

Alfred Holl

Scientific work and writing

Introducing sections

Title, abstract, preface, structure, introduction, lines of argumentation

Main part

Subject, formal requirements, terminology, abbreviations, reader guidance, applied CS, motivation of solutions, documentation, use of literature

Indexes

Bibliography

Technical remarks

Administrative requirements, pre-correction and supervision, juridical requirements, grading, grading persons

Subject and title

Title and contents of your thesis should fit together

Title understandable for a large public, subtitle in detail

Title should contain important **keywords**, should **not** be **too comprehensive**

Maybe you will have to start with a **preliminary title**.

Abstract

Should summarize the contents in a well understandable language,
attract attention (“research marketing”)

Key Words

Introducing sections

Preface 1

No chapter number

Brief background information **not belonging to the subject** of your thesis.

History and circumstances of the development of your thesis.

Impulse of the thesis, suggestion by whom, how; personal motivation.

Motivation of **particularities and limitations**
which could otherwise be interpreted as defects.

Preface 2

Previous knowledge of your own,
e.g. necessity of getting more familiar with related topics
before starting to discuss the central topic.

Duration and type of your **search for bibliographical references**.

What did you learn by working on your thesis?

Previous knowledge the **reader** is expected to have.

Requirements by the company where you wrote your thesis.

Acknowledgements (optional)

