Technical writing I

Introduction

Introduction to technical writing

Introduction to technical writing

- Usual or professional communication

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- Usual or professional communication
- Oral or written form

Introduction to technical writing

- Usual or professional communication
- Oral or written form
- Communication about technical topics is called **technical communication**

Introduction to technical writing

- Usual or professional communication
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- Communication about technical topics is called **technical communication**
- Technical communication in written form is called **technical writing**

Introduction to technical writing

- Usual or professional communication
- Oral or written form
- Communication about technical topics is called **technical communication**
- Technical communication in written form is called **technical writing**
- Technical communication in oral form is called a **presentation**

Definition

ISO 5966 “Documentation – Presentation of scientific and technical reports” defines, that a **scientific or Technical Report describes**

a research process or

research and development results or

the current state-of the-art in a certain field of science or technology

Novel *vs* technical report

What is the difference between writing a novel and writing a technical report?

Technical writing standards

- General standards
- Corporate design standards
- Logical rules
- Practical experience

Technical report timeline phases

Technical report timeline phases

- Planning

Technical report timeline phases

- Planning
- Creating

Technical report timeline phases

- Planning
- Creating
- Finishing and presenting

Technical report timeline phases

- Planning
- Creating
- Finishing and presenting
- (Main themes of this course)

Planning the technical report

- Accepting and analysing the task
- Checking or creating the title
- The structure (backbone) of the technical report

Technical report timeline phases

- Planning
- Creating (writing)
- Finishing and presenting
- (Main themes of this course)

Creating the technical report

- Parts of the report
- Collecting and ordering the material
- Creating tables
- Instructional figures
- Literature citation
- Text
- Completion

Technical report timeline phases

- Planning
- Creating (writing)
- Finishing and presenting
- (Main themes of this course)

