



Die Matiker e.V.

Freundinnen und Freunde
der Mathematik und Informatik
an der Universität Paderborn

How to write a Bachelor's or Master's thesis

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- What is to be done?
 - Find an interesting topic
 - Narrow down the topic to a question that can be answered within the given time
 - Plan the project: Deadlines, Time management
 - Do your research: Books, Journals, Web, Talks
 - Find a structure: Mind Mapping, Snowflake method
 - Write it all down
 - Present your work
 - Earn the merit and receive feedback
- Mind the tools
 - TeX, Word, OpenOffice, ...—whatever you like, but know your software
 - Little helpers: Literature management, versioning, revisions, backup
- Plan ahead and reserve your time
 - Bachelor thesis: parallel to courses, exams, etc.
 - 15 ECTS \triangleq 450 hours

Find an interesting topic



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- Topics offered by a research group
 - Overview of current work in a group
 - Topics often well-defined; sometimes limited room for own ideas
 - Supervisor is usually interested in a certain result
- Talking with potential supervisors
 - Development of the topic—takes some time
 - Takes into account your motivation as well as that of the supervisor
 - The better your ideas are, the more interesting will the topic be to you
- Bring your own idea
 - Rather the exception than the rule, yet possible
 - Results often not of particular relevance to the supervisor
 - Students tend to think too big
- Cooperation with a third party
 - Serving to masters
 - Works best if the supervisor is involved in a cooperation with the third party

Narrow down the topic



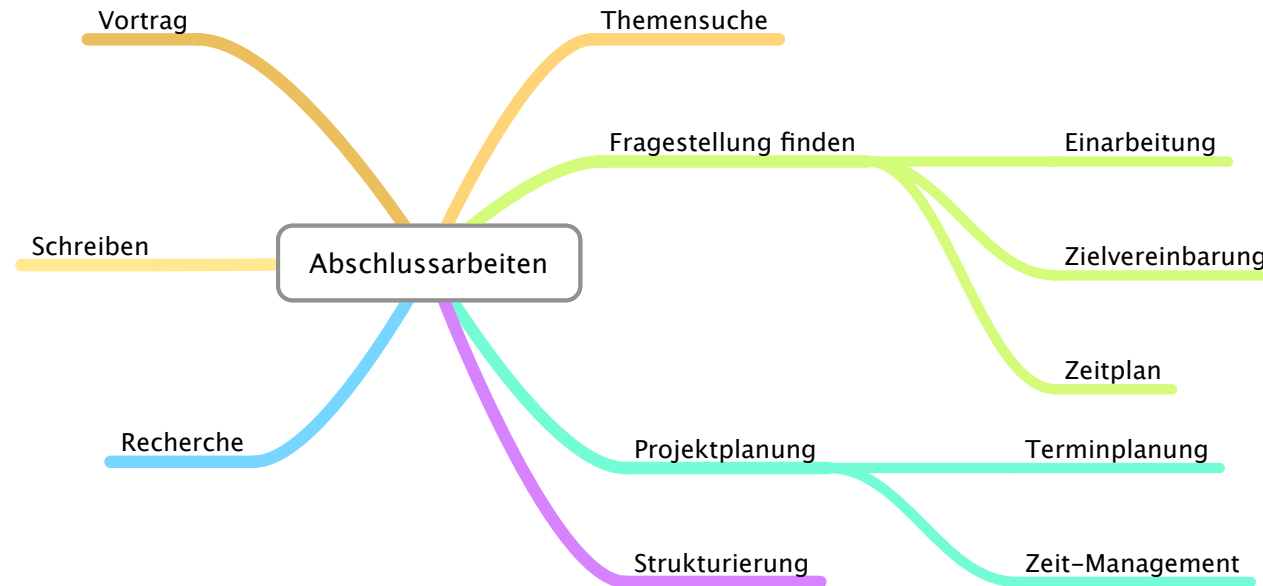
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- Preparation and planning
 - Bachelor thesis: 4 weeks \triangleq 90 hours
- Written agreement on exact topic, objectives, and schedule
 - What is the goal of the thesis?
 - Agreement on objectives: about 10 lines
 - Draft by you
 - Final version in coordination with the supervisor
 - Detailed plan: 1–2 pages
 - Which work packages are necessary?
 - Plan the sequence and time needed for each of the packages
- Register the thesis
- Start working immediately
 - Bachelor thesis: 5 months \triangleq 360 hours