Table of contents – structure

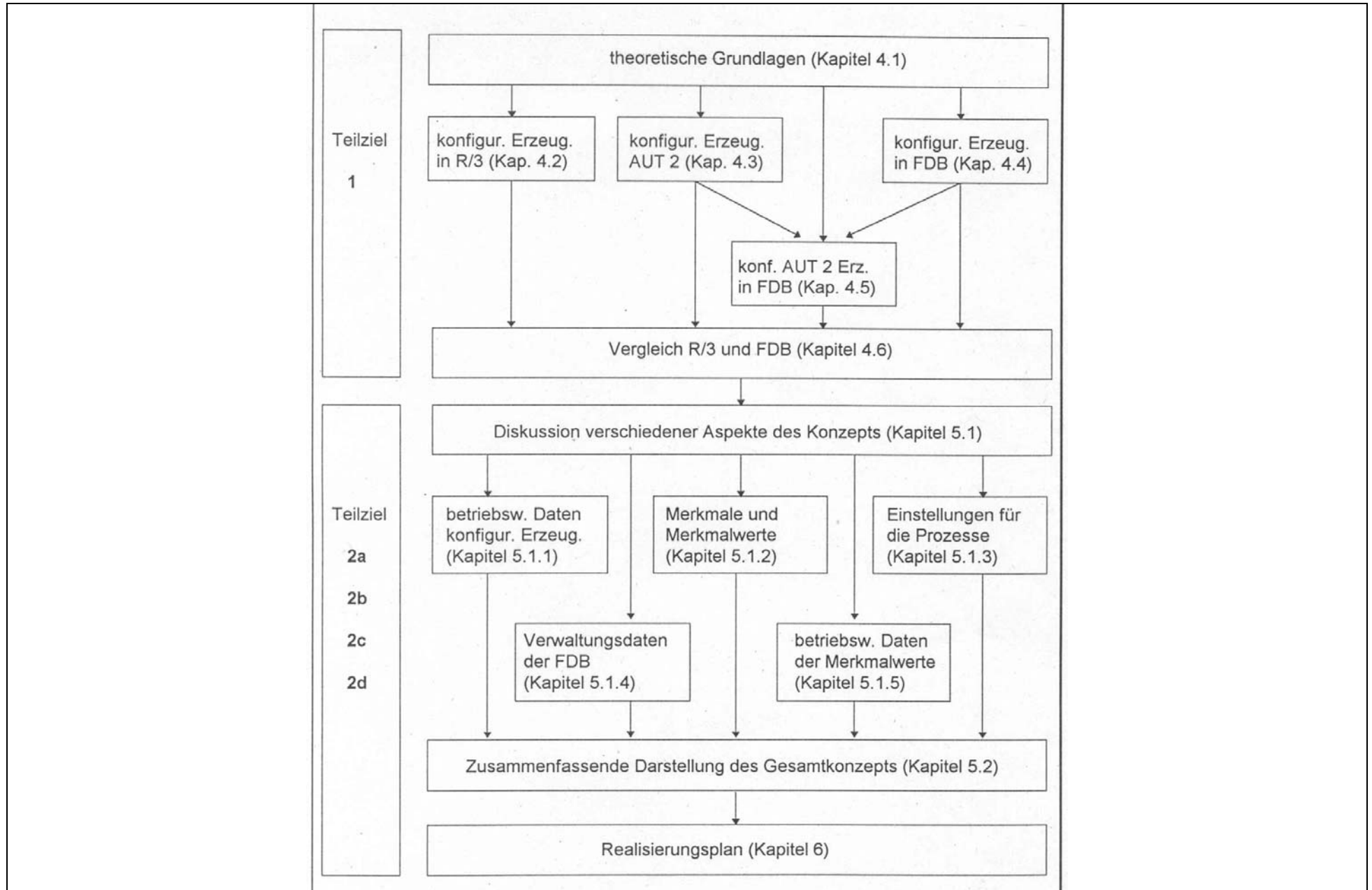
Decimal section numbers

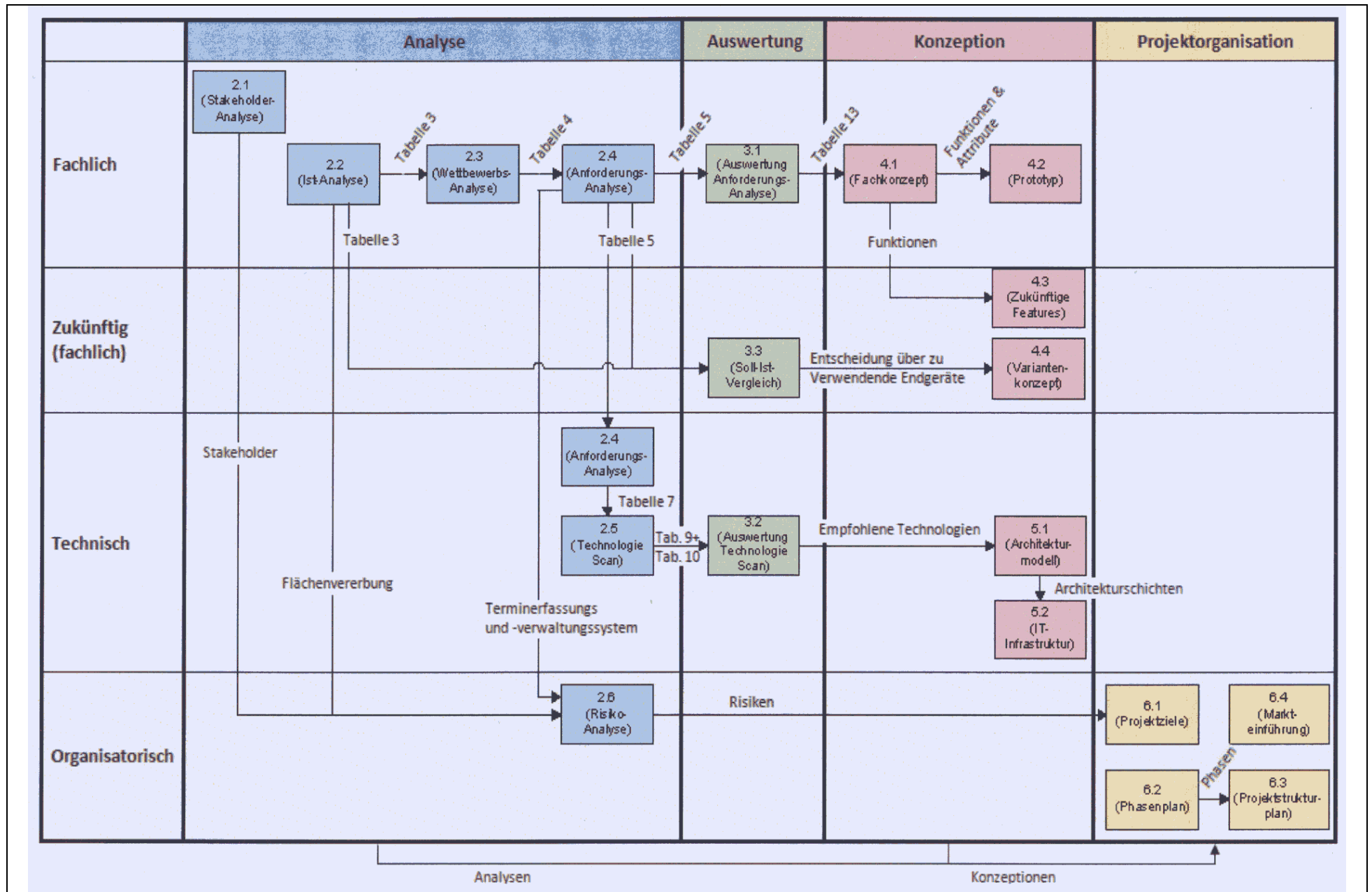
Clear and detailed fine (not only coarse) structure;
give your thesis a good structure,
not more than **7 structure entries** on one structural level.

Only similar and comparable entries / topics
should be put together on one structural level;
parallelization should be made recognizable if there are parallel structural
entries: therefore, not “apples, computers, desks”, but only “green, yellow,
red apples”.