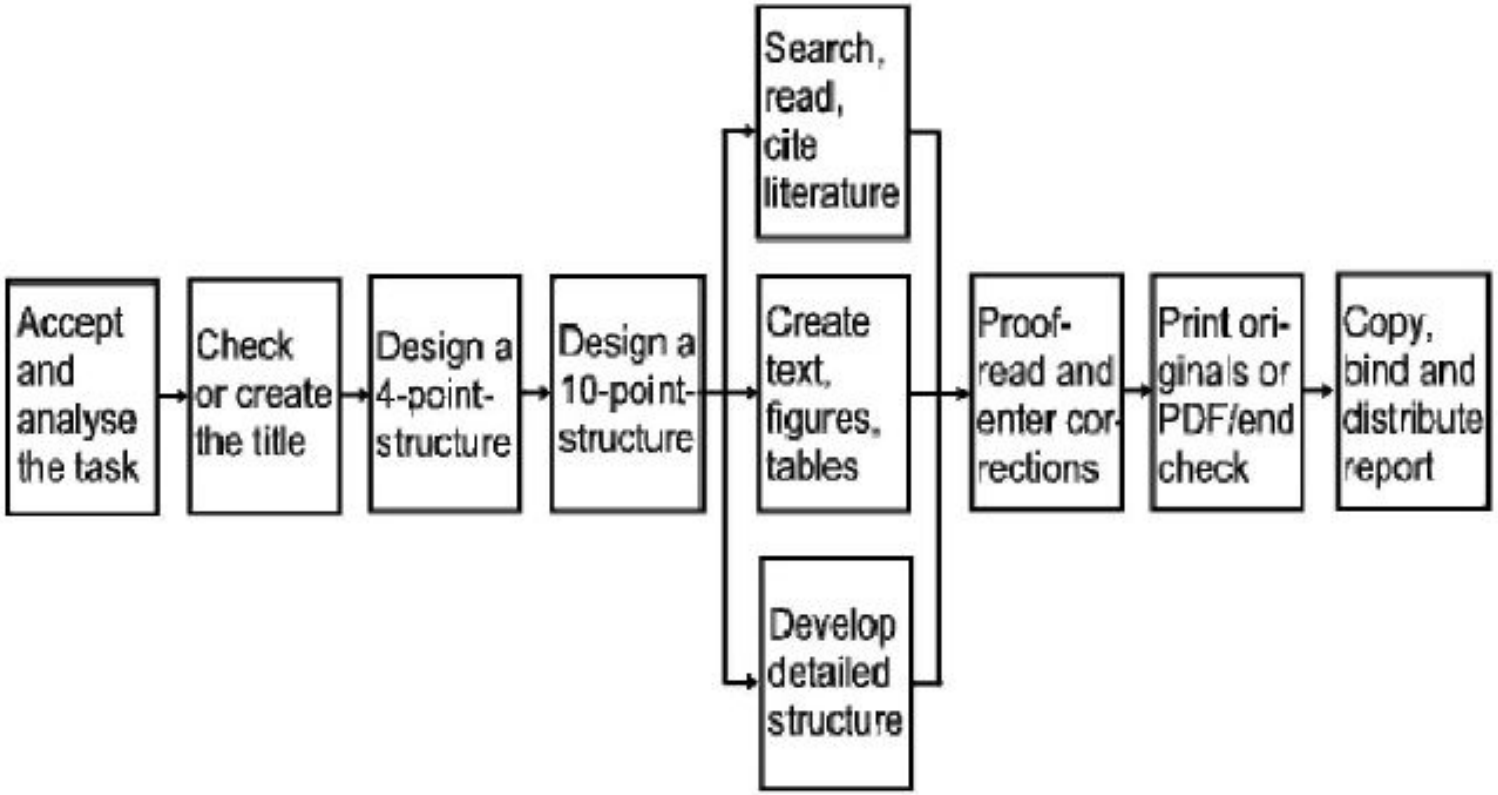
Presenting the technical report

- What benefit?
- Planning the presentation
- Creating the presentation (slides)
- Giving the presentation

Technical report checklist

- Accept and analyze the task
- Check or create the title
- Design a 4-point-structure
- Design a 10-point structure
- Search, read and cite literature
- Elaborate the text (on a computer)
- Create or select figures and tables
- Develop the detailed structure
- Perform the final check
- Print copy originals or create PDF file
- Copy and bind the report
- Distribute the report to the defined recipients

Technical report checklist



How to write in English

- Verb tense and number
- Word order in a sentence
- Use of articles
- Punctuation
- Useful words and expression
- Possessive case (explaining the owner)
- Dividing the text into paragraphs, sentences and clauses

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Accepting and analysing the task

- Who has defined the task?
  - a professor or an assistant (in case of a report written during your studies)
  - a supervisor
  - the development team
  - a consulting company
  - a customer
  - you yourself (e. g. if you write an article for a scientific journal)
- Did I understand the task correctly?
- Who belongs to the target group? For whom do I write the report?
  Please take notes accordingly!
- Which contents shall my report contain? Please write that down!
- Does the task already contain a correct and complete title?
- Which work steps are necessary?
- Which help and assistance do I need?
  - help by people, e. g. *advice-giving specialists*
  - help by equipment, e. g. *a color laser printer*
  - help by information, e. g. *scientific literature*

Accepting and analysing the task

In addition, during the planning of the report the following questions must be answered:

- Which shall be the title of the report?
  (develop a proposal and discuss it with the supervisor or customer)
- Which work steps that are not mentioned in the network plan need to be accomplished?
- Which background knowledge, interests and expectations do the readers of the Technical Report have?
- How do I organize the required help?
- Which help and work steps are time-critical?

Technical report checklist

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Creating the title

- First thing a reader will notice
- Should create interest and curiosity
- Main topic, keywords
- Short, precise and true!
- Must not create undesired associations or wrong expectations
- (Title checklist)

Examples of titles

- Design of a drilling rig
- Outline of a sprayer shredding rig
- Analysis of component combinations for sales optimization
- Equipment of a meeting room with radio technology
- Other variants??

Example

We are looking for the title of a doctorate thesis.

In the doctorate project a computer program has been developed, that allows the selection of the materials of designed parts depending on the stress on the part, abrasion requirements etc.

The designer enters the requirements which the material must fulfill and the system provides the materials, which are stored in its database and match the given requirements. It has been quite early in the project that the developer of the system, the doctorate candidate, has defined the term “CAMS” = Computer Aided Material Selection to describe the purpose of the program.