- Deadlines
 - Be serious about the deadlines for work packages
 - If you do an implementation, define for how long you will work on it
 - in agreement with the supervisor
 - guideline: maximum 50% of the time
 - You will need longer for writing everything down than you anticipate
 - Plan for two weeks at the end for proofreading
- Time management
 - A plan is a plan is a plan—it is meant to change
 - Permanently watch your time management and adjust when needed
 - Keep in mind that delays in a work package are provided for in the new plan
 - When serious problems occur: talk to your supervisor—and do it early
 - Take into consideration: courses, exams, job, term start and end, absence of the supervisor



- How to write a thesis
 - Finding a topic
 - Narrowing down
 - Preparation
 - Objectives
 - Planning
 - Project Planning
 - Deadlines
 - Time management
 - Finding a structure
 - Writing in down
 - Presenting

- Mind Mapping as just one example
- First draft will most certainly be different from the result
- Uncertainty can lead to writer's block
 - Snowflake method
 - Kompetenzzentrum Schreiben: <http://www.uni-paderborn.de/schreiben/>
 - Meet your supervisor at regular intervals



- State your questions clearly and enable the reader to follow your arguments
 - State of the art: Where are you starting from?
 - What are the problem and the objectives?
 - Do not make claims, do not make statements.
 - Make arguments, give proof or evidence and name your sources.
 - Present your solutions and let the reader understand what your achievements are
 - Do not just describe the result.
 - Describe alternatives you considered.
 - Compare your results to those of others.
 - Name your methods and why you used them—and not others.
 - Draw conclusions and let them have an effect on what follows.
- Be clear in your terminology and know your readers.

Structure of a thesis



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- Title and abstract give you an overview of the thesis.
- The conclusion surveys the results of the presented work.
- The introduction gives you an overview of the context and assumptions.
- The introduction states the main results.
- The introduction describes the structure of the thesis.

Title

Abstract

Introduction

- What is it all about?
 - Motivation
 - Definition of the problem
 - Methods used
 - Main results
 - Conclusion
- Structure of the thesis

Body

Conclusion

- Summary and assessment of results
- Relation to the context
- Future work
- Reflection



- Give references
 - when quoting a short or long passage from another publication
 - when referring to another publication by summarizing statements, e.g.
 - when interpreting statements from other publications
 - when using other publications to strengthen your point
- Reference the source
 - within the text
 - The notion of an external memory is explained in Keil-Slawik (1990).
 - The notion of an external memory (cf. Keil-Slawik, 1990) ...
 - or in footnotes—which should only be used for references and short remarks
 - see also Engbring, Keil-Slawik, Selke (1995), pp. 12ff.
- Choose the way of referencing to ease reading and ask your supervisor for their preferences: [42], [GS90], (Gibson, Sterling 1990), ...



- Keep the context of the referenced source in mind and do not distort the statement.
- Always use primary sources, giving precise information on where the statement is to be found—in general this means stating the page.
- Secondary sources may only be used when there is no way of obtaining or understanding the primary source.
 - Clarify that you only read the secondary source!
- Long quotations are rarely necessary. If you need one, format them in a way that the quotation can be easily identified.
- Do not use quotations instead of own statements and arguments.
- Do not alter anything within a quotation with the exception of abbreviations, additions or emphasizing:
- Identify abbreviations by »...«, additions in square brackets, emphasis by »emphasis in the original« or »emphasis by me«.
- Errors and typos in the source must not be corrected »[sic!]«



- Hamm, Ingrid, und Detlef Müller-Böling (Hrsg.): *Hochschulentwicklung durch neue Medien: Erfahrungen – Projekte – Perspektiven; mit einer Bestandsaufnahme über Multimedia-Projekte an deutschen Hochschulen*. Verlag Bertelsmann Stiftung, 1997.
- Höök, Kristina, Alan Munro and David Benyon (eds.): *Workshop on Personalised and Social Navigation in Information Space*. SICS Technical Report T98:02, Kista, Sweden, 1998.
- Jonassen, David H., and Heinz Mandl (eds.): *Designing Hypermedia for Learning*. NATO ASI Series F, vol. 67. Springer, 1989.
- Riehm, Ulrich, und Bernd Wingert: *Multimedia – Mythen, Chancen und Herausforderungen*. Arbeitsbericht Nr. 33, Büro für Technikfolgenabschätzung beim Deutschen Bundestag (TAB), 1995.



