JADE UNIVERSITY
OF APPLIED SCIENCES
Wilhelmshaven Oldenburg Elsfleth

Department of Maritime and Logistic Studies

Post-graduate course in

International Maritime Management (M.Sc.)

Co-operative programme of work and study

IMM01

Academic Research Methods

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Learning Objectives

Upon completion of this learning unit, students are able to …

1. state the principles of academic research and discuss the requirements for academic research activities.
2. develop research questions and hypotheses which arise in their own work environment and apply them in their academic writing.
3. critically analyse academic peer reviewed research papers.
4. select, implement and give the rationale for their own research activities on an advanced academic level.
5. apply the basic principles of the degree course, the degree course's didactic concept as well as distance learning to other topics and their own lifelong learning.
6. identify problems and knowledge gaps in the field of maritime management related to both theory and practice including an international framework.
7. create self-study plans by implementing the proposed methodology for a successful integration of academic contents with work-related matters.
8. write a research proposal including relevant theories, methodologies, and systematic plans to answer a research question or test hypotheses.

Please find further information in the module handbook of the International Maritime Management degree course. It is available on the Internet pages of the degree course: jade-hs.de/imm

Unit Questionnaire on Academic Research Methods

No.	Criteria	1	2	3	4	5
1	I know the different academic assignments, how they differ and what research is about.					
2	I am able to structure my own academic work; I know how to find a tutor for my thesis and when I have to communicate with them.					
3	I can identify academic research topics and devise relevant research questions.					
4	I know my own strengths and weaknesses concerning academic research work and the impact of the choice between an empirical or theoretical project.					
5	I am familiar with the theoretical background of academic research, and I can formulate research hypotheses.					
6	I am familiar with inductive and deductive research approaches.					
7	I know the different sources of information for academic writing, how to search, obtain, evaluate and manage them.					
8	I know the legal basis for copyright and patent protection.					
9	I am able to collect data for my research project and I am familiar with the different methods of data analysis (for example, scales).					
10	I know the difference between qualitative and quantitative variables.					
11	I understand the importance of statistical analysis for evaluating empirical data.					
12	I am able to summarise the data collected in my research project and I know how to make inferences.					
13	I am able to structure and write my own academic research texts in consideration of formal issues (for example, citations).					
14	I am able with use of different types of charts, images and figures and know how to assemble presentations.					

15	I am familiar with the topic and aims of research and development (R&D).					
16	I know different research institutes and principles of financing R&D.					

Dear student,

Congratulations! You have chosen the distance education post-graduate Master of Science (M.Sc.) degree course in International Maritime Management. It is a co-operative programme of work and study. This means that the integration of the theoretical knowledge acquired in the different learning units with your professional experience is the core part of your studies and our programme. In order to achieve this integration we will support you in your learning process by strengthening your competencies, applying new methodologies and theories, as well as reflecting on your individual professional matters.

You will find this concept in the different learning units of our course. All learning units are divided into two parts of more or less equal size. Each learning unit starts with a theoretical part, followed by a practical part. Based on the theory put forth in the learning units, your individual work environment will be integrated into the learning unit. Referring to your practical experiences is an integral part of each learning unit and of the examination. If reasonable, practical examples and case studies are used. Accordingly, you can transfer and blend the theoretical concepts into your work-based matters and reflect on your actions as well as your learning success simultaneously.

As you have already learned in the introduction in the first attendance phase, every learning unit is divided into a first part containing the unit's basic theoretical principles and a second part for the practical application of the concepts introduced. The theoretical part is sub-divided into different parts which for your convenience are available as a printable PDF file.

The initial questionnaire should give you an impression of the topics the learning unit deals with. A maximum level of transparency and traceability facilitates your studies and is important for us. At the beginning of every chapter you will find a summary of its contents. They are displayed in compressed form as several Learning Objectives, illustrated in a box and abbreviated with an identification code. This code consists of the abbreviation 'LO' (for learning objective) and sequential numbers which refer to the respective chapter. The following example displays a learning objective:

LO1.2.3 I can create …

At the end of every chapter you will find one (or more) question(s) concerning the chapter's contents. They serve to assist your process of understanding and learning while you think about the chapter and reflect on what you have just read. The reflection questions are illustrated as a box and start with the abbreviation 'R' (for reflection) and sequential numbers which refer to the respective chapter. The following example displays a reflection question:

R1.2.3 Which, what … ?

All reflection triggers provide a QR code. This code will lead you directly into our virtual classroom – the Learning Management System (LMS). You reach it by reading the QR code next to the reflection questions with your mobile device, or by simply clicking on the QR code. Go to the forum to communicate with your fellow students and with us – your IMM team. You can check if your device identifies QR codes by opening the LMS with the code to the right.

In connection with the course books and your work on the theoretical part of the learning units we have prepared self assessments for you. They allow you to estimate your progress in knowledge and competencies, to give you feedback on your learning path, and also assist you by giving you an answer to the important question 'Am I on the right track?' The next steps are to reflect on what you have acquired and to transfer the 'lessons learned' into practice. This builds the focus of the learning units and leads to the examination of the unit.

Your studies of 'International Maritime Management' start with the learning unit Academic Research Methods. Your studies of this learning unit are about to begin. You have probably been confronted with the challenge of academic research matters in your under-graduate studies as well as in your professional life before you decided to start with this course book. Be excited! The mandatory basis for all academics is the ability to work in an academic, scholarly and methodical manner reflecting the philosophy of science – whether they are learners or lecturers. The main competencies in this field are: understanding theories, inferring questions, developing different approaches, deliberating alternatives, searching for proper information and literature, collecting and analysing data, writing academic texts and presenting results.

Besides providing a homogeneous academic basis, our learning unit Academic Research Methods serves one main purpose: It helps you to familiarise yourself with the didactic concept of our degree programme of 'International Maritime Management' and its learning units. It is intended to strengthen your expertise in ways of looking at problems, structuring objectives and questions as well as linking theory and professional matters.

Now we recommend you take a sheet of paper for your personal notes and questions. Then go on to the next chapter and start reading slowly. The sentences have a very high information density. Go backward or forward in the text as required, or visit the LMS. Let's get started!

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The Academic Research Methods learning module contains the principles of academic research and is divided in eight sub-categories: Basic Principles and Definitions (chapter 1), Research Objectives and Questions (chapter 2), Philosophy of Academic Writing (chapter 3), Sources of Information (chapter 4), Information Handling (chapter 5), Information Analysis (chapter 6), Official Issues and Requirements (chapter 7), and Research and Development (chapter 8).

1 Basic Principles and Definitions

In this chapter you are given an introduction to Academic Research Methods. It starts with the presentation of the different types of academic text you will have to read and understand as part of your studies (chapter 1.1), followed by the relevance of academic principles (chapter 1.2), some advice on organising your academic research work in terms of time management (chapter 1.3) and which aspects influence the selection of and contact to the appropriate tutor(s) (chapter 1.4). These contents lead to the following learning objectives:

LO1.1	*I know the different academic and non-academic publications and their standards.*
LO1.2	*I know the relevance of academic principles and what academic research is about.*
LO1.3	*I am familiar with academic work and time management. I can apply the different steps to organise my own academic work. I have the skill to evolve a Gantt chart and recognise whether I am on the right track (or not).*
LO1.4	*I know my tutor (head of department) and when/what I have to communicate with them while working goal-oriented on my own academic texts (professional matters).*

1.1 Academic Writing as Part of Your Studies

In this chapter you learn about the different assignments you will have to submit as part of your studies. In addition to documentation which you need yourself, like notes of lectures or protocols, you will have to pass course achievements relevant for the examinations. They are in written form and must be developed and submitted. They are necessary for earning the credits based on the European Credit Transfer System and must meet different requirements concerning the available time, form and number of pages, etc. In addition, they are intended to initiate a discussion in class and to rate your performance (Bensberg, 2013, p. 9). Irrespective of the different types of assignments you learn to identify topics, to generate and sequence your own ideas, to collect and evaluate sources of information, to identify and describe contexts and differences, and many more. The following figure lists the different scientific and non-scientific papers you typically have to deal with. The figure is simplified and the last step is reached only by a small number of all students – the doctoral thesis:

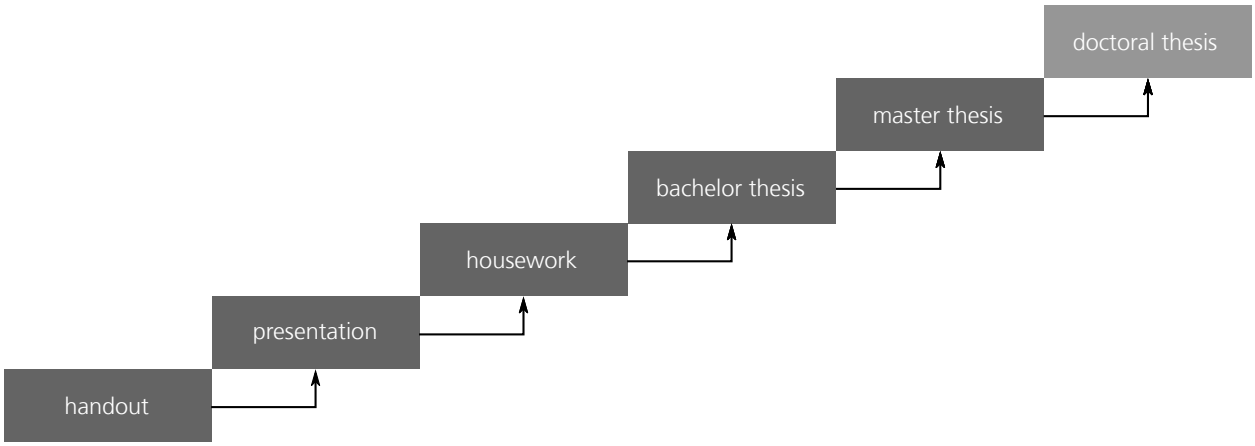

Figure 1: Elaboration of scientific and non-scientific papers throughout university studies, following Bensberg, 2013, p. 9 ff.; Disterer, 2009, p. 49.

- Handout: the discussion paper summarises the most important statements and assumptions. It normally consists of one written page only and guides the audience (fellow students, lecturers, etc.) through your presentations.
- Presentation: presentations underline and clarify the contents using the spoken word. Computers and projectors are commonly used in presentations nowadays. Presentations are practised during your university studies and can be considered an essential tool for your professional life.
- Homework: this is the smallest written academic text. It has to be written in every degree programme to demonstrate that you are able to understand the demands and adopt the instruments of your academic discipline. The rules of action differ according to examination regulations and tutor requirements. The homework is often linked to a subsequent presentation and writing a handout or a paper containing proper theses. You should be familiar with this kind of document from your under-graduate studies. They are of course also a usual requirement at an advanced level in the post-graduate studies' units as in the distance-learning M.Sc. course of International Maritime Management. The advanced level applies the depth of your research questions, the reasoning and the relevant sources of information involved.
- Bachelor thesis: this is the last exam of under-graduate studies to verify that you are able to deal autonomously with an academic research question over a specified period of time. It is an advanced academic research project.
- Master thesis: this will be the last exam of your post-graduate studies. It is similar to the bachelor thesis but is more demanding due to a more advanced level of examination and the greater depth of the research carried out. Accordingly the period of time working on the thesis is longer, too.

- Doctoral thesis: this is a very advanced task in terms of academic achievement. The research question is very detailed and it takes several years to complete it, depending on the scientific discipline. The writer has to study a significant number of sources of information and to arrive at and consolidate findings in their field of research. The doctoral thesis has to fulfil different requirements. These are outlined in the next chapter and serve to introduce you to the academic principles.

Besides the texts mentioned above you will be faced with non-academic texts as an integral part of your studies. The most common forms are internship reports and project reports as explained in the following:

- Internship report: practical on-the-job training periods during your university studies usually conclude with a written report. They are not academic research texts but they serve as an evidence of your practical training.
- Project report: another skill is to write project reports. Although they are not academic research texts, it is nevertheless important to write them. They describe the status quo and outline the goals and measures taken to reach the objectives formulated within the project. At the end you summarise the outcome of the project and document whether the aims were achieved or not. If the aims were not achieved or too much money was spent, it is important to state the reasons for this. The scope and topics covered also depend on your role in the project in coordinating the project members and taking on executive functions. If relevant, elements of project management should be referred to in the final project presentation as well.

R1.1 What are the differences between the various academic and non-academic texts?

1.2 Academic Principles

In this chapter you will be introduced to academic principles. This is important for your individual academic research questions: do your plans and ideas fulfil all requirements to be considered adequate academic research questions (Bensberg, 2013, p. 36)? To be able to answer this question we will take a look at what experts think about this issue. In general we have to consider that different people from different academic areas have different opinions as to the definition and understanding of academic principles. In their book Ebster and Stalzer (2017, p. 20) list some absurd opinions referring to the term ‘science’ as a relic of the past. While the English biologist Henry Hux-

ley put forward 'an organised common sense', the French philosopher Simone Weil suggested 'studies of the world's beauty' as a definition of science. In the following, some definitions and criteria are listed for the terms science and academic principles:

- "Academic research activities manifest themselves as a systematic and methodically-controlled combination of independent and creative thoughts with existing scientific findings. Procedures are accurate, notion-defining and related to one area or discipline." (Bohl, 2018, p. 12; translation by authors).
- "Academic work aims to find new answers to a question or hypothesis which are based on facts and supported by sources, and which you have to submit to a general review." (Bröning, 2005, p. 47; translation by authors).

On the one hand opinions differ, depending on the different sciences. On the other hand some criteria are consistent; the common demands on an academic research text apply, irrespective of the different academic disciplines:

- Academic work should deal with a clearly identifiable topic. This is reflected in the title, research question(s) and summary (Ebster & Stalzer, 2017, p. 21 f.).
- A logical and systematic structure must guarantee transparency for the reader. In the different areas of the arts this may be of secondary importance and seen as a restriction of one's freedom of artistic expression.
- The state of the current research activities must be presented as the starting point. This should be the basis on which the researcher's own thoughts and ideas are constructed (Bohl, 2018, p. 10).
- An academic text should provide a clear benefit of the results in terms of carrying the research further. Furthermore, the level of knowledge should be increased or at least the perspective should be changed. This is the key element for a graduate thesis, although it also applies to the other texts mentioned, albeit in a less strict manner.
- The author has to guarantee that the reader can follow and check the objective results obtained by the author and his or her suppositions (Bensberg, 2013, p. 37).
- Every academic area provides a 'toolbox' which contains the appropriate methods and techniques which have to be meaningful, permissible, relevant, adequate, useful and necessary. Students should not only keep these techniques in mind but know how to use them. Furthermore, they must introduce them in their texts and use them actively. Typically, a huge volume of specialist literature exists and this should be consulted (Disterer, 2009, p. 14 f.).
- The academic text should be comprehensible to a reader competent in one's academic field. Therefore suitable language, terminology, recognised standards of good practice and logic must be used. The author must also take care to write concisely and articulately (Disterer, 2009, p. 20 f.).

- Finally, honesty concerning all citations used is imperative. Dishonesty in this sphere constitutes plagiarism – the theft of thoughts and opinions – and may violate intellectual property rights (Bohl, 2018, p. 12).

An academic research topic always aims at answering a research question. These are characterised by the use of question words to initiate them. The guiding principle for the wording of the academic research question(s) ends in: "Why was, is or will something be like this (and not different)" (Karmasin & Ribing, 2009, p. 24). An academic research text should moreover always aspire towards universal validity. Although in some research areas universal validity is limited, it is not enough to work on individual cases without an attempt to generalise. Research projects carried out by companies often serve as a basis for a decision by their management only. They should therefore not be considered academic research (Ebster & Stalzer, 2017, p. 21). In the following, criteria applied to academic principles are illustrated:

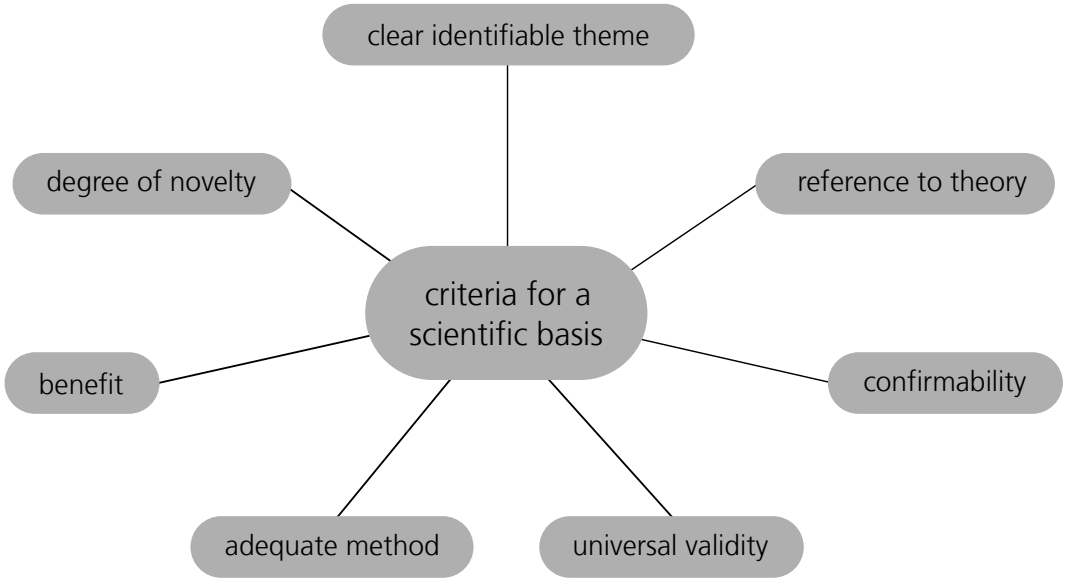

Figure 2: Criteria for principles of academic writing, according to Ebster and Stalzer, 2017, p. 21.

Keep in mind that the more progress you make on your way to completing your studies, the higher the demand on your performance will be, as shown in figure 1; criteria are summarised in figure 2. Diverging definitions and views of different tutors should be kept in mind. This is why you should ask for the expectations of your tutor at an early phase of your academic research paper.

R1.2	What comes to your mind when you read the term 'academic principles'?	

1.3 Time Management

In this chapter we discuss time management, an essential element of any academic publication. The available time for carrying out your research and publishing its results depends on the type of your academic paper. When writing a homework paper the available period of time may be negotiable. The available time differs with a bachelor or master thesis as it is defined by the examination regulations of the university's faculties or departments. At the Faculty of Maritime Studies and Logistics in Elsfleth, for example, the bachelor thesis must be finished within twelve weeks and its completion within these limits is part of the examination. In addition, there may be a restriction concerning its length. As a consequence you should organise your work systematically and in a structured manner. This necessarily leads to good management of the available time. Disruption is common, as is the need for corrections, and this needs to be taken into account. Relevant criteria and options differ depending on the different sciences, but some criteria are nonetheless universally applicable. Academic research texts have common demands and sequences (Rost, 2012, p. 26). The most important criteria are mentioned in the following:

- Differentiation and formulation of the topic: for the classification of the topic and questions of your academic project a basic literature search is necessary. Once your topic has been chosen, the hard work starts. Reflection on the chosen topic is a process which starts with your very first thoughts about the topic and continues until the paper has been finished. With every step in the long process of writing an academic paper your knowledge and findings will increase, leading to a more detailed analysis of the research questions.
- Literature research and acquisition (chapter 4.2): after you have chosen your research topic, a detailed search for information sources starts. This phase will continue until the research paper has been submitted.
- Literature evaluation (chapter 4.3): after having identified and obtained the first sources of information, the literature must be evaluated. With this step the selection of your research topic becomes increasingly concrete and a first outline should be developed. It is also advisable to start writing notes in your own words to get used to the writing process.
- Developing the structure (preliminary): at this stage of your academic research project the outline and a draft of your plan should be discussed with your tutor. After receiving their feedback on your draft the direction of your research will be established and you will be able to concentrate your efforts on your paper without any delay.
- Contacting the company or collecting data (if necessary): when a company is involved in your research topic or you are writing an empirical text, the step of collecting the relevant data should be inserted here.
- Writing the manuscript (preliminary): upon completion of the steps mentioned above you will get more involved in the topic, and, due to the literature research, you should be able to make good progress with your text.

- Final inspection of the manuscript and layout: the next and last step is proof-reading. This includes the arrangement of the layout (including figures and tables). Writing an abstract may also be necessary.
- Printing and binding: when everything is done and your work has been compiled in one file you can finally print, copy and bind your text (Brink, 2013, p. 7 ff.; Ebster & Stalzer, 2017, p. 22 f.). Congratulations – your academic research text is complete!

To get an impression of your project as regards your progress and the tasks remaining, it is recommended that you create a table with the different work packages on the axis of ordinates and the available time on the axis of abscissae. Planning of structure and time can be carried out with the aid of critical path planning resulting in a Gantt chart, as shown in figure 3.

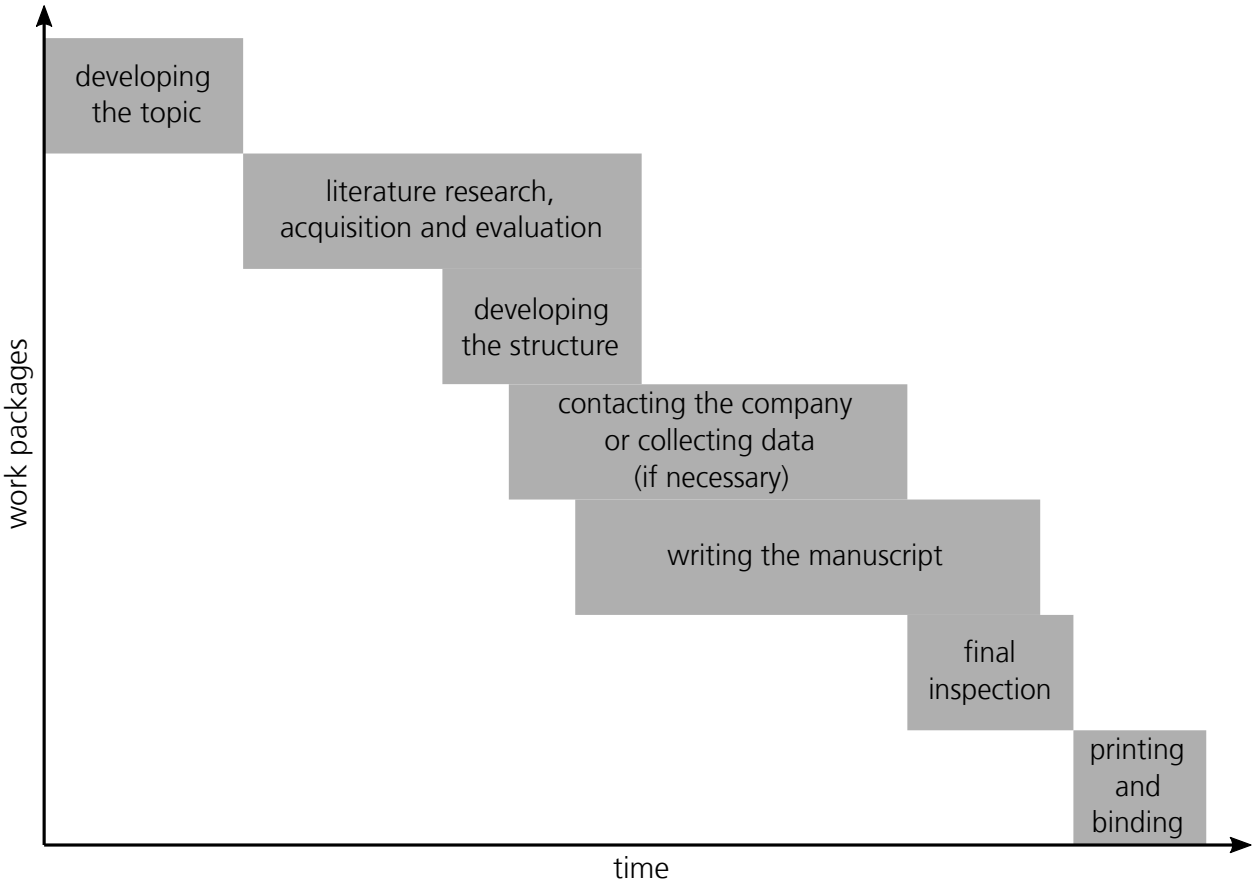

Figure 3: Gantt chart, own illustration.

Every academic research project can be illustrated as a Gantt chart, irrespective of type and scope of the project. The phases are identical as only the time invested for the different tasks is variable. The time required to accomplish the different tasks shown above is estimated and pictured as bars. You can then see when the individual production steps have to be finished or started. With this type of chart the organisation of your work will be easier and the motivation for the ongoing work increased.

You can choose between two options. The first option is to differentiate between long-term (months), intermediate-term (weeks) and short-term planning (days). The other option is to work with just one diagram and choose calendar weeks as units of measurement and check continuously whether you are able to complete the tasks on time. If you are running late, think about the reasons and how you can possibly recover the time lost. Gantt charts can be used to display the different stages in more detail than those summarised in figure 3, and milestones can be defined.

The most important aspect of both options is to check whether you are completing your tasks in time and to react accordingly if not. You should be honest with yourself when generating the time frame for your work. There will be other demands on your time, like your work or other examinations, and family obligations need to be taken into account, too. Be aware that an overload of work can lead to frustration and boredom which can cause students to give up altogether.

You should be sure that all preliminary work is accomplished before you start with your research. Examples for preliminary tasks to be carried out include checking whether your computer works, if you have admission to your university's or other libraries and if you have finished all organisational tasks (Bensberg, 2013, p. 49; Brink, 2013, p. 40; Theisen, 2008, p. 17 f.).

R1.3 Have you thought about the advantages of using a Gantt Chart to help manage your time and deadlines for your studies and assignment deadlines?

1.4 Tutor Contact and Supervision

In this chapter you will learn about the role of the tutor in your academic research project. Writing an academic research text require not only organisational skills, it is also a social process. The tutor will be the most important contact person during your research work. The mentoring process of homework is usually carried out during a lecture series, with the lecturer and the supervisor of your homework typically being the same person. This differs when you are developing and writing a thesis where the supervision process normally takes place within the contact hours of the lecturer or during special meetings which are organised for this purpose. Other options are possible – for example by phone or by e-mail.

The tutor will give you advice and hints on how to improve your work. You should be aware of the fact that the tutor has two main functions within the process of your developing and finishing your research project:

- they will be committed to helping you produce a good result,
- upon completion and submission of your work, they will write a detailed report on your work and grade it.

Generally you should act on the assumption of the ideal case: the tutor is friendly towards you personally, and they are professional and dedicated to supporting you while you are writing your academic text. At the end the tutor will give you a mark for your text. Advice given by the tutor should not be taken as negative criticism. Be careful! Keep your demands on your tutor within reasonable bounds. The tutor could interpret too many demands as evidence of a lack of independent thought. The appraisal differs from lecturer to lecturer and is also impacted by the topic, complexity and involvement of the tutor and your research topic. Finally, this basic principle should be remembered: the student writes the text and not the tutor.

Unlike homework, a thesis is usually supervised by two lecturers. The combination of lecturers depends on the examination regulations, the topic and on your choice. If applicable, one of the tutors can also be a person working in a company, provided that he or she fulfils the formal requirements for being a supervisor. In any case you should consider all persons involved and balance their interests and positions. Be careful not to offend anyone. It's very unwise to play one lecturer off against another. Your ability to communicate and your social skills are demanded here.

Self-reliance while writing an academic research text should not lead to the 'it's-my-baby' syndrome. It can be difficult to take an objective stance, especially when you are close to the topic. Valid objections and suggestions for improvement may sometimes be interpreted as annoying rather than helpful, or taken as personal criticism. Even though you see the project as your own 'baby' any advice from others should be taken seriously and not considered as negative. Even though you, as author of the research project, are ultimately responsible, you should accept the support offered.

The available time for a talk with the tutor is often tightly scheduled. You should therefore prepare for it well and think about your questions beforehand. The recommended way is to write down your questions and ideas in order to benefit from the discussion and to make the best possible use of the time. You should have elaborated a concept at this stage. Especially when working on an extensive project a draft is unavoidable and often demanded by the tutor. A written concept helps you to communicate with your tutor. It is thus strongly recommended that you write down your own ideas to compare them with the opinions and demands of the lecturer(s) and to clarify any misunderstandings. Furthermore a written concept usually offers more scope for feedback. At the beginning of your project it may be better to have an open discussion before you start writing several pages or even chapters, as this will help you avoid extensive modifications to your work at a later stage. When contacting your tutor – irrespective of the type of academic assignment – you should at least present them a concept which contains the following criteria and the corresponding answers:

- Working title – which topic do you want to work on?
- Academic research question(s) – what do you want to analyse in detail?
- Academic and practical relevance of your work – why and for whom is the work relevant?
- Rough outline – how is the text structured and in how much detail do you want to handle the sub-areas?

- Time management plan – how long do you need to finish the project?
- Basic literature – which sources of information seem to be relevant for you at the moment?