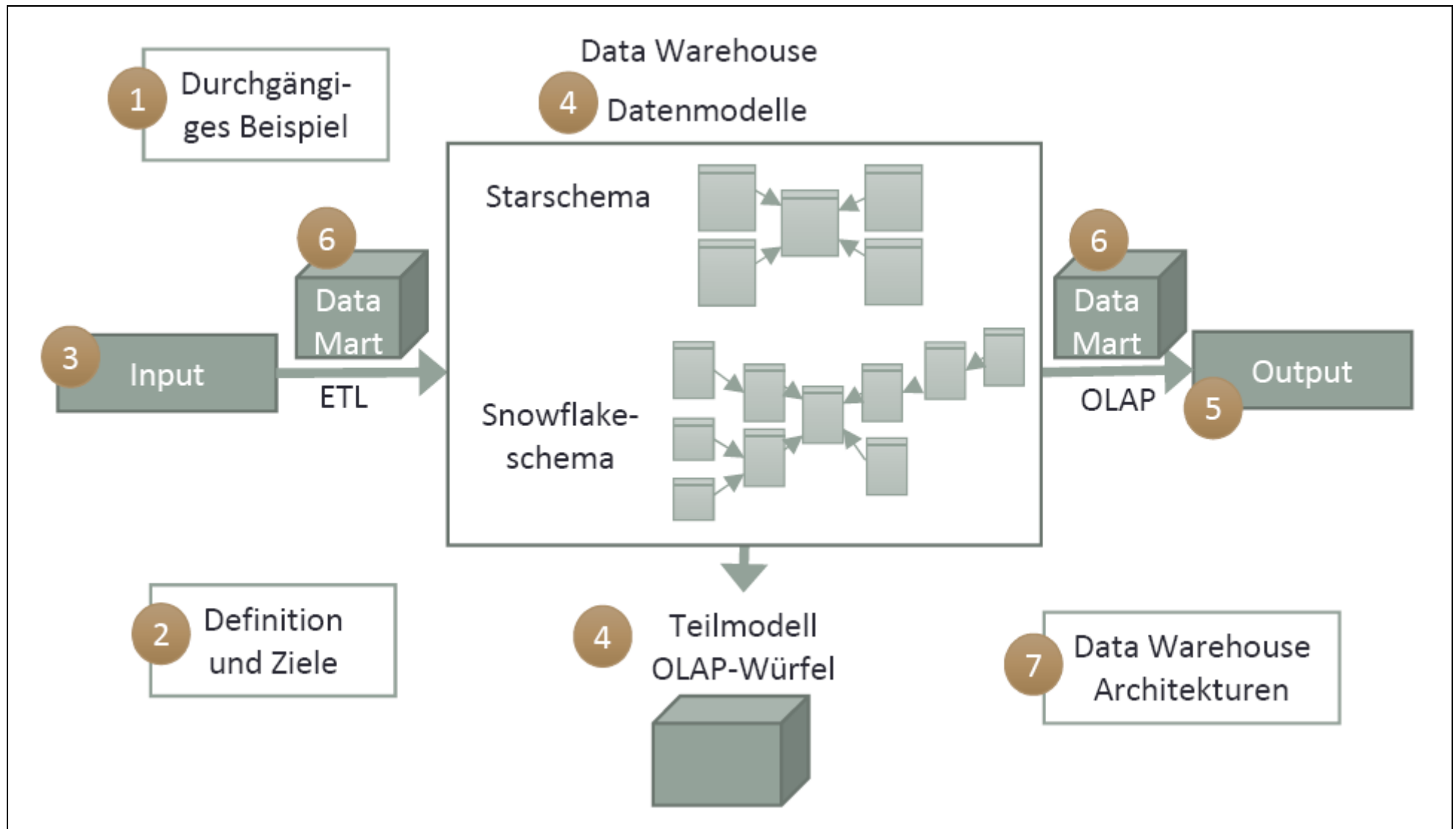
In addition to a linear structure,
a **two-dimensional** structure can be helpful or necessary:
table / matrix, network, mind-map, spider net structure.

| Kernbereiche des PM PM in ... | Strategie / Planung | Vertragsgestaltung | Finanzierung | Durchführung |
|--|----------------------------|---------------------------|---------------------|---------------------|
| Kleinunternehmen | 5.1.3 | 5.1.1 | 5.1.2 | 5.2 |
| Großunternehmen | 6.1.3 | 6.1.1 | 6.1.2 | 6.2 |
| der Wunschvorstellung | 4.2.1 | 4.2.2 | 4.2.3 | 4.3 |





Temporal structure



Introduction 1

Brief introductory **information** about the **subject**: scientific context.

Embed the subject into a broader context, use an **introductory example**, guide from commonly understandable areas to your particular subject.

Description / motivation of the **structure** (from where? how? where?)

- **Starting point** of your thesis: what do we know? Where are the problems?
Clear description of **research questions** / **scientific issues**
- Exact **definition of the objectives** (to answer the research questions),
description of your task in detail;
motivation: what is the purpose of your thesis? What are you aiming at?
Objectives: reachable, pragmatic, not too optimistic / high / broad
- Motivation of the **way how the methods are applied**
(how shall the objectives be reached) and
motivation of the use of particular methods.

Introduction 2

Distinction of the goals:

- generally **desired goals** to which your thesis contributes
- **goals reached** within your thesis (do not wake false expectations!)
- **actual results** of your thesis, **form** of the results

Formally structured overview of the entire thesis

for each section: number, title, methods used, partial goals

Motivation of the **numeric structure** of your thesis

by comparing it to the way how the methods are applied

(reflections about the structure, → already important for exposé).