- Brennecke, Andreas, et al.: Das Lehren mit elektronischen Medien lernen – Erfahrungen, Probleme und Perspektiven bei multimediagestütztem Lehren und Lernen. *Wirtschaftsinformatik* 39 (6), 563–568 (1997).
- Keil-Slawik, Reinhard, et al.: Multimedia in der universitären Lehre. Eine Bestandsaufnahme an deutschen Hochschulen. In: I. Hamm, D. Müller-Böling (Hrsg.): *Hochschulentwicklung durch neue Medien: Erfahrungen – Projekte – Perspektiven; mit einer Bestandsaufnahme über Multimedia-Projekte an deutschen Hochschulen*. Gütersloh: Verlag Bertelsmann Stiftung 1997, S. 73–122.
- Klemme, Michael, Ralf Kuhnert and Harald Selke: Semantic Spaces. In: Höök, Munro, Benyon (1998), pp. 109–118.
- Online sources:
 - Author and Title of the document
 - Last date of change (when available)
 - Make sure the document will be available to the reader

Some remarks on language



- You are not writing for a computer magazine, nor for a newspaper or a novel.
- You are writing not to express yourself but to make your reader understand what you were thinking when writing your thesis down.
 - Be more or less specific. It's is not, it isn't ain't, and it's it's, not its, if you mean it is.
 - Who needs rhetorical questions? If you don't, it's its.
 - Contractions aren't necessary. Then too, it's hers. It isn't her's.
 - One-word sentences? Eliminate them. It isn't our's either. It's ours, and likewise yours and theirs.
 - Do not use excessively long sentences. If your argumentation requires them; your readers are not dumb.
- If there is a relationship between two arguments, use linguistic means to clarify that relationship instead of letting the reader guess about its nature.
- Always think about your reader:
 - Reading your thesis should be somewhat pleasant.
 - Mistakes are at least annoying to any reader familiar with the rules.



- Typesetting is
 - not a question of art, but one of simple readability of text.
 - not a question of software but a question of professionalism—just like grammar.
- The content determines the layout.
- General guidelines:
 - Be consistent in the use of all elements
 - Align items with the eye not with the ruler.
 - Use as few design characteristics as possible but as many as necessary.
 - Design these elements so that they can be distinguished easily.
 - Be aware of the rules and conventions—down to micro-typography.

■ Typefaces

- Sans-serif typefaces usually work best for slides and headlines
- Serif typefaces usually work best for longer texts
- Combining typefaces is not an easy job

Times Century Schoolbook Garamond

■ Often-used type sizes

Helvetica Futura Syntax Meta

- Body 10 to 12 pt
- Footnotes and long quotations 2 pt less
- Headlines 24, 18, and 16 pt without any further emphasis
- Cover-page 36, 48 or 72 pt