During the meeting it is recommended that you write down key words and phrases, and after the meeting you should write down from memory a record of what was said. The number, date and duration of the meetings should be in reasonable proportion to the scope of the text you have already produced.

It is useful to present single chapters to the lecturer as you produce them, rather than confronting them with an advanced version at a very late stage in your work. The advantage of presenting single chapters is that the feedback from the tutor comes at a point when it can still be integrated into the project. The basic principle is the same – the feedback on the single chapters gives the tutor an impression as to whether you are on the right track or if serious modifications are necessary. This will help you minimize the time required for corrections.

Before you present text passages or chapters to the tutor you should read your document in a systematic and in-depth manner to avoid spelling mistakes and typing errors. A committed tutor will inform you about orthographic errors but it is not their task to correct these. His function is to give you advice on the content, concept, central topic and on matters concerning the use of academic research texts, methods and projects. The tutor is not responsible for correcting orthography and grammar. In order to reduce errors, have friends proof-read your text! Besides correcting any orthographic errors they can help you identify incomprehensible or imprecise text passages, thus improving the quality of your work. Proof-reading does not mean that your friend becomes a tutor or co-author of your text.

You should appear, and appear punctually, for any meetings which have been arranged, and you should not cancel appointments at short notice. You should become familiar with the academic preferences, publications and activities of your tutor.

Yet another tip: your tutor will draw conclusions based on your organisational skills and your work ethics, so pay attention to these aspects (Ebster & Stalzer, 2017, p. 25 ff.; Theisen, 2008, p. 125 ff.).

R1.4	What is your experience of contact with tutors (head of department) while you work on an academic (professional) topic and what can be improved?	

2 Research Objective and Question

In this chapter you will consider the development of your individual academic research project. Starting a project comprises different steps. The first step is to work out an idea of interest. The next step is to integrate the idea into an academic background and to find a topic for your research. Creating a mind map is suggested (chapter 2.1). This should help you take the next step, which is choosing a specific topic (chapter 2.2). The next chapter will introduce you to the two possibilities of academic research – empirical and theoretical research (chapter 2.3). The last step is to develop a specific academic research question and think about the procedural method to deal with this question (chapter 2.4). This leads to the following learning objectives:

LO2.1	*I can generate ideas and arrange them into the corresponding academic research context. Referring to my problem-solving competence, I can link my ideas with my work environment.*
LO2.2	*I can assess my strengths and weaknesses and assess the impact on the choice of an academic research topic.*
LO2.3	*I know the difference between empirical and theoretical research. Furthermore, I know how and when to use or combine them to achieve valid findings.*
LO2.4	*I can identify problems, derive topics, structure them and develop research questions. I am familiar with this process, irrespective of professional or academic research matters.*

2.1 From Research Idea to Research Topic

Prior to writing an academic text, the candidate must choose a topic they want to research. At some universities the topic and tutors are drawn by lot (Krämer, 2009, p. 16). At the Faculty of Maritime and Logistics Studies in Elsfleth and especially for the M.Sc. degree course of International Maritime Management, all students are free to select a topic of their personal interest.

At the beginning of every academic project an idea has to be identified, a research topic found and a research question defined. This is the basis for all academic research and it has an important influence on the whole project and its success. This step is a big challenge for many students. The aim of this chapter is to familiarise you with the different techniques of identifying your ideas and creating a relation to the relevant academic approach (Ebster & Stalzer, 2017, p. 30 ff.). The following two processes will help you identify a topic for your academic research project:

1. reading literature related to your topic and to getting an overview,

2. defining the scope of the academic project (Theisen, 2008, p. 37) in relation to the different academic papers you read – the more progress you make in your studies, the wider the topic becomes (Bensberg, 2013, p. 37).

Generally two options can give you an initial idea for your academic research text. The first option is that the lecturer suggests topics of their interest. You can choose between them, take one and build on it. The other option is to come up with an idea of your own and then check whether the tutor is willing to accept and supervise it (Ebster & Stalzer, 2017, p. 34 f.). Arrangements are generally possible and negotiable but they cannot be guaranteed and are non-actionable. Certainly the degree of freedom concerning the work on the topic is considerable: nonetheless it should correspond to the degree course or the unit you are enrolled in. At many Universities of Applied Sciences a further aspect has to be taken into account; reference to the practical aspects of the work experience during your university studies (internships). The company you are working for during your practical placement can have a legitimate interest in requesting that you work on their project and solve issues related to it. It is very important for you to remember that your research project does not aim primarily to solve company issues. It is an academic project and has to comply with academic demands. Sometimes a practical topic appears more tangible and can be considered a first step towards your professional career. Nevertheless, do not forget that a practical topic also requires a theoretical basis. Beware of the risk of neglecting the theoretical academic basis that is fundamental to your research (Disterer, 2009, p. 62 ff.).

The approach to finding a research idea and topic is influenced by the educational background of the candidate. When starting an under-graduate course or working on homework, the usual way is for a student to take on a topic defined by the lecturer for the particular unit. This is good for your first project(s) because the first step is taken by the lecturer and they are very familiar with the topic and can give you good support. As aspirants for bachelor or master theses are more advanced in their studies, the majority will look for their own topics rather than take on topics offered by lecturers. Doctoral candidates, however, must work on their research idea and topic and set their objective themselves because it is an inherent task on the way to the doctoral level and demonstrates the candidate's ability to carry out research independently.

Working on a draft proposal by a lecturer may have certain advantages. We can assume that the lecturer

- is generally interested in the idea because their own research project can be delegated to the students in individual steps as 'building blocks' (Disterer, 2009, p. 60),
- can differentiate between 'suitable' and 'unsuitable' topics due to their experience,
- can give literature references to start you off.

You should develop an interest and figure out an idea for an academic research project yourself, either because you are interested in a particular topic, or because this is required (Ebster & Stalzer, 2017, p. 32). If you are given the opportunity to work on the proposal of your own project you

should do it very thoughtfully. It may be a difficult phase but the decision process itself constitutes the starting point in the search for adequate information sources. It is assumed that the lecturer and the company you may work in accept your research idea (Theisen, 2008, p. 37).

The preliminary decision has a major impact on your whole project. You will experience pleasure, interest and excitement while working on a topic of your own choosing, whereas there is a risk that you may work 'half-heartedly' on a topic given by the tutor which may not appeal to you at all. The project will require effort, concentration, creativity and accuracy and it is well worth brainstorming the topic (Disterer, 2009, p. 59 f.). In addition, your personal research interests can be realised when the decisions being made are your own, reached agreement with your tutor (Bensberg, 2013, p. 36).

Students tend to choose topics which reflect their prior knowledge and interests. The same is valid for the course of action taken in the production of their academic texts referring, for example, to conceptual description, calculation, structure and empirical analysis. Career opportunities which the topic may lead to can be a factor influencing choice.

Another opportunity is presented by the challenge of choosing a topic in a more distant discipline which will allow you to become acquainted with a new area of expertise (Disterer, 2009, p. 61 ff.). For instance, you can read journals and books referring to topics which are connected with your field of study and interest, but which additionally contain a totally different view or core area. You can also realise that this is an opportunity during your studies to practise for your professional life. Later you will also be confronted with new situations where you will have to weigh up facts and reach conclusions.

As outlined in the text above the possibilities of finding an idea and generating a topic for your academic research are manifold. To identify and develop ideas you can revert to different strategies such as those summarised and shown in the following figure:

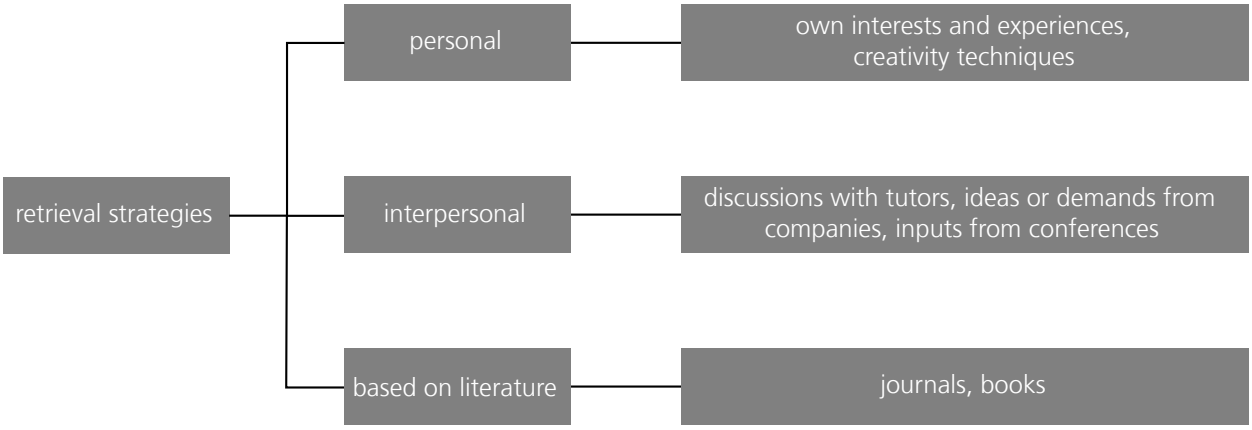

Figure 4: Retrieval strategies for academic research topics, following Ebster and Stalzer, 2017, p. 31.

The topic retrieval strategies are divided into the three categories: personal strategies, interpersonal strategies and those based on literature. The first group (personal strategies) covers the search for a topic taking into consideration one's own interests and experiences and with the help of creativity techniques:

- Own interests and experiences: they appear throughout your university studies as well as in your personal life. There may be phenomena at your faculty or in your everyday life that have awakened your interest. You may be interested in finding answers or have the wish to explain them. Initially it is not relevant that the topic is too broad or that it may or may not be a feasible academic research topic. Perhaps the essential sources of information might be unavailable or the data acquisition too wide-ranging for your type of academic research. Don't give up – look for solutions and don't censor your idea right from the beginning and reject it before you have considered the topic thoroughly (Ebster & Stalzer, 2017, p. 31).
- Creativity techniques: we will take a look at Brainstorming and Mind Mapping methods. Perhaps you are already familiar with them:
    - Brainstorming is widely-known and it serves to generate a huge number of ideas in a short time span. This can be achieved alone or in a group by writing ideas down without any structure in a short and intensive activity (Schawel & Billing, 2012, p. 44 f.). It is useful for every kind of topic and different ways of approaching it are possible. In Brainstorming, quality follows quantity; discussion and the rating of ideas should be left for a later stage.
    - Mind Mapping is a method which is used to structure a given topic and make connections visible between the different elements. A first step consists of writing the central idea in the middle of a piece of paper. Using nouns only is recommended. The second step is to write and connect the relevant sub-ideas, images and concepts. Arrows or lines can be used with different intensities to clarify different correlations. Mind Map-

ping can be used for any kind of topic, even if the logical structure is not totally apparent. With the help of Mind Mapping the topic is illustrated and structuring complex connections becomes easier (Bensberg, 2013, p. 94 f.; Rost, 2012, p. 225 f.; Schawel & Billing, 2012, p. 168 f.). Although the easiest way is to use a pen and a piece of paper, computer programmes are also available. The most common one is called Mindjet Mind Manager. A campus-wide licence is available for all students of Jade University of Applied Sciences, and free use of the software is available for one month. It is compatible with the Microsoft Windows and Apple Mac OS X operating systems. Alternative software is FreeMind, open-source software at no charge and platform-independent. The main advantage of using computer software is the possibility of extract the Mind Map to an outline which can directly be used by text processing software.

The second group (interpersonal strategies) encompasses the search for a topic by interacting with other people (of the same academic discipline). The different options are outlined as follows:

- Discussions with tutors: the tutors at your university are mentioned first. They are of the same academic discipline and they have a core area of research which ideally overlaps with your academic interests. As a consequence you may find a research topic which is both within your preferred area and the main field of research of the lecturer. If you are interested in research and are able to work within a given research project a topic can arise out of this project. This research topic can be used for your own academic text and as an integral part of the project as well.
- Ideas or demands from companies: the relevant professional experience can provide you with ideas and challenges. Topics based on real questions in professional life are especially apt for degree programmes of work and study. It is likely that your employer has topics of interest for you. In your research you can work on solving company issues while at the same time studying the topic within the context of your academic studies. Synergy can be generated and the interaction can have positive impacts on both your professional issues and your academic research project.
- Input from conferences: as well as from persons in your own environment you can gain insights at conferences. You can listen to fascinating presentations, get to know research findings or talk to experts in the field.

The third and last group (based on literature) covers the search for a topic by studying journals and books. Many articles contain questions and proposals for ongoing academic projects or the research discipline itself. Some even include explicit proposals for interested researchers (Ebster & Stalzer, 2017, p. 33 f.).

R2.1 What are your impressions concerning academic research ideas and topics when looking back at your under-graduate studies as well as your professional experiences?

2.2 Choosing a Topic

After having developed different topics or considered the offers by lecturers it is time to take the next step. One specific topic must be chosen and pursued. In the first instance the topic should be chosen according to your own interests. If you enjoy working on the topic and you are interested in the results the prospects of success are considerably higher than when working on a topic you are not much interested in. Your previous knowledge and competence are certainly decisive for your final result (Ebster & Stalzer, 2017, p. 34 f.).

Before defining the topic or accepting a topic from a lecturer or a company one should ask oneself some questions about one's own abilities. Here are some examples: What are my strengths (and weaknesses)? What am I interested in? In the comparison of crucial literature? In studying sources? In logical reasoning and reaching conclusions? Whom (if anyone) do I want to impress with my project? Am I heading towards an academic career? Am I interested in theoretical or practical relations? Do I need foreign languages and am I able to speak and write them? Am I familiar with computers and the required software? Do I need a lecturer who will give me detailed instructions or am I autonomous, knowing what to do and requiring only infrequent feedback (Krämer, 2009, p. 16-18)? Discussing these questions with your lecturer is advisable.

You should not only think about your own interests and strengths but also think about your relation to your possible lecturer and whether you get on well (Ebster & Stalzer, 2017, p. 34 f.). A project may also be developed in co-operation with a company or organisation. Opportunities for teamwork can arise and this will have an influence on your work, in that on the one hand the (academic) direction of your topic may change and on the other hand the company or organisation may assume expenses for data collection, business trips or congresses.

In the following some typical types of academic research texts are outlined, including a possible initial formulation of academic research topics:

- description (Illustration of …; Overview of …),
- explanation (Analysis of …; Appraisal of …),
- forecast (Challenges and opportunities of …; Prospects and hazards of …),
- design (Proposals for …; Approach to …),
- criticism or evaluation (Critical statement of …; Advantages and disadvantages of …) (Theisen, 2008, p. 38).

Another challenge when choosing a topic is to ensure it is not too wide, since the consequences of a widely formulated topic are diverse: the text becomes too long, the formulation of a precise academic question becomes impossible and it takes more than the appropriate time to complete (Ebster & Stalzer, 2017, p. 35). Avoid this by limiting the field of research, introducing regional/temporal restrictions on use of sources, point of view, main aspect, area of application, or use a specific example (Rost, 2012, p. 322). The following table lists some negative examples of too broad interpretations of possible topics and modifications suggesting improvement by limitation:

Negative examples of too broad interpretations of topics:	Modified, better and narrower suggestions for topics:
Consequences of slow steaming for the shipping industry	Impacts of slow steaming on the charter rates in the container shipping market
Challenges and opportunities of cost and activity accounting in the automotive industry	Calculation of the life cycle costs for a medium-sized vehicle using the example of the VW Golf V
Overview of organisation and leadership in shipping companies	Appraisal of human resources management on board German military vessels
Analysis of port logistics in Germany	Critical comparison of AGV and VC operated container terminals using the examples CTA and CTB in Hamburg, Germany

Table 1: Too broad and narrower interpretations of topics for academic research projects, own exposure.

Table 1 lists different topics for academic projects. Each line contains topics from the same area of expertise. The topics in the left column are not limited by any restrictions. It would be virtually impossible to write academic texts on subjects which are as broadly defined as these. The topics listed in the right column deal with the same subject but they are made shorter and more precise by concentrating on a sub-area of the particular field of research as well as by giving an example as a reference object. Limiting the scope will lead to a better, more individual result.

R2.2 Choose a manageable, concise topic based on your professional life, practical training or personal interest! Think about a topic as well as your experiences and challenges and share your thoughts!

2.3 Empirical or Theoretical Research

In this chapter you will learn about the difference between empirical and theoretical research. The basic principle is as follows: while theoretical projects are literature-related, empirical projects are based on work with given databases or on your own data collection (Bensberg, 2013, p. 36). Neither empirical nor theoretical academic research texts exist in a vacuum. They are based on existing findings and on knowledge to be discovered. Researcher can base their work on different sources of knowledge. In this process a differentiation takes place on two levels:

1. variety of the information search (secondary/derivative versus field/primary research),
2. origin of the information (literature versus empiricism) (Kornmeier, 2007, p. 107).

Consequentially, a matrix can be developed showing four possibilities for systematic generation of knowledge (see table 2):

generation of knowledge		origin of the information	
		literature	empiricism
variety of the information research	derivative	literature study (I)	'desk research' (III)
	primary	meta analysis (II)	'field research' (IV)

Table 2: Systematic generation of knowledge, according to Kornmeier, 2007, p. 107.

In the following, the different possibilities shown in table 2 are explained. The focus is on options I, III and IV. The meta analysis (combination II) can be disregarded in connection with under-graduate and post-graduate studies. It is very complex and serves to obtain general conclusions by carrying out an 'analysis of analyses'. Put simply, the meta analysis is a statistical analysis to summarise the results of several statistics in one statistic (Kornmeier, 2007, p. 137). The instrument is used comparatively seldom and is not outlined in the context of this unit. Options I, III and IV are more popular and therefore used frequently:

- Literature study (combination I) is basically the use of existing knowledge. The candidate must at least question existing opinions. Furthermore, literature research serves as a basis for a presentation of the 'state-of-the-art' in which the researching student will express his or her own thoughts and findings. In this context, the academic research approach means that they should be able to identify the most important sources of information, to work with the topic and be able to recapitulate up-to-date information from the research field, and to discuss it in a methodical and critical manner.

- 'Desk research' (combination III) refers to the fact that the candidate re-analyses data which has already been collected (at the desk). This way of secondary research can be advantageous. Possibilities are to consider existing data from a new perspective, under different circumstances or boundary conditions. Moreover, expenses and costs can be reduced and former analyses can lead to new ideas or further questions.

- 'Field research' (combination IV) includes the collection of new data. This can be necessary either because data is not available or not up-to-date. The research techniques differ and depend on previous knowledge and available resources. The core element is enquiry (Kornmeier, 2007, p. 107 ff.) although observations and experiments are also possible (Kornmeier, 2007, p. 158; Theisen, 2008, p. 89; Borchardt & Göthlich, 2007, p. 37).

An academic research text with a theoretical focus aims to handle relevant sources of information, especially literature, to answer the given research question(s). Examples for topics are comparisons of two different systems or strategies, or the exposition of the latest knowledge in an academic discipline. The development of theoretical models or research patterns is also possible. The basic principle differs when working on an academic research text with an empirical focus. The enquiry, observation or experiment aims to analyse, or show an effect or correlation between different causalities. The decision for or against one procedure is determined by different factors:

- The different academic assignments: an extensive collection of data while working on a short text for a unit is normally neither expected nor possible. The longer and more comprehensive the project becomes the more time is available for collecting and analysing one's own data, or working on existing data by re-analysing it.

- Field of study: this has a clear impact on the decision. While working in a field of study (or on a topic) in behavioural science (behavioural-science perspective, behaviouristic perspectives) the academic project will require an assessment of relevant data on a suitable topic (for example, psychology). If the field of study (or a topic) is in cultural and social sciences the project will require a discussion about the available literature and sources of information (for example, history). Other fields of study (for example, politics) offer the possibility of either key aspect of activity – theoretical or empirical. The decision is influenced by the unit or the preferred orientation of the research. Another example is the field of business sciences; if choosing a topic in the marketing area, an empirical approach seems promising and if choosing a topic in business law, a theoretical approach based on cases and textbooks may seem appropriate.

- Preferences of the tutor: different lecturers have different interests and requirements. They are influenced by their various areas of chief research, their knowledge of research methods and the time available for tutoring the projects.

- Time and amount of work: the development of an extensive academic research text chiefly based on working with literature requires a remarkable amount of work and time. Nevertheless, while working on an academic research text with an empirical focus some addi-

tional design steps may come up (the development of the method for the collection of data, the collection and the analysis of the data). On the other hand a well-founded discussion is especially relevant for theoretical texts and is demanded from the candidate.

- Topic: finally, in your research topic you must be able to work with empirical data. Does the relevant data already exist or are the relevant resources for collecting the data available (Ebster & Stalzer, 2017, p. 37)?

To put it in a nutshell, when working out your personal research topic you should think about both main strategies and decide which strategies are in line with your interests and strengths. In most (extensive) academic research projects a combination of methods is usually applied. The work is generally not only based on one strategy only but on a combination of both – the theoretical approach is combined with an empirical one.

R2.3 Think about different ways of generating knowledge and consider which could be relevant in connection with your topic 2.2. Share your thoughts!

2.4 From Research Topic to Research Question

In this chapter you will be familiarised with the next step: how to move from a research topic to a concrete research question. This step is essential because it will contain the problem to be solved or the question to be answered. In the following, the steps from thinking about an idea, putting it into context and concluding a question are extremely important. If you do not come up with a question you will not find an answer (Rost, 2012, p. 26). In the whole academic project, identifying and formulating academic questions in an answerable, relevant, precise and suitable way is nearly as demanding as answering the questions at a later stage (Ebster & Stalzer, 2017, p. 38 f.). The choice of topic and academic question(s) is very important and hence an adequate concentration will be necessary. It also requires previous knowledge and it affects the whole project in terms of the level of difficulty and the core area. Furthermore, the research question should be answered (Theisen, 2008, p. 37). When you have found your idea and topic you should ask yourself: What question do I want to answer with my academic research?

The academic research question(s) serve(s) as a specification of the chosen topic. Note that just a couple of questions or even one might be enough! Having too many questions leads to the danger of overflow. At the beginning of the writing process the question(s) should be formulated. Failing to do this can lead to some negative surprises: realising you have searched for the wrong literature, collected the wrong data or deviated from the intended research. These dangers can be avoided by formulating the question right at the beginning. In case of doubt it is better to work on one question in detail rather than work on different questions superficially. The formulation of the

question(s) defines the project's framework. Great care and attention are therefore required. The better the planning, the easier the definition of the outline and the search for literature will be. While thinking about the academic research question you may realise that you cannot identify a question or the question appears to be artificial or 'far-fetched'. In this case you should reconsider the topic.

Especially while working on an empirical topic it is frequently necessary to specify the academic research question during the project – this happens while working on the definition of the question and the so called hypotheses (more details follow in chapter 3). The academic research question is – as the name suggests – always formulated as a question and starts with one of the different question words (what, when, where, why, who, whose, which, how, how much, how many). Hypotheses, on the contrary, are formulated as declarations. They are reviewed in the course of the project.

Finally, you have to be aware of the fact that finding the topic and formulating a relevant research question is not a one-off process – it is rather a repetitive one. The higher the grade of knowledge the more the topic is appreciated. This can lead to a revision of the concrete definition of topic, question and hypotheses (Ebster & Stalzer, 2017, p. 37 ff.). For clarification purposes, the different steps in the process from the topic to the question(s) and the hypotheses are illustrated in the following table:

	task	grade of specification	position in the text
topic	catching the attention	low	front page
question	presentation of the academic research topic handled in the text	medium	introduction
hypotheses	clear definition of the topic and line of action for the review	high	before the presentation of the method

Table 3: Topic, question and hypotheses in the academic research process, according to Ebster and Stalzer, 2017, p. 40.

As you can see in table 3 the terms topic, question and hypothesis are different from the tasks related to them as their formulation and purpose are different. The more you go down in the table the more concrete the content of the tasks and the grade of specification gets. Furthermore, the position in the text illustrates the different steps in the project. A rough description is shown on the front page. Once you are more interested you go into more detail and read the introduction and

the topic will be made more concrete by the illustration and the academic research question itself. The same may happen again as you go into more detail and read the hypotheses and the research method.

R2.4	You have already gained experience in writing academic texts (home assignments, bachelor thesis, etc.). If you think back to your former texts, would you formulate and work on the topics, questions, hypotheses (if applicable), etc. in exactly the same way today again? Or would you rather change something? If no, why not? If yes, in how far would you change your approaches in order to improve your work?	

3 Philosophy of Academic Writing

This chapter introduces you to the theoretical background of academic research, for example, the way of thinking you will have to adopt in order to succeed with your personal academic research projects. Some basic concepts are explained and different approaches to academic research are presented. We start with some ideas on the theoretical background of academic writing (chapter 3.1), continue with some underlying principles of the research process (chapter 3.2) and finish by introducing the concepts of logical reasoning (chapter 3.3). These contents lead to the following learning objectives:

LO3.1	*I am familiar with the common outline of academic texts including the different chapters they contain.*
LO3.2	*I am familiar with the theoretical background of academic research, and I can formulate research questions and hypotheses.*
LO3.3	*I am familiar with inductive and deductive research approaches. In addition, I know the pros and cons and I can apply both approaches to my own topics.*

3.1 Theoretical Background of Academic Writing

Academic writing can be considered as a report of research activities which have been carried out. Unlike research and development (R&D) efforts in business and industry which centres around the development of new products, academic research primarily focuses on expanding the general knowledge of the research area while enhancing the methods adopted to increase this knowledge. According to Shuttleworth and Wilson (2008), "[i]n the broadest sense of the word, research includes any formal gathering of data, information and facts for the advancement of knowledge."

By writing and publishing academic papers you inform other people about the outcomes of your research and help them avoid any overlapping work. By bringing the results of your research into the public domain, the body of knowledge in that specific area will be extended and new research questions may arise.

Academic writing aims to document the newly acquired knowledge of a research project in a systematic manner and to introduce and explain new research methods which have been developed. The delivered academic text (for example, your master thesis) is only a description of your research and it is not the research itself. Nevertheless, most often the academic paper is the only available document to report on the progress of a research project. So due diligence and care should be exercised in its preparation.

In the case of a graduate or post-graduate thesis, the research report should also reflect the student's ability to tackle a research question independently. Your ability to carry out a research project is assessed on the basis of the academic papers (homework, presentation, thesis, etc.) you deliver throughout your studies.

3.2 Underlying Principles of the Research Process

Any academic research project needs a clear structure which enables its readers to study the research questions, adopted methodology, data collection and data analysis as well as the summary of the project's results. Given the wide scope of possible research questions, different methodologies may be adopted. These include comparative, descriptive, experimental, historical, naturalistic, philosophical and practical approaches, although this short list cannot by any means considered to be exclusive.

All academic texts start with an introduction to the research topic. This introduction aims to inform the readers about the research topic itself and outlines the methodology, data collection and analysis. The introduction also raises the research questions. These can be formulated as real questions which are answered by the research you carried out (chapter 2), but more often the research questions are defined as hypotheses.

A hypothesis is a statement which gives a suggested explanation for an observed phenomenon that the research tests for its validity. The following table displays examples of research questions and hypotheses:

Research question:	Hypothesis:
Why do I find more traffic on my way to work on Mondays?	On Mondays more people go to work using their own car.
Do freight rates express the current shipping market situation?	A strong correlation exists between freight rates and the current shipping market situation.
Can team work be improved by reducing the number of a team's members?	Smaller teams improve the quality and effectiveness of team work.
Does marketing help ports to increase their throughput?	An optimal marketing strategy helps ports to achieve a higher throughput.

Table 4: Examples of research questions and hypotheses, own exposure.

As illustrated by these examples, formulating hypotheses assists you in defining your research topic in a precise and unambiguous manner. The hypothesis already summarises the outcome of your research activities which will concentrate on finding ways to prove that your hypothesis is true.

In many research areas, hypotheses are formulated in a negative way (for example, Smaller teams DO NOT improve the quality and effectiveness of team work.). This so-called 'null hypothesis' is usually used because it is easier to prove that it is wrong than prove that a positive hypothesis is true. This aspect will further be discussed in chapter 6.

After introducing your topic and formulating one or more research questions or hypotheses, an overview of the existing research in this specific area is expected. This literature overview helps the reader to identify the exact focus of your research and at the same time it provides good evidence of your preparedness for the research, in terms of your familiarity with relevant and recent research papers.

The next step is the explanation of how you collected the data your research is based upon. It is not necessary that you collected the data yourself (chapter 4), but the reader needs to know which information has been used in order to be able to replicate your research or to apply the same method to other data sets.

After giving an account of the data collected the next step is to explain how you analysed the collected data. Here, you are expected to explain your methodology in detail and to describe how you applied the method to your research data.

You finish your research report by drawing conclusions and explaining the outcome of your research. This is also the right place to refer again to your research questions or hypotheses and explain if and how you have been able to answer them or found them to be correct or false.

R3.1	What is the difference between research questions and research hypotheses?	
R3.2	Why should data collection and data analysis be treated in two different sections of your academic text?	