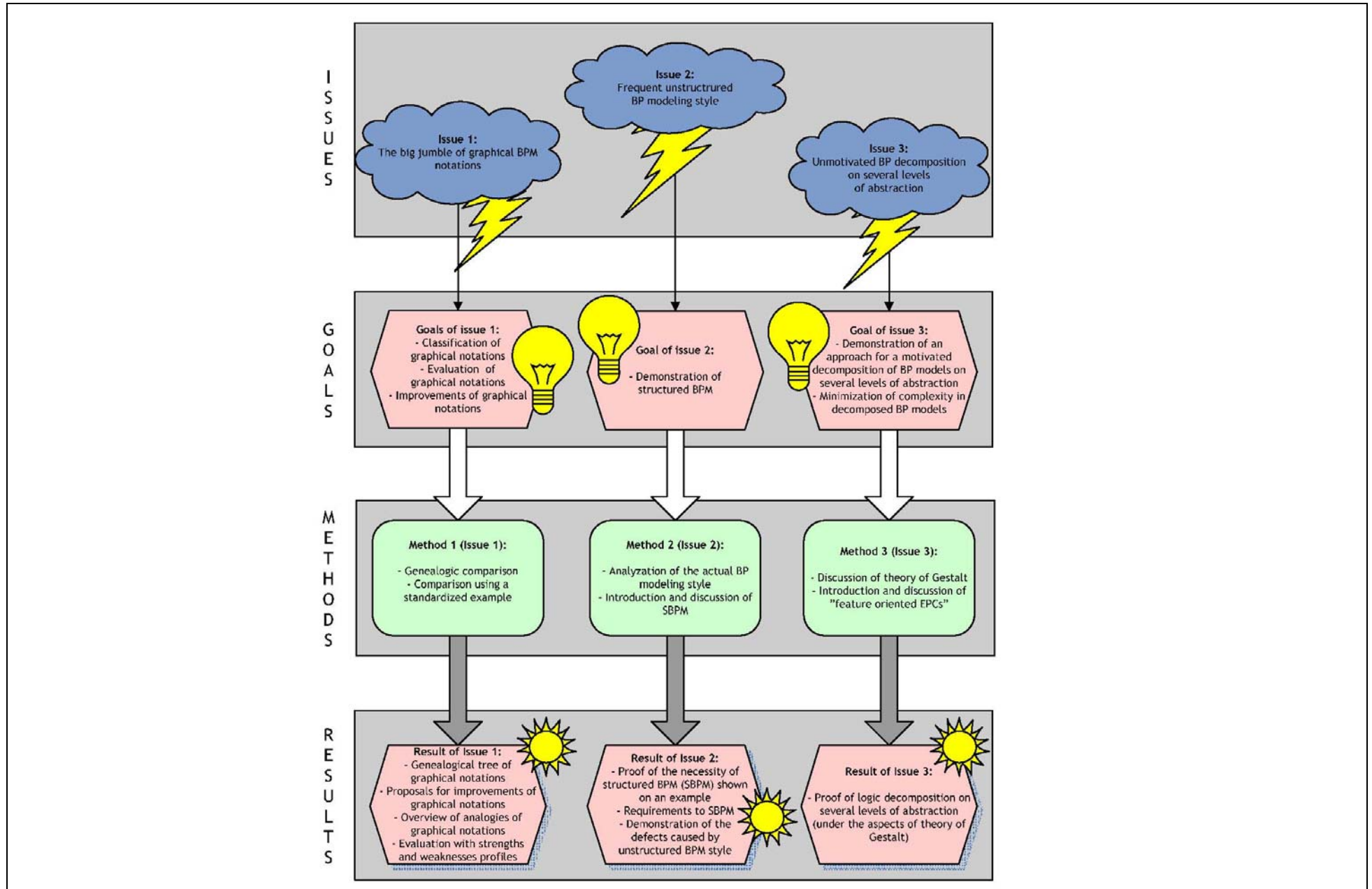
Related work: explain previous research and the novelty of your ideas

Conventions for the reader:

use of character attributes (italics, underline, bold) and font sizes.

Introduction 3

| | Where from? Starting point scientific issues | Where? Definition of the objectives | How? Methods (and their use) | What? (Form of the) Results |
|------------------|---|--|---|--|
| Entire thesis | | | | |
| Chapter 1 | | | | |
| Chapter 2 | | | | |
| Chapter 3 | | | | |
| etc. | | | | |



Design and development methods

Requirements engineering and systems analysis

Reference modeling (analogy)

Business process modeling, algorithm modeling

Business Process Reengineering

Information flow modeling

Data modeling, class modeling

Data mining methods

Programming with special development environments

Customizing, tailoring

Design science

Empiric and rationalistic methods to construct models

Methods in information systems continued

Organization-theoretical methods

Elicitation methods such as questionnaire, interview, workshop

Information and knowledge management methods

Market study on standard software

Function point method (for comparisons)

Project management methods

Case studies

Research methods (according to Wilde / Hess 2007)

Main methods (91%)

Deductive by reasoning (using natural language)

Case study (including ethnography)

Prototyping

Quantitative-empiric

Conceptional-deductive (in semi-formal models)

Formal-deductive (in mathematical models)

Side methods (9%)

Reference modeling

Qualitative-empiric (including grounded theory)

Lab / field experiment

Simulation

Action research

References regarding research methods

Backlund, Per: On the research approaches employed at recent European Conferences on Information Systems (ECIS 2002 – ECIS 2004). In: Proceedings of the 13th European Conference on Information Systems, Regensburg 2005.

Becker, J; Rosemann, M; Schütte, R: Grundsätze ordnungsmäßiger Modellierung. Wirtschaftsinformatik 37(1995) 435-445.

Fettke, Peter; Houy, Constantin; Loos, Peter: Zur Bedeutung von Gestaltungswissen für die gestaltungsorientierte Wirtschaftsinformatik. Konzeptionelle Grundlagen, Anwendungsbeispiel und Implikationen. Wirtschaftsinformatik 52(2010) 339-352.

Fettke, Peter; Loos, Peter: Referenzmodellierungsforschung. Wirtschaftsinformatik 48(2006) 257-266.

Hevner, Alan R.; March, Salvatore T.; Park, Jinsoo; Ram, Sudha: Design science in information systems research. MIS Quarterly 28(2004) 1, 75-105.

Klein, H. K.; Myers, M.: A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly*, 23(1999) 1, 67-97.

Kock, N.: *Information systems action research. An applied view of emerging concepts and methods.* Springer 2007.

