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by

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Abstract

This is a placeholder for the abstract. It summarizes the whole thesis to give a very short overview. Usually, this the abstract is written when the whole thesis text is finished.

Contents

1 How to use this LaTeX document template

This LaTeX document template from LaTeX@TUG[1] is based on KOMA script[2]. You don't need any special KOMA knowledge (but it woun't hurt either). It provides an easy to use and easy to modify template. All settings are documented and many references to additional information sources are given.

In general, there should not be any reason to modify a file in the `template` folder. *All important settings are accessible in the main folder, mostly in the `main.tex` file.* This way, it is easy to get what you need and you can update the template independent of the content of the document.

The *absolute minimum you should read* is listed below and marked with the hand symbol:

- Section 1.1: basic configuration of this template.
- Section 1.3: how to generate the PDF file
- Section 2.4: using biblatex (instead of bibtex)

In order to get a perfect resulting document and to get an exciting experience with this template, you should definitely consider reading following sections which are also marked with the pencil symbol:

- Section 1.5: extend the template with your own usepackages, newcommands, and so forth
- Section 3: pre-defined commands to make your life easier (e.g., including graphics)
- Section 4.4: how to do acronyms (like ACME) beautifully
- Section 4.8: how to "quote" text and use parentheses correctly

[1] `http://LaTeX.TUGraz.at`
[2] `http://komascript.de/`

The other sections describe all other settings for the sake of completeness. This is interesting for learning more about LaTeX and modifying this template to a higher level of detail.

1.1 Six Steps to Customize Your Document

This template is optimized to get to the first draft of your thesis very quickly. Follow these instructions and you get most of your customizing done in a few minutes:

1. Modify settings in `settings.tex` to meet your requirements:
   - Basic settings
     - Paper size, languages, font size, citation style, title page, and so forth
   - Document metadata
     - Preferences like `myauthor`, `mytitle`, and so forth
2. Further down in `main.tex`:
   - Create your desired structure for the chapters (`\include{introduction}`, `\include{evaluation}`, ...)
3. Create the TEX files and fill your content into these files you defined in the previous step.
4. In case you are using GNU make[3]: Put your desired PDF file name in the second line of file `Makefile`
   - replace "Projectname" with your filename
   - do not use any file extension like `.tex` or `.pdf`

1.2 License

This template is licensed under a Creative Commons Attribution-ShareAlike 3.0 Unported (CC BY-SA 3.0) license[4]:

- You can share (to copy, distribute and transmit) this template.
- You can remix (adapt) this template.
- You can make commercial use of the template.

[3] If you don't know, what GNU make is, you are not using it (yet).
[4] `https://creativecommons.org/licenses/by-sa/3.0/`

- In case you modify this template and share the derived template: You must attribute the template such that you do not remove (co-)authorship of Karl Voit and you must not remove the URL to the original repository on github[5].
- If you alter, transform, or build a new template upon this template, you may distribute the resulting template only under the same or similar license to this one.
- There are *no restrictions* of any kind, however, related to the resulting (PDF) document!

1.3 How to compile this document

I assume that compiling LaTeX documents within your software environment is something you have already learned. This template is almost like any other LaTeX document except it uses state-of-the-art tools for generating things like the list of references using biblatex/biber (see Section 2.4 for details). Unfortunately, some LaTeX editors do not support this much better way of working with bibliography references yet. This section describes how to compile this template.

1.3.1 Compiling Using a LaTeX Editor

Please do select `main.tex` as the "main project file" or make sure to compile/run only `main.tex` (and not `introduction.tex` or other TeX files of this template). Choose `biber` for generating the references. Modern LaTeX environments offer this option. Older tools might not be that up to date yet.

1.3.2 Activating `biber` in the LaTeX editor TeXstudio

The TeXstudio editor is a simple LaTeX editor to start with. It works very well with MiKTeX.

[5] `https://github.com/novoid/LaTeX-KOMA-template`

To activate `biber` go to: `Options` → `Configure TeXStudio` → `Build` → `Default Bibliography` → `biber`.
In the case you have a German user interface go to: `Optionen` → `TeXstudio konfigurieren` → `Erzeugen` → `Standardbibliographieprogramm` → `biber`.

To make a bibliography run `PDFLaTeX` → `Bibliography` → `PDFLaTeX`.

1.3.3 Activating `biber` in the LaTeX editor TeXworks

The TeXworks editor is a very basic (but fine) LaTeX editor to start with. It is included in MiKTeX and MiKTeX portable and supports syntax highlighting and SyncTeX to synchronize PDF output and LaTeX source code. Unfortunately, TeXworks shipped with MiKTeX does not support compiling using `biber` (biblatex) out of the box. Here is a solution to this issue. Go to TeXworks: `Edit` → `Preferences ...` → `Typesetting` → `Processing tools` and add a new entry (using the plus icon):

Name: `pdflatex+biber`
Program: *find the `template/pdflatex+biber.bat` file from your disk*
Arguments: `$fullname`
`$basename`

Activate the "View PDF after running" option. Close the preferences dialog and you will now have an additional choice in the drop down list for compiling your document. Choose the new entry called `pdflatex+biber` and start a happier life with `biber`. In case your TeXworks has a German user interface, here the key aspects in German as well: `Bearbeiten` → `Einstellungen ...` → `Textsatz` → `Verarbeitungsprogramme` → + *(neues Verarbeitungsprogramm)*:

Name: pdflatex+biber
Befehl/Datei: *die `template/pdflatex+biber.bat` im Laufwerk suchen*
Argumente: `$fullname`
`$basename`

»PDF nach Beendigung anzeigen« aktivieren.