3.3 Logical Reasoning[1]

Logical reasoning is part of the everyday life, as observations, experiences and information result in conclusions. This process is more or less intentionally (or unintentionally), happens all the time and starts with mundane things. For example, we conclude from a sky covered with dark clouds that it is about to rain soon. When we plan to leave the house, we will take an umbrella or a rain jacket with us. In other words, observations, experiences and information that were previously unorganised are related to one another and therewith conclusions are drawn. In science, the same thing happens, but in contrast to everyday life, it happens using *systematic* approaches. Observations, experiences and information are processed using certain principles and rules in order to arrive at conclusions. Moreover, conclusions are evaluated to assess to what extent they provide appropriate explanation patterns for similar experiences, predictions as well as future events or circumstances. Such coherent systems are called 'theories' or 'models'.

Arriving at a conclusion is one of the essential parts of (your) academic research. Generally, two (three) different ways of reasoning exist which allow you to draw conclusions:

- Deduction or deductive reasoning: "An approach to the relationship between theory and research in which the practitioner conducts research with reference to hypotheses and ideas that have been inferred from theory. Compare with inductive." (Clark et al., 2021, p. 607) In other words: Deriving predictions and explanations from laws and theories (Chalmers, 1976/1999, chapter 4).
- Induction or inductive reasoning: "An approach to the relationship between theory and research in which the researcher uses the research results to generate theory. Compare with deductive." (Clark et al., 2021, p. 609) In other words: Deriving laws and theories from facts acquired through observation (Chalmers, 1976/1999, chapter 4).
- Abduction or abductive reasoning: "A form of reasoning with strong ties to *induction* that grounds social-scientific accounts of social worlds in the perspectives and meanings of participants in those social worlds." (Clark et al., 2021, p. 604; emphasis in original) So, abduction is about the search for (unknown) causes which, together with a (known) theory, can plausibly explain an observation; we often find this approach in everyday life (Kornmeier, 2007, p. 82).

In the following, we will concentrate on deductive reasoning and inductive reasoning and will come back to abductive reasoning later in chapter 3.6. Induction and deduction are shown in figures 5 and 6 below; please refer to these recommended authors if you feel the need to revise this: Clark et al., 2021; Wallace, 1971/2017; Chalmers, 1976/1999[2].

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[1] In general, this chapter and all the following chapters 3.4, 3.5, 3.6 and 3.7 are somewhat technical. Nevertheless, as a post-graduate student, you must be familiar with logical reasoning, the different approaches, their characteristics as well as pros and cons. Moreover, you must be able to identify them in texts written by others and apply them in your own work (for example, assignments and proposals); we will come back to this later.

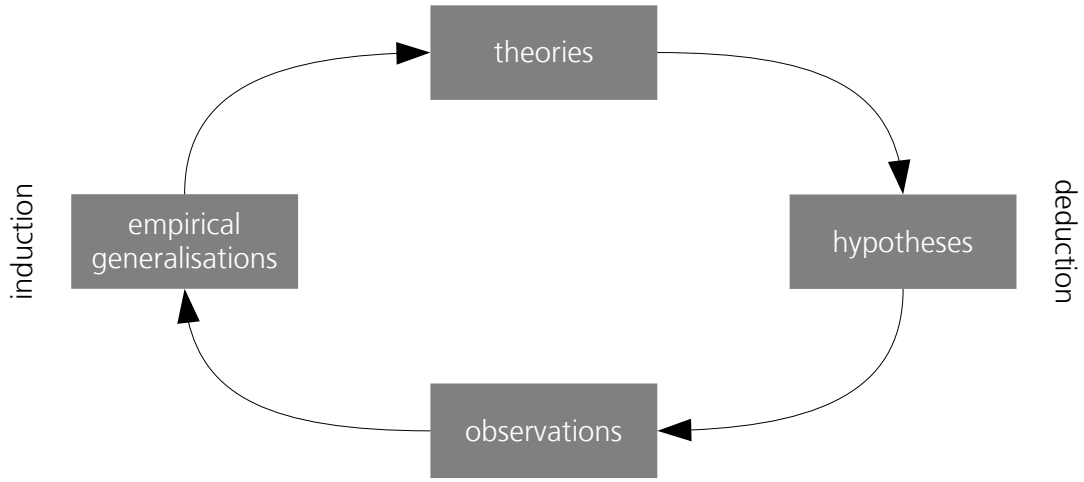

Figure 5: The scientific process, following Wallace, 1971/2017, p. 18.

Chalmers (1976/1999) puts it in a slightly different way which we have attached in the following for your convenience, too:

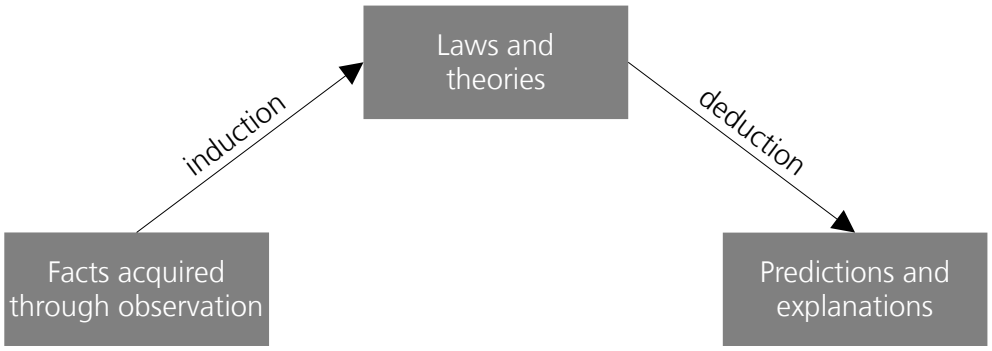

Figure 6: The scientific process, following Chalmers, 1976/1999, p. 54.

As you can see, both figures include the elements of laws and theories, initial conditions, predictions and explanations as well as induction and deduction.

Deduction

In deductive reasoning, you base your conclusion on general information which you narrow down to a specific hypothesis which can subsequently be found to be true or false. Here, the conclusion must follow the premises in an analytical way leading to a logical coherence. The following examples illustrate deductive reasoning:

[2] We refer to the original edition of the book in the English language as this study text is written in the English language. However, the book is also available in German translation (Chalmers, 2007).

Example 1: (deduction)	All organisations need management. Company A is an organisation. Company A needs management.
Example 2: (deduction)	Cities located near the equator do not have four seasons. Singapore is located near the equator. Singapore does not have four seasons.

In a 'top-down' manner, logical conclusions are based on general premises. If premises are true, the conclusion will also be true. If they are false, the conclusion will also be false.

Example 3: (deduction)	"All cats have five legs. Bugs Pussy is my cat. Bugs Pussy has five legs." (Chalmers, 1976/1999, p. 43)

Here, it is immediately striking that the premise is wrong and therefore the conclusion is wrong, too. However, in terms of how deduction works this example is perfectly valid. Moreover, this result is also evident from 'everyday knowledge'.

Induction

In contrast to deductive reasoning which distils general information into conclusions by logical reasoning, in inductive reasoning, you proceed in a 'bottom to top' manner, for example, from particulars to generalisations. If your research project includes data collection which you analyse in order to come to conclusions, your reasoning will be inductive, as you depart from a limited sample of specific examples from which you generalise. Inferences made on the basis of a given data set can never be absolutely true; instead, you will always deal with more or less probable outcomes. Induction is therefore called a probabilistic approach. The approach corresponds to the following pattern:

Example 4: (pattern of induction)	"The principle of induction worked successfully on occasion x_1 The principle of induction worked successfully on occasion x_2 etc. The principle of induction always works" (Chalmers, 1976/1999, p. 51; emphasis in original).

Unlike deductive reasoning in which the conclusion is true if all premises are true; induction can lead to wrong conclusions even if all premises are true (Vickers, 2018/2022). In the same fashion, an identical set of particular data can lead to different conclusions. The process of drawing conclusions from a particular observation is referred to as hypothesis construction.

The following examples are all based on inductive reasoning:

Example 5: (induction)	In a given school class nearly all boys are taller than girls. All boys are taller than girls.
Example 6: (induction)	Our company makes more profit if we allow people to work from home. Allowing people to work from home makes companies more profitable.
Example 7: (induction)	All the swans we have seen are white. Therefore, all swans are white.

However, you have to be careful. We will now come back to figures 5 and 6. Within the context given, laws and theories which constitute the scientific basis or knowledge are derived from observation, experiments, etc. (induction). As soon as such laws and theories are available, they can be used in order to make predictions or give explanations in other contexts, etc. We will now have a look at an example:

Example 8: (induction)	"1. Fairly pure water freezes at about 0°C (if given sufficient time). 2. My car radiator contains fairly pure water. 3. If the temperature falls well below 0°C, the water in my car radiator will freeze (if given sufficient time)." (Chalmers, 1976/1999, p. 54)

The example above is valid from a logical point of view. It is possible to deduce the prediction (3) from the scientific knowledge contained in the premises (1, 2); as long as the premises are true, the conclusion/prediction must be true, too. However, the truth of these three arguments must not be established by this or any other deduction. On the other hand, in inductivism the source of the scientific truth is experience (observation, etc.) but not logic. Following this view, the law or theory (1) was ascertained by direct observation of the process of freezing water. So, once the premises (1, 2) have been confirmed by observation (induction), "then the prediction 3 can be *deduced* from them." (Chalmers, 1976/1999, p. 54 f.; accentuation by authors)

3.4 Examples for Deductive and Inductive Studies/Research Approaches

Below, two examples (studies/journal articles) are presented for illustration purposes – both studies are related to maritime topics –, whereby the authors of one study apply a deductive approach while the authors of the other study apply an inductive approach for linking theory and empirical data. The differences between the approaches taken also result in different outlines of the corresponding texts. This applies not only to the two examples presented here but also to such academic research texts (articles, books, etc.) in general; this aspect will be examined in more detail below in the context of official issues and requirements as well as writing up quantitative and qualitative research (see chapters 7.1 and 7.2).

A Deductive Study

Pauksztat et al. (2021) investigate "[…] the impact of the COVID-19 pandemic as well as the effects of respondent and work-related characteristics on seafarers' self-reported symptoms of depression and anxiety. Data came from two cross-sectional convenience samples of seafarers on international commercial vessels, surveyed before ($N_{pre\text{-}pandemic}$ = 793) and during the pandemic ($N_{pandemic}$ = 504). […]" (p. 1)

They start with a description of the background (literature review on demands and impacts on mental health of seafarers in general as well as the results of Covid-19 pandemic in such terms in particular) and proceed with the presentation of the Job-Demands-Resources model (theory). Based on this information, they derive two hypotheses:

"**Hypothesis 1.** Mean levels of depression reported by seafarers during the COVID-19 pandemic will be higher compared to mean levels of depression in the pre-pandemic sample.

Hypothesis 2. Mean levels of anxiety reported by seafarers during the COVID-19 pandemic will be higher compared to mean levels of anxiety in the pre-pandemic sample." (p. 3, emphasis in original)

In the further course, the authors carry out a secondary analysis of two surveys A and B and test their hypotheses: "[…] we found a significant treatment effect both for depression […] and anxiety […], indicating significantly higher average levels of symptoms of depression and anxiety during the

pandemic than before. This provided support for Hypotheses 1 and 2." (p. 8) As a next step, they discuss their results in a wider context, namely in terms of practical implications, limitations and future research. The article finishes with a conclusion.

The article shows the deductive approach that was carried out by the authors. They came up with a problem, studied the theoretical background and narrowed down what was already known to a new or given problem as they formulated and tested aforementioned hypotheses. Therewith, they arrived at new knowledge (conclusion); the approach is in line with the concept shown above.

An Inductive Study

Simon and Fernandez (2016) investigate maritime piracy experiences of Filipino seafarers. They explore the following research question (and further sub-questions): "How do Filipino seafarers understand and make sense of their experiences of maritime piracy?" (p. 41) For answering the research questions, they carried out three semi-structured individual interviews with Filipino seafarers who "have had at least one firsthand encounter with pirates onboard the vessel on which they worked." (ibid.) They recorded the interviews and carried out an interpretative phenomenological analysis: "From the experience of maritime piracy, four cluster themes emerged: fear and helplessness, holding onto protocol, prayer as an automatic coping response, and the importance of family. Respectively, these themes described the seafarers' emotional, behavioral, and cognitive reactions to their experiences of piracy." (p. 42) In the further course they discuss their results in a wider context, too (as discussed above in terms of the outline of the deductive study), and moreover, they arrive at implications for trauma research in general as well as interventions for piracy-affected seafarers.

The article shows the inductive approach that was carried out by the authors. They present some prior knowledge, come up with a research question (and further sub-questions) and interviewed people who can provide answers to their questions or, in this case, who have been victims of piracy in the past. Based on that, they carried out an analysis and discussed their observations – which are context-related, specific and focus on understanding the meaning – with what was already known (theory) as well as to what extent their results and interpretations are transferable to other contexts. Therewith, they derive their own theoretical ideas from the interviews (data) rather than being formed from literature before they had carried out their analysis.

Further studies

Below, more examples (studies/journal articles) are presented in a very brief manner for illustration purposes following Clark et al. (2021, p. 21 f.) and Bryman (2012, p. 25 f.).[3] These examples are not related to maritime topics, although they are particularly suitable for illustrating and highlighting the differences and similarities between deductive and inductive research approaches. You can for further details search for and study the original studies. We start with the presentation of two further deductive studies:

[3] Clark et al. (2021) and Bryman (2012) are two different editions (fourth and sixth) of the same book.

1. Röder and Mühlau (2014) analyse adaptation processes of immigrants in Europe: "A substantial share of Europe's population consists of immigrants and the children of immigrants. Using European Social Survey data, this study examines whether the gender-egalitarian values of immigrants are shaped by the gender relations in their origin country and whether they adapt their values to the standards of their residence country. The analyses show […]" (p. 899) The authors start with a literature review and study relevant topics for their analysis. These are gender egalitarianism, gender ideologies, intergenerational and intra-generational acculturation as well as gender differences. Based on the theoretical part, the authors define five hypotheses; some of them divided into two sub-topics (a, b). As a next step, they describe in how far they proceeded with the extraction and processing of data from the European Social Survey. In other words, they re-analyse an existing set of data; we have discussed this above, see chapter 2.3. As part of the results section, they test the hypotheses, present their findings and discuss them in a wider context. The text finishes with a conclusion and discussion, followed by a notes section and list of references.

2. Kelley and De Graaf (1997) analyse religion as a central element of modern life and its impacts on world-views, perspectives, etc.: "How much does a nation's religious environment affect the religious beliefs of its citizens? Do religious nations differ from secular nations in how beliefs are passed on from generation to generation? To find out, we use data from the 1991 International Social Survey Programme collected in 15 nations from 19,815 respondents. […] We find that […]" (p. 639) The authors start with a chapter on theory and derive three hypotheses (1, 2a, 2b). In the further course, they present data, measurement, methods and models as well as results. In the results section they apply a diagonal reference model, test their hypotheses and discuss their findings. The text finishes with a conclusion, followed by the list of references.

In the following, we present two further inductive studies:

1. O'Reilly et al. (2012) discuss the grounded theory[4] (GT) method. They start with an explanation of the approach, its fundamentals, advantages but also pitfalls which hamper an appropriate use. Throughout the discussion, the authors refer to an example, a 'recently' completed GT study of the first author, which is called the *Silo Study* (O'Reilly, 2010): "The Silo Study was designed to explore ways to develop lasting relationships between customers and companies and better understand the nature of customer-company interactions." (O'Reilly et al., 2012, p. 249, emphasis in original) Therefore, Kelley O'Reilly conducted 18 in-depth interviews on interactions between customers and front-line employees and analysed the data within a GT framework. The data collection was supplemented by in-store observations, which allow "a view of retail employees and their customers in their natural habitat" (O'Reilly, 2010, p. 42). The term 'silo study' refers to the idea of workers who see themselves working in a service silo, namely separate areas from which they can not easily break out. This is one key idea which emerged from the data during the analysis. Clark et al. (2021, p. 22) summarise: "The idea that people work in silos […] may seem in-

[4] "An iterative approach to the analysis of qualitative data that aims to generate theory out of research data by achieving a close fit between the two." (Clark et al., 2021, p. 608)

evitable and like common sense, but O'Reilly noticed that the theoretical construct of the silo had a different meaning in this context because the areas had been strategically created by senior managers. Service silos were meant to act as mechanisms of control by constraining what front-line employees could do, and they were introduced in response to the management's recognition that its existing arrangements could not cope with the volume of activity. The silo approach had implications for the quality of employees' relations with customers." O'Reilly (2010, p. 116) in her dissertation sums up: "In contrast, in a traditional service silo or Customer Service Center, it is more likely that deep knowledge may be acquired only amongst a small group of employees that work in the Service Center. For instance, when I asked John about how I would return or exchange a product with him, he said sarcastically: 'Well I can't really return that defective product for you Mrs. Customer… I know it is only 69 cents, but I can't walk to the shelf and get you one that works. I am going to give you a sticker and you've got to go to a separate line, because the company doesn't trust me to make 69 cent decisions…'" John's reply clearly points out the fact that he has not the permission to deal with such issues himself, even though the amount is not worth mentioning. In summary, the inductive character of the study refers to the fact that the theoretical idea of the 'service silo' as control strategy of the management comes from the data; it was not being formed or even 'seen' before Kelley O'Reilly had carried out her data collection.

2. Charmaz (1991; 1994) studies people who face chronic illness and compared results of men and women with such conditions. She summarises in one of her reports (1994, p. 269): "Chronic illness frequently comes to men suddenly with immediate intensity, severity, and uncertainty […, which result in] different identity dilemmas. This paper explores men's identity dilemmas by studying how men experience chronic illnesses and by looking at how assumptions about masculinity affected their identity. The paper explores four major processes: […] The data are derived from forty in-depth formal interviews of twenty men, informal interviews with these men, and an extensive collection of published and unpublished personal accounts. The data were analyzed through the strategies of grounded theory." In the further course, Kathy Charmaz (1994, p. 270) presents the background and derives six research questions, for example, the first one is: "What is it like to be an active, productive man one moment and a patient who death the next?" Bryman (2012, p. 26) summarises: "She argues that a key component of men's responses is that of a strategy of preserving self. Although the experience of chronic illness invariably necessitates a change of lifestyle that itself occasions a change in personal identity […]." On the other hand, this also means to maintain "essential qualities, attributes, and identities of [the] past self that fundamentally shape the self-concept." (Charmaz, 1994, p. 278) In contrast to that, she finds that women were less reliant regarding this. Based on her theoretical considerations and the data collected, she works out factors relating to self-preservation, which means „conditions that shape whether a man will reconstruct a positive identity or sink into depression." (Charmaz, 1994, p. 284 f.) In this context, she considers it crucial whether chronic ill men have access to actions that enable them to build on their previous everyday life or their previous self and to transfer it into the future, for example, through professional or leisure activities. Again, in

summary, the inductive character of the study refers to the fact that the theoretical idea of the 'preserving self' as strategy comes from the data; it was not being formed or even 'seen' before Kathy Charmaz had carried out her data collection.

As mentioned above, you can find further details in the original articles. However, the very brief summaries show that the approaches are more or less typical for deductive research or inductive research respectively. We will discuss the differences and similarities in some more detail in the following section.

3.5 Differences Between Deductive and Inductive Studies/Research Approaches

Deductive approaches are often associated with quantitative research, while inductive approaches are often associated with qualitative research (Clark et al., 2021, p. 21; Schreier et al., 2023, p. 19); probably you have already derived that while reading the summaries of the examples stated above (or perhaps even the whole studies/journal articles). However, all these examples are not exemplary or representative, although they all provide some features that can often be seen in terms of the presentation of results and the structure of the corresponding scientific texts accordingly.

In addition, you have probably realised that the general ideas or aims of the two approaches are different. Research interest of quantitative researchers or studies respectively – Clark et al. (2021, p. 144) in this context refer to preoccupations and grounded beliefs of quantitative researchers – is on: "measurement, causality, generalization, and replication" (ibid.). In contrast, research interest of qualitative researchers or studies respectively – Clark et al. (2021, p. 353 ff.) in this context also refer to preoccupations and grounded beliefs of qualitative researchers – is on: "Seeing through the eyes of the people being studied, Description and the emphasis on context, Emphasis on process, Flexibility and limited structure, Concepts and theory grounded in data" (ibid.). These differences result from the fact that researchers are influenced by contrasting beliefs and preoccupations (as a result of their education or attribution to 'schools of thought'[5]) regarding their understanding of

[5] In this context Culnan (1986) refers to the term of 'invisible colleges' which is inherent to innovative research: "Researchers in any academic discipline tend to cluster into informal networks, or 'invisible colleges,' which focus on common problems in common ways (Price 1963). Within these networks, one researcher's concepts and findings are soon picked up by another to be extended, tested and refined, and in this way, each person's work builds on that of another. The history of the exchanges between members of these subgroups in a discipline describes the intellectual history of the field. Subsequent citation by one researcher to the prior work of another scholar provides one means of documenting this history."

what constitutes acceptable or *good* knowledge. While quantitative researchers refer to natural science approaches, for example, positivism[6], in contrast qualitative researchers refer to interpretivism[7] (Clark et al., 2021, p. 23 f.).

In hand with these facts goes that research approaches are different (what you already know). The process of deduction is: Theory → Hypotheses → Data collection → Findings → Hypothesis confirmed or rejected → Revision of theory (Clark et al., 2021, p. 20). The process of induction is inverse (see above, especially figures 5 and 6; we will discuss that in more detail below). This also leads to the fact that deductive research approaches or strategies in terms of the relationship between theory and research (empirical data) are mostly more or less (in other words: ideal-typical) linear or sequential. Thus, it is very unlikely as well as hardly possible that amendments will be considered during the research process. This refers, for example, to the data collection method which will not be revised during the phase of the data collection. This also, for example, refers to the data collection which will not be extended once it has been finished and the data analysis has been started. In other words, decisions made or approaches taken at the beginning can hardly be reversed later on (we will take on this aspect again below). Hence, a very thorough preparation of a study and all steps to be taken (literature review, pretest of data collection instruments (if applicable), consultation of colleagues, etc.) is especially in quantitative research of utmost importance. Once the planning is finished, more practically, linearity means that the planned phases are processed in sequential order one after the other; there is hardly any overlap of different steps. Nevertheless, the different phases of the research process are very closely interconnected because, as already mentioned, earlier decisions have a fundamental impact on the further course of the research. At the same time, aspects or requirements that become relevant or come into play later in the course of the project, for example, during the data analysis phase, must be thoroughly considered during the planning phase. For example, if you forget to ask some demographic data (be it just one question missing in the questionnaire), you may not be able to carry out the data analysis as initially planned

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[6] "*Positivism* is an epistemological position that argues for the use of natural science methods to study social reality and beyond. The term stretches beyond this principle, and different authors describe its elements in varying ways." (Clark et al., 2021, p. 23; emphasis in original) Generally, descriptions include the principles of phenomenalism (things/phenomena confirmed by the senses can only be considered), deductivism (hypotheses are derived from theory and tested), inductivism (observations provide the basis for (new) laws or theories) as well as the necessity of researches carried out have to be 'value-free'/objective. Moreover, there is a need for scientific statements; normative statements are not acceptable (ibid.).

[7] "*Interpretivism* is the term often used to describe an alternative to the positivist epistemology that has dominated the social sciences for decades. It is based on the view that there are fundamental differences between people and the objects of the natural sciences. Therefore, social scientists need to distinct research methods that respect the differences between the natural world and the human one. These methods require the researcher to grasp the subjective experience of social action, what these experiences mean in practice, how those experiences and meanings are understood by others, and why they are interpreted in such ways. Interpretivism has been influenced by a number of intellectual traditions, including Weber's idea of *Verstehen*; the hermeneutic–phenomenological tradition; and symbolic interactionism." (Clark et al., 2021, p. 25; emphasis in original)

(Döring, 2023, p. 23). If you, for example, do not ask participants how old they are, your database does not allow any analysis in terms of age, namely younger and more mature participants, or in a wider context in terms of differences between generations.

In contrast to this, inductive research approaches are often characterised by so-called iterative strategies which means that the researcher(s) are "moving back and forth between data and theory." (Clark et al., 2021, p. 20) In other words, assumptions, instruments, etc. in qualitative research are regularly *flexibly* adapted during the research process in a way that it matches with the research subject and that it is suitable in order to answer the questions in focus (Schreier et al., 2023, p. 209). They refer to the term of emergent flexibility (ibid.). The necessity of such flexible approaches is described in a similar manner as iterative strategies by Clark et al. (2021, p. 20) as well as circular approaches or strategies by Witt (2001, chapter 3; see also Döring, 2023, pp. 26-28).

Iterative strategies are necessary in inductive or qualitative research projects due to the research interest, which is the most comprehensive presentation and understanding of the subject of research in focus possible in terms of everyday orientation, holistic approach, openness as well as exploration. At the same time, representativeness or statistical validity is explicitly *not* the aim. Moreover, it is the nature or logic of such investigations to apply open and non-standardised research strategies. It is more about 'rulelessness' and creativity; emphasis is put on such research strategies that are suitable for an in-depth analysis of the research subject or object and to answer the research question(s) in focus best. Flexible or circular approaches here mean that different steps within the research process are run through several times; the results of the previous step influence the subsequent step and so on. This especially applies to the steps of the selection of the research method or design, research subjects as well as the methods of data collection and data analysis. Running through this process several times results in the specification, improvement or even, if necessary, the correction of procedures and results. This also applies in a broader way to the whole research process from a vague understanding of the research idea and research question at the beginning until the detailed presentation of the results, the answers to the research question or the further development of theory at the end. (In the case of deductive or quantitative approaches, this aspect can only be taken into account upon completion of one investigation if the results are proceeded further by taking them into account in terms of the planning of a subsequent (new) investigation; see above.) On a more practical level, this means that researchers often have a rough understanding of the research subject only at the beginning. This, at the same time, initially allows only a rough planning of a few steps, for example, the preliminary decision for a specific data collection method, of a person to be interviewed or an interview guideline to use. All such decisions in inductive research for or against one or another approach can have consequences both in one direction, for example, on how to proceed in the further steps, and in the other direction, for example, on the re-formulation of the research question. The research process develops step by step and steadily improves, which can hardly be planned and determined at the beginning or even in advance (Witt, 2001, chapter 3).

The two different approaches are illustrated in figure 7 below:

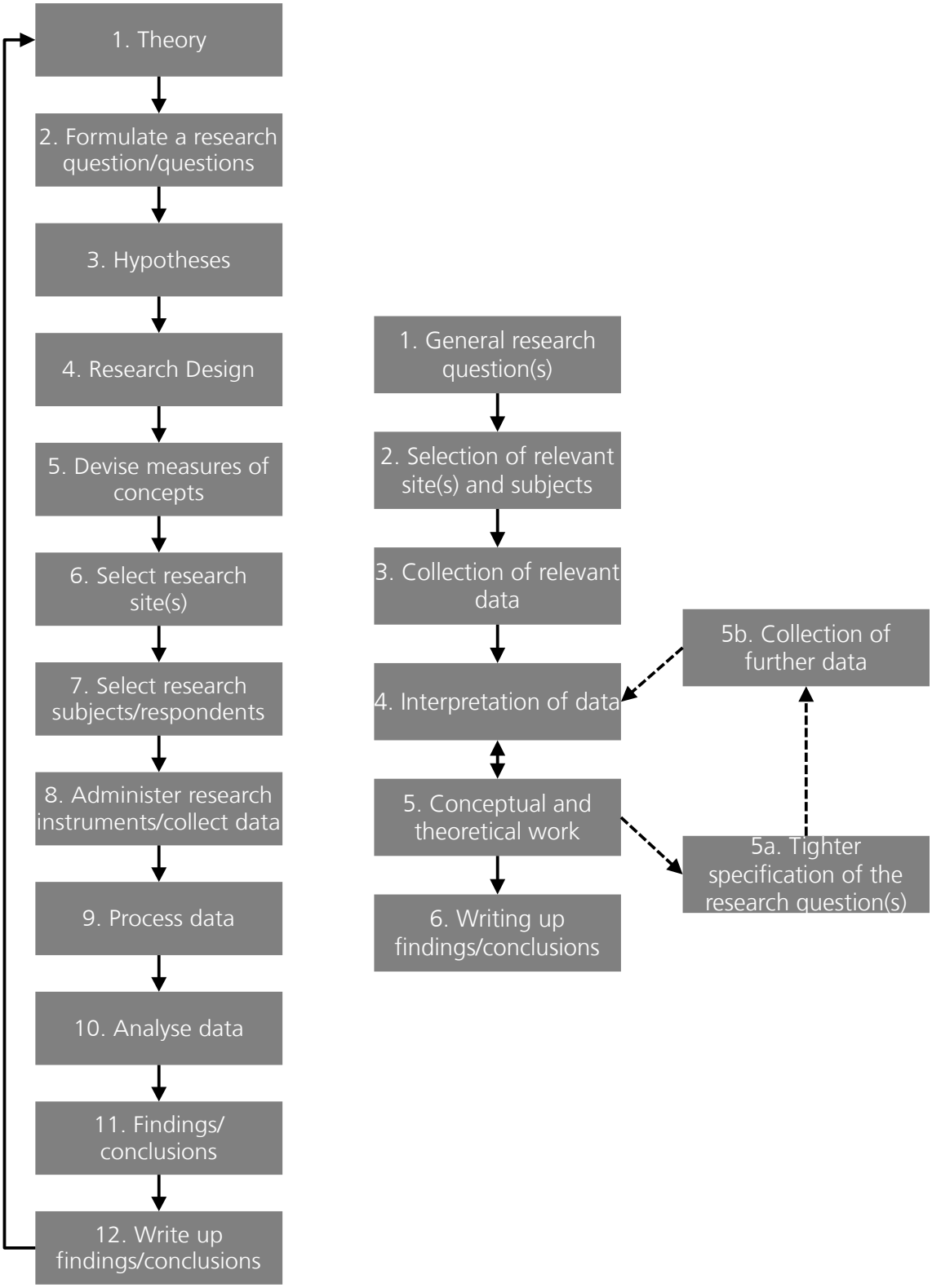
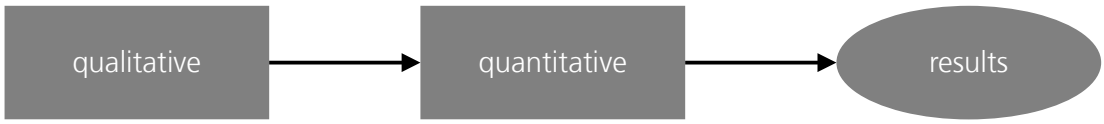


Figure 7: The process of quantitative research (left) and qualitative research (right), according to Clark et al., 2021, pp. 147 and 358.