Lee, Allen S. (ed.): *Information systems and qualitative research (conference proceedings).* Philadelphia, PA 1997.

Morgan, G; Smircich, L: The case for qualitative research. *Academy of Management Review* 5(1980) 491-500.

Myers, Michael D.; Avison, David (ed.): *Qualitative research in information systems. A reader.* London: Sage 2002.

Palvia, Prashant; En, Mao; Salam, A. F.; Soliman, Khalid S.:
Management information systems research: what's there in a methodology? In:
Communications of AIS 6(2003) 11, 289-308.

Palvia, Prashant; Leary, David; En, Mao; Midha, Vishal; Pinjani, Praveen; Salam, A. F.: Research methodologies in MIS: an update. In: Communications of AIS 6(2004) 14, 526-542.

Peppers, K; Tuunanen, T; Rothenberger, M A; Chatterjee, S: A design science research methodology for information systems research. Journal of Management Information Systems 24(2007), 3, 45-77.

Susman, G. I.; Evered, R. D.: An assessment of the merits of scientific action research. Administrative Science Quarterly, 23(1978) 4, 583-603.

Trauth, Eileen Moore: Qualitative research in IS. Hershey, PA: Idea Group 2001.

Ulrich, H.; Probst, G. J. B. (ed.): Self-organization and management of social systems: insights, promises, doubts and questions. Berlin: Springer 1984.

Wilde, Thomas; Hess, Thomas: Forschungsmethoden der Wirtschaftsinformatik. Eine empirische Untersuchung. Wirtschaftsinformatik 49(2007) 280-287.

Main part

Presentation of the subject of your thesis.

The following requirements partly apply already for introduction and preface.

Secondary topics should be avoided as they do not belong to your subject. Broad digressions far from your subject will lead to downgrading.

No statements of common knowledge in order to fill pages.

Formal requirements 1

Good results lose their value when they are **presented** badly.

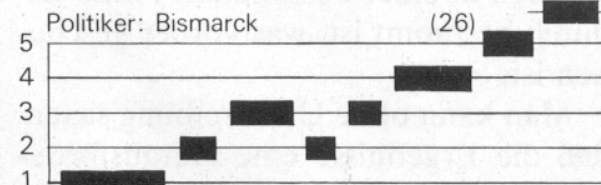
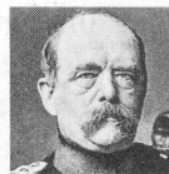
Accurate formal presentation: orthography, punctuation, page layout.

Use of I /we, my / our

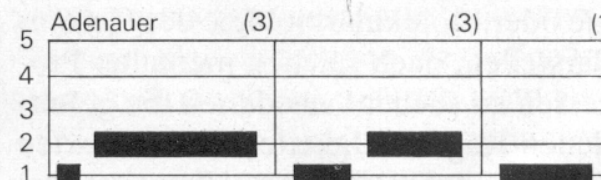
Use of language: simple syntax, clear understandability, fluent readability, precision, transparency for a broad public, for every other information systems expert or computer scientist.

Graphic overviews, outlines, diagrams should have a logical arrangement (train of thought; clockwise, from left to right, diagonal etc.); comments should be consistent with contents and disposition of the graphics; arbitrary, but quickly and easily understandable symbolic / notation. Same set of symbols in all of your graphics

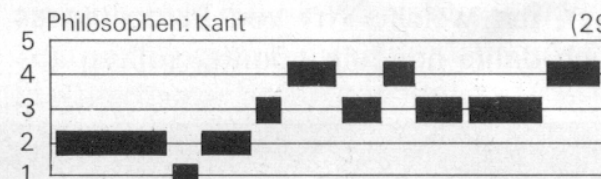
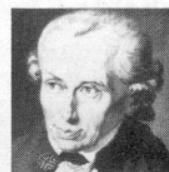
„Der gesamte Konflikt der Regierung mit der jetzigen Landesvertretung leitet seinen Ursprung aus dem unnatürlichen Verhältnis ab, daß Preußen der einzige der deutschen Staaten ist, welcher sein Heerwesen den Anforderungen der Zeit entsprechend eingerichtet hat, und daß wir dadurch genötigt sind, die Kräfte des Landes so anzupassen, daß sie zur Verteidigung des Territoriums auch aller derjenigen deutschen Staaten hinreichen, welche mit uns dasselbe Verteidigungsgebiet bewohnen, ohne verhältnismäßig zu den Lasten der Verteidigung beizutragen.“ (Aus einem Brief Bismarcks an Moltke.)



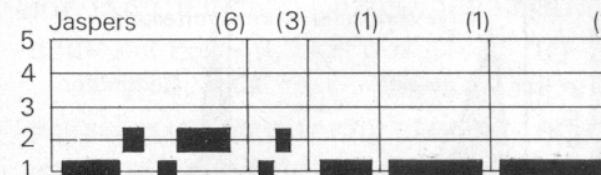
„Ich war der Auffassung, daß die politische Spannung zwischen der Sowjetunion und den westlichen Mächten nicht auf einzelnen Differenzen, einzelnen Meinungsverschiedenheiten oder einzelnen Ansprüchen oder Gegenansprüchen beruhte. Es handelte sich vielmehr um eine große Spannung zwischen zwei Mächtigkeitsgruppen, innerhalb derer jeweils nach dem Willen der Sowjetunion bald dieser bald jener Punkt stärker in Erscheinung gebracht wurde. Dieses Spannungsfeld würde sich sicher nicht im ersten Stadium von Verhandlungen in Einzelprobleme auflösen lassen.“ (Aus dem ersten Band der „Erinnerungen“ Konrad Adenauers.)