The doctorate candidate starts to create a title for his thesis as described above.

He starts to **write down the keywords that shall be contained in the title.**

Keywords

- **– material selection**
- **– design**
- **– education**
- **– CAMS**
- **– with computer**

Keywords combination to get different title

- **Contribution to computer-aided material selection**
- **Computer-aided material selection in design**
- **Computer-aided material selection in design education**
- **Computer Aided Material Selection = CAMS**
- **CAMS in design education**
- **Help to select materials by the computer**
- **Computer application for material selection**
- **CAMS in design**
- **Design with CAMS**
- **Computer support in design education**
- **Material selection with the computer**

Title

- **Computer Aided Material Selection – CAMS in Design Education**

How to find a good title for your technical report

Use the following work steps to create the title:

- *write down the task*
- *write down the keywords which characterize the report*
- *combine the keywords to a title*
- *find new titles by varying the usage of these keywords*
- *read possible titles aloud to optimize the speech melody*
- *select the “best” title*

- Next lecture: Structure

Technical report timeline phases

- Planning
- Creating
- Finishing and presenting
- (Main themes of this course)

Phase I planning

- Accept and analyze the task
- Check or create the title
- Design a 4-point-structure
- Design a 10-point structure
- Search, read and cite literature
- Elaborate the text (on a computer)
- Create or select figures and tables
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Keywords combination to get different titles

- **Contribution to computer-aided material selection**
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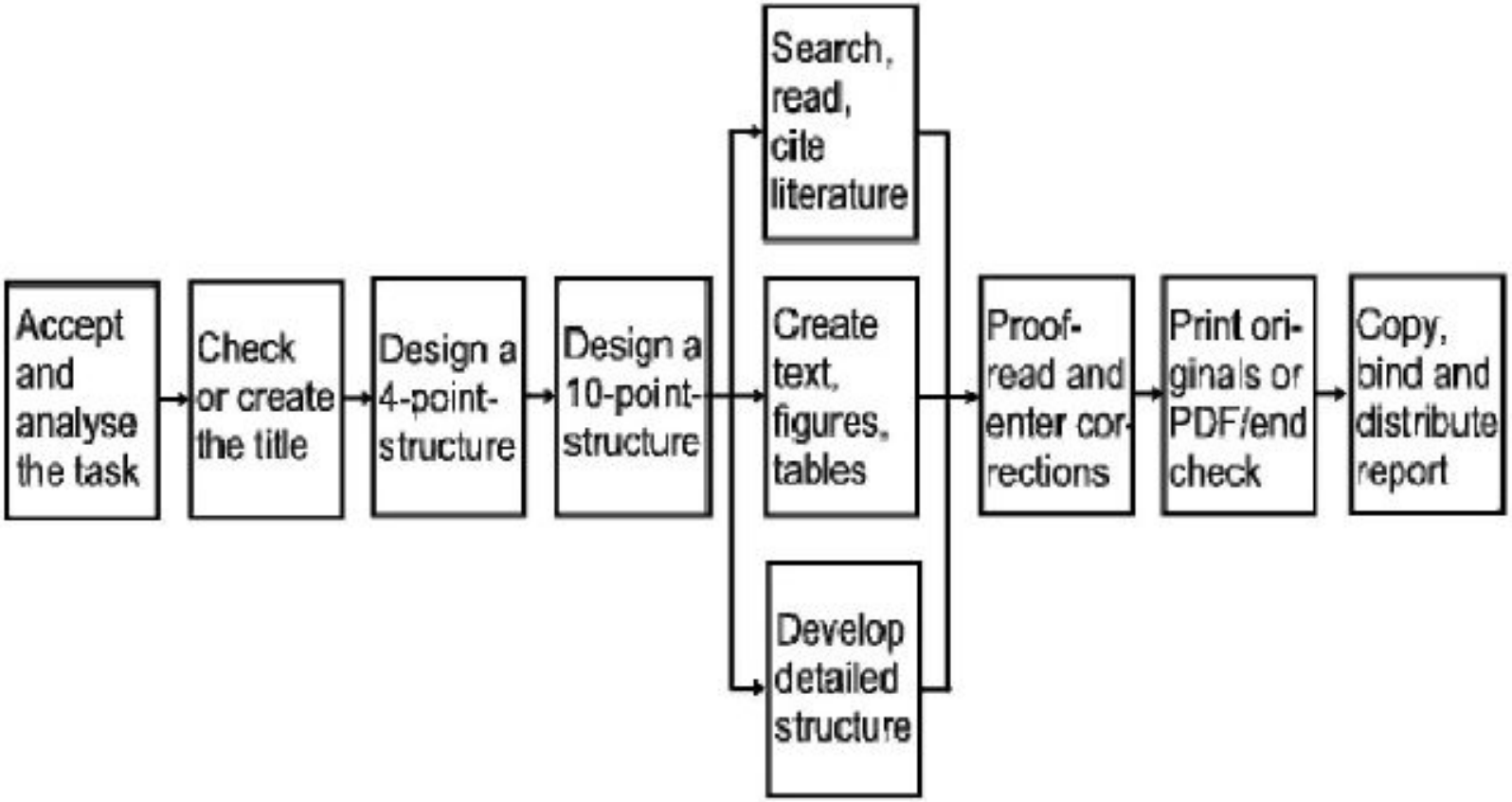