You are now familiar with the different research approaches of quantitative research and qualitative research. This also includes the differences and similarities between these two approaches. However, we would like to mention one important aspect, which already has been discussed indirectly. Hypotheses that have been developed in the context of an (inductive) study based on collected data must not be tested on the same data; it is not decisive that they may possibly not be tested due to the characteristics of the collected data, for example, which can typically be assigned to the qualitative spectrum. The hypotheses were developed based on the distribution of the characteristics and properties of the sample. A test of the hypotheses must therefore be carried out using a new sample or data collection respectively (Döring, 2023, p. 152).

Quantitative and qualitative research designs might be integrated in four different ways which are described hereafter and followed by schematic drawings (Steckler et al., 1992; Mayring, 2001):

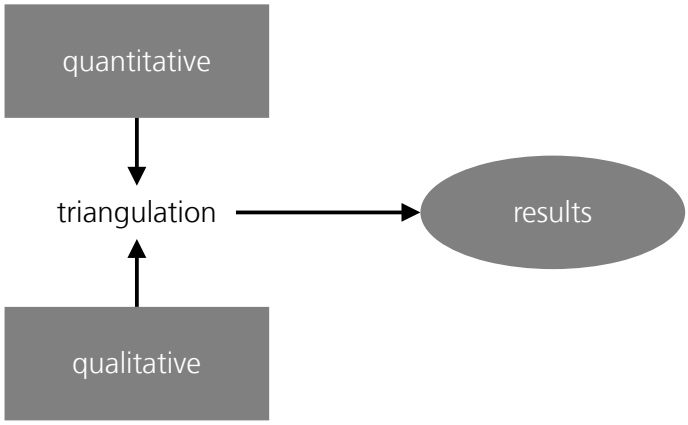
1. The first possible approach is a 'classical' one. Here, an exploratory (qualitative) pilot study serves the purpose to develop hypotheses, which is followed by an explanatory (quantitative) study that tests the hypotheses; these two subsequent steps are part of one study.



2. In the next possible approach, the general idea is the same but the two aforementioned steps have a higher relevance. Therefore, one study is dedicated to each of the two steps. First, a qualitative study is carried out and fully evaluated, before in the second step and study respectively the results are taken up, generalised and verified using quantitative methods.

3. It is also possible to integrate qualitative and quantitative analyses in the opposite direction. A completed quantitative study precedes a qualitative study. This makes the results easier to interpret; for example, case analyses can be used to interpret the direction of possible causality in correlations. Quantitative results can be further investigated in this way; for example, in order to help explain a missing characterisation or typology or description of different groups.

4. Besides, it is, of course, possible to apply both methodologies equally and parallel which constitutes the most complex approach of integrating quantitative and qualitative methods ('mixed methods approach'). Here, research question(s) are investigated from different viewpoints with different approaches. It is not about the question of what is or works better. Rather, the results should support each other, the intersection of the individual results represents the final results (for further information on the triangulation of quantitative and qualitative methods or so-called mixed methods approaches, see, for example, Clark et al., 2021, chapter 24).



R3.3	What is the difference between deductive and inductive reasoning? Think about 'your' example in reflection 2.2 or in a different case and share your thoughts!	
R3.4	What experience do you have with deductive or inductive studies? To what extent are you familiar with such research projects from previous studies, your professional or private life? Or have you perhaps already taken part in a research project as member of the research staff or participant, for example, as survey respondent or interviewee?	
R3.5	Search and select one quantitative study and one qualitative study and identify the different steps of the research process. Which approach (linear or circular) was applied?	

3.6 Abduction

For the sake of completeness, abduction (also referred to as abductive reasoning or abductive inference) is also mentioned here, which – at least in the opinion of some authors – is very useful for finding new hypotheses (see, for example, Brühl, 2006, p. 183). Charles Sanders Peirce (1839-1914) was an American philosopher and developed abduction as a third mode of reasoning or inference (Burks, 1946; Brühl, 2006, p. 183). According to Kennedy (2018, p. 51 f.): "[…], we understand abduction as selecting or inventing a provisional hypothesis to explain a particular empirical case or data set better than any other candidate hypotheses, and pursuing this hypothesis through further investigation […]. Abduction is about discovering new concepts, ideas and explanations by finding surprising phenomena, data, or events that cannot be explained by pre-existing knowledge. […] They [qualitative researchers; accentuation by authors] go beyond the data and pre-existing theoretical knowledge by modifying, elaborating upon, or rejecting theory if needed, or putting old ideas together in new ways to examine, understand, and explain the data."

Based on this – admittedly somewhat abstract – description, we will now try to present the topic in a more vivid way. Abduction has rarely been used to date, but will be discussed here very briefly nonetheless. We start with a few examples from professional and everyday life, since we (probably unintentionally) constantly make use of abduction:

- A patient tells a doctor about symptoms such as fever, aching limbs and fatigue, which indicate a flu. However, the doctor will also think of malaria if the patient mentions that he has just returned from a trip to a tropical country. The doctor therefore includes not only knowledge of the rule/theory in her diagnosis, but also includes additional background knowledge (Helfrich, 2024, p. 39).
- "If you visit a friend unplanned after work and he is not there, you will assume that he is perhaps working late or out shopping. You will most likely not assume that he has emigrated or, even more implausibly, has been abducted by Martians. You will consider the first two reasons to be the better explanations. And if you know that your friend has never worked late, you will think that he is still shopping. Without further knowledge, you will consider this alternative to be the most plausible explanation. However, you could be wrong." (Brühl, 2006, p. 184; translation by authors)

Both act – consciously or unconsciously – according to the principle of abduction. Although this probably reminds you somewhat on induction but "[…] what distinguishes abduction is that the theoretical account is grounded in the worldview of those one researches. Abduction is broadly inductive in approach but is worth distinguishing by virtue of its reliance on explanation and understanding on participants' worldviews." (Bryman, 2012, p. 401) In other words, in abduction, the case but also additional background knowledge/information (the so-called explanandum) serve as the starting point for the conclusion, while in induction a series of individual cases 'only' leads to a theory/rule (Helfrich, 2024, p. 38).

In general, conclusions shown in the sense of abduction are highly uncertain. As shown by the examples, the hypotheses presented can be true; however, there are actually many other causes – formulated here as hypotheses – that can explain the facts, too. As indicated before, basic ideas are the search for the *best explanation* that these assumptions (as well as abduction in general – like induction, too) are to be viewed as extending the knowledge. In line with this, the idea is that in the course of the search for the best explanation, an original belief must be revised in light of new findings. The degree of belief is measured by the probability of the explanation being correct (prior probability) based on a subjective assessment or objective data. If new information is added, the original belief can be revised, which takes the new information into account and is calculated including conditional probability (posterior probability; Helfrich, 2024, p. 39 f.). However, if information is incomplete (premises), the conclusion may be wrong. Therefore, abduction in the first place is rather an attitude than a specific form of associating thoughts.

Please refer to these recommended authors if you feel the need to study this topic in more detail: Reichertz, 2013 (in German), Kennedy, 2018 (in English). In the case that you would like to study the original work, you can find The Collected Papers of Charles Sanders Peirce in one edition (Deely, 1994).

3.7 Summary

The differences between induction, deduction and abduction will be illustrated altogether in the following using an example (adapted from Helfrich, 2024, pp. 36-39; see also Kornmeier, 2007, p. 82 f.).

Induction – more precisely its direction of thought – moves from the experience (explanandum) to the conclusion (explanans); for further information see Hempel and Oppenheim (1948). Example:

Experience 1	Products A, B, C, …, N can be purchased cheaply on market X (cases).
Experience 2	Products A, B, C, …, N are of inferior quality (results).
Conclusion?	On market X, cheap products are of inferior quality (theory/rule).

You have already learned that following case(s) and result(s), the theory/rule is certainly probable, but not necessarily true. Even if the premises are correct, the conclusion might be wrong. This is often a consequence of too few cases. More important, it is independent of that the number of cases as only one contradiction (here, only one cheap product not having an inferior quality) is sufficient in order to falsify the theory/rule inferred; we have therefore added the question mark behind the conclusion.

Therefore, the use of induction is not uncontroversial in the scientific community; this aspect is discussed under the keyword of the so-called 'problem of induction'. On the other hand, induction is very important as it has the potential to expand or construct existing knowledge or theory.

Deduction – more precisely its direction of thought – works in the opposite direction. It moves from conclusion or theory/rule (explanans) to the experience or case (explanandum). Example:

Knowledge	On market X, cheap products are of inferior quality (theory/rule).
Experience	Product A can be purchased cheaply (case).
Conclusion!	Product A is of inferior quality (result).

You have already learned that theory/rule and case necessarily imply the result; we have therefore added the exclamation mark behind the conclusion. If premises are correct, the result necessarily is correct, too. However, please remember that the conclusion can be wrong if premises are wrong.

In **abduction** – more precisely in its direction of thought – not only the theory/rule and case is known but also additional background information. So, based on these pieces of information, the best explanation (result) for the observed individual case is sought. In induction, a series of experiences of individual cases forms the basis for the conclusion, whereas in abduction, additional background information is also taken into account and therewith starts a search for unknown causes that are likely to explain the known result (explanandum). Example:

Knowledge??	On market X, cheap products are of inferior quality (theory/rule).
Experience??	Product A can be purchased cheaply (case).
Background knowledge	Product A was produced by a quality manufacturer in a country with low wage levels.
Conclusion	Product A could also be of higher quality (result).

According to the result, theory/rule and case are possible and might also be the best explanation. However, these conclusions are quite uncertain as they speculate and use circumstantial evidence; we have therefore added two question marks behind the theory/rule and case whereas additional background information can lead to better explanations. On the other hand, abduction has the potential to arrive at substantially new insights.

R3.6 Reflect about the similarities and differences of the three modes of reasoning and discuss an example in a context of your choice.

4 Sources of Information

In this chapter you will be familiarised with the process of how to handle different kinds of sources of information. We start with an overview of the different kinds of literature (chapter 4.1). In connection with the different sources of information, questions concerning literature research and acquisition (chapter 4.2) arise. After having collected all relevant information an analysis and evaluation (chapter 4.3) of this information is inevitable. You will further learn how to organise sources of information (chapter 4.4). The last matter deals with copyright and the patent protection (chapter 4.5). This leads to the following learning objectives:

LO4.1	*I know the different sources of information for academic writing. I can rate the reliability of given information and scrutinise it.*
LO4.2	*I know how to search for, obtain, and evaluate academic literature.*
LO4.3	*I know the reasons for the use of literature administration software.*
LO4.4	*I know how to respect copyright and patent protection.*

4.1 Overview

This chapter provides you with an overview of the different types of sources of literature used for academic research. When writing an academic research paper different types of literature are relevant. Research texts are based on a variety of sources of information. To comprehend the background of the individual research topic and related questions, the first step typically is to read literary sources or to examine empirical data sources.

As a basic principle academic literature is divided into different categories as displayed in the following figure:

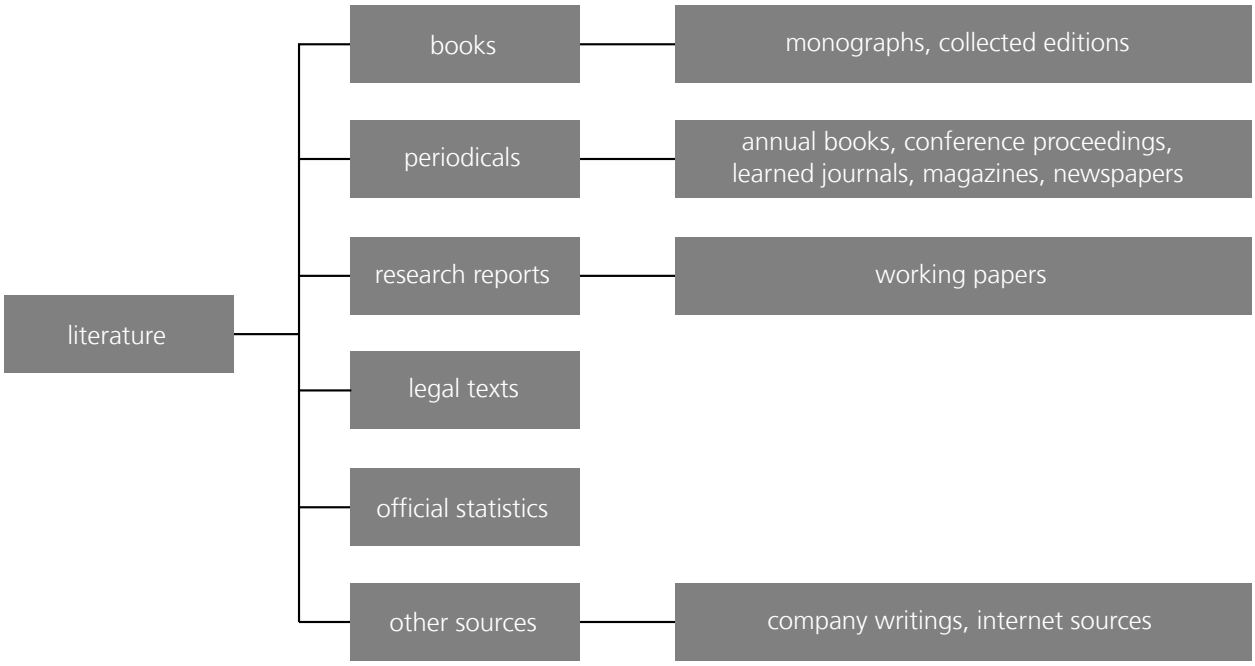


Figure 8: Different types of literature, following Ebster and Stalzer, 2017, p. 42.

Literature can be divided into six sub-categories as shown in figure 8. Books are classified as monographs and collected editions. Monographs deal with one topic and are written by one author individually or by several authors collectively. Characteristic examples are textbooks, graduate theses and guidebooks (Brink, 2013, p. 48; Ebster & Stalzer, 2017, p. 42 f.). In collected editions, articles by different authors on one subject area are published together. A collected edition is issued by one or several publishers. Characteristic examples are dictionaries and handbooks (Brink, 2013, p. 48; Ebster & Stalzer, 2017, p. 42 f.).

Periodicals are frequently published research papers. They are of utmost importance in the field of academic research because they contain in-depth discussions. Furthermore, expert knowledge and research findings are published here before they can be found in books. Periodicals are classified into three groups, explained as follows (Brink, 2013, p. 48; Disterer, 2009, p. 76 f.; Ebster & Stalzer, 2017, p. 42 f.; Theisen, 2008, p. 58 ff.):

- Annual books and conference proceedings are usually released once or twice per annum. They are predominantly published after conferences and the findings are introduced to professionals and trade visitors. The content is collected from a defined field of activity and space of time.
- Learned journals are usually published on a quarterly or monthly basis. They are very significant sources of information because they resume the current level of academic research. Moreover, the inputs and articles are reviewed by professionals in the area of expertise before they are published. In comparison with books, (peer-review) journals contain detailed information and solutions to very concrete research questions. The relevance of journals can

be determined quantitatively (Ramírez et al., 2000, p. 3). The 'impact factor' was introduced as a classification parameter in 1975 and is calculated yearly. It reflects the number of citations of the articles of a journal, for example, how often all articles of one specific journal are cited. The more often the articles are cited the more important the journal is considered.

- Magazines and newspapers have a lower relevance for academic research and are released on a weekly or daily basis. They are useful for keeping one's knowledge of changes and developments up-to-date.

Research reports (for example, working papers) are considered 'grey literature'. They are composed by the members of staff of universities or authorities, companies and other organisations (Ebster & Stalzer, 2017, p. 42 f.). They are generally distributed as preprints (Theisen, 2008, p. 115) by direct selling in small editions and are not issued in the book trade. Working papers by universities can be considered under similar conditions as learned journals (Ebster & Stalzer, 2017, p. 42 f.). Furthermore, research reports describe a state of 'work-in-progress', thus helpful suggestions and constructive criticism are expressly declared (Brink, 2013, p. 48; Disterer, 2009, p. 80).

Legal texts and official statistics can serve as a basis for academic research (Ebster & Stalzer, 2017, p. 42 f.). Various statistics are published in Germany by the Federal Statistical Office (Destatis) and are open to the public via a free Internet access. Another free database containing statistical data is 'Eurostat', published by the European Commission.

Other sources (for example, company brochures, Internet sources, data stored in databases) can support the process of academic research. Taking the sources of information mentioned above into consideration leads to a case-by-case review in order to determine the appropriateness of each publication. In general, publications by companies should only be included in academic research to a limited extent – the exception is when the company is the object of research (Ebster & Stalzer, 2017, p. 42 f.).

The next step is to understand how academic knowledge is generated and how the different types of literature are produced. It is also relevant to embed your own academic research question or hypothesis into the most recent findings. This leads to the question where reliable sources of information can be found and read. The answer is complex and leads to different sources of information in different stages of maturation. They have already been explained to you above, so now you will learn in what chronological order academic research results are published and understand the reasoning behind them (Disterer, 2009, p. 79 ff.):

1. The first step is to publish scripts as grey literature (working papers). They are written for the interested academic community. They are published under reserve and represent the phase of 'work-in-progress'. Working papers cover new trends in a specific field of research.
2. The second step is to make the new studies accessible orally to a wider audience at conferences. The presentation and discussion with experts serves for checking purposes. Furthermore, innovations are presented to a higher number of interested listeners.

3. The third step is to publish the findings in learned journals. Some journals publish articles after a uniform peer review process[8], other do without them. Papers published in journals with appraisal have a higher significance and are considered to be of a higher quality. In a 'double-blind' peer review process, the names of the author(s) and reviewer(s) are unknown to each other. The vis-à-vis method refers to journal articles without external assessment. They are 'only' read by the editorial staff before they are printed. With this step the author(s) reach a very broad public with their knowledge and expertise in a printed form as it is written in 'black and white'. Learned journals are excellent sources of information to establish the status quo of the research.

4. The fourth and last step can be started as soon as enough material is generated. It leads to the creation of a reference or text book to deal with one topic in a very intensive and academic way.

The four steps result in a cascading of academic knowledge. The following figure displays the process in a graphical manner:

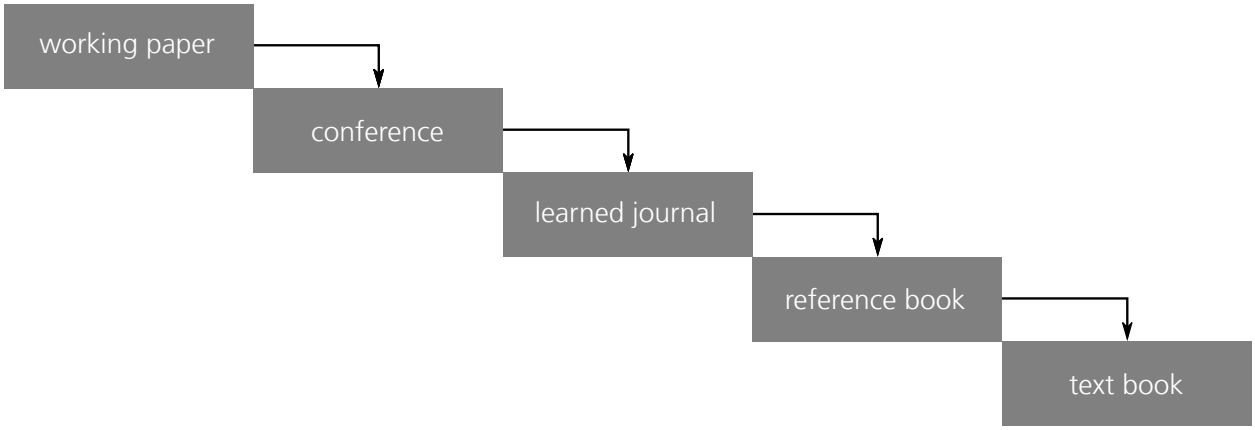


Figure 9: Cascading of academic knowledge, according to Disterer, 2009, p. 86.

Regarding the overview of information sources and available literature you may have asked yourself why Internet sources and Wikipedia have not been mentioned. This is likely to change soon as Internet sources and especially Wikipedia offer opportunities for getting a first impression, for example, a welcome overview, review one's own assumption and understanding basic principles.

Be careful! The downside is that not all information on the Internet is correct and has therefore to be scrutinised with the utmost care and attention. The Internet comprises hundreds of billions of pages worldwide; its number expands daily by several million pages. Accordingly everyone is tempted to use the Internet for research purposes. This extends traditional information retrieval by adding a lot of useful – and also useless – material. Nonetheless, electronic sources of information

[8] "Peer-review: The process of collecting comment from academic authorities on an article before publication in a journal. This system gives increased validity to the publication." (Bailey, 2011, p. 289; for further information on the peer review process, see Elsevier, n.d.; Kelly et al., 2014).

can be used for academic research work but you have to keep in mind that the availability of the information may be limited in time and it therefore needs to be saved, printed and included as an annex to your publication. You should also keep in mind that an information overload can complicate your choice and assessment of the sources. You should make sure that your Internet search does not lead to frustration if there is not a link between your research questions and the material to be found on the Internet (Theisen, 2008, p. 68 ff.). Information on the Internet is very often published by manufacturers of industrial products or service providers. This information can be biased, so it must be read while bearing its origin and degree of trustworthiness in mind. A huge number of the electronic information sources mentioned, and Wikipedia especially, are not suitable for academic research. Some weak points are listed in the following:

- lack of precision,
- ambiguous motivation and doubtful expertise of the author(s),
- impermanence of the items,
- editing of the subjects in piecemeal fashion,
- unreliable sources,
- lack of quality conformance tests.

In general Wikipedia is based upon the principle of consensus. The active group of authors is small in comparison to the request for information. To put it in a nutshell it is useful as a first approach to a new topic but should only be used as an introduction to the topic. Exceptions are academic research activities like the Wikipedia phenomenon itself, for example (Disterer, 2009, p. 86 ff.).

R4.1	What are the four steps in generating academic knowledge?	
R4.2	What is the main weakness of using the Internet for academic research? Think about your use of the Internet for gaining information and share your thoughts!	

4.2 Literature Research and Acquisition

As you have already seen, an academic research text requires well-grounded argumentation to persuade the reader of the validity of your work. A good way to start is by reading papers related to your topic, then developing a methodology and then writing down a theoretical basis and the most

recent findings in your topic's academic area. In order to follow these steps the search for and acquisition of literature is indispensable. It is furthermore a fundamental component of any academic research work. It is necessary to outline the individual project and to map out the state of knowledge. The search can be carried out by using different resources and diverse strategies. This will also enable you to gain an overview of the quantity and quality of the required number of literature sources needed. These aspects are explained in this chapter.

When searching for literature the following facilities can support you: libraries, interlibrary lending services and specialist book dealers (Kornmeier, 2007, p. 109 f.). Libraries fulfil a key function and act as a starting point when making enquiries. In Germany the library system is organised hierarchically. The spearhead is the German National Library with its locations in Leipzig and Frankfurt am Main. In accordance with the German National Library Law (Gesetz über die Deutsche Nationalbibliothek, DNBG) every German publication is deposited in the German National Library (§ 2 DNBG), where it can be read and in many cases also be borrowed. The second level is constituted by the national libraries, regional libraries and the libraries of universities. The third and fourth levels are formed by the libraries of university faculties and departments (Brink, 2013, p. 50 f.). In every library, card indexes serve as orientation. The catalogues contain all the sources of information (for example books and journals) of the appropriate library and they are ordered by specifying names, titles and locations. Often even more catalogues exist. They are sorted for example by topics, keywords or locations (Theisen, 2008, p. 42 ff.).

At the beginning of a research project the literature related to your individual topic will normally be unknown. In such a case you should refer to a bibliography. In (printed or digital) bibliographies the published literature is listed. The multiplicity of literature is sorted for any number of reasons – the literature of a country, language area, period of time or field of reference. They serve as proof of individual titles in combination with a common classification criterion. A bibliography never contains a reference to a location (Brink, 2013, p. 60; Theisen, 2008, p. 46).

Apart from the traditional way, you can also search for literature on the Internet. As a consequence of the evolution of electronic data, processing databases will help you find literature. A search using electronic databases cannot be considered equally comprehensive because a high number of databases are not accessible or their access is not free. Universities (of Applied Sciences) nowadays spend huge amounts on licences for databases to improve the possibilities for an electronic search function. They serve as a very important instrument for the search of adequate sources of information and offer many advantages:

- huge amounts of information can be browsed/searched in a short time,
- the danger of overlooking important sources of information is lower than with a manual search,
- high actuality due to frequent updating,
- truncations can be used for a wider search result,
- the flexibility is very high because the databases are always reachable from everywhere in the world with computers, tablets and smart phones,

- search results can easily be printed on paper or saved in documents,
- so-called hosts consolidate several databases and search simultaneously in integrated databases,
- often a table of contents is available online giving a first impression of the source of interest.

On the other hand, an electronic search has some disadvantages. The access can only be efficient if the student is familiar with all search functions. Some services are not exempt from charges. They depend on individual rates which are usually assumed by the institutions of education (Brink, 2013, p. 65 ff.). In the following, some available online databases are mentioned as examples:

- The catalogue of the German National Library offers access to an online catalogue: 'Home'.
- The University of Karlsruhe (Germany) offers access to a huge number of online catalogues: 'KIT-Bibliothek'.
- Jade University of Applied Sciences offers the access to different catalogues: 'Business Source Premier', 'DBIS', 'Journal List by Subject'. By logging into the Intranet (by using a VPN connection; for information click here) or using the computers of Jade University of Applied Sciences you get access to the digital library. It offers the use of different databases with a huge quantity of online contents, abstracts, full articles and scientific information of books and journals. Before you proceed you should log into the Intranet and search for some books, articles, statistics or whatever you are interested in at the moment.

With the aid of all possibilities mentioned above (databases and libraries) you are able to search for any relevant information and you will get to know the optimal strategies for researching literature for your individual academic research project. As a general rule, two methods exist for carrying out a literature search. In the following, the two strategies are presented and the assets and drawbacks are highlighted.

1. Method of concentric circles (also known as backward-directed search or pyramid scheme): the pyramid system is an easy method. Starting with one central source of information in the relevant discipline leads to a multitude of ongoing sources which the author of the first book has used if the list of references is studied. The important advantage of the method is a fast identification of the essential (here: often-cited) sources (Kornmeier, 2007, p. 117 f.). However, this method also has some risks. The search is always backwards (from the current to the past). Moreover, authors often have 'circles/syndicates of quotation' based on similar points of view or personal relations and which makes them quote each other (Disterer, 2009, p. 102). This leads to the fact that neighbouring disciplines which might also offer profound knowledge remain unknown. Due to these risks the backward-directed search should only be used together with a systematic search (Ebster & Stalzer, 2017, p. 47 f.).
2. Systematic search: for the reasons mentioned above the backward-directed search is generally not sufficient. Considerably more success (but more costly in terms of time and investment) can be achieved with a systematic search. Search materials should include books

> (monographs, collected editions), learned journals, literature databases and write-ups of new publications. Everybody who wants to write an academic research text with a fundamental basis should consider a systematic search essential. As a basic principle the exhausting but absolutely worthwhile search starts with an extensive review of the volumes of relevant learned journals. The search will not be limited to current volumes but will also cover older ones (five to ten years). The result will be access to the best articles and will give you a bird's eye's view of the discipline. In many cases journals can be reviewed via the Internet which considerably reduces the search effort (Kornmeier, 2007, p. 118 ff.).