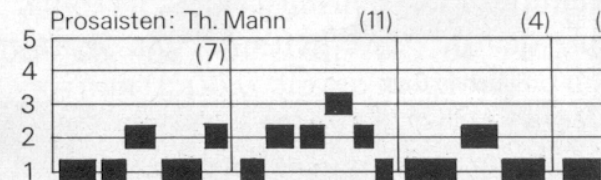
„Um nun den scheinbaren Widerspruch zwischen Naturmechanismus und Freiheit in ein und derselben Handlung an dem vorgelegten Fall aufzuheben, muß man sich an das erinnern, was in der Kritik der reinen Vernunft gesagt war oder daraus folgt: daß die Naturnotwendigkeit, welche mit der Freiheit des Subjekts nicht zusammen bestehen kann, bloß den Bestimmungen desjenigen Dinges anhängt, das unter Zeitbedingungen steht, folglich nur denen des handelnden Subjekts als Erscheinung, daß also sofern die Bestimmungsgründe einer jeden Handlung desselben in demjenigen liegen, was zur vergangenen Zeiten gehört und nicht mehr in seiner Gewalt ist.“ (Aus der „Kritik der praktischen Vernunft“ von Kant.)



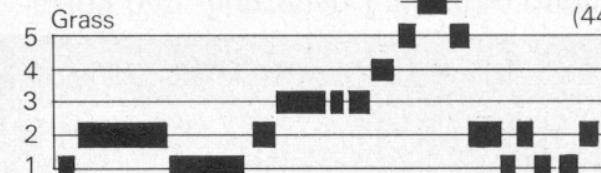
„Die Forschung zeigt uns zwar sehr merkwürdige, überraschende Dinge am Menschen, aber je klarer sie wird, desto bewußter auch, daß sie nie den Menschen im Ganzen zum Forschungsgegenstand gewinnen kann. Der Mensch ist stets mehr, als er von sich weiß. Das gilt sowohl vom Menschen überhaupt, wie von jedem einzelnen Menschen. Man kann nie die Bilanz ziehen und nun Bescheid wissen, weder über den Menschen überhaupt, noch über irgend-einen einzelnen. Verabsolutieren eines immer partikularen Erkennens zum Ganzen einer Menschenerkenntnis führt zur Verwahrlosung des Menschenbildes.“ (Aus „Der philosophische Glaube“ von Jaspers.)



„Ein scharfer Wind trieb den Regen seitwärts herunter, und die alten Krögers krochen, in dicke Pelzmäntel gewickelt, eiligst in ihre majestätische Equipage, die schon lange wartete. Das gelbe Licht der Öllampen, die vorm Hause auf Stangen brannten und weiter unten an dicken über die Straße gespannten Ketten hingen, flackerte unruhig. Hie und da sprangen die Häuser mit Vorbauten in die Straße hinein, die abschüssig zur Trave hinunterführte, und einige waren mit Beschlägen oder Bänken versehen. Feuchtes Gras sproß zwischen dem schlechten Pflaster empor.“ (Aus „Die Buddenbrooks“ von Thomas Mann.)



„Die Fähigkeit, mittels einer Kinderblechtrommel zwischen mir und den Erwachsenen eine notwendige Distanz er-trommeln zu können, zeitigte sich kurz nach dem Sturz von der Kellertreppe fast gleichzeitig mit dem Lautwerden einer Stimme, die es mir ermöglichte, in derart hoher Lage anhaltend und vibrierend zu singen, zu schreien oder schreiend zu singen, daß niemand es wagte, mir meine Trommel, die ihm die Ohren welk werden ließ, wegzunehmen; denn wenn mir die Trommel genommen wurde, schrie ich, und wenn ich schrie, zersprang Kostbarstes: ich war in der Lage, Glas zu versingen.“ (Aus „Die Blechtrommel“ von Grass.)



Formal requirements 2

Punctuation

Formal requirements 3

Headlines (if helpful, put them in the form of questions) should fit the contents of the text.

Section headers (one / two digit sections) in page header.

Structure of the text: frequent headlines (no four pages in a row without any headlines), structure in numerous paragraphs, visible underlines and bold types, comfortable font size (e.g. Word 12 pt), line spacing 20 pt.

No unstructured enumerations (“another”, “a further”, bullet points) Give rise to questions such as: Why just these aspects? Is the list complete?

Literal **quotations** and inserts similar to footnotes: other character attributes, less line space.

Formal requirements 4 – English

Correct English (good native proof reader)

Vocabulary (simple, no literary English, no dictionary translations and bulky expressions); use Merriam-Webster and the web
Try to find better expressions using paraphrases and synonyms

Morphology

Syntax: simple, short sentences; verb language

Punctuation

Terminology and abbreviations 1

Definition of the terminology used (complete, correct, clear) in the place of first occurrence (except for standard IS / CS) or reference to **glossary**; highlighting with bold type (no italics as they are not well visible!)

Preliminary definitions of your own if definitions in literature are not clear.

Use only a few, well-defined, really necessary **abbreviations**, not mixed with full expressions.

