How to Write a Thesis

1 Application

- A list with ideas for current research projects is available via the internal ETH network. Please note that this is for illustrative purposes: we always try to tailor the actual topic to personal interest and background.
- We have no formal application process. Simply send an e-mail to Prof. Feuerriegel with the following information:
  a) Curriculum vitae
  b) Transcript with recent grades

  Please also indicate if you are a MSc or MAS student. Own suggestions of topics or indication of interests are also welcome (e. g., name a sample topic). We will respond as soon as possible.
- Firm collaborations are welcome but are not a "must".
- We are aware of the different background, objectives and formal requirements between MSc and MAS students. Hence, the following list should not be seen as a static set of rules but should rather be interpreted on an personalized basis.

2 General Information

- *MSc only*: we welcome theses written in LaTeX instead of Microsoft Word. You can find numerous tutorials online. As a LaTeX distribution, we recommend MikTeX (`http://miktex.org`, Windows only) together with TeXnicCenter (`http://texniccenter.org`) as an editor. Note that both must be installed in this order, i. e., MikTeX first, then TeXnicCenter. When using LaTeX, we usually provide you with a template in order to align with formal requirements regarding the layout.
- *MAS only*: feel free to include PowerPoint exhibits to your thesis where appropriate, i. e., show materials via appropriate diagrams or other forms of visualizations.

3 Managing the Process

- Stay in touch with your supervisor and keep him/her regularly updated about your progress. Your supervisor is not responsible for reaching out to you.
- Always keep in mind: a master's thesis is an independent piece of work! Therefore, we expect you to work independently and show initiative, leadership, and creativity in the sense that you tackle upcoming questions and problems yourself, before contacting your supervisor. The role of your supervisor is to guide you through your thesis (e. g., hint at important literatures, give possible directions, suggest ways out of dead ends), but the actual work has to be done by you. You may get stuck, of course, after exhausting your possibilities, and then you are always welcome to solicit help.

4 Git repository (MSc only)

- We usually set up a *git* repository that you can use to store and back-up your materials (e. g., code, results, figures, documents). There are numerous tutorials online that explain the process of working with *git*.
- Please refrain from pushing binary data files excessively.
- Please do not push temporary files (e. g., *.aux, *.bbl). Please set up the ".gitignore" file, so that temporary files (e. g., from LaTeX) are not stored. You will find more details online.
- To access your git repository, we recommend the visual explorer from *GitHub* (or *gitkraken*).

5 Citations

- Please be careful when citing in order to avoid plagiarism (`http://en.wikipedia.org/wiki/Plagiarism`)! Plagiarism will result in failing.
- There is a difference between *direct quotations*, *citing an approach or similar directly* and *indirect quotations*. Make sure you understand the differences.
- As a general recommendation, avoid using direct quotations frequently, only if you want to quote one of the "big guys" or unique statements.
- When citing websites, add the date at which you retrieved the content.
- Be consistent with your citation style and your bibliography.
- Please use the APA (American Psychological Association) citation style. Exceptions usually apply for theses located in computer science.

6 Literature

There are many sources of literature for your thesis, however, many of them have not gone through a strict peer reviewing process and should be cited with caution. A good starting point are the following high quality journals/-conference proceedings.

- Information Systems:
  a) Management Science
  b) Information Systems Research
  c) Management Information Systems Quarterly
  d) Journal of Management Information Systems
  e) Journal of Information Technology
  f) European Journal of Information Systems
  g) Journal of the Association for Information Systems
  h) Decision Support Systems
  i) Decision Sciences
  j) ACM Transactions on Management Information Systems
- Management:
  a) Harvard Business Review
  b) Journal of Management
  c) Journal of Operations Management

d) Management Science
e) Manufacturing and Service Operations Management
f) Production and Operations Management
g) Sloan Management Review

- Operations Research / Operations Management:
  a) Journal of Operations Management
  b) Management Science
  c) Manufacturing and Service Operations Management
  d) Production and Operations Management
  e) Operations Research
  f) European Journal of Operational Research
  g) OMEGA
  h) Annals of Operations Research
- Natural Language Processing:
  a) Conference on Empirical Methods in Natural Language Processing (EMNLP)
  b) Annual Meeting of the Association for Computational Linguistics (ACL)
  c) Annual Conference of the North American Chapter of the Association for Computational Linguistics (NAACL)
- Machine Learning:
  a) The Web Conference (WWW)
  b) SIGKDD Conference on Knowledge Discovery and Data Mining August (KDD)
  c) International Conference on Machine Learning (ICML)
  d) International Conference on Learning Representations (ICLR)
  e) ACM International WSDM Conference
  f) Annual Conference on Neural Information Processing Systems (NeurIPS)
  g) Association for the Advancement of Artificial Intelligence Conference (AAAI)

You may also look through journals listed in the Financial Times 50 list. Please also be aware of different intentions behind referencing. Below you can find a list of reasons why one would use a reference:

- Similar research
- Proof of relevance
- Proof of novelty
- Same methodology
- Links for background search
- Theories for discussion

During your research, you will presumably collect a fairly large number of publications. The proper organization of your literature will ease your writing and citing later on. We recommend that you use software which to help you with the organization, such as Citavi (recommended, Windows only) or Mendeley. Citavi works well together with LaTeX.

7 Writing your Thesis

When it comes to writing your thesis, we expect a scientific style, structure and form which is described below. Allow yourself enough time for the actual writing process and revising, since writing is not a trivial task!

7.1 Style

- Check your spelling and grammar.
- Use understandable/clean English. You might want to check for synonyms using e. g., `http://thesaurus.com`. Another good dictionary is `http://www.ldoceonline.com