In order to complete the list the forward-directed search is also outlined. This method is the opposite of the first method. It is not based on the sources the author of the first book worked with. Instead the relevance of the book is the matter of interest. The more the first book is mentioned later in other books by other authors the more important is the first book. The search is possible with the help of an interdisciplinary citation index product – the 'Social Sciences Citation Index' (Kornmeier, 2007, p. 121).

After identifying the relevant literature for your academic project your next step is to obtain it. You can choose between the different possibilities of buying, lending or copying (Brink, 2013, p. 107). They entail different assets and drawbacks (ownership, expenses, time of delivery, and period of borrowing):

- Purchase: the sources of information can be bought in a bookshop, online shop or directly from the publishing house.
- Loan: the sources of information can be borrowed from a library.
- Interlibrary loan: when the sources of information are not within reach they can usually be borrowed via the interlibrary service.
- Electronic (file, print): digital libraries offer full online access to books and journals where the sources can be downloaded or printed.

In general the quality of the sources used as references have to fulfil the level of the academic research work. Hence reference books and encyclopaedias (for example Duden, Brockhaus) are not suitable. They are 'only' intended for non-academic purposes because the definitions are too short and too narrow. In contrast monographs, collected editions and especially journals are suitable. The content comprises the latest findings. It should go without saying that the search for journals and contributions from English-speaking countries should be considered in your search for relevant information (Kornmeier, 2007, p. 113 f.).

Every student will be confronted with the question of how many sources they 'must' use for an academic research text. There is no universal answer to this question. Rather the candidate will see themself confronted by a dilemma. A short list of references can lead to the impression the candidate has not used all relevant sources. An extreme long list of references can lead to the impression that the candidate has not read all quoted sources in detail (Brink, 2013, p. 107). Some relevant and useful criteria are mentioned:

1. It depends on the individual academic question how many sources of information are available.
2. The scope and the level of the academic project. It differs between a term paper with 15 pages, a Bachelor thesis with 50 pages or a Master thesis with 100 pages.
3. Quantity does not follow quality. It is not constructive to link several sources without looking into the subject and arguing for or against the different positions (Kornmeier, 2007, p. 116).

R4.3 What is the difference between the forward and backward directed approach to literature searches?

4.3 Literature Evaluation

After identifying and accessing the relevant sources the next steps follow – reading and evaluation. When the long and exhausting search has been done, enough literature has hopefully been collected. This involves a risk: the effort and stress of the search can lead to an inattentive study of the sources with the consequence of citing sources which do not match the academic topic being researched. Independently of this risk every source of information has to fulfil two criteria: adequate citation and preferred quotation.

Adequate quotation as the first criterion refers to the availability of the information source. An essential element in academic research matters is the inter-subject traceability. All processed sources have to be mentioned in the text and in the list of references so that they may be reviewed later by the reader. This circumstance is fulfilled by the use of sources open to the public. Examples are books or journals. Considerable effort is required by the reader with the use of grey literature because of its restricted visibility. Internet sources are available to everyone but archiving is a problem. Referring to the last two information sources a copy of the original should be added to the annex or the tutor should be contacted for finding an individual solution (Ebster & Stalzer, 2017, p. 66 f.).

The second criterion (preferred quotation, also known as recommended citation) is more important and harder to fulfil. It affects the requirements of academic research quality. It depends on the individual source of information whether the different types of sources of information are adequate or not. Books on research can be divided into academic books (monographs and collected editions) and popular scientific books. Of these two sources the former one is suitable. The latter is not suitable although popular scientific books can contain useful and helpful information even though they are not written at an academic level. A hybrid position can be observed in academic textbooks and bachelor theses which need a case-by-case review. Academic textbooks are written by experts but the literature is only adequate as an introduction to a topic. Bachelor theses should correlate to aca-

demic research demands but the outcome is often not encouraging. Periodicals can be divided into learned journals and journals for practical purposes. The former contain reliable information as a consequence of the exact documentation of the method used and they are peer-reviewed. The latter normally do not fulfil these requirements and are therefore not suitable. The same is valid for weekly and daily newspapers. Exceptions are the use of articles as an introduction, a comparison of theory and practice or on an individual basis. The popular press is not qualified in either case. The same applies to many Internet sources although you should keep in mind that they may contain important information for your academic research project (Ebster & Stalzer, 2017, p. 66 f.).

The amount of available literature has increased explosively during the last few decades depending on the different sciences. One good example is Economic Sciences. This leads to the fact that nearly every academic research question can be dealt with because enough sources of information are available. However the relevant sources of information can sometimes not be found or read. In conclusion it is important not to be discouraged by the 'mountains of literature'. Lack of concentration on the relevant sources at the beginning of your project can lead to failure as your motivation or overview get lost.

The process of reading sources of information consists of three steps: search, acquisition and evaluation. To assure your literature research is effective (for example, read only relevant sources) and efficient (for example, read as fast as possible while gathering all relevant data/facts). To summarise: first filter – pre-select your sources, second filter – skim read the text for its gist.

While you are working on your own academic research question your time is generally limited while the available sources of information seem almost endless. Therefore pre-selection consists of an assessment regarding the suitability or unsuitability of the sources of information. Reaching a decision concerning the relevance of the sources for the academic question is not possible until you have studied the sources completely. Accordingly, all sources of information which have passed the first selection are obtained. The criteria for decisions are the title (if applicable, subtitle), keywords, reviews, abstract, citation indices, author and publisher, publishing company, edition and year of publication, content and appraisal (of journals).

After the sources have been acquired they are skim-read as the second filter. Now you get an impression as to whether the sources are really suitable or not. To reach the maximum effectiveness and efficiency the reader should start by quickly reading the sources for the gist. When the sources seem apt they come into consideration for your academic research question. The criteria for decisions are found in: blurb and rear page, preface, foreword and introduction, table of contents and subject index, quotations and explanatory notes, references and number of hits while searching in databases (Brink, 2013, p. 106 ff.).

The evaluation of the sources of literature found is generally not carried out by reading everything. Instead different reading strategies come into operation. The basic concept of reading academic texts differs from reading literary texts. Instead of reading everything from the first to the last page you handle the texts with strategies of research reading. Comprehension will be greater if the text is handled in multiple steps. A multiplicity of similar strategies exist (Ebster & Stalzer, 2017, p. 72 f.). Here, the two exemplary SQ3R and PQ4R methods are mentioned.

The acronym SQ3R stands for Survey, Questions, Read, Recite and Review:

- Survey: first you get an initial impression of the text. For this reason the study of tables, headings, preface and afterword, figures and the author's stance is recommended. Detailed reading of the text or even passages is not intended.
- Questions: formulate questions which arise when reading the text. They should be based on the headings and your cognitive interest. Use the question words to express your doubts.
- Read: read the text in a goal-oriented way and answer your own questions. Read the text chapter by chapter and recap what you have read. You should differentiate between essential and inessential information and limit your attention to the quintessence. Highlight the important contents in the text using different colours. You can differentiate, for example, between important content, research results, hypotheses, requirements, examples, empirical results (Brink, 2013, p. 35).
- Recite: repeat and recap what you have read by thinking, writing or speaking.
- Review: answer all questions and check whether you've grasped the general context. You should repeat the essential issues and your thoughts aloud or write them down (Bensberg, 2013, p. 87 f.; Brink, 2013, p. 34).

The acronym PQ4R stands for Preview, Questions, Read, Reflect, Recite, Review. The first three steps of both methods are the same:

- Reflect: read the text and consider whether you understand it. Link the text to your own thoughts and circumstances and think of examples to generate a dialogue with the text.
- Recite: read the text intently chapter by chapter and note what you have read. For this purpose write down what you have read from memory only.
- Review: the last step is to check your own notes and reconsider them. For this purpose it can be useful to follow the argumentation of the text and write down the content in a very short form (just a few sentences). You can furthermore illustrate your thoughts by drawing a figure (Rost, 2012, p. 204 ff.; Ebster & Stalzer, 2017, p. 73).

As you can see, both reading strategies mentioned are similar. Irrespective of your reading strategy and the source of information you should always ask yourself whether you agree with the author, if you think the argumentation is reasonable and if you require it for your own academic project or text.

R4.4	What it is the difference between adequate and preferred/recommended citations?	
R4.5	What is the difference between reciting and reviewing literature?	

4.4 Literature Administration

The administration of the sources of information used has mainly two reasons. On the one hand we have learned in the preceding chapter that reading sources is not enough – we must also remember the text's quintessence and comment on it. This process should not only happen mentally but also in writing (Ebster & Stalzer, 2017, p. 73 ff.). On the other hand the abundance of information related to your individual academic topic can be so extensive that it is simply too much to remember. This is where memos come into play. They are available in a classic and in an electronic form. The latter will be explained first. This chapter concentrates on software only for this purpose. Software is easily available, and usually either free of charge or inexpensive. Although a lot of programmes are available, just a few examples for literature administration are mentioned here:

- Citavi for Microsoft Windows: free of charge for the maximum of 100 entries per project; if you need more entries it costs money but it is free for students of Jade University of Applied Sciences due to the existing campus licence,
- Bibus for Linux: free of charge,
- Zotero for the operating systems Microsoft Windows, Apple Mac OS X and Linux: free of charge.

The values of a literature administration programme are mentioned in the further progress of the text using the example of Citavi. It serves mainly for the purpose of managing the literature you use. For every academic research project one file can be created and all information belonging to it can be saved and 'remembered' for you instead of keeping everything in your head. When you want to enter a source of information, Citavi 'asks' you what type of literature (for example monographs or learned journals) you want to add. The input boxes for the database differ according to the different types. A multitude of types are possible. Help texts are available for every input box and hence beginners can start without having to read the programme's documentation first. While you search for literature we assume that your computer is connected to the Internet. This offers the advantage that you can enter sources of information just by typing the International Standard Book Number and Citavi will complete your entry. The same applies to the Digital Object Identifier. Any

exhausting typing is reduced but you should be aware of mistakes and incompleteness of information and verify the date record. Moreover Citavi helps you to organise your knowledge by integrating excerpts and citations of the content, collecting paraphrases and buzzwords or forming categories. Besides other documents like texts or pictures, signatures of 'your' library or other sources can be added or brought in line with the different sources. This is done by assigning the last objects looked at to the sources they belong to. The third advantage is that you can organise your own schedule and tasks (Rost, 2012, p. 98 ff.).

Further options are also offered:

- searching in more than 4,000 catalogues and databases and adopting them into your project by one mouse click,
- generating tables of literature automatically by using different standards,
- importing documents from the Internet into your project very comfortably by one mouse click with the add-on programme 'Citavi-Picker',
- sharing projects and working together with fellow students using the team function.

R4.6 Which are the three main purposes for using literature administration software?

4.5 Patent Protection and Copyright

This chapter deals with patent protection and copyright. You will learn background information, important criteria, practical applications and get some advice.

We start with the general point of origin – the innovations. Companies are increasingly faced with a highly dynamic and complex environment, globalisation and a highly competitive challenge. This leads to a declining success rate for innovations. In their book, Gassmann and Bader (2007) refer to a research study and conclude that only 0.6 percent of all innovative ideas result in striking success. In the pharmaceutical industry the rate is even lower – only one in ten thousand ideas turns out to be effective. Moreover, during the past few decades demands have changed: globalisation, an explosion of technical know-how, mergers and acquisitions in technology, decentralisation of knowledge, escalation of financial innovations, shorter cycles of the innovations, and an acceleration of the diffusion process of innovations (Gassmann & Bader, 2007, p. 1 f.).

To protect the output of ideas, different industrial property rights exist. They differ according to different criteria like type, object, registration, survey and the period of validity (Gassmann & Bader, 2007, p. 9). Several forms of protection can be found in the relevant literature, for example patents, utilities, designs, specifications, brands, copyrights and many more. The types differ according to the criteria mentioned above – the details will not be dealt with in this chapter.

In Germany literary property is protected by different laws – for example the Patent Law (Patentgesetz, PatG) and the Copyright Law (Urheberrechtsgesetz, UrhG). Both topics are outlined in the following.

As an intangible property right, the patent law grants the owner of the patent an exclusive right. The owner is allowed to suspend other persons of the use of their usage or admit other persons to use their invention. The government awards patents on inventions and enables and protects monopolies. An exchange relationship between the state or community and the inventor is considered a collective good. Though knowledge is shared, a preferential position is warranted for many years (Ensthaler & Wege, 2013, p. 7 ff.) and protected by PatG. The requirements arise from § 1 (1) PatG.

According to law, possible protection is conditional on an invention being in a research area of engineering with an innovative and newly discovered character for commercial purposes. In Germany the granting of a patent is an administrative act. The invention in question is judged eligible for protection. The benefit for the applicant is the exclusive use of the patented invention. The details are outlined in § 9 PatG. In Germany the application is administrated by the German Patent and Trade Mark Office with its headquarters in Munich. The conditions the invention must meet are defined in § 2 PatG and the application is regulated in the Verordnung zum Verfahren in Patentsachen vor dem Deutschen Patent- und Markenamt (Patentverordnung – PatV). The details are not stated here but you should know about rights and duties.

Intellectual property is protected against illegal copy and exploitation. At the same time a commercial right results, namely the creator's commercial benefit and the incentive to work on improvements. Intellectual property rights come into being automatically and therefore are not registered – in contrast to the patent protection described in the previous paragraphs. The copyright guarantees and enables the creator to decide on the publication or dissemination of their property (personal rights) and the economic utilisation (rights of use). The creator should fulfil the following two terms and conditions. The creation should comply with an adequate aspiration level and should be noticeable at a specified position. The protected works of literature, science and art are defined in the § 2 UrhG. Some examples are spoken and written works, software, music and technical works like images, drawings, figures and tables. Typically protected creations are computer software, collected editions and databases, web-designs, symbols, logos, icons, layouts, photography, films and texts (Kaesler, 2011, p. 19 ff.).

As you may also need to consider whether work is protected, the following list will give you an overview of the different rights of use of the creator for images, texts, figures, tables and so on. The creator has personal rights and rights of use over their works and the use of it by other people.

Personal rights cover:

- the right to publish the work – zur Veröffentlichung des Werkes (§ 12 UrhG),
- the recognition of the authorship – zur Anerkennung der Urheberschaft (§ 13 UrhG),
- the misrepresentation of the work – zur Entstellung des Werkes (§ 14 UrhG).

Exploitation rights cover:

- the right of reproduction – das Vervielfältigungsrecht (§ 16 UrHG),
- the right of distribution – das Verbreitungsrecht (§ 17 UrhG),
- the right of exhibition – das Ausstellungsrecht (§ 18 UrhG),
- the right of recital, performance and presentation – das Vortrags-, Aufführungs- und Vorführungsrecht (§ 19 UrhG),
- the right of public accessibility – das Recht der öffentlichen Zugänglichmachung (§ 19a UrhG),
- the right of broadcast – das Senderecht (§ 20 UrhG),
- the right to distribute, reproduce and broadcast by means of audio or audiovisual carriers – das Recht der Wiedergabe durch Bild oder Tonträger (§ 21 UrhG).

Related areas are trademark rights and Internet rights. The Internet rights are particularly important nowadays. The aspects listed above are relevant to texts on Internet pages, downloadable programmes, digital music files (for example, mp3-files), pictures, figures, maps, photographs, films, texts from encyclopaedias (for example, Wikipedia), online databases or dictionaries (Kaesler, 2011, p. 57 ff.).

In addition to the rights of authors mentioned above, some aspects concerning legal copying are also of interest. In general, work is copyrighted and its usage is limited. According to law a differentiation is made between copying for personal and private purposes and commercial usages. Copies for the former purposes are legal and regulated in § 53 UrhG.

One more very interesting aspect is the permission stated in § 52 (2) UrhG: it allows the use of protected works for academic purposes without a commercial background. Public disclosure for teaching and research purposes is allowed according to § 52a UrhG.

There are also limits to copyright. Use of copyright material is allowed for defined purposes and under certain conditions – free of charge, at a low charge and without permission from the author. The conditions are defined in §§ 62 and 63 UrhG and require that no alterations be made and the source named. Furthermore laws, acts, promulgations and announcements of public and communal authorities, courts and churches have no copyright.

Be careful. A lawyer writes a letter. It is protected. Later the letter becomes part of a judicial decision and then it loses its protection. Private basic rules (for example DIN standards) do not lose their copyright protection if laws, acts, promulgations or announcements refer to them (Branahl, 2013, p. 247). Single speeches, articles in daily and weekly newspapers and radio broadcasts are free to be repeated in public. The reason is the reference to current events and the enduring significance (§§ 48, 49 and 50 UrhG).

The legal system assigns the absolute right of a literary property (for example patent, copyright, etc.) to the owner. It is binding for everyone and assuring one's right. The owner holds not only the exclusive rights to use their invention(s) but also the authority to deny or refuse its use by third persons. The effect of the exclusion becomes especially apparent when third parties make use of the literary property without authority. In the case of unlawful acts action is taken by the appropriate authorities – the PatG, UrhG, etc. A considerable range of judicial steps is available to the owner of the literary property. Legal measures are possible within the scope of civil, criminal and public law (Ensthaler & Wege, 2013, p. 265 ff.).

A short digression: historically, copyright affected only a very small number of people – professional companies operating in the music, video and publishing industries. Only lawyers and managers had to deal with these aspects and the private user was not involved because nobody was able to make copies. Later the technologies to copy music, films and books became widely available and made copying possible for everyone. Fees for duplicating machines and blank data storage devices were introduced. A sudden change came about with the introduction of Internet connections to private households. With the spread of digital media (computers and smart phones) a change took place. Nowadays almost everybody is able to be a user, creator, producer and distributor by using websites or blogs and by uploading and downloading files. Furthermore, texts, music, pictures and videos are disseminated on the Internet and can be found on Youtube, Rapidshare, etc. (Kreutzer, 2012). In view of all this, think about the terms 'freebie mentality', copyright and literary property!

5 Information Handling

You have already learned that academic writing can be considered a process which reports on the research activities you have carried out (chapter 3.1). These activities may include empirical or theoretical research approaches based on data collected in studies of literature, desk research, field research and meta analysis (chapter 2.3).

However, whatever strategy you adopt for finding answers to your research questions or to accept or reject your hypotheses (chapter 3.2), your research will always include a collection of data to be analysed. The quality of your findings will rise and fall with the methods you have adopted for storing, categorising and analysing the information gathered.

Chapter 5 outlines some general rules for storing (chapter 5.1) and structuring (chapter 5.2) your data, and chapter 6 will introduce you to different ways of analysing data including some statistical methods.

LO5.1	*I know the differences between primary data and processed data.*
LO5.2	*I can explain why reproducibility is of utmost importance in any academic research.*
LO5.3	*I know the difference between qualitative and quantitative data. Furthermore, I know the pros and cons as well as how and when to use or combine them to achieve valid findings.*
LO5.4	*I can explain the differences between nominal, ordinal and metric variables. Furthermore, I can apply it on given data and identify the different variables.*

5.1 Handling and Storing Information

Computer technology has made it easy to handle huge amounts of data and carry out multiple calculations in a fraction of a second. However, a good strategy is needed to make sure that the basic principles of academic research are ensured, for example, objectivity, data recording and sharing, and reproducibility or repeatability (also called test-retest reliability).

It goes without saying that all data collection must be carried out in an objective manner without tampering with or even falsifying any information. Any primary (raw) data such as questionnaires, measurement logs, recorded interviews, e-mail communication, etc. must always be recorded and stored safely. As collecting primary data is a very time-consuming part of your research, a possible loss could have dramatic consequences and might turn your whole research project into a personal disaster.

It is strongly recommended that you make copies of all relevant research data and store it in different locations. Always make safety copies of your work on a regular basis (for example, hourly, daily, etc.)! Computer storage is not very expensive, so make sure you store spare copies of your research in different places (with parents, friends, etc.).

By strictly separating your raw data from any subsequent use as processed data in databases, spreadsheet applications or other computer software, you make sure that the raw information can be accessed at a later stage of your research to apply a different methodology or to study other aspects than those considered in your current research. You may also want to share the raw data with the research community or add further information later on.

An essential aspect of all academic research is that it must be possible to replicate or reproduce your findings. All steps required for collecting data should be described in detail so that other researchers will obtain the same or very similar results when repeating the data collection in the same way as you did. This reproducibility is an essential principle in any academic research area and has to be considered whenever you define, structure or analyse the information you have collected. Keeping in mind the reproducibility requirement also helps you describe your research work in a more structured manner.

R5.1	Why is it important to store primary data and processed data separately?	
R5.2	How can you guarantee that the results of your research are reproducible?	

5.2 Categorising Information

Before you start collecting any information you should have defined your research questions or hypotheses and the way you actually want to collect the required information. Is it by viewing existing literature, by carrying out interviews or experiments, or through field observations? It is very important to consider your available time for acquiring data as this is usually a very time-consuming process. Good time management contributes significantly to the success of your academic research. Use a diary or calendar in which you define time frames for data collection and data analysis (chapter 3).

Once you have identified a research topic, relevant research questions or hypotheses, the character of your data collection, and you have set up a time frame for acquiring and analysing data, it is time to consider the structure of the data to be collected. Your research may involve people, so it is very likely that some personal or biographical data is involved: gender, area and position in a company, years of work experience, information on the geographical location of the workplace, the technical equipment and methods people use, etc. Your research may also include dates, for example, frequency of publication of a specific topic, coverage of that topic in pages, words, etc., geographical areas where your topic is considered important, and so on. If your research is technical, it probably includes measurements, tolerances, speeds, bearings, angles, heights, load factors, etc. Interviews often include open questions (for example, Do you like working here?), the answers to which you want to analyse.

Information or data can be classified according to its respective characteristics and schemes. It can be qualitative or quantitative; it can also be nominal, ordinal, scalable or metric. Different academic fields treat information differently and use different terms for describing them. As in this unit data will be collected, analysed, presented and interpreted, the statistics nomenclature is used.

In statistics, collected pieces of data usually represent values or characteristics and are usually referred to as variables. Nominal variables are limited to qualitative data. In the examples given above these would include a person's gender, his or her position in a given company, the geographical location of the workplace, the technical equipment the company used, and methods employed by the company. Nominal variables are not countable and they do not express any order. They are commonly used for differentiating groups, as the following sample research questions show:

- Do smokers die earlier (smoker/non-smoker as nominal variable)?
- Does method A deliver a better outcome than method B (methods A/B as nominal variables)?
- Is it more profitable to manufacture in Smalltown or in Bigtown (Smalltown/Bigtown as nominal variables)?

Ordinal variables express an order, as the name suggests. This type of variable is only used to establish a sequence. No conclusions can be drawn as to the quality of the differences between one value and another value. Typical examples are stars categorising a hotel (*, **, ***), sizes used for expressing sizes in clothing (S, M, L, XL), agreement measured on a Likert scale from 1 (fully agree) to 5 (strongly disagree) and school marks.

Metric variables are of a quantitative (countable) nature. In the examples given above, the following variables are metric: years of work experience, frequency of publication of a specific topic, measurements, tolerances, speeds, bearings, angles, heights, load factors, and others. Metric variables can further be divided into interval-scaled and ratio-scaled variables, depending on whether a natural value of '0' exists or not. Temperature has to be considered interval-scaled as the value '0' is arbitrary and does not express 'no temperature'. On the other hand, age is ratio-scaled as the value '0' is not an arbitrary value.

Now that you have learned about the different scale levels, the following figure provides a guide to help you decide how to categorise data you come across:

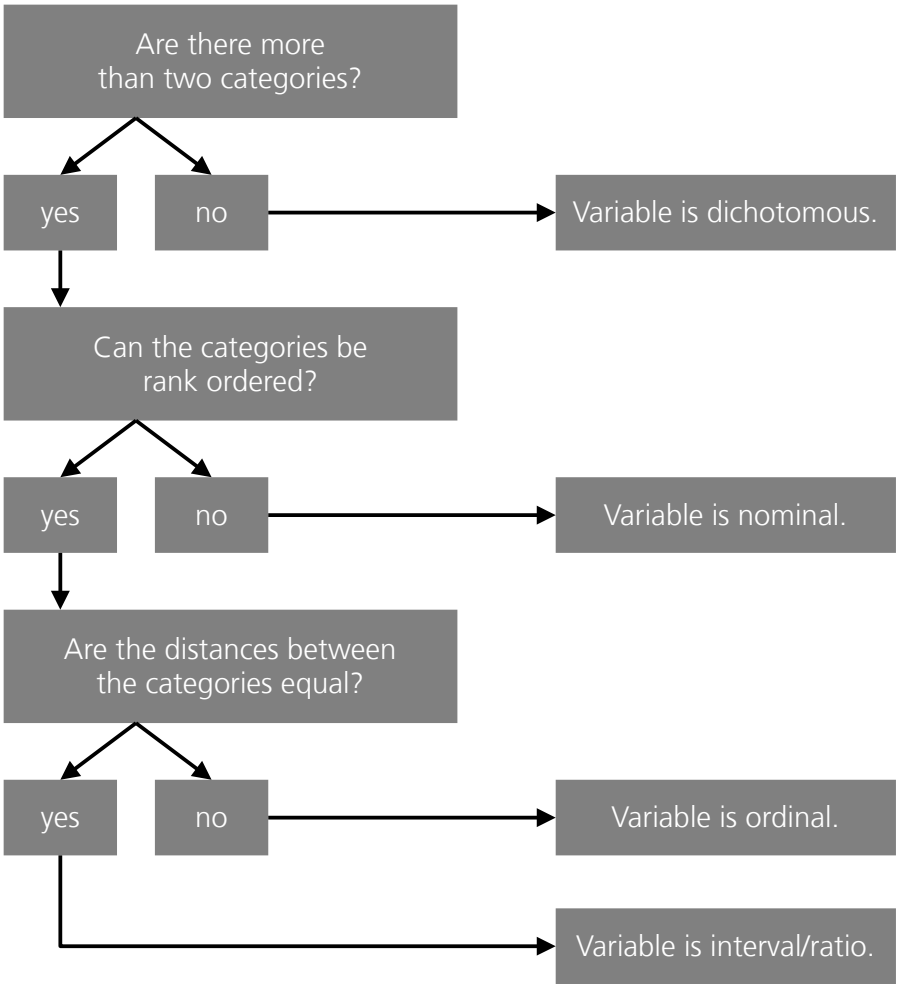


Figure 10: Deciding how to categorise variables, according to Clark et al., 2021, p. 325.

As soon as you are confronted with data, you can go through the following figure from the top to the bottom and answer the questions mentioned therein until you find the scale level you are looking for. Based on the answer, you can as a next step decide in terms of how to process data; we will discuss different possibilities in terms of data analysis in the next chapter 6.

For further information on types of variables, see Jupiter (2014) and the following table:

scale level		definition	example
categorical	nominal	without natural order	desired item (shower head, dungarees, stuffed bunny)
	ordinal	with order, but without quantifiable distances	stars categorising a hotel (*, **, ***), sizes used for expressing sizes in clothing (S, M, L, XL)
metric/cardinal	interval scaled	with quantifiable distances, but without a defined zero point	dates
	ratio scaled	with a natural zero, but without a natural unit	Temperature in Kelvin
	absolutely scaled	with natural zero and natural unit	order quantity

Table 5: Scale levels with examples, according to Baars and Kemper, 2021, p. 130.

The type of information you plan to collect will define the way you structure and analyse it at a later stage. A personalised questionnaire, for example, often contains all variables stated above. Personal or biographical data is mostly of a nominal type. Personal preferences, assessments of quality, etc. are usually ordinal, and measurements are most often metric variables.

Spend some time thinking about what type of variables you aim to collect and what is the best way to structure and store them. This planning phase will assist you in concentrating on your research questions and hypotheses and help you avoid being side-tracked.

One last piece of advice: open questions used in questionnaires (for example, Tell me why you like to work here!) are very easy to formulate, but the analysis of the answers might turn out to be very time-consuming as you will have to think of a coding system; for example, the number of positive versus the number of negative words used in the answers. Open questions deliver open answers. This sounds pretty straight forward, but this actually means that you never know what you will get back. It is a good idea to include one or two open questions in your questionnaire because the answers may be used as direct citations (chapter 7.5) to underline your findings. However, classifying the answers might simply turn out to be a time killer.

R5.3	What are the differences between qualitative and quantitative data? Which one do you like more?	
R5.4	What are the differences between nominal, ordinal and metric variables? Can you clearly identify them? Give an example and share your thoughts!	

6 Information Analysis

In chapter 5 you were given some hints as to how to handle and categorise the information you aim to gather. In this chapter, some common methods of data analysis will be described. Basic terms used in descriptive statistics such as population and samples, the Gaussian (bell-shaped) distribution, mean, median and mode, etc. will not be explained in detail here as you will have learned them during your under-graduate studies. Please refer to these recommended authors if you feel the need to revise this: Hornsteiner, 2012 (in German), Myers et al., 2012 (in English).