Homonymy / polysemy: constant terminology attention with regard to identical terms with different meaning when used by different authors, IT systems, companies (idiolects)

Terminology and abbreviations 2

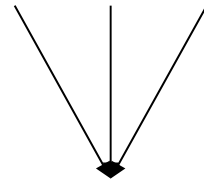
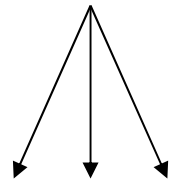
natural language

formal language

one meaning

many meanings

one meaning



many forms

one form

one form

synonymy

homonymy
polysemy

non-ambiguity

e.g.

glasses
spectacles

floor, earth,
tree, root

Quasi-synonymy, quasi-homonymy: overlapping meanings

Terminology and abbreviations 3

Reduce the use of company-internal language

Write for a broader scientific community

Avoid a project-internal tunnel view

Step back, have a look at your project from a distance

Describe your ideas and your project experience on a more general level

Explain background knowledge

Reader guidance 1: A didactic task

The reader must be able to follow your thoughts, must be guided:
top-down presentation (move details to lower levels)
oriented towards the hierarchic memory structure of humans

Help the reader with graphics, **illustrations** and **good examples**

At the beginning of larger chapters: put **overviews / summaries** there,
briefly explain the current state of your reasoning,
refer to the structural concept, to the context,
describe the next step / objective;
comment and motivate the fine structure of the chapter and
the methods to reach the next objective.

Describe your **lines of argumentation** in detail and make them transparent.
You have to make your ideas discussible to a larger public

Reader guidance 2

Use **references** within your thesis only directly related to chapter / section numbers (or page numbers), not unclearly (“earlier”, “later”);
“see above” or “see below”
only recommended with reference to the same page.

Use “To be improved” **hints** in those places
where you yourself are not yet content with your text.

Help one another mutually as **proofreaders**.

Your thesis should be
understandable for every other master’s student with the same major;
do not read on the monitor, use print-outs!
If helpful, contact former master students.

Read the text of your thesis aloud to yourself.

General remarks regarding the contents

Be aware of the **methods** you use

Do **not** write **only on a detailed level**

Problem of NDAs

No internal project report, no insider text, no esoteric text
which does not go beyond the horizon of some company
or some small research area
but a well readable scientific report,
e.g. a readable developer (and user) documentation.

At the latest on the master's level: **A mere case study is not sufficient,
produce general knowledge which is transferable to other companies**

Master theses in applied computer science and information systems 1

Explain the **purpose** of the IT application:

starting point is some course of events in a company (business process) where the IT application has to be embedded;
a **business task** which it has to support.

A system manual (that is, starting point is your IT application) can therefore be at the most a part of your thesis.

Do not forget about the **responsibility** of computer scientists / information systems experts (e.g. **data privacy**)! Are you allowed to model / program everything which can be modeled / programmed?

Information systems (or socio-technical IS): organization

Organizational information systems (or social IS)

Business IS, applications (or technical IS)

Master theses in applied computer science and information systems 2

A complete business concept is mandatory.

Distinguish your partial models clearly according to the three dimensions of **multi-perspectivity**:

horizontal: information flow, function/process, data/object models

vertical: partial models on different abstraction levels

diaphasic: business concept, user surface, reports, IT concept

All **modeling approaches** have to fit together (**be consistent**).

Business concepts have to be active, they have to include new aspects which do not show up before IT concept design or programming!

1. Horizontal multi-perspectivity / decomposition: static and dynamic data and function models

2. Vertical multi-perspectivity / decomposition: levels of abstraction

Using **design methods** (top-down, bottom-up, inside-out), models have to be decomposed into small and transparent partial models on different **levels of abstraction** (hierarchical levels with different degrees of abstraction).

3. Diaphasic multi-perspectivity: phase concepts / software process models

On its way through a systematic **software (development) process model**, a model of a technical IS has to be **transferred** in several steps via different models, each of which in turn is split vertically and horizontally, from an organization / enterprise model on the information level to a technical model on the implementation level.

Motivation of solutions: documentation of all of your reasoning 1

Do not write just a mere protocol of results,
but a **documentation** of your ideas:

Do not apodictically (without motivation) present finished results and solutions, but **render account in detail and motivate**,
why you choose just this method and technique and not other ones!

It has to be possible to follow **your reasoning, the way how you found your solution**. What gave you just this idea?

Which other possible solutions, which other considerations had to be excluded and why (documentation of dead ends)?

It is important that you **reflect** on and render account of your reasoning and your methods.

This is the only way which allows your advisors to recognize your intellectual work!

Motivation of solutions: documentation of all of your reasoning 2

It is not only important what you did, but also all **which you did not do, what you omitted, what you excluded** consciously and intentionally.

Where could the reader go beyond your thoughts?

Do not give rise to considerations such as:

“Why does the author not mention this aspect?

In my opinion, it would be a logical consequence, an obvious solution!”

Of course, there is no need to document trivialities which are of no importance:

do not give long-winded explanations where a single sentence is sufficient.

It is also intellectual work **to distinguish between essential and non-essential**, between important and unimportant

(opinions about this point can, of course, differ in detail).

Deal consciously with **norms for diagrams (charts) and methods**:

do not blindly follow them,

but adapt them to the particular requirements of your project if necessary.

Use of literature 1

Think **independently**: Simplistic copying from literature without understanding, comments and reflections of your own is entirely worthless.

Consider precisely which quotations you **choose**!
Quoting without any accurate reflection will put your work in an unfavorable light (nonsense can be found in books, too; the fact that a word is printed is no guarantee for its absolute quality).