1.3.4 Compiling Using gnu make

With GNU make[6] it is just simple as that: `make pdf` Several other targets are available. You can check them out by executing: `make help` In case you are using TeXLive (instead of MiKTeX as I do), you might want to modify the line `PDFLATEX_CMD = pdflatex` within the file `Makefile` to: `PDFLATEX_CMD = pdflatex -synctex=1 -undump=pdflatex`

1.3.5 Compiling in a Text-Shell

To generate a document using `Biber`, you can stick to following example:

```
pdflatex main.tex
biber main
pdflatex main.tex
pdflatex main.tex
```

Users of TeXLive with Microsoft Windows might want to try the following script[7] which could be stored as, e.g., `compile.bat`:

```
REM call pdflatex using parameters suitable for TeXLive:
pdflatex.exe  "main.tex"
REM generate the references metadata for biblatex (using biber):
biber.exe "main"
REM call pdflatex twice to compile the references and finalize PDF:
pdflatex.exe  "main.tex"
pdflatex.exe -synctex=-1 -interaction=nonstopmode "main.tex"
```

1.4 How to get rid of the template documentation

Simply remove the files `Template_Documentation.pdf` and `Template_Documentation.tex` (if it exists) in the main folder of this template.

[6] `https://secure.wikimedia.org/wikipedia/en/wiki/Make_%28software%29`

[7] Thanks to Florian Brucker for provinding this script.

1.5 What about modifying or extending the template?

This template provides an easy to start LaTeX document template with sound default settings. You can modify each setting any time. It is recommended that you are familiar with the documentation of the command whose settings you want to modify. It is recommended that for *adding* things to the preambel (newcommands, setting variables, defining headers, ...) you should use the file `settings.tex`. There are comment lines which help you find the right spot. This way you still have the chance to update your `template` folder from the template repository without losing your own added things. The following sections describe the settings and commands of this template and give a short overview of its features.

1.6 How to change the title page

This template comes with a variety of title pages. They are located in the folder `template`. You can switch to a specific title page by including the corresponding title page file in the file `main.tex`. Please note that you may not need to modify any title page document by yourself since all relevant information is defined in the file `main.tex`.

2 preamble.tex — Main preamble file

In the file preamble/preamble.tex you will find the basic definitions related to your document. This template uses the KOMA script extension package of LaTeX. There are comments added to the \documentclass{} definitions. Please refer to the great documentation of KOMA[1] for further details.

What should I do with this file? For standard purposes you might use the default values it provides. You must not remove its include command in main.tex since it contains important definitions. This file contains settings which are documented well and can be modified according to your needs. It is recommended that you fully understand each setting you modify in order to get a good document result. However, you can set basic values in the main.tex file: font size, paper size, paragraph separation mode, draft mode, binding correction, and whether your document will be a one sided document or you are planning to create a document which is printed on both, left side and right side.

2.1 inputenc: UTF8 as input charset

You are able and should use UTF8 character settings for writing these TeX-files.

[1] scrguide.pdf for German users

2.2 babel: Language settings

The default setting of the language is American. Please change settings for additional or alternative languages used in main.tex. Please note that the default language of the document is the *last* language which is added to the package options. To set only parts of your document in a different language as the rest, use for example \foreignlanguage{ngerman}{Beispieltext in deutscher Sprache}. For using foreign language quotes, please refer to the \foreignquote, \foreigntextquote, or \foreignblockquote provided by csquotes (see Section 4.8).

2.3 scrpage2: Headers and footers

Since this template is based on KOMA script it uses its great scrpage2 package for defining header and footer information. Please refer to the KOMA script documentation how to use this package.

2.4 References

This template is using biblatex and Biber instead of BibTeX. This has the following advantages:

- better documentation
- Unicode-support like German umlauts (ö, ä, ü, ß) for references
- flexible definition of citation styles
- multiple bibliographies e. g. for printed and online resources
- cleaner reference definition e. g. inheriting information from Proceedings to all related InProceedings
- modern implementation

In short, biblatex is able to handle your bib-files and offers additional features. To get the most out of biblatex, you should read the very good package documentation. Be warned: you'll probably never want to change back to BibTeX again. Take a look at the files references-bibtex.bib and references-biblatex.bib: they contain the three references tagstore, Voit2009,

and `Voit2011`. The second file is optimized for `biblatex` and takes advantage of some features that are not possible with BibTeX. This template is ready to use `biblatex` with `Biber` as reference compiler. You should make sure that you have installed an up to date binary of `Biber` from its homepage[2]. In `main.tex` you can define several general `biblatex` options: citation style, whether or not multiple occurrences of authors are replaced with dashes, or if backward references (from references to citations) should be added. If you are using the LaTeX editor TeXworks, please make sure that you have read Section 1.3.3 in order to use `biber`.