LO6.1	*I know the difference between independent and dependent variables. I know how to explain their relationship and apply the combination on given topics.*
LO6.2	*I understand the importance of statistical methods for analysing data collected during my research project.*
LO6.3	*I know the most common statistical methods for analysing (quantitative) data containing nominal, ordinal and metric variables.*

6.1 Independent and Dependent Variables

In chapter 5.2 the differences between nominal, ordinal and metric variables were outlined and examples were given for possible applications. Some isolated examples were given for possible applications. If you do not look at the variables separately, but analyse them as different aspects of the same data collection you will be able to figure out relationships between variables as co-appearances, causes and effects and so on.

Independent variables can be considered causes or inputs, for example, the reason why some characteristics or values adopt different values. Dependent variables are the output or effect, the values which are influenced by the independent variables. The following examples explain the relationship between independent and dependent variables:

Research question: Are the costs (in euros or US dollars) for transporting one container over one kilometre higher for trucks or barges? Here, trucks and barges are two independent nominal variables and the costs are dependent metric variables. Trucks and barges influence the level of the transportation costs (in euros or US dollars).

Research hypothesis: Writing by hand leads to more innovative ideas than writing on a computer. Here, by hand and by computer are two independent nominal variables which define the innovativeness of the output, which is the dependent nominal variable. If innovativeness is counted on a Likert scale from 1 (highly innovative) to 5 (not innovative at all), for example, then innovativeness is a dependent ordinal variable.

Research hypothesis: Smaller teams improve the quality and effectiveness of team work. In this case, team size is an independent metric variable, while quality and effectiveness are two dependent nominal variables, unless they are counted on a Likert scale (see above).

Another example stated in chapter 3.2 is the hypothesis "An optimal marketing strategy helps a port achieve a higher throughput". Throughput is obviously a dependent metric variable as it can be measured in units imported or exported or simply moved in the port area, depending on the type of cargo considered. Optimal marketing strategy, however, can hardly be categorised as some degree of optimisation. A classification of the term optimal is difficult as an independent nominal variable (as opposed to non-optimal), but it is also impossible to categorise it as an independent ordinal variable (1 = optimal, 2 = less optimal). This example shows the importance of considering the types of variables you will use in your data collection at an early stage and definitely before you actually start to gather any data.

6.2 Statistical Analysis for Comparing Variables

Chapter 6.1 has provided you with a few examples of which types of analysis are possible using independent and dependent variables. This chapter outlines which types of analysis exist and how they are in fact carried out.

You have already seen that the types of variables define the way the data can possibly be analysed to answer your research questions or to make you accept or reject your research hypotheses. Four major statistical types are available to study relationships between sets of data. They aim at proving differences, dependencies, relationships or inter-dependencies. Depending on the type of variables (nominal, ordinal or metric), their distribution (standard Gaussian distribution or other) and on whether they are treated as independent or dependent variables, a variety of statistical methods are available. This unit will only outline them to enable you to find relevant literature on the different methodologies, and introduce a few methods based on the examples given above. The following table summarises some statistical methods and states the types of variables the methods can be used on: (n) stands for nominal, (o) for ordinal and (m) for metric. No information is given as to the distribution requirements of the different methods.

differences	central tendency	t test (m), Mann-Witney (o), unifactorial variance analysis (m), Kruskal Wallis (o), multi-factorial variance analysis (m)
	variances	Chi^2 (n, o, m), f test (m)
	proportions/frequencies	binomial test (n), Pearson Chi^2 (n, o)
relationships	Pearson Chi^2 (n), ordinal correlation (o), correlation (m), simple regression (m), multiple regression (m), logistical regression (n)	
inter-dependencies	object grouping, cluster analysis (n, o, m), variable reduction, factor analysis (n, o, m)	

Table 6: Types of statistical analyses, own exposure.

Going back to the examples in chapter 6.1, one applicable statistical method will be highlighted for each case, and a possible outcome is described.

- Are the costs (in euros or US dollars) for transporting one container over one kilometre higher for trucks or barges? (trucks/barges = independent nominal variables, costs = dependent metric variables). A test will find out if the two data sets are significantly different from each other. The term significant describes the probability with which an observation is not due to randomness.
- Writing by hand leads to more innovative ideas than writing on a computer (by hand/by computer = independent nominal variables, innovativeness counted on a Likert = dependent ordinal variable). This test will lead to the same findings as the t test. The Mann Whitney test (which is also called Mann Whitney Wilcoxon, Wilcoxon rank sum test, or Wilcoxon Mann Whitney test) is applicable for ordinal variables which the t test is not.
- A heavier container leads to higher diesel consumption in transportation (container weight = independent metric variable, consumption = dependent metric variable). In this case, two metric variables can be analysed by means of linear regression. The result will be an equation (linear, exponential or logarithmic) which allows you to estimate the diesel consumption for any given container weight.

Within the framework of this unit, no detailed explanation of the presented statistical methods is possible. However, the two chapters on data handling and data analysis should have helped you see the relevance of a structured approach towards collecting data for your research project. You have seen the importance of developing a strategy for identifying useful variables for your research and have seen how statistics assist you in finding probable relationships between these variables. Whether you use descriptive statistics to outline your findings or inferential statistics to predict de-

pendent variables which are not included into your data collection on the basis of relationships between the independent and dependent variables which are a part of your data collection, results will be clearer and possible criticism will be minimised if you include the probabilities that your findings are correct into your academic research text.

R6.1 What are the major statistical types?

R6.2 Which criteria affect the choice of the different statistical methods?

7 Official Issues and Requirements

In this chapter you become familiar with the official issues and requirements of your own academic research projects. The first step consists of developing the structure and outline of academic research texts (chapter 7.1) under consideration of the differences between quantitative and qualitative research (chapter 7.2). Afterwards the basic principles of the scientific notation (chapter 7.3) are presented. The next chapter dwells on the visualisation of academic research texts (chapter 7.4) and citing (chapter 7.5) the sources of information used. The last step outlines the presentation of academic research projects (chapter 7.6). This brings us to the following learning objectives:

LO7.1	*I know the different elements that academic research texts consist of. Moreover, I am aware of the importance of good writing in research and I can write up the results of my work.*
LO7.2	*I am able to structure my own texts under consideration of the differences between/ characteristics of quantitative and qualitative studies.*
LO7.3	*I am familiar with the basic principles of scientific notation and I know how to develop my own texts.*
LO7.4	*I am familiar with the use of different types of tables and diagrams and their strengths and application areas.*
LO7.5	*I know how to make citations directly and indirectly and I am familiar with the differences between diverse quotation styles (for example, MLA, APA and ISO 690).*
LO7.6	*I am familiar with the creation of presentations and I know to present them to the listeners.*

Before we start with the topic 'Official Issues and Requirements' you are given a short introduction. In chapter 1.3 you learned about the different steps required in organising your own project. Once you have organised your project, this does not mean that the approach cannot be modified! Although you have developed an idea, it will go through a few changes before you finish your research project. At the beginning of your project you cannot know how fruitful the topic will turn out to be and which obstacles will have to be overcome.

Let's start with a comparison. When preparing a voyage of some length, choosing a destination of interest is the first step, followed by a phase of getting an overview and collecting pieces of information. Stages will be worked out by which the destination will be reached. The same procedure can be adopted for your academic research topic and is illustrated in your title, outline and introduction.

Now you can start to work on your project. You may have had a negative experience already with an approach that was not successful. In spite of serious planning actions a previous project failed. Often the consequence is the conclusion that the planning stage is superfluous. This is normally based on insufficient experience regarding the assessment of the duration of the different steps. In academic projects the questions may be formulated too widely or a person may even be afraid of writing their own text.

When working on your own project make sure that you have a research idea and a corresponding concept. Dithering about a question, looking for sources of information and hoping to find a question will not lead to success! You will lose track and lose sight of your goal (Rost, 2012, p. 317 ff.)!

7.1 Structure and Outline of Academic Research Texts[9]

An important step in the process of working on your academic research topic is the structure and outline of your text. The reader should be provided with a comprehensible text and be able to follow your approach and thoughts. Here is some advice to support you with your project. (Please refer to this recommended book if you feel the need to revise this: Clark et al., 2021, chapter 25 (in English)).

The official issues and requirements section covers possible citations and the type and layout of the list of references. Criteria concerning the text's layout and structure are defined, for example, the size and type of font, margins and the pagination. Furthermore, in the degree courses of some faculties, departments or universities the use of footnotes is common; in others it is frowned upon. Consequently, a general guidebook is not advisable. Instead every university, faculty or department has its own instructions, the so called style guides (Bensberg, 2013, p. 38). A style guide is available to students enrolled in under-graduate degree programmes of the Faculty of Maritime Studies and Logistics. However, we do not provide a template for your assignments; use this textbook as an orientation for writing your own texts within your studies of International Maritime Management (personal template or style guide).

Every academic research text consists of different basic elements which appear in nearly every text and can be used in a variable order. They are listed and described for you below (Bensberg, 2013, p. 43 ff.; Brink, 2013, p. 159; Ebster & Stalzer, 2017, p. 77 ff.; Kornmeier, 2007, p. 146 ff.; Theisen, 2008, p. 132 ff.):

- Title page: on the title page the key specifications of the text are summarised. It contains the name and matriculation number(s) of the author(s), the title of the text, the tutor(s) and the date of delivery. Typically the examination regulations or the style guides outline the instructions and contain an example.

[9] For further information, sometimes referred to as 'research cycle', see, for example, Chisnell (2021) or here for a summary of the work or see Thesis Writer from the Zurich University of Applied Sciences, Switzerland.

- Preamble: a preamble in under-graduate studies is unusual. In more advanced post-graduate and especially in doctoral theses a preamble is often included at the beginning of the text. It contains acknowledgement of the assistance of the lecturer(s) and other important people who supported the development of the work. Sometimes it also includes the individual motivation for tackling the specific topic.

- Table of contents: the table of contents reflects the structure of the text and delivers an overview of the different chapters. All chapters of all structural levels have to be stated including their page numbers. When the academic project is very extensive an overview page can be put before of the table of contents to give a rough overview by stating only two structural levels. In addition to the chapters, the different lists (of figures, tables, abbreviations, references) and the appendix have to be included without numerical classification. A heading stated in the table of contents should contain at least half a page or better one page of text!

- List of figures: figures are numbered sequentially and all have an individual title. The collected information and the page number are arranged in the list of figures.

- List of tables: tables are an integral part of texts. An overview is given in a list of tables. The technique is the same as for the list of figures.

- List of abbreviations: it is common to list and explain all abbreviations which are not generally understood in a list – the list of abbreviations. Commonly used abbreviations are not part of the list, for example 'e.g.'

- Text: the text is the main part of an academic research text. It consists mainly of three blocks: introduction, main part and conclusion:

    1. The introduction serves – as the name suggests – as the starting point of the text and should awake the interest of the reader and lead to the topic. It should furthermore include your own interests and motivations, the research question(s) or hypotheses, current state of the research field, and an overview of the project including its benefits and structure. Gradually narrowing down from the general to the particular is recommended.

    2. The main part of the text is the core area of the whole project and should include several chapters. Advice concerning the number of chapters cannot be given because it depends on the type of academic research text (chapter 1.1), the preference of the lecturer(s) and also on the scope and content. Depending on the different degree courses and fields of research, different specifics have to be considered. (Nearly) every text includes a chapter concerning the current state of the research field. The status quo includes previous results, theories, etc. On that basis you outline your own ideas, hypotheses and question(s). Methods and instruments used are also explained. At the end of the main part your results are presented and discussed.

3. With the conclusion a short summary of the text is given and the most important results are discussed. Moreover, a reference to the initial question is made and an answer should be given. The last step is to make a projection identifying ongoing research questions of interest.

- Reference list: in the reference list all sources of information used in your work have to be mentioned! This principle applies irrespective of the use (literature cited or referred to). The guidelines are different depending on the field of research and the lecturer(s)' preferences. Ask them and read the style guide at the beginning of your project! In some disciplines (mainly in Humanities) a distinction between 'Literature references' and 'Source references' is made – the former for secondary literature (interpretations, etc.) and the latter for the primary literature (original sources).
- Declaration of authorship: in most cases universities (of Applied Sciences) demand a declaration of authorship of bachelor, master (and doctoral) theses. The aim is to guarantee that everything has been thought and written by the candidate and that all sources are stated. It must be signed by the author.
- Appendix: an appendix is not mandatory. It can be added to a text and typically contains further information like tables, figures, interviews, tests, questionnaires, etc.

Table 7 provides you with an exemplary outline of a post-graduate thesis. Formal aspects of your master thesis are explained later and summarised in the following table:

Section	Example
Title page	Analysis of the influence of team sizes on the team's quality and effectiveness
(Preamble)	
Table of contents	
List of figures	
List of tables	
List of abbreviations and acronyms (in alphabetical order!)	LPG – Liquefied Petroleum Gas MAIB – Marine Accident Investigation Branch MRCC Bremen – Maritime Rescue Coordination Centre Bremen

Introduction (including research questions or hypotheses)	See table 3
Literature overview or literature review	
Data collection	Own data collection (field research) or research based on existing data base?
Data analysis	Methodology adopted, application to collected data, outcome
Conclusion and summary	Research questions or hypotheses correct or wrong? Implications for further research?
Bibliography	Hofstede, G. (2001): *Culture's consequences: Comparing values, behaviours, institutions, and organizations across nations.* Thousand Oaks, Calif: Sage Publications.
Declaration of authorship	I hereby declare that the thesis submitted is my own unaided work. All direct or indirect sources used are acknowledged as references.
Annex	Documents needed to understand the research topic which are not publicly available

Table 7: Exemplary academic paper outline, own exposure.

The final outline of your academic text should always be discussed with your supervisor(s).

You will now get some more detailed information concerning the outline and structure of texts. The outline of an academic research project is comparable with a map or nautical chart serving as an orientation. Within the project the arrangement and structure are shown. Furthermore, the different aspects of the research topic are not only interconnected, but a common thread runs through the concept and the different areas are linked and serve as a complete argumentation for answering the research question. Information about the project is given in an outline concerning the following aspects and pertinent questions:

- What contents are relevant? Are they listed in the outline?
- What importance do the different aspects of the text have? Are they adequate in scope?
- Which aspects link the different steps together to one concept? Is this reflected by the outline?

The creation of the outline should take place at the beginning of the project after you have finished the phase in which you read about the topic. This approach offers some advantages. By outlining your ideas you will be able to structure your first thoughts on the subject. At the same time it can help with your time management by adding the number of pages you intend to write. The outline is also an instrument for communicating with your tutor(s). The different aspects and relations between these aspects and whether an adequate coverage of the topic can be achieved will be discernible. The design of the (first) outline before you begin writing the text does not mean that the different parts cannot be moved, deleted, amended or modified if necessary.

When working on the outline, you can adapt the design to changing demands. A differentiation between the main order and principle can be made:

- The order reflects the different ways of describing the hierarchy – numeral, alpha-numeric or mixed. The numeral order is the most common way and is therefore recommended for your work. When writing very extensive texts a mixed form can be used to increase clarity by denoting different parts by using letters (for example, Part A, Part B, etc.).
- Basically, the principle means a differentiation between in line and in gradation. The term 'first principle' means all aspects are listed and are aligned with the left border. The term 'second principle' means all aspects are listed, too, but the different levels are inserted according to their level. This allows the reader to obtain a better overview of the different levels.

The outline should always be consistent in its composition, as an expression of the so-called vertical clarity. This means that the different aspects of one hierarchic level are approximately identical concerning their scope. However, the axiom is: 'form follows function', for example, superfluous expansion or fragmentation should be avoided! Identical hierarchic topics should be approximately of the same size as regards their contents.

In addition, your outline has to fulfil logical demands. One hierarchic level must never have one bullet only. This aspect is commonly known as horizontal clarity.

Headings should be formulated in a concise, significant and short manner. Sentences, abbreviations, formulae and complex definitions should be avoided. Using one word as a heading is also not very common (Brink, 2013, p. 131 ff.; Ebster & Stalzer, 2017, p. 80 ff.).

In the following a rough framework of an outline is shown as an example for an empirical research topic (Rost, 2012, p. 327):

1. introduction, including the presentation of the topic,
2. theory, including the identified research question(s),
3. method, including information on research subject, variables, collection and evaluation of data,
4. result, including a truthful presentation of the results in figures and tables with explanations,

5. discussion, including the answer to the research question(s), personal appraisal and a projection.

In conclusion, one last aspect concerning the outline of your research text: an outline is not identical with the table of contents! The more detailed the outline, the easier it is afterwards to write the text. When writing the text some bullet points of the outline should be reduced to one bullet point in order to avoid the danger of fragmenting the topic. Remember also these rules of thumb: for an under-graduate thesis a maximum permissible value of three and for a graduate thesis a maximum permissible value of four hierarchic levels is sufficient.

R7.1 Which aspects are part of a typical outline of an academic thesis (bachelor or master)?

7.2 Writing Up (Your) Research

In the previous section, you learned general information and formal requirements in terms of the structure of (your) scientific texts. Based on this, we will now focus on the particularities of the structure of texts that arise from the nature of quantitative and qualitative studies. Moreover, we assume that quantitative approaches go in line with deduction, while qualitative approaches go in line with induction (we have already discussed this topic above in chapter 3.4). Based on that, we will also have a very brief look at the similarities and differences as well as mixed methods research.

Writing up quantitative research

In the following, we will highlight some general characteristics of quantitative articles and will refer to the aforementioned articles written by Pauksztat et al. (2021), Röder and Mühlau (2014) as well as Kelley and De Graaf (1997). The articles and the approaches chosen respectively are not intended to be representative for quantitative reports, the best way or perfect. On the other hand, for example, the last of the three articles mentioned was published in one of the most prestigious journals in sociology – the American Sociological Review[10]. We should bear in mind that most submissions for these journals are rejected during the review process. The usual case for these articles

[10] The Journal Citation Report dataset lists 21,973 journals as per 23 October 2024 (Clarivate, 2024). The American Sociological Review is ranked at position 960 with a 2023 JIF (journal impact factor) of 7.1. Only 144 (500) journals have an impact factor of 20.0 (10.0) or above (approximately 0.7 percent or 2.3 percent respectively). The next approximately 7,750 journals have an impact factor between 9.9 and 2.0 (another approximately 35 percent). The major part of all journals remains with impact factors of 1.9 and below which resembles the remaining approximately 63 percent. This very brief summary serves as a benchmark, but does not take into account the specifics between disciplines, for example, in terms of community sizes or publication patterns.

which pass this first step is a revision based on reviewers' comments. The overall quality of texts improves during the feedback process between the author(s) and reviewers. In other words: acceptance without corrections is very unusual or unlikely, and may even be impossible. So, based on that, we can assume that the article has the potential for transferability for further texts.

Let's concentrate on the structure of quantitative research texts. The aforementioned article written by Kelley and De Graaf (1997) has the following structure: (abstract), introduction, theory, data, measurement, methods and models, results, conclusion.

The structure of the other two articles is similar, but differs in the details and some names of the chapters:

- Pauksztat et al. (2021): (Abstract), Introduction, Seafarers' mental health and the impact of the COVID-19 pandemic, The role of respondent and work-related characteristics, Methods, Results, Discussion (including conclusion).
- Röder and Mühlau (2014): (Abstract), Introduction, Gender Egalitarianism in Post-Industrial Societies, Gender Ideologies of Immigrants and Origin-Country Context, Intergenerational Acculturation of Gender Attitudes, Intra-Generational Acculturation, Gender Differences in Acculturation Patterns, Data, Modeling, Results, Conclusion and Discussion.

Summarising, we can use the article written by Kelley and De Graaf (1997) as some kind of a template. Its outline is comprehensible, clearly structured and – most importantly here – offers the best template in terms of transferability to further work in the sense of an example of good practice.

Irrespective of the differences and similarities between the three examples, we find the (more or less) same structure in all texts mentioned. We have already discussed further information about the background to the structure of the texts or texts in general (see above). As a next step, we strongly recommend to research the aforementioned articles (or at least one) and analyse the different sections (if you have not already done so) in order to understand in more detail what the authors have done in what sections and why (see also Bryman, 2012, pp. 692 ff.)[11]. This helps you to get a better understanding on how to structure your future work not only in this learning module or your studies in general but also in your professional and personal contexts.

[11] You can find another in-depth analysis in the newer edition of the same book. Clark et al. (2021, pp. 591 ff.) analyse the article "Towards an Ethical Framework for Publishing Twitter Data in Social Research: Taking into Account Users' Views, Online Context and Algorithmic Estimation" by Williams et al. (2017). The authors carry out Twitter-based research in terms of "(1) views of Twitter users through analysis of online survey data; (2) the effect of context collapse and online disinhibition on the behaviours of users; and (3) the publication of identifiable sensitive classifications derived from algorithms." The article's structure is: (Abstract), Introduction, Context, Ethics in Social Media Research, Methods and Measures, Findings, Discussion, Conclusion.

Writing up qualitative research

In the following, we will have a look at some general characteristics of qualitative articles. Again, the articles mentioned hereafter and the approaches chosen and described therein respectively are not intended to be representative for qualitative reports, the best way or perfect. On the other hand, we will again refer to a text which was published in a leading journal. We refer – following Bryman (2012, p. 695)[12] – to Jones et al. (2010, p. 103) who study "[…] UK men and women who had previously worked in executive and higher management posts and who had recently taken early retirement as a matter of choice." The subject of the study is an analysis of 20 structured interviews "to explore the experiences of retirement, changes in lifestyle and social roles and the meanings associated with retirement." (ibid.) The article was published in a journal named Sociology[13] and its structure runs as follows: (abstract), introduction, background, methods, findings, discussion, conclusion.

The structure of the three articles presented above (see chapter 3.4) is similar, but differs in the details and some names of the chapters, too:

- Simon and Fernandez (2016): (Abstract), Method, Results, Discussion. The text contains a text between the abstract and methods section which resembles the introduction, even if it is not headed or marked with a corresponding heading. Therefore, the chapter is not listed in the previous list.
- O'Reilly (2010)[14]: (abstract), Introduction, Method, Review of Literature, Key Findings, The Theory of Strategically Constructed Silos, Implications for Theory, Managerial Recommendations, Concluding Remarks.
- Charmaz (1994): (abstract), Methods and Data, Awakening to Death, Accomodating to Uncertainty, Defining Illness and Disability, Preserving Self, Discussion. This text also contains a text which resembles the introduction between the abstract and methods section, which is not headed or marked, too.

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[12] You can find another in-depth analysis in the newer edition of the same book. Clark et al. (2021, pp. 595 ff.) analyse the article "Holding Court: The Social Regulation of Masculinity in University Pickup Basketball" by Rogers (2019). The author uses the concept of 'inclusive masculinity' to find out how a group of people who do not know each other play together university pickup basketball. Moreover, they are international and therewith take over roles as so-called 'diverse strangers'. The article's structure is: (Abstract), Introduction, Pickup Basketball, Methodology, Findings, Discussion, Conclusion.

[13] Sociology is a leading journal in the same field (sociology). It is ranked at position 6,347 with a 2023 JIF of 2.4 in the Journal Citation Report as per 23 October 2024 (Clarivate, 2024). According to the journal overview and metrics the acceptance ratio for articles is 22.0 percent (Sage Publications, n.d.).

[14] O'Reilly et al. (2012): The outline is (abstract), introduction, concluding remarks. This text mainly refers to the method of grounded theory research. It refers to the study of O'Reilly (2010) as an example for illustrating purposes but, of course, differs from the aforementioned outline of qualitative studies. However, the article is mentioned here for the sake of completeness although it differs in terms of the structure which is not relevant for this chapter.

Again, summarising, we can use the article written by Jones et al. (2010) as some kind of a template. Its outline is comprehensible, clearly structured and – most importantly here – offers the best template in terms of transferability to further work in the sense of an example of good practice.

Moreover, when comparing quantitative and qualitative approaches, we find that the structures of these two are quite similar to each other. So, we can bear in mind that "a structure that runs

Introduction → Literature review → Research design/methods → Results → Discussion → Conclusions

is not obviously associated with one research strategy rather than the other." (Bryman, 2012, p. 695)

We have discussed the basics of structuring texts above. This also necessitates the importance of understanding the peculiarities of your own topic and the need to flexibly adapt the outline accordingly (see chapter 3, especially section 3.5).

Again, the approaches in general (quantitative and qualitative but also mixed methods) and the examples presented in particular on how to write up your results and documents respectively – be it home assignments, articles, thesis, etc. – are examples on how you *can* structure your text. The exemplary academic paper outlines presented here are neither exemplary nor representative, although they provide some features that can often be seen in terms of the presentation of results and the structure of these texts accordingly; and we also have evidence that these texts have crucial qualities. Again, make sure to always discuss the final outline of your academic texts with your supervisors.

7.3 Basic Principles of Scientific Notation

Once the preliminary studies are finished, you can begin writing. Different considerations are mentioned and illustrated in this chapter. Independently of the style guides mentioned above and your field of research, you will have to observe these two mandatory and essential criteria:

1. All sources of information used must be stated in your text. Omitting citations is considered plagiarism and an attempt to cheat.
2. A chosen formal principle has to be used continuously and without any changes; this also applies to the way you cite literature.

The first *impact* concerns the classification of texts within a range of different types of texts and genres (for example, academic research texts, course books, lab report, etc.). You probably know different texts from your preliminary studies and are aware of the fact that different texts have substantially different characteristics. Academic research texts belong to the specialised text category. The easiest way to get used to them is to read some good examples of academic research texts or to practise your writing skills. Accurate orthography, punctuation and grammar should be a matter of course for your academic research texts. Proof-reading is highly recommended and can be carried out by fellow students and friends (as outlined in chapter 1.4). Moreover, the wording and style of your texts should match academic demands in general and of the relevant discipline in particular. You should follow these basic rules:

- Comprehensibility with regard to the target group: every text should be written with the reader in mind. It should be as concise as possible and illustrated with examples, descriptions and images. You should be aware of the fact that the interested reader has a subject-specific background. The text does not need to be made comprehensible for everybody. Explaining the words 'consignor' and 'consignee', for example, seems rather unnecessary for someone working in the logistics industry. Keep the following rule in mind: write as comprehensibly as possible and as incomprehensibly as necessary! Your text should be comprehensible for both alumni and students in advanced semesters in your field.
- Definition of technical terms: all necessary specialised terms have to be defined with regard to their use in the text. Do not explain words which are not significant for the project or are generally accepted principles.
- Logical structure: the text as a whole and every single chapter should have a clear, logical and comprehensible structure. The text has to fulfil the demands of the relevant field of research.
- Use of loanwords: the excessive use of loanwords should be avoided. Common terms of the relevant field of research should be used even though they seem to be complicated at first sight. This rule applies only to texts which are written in German language.
- Use of colloquial language: avoid the use of colloquial language in academic research texts. The legitimate use of these words by using quotation marks is only possible in academic research texts under certain conditions.
- Literal citations: direct (literal) citations should be used extremely rarely as they rather indicate that the author has not taken the effort to summarise other authors' thoughts but has just written them down. An exception to this is wording so good that you cannot express it any better.
- First person: sentences expressing a first person's point of view should be avoided. 'The author would like to add …' is an obsolete formulation and should never be used! It should only be used when the emphasis of one's personal opinion is absolutely necessary (Theisen, 2008, p. 138 f.).
- The full documentation of the sources of information used, without any gaps, should be a matter of course. Further information will be given in chapter 7.5.
- Factual argumentation: factual argumentation is a requisite in any academic research text. Assertions require a proof in all cases. Jokes and emotional remarks are not appropriate.

The rules mentioned above are not unbreakable. If justified you can deviate from certain rules, but be careful! If you deliberately ignore them, you will distract your tutor and other readers from the core message of your work and they will question your reliability (Bensberg, 2013, p. 38 ff.; Brink, 2013, p. 162 ff.; Ebster & Stalzer, 2017, p. 88 ff.).

To comply with the stated demands and to produce a readable text, follow the advice given above and take the following into consideration (Bensberg, 2013, p. 42; Brink, 2013, p. 163):

- express yourself clearly and simple,
- state one piece of information per sentence only,
- (avoid loanwords),
- avoid very long (nested) sentences,
- use approximately fifteen words per sentence,
- avoid padding out your text with empty phrases.

Besides, make sure that you do avoid discriminatory language (Clark et al., 2021, p. 583). You can find an introduction to and advice on equality, diversity and inclusion on the Internet pages of the British Sociology Association.

Let's change the topic. Basically, as you have seen in the paragraph above, academic research texts have an informative character. You will therefore have to convince the reader of the credibility of your text. For this purpose propositions have to be outlined and argued. The classical technique has a long history and follows a set order:

- Exordium: introduction to the topic is written and its importance stated.
- Narratio: the background to the topic is explained.
- Partitio: the aims are stated and the structure of the argumentation is outlined.
- Confirmatio: the main body of your text is clearly defined and research results are presented to support your argument.
- Refutatio: divergent opinions are outlined and explained and subsequently refuted.
- Peroratio: in conclusion the most important criteria are summarised and illustrated (Small, 2013, p. 349; Kirchner et al., 2006, p. 184 ff.).