Accept and analyse the task
Check or create the title
Design a 4-point-structure
Design a 10-point-structure
Search, read, cite literature
Create text, figures, tables
Develop detailed structure
Proof-read and enter corrections
Print originals or PDF/end check
Copy, bind and distribute report

technical Designing the structure of the report

- Designing the structure is the main step of planning the technical report
- The **structure** is an intermediate result that **contains the logic** of the technical report
- The **table of contents ToC** is a final result that **allows searching**

Information about structure and ToC

- Structure and ToC are the **front entrance door**

☞ *A good structure is so important for the understandability and plausibility of texts – even of short texts like e-mails –, that you should always structure every text that exceeds the amount of about one page with intermediate headings – at least every text describing facts.*

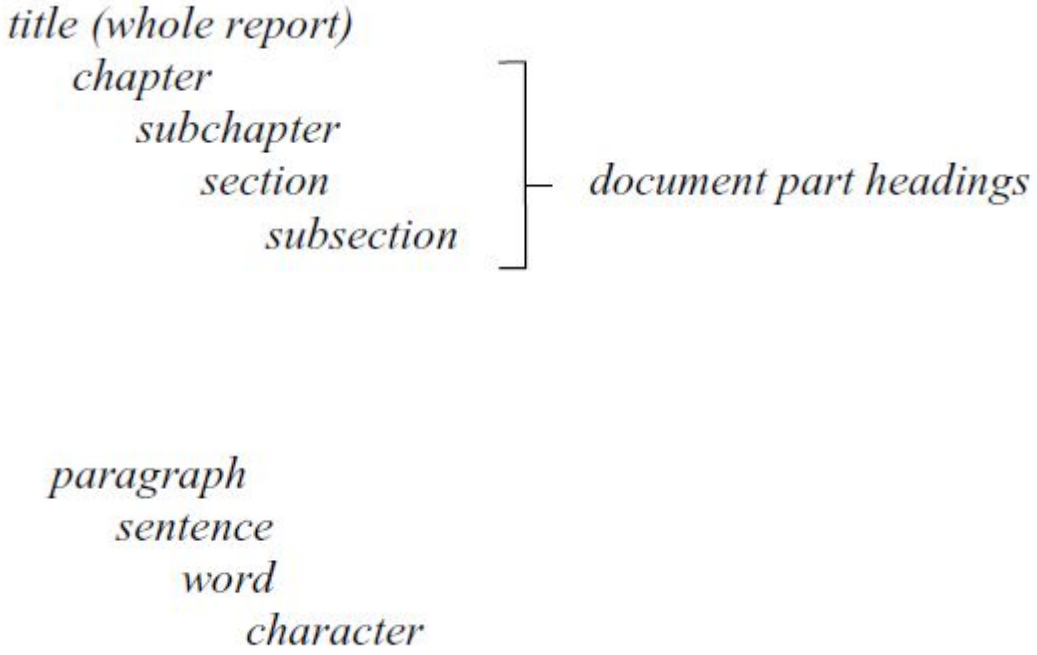
- The structure allows to get a quick overview
- To find a way into the contents
- To get help from supervisor
- To evaluate/grade your technical report