2.4.1 Example citation commands

This section demonstrates some example citations using the style `authoryear`. You can change the citation style in `main.tex` (`mybiblatexstyle`).

- cite **Eijkhout2008** and cite **Bringhurst1993**; **Eijkhout2008**
- citet **Eijkhout2008** and citet **Bringhurst1993**; **Eijkhout2008**
- autocite (**Eijkhout2008**) and autocite (**Bringhurst1993**; **Eijkhout2008**).
- autocites (**Eijkhout2008**) and autocites (**Bringhurst1993**; **Eijkhout2008**).
- citeauthor **Eijkhout2008** and citeauthor **Bringhurst1993**; **Eijkhout2008**
- citetitle **Eijkhout2008** and citetitle **Bringhurst1993**; **Eijkhout2008**
- citeyear **Eijkhout2008** and citeyear **Bringhurst1993**; **Eijkhout2008**
- textcite **Eijkhout2008** and textcite **Bringhurst1993**; **Eijkhout2008**
- smartcite[3] and smartcite[4].
- footcite[5] and footcite[6].
- footcite with page[7] and footcite with page[8].
- fullcite **Eijkhout2008** and fullcite **Bringhurst1993**; **Eijkhout2008**

[2] `http://biblatex-biber.sourceforge.net/`
[3] **Eijkhout2008**.
[4] **Bringhurst1993**; **Eijkhout2008**.
[5] **Eijkhout2008**.
[6] **Bringhurst1993**; **Eijkhout2008**.
[7] **Eijkhout2008**.
[8] **Eijkhout2008**.

Please note that the citation style as well as the bibliography style can be changed very easily. Refer to the settings in main.tex as well as the very good documentation of biblatex.

2.4.2 Using this template with apa style

First, you have to have the APA biblatex style installed. Modern LaTeX distributions do come with biblatex and APA style. If so, you will find the files biblatex-apa.pdf (style documentation) and biblatex-apa-test.pdf (file with citation examples) on your hard disk.

1. Change the style according to \newcommand{\mybiblatexstyle}{apa}
2. Add \DeclareLanguageMapping{american}{american-apa} or \DeclareLanguageMapping{german}{german-apa} to your preamble[9]

These steps change the biblatex style to APA style

2.4.3 Using this template with BibTeX

If you do not want to use Biber and biblatex, you have to change several things:

- in preamble/preamble.tex
  - remove the usepackage command of biblatex
  - remove the \addbibresource{...} command
- in main.tex
  - replace \printbibliography with the usual \bibliographystyle{yourstyle} and \bibliography{yourbibfile}
- if you are using GNU make: modify Makefile
  - replace BIBTEX_CMD = biber with BIBTEX_CMD = bibtex
- Use the reference file references-bibtex.bib instead of references-biblatex.bib

[9] You might want to use section "MISC self-defined commands and settings" for this.

2.5 Miscellaneous packages

There are several packages included by default. You might want to activate or deactivate them according to your requirements:

`graphicx` The widely used package to use graphical images within a LaTeX document.

`pifont` For additional special characters available by `\ding{}`

`ifthen` For using if/then/else statements for example in macros

`eurosym` Using the character for Euro with `\officialeuro{}`

`xspace` This package is required for intelligent spacing after commands

`xcolor` This package defines basic colors. If you want to get rid of colored links and headings please change corresponding value in `main.tex` to {0,0,0}.

`ulem` This package offers strikethrough command `\sout{foobar}`.

`framed` Create framed, shaded, or differently highlighted regions that can break across pages. The environments defined are

- framed: ordinary frame box (`\fbox`) with edge at margin
- shaded: shaded background (`\colorbox`) bleeding into margin
- snugshade: similar
- leftbar: thick vertical line in left margin

`eso-pic` For example on title pages you might want to have a logo on the upper right corner of the first page (only). The package `eso-pic` is able to place things on absolute and relative positions on the whole page.

`enumitem` This package replaces the built-in definitions for enumerate, itemize and description. With `enumitem` the user has more control over the layout of those environments.

`todonotes` This packages is *very* handy to add notes[10]. Using for example `\todo{check}` results in something like this in the document. Do read the great package documentation for usage of other very helpful commands such as `\missingfigure{}` and `\listoftodos`. The latter one creates an index of all open todos which is very useful for getting an overview of open issues. The package `todonotes` require the packages `ifthen`, `xkeyval`, `xcolor`, `tikz`, `calc`, and `graphicx`. Activate and configure `\listoftodos` in `main.tex`.

check

[10] `todonotes` replaced the `fixxme`-command which previously was defined in the `preamble_mycommands.tex` file.

`units` For setting correctly typesetted units and nice fractions with `\unit[42]{m}` and `\unitfrac[100]{km}{h}`.

3 mycommands.tex — various definitions

In file `template/mycommands.tex` many useful commands are being defined.

What should I do with this file? Please take a look at its content to get the most out of your document.