Different elements can be assigned to different parts of the text. Typically, your text will adopt a macro structure which turns out as follows: elements one to three are parts of the introduction, elements four and five belong to the main part and element six is part of the conclusion.

Besides the macro structure, a micro structure can also be identified when going into further detail. A so called 'scheme of argumentation' is often adopted, as used by the English philosopher and logician Stephen Edelston Toulmin (1922-2009). This will be roughly outlined in this section. An argumentation consists of six steps: claim, data, warrant, backing, rebuttal and qualifier (Toulmin, 1958). By connecting them an argumentation is created. The details will not be explained here.

Let's rather concentrate on the original topic again (the scientific notation). You should be advised of the following risk: students often make assertions without stating the corresponding proof, for example, it is generally known that more men than women are seafarers. This may sound plausible and may represent reality. However, it is only an assertion, which is not sufficient because an explanatory statement is inevitable. If a simple checkable fact is stated then it is enough to add a

source of information concerning the different criteria,[15] as you already saw in chapter 4.3. In most cases, however, this is not sufficient, and evidence has to be shown. A plausible argumentation includes the discussion between pros and cons and a conclusion. This leads to the following assumptions:

- Critic scientific authorities will help to convince of the reader.
- The use of the 'common sense' is not enough in science.
- Evidence based on individual cases is mostly not acceptable.

It is also important to show rebuttals and qualifiers. Potential exceptions are discussed and this strengthens the credibility of the text. For this purpose, you as the author can make use of stylistic elements. This is illustrated by some phrasing examples. The wording 'to a great extent' can be used to outline that a constant X does not only affect the dependence of a variable Y, but that more factors influence the correlation. You can make use of different possibilities:

- restriction and refusal (Indeed … but …),
- acknowledgements (Certainly … as …),
- limitation of the area of application concerning time, location, etc. (… to a great extent …).

In a nutshell, be aware of adequate rules of conclusion from the reader's point of view. Contact your tutor(s) in good time to reach an agreement on these issues (Brink, 2013, p. 172 f.; Ebster & Stalzer, 2017, p. 95 ff.).

Concerning the layout and formal criteria, especially when writing theses, in most cases style guides of the different faculties and departments exist. For writing academic texts in the context of your studies the same rules apply and you should know them. The opinions and advice of the tutor(s) are relevant. Some common rules are formulated below and it is in your interest to follow them:

- Paper: it is recommended that you use white paper of good quality in DIN A4, writing on one-side only.
- Line spacing: the typical line spacing is 1.5. This increases readability and allows space for corrections. In footnotes and citations the line spacing is reduced to 1.
- Character style: use a classical font like '**Arial**' without serif or '**Times New Roman**' with serif. Do not use old-fashioned types like '**Courier New**' (it resembles a typewriter) or squiggly fonts like '**Purisa**'.[16]

[15] Even if the aforementioned claim is correct and seems plausible when reading it, a source or evidence must always be included. Support or evidence for the aforementioned assertion provides, for example, BIMCO (2021): "The percentage of female STCW certified seafarers is estimated to be 1.28% of the global seafarer workforce […]"

- Character size: character sizes are measured in points. For your text, use a size of 11 or 12 points, for headings the size can be increased to between 12 and 16 points and for footnotes the size should be reduced to 9 or 10 points.
- Margins: the following margins are recommended: Left side: 3 to 3.5 cm, right side, top and bottom margin: 2 to 2.5 cm. The bigger margin on the left side is required for binding your work. Do not deviate from the guidelines when adding figures and tables or in the appendix.
- Paging: the pages of an academic research text are numbered sequentially with Arabic numerals (1, 2, 3, 4, etc.). It starts with the first page and runs to the last page of a text (see, for example, the paging of this study text).[17] The actual page number begins on the second page or the third page after the title page in the case that the second page remains blank. The numerals are put at the top or the bottom and are centred or right-aligned (Theisen, 2021, p. 191; Krämer, 2009, p. 179 f.).
- Highlighting: highlighting is done only with **bold characters** or *italic script*. Underlining and l e t t e r s p a c e p r i n t s are unsophisticated and remind the reader of the typewriter era. SMALL CAPITALS do not make for easy reading and should only be applied for individual words or completely avoided. Please note that the more highlights you use the weaker the signalling effect will be.
- Text alignment: The following three possibilities exist. Centring is unusual. Grouped style is mostly used because it looks attractive. To avoid gaps the syllabification function should be activated in your word processing program. The alternative is left alignment.
- Colour: The text and headlines should be printed in black. To increase the visibility of figures, tables and pictures the use of different colours is appropriate. For printing the text a laser printer is the first choice because of its higher quality and greater fade resistance compared to an ink jet printer (Brink, 2013, p. 161 f.).

While reading the above advice you have perhaps asked yourself the following questions: Is it really important whether the formalities are observed in detail? Does it really matter whether a citation is marked by quotation marks or not?

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[16] The character styles mentioned are very popular and they are available in the 'Microsoft Office' software package. Metrically compatible fonts under an open source license are collected in the so-called 'Liberation' font family. Its names are 'Liberation Sans', 'Liberation Serif' and 'Liberation Mono' and they are, for example, freely available in the 'LibreOffice' software package.

[17] The title page, preamble, table of contents and the lists of figures, tables and abbreviations can be numbered with Roman numerals (i, ii, iii, iv, etc.). The numbering of these pre-texts, which were usually created later, in book printing was independent of the text pagination due to the separate numbering with Roman numerals; 'nowadays', word processing software has essentially made this once necessary distinction obsolete as page numbers in such software adjust automatically (Krämer, 2009, p. 179 f.).

Let's concentrate on two arguments to see whether full compliance with formalities is of great importance. On the one hand the formalities serve to clarify the content. The interested reader can see from one glance at the literature list whether a source of information is a monograph or a collected edition and how recent information is. On the other hand the formalities have a pragmatic background – your texts are normally examinations and therefore it should be central to your interests to present your text to the lecturer(s) as attractively as possible. Although the content has the higher significance, respecting formalities also has a major impact. Especially when you work on a topic which is very specialised (in connection with a company) or new to your tutor(s) the observance of formalities is essential as they can be checked easily and objectively (Ebster & Stalzer, 2017, p. 99 ff.).

Something else is worth remembering: perhaps you are familiar with the situation of having accumulated a huge quantity of information sources. The facts and figures of your topic are well structured in your head and the date of delivery is approaching. In spite of this the writing flow is somehow blocked. Writing a text is a lengthy process which starts long before you really start writing it and ends when you finish the raw version. To support you when working on your text, here are some strategies to avoid getting stuck in your writing process:

- Often an unfinished concept of the overall work structure and sub-division is the reason for a writing block. Check your outline and what you want to write in the different chapters, etc.
- Do you have excerpts from your literature research as a basis?
- The production of the raw version and the revised version of your text are two different steps – carry them out in two steps! This improves the production of a coherent text.
- Find out which time frames are the best for you. Do you work best during the day or at night?
- Jot down thoughts you have while you are away from your desk.
- If possible, avoid any time pressure.
- Be careful with expectations concerning your text. Writing has to be considered a skill which you still have to improve. Use every possibility to speak to your colleagues, fellow students and tutor(s).

Many students have experienced the problem of expressing themselves badly or writing incomprehensible sentences. When the sentences do not make sense, different strategies may help:

- Check the basic conditions concerning your workplace.
- Look at your most recent piece of good writing for encouragement.
- Use creative techniques like the 'free-writing' method.
- Reward yourself for some good writing by relaxing and doing things you really like.

- Try to get feedback on your texts. Responses and discussions have a positive impact on your project (Ebster & Stalzer, 2017, p. 102 ff.).

A further problem which leads to a writer being blocked is the absence of a reader. Writing a text seems be a sort of monologue. This is a misconception – writing an academic research text should resemble a dialogue. Consider it a dialogue between reader and writer and adapt your approach accordingly (Keseling, 2011, p. 215 ff.). Another block may be the inner critic asking 'What do I have to say if others have already expressed it better?' Or you worry about the actual critics – your two lecturers. Try instead to see your text as intended for people with an interest in the research topic (Rost, 2012, p. 335).

When the inner critic is the main barrier the first step is to overcome any inhibitions and to get into the 'writing flow'. Writing down everything you have on your mind will help you get into gear. This 'free-writing' activity is a useful method for initiating your writing process (Wolfsberger, 2010, p. 141 f.).

R7.2 What is the difference between the micro structure and the macro structure concerning the argumentation in academic research texts?

7.4 Visualising Academic Research Texts

This chapter explains the use of visualisations (figures, tables) to improve your text's comprehensibility. Visualisations also act as an orientation aid in the text. Important statements are precisely outlined and correlations illustrated. Visualisations not only attract attention, they also loosen up the text and help you avoid confusing, overloaded pages.

Every visualisation has to fit into the context of its text passage. For this purpose three options may be considered: integrating a visualisation which is true to its original, modifying an original for your own purposes or creating your own visualisation. The latter option offers the highest personal contribution as it shows the expertise and creativity of the author. Integrating existing visualisations is acceptable but adaptations may enable you to convey your message better (Ebster & Stalzer, 2017, p. 107 ff.). Irrespective of the three options you should be careful to use visualisation in order to improve the text's comprehensibility. Visualisation and text must therefore relate to each other. A sequential numbering of figures and tables is required as well as a specific title. When adapting existing visualisations, mentioning the source should be a matter of course (Theisen, 2008, p. 162 ff.).

In the following, the most important visualisations and the pertinent tasks are presented by different generic terms to present information differently. The figures have sequential numbers and names and, if required, a source of origin. They are not explained and there is no connection to the context. Their purpose is for illustration reasons only:

- 'Explanatory information graphs' are structural (networks, tree diagrams (figure 11), flow diagrams (figure 12)) and schematic descriptions.
- 'Enumerative graphs' are diagrams with bars (figure 13), pillars (figure 14), lines (figure 15) and circles (figure 16).

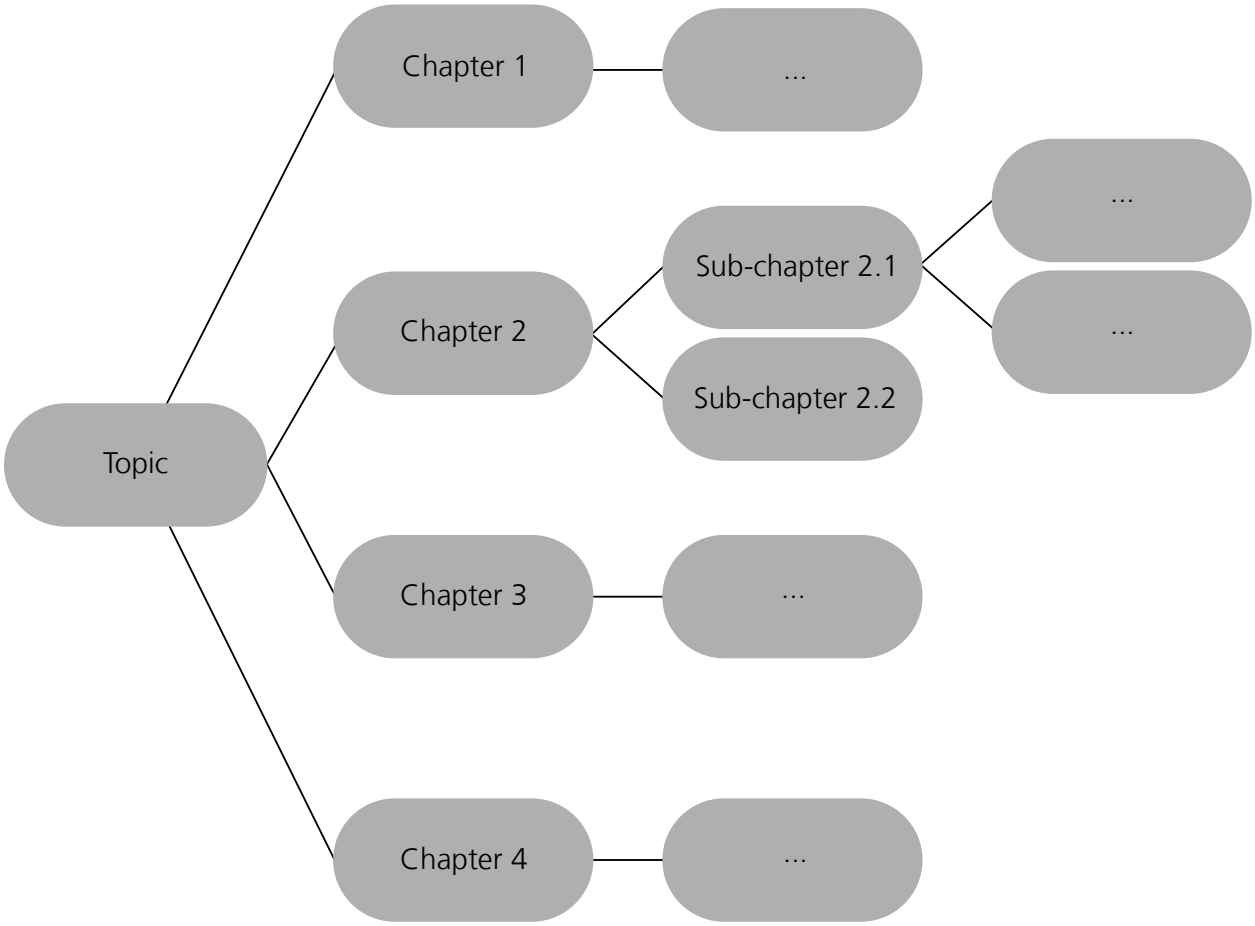

Figure 11: Schematic structure of an academic research text, own illustration.

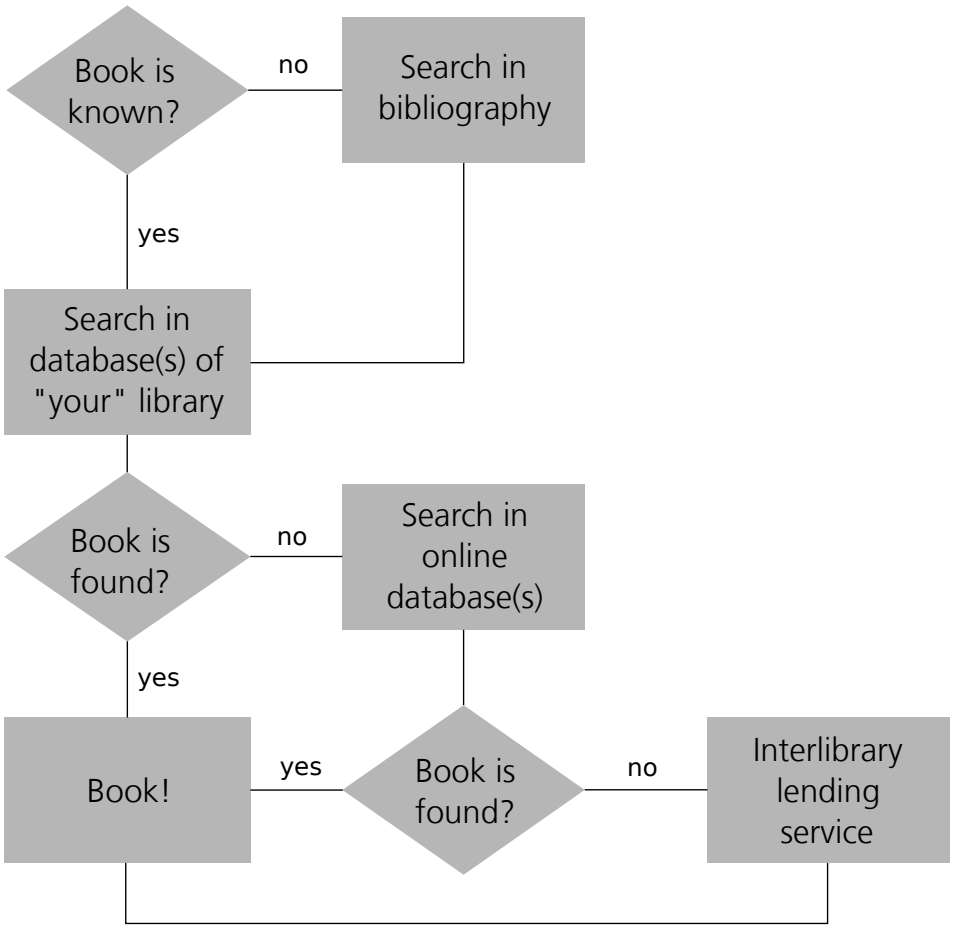

Figure 12: The different steps in the process of obtaining a book, own illustration.

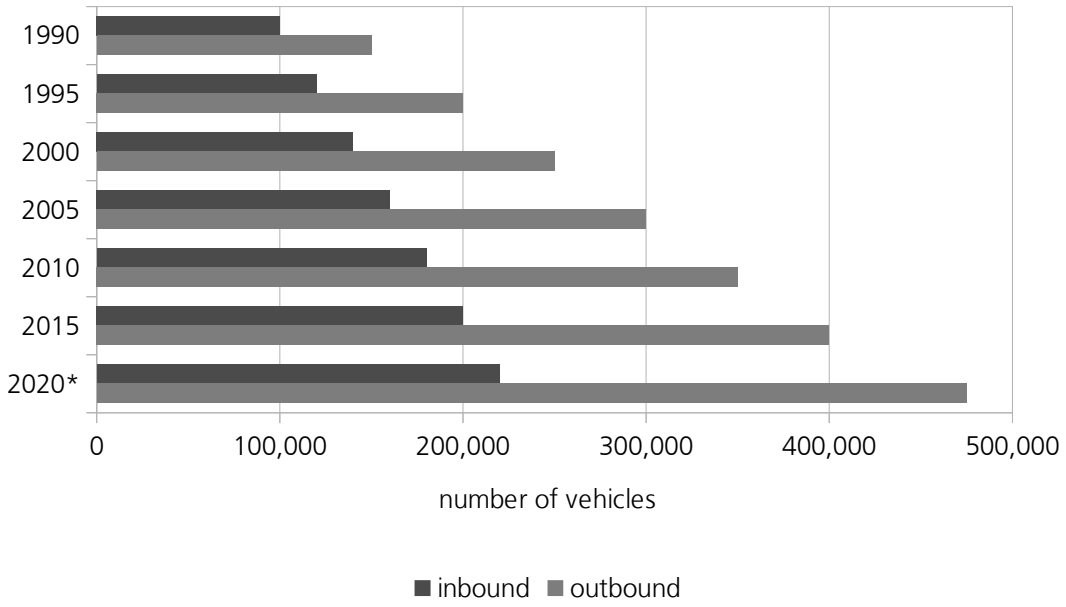

Figure 13: Seaborne motor vehicle handling in Port ABC from 1990–2020, own illustration.
**: the values for 2020 are forecast.*

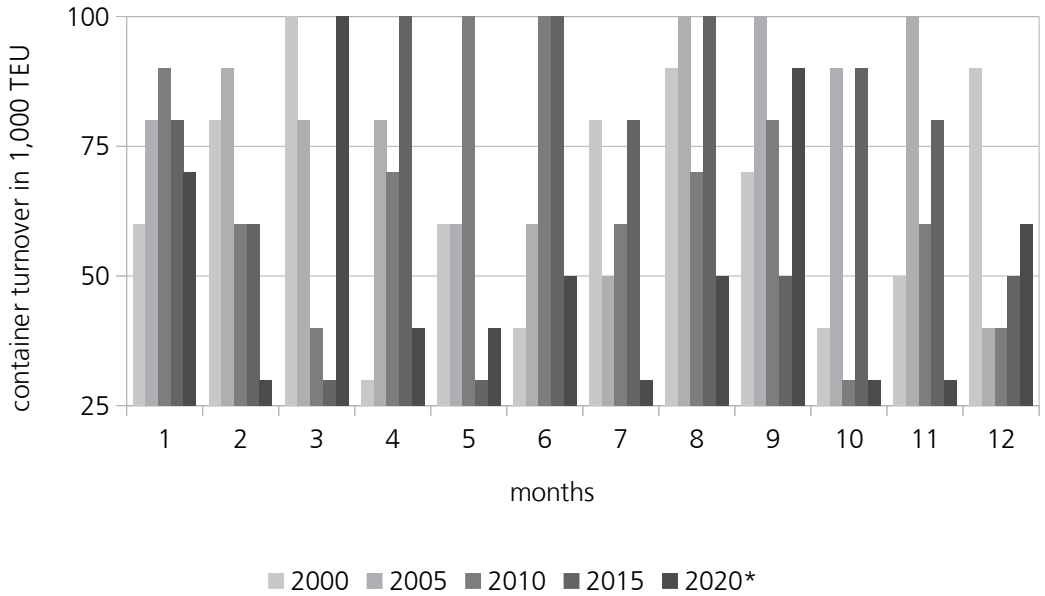

Figure 14: Development of container turnover figures in Port ABC from 2000–2020, own illustration.
**: the values for 2020 are forecast.*

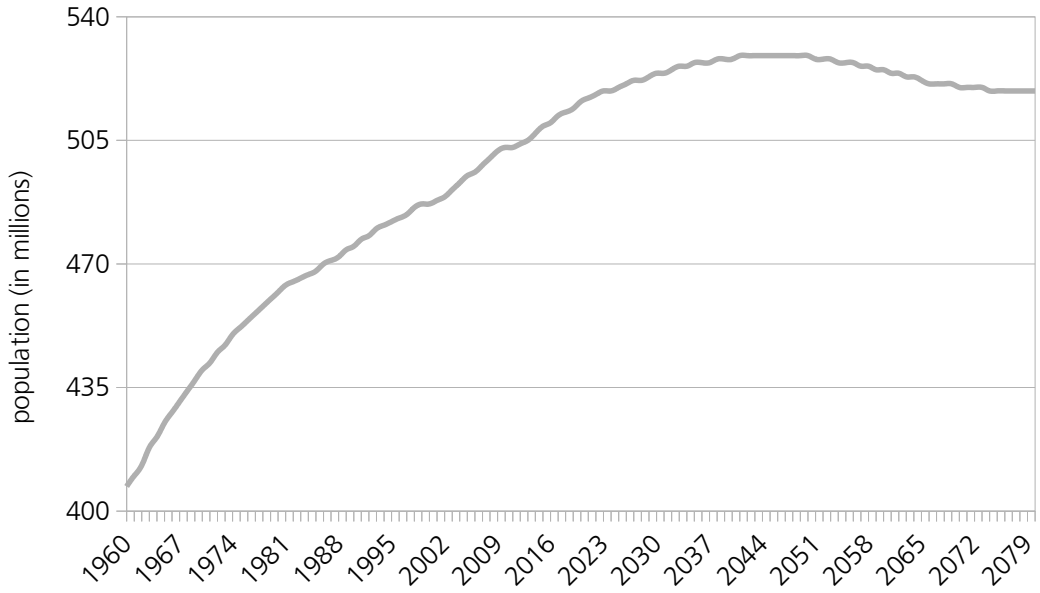

Figure 15: Population development and projections in the European Union – 28 countries, according to Eurostat, 2019b.

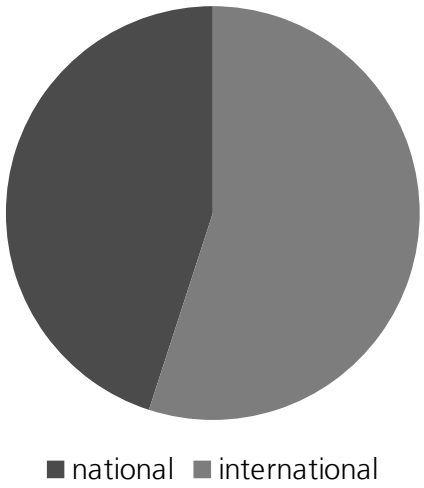

Figure 16: Composition of a student cohort in a degree course according to students' geographical origin, own illustration.

As shown by the figures, the different types serve different purposes. Have a look at the following table and then scroll back to the figures to find conformities. The different tasks and advantages are summarised and shown in the following table – anomalies and exceptions are allowed in particular cases:

	intended message					
numerative geraphics	diagram with	percentage	ranking	frequency	time course	correlation
	pillars			✔	✔	
	bars		✔			✔
	lines				✔	
	circles	✔				

Table 8: Usage of enumerative graphs in dependence of the intended messages, according to Ebster and Stalzer, 2017, p. 114.

When analysing visualisations in texts some mistakes are typical and recurrent: deficient or missing labelling, excessive content, and reduced, extended or discontinuous axes. The labelling is a main component in the process of communicating contents when a visualisation is used. The label should include a number, title, reference and, if required, a legend or explanation.

Concerning the composition of a visualisation, take the following advice into consideration: avoid distorting the figure to imply a wrong message, for example, a peak which seems higher than it is or should be. Use colours if it is helpful or leave it in black and white if it is not. If you use colours be aware of the different moods the reader may associate with colours – for example, green is positive, red signals a danger, pink stands for female, blue for male, etc. Use colours consistently and avoid three-dimensional visualisations as they may side-track the reader's interest.

Tables are useful for presenting quantitative data. Data should always be presented in the clearest possible way and tables are a very effective way of achieving this. A diagram can be an alternative as it offers a quick first overview, especially where tables may contain too much data and hide the decisive aspects from the reader. Some advice should be considered when designing a table: think about your message and the question you intend to answer with your table. Try to limit your tables to two dimensions, the so-called characteristic values. The alignment of rows and columns has an impact on the table's readability. The values in rows and columns should present a logical sequence (ascending, descending, etc.). A table conveys no message when the units (%, etc.) are not displayed. Do you include frequencies, percentages, mean values? An attractive layout can improve the table's legibility, for example, inserting a number of lines suitable for the description, etc.

R7.3 What are the benefits of the different types of illustrations ('explanatory information graphs' and 'enumerative graphs') and tables?

7.5 Citation

As emphasised before, the documentation of the sources of information (citations) used is absolutely essential. It is a basic requirement in every academic research text. In the text, citations are made in the appropriate position, and at the end there is a list of references showing all citations used. This chapter summarises the following aspects: avoidance of plagiarism, citations embedded in a text, list of references and special characteristics of texts written in English.

Over the last couple of years some spectacular cases of plagiarism have become public. For example a German minister of defence had to step down from his job. An important instrument in using and discovering plagiarism is the Internet. It has become easier to copy other people's texts and ideas, but it has also become easier to verify suspicions regarding text by comparing it with the contents of special electronic databases to identify plagiarism.

Plagiarism can occur unintentionally. This is why some advice is given to make you aware of possible risks related to writing academic research texts. We start with a definition of plagiarism (Ebster & Stalzer, 2017, p. 124). According to Weber plagiarism is "the presentation of other people's intellectual property as your own" (Weber, 2007, p. 41; translation by authors). It is a matter of academic honesty to mark other authors' literary intellectual property by stating the sources of their thoughts, information and argumentation. The aspects of traceability, comprehensibility, completeness, taxonomy, etc. have to be guaranteed.

Other researchers' knowledge and thoughts serve as a starting point for your own academic research project and help you with your progress (Disterer, 2009, p. 109 ff.; Kornmeier, 2007, p. 121 f.). The insistence on rules concerning citation should not be considered as simple formalistic aspects. Far from it! Traceability is an essential formal criterion (Rost, 2012, p. 269). Be aware that breaches of the rules will always be considered plagiarism and have to be taken very seriously!

Another risk has to be considered. All sources of information may contain errors. The reasons are diverse – faulty approaches, incomplete analyses, non-academic lines of action, etc. In many cases errors are not apparent, and they are identified and revised much later. If you adopt errors without an indication of source they will be considered your errors. Errors in an assumption may lead to an incorrect foundation for your work and individual parts may be mistrusted or declared to be incorrect. A comparison with counterfeiting may illustrate the point. If someone accepts counterfeit money, they must accept being considered guilty of fraud with the consequence of a possible financial loss. Someone spending counterfeit money – intentionally or unintentionally – may be liable

to prosecution (Disterer, 2009, p. 114 f.). All opinions, positions, thoughts, results adopted from other people have to be marked as citations, and the sources of origin have to be obvious, verifiable and unambiguous.