Information about structure and ToC

- *Therefore you should always take the current state of the structure with you when you are going to discuss the current status of your project with your supervisor (boss, assistant, professor, etc.) or with your customer. They ask for it quite frequently!*

- *For each reader of a Technical Report the structure is the most important tool to understand the contents. Therefore you should not make any compromises with yourself when designing the structure! This also holds true for writing the whole Technical Report. Wherever you are not confident with your report, the supervisor will criticize this not so successful part of the Technical Report in most cases – and a customer will make up his/her mind.*

Document part heading



Document part heading

- A **document** has nine **chapters**
- Chapter two is subdivided into **subchapters** 2.1 and 2.2.
- Subchapter 2.1 is subdivided into **sections** 2.1.1, 2.1.2 and 2.1.3
- ISO 2154 Documentation –Numbering of Division and Subdivisions in written texts recommendations:
- The number of document part levels should be limited to three, if possible. (1 Chapters, 2 subchapters and 3 sections)
- The number of equal document parts on the same level should not exceed nine.

Document part heading

- Different document part headings on the same level of hierarchy must be equally important and consistent
- Example

3.5 Technical evaluation of concept variants
3.5.1 Technical evaluation table
3.6 Economical evaluation table

3.5 Technical-economical evaluation of the concept variants
3.5.1 Technical evaluation of the concept variants
3.5.2 Economical evaluation of the concept variants
3.5.3 Summarizing evaluation of the concept variants in the s-diagram

Document part heading

- Different document part headings on the same level of hierarchy must be equally important and consistent
- Example

3.5 Technical evaluation of concept variants
3.5.1 Technical evaluation table
3.6 Economical evaluation table

Not logical! Part heading subdivided only once!

3.5 Technical-economical evaluation of the concept variants
3.5.1 Technical evaluation of the concept variants
3.5.2 Economical evaluation of the concept variants
3.5.3 Summarizing evaluation of the concept variants in the s-diagram

Logical

Document part heading

- Another example

Not logical:

1 Introduction
1.1 Starting point
2 Basics of metal powder production

Logical solution:

1 Introduction
1.1 Starting point
1.2 Goals of this work
2 Basics of metal powder production

Other logical solution:

1 Introduction
2 Basics of metal powder production

Document part heading

- Each document part heading shall be complete in itself
- It shall represent the contents of the document part properly
- It shall be short, clear and accurate as the title of the whole technical report
- Document part headings that consist of one word only can often be improved.
- Exceptions from this rule are *generally-used* single words like Introduction, References, Appendices etc.

Work steps to create a structure

1. Formulate the title of the main topic, main target or core message of the Technical Report in one sentence.
2. Subdivision into 3 to 4 main items (4-point-structure).
3. Further subdivision into 8 to 10 main items (10-point-structure).
4. Further subdivision of extensive main items.
5. Further subdivision into the final detailed structure parallel with the further elaboration of the Technical Report.
6. Last but not least: Check whether the document part numbers and headings are identical in the structure and in the text (check for completeness and correctness) and add page numbers to the structure to make it a table of contents, if the table of contents shall not be automatically created by your word processor.

Example 1 creating a structure

Example 1: Report about the enhancements of a computer network

Title of the report:

Equipment of a meeting room with radio technology

1st Step: Formulate the main topic (main target) of the Technical Report

The computer network in the customer company shall be enhanced so that there are two additional internet access points for external staff members in the training room and two additional internet access points for training participants in the lounge.

2nd Step: Subdivision into 3 to 4 items (4-point-structure)

- Analysis of the customer's requirements
- Planning of the new network structure
- Realization of the network enhancements in the customer company
- Billing and payment

Example 1 creating a structure

3rd Step: Subdivision into 8 to 10 items (10-point structure)

1 Introduction
2 Analysis of the customer's requirements
3 Planning of the new network structure
4 Preparing work steps
5 Realization of the network enhancements in the customer company
6 Inspection
7 Billing and payment
8 Conclusions

4th Step: Further subdivision of extensive main items

Chapter 2 can be subdivided into the steps status quo-analysis and target situation-analysis. Chapters 3, 4 and 5 and 9 Appendices have also been subdivided further in the original work.