One of the best advantages of LaTeX compared to WYSIWYG software products is the possibility to define and use macros within text. This empowers the user to a great extend. Many things can be defined using `\newcommand{}` and automates repeating tasks. It is recommended to use macros not only for repetitive tasks but also for separating form from content such as CSS does for XHTML. Think of including graphics in your document: after writing your book, you might want to change all captions to the upper side of each figure. In this case you either have to modify all `includegraphics` commands or you were clever enough to define something like `\myfig`[1]. Using a macro for including graphics enables you to modify the position caption on only *one* place: at the definition of the macro.

The following section describes some macros that came with this document template from LaTeX@TUG and you are welcome to modify or extend them or to create your own macros!

3.1 myfig — including graphics made easy

The classic: you can easily add graphics to your document with `\myfig`:

[1] See below for a detailed description

```
\myfig{flower}%% filename w/o extension in the folder figures
      {width=0.7\textwidth}%% maximum width/height, aspect ratio will be kept
      {This flower was photographed at my home town in 2010}%% caption
      {Home town flower}%% optional (short) caption for list of figures
      {fig:flower}%% label
```

There are many advantages of this command (compared to manual `figure` environments and `includegraphics` commands:

- consistent style throughout the whole document
- easy to change; for example move caption on top
- much less characters to type (faster, error prone)
- less visual clutter in the TEX-files

3.2 `myclone` — repeat things!

Using `\myclone[42]{foobar}` results the text "foobar" printed 42 times. But you can not only repeat text output with `myclone`. Default argument for the optional parameter "number of times" (like "42" in the example above) is set to two.

4 typographic_settings.tex — Typographic finetuning

The settings of file `template/typographic_settings.tex` contain typographic finetuning related to things mentioned in literature. The settings in this file relates to personal taste and most of all: *typographic experience*.

What should I do with this file? You might as well skip the whole file by excluding the `\input{template/typographic_settings.tex}` command in `main.tex`. For standard usage it is recommended to stay with the default settings.

Some basic microtypographic settings are provided by the `microtype` package[1]. This template uses the rather conservative package parameters: `protrusion=true,factor=900`.

4.1 French spacing

Why? see **Bringhurst1993** '2.1.4 Use a single word space between sentences.'

How? see **Eijkhout2008**

```
\frenchspacing  %% Macro to switch off extra space after punctuation.
```

Note: This setting might be default for KOMA script.

[1] `http://ctan.org/pkg/microtype`

4.2 Font

This template is using the Palatino font (package `mathpazo`) which results in a legible document and matching mathematical fonts for printout.

It is highly recommended that you either stick to the Palatino font or use the LaTeX default fonts (by removing the package `mathpazo`). If you want use the LaTeX default font (Computer Modern), just comment or delete `\usepackage[sc,osf]{mathpazo}`.

Chosing different fonts is not an easy task. Please leave this to people with good knowledge on this subject.

One valid reason to change the default fonts is when your document is mainly read on a computer screen. In this case it is recommended to switch to a font which is sans-serif like this. This template contains several alternative font packages which can be activated in this file.

4.3 Text figures

. . . also called old style numbers such as 0123456789. (German: "Mediävalziffern[2]")

Why? see **Bringhurst1993**

> '3.2.1 If the font includes both text figures and titling figures, use titling figures only with full caps, and text figures in all other circumstances.'

[2] https://secure.wikimedia.org/wikibooks/de/wiki/LaTeX-W%C3%B6rterbuch:_Medi%C3%A4valziffern

How? Quoted from Wikibooks[3]:

> Some fonts do not have text figures built in; the textcomp package attempts to remedy this by effectively generating text figures from the currently-selected font. Put `\usepackage{textcomp}` in your preamble. textcomp also allows you to use decimal points, properly formatted dollar signs, etc. within `\oldstylenums{}`.

...but proposed LaTeX method does not work out well. Instead use: `\usepackage{hfoldsty}` (enables text figures using additional font) or `\usepackage[sc,osf]{mathpazo}` (switches to Palatino font with small caps and old style figures enabled).

4.4 myacro — Abbrevations using small caps

Why? see **Bringhurst1993** '3.2.2 For abbrevations and acronyms in the midst of normal text, use spaced small caps.'

How? Using the predefined macro `\myacro{}` for things like UNO or UNESCO using `\myacro{UNO}` or `\myacro{UNESCO}`.

4.5 Colorized headings and links

This document template is able to generate an output that uses colorized headings, captions, page numbers, and links. The color named 'DispositionColor' used in this document is defined near the definition of package `color` in the preamble (see section 2.5). The changes required for headings, page numbers, and captions are defined here.

Settings for colored links are handled by the definitions of the `hyperref` package (see section 5).

[3] `https://secure.wikimedia.org/wikibooks/en/wiki/LaTeX/Formatting#Text_figures_.28.22old_style.22_numerals.29`

4.6 No figures or tables below footnotes

LaTeX places floating environments below footnotes if `b` (bottom) is used as (default) placement algorithm. This is certainly not appealing for most people and is deactivated in this template by using the package `footmisc` with its option `bottom`.