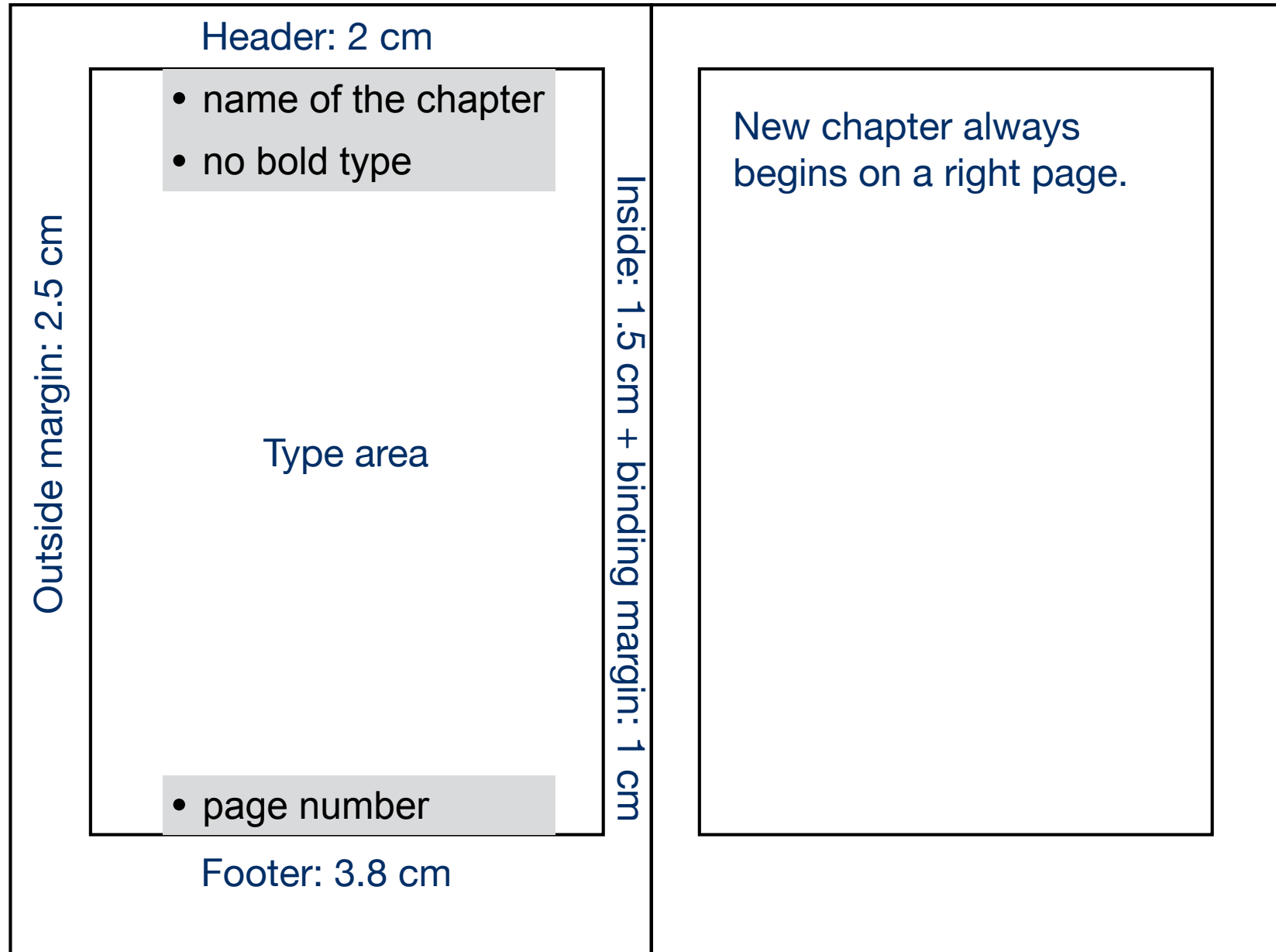
- Emphasis by italics; no bold face, no underlining.





- Do not use a linespacing of $1\frac{1}{2}$.
- But do use 2 to 3 pt leading (Durchschuss) depending on the type size, the length of the lines and the setting.
- Typography experts recommend to use no extra space between paragraphs but to use an indent for the first line 0.5 to 0.7 cm.
- Use either justified setting (Blocksatz) or draft setting (Rauhsatz).
 - Watch out for maximum word distances in justified setting.
 - Linespacing should be larger than the maximum word distance.

▼
Der Zeilenabstand ist größer
▲ als der Durchschuss. ▲





- Cover page
 - Set headings in type size 36, 48 or 72 pt
 - Organise all elements into 3 groups
 - Title plus subtitle (if any)
 - Type of thesis (Master's thesis, Seminar paper etc.)
 - Author, affiliation, date
 - Do not use logos if no one requires you to do so.
 - Ask the supervisor and the Prüfungssekretariat for specific requirements.
- Table of Contents
 - Subsections to third or fourth level maximum.
 - Including page numbers.
- Appendices if necessary:
 - Large tables
 - Source code