Citations are usually classified into two categories (Ebster & Stalzer, 2017, p. 127, Kornmeier, 2007, p. 122; Rost, 2012, p. 270):

1. Literal (also: direct) citations are true to the original in wording. They appear in quotation marks and the source of information is stated without any comment, starting with the author's name. Apart from very few exceptions, direct citations are not necessary for academic research texts. A direct citation need never extend to more than two or three sentences. Use direct citations only when the original is formulated in a way you could not reword better. Mistakes have to be adopted and marked with the comment [sic!] (from Latin: thus) directly behind the word with the mistake to indicate that the mistake has been made in the original source and has been recognised by you as such. Adaptations concerning upper and lower cases as well as punctuation are allowed. Modifications (notes, accentuations and omissions) always appear in square brackets (Kornmeier, 2007, p. 123 f.):

    - Example of a note: "The last decade has seen tremendous investments in new [and larger; authors' comment] container ports, vessels, and linked onshore transportation systems." (Chew et al., 2013, p. 463)

    - Example of an accentuation: "The last decade has seen **tremendous** [accentuation by authors] investments in new container ports, vessels, and linked onshore transportation systems." (Chew et al., 2013, p. 463) Alternatively, it can also be written like this: "The last decade has seen **tremendous** investments in new container ports, vessels, and linked onshore transportation systems." (Chew et al., 2013, p. 463; accentuation by authors)

    - Omissions: [.] for one word, […] for more than one word. Example of an omission: "The last decade has seen [.] investments in new container ports, vessels, and linked onshore transportation systems." (Chew et al., 2013, p. 463)

2. Logical (also: indirect) citations (also: paraphrase): it is analogous to the original but written in your own words following other author's thoughts or argumentations. It does *not* mean, that the sentences are simply put in a different order. The original text should be described in your own words and free of original text passages. A logical citation does not appear in quotation marks but can be marked with the abbreviation 'cf.' (from Latin: confer, compare) (Kornmeier, 2007, p. 124). The abbreviation is not mandatory. This sentence is an example for a logical citation: in the past years several investments have been made for financing container transportation systems including vessels, ports and hinterland connections (cf. Chew et al., 2013, p. 463).

Some basic advice concerning citations in the economic and social sciences follows. The integration of outside knowledge, argumentations, thoughts, etc. is only useful if it is complemented with your own ideas, concepts, thoughts, etc. A simple listing of citations without comment or discussion is

not useful and will only confuse the reader. Moreover, you should make text passages by other authors fit into the context of your own text and make sure they do not affect its readability (Kornmeier, 2007, p. 125). Let's concentrate on types of citations. The following three possibilities exist:

1. The German-style quotation (with footnotes) is used seldom because it is circuitous and extensive. All bibliographic information appears in footnotes. Due to the low relevance for academic research texts by students it is not explained further in this unit.

2. The Harvard quotation (with footnotes): If more than one source of information is used, all sources are listed within one footnote. In a longer text, such as a master thesis, restarting counting in every chapter to guarantee clarity should be considered, if applicable.

3. The Harvard quotation form (within the text): This 'modern' quotation form is used especially in international journals. In some disciplines it is used exclusively – for example in psychology texts. In the economic sciences it also enjoys great popularity and is used increasingly. Texts written in English follow the Harvard quotation form exclusively (Ebster & Stalzer, 2017, p. 126 f.).

Examples:

1. 1. With the aim of reducing global warming it is necessary to decrease the consumption of fossil fuels.[1]

_____

[1] Cf. Komiyama, Hiroshi, Kraines, Steven: Vision 2050, Tokyo 2008, p. 131.

2. With the aim of reducing global warming it is necessary to decrease the consumption of fossil fuels.[1]

_____

[1] Cf. Komiyama/Kraines (2008), p. 131.

3. With the aim of reducing global warming it is necessary to decrease the consumption of fossil fuels (Komiyama/Kraines, 2008, p. 131).

In the following you will get some advice concerning the possibilities of citing different sources of information following the Harvard citation form within the text. All examples are based on indirect citations (Kornmeier, 2007, p. 134; APA, 2010, chapter 6):

- Reference to one author: It is argued that … (Public, 2013, p. 1234). or: As Public (2013, p. 1234) argues …
- Reference to an authorship with two or more than two authors: … (Public & Public, 2013, p. 1234) … (Public et al., 2013, p. 1234).
- Reference to two pages: … (Public, 2013, p. 1234 f.) … Reference to more than two pages: … (Public, 2013, p. 1234 ff.) or (Public, 2013, pp 1234–1236).

- Reference to a source without pagination like sources on the Internet or if the reference to a whole book is stated: … (Public, 2013) (Kornmeier, 2007, p. 126).
- References where one author has published more than one cited document in one year. They are distinguished by adding letters (a, b, c, etc.) behind the year: … (Public, 2013a, p. 1234) … (Public, 2013b, p. 1234), etc.
- References to a source of information where individual details are missing (here: no year): … (Public, n.y., p. 1234) (Ebster & Stalzer, 2017, p. 129).
- References where one source is quoted in a second source and both are relevant for the text: The meta-analysis of Bloggs (2012 cited Public, 2013, p. 1234) came to the finding that … (In this case you would refer to the book by the author Public and state this source in your text and in the list of references; Public referred to Bloggs and Bloggs' meta-analysis is important for your text but you have not read the original source – Bloggs' source of information – and therefore mentioned only in your text).

Following the use of the most important types of citation: the list of references. All cited sources of information are documented twice in your academic research text: the first time in the text as mentioned above and a second time in the list of references. This is especially necessary if the Harvard quotation form is used because it does not contain all the bibliographic information to identify the source of information. Hence the following two relations are important:

1. If it directly or indirectly refers to a source of information in the text then it has to be stated within the list of references.
2. Every source of information which is contained in the list of references has to be referred to directly or indirectly at least once in your text.

To put it in other words, a proportion of 1:1 must be reached. If books are read and rejected later (for example, not used and therefore not cited in your text) then they should not be mentioned in the list of references.

When generating the list of references the following information is useful. Entries always begin with the last name of the author(s) and are sorted in a descending order. Academic titles are not mentioned (Ebster & Stalzer, 2017, p. 135). Additionally, the following criteria are relevant:

- accuracy: error-free listing of the sources of information used,
- completeness: description of the relevant information which enables the reader to identify all sources of information used,
- rigidity: maintaining the chosen scheme concerning the listing of sources of information,
- clarity: alphabetical order and clearly arranged layout (Kornmeier, 2007, p. 127).

With regard to their usability the explanations for the list of references are based on the principles for texts written in English. Two main rules apply to citations in English; these are the citation rules of the 'Modern Language Association' (in the sciences known as MLA) for humanities and the

'American Psychological Association' (APA). The APA style is also used in the social and economic sciences. If the APA style is followed, the source of information is stated in the text in short form as outlined above. A list of references is mandatory and its heading is just 'References'. In the following different sources of information are listed including the required data and examples for a list of references (Ebster & Stalzer, 2017, p. 136 ff.; APA, 2010, chapter 7):

- Book (one author): Last name of the author, first letter of the first name (year of publication). *Title of the book.* Location: Publisher. Example: Parameswaran, B. (2004). *The Liberalization of Maritime Transport Services – With Special Reference to the WTO/GATS Framework.* Heidelberg: Springer Verlag.
- Book (two or more authors): Last name of the authors, first letter of the first names (the last author is separated by '&' from the other authors) (year of publication). *Title of the book.* Location: Publisher. Example: Ebster, C. & Stalzer, L. (2017). *Wissenschaftliches Arbeiten für Wirtschafts- und Sozialwissenschaftler.* Wien: Facultas WUV.
- Article in a collected edition: Last name of the author(s), first letter of the first name(s) (year of publication). Title of the article. In first letter of the editor, name of the editor (Ed.), *name of the collected edition* (pages of the article). Location: Publisher. Example: McCulloch, K. (2013). Erving Goffman: sail training, interactionism and the 'total institution'. In E. C. J. Pike & S. Beames (eds.), *Outdoor Adventure and Social Theory* (pp. 66–76). London: Routledge.
- Paper in a journal with digital object identifier (DOI): Last name of the author(s), first letter of the first name(s) (year of publication). Title of the article. *Name of the journal, Volume*(Issue), pages of the article. doi:xx.xxxxxxxxxx. Example: Vis, I. F. A. & Anholt, R. G. van (2010). Performance analysis of berth configurations at container terminals. *OR Spectrum, 32*(3), 453–476. doi:10.1007/s00291-010-0201-8
- Internet page: Last name of the author(s) and first letter of the first name(s) (year of publication). Title of the Internet page. Uniform Resource Locator (URL): web address [YYYY-MM-DD]. The following example states the editor instead of the author: Elsevier (n.d.): What is peer review? URL: https://www.elsevier.com/reviewers/what-is-peer-review [2023-08-16].

As you may have recognised the APA style is very similar to the short Harvard citation form. The APA style certainly contains a high number of extensive rules and standards, a style guide has been published by the Trexler Library of Muhlenberg College. For more information concerning the use of the APA style take a look at the homepage of Purdue University or the Publication Manual of the 'American Psychological Association' (2010).

You may also come across with a citation style which consists of numbers only. This citation style is called IEEE style and refers to the Institute of Electrical and Electronics Engineers (IEEE). It is very common to use it in technical fields. The corresponding citation numbers are included in the text in square brackets.

Example: With the aim of reducing global warming it is necessary to decrease the consumption of fossil fuels [1].

You probably remember the example which has been used before (see above). All bibliographical information is exclusively included in the list of references at the end of the text which also shows the respective citation number. In line with that, we do not state the corresponding entry from the list of references here but you can, of course, find it at the end of this study text (without stating [1] at the beginning as we do not use the IEEE style within this learning module). Find out more on how the IEEE style works here.

On the one hand, this approach interrupts the flow of reading less than others do which is the most important advantage. On the other hand, while reading a text, the origin of a statement, paragraph or section, the reference where further information is available, etc. remains hidden (in other words: becomes clear only) until looking at the list of references. This is an important aspect while reading a text as the choice of sources, namely the names of authors, plays a role particularly in the context of social sciences or in the humanities, since authors often represent or are usually associated with a 'school of thought' (see footnote 5) or viewpoint, for example, the American (Canadian-born) sociologist Erving Goffman (1922-1982) is associated with the concept of the 'total institution' (1961), among other things.[18] Perspectives of different authors regarding the same topic might be consensus but they are often contradictory. They might also take into account different theories, have originated in a different time or simply be multidisciplinary. Therefore, these aspects should always be taken into account, reflected and considered while reading texts, searching for and analysing sources of information and, most important, writing texts. Looking at it the other way around, this influencing factor is regularly not so decisive in natural sciences, since (mathematical) proofs, for example, are about natural laws that are not (or at least less) affected by the aforementioned influencing 'soft' factors. Therefore, the good readability of the IEEE style is particularly important here and outweighs the aforementioned disadvantages.

As you have seen there are several different ways to cite your sources. The most important issue to remember is to never mix them up, and, having made a choice, to be consistent. For clarification purposes, APA, MLA and Chicago are illustrated in the following – you can look up the sources of information by using Google Scholar to generate the following pieces of information (Google Scholar):

- APA: Goffman, E. (1961). Asylums: Essays on the Social Situation of Mental Patients and Other Inmates. USA: Anchor Books.
- MLA: Goffman, Erving. Asylums: Essays on the Social Situation of Mental Patients and Other Inmates. USA, Anchor Books, 1961.
- Chicago: Goffman, Erving. Asylums: Essays on the Social Situation of Mental Patients and Other Inmates. USA: Anchor Books, 1961.

As you can see all the styles mentioned contain the same information. They just use a different order and pattern. The examples also correspond to the citation theory of Disterer (2009). He explains that, depending on the source, you typically give the following information:

[18] You might also have heard of Michel Foucault, Pierre Bourdieu or Anthony Giddens, for example.

- Monographs: Name of the author, title of the book, edition, publisher, location and year.
- Papers in journals: Name(s) of the author(s), title of the article, name of the journal, year, edition, pages.
- Papers in collected editions: Name(s) of the author(s), title of the paper, editor, name of the collected edition or the congress, edition, location, pages, year (Disterer, 2009, p. 118).

Publications by companies, theses and other grey literature can of course be used as well. If you use them, think of the relevant citation information or look it up!

R7.4	Which citation style have you used mainly in the past? Are you experienced with the topic?	

7.6 Presentation of Academic Research Projects

As part of your under-graduate studies or in your professional career you may have already been confronted with presentations. To stand in front of an audience and to present your own project is another important skill you should acquire. Presenting your own ideas includes using your written words in combination with the spoken word to present your topic, its outline, development and eventually your results to your listeners. You must demonstrate presentation skills during your colloquium as an integral part of the master thesis. However, of much greater importance is your knowledge and experience with presentations for the later demands by your company. In addition, you will learn to interact with and overcome any fear of questions and criticism by listeners (and lecturers).

When planning and preparing a presentation a few aspects are decisive. They concern the arrangement and structure for your target group, the content and the aim of the presentation. The American political scientist and communication theoriser Harold Dwight Lasswell (1902-1978) developed an axiom – the so-called 'Lasswell rule'. Basically, its core elements can be summarised as "Who says what using which channel to whom with what effect?" (Lasswell, 1948, p. 37 cited by Höfer, 2013, p. 56). They are illustrated in the following figure 17 which also includes information on a typical case as part of your studies:

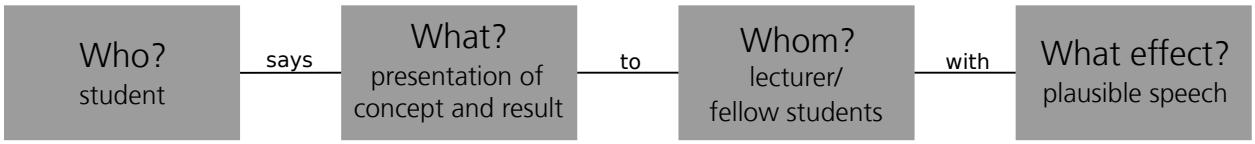

Figure 17: Core elements of a presentation, following Ebster and Stalzer, 2017, p. 141.

The presentation resembles the writing process in that both can be considered as a skill which can be learned. Do not be discouraged when your first presentation does not turn out as expected. Presentation skills can only be learned by presenting and not by reading books about them. With experience comes routine (Renz, 2013, p. 209). To support you in the preparation of your presentations, some background knowledge and advice is given in the following.

Before structuring your presentation you should ask yourself a few questions:

- Who are the listeners? Fellow students, lecturer(s), colleagues, researchers?
- Is the group of listeners familiar with the relevant terms and definitions?
- Is the interest of the listeners equally distributed?
- What media is used? Nowadays it will probably be a projector in connection with a presentation software like 'Microsoft PowerPoint' or an equivalent (for example the open source software 'LibreOffice Impress').
- How much time will be available?
- Will questions be answered following the presentation?

A successful presentation consists not only of well structured and comprehensible documentation. In addition you have to win the listener's interest in your topic and presentation. As a consequence every presentation should be divided into three parts – introduction, main part and conclusion. You can see that your presentation will roughly follow the same arrangement as the text it is based upon (Ebster & Stalzer, 2017, p. 141 ff.; Theisen, 2008, p. 230 f.):

- Introduction: At the beginning you welcome the audience, introduce yourself and give a short introduction to your presentation. You never get a second chance to make a first impression. Give the audience the impression that you are happy to present your topic and results.
- Main part: The bridge to the main part begins with a clear outline of the topic. Give a short and precise overview and describe the course of the project. This will increase the audience's interest and comprehension. Then go through the presentation's structure including literature, research questions and hypotheses, its development and any results. You should ask yourself what the important messages are. Limit your presentation to core messages.

- Conclusion: The conclusion begins with a summary of the presentation, followed by a look into the future including possible challenges. If appropriate, advanced discussion issues can be mentioned. Thank the audience for their interest and ask (again) whether they have questions.

It is assumed that your presentation is worked out in detail as the day of the presentation comes closer. Every presentation should be practised. You should therefore practise your speech in front of an imaginary audience or in front of a friend. You will not be aware of your (negative) habits yourself, but family and friends will tell you. Make use of a simulation of your charts and possibly of other media. You should keep in mind that you need some time for practising. In many cases, time is a major challenge if the presenter has a) not practised the presentation and b) little experience in presenting. Over-running the allotted time leads to the impression that you are not well prepared and may also annoy your audience. Your test run should be shorter than the original target time, as interposed questions may interrupt the real presentation and increase the time required (Ebster & Stalzer, 2017, p. 144 ff.).

Developing and preparing a presentation is the basis for a good performance. During your presentation you will have to convince the audience with your behaviour and powers of communication, for example, by your linguistic expression and body language. A presenter appears more believable if the topics and contents are dealt with in a motivated manner. Enthusiasm is contagious and draws the audience into your topics. Be careful of appearing to be *un*enthusiastic! How should an audience feel excited by a presentation if the presenter seems to be bored with their own topic?

Linguistic expression: Presentation skills are not distributed evenly, but they can be practised and improved. Practice leads to self-reliance and routine. Keep in mind the following advice (Ebster & Stalzer, 2017, p. 144 ff.):

- Make use of your pronunciation, volume and the tone of your voice to be heard by the audience (Renz, 2013, p. 176).
- Use precisely articulated sentences and speak loudly and clearly to be understood by the audience.
- Turn to the audience while speaking and not to your computer or to the screen on the wall behind you.
- Speak slowly so that the audience can follow your words. The more important the content the slower the speech should be. Speaking fast suggests that you are nervous.
- Make use of deliberate pauses to enable your audience to think about your words. Emphasise what you have just said by inserting pause.
- When you have to give a presentation, make sure you speak from memory. Presentations should be carried out without writing the text out in full, as in most cases this leads to monotonous and unnatural speech (Renz, 2013, p. 178 f.). To help you, you can make use

of index cards containing central points or key notes. You may also want to remind yourself of the greetings and finish. All other parts should be performed without reading to avoid running the risk of losing face-to-face interaction.

- Index cards for your own comments can be very different – it is important that they are numbered to guarantee the link to any charts you use in your presentation.

Gesture and facial expression: by using gestures and facial expressions you can emphasise what you say and present. Use face-to-face interaction as well. Think about your own way of presenting your topics and remain authentic taking the following advice into account:

- Generally it is better to stand than to sit when presenting, so that any changes can be arranged, your position be changed and your audience's attention attracted.
- Do not hide behind a speaker's desk – it looks like a barrier.
- The use of gestures should be convenient. Do not rest your hands on your sheets. Use the computer and the remote control to switch on charts. Avoid folding your arms – it is a sign of defensiveness and uncertainty.
- Face-to-face interaction is most important as it allows you to receive feedback from the audience. You can encourage your audience to ask questions. If you look at uncomprehending faces, you may have to add more explanations.

The end of your presentation is not the end of your performance. Your audience may have questions which you have to answer. You are leading the discussion, which gives you the chance to prove your expertise. Keep in mind the following advice (Ebster & Stalzer, 2017, p. 145 f.):

- Give short and precise answers. Long answers invite the audience to ask new questions.
- You can repeat the question to gain some time to think about your answer and to guarantee that there is no misunderstanding between the enquirer and you.
- It may be the case that a listener objects to a finding in your presentation. Take it as a question and answer it.
- When several questions are asked at once it may be useful to write them down and then answer them in the order of their being asked or in relation to the context.

Another point has to be considered in this context. Perhaps you already know how it feels when you are about to give a speech or presentation and although you are well prepared and competent in the field, you are nervous and think you will not be able to cope with your stage fright. Giving a presentation in front of an audience is not everyone's cup of tea but it is an essential part of the executive position which you hope to work in. Getting nervous when holding a presentation is similar to writer's block. Depending on the situation, you may find yourself struck dumb, unable to talk. Someone may be able to talk about academic topics for hours when the audience is familiar. The situation can change dramatically, however, when the same person stands in front of a group or sits in a seminar or workshop and the lecturer asks a question. The anxiety is often based on a fear of

giving a wrong answer or being confronted with negative criticism (Bensberg, 2013, p. 12). Hopefully, however, you will be able to learn actually to enjoy presenting your academic research work to other people:

- The audience will be aware that you do or don't feel good when standing in front of a group of people to present a research topic. For self-critical persons it is useful to think about a positive experience in previous projects, or even to write them down. Thinking about difficult situations in the past which you coped with confidently, like the successfully completed bachelor thesis and its colloquium, will increase your confidence now.
- To show a positive attitude is important. A negative attitude makes you feel small and doubtful and this is recognised by the audience. If you do not feel confident about your own message it will be nearly impossible to convince an audience. Moreover, if you take a negative attitude the audience will react negatively, too and you will not be able to reach them with your presentation.
- If giving presentations makes you nervous you should start to work on this. For example, in discussions you can stand up to speak and learn how to cope with intimidating and unknown situations. The more use you make of this technique, the more confidence you gain (Renz, 2013, p. 169).

As a last input on this topic, here is some advice on the design of your presentation with regard to the central criteria:

- Eye-catcher: starting the presentation with a question, image or citation is a good way to arouse the interest of the audience.
- Conclusion: summarise the contents at the end. Give a forecast and options for further research which have not been covered in the scope of your project.
- Outline: a clearly defined outline increases the comprehensibility of your presentation, so that the audience can follow you. The progression of the charts and the charts must be logically laid out.
- Charts: the arrangement of the charts should not be too colourful, and you should not overdue the use of pictures. Be sparing with the colour red.
- Language: use short sentences, or better, limit yourself to key words or phrases. Do not use more than six to eight lines per chart.
- Font: the font size should be at least 14 points, but it can also be bigger. The use of more than three different font sizes in one presentation looks confusing and is not advisable.
- Animations and other effects: be careful with the excessive use of animations and other effects. Your presentation might not be taken seriously.

When holding a presentation it is recommended that you present a table of contents at the beginning. You are advised to use headlines for sub-chapters to allow the audience to gain an overview. Questions like 'where are we at the moment?' help you structure a longer presentation (Bensberg, 2013, p. 11).

If you follow this advice and have fun working on academic research topics you will also have fun presenting your results to fellow students and later to your colleagues. See it as something to enjoy!

R7.5	What comes to your mind when you think about what you just have read and put it in connection with your previous presentations?	

8 Research and Development

In this chapter we cover research and development (R&D). The chapter consists of the following sub-chapters: an introduction to the R&D area, an overview on the facts and figures of R&D in Germany (chapter 8.1), and an introduction to some German research institutes (chapter 8.2). These contents lead to the following learning objectives:

LO8.1	*I am familiar with the importance and different dimensions of R&D.*
LO8.2	*I know facts and figures of R&D and its benefits for companies.*
LO8.3	*I know the main research institutes in Germany, how they are organised and what they are doing.*

8.1 Definition and Relevance of Research and Development

This chapter is the introduction to the R&D topic. It starts with a definition/description and continues with an outline of the importance of R&D. The term R&D stands for research and development.

The Department of Education of the Western Sydney University (n.d.) defines the term 'research' as follows: "Research is defined as the creation of new knowledge and/or the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies and understandings. This could include synthesis and analysis of previous research to the extent that it leads to new and creative outcomes." Based on the definition presented, the term research encompasses three dimensions of research: pure and strategic basic research, applied research and experimental development (Ermisch, 2007, p. 32 f.):

1. Basic research: aims to make new findings, to establish basic principles and the origin of phenomena. The characteristic of basic research is the autonomy of pragmatic focuses, solving of practical problems, or realisation of profit.
2. Applied research: aims also to make new findings but it is directed "towards a specific, practical aim or objective" (Western Sydney University, n.d.). There is a focus on solving individual practical problems (projects) with the use of goal-oriented applications.
3. Development: experiments made on the basis of existing findings and knowledge lead to the development or advancement of new materials, products, machines and the installation of new processes, systems and services. Development is restricted by technological and monetary influences.

There is demand for R&D in every business area. When competition between different companies occurs in a market (no monopoly!), competitors want to secure or improve their market share and earn money. To guarantee these earnings for the future and to exist as a company in our globalised world requires innovative products or services. Therefore R&D activities are unavoidable – for both the product/service itself and the process of building the product or realising this service. The former refers to an innovative product/service in comparison with the competitors and the second expresses the necessity of saving costs (Bester, 2010, p. 175). The process is intensified by the possibility of registering patents. The chance of an exclusive right leads to the expansion of the market position and makes the investment in R&D attractive for companies (Bester, 2010, p. 191). To underline the importance of R&D some statistical data published by Federal Statistical Office (Destatis) is presented. Destatis publishes official statistical data in the Federal Republic of Germany (FRG) (chapter 4.1).

In the context of research, the following figure 18 presents some significant data. It gives a first impression concerning the scope and importance of R&D in and for the FRG as a nation with a huge number of international trade relations and as a country of technological innovations. The figure illustrates the development of expenses in the R&D field for the past twenty years:

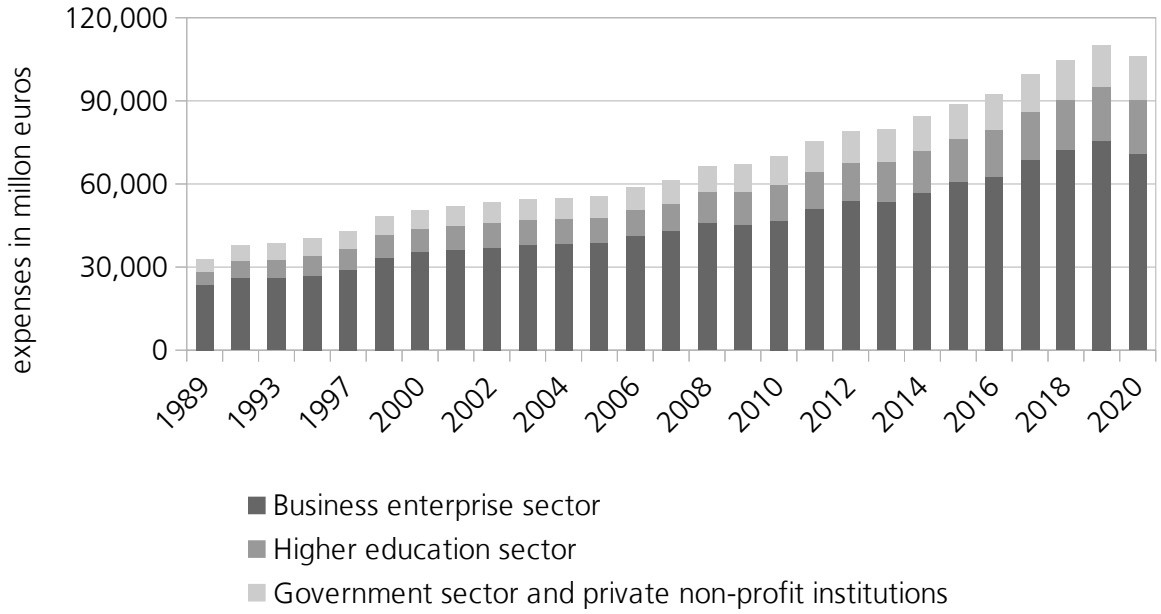

Figure 18: Development of the expenses for R&D in the FRG from 1989–2020, following Destatis, 2013a; Destatis, 2023a.

In the figure the development of the expenses for R&D is shown. The development is listed for the period from 1989 (only Western Germany) to 2016. As you can see, expenses have risen steadily and doubled in the past twenty years. In the year 2020 approximately 735,200 people worked in the field of R&D (Destatis, 2023b). The expenses in this field represent 3.17 percent (2020) of the

gross domestic product (Destatis, 2023c). Approximately two thirds of the expenses are dispensed by companies. In the following, some examples for the expenses by R&D by important German companies are given:

Company	Revenue	Research and development expenses	percentage of sales revenue
Daimler AG	164,330	8,711	5.3
Robert Bosch GmbH	78,066	7,264	9.3
Siemens AG	83,049	5,164	6.2

Table 9: Revenue and research and development expenses by four German companies, own exposure based on data from Daimler AG, 2018, p. Cover2; Robert Bosch GmbH, 2018, p. 58; Siemens AG, 2017, p. 58. Notes: fiscal year 2017, values are measured in millions of €.

The sum amounts to €21,139m. This equals approximately 23 percent of all German expenses for R&D!

R8.1	Which importance/priority has the R&D department in 'your' company? Does it even exist?	
R8.2	What do you think about the different priorities of R&D in the companies mentioned?	

8.2 Research Institutes in Germany

In this section you get to know the different research institutes in Germany. According to a list of the Statistisches Bundesamt (Destatis, 2023d) the expenses of the FRG are distributed to different facilities. The three major ones are the following and they receive 64.15 percent of all investments by the FRG on R&D:

- Helmholtz Association of German Research Centres (31.54% of all R&D expenses): The Helmholtz research institute was founded in 1958 and is the biggest one in the FRG today (Helmholtz Association, n.d.). The six core fields of research are Energy, Earth and Environment, Health, Information, Aeronautics, Space and Transport, and Matter. In 2020 approximately 43,600 people were employed (Helmholtz Association, 2021).
- Max Planck Society (14.09% of all R&D expenses): the Max Planck Society was founded in 1948 and it maintains 84 institutes today. The researchers work in the core fields of natural sciences, life sciences, social sciences and humanities (Max Planck Society, 2019). As of 31 December 2017 the institutes employed 23,425 people, exclusive of junior and visiting scientists and students. Approximately 45 percent of all employees are women (Max Planck Society, 2018).
- Fraunhofer-Gesellschaft (18.52% of all R&D expenses): The core fields of research of the Fraunhofer-Gesellschaft are health, security, communication, energy and the environment. As the Fraunhofer-Gesellschaft is the largest application-oriented research organisation in Europe, they say of themselves that they 'forge the future' (Fraunhofer-Gesellschaft, 2019) with the work of their approximately 25,000 researchers and developers as of January 2018 (Fraunhofer-Gesellschaft, 2018).

R8.3 Have you ever been in touch with research institutes during your studies or in your professional career?

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