions – can be applied (Wichmann, 2020, p. 7).

Qualitative approaches assume that humans cannot be studied with the same principles and research methods as applied to natural sciences. Since human beings are not only bodies, but also minds and souls, a separate range of methods that is independent of the natural sciences is needed (Wichmann, 2019, p. 7). The human being is viewed **holistically.** This means that the person themselves, the situation in which they find themselves, and their history are analyzed (Schumann, 2018, p. 149).

Qualitative and quantitative methods are also based on different scientific theoretical positions (Wichmann, 2019, p. 7).

Positivism is seen as the foundation of quantitative methods and is based on the assumption that a truth exists. It also assumes that human behavior follows certain regularities and runs along cause-effect relationships. Learning about these relationships, e.g., by means of experiments or questionnaires, is the researcher’s task (Wichmann, 2019, p. 8).

In contrast, interpretivism and constructivism are the basis for qualitative methods. Proponents of interpretivism and constructivism see the human being as an actor and reject the stimulus-response (cause-effect) model. Rather, humans attribute meanings to their actions and therefore act according to meaning and intention. The environment is used for social exchange and thus influences the personal attribution of meaning. According to the proponents of interpretivism, not only one, but rather several truths exist. Which truth is considered correct depends on individual people’s particular experiences (Wichmann, 2020, pp. 9–10).

The figure below illustrates the differences between qualitative and quantitative approaches in detail:

Comparison of Qualitative and Quantitative Approaches

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Automatisch generierte Beschreibung

Source: Schumann, 2018, pp. 1–3.

Despite the differences in these two approaches, researchers must decide which one to take.

The most important decision criterion is the scientific question. Not every method is suitable for every question. Qualitative methods are only suitable when a small amount of knowledge on a specific matter exists and background factors are to be researched. In contrast, quantitative methods are useful when extensive knowledge is already available. In practice, aspects of time and budget also play a major role in the decision (Brosius et al., 2016, pp. 4–5).

The terms *explorative*, *descriptive*, and *explanatory* are also to be noted here. The distinction between explorative, descriptive, and explanatory studies is based on a study’s interest in a particular knowledge:

Explorative studies address new or barely researched subjects with many open research questions. These studies aim to describe the subject matter and formulate hypotheses and theories. Both qualitative and quantitative methods are used for this purpose. Descriptive studies address characteristic expressions in larger samples with a focus on precision. Standardized quantitative measurement methods are often used for this purpose. Explanatory studies are essentially hypothesis testing. They aim to test and further develop theories derived from hypotheses. Explanatory studies use quantitative as well as experimental or quasi-experimental designs (Döring & Bortz, 2016, p. 149).

The practical examples below are intended to further clarify the differences between the terms:

* Exploratory study: analysis of the population’s fears and concerns related to food supply at the beginning of the Covid crisis.
* Descriptive study: satisfaction with the current political situation within the population as a whole.
* Explanatory study: verification of the cause-effect relationship of individual people’s character attributes and leadership positions.

### Self-Check Questions

1. Please complete:

A distinction is made between science and *everyday knowledge*. In comparison to everyday knowledge, assumptions and assertions are *verified* inscience. *Quantitative* and *qualitative* methods are used for this purpose.

The underlying conception of the human being in quantitative approaches is referred to as *positivism* and as *constructivism* in qualitative approaches.