4.7 Spacings of list environments

By default, LaTeX is using vertical spaces between items of enumerate, itemize and description environments. This is fine for multi-line items. Many times, the user does just write single-line items where the larger vertical space is inappropriate. The enumitem package provides replacements for the pre-defined list environments and offers many options to modify their appearances. This template is using the package option for `noitemsep` which mimimizes the vertical space between list items.

4.8 `csquotes` — Correct quotation marks

Never use quotation marks found on your keyboard. They end up in strange characters or false looking quotation marks.

In LaTeX you are able to use typographically correct quotation marks. The package `csquotes` offers you with `\enquote{foobar}` a command to get correct quotation marks around "foobar". Please do check the package options in order to modify its settings according to the language used[4].

`csquotes` is also recommended by `biblatex` (see Section 2.4).

[4] most of the time in combination with the language set in the options of the `babel` package

4.9 Line spread

If you have to enlarge the distance between two lines of text, you can increase it using the `1.0` command in `main.tex`. By default, it is deactivated (set to 100 percent). Modify only with caution since it influences the page layout and could lead to ugly looking documents.

4.10 Optional: Lines above and below the chapter head

This is not quite something typographic but rather a matter of taste. KOMA Script offers a method to add lines above and below chapter head which is disabled by default. If you want to enable this feature, remove corresponding comment characters from the settings.

4.11 Optional: Chapter thumbs

This is not quite something typographic but rather a matter of taste. KOMA Script offers a method to add chapter thumbs (in combination with the package `scrpage2`) which is disabled by default. If you want to enable this feature, remove corresponding comment characters from the settings.

5 pdf_settings.tex — Settings related to PDF output

The file template/pdf_settings.tex basically contains the definitions for the hyperref package including the graphicx package. Since these settings should be the last things of any LaTeX preamble, they got their own TeX file which is included in main.tex.

What should I do with this file? The settings in this file are important for PDF output and including graphics. Do not exclude the related input command in main.tex. But you might want to modify some settings after you read the documentation of the hyperref package.

6 Example Chapter 1

A very well prepared tutorial is available at **TUG.2015**[1].

> In the current release (2.6 branch), TeXstudio's build process ('Build & View') by default runs pdfLaTeX but not a bibliography tool, which you need to do separately. There is also a need to change the settings to run Biber rather than BibTeX for creating a bibliography. Thus the steps required are as follows:
>
> 1. In the TeXstudio preferences ('Preferences ...' on the Mac or 'Options → Configure TeXstudio' on Windows)[2], choose the Build tab and alter the 'Default Bibliography' to 'Biber'. Save and close the preferences.
> 2. Run 'Build & View' from the 'Tools' menu (or press the two green arrows icon), which will create a PDF but with the bibliography not completed
> 3. Run 'Bibliography' from the 'Tools' menu.
> 4. Run 'Build & View' again: the bibliography will appear in the PDF.
>
> It is possible to set up TeXstudio in alternative ways to achieve the same effect. The key is that you have to ensure that the is a sequence
>
> 1. LaTeX
> 2. Biber
> 3. LaTeX
>
> which can be done 'by hand' (as I have) or can be automated in various ways. Note that the same general idea applies whatever editor is used: this is a feature of LaTeX and not of the editor.

Figures can be inserted as PDF (see Figure **??**) or drawn/saved via Inkscape[3] (see Figure **??**). To embed an Inkscape drawing inside a LaTeXdocument draw

[1] **TUG.2015**.

[2] For versions up from 2.8 in chose the tab 'Optionen' → 'Erzeugen'.

[3] For further information/download see at **Inkscape.2015** **Inkscape.2015**

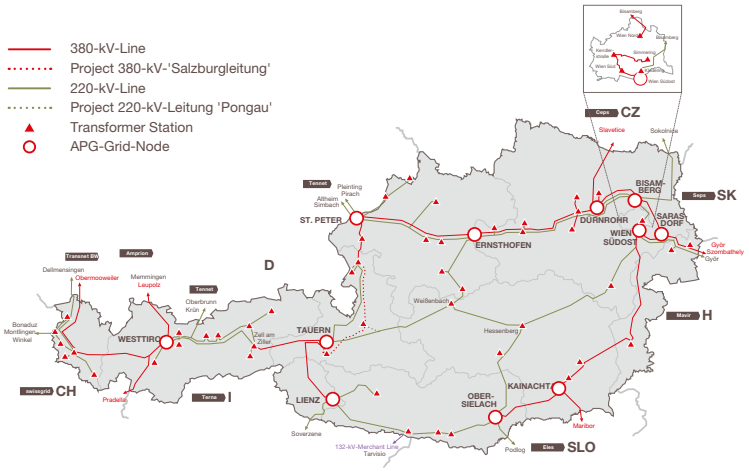

Figure 6.1: APG power grid and border transmission lines based on „**APG.11.2013** “, **APG.11.2013**

it and save it as PDF. After a window pops up you have to confirm the entry 'PDF + LATEX: ...' and save the PDF. If you look in the figure's folder you will find a '.pdf_tex' and '.pdf' file. Now you just have to embed the '.pdf_tex' file in you LaTeXcode/file.