Clearly distinguish your **own opinion** from literally **quoted opinions** (quotation marks) and non-literal, **reported** / mentioned **opinions** (reported speech) of other authors.

You are allowed to use the word “I”!

Quotations should serve as a **reference** or support your opinion or clearly serve as **contrast** to your opinion.

Use of literature 2

Put **notes and bibliographical references** at the best in the text (after the quotation, before period),
footnotes do not make a paper more scientific.

Abbreviated bibliographical reference: (author's last name, year: page) or (author's last name, shortened title, [year,] page)

Non-literal quotations in your own words
also require a bibliographical reference.

Essential **hints** – particularly from your advisors –
are sources which have to be quoted.

Overall quotations (adapted from ...) for encyclopedic basics

Quoting a quotation is done by double bibliographical reference.

Bibliographic search

Independent literature: books

BVB Bayerischer Bibliotheksverbund

KVK Karlsruher virtueller Katalog (world wide)

scholar.google.com

e-books

Dependent literature: papers in journals and collections

electronic journals (EZB)

Paper databases (DBIS): searching them is mandatory!

Indexes

Glossary

(with reference to page / chapter of the first occurrence of a term)
if necessary

Abbreviation index

(with reference to page / chapter of the first occurrence of an abbreviation)

Figure index

Table index

Key word index

The **granularity** of glossary and abbreviation index
should be adapted to the expected previous knowledge of the reader.

Bibliography 1

Sort your references alphabetically according to the authors' last names, corporative / institutional authors as well.

Distinguish between **used and unused literature**.

The latter is necessary if the number of possible sources is so big that you have to make a choice or if some sources are not available via internet or libraries.

Give a brief **comment** (max. 5 lines) to each of the sources mentioned in your bibliography: do you consider it as good, usable or bad, do you use it often, rarely or not at all and why? Although it is not common practice, some books already use this sort of comments which is very helpful for bibliographical research.

Bibliography 2

Monograph:

Author / editor last name, first name: title. place[: publisher] edition year.

Mark editor(s) with following (ed.).

Example for edition and year: 2nd ed. 2005 or ²2005

Paper in a journal:

Author last name, first name: title.

Journal title volume (year) pages from - to.

Paper in a collection (e.g. festschrift, proceedings, anthology):

Author: title. In: Monograph, pages from - to.

As a rule, “grey” literature (e.g. web sites, system manuals) has only short duration. Therefore, print-outs or a CD of the parts used of such sources with the date of access have to be included into the appendix of your thesis.

References of web sources require author and title.

Oral presentation – talk

You should have a **structure** with a **decimal classification** (also in detail); show it to your audience and recur to it when arriving at a new section.

Overview: Relation of the sections of your presentation to the goals of your presentation and the subject of your presentation.

Relevance of your topic for the **subject of the seminar**

References with pages, also for figures

Short **handout** with key words

You should not read **PowerPoint notes**; use cards instead

New lines according to the **syntactical structure** of a sentence

Technical remarks

Administrative requirements

Entire size: about 100 pages, double line spacing.
You can use single line spacing for the final version,
but double line spacing is required for all of the pre-corrections.

A thesis for two is possible,
but has to be formally separable in the end (e.g. 1st / 2nd part)
to meet administrative requirements by some authorities.
The actual contributions of the two authors
can differ from the formal separation and
have to be discussed in the introduction.

A thesis (with reduced size)
can have the form of a journal paper or a contribution to a congress.

Pre-correction and supervision

It is your duty
to regularly inform your advisors about the progress of your thesis and
to submit finished chapters for pre-correction.

These documents have to be on paper.
Students from abroad can send pdf-files via e-mail.

The formal requirements
have to be accurately met already for pre-correction.

I am available for pre-correction of the final wording only once per chapter.
Of course, you can discuss contents and structure of your thesis
several times with me before you submit texts for pre-correction.

Pre-corrections have to be submitted together with the final version.

Juridical requirements

Always meet the deadlines
you agreed upon with your advisors and the university administration.

Include a confirmation of working independently
at the beginning of your thesis.

Information relevant for grading

A master's thesis shall prove that a student is able to independently discuss a problem from his / her degree program on a scientific basis.

All of the information which shall be taken into consideration for grading (intellectual work, temporal effort, external requirements by a company etc.) has to be made evident in the text of your thesis.

Additional oral information, side agreements, interpretations, implicit consequences, hints between the lines, no matter of what type and no matter by, with and for whom cannot be considered for grading.

Grading persons

Each grading person is completely autonomous in his / her judgment of your thesis, that is, completely independent of the advisor's or any other grading person's opinion.

In Germany, there are two grading persons, in other countries, there may be only one. Sometimes your advisor is also a grading person.

Contact grading persons at the latest when you have accomplished one half of structure and text of your thesis.

Problems with the company involved should be explained on a separate page.

Method report 1

The focus of a method report in an information systems master's program are scientific methods relevant in the field of information systems.

What is the purpose of scientific methods?

Scientific methods are used in order to find answers and solutions to scientific issues (scientific questions, scientific problems).

Remember a hard requirement: work in teams of two students.

Method report 2

There are different possibilities to choose a subject for a method report in the framework of an information systems master's thesis:

Describe the scientific issues and the methods you use to arrive at answers and solutions.

Describe a certain scientific issue relevant for information systems and discuss methods to answer / solve it.

Describe a scientific discipline / approach / theory relevant for information systems, its issues and the methods it uses (state of the art).

Describe a scientific method relevant for information systems and possible scientific issues where it can be used.