5th Step: Further subdivision into the final detailed structure parallel with the further elaboration of the Technical Report

3 Planning of the new network structure
3.1 Collection of offers from hardware suppliers
3.2 Benefit analysis and decision of suppliers for the hardware to be used
3.3 Planning the wiring
3.4 Planning of external services

Example 2 creating structure

Example 2: Design report

Title of the report:

Redesign of a production plant for Magnesium-Lithium-Hydrogen alloys

1st Step: Formulate main topic (main target) of the Technical Report

Weaknesses of the existing founding plant shall be improved by the redesign.

Example 2 creating structure

2nd Step: Subdivision into 3 to 4 main items (4-point-structure)

- State of the art
- Description of the existing weaknesses
- Description of the modifications

Example 2 creating structure

3rd Step: Subdivision into 8 to 10 main items (10-point-structure)

1 Introduction
2 State of the art
3 Necessary modifications of the existing plant
4 Requirements the new plant shall fulfill
5 Redesign and reconstruction of the existing plant
6 Practical testing of the new plant
7 Evaluation of the tests with the new founding plant
8 Conclusions and outlook

Example 2 creating structure

4th Step: Further subdivision of extensive main items

Chapter 3 can be subdivided into the necessary modifications (possible usage of the plant for other technological processes, facilitated usage and handling, facilitated cleaning, improved safety while working with hydrogen etc.).

Chapter 5 can be subdivided into basic design principles applied for the redesign of the founding plant and design details.

Example 2 creating structure

5th Step: Further subdivision into the final detailed structure parallel with the further elaboration of the Technical Report

5 Redesign of the new plant
- 5.1 Basic design principles and principle drawing
- 5.2 Design details to realize the required modifications
  - 5.2.1 Basic design of the founding plant
  - 5.2.2 Temperature flow in the plant components
  - 5.2.3 Gas flow of inert gas and alloy gas
  - 5.2.4 Modifications of the casting device
  - 5.2.5 Flexible structure of the cast container via plugging system
  - 5.2.6 Inert gas container for the die-cast
  - 5.2.7 Central plant control via the control panel

Example 3 creating structure

Example : Report about the development of software

Title of the report:

Computer-aided analysis and optimization of the understandability of technical texts

Example 3 creating structure

1st Step: Formulate the main topic (main target) of the Technical Report

Starting from existing approaches to improve the understandability of texts an interactive computer program shall be developed that measures the understandability of text and that stepwise improves the understandability of the text in constant dialogue with the user.

Example 3 creating structure

2nd Step: Subdivision into 3 to 4 main items (4-point-structure)

- Approaches to measure and improve the understandability of texts
- Development of the understandability improvement concept of docutune
- The program system docutune
- Documentation of the source code

Example 3 creating structure

3rd Step: Subdivision into 8 to 10 main items (10-point-structure)

1 Introduction
2 Approaches to measure and improve the understandability of texts
3 Development of the understandability improvement concept of docutune
4 The program system docutune
5 Documentation of the source code
6 The practical use of docutune
7 Further development of docutune
8 Conclusions and outlook

Example 3 creating structure

4th Step: Further subdivision of extensive main topics

Chapter 2 deals with the state-of-the-art as it is described in the literature. It has been further subdivided into scientific approaches to the research on understandability, practically-oriented approaches to improve the understandability and Hamburg concept of understandability.

Example 3 creating structure

5th Step: Further subdivision into the final detailed structure parallel with the further elaboration of the Technical Report

4 The program system docutune
- 4.1 The menu structure of docutune
- 4.2 The sequence of docutune's feature groups
  - 4.2.1 General overview of the sequence of all feature groups
  - 4.2.2 Sequence of the feature group Typography
  - 4.2.3 Sequence of the feature group Clarity
  - … (further sections for Logic, Shortness, Motivators)
  - 4.2.8 Sequence of the feature group Orthography
- 4.3 Help features for searching and classification
  - 4.3.1 The word classification object
  - 4.3.2 The dictionary object

Creating structure checklist

1st Step: Formulate main topic (main target) of the Technical Report

Here you should formulate the target of the project, the literature research, the tests, the measurements, the design, the expert opinion or the report in general. Even if it seems hard to accomplish: Write that down in one sentence only!