If mathematical formulas, equations, etc. are used in the work, consider following points:

- Formulas are components of sentences and must be a part of these. For example: According to Einstein (1905), the 'rest energy' of a physical system with mass m

$$E_0 = mc^2, \tag{6.1}$$

  is calculated with the speed of light $c = 299\,792\,458\,\mathrm{m/s}$.
- For ease of readability formulas are written in a separate paragraph and numbered consecutively. By numbering, it is possible to refer to formulas (eg. see equation 6.1).
- Variables are italicized, while units are to be written in plain text form (e.g. $c = 299\,792\,458\,\mathrm{m/s}$). Use the "siuntix" package for formulation, e.g. `\SI{10}{kW}` $\rightarrow 10\,\mathrm{kW}$.

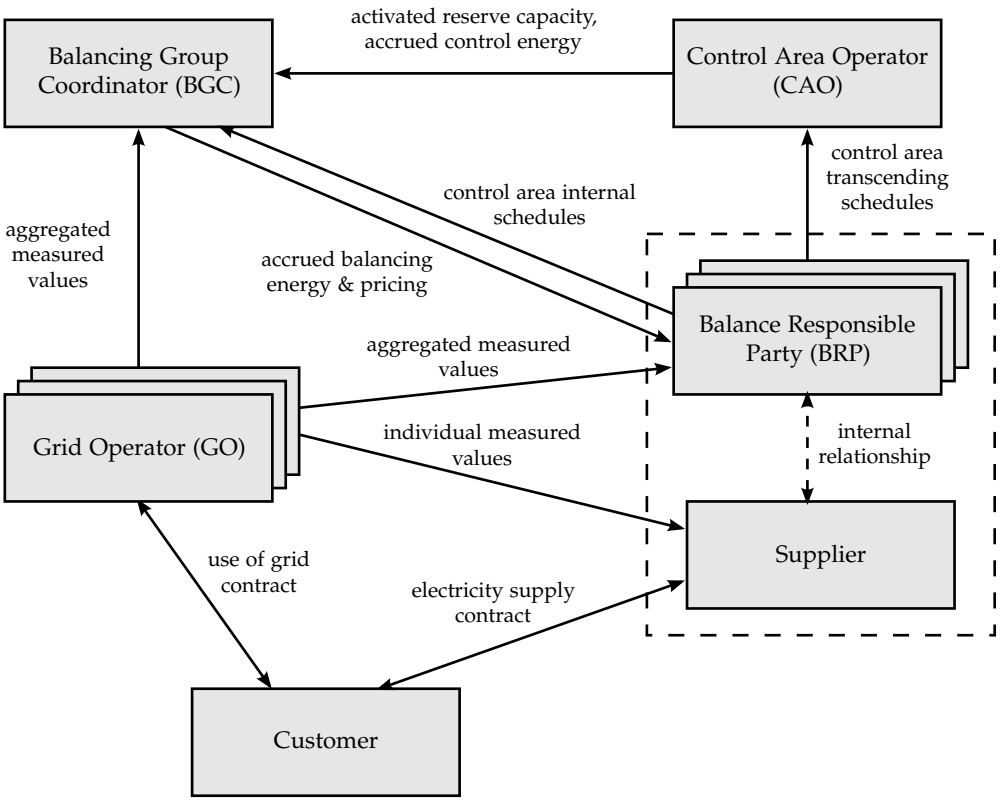

Figure 6.2: Communication and data flows between market participants.

- Linear Algebra: vectors are shown in the form (lowercase and boldface)

$$\mathbf{x} = \left[x_1, x_2, \dots x_N\right]^T \tag{6.2}$$

and matrices in the form of (capital letters and bold font)

$$\mathbf{X} = \begin{bmatrix} x_1 & 0 & \dots & 0 \\ 0 & x_2 & \dots & 0 \\ \vdots & \vdots & \ddots & \\ 0 & 0 & & x_N \end{bmatrix}. \tag{6.3}$$

- An optimization problem's standard form can be written as

$$\min_{\mathbf{x}} \quad f(\mathbf{x}) \tag{6.4a}$$
$$\text{s.t.} \quad g_i(\mathbf{x}) = b_i,\ i = 1, \ldots, p \tag{6.4b}$$
$$h_i(\mathbf{x}) \leq 0,\ i = 1, \ldots, q. \tag{6.4c}$$

7 Language and Writing Style

This chapter is an adopted version of a single chapter of **KeithThesis** thesis template **KeithThesis** in its version from 2011-12-11.

The reason why **KeithThesis** is not recommended to be used instead of this template is its more "traditional" LaTeX implementation. But the information contained regarding "How to write a thesis" is generally brilliant and worth reading.

Using this chapter here is meant as a teaser. If you do like this chapter, please go and download the full template to read its content: **KeithThesis**

What was modified from the original chapter:

- strikethrough of bad examples
- minor typographical details
- technical modifications
  - moved citations from `\citet{}` and `\citep{}` to `\textcite{}` and `\cite{}`
  - changed quoting style to `\enquote{}`
  - created various commands and environments to encapsulate format

The classic reference for English writing style and grammar is **StrunkWhite** The original text is now available for free online **Strunk** so there is no excuse at all for writing poor English. Readers should consult it first, then continue reading this chapter. Another good free guide is **NASAGuide**

Zobel-WritingCompSci and **BugsInWriting** are guides specifically aimed

at computer science students. **Phillips-HowGetPhD** gives practical advice for PhD students.

The following Sections 7.3 and 7.4 are adapted from the CHI'94 language and writing style guidelines.

7.1 Some Basic Rules of English

There are a few basic rules of English for academic writing, which are broken regularly by my students, particularly if they are non-native speakers of English. Here are some classic and often encountered examples:

- *Never* use I, we, or you.
  Write in the passive voice (third person).
  Bad: ~~You can do this in two ways.~~
  Good: There are two ways this can be done.

- *Never* use he or she, his or her.
  Write in the passive voice (third person).
  Bad: ~~The user speaks his thoughts out loud.~~
  Good: The thoughts of the user are spoken out loud.

  See Section 7.4 for many more examples.
- Stick to a consistent dialect of English. Choose either British or American English and keep to it throughout the whole of your thesis.
- Do *not* use slang abbreviations such as "it's", "doesn't", or "don't".
  Write the words out in full: "it is", "does not", and "do not".
  Bad: ~~It's very simple to…~~
  Good: It is very simple to…

- Do *not* use abbreviations such as "e. g." or "i. e.".
  Write the words out in full: "for example" and "that is".
  Bad: ~~…in a tree, e. g.the items…~~
  Good: …in a tree, for example the items…

- Do *not* use slang such as "a lot of".
  Bad: ~~There are a lot of features…~~
  Good: There are many features…

- Do *not* use slang such as “OK” or “big”.
  Bad: ~~. . . are represented by big areas.~~
  Good: . . . are represented by large areas.
- Do *not* use slang such as “gets” or “got”.
  Use “becomes” or “obtains”, or use the passive voice (third person).
  Bad: ~~The radius gets increased. . .~~
  Good: The radius is increased. . .

  Bad: ~~The user gets disoriented. . .~~
  Good: The user becomes disoriented. . .
- *Never* start a sentence with “But”.
  Use “However,” or “Nevertheless,”. Or consider joining the sentence to the previous sentence with a comma.
  Bad: ~~But there are numerous possibilities. . .~~
  Good: However, there are numerous possibilities. . .
- *Never* start a sentence with “Because”.
  Use “Since”, “Owing to”, or “Due to”. Or turn the two halves of the sentence around.
- *Never* start a sentence with “Also”. Also should be placed in the middle of the sentence.
  Bad: ~~Also the target users are considered.~~
  Good: The target users are also considered.
- Do *not* use “that” as a connecting word.
  Use “which”.
  Bad: ~~. . . a good solution that can be computed easily.~~
  Good: . . . a good solution which can be computed easily.
- Do *not* write single-sentence paragraphs.
  Avoid writing two-sentence paragraphs. A paragraph should contain at least three, if not more, sentences.

7.2 Avoid Austrianisms

I see these mistakes time and time again. Please do not let me read one of them in your work.

- "actual" $\neq$ "current"
  If you mean "aktuell" in German, you probably mean "current" in English.
  Bad: ~~The actual selection is cancelled.~~
  Good: The current selection is cancelled.
- "allows to" is not English.
  Bad: ~~The prototype allows to arrange components...~~
  Good: The prototype supports the arrangement of components...
- "enables to" is not English.
  Bad: ~~it enables to recognise meanings...~~
  Good: it enables the recognition of meanings...
- "according" $\neq$ "corresponding"
  Bad: ~~For each browser, an according package is created.~~
  Good: For each browser, a corresponding package is created.
- "per default" is not English.
  Use "by default".
  Bad: ~~Per default, the cursor is red.~~
  Good: By default, the cursor is red.
- "As opposed to" is not English.
  Use "In contrast to".
  Bad: ~~As opposed to C, Java is object-oriented.~~
  Good: In contrast to C, Java is object-oriented.
- "*anything*-dimensional" is spelt with a hyphen.
  For example: two-dimensional, three-dimensional.
- "*anything*-based" is spelt with a hyphen.
  For example: tree-based, location-based.
- "*anything*-oriented" is spelt with a hyphen.
  For example: object-oriented, display-oriented.
- "*anything*-side" is spelt with a hyphen.
  For example: client-side, server-side.
- "*anything*-friendly" is spelt with a hyphen.
  For example: user-friendly, customer-friendly.
- "*anything*-to-use" is spelt with hyphens.
  For example: hard-to-use, easy-to-use.

- "realtime" is spelt with a hyphen if used as an adjective, or as two separate words if used as a noun.
  Bad: ~~. . . using realtime shadow casting.~~
  Good: . . . using real-time shadow casting.
  Bad: ~~. . . display the object in realtime.~~
  Good: . . . display the object in real time.