Creating structure checklist

2nd Step: Subdivision into 3 to 4 main items (4-point-structure)

Examples:

- "Starting situation – Own contribution – Improvements of the situation – Summary"
- "State-of-the-art – Testing rig design – Test execution – Test results – Conclusions"

If you integrate the task of your project into your Technical Report as an independent chapter, then the chapter "Task" and the various chapters about fulfilling the task (general draft, detailed design, computation of loads or testing rig design, test execution, test results etc.) are each an individual chapter.

Creating structure checklist

3rd Step: Subdivision into 8 to 10 main items (10-point-structure)
Possible structuring principles for the 3rd, 4th and 5th step are:

- by time sequence or
- by starting point conditions
- by project targets
- by possible alternatives
- by components or part groups
- by improvement steps
- by related topics or in the special case depending on the task

Creating structure checklist

4th step Further subdivision of extensive main items

- Creating a structure for each chapter in the same manner of structuring the whole report

5th Step: Further subdivision into the final detailed structure parallel with the further elaboration of the Technical Report

Creating structure of an experimental work

Structure pattern of an experimental work

1 Target and scope of the test
2 Theoretical basics
3 The laboratory experiment/test
  3.1 Testing rig design
    3.1.1 Testing machine, plant, rig or device
    3.1.2 Used measuring instruments
  3.2 Test preparations
    3.2.1 Specimen preparations
    3.2.2 Setup of the starting conditions
  3.3 Test execution
    3.3.1 Execution of the preparation tests
    3.3.2 Execution of the main tests
  3.4 Test results
  3.5 Test evaluation
  3.6 Estimation of measurement flaws
4 Critical discussion of the laboratory experiments/tests
5 Conclusions
6 References
A Measurement protocols of the preparation tests
B Measurement protocols of the main tests

Creating structure for manuals

Structure pattern for manuals and instructions for use

1 Before operating the machine/device
- 1.1 Important information about the machine/device (Definition/description of the machine/device, description of the benefits, safety notes and warnings, overview of the functions)
- 1.2 Supplied/delivered scope and optional parts
- 1.3 Usage of the machine/device (Rules and regulations, safety notes and warnings, intended usage, unintended usage, documentation provided by third parties)
- 1.4 Transportation of the machine/device
- 1.5 Requirements regarding the site
- 1.6 Unwrapping, assembling, mounting and setup of the machine/device
- 1.7 Connection of the machine/device to supply and disposal networks (water, electricity, computer network etc.) and operation test

2 Operation and usage of the machine/device
- 2.1 Initiation of the machine/device
- 2.2 Functions of the machine/device during normal operation, safety notes and warnings
- 2.3 Refilling consumptive materials
- 2.4 Cleaning the machine/device
- 2.5 Preventive maintenance (maintenance, inspections)
- 2.6 Disposal of supporting and operating materials
- 2.7 Shutting-down the machine/device

Creating structure for manuals

3 After operating the machine/device
- 3.1 Finding the cause of disorder and resolving it
- 3.2 Ordering spare parts, wear and tear parts and electric plans
- 3.3 Disassembling the machine/device
- 3.4 Disposal and recycling of the machine/device (what? where? how?)

4 Appendices
- 4.1 Possible causes of disorder/Trouble shooting (what shall I do, if ...?)
- 4.2 Spare parts, additional parts (exceeding the supplied/delivered scope)
- 4.3 Glossary
- 4.4 Index

…Final thoughts, jotter

In a guideline how to write Technical Reports by Thomas Hirschberg, a professor at the University of Applied Sciences in Hannover I found the following advice.

- You should *structure the contents of your report as early as possible and note all open problems, decisions and remaining work steps regarding your project "online" in a project notebook (jotter). Do* ***not*** *start with writing your Technical Report after all practical work has been completed.*

Since you need your project notebook both at your workplace/in the laboratory and at home, you should use a small booklet in DIN A5 or DIN A6 format.