7.3 Clear Writing

The written and spoken language of your thesis is English as appropriate for presentation to an international audience. Please take special care to ensure that your work is adapted to such an audience. In particular:

- Write in a straight-forward style, using simple sentence structure.
- Use common and basic vocabulary. For example, use "unusual" for "arcane", and "specialised" for "erudite".
- Briefly define or explain all technical vocabulary the first time it is mentioned, to ensure that the reader understands it.
- Explain all acronyms and abbreviations. For example, the first time an acronym is used, write it out in full and place the acronym in parentheses.
  Bad: ~~. . . When using the GUI version, the use may. . .~~
  Good: . . . When using the Graphical User Interface (GUI) version, the use may. . .
- Avoid local references. For example, not everyone knows the names of all the provincial capitals of Austria. If local context is important to the material, describe it fully.
- Avoid "insider" comments. Ensure that your whole audience understands any reference whose meaning you do not describe. For example, do not assume that everyone has used a Macintosh or a particular application.
- Do not "play on words". For example, do not use "puns", particularly in the title of a piece. Phrases such as "red herring" require cultural as well as technical knowledge of English.

- Use unambiguous formats to represent culturally localised things such as times, dates, personal names, currencies, and even numbers. 9/11 is the 9th of November in most of the world.
- Be careful with humour. In particular, irony and sarcasm can be hard to detect if you are not a native speaker.
- If you find yourself repeating the same word or phrase too often, look in a thesaurus such as **Roget**; **RogetII** for an alternative word with the same meaning.

Clear writing experts recognise that part of writing understandable documents is understanding and responding to the needs of the intended audience. It is the writer's job to maintain the audience's willingness to go on reading the document. Readers who are continually stumped by long words or offended by a pompous tone are likely to stop reading and miss the intended message.

7.4 Avoiding Gender Bias

Part of striking the right tone is handling gender-linked terms sensitively. Use of gender terms is controversial. Some writers use the generic masculine exclusively, but this offends many readers. Other writers are experimenting with ways to make English more neutral. Avoiding gender bias in writing involves two kinds of sensitivity:

1. being aware of potential bias in the kinds of observations and characterisations that it is appropriate to make about women and men, and
2. being aware of certain biases that are inherent in the language and of how you can avoid them.

The second category includes using gender-specific nouns and pronouns appropriately. Here are some guidelines for handling these problems:

- Use a gender-neutral term when speaking generically of people:

man	the human race
mankind	humankind, people
manpower	workforce, personnel
man on the street	average person

- Avoid clearly gender-marked titles. Use neutral terms when good ones are available. For example:

chairman	chairperson
spokesman	speaker, representative
policeman	police officer
stewardess	flight attendant

- If you are speaking of the holder of a position and you know the gender of the person who currently occupies the position, use the appropriate gender pronoun. For example, suppose the "head nurse" is a man:
  Bad: ~~The head nurse must file her report every Tuesday.~~
  Good: The head nurse must file his report every Tuesday.

- Rewrite sentences to avoid using gender pronouns. For example, use the appropriate title or job name again:
  Bad: ~~Interview the user first and then ask him to fill out a questionnaire.~~
  Good: Interview the user first and then ask the user to fill out a questionnaire.

- To avoid using the third person singular pronoun (his or her), recast your statement in the plural:
  Bad: ~~Each student should bring his text to class.~~
  Good: All students should bring their texts to class.

- Address your readers directly in the second person, if it is appropriate to do so:
  Bad: ~~The student must send in his application by the final deadline date.~~
  Good: Send in your application by the final deadline date.

- Replace third person singular possessives with articles.
  Bad: ~~Every student must hand his report in on Friday.~~
  Good: Every student must hand the report in on Friday.

- Write your way out of the problem by using the passive voice.
  Bad: ~~Each department head should do his own projections.~~
  Good: Projections should be done by each department head.

- Avoid writing awkward formulations such as "s/he", "he/she", or "his/her". They interfere when someone is trying to read a text aloud. If none of the other guidelines has been helpful, use the slightly less awkward forms "he or she", and "his or hers".

Remember, the goal is to avoid constructions that will offend your readers so much as to distract them from the content of your work.

7.5 Titles and Headings in Initial Caps

7.6 Use a Spelling Checker

In these days of high technology, spelling mistakes and typos are inexcusable. It is *very* irritating for your supervisor to have to read through and correct spelling mistake after spelling mistake which could have been caught by an automated spelling checker. Believe me, irritating your supervisor is not a good idea.

So, use a spelling checker *before* you hand in *any* version, whether it is a draft or a final version. Since this is apparently often forgotten, and sometimes even wilfully ignored, let me make it absolutely clear:

> *Use a spelling checker, please.*
> *Use a spelling checker!*
> *Use a spelling checker, you moron.*

7.7 Use a Dictionary

If you are not quite sure of the meaning of a word, then use a dictionary. **DictionaryCom** is a free English dictionary, **DictChemnitz** and **DictLeoOrg** are two very good English-German dictionaries.

7.8 Use a Thesaurus

If a word has been used several times already, and using another equivalent word might improve the readability of the text, then consult a thesaurus. **Roget** and **RogetII** are free English thesauri.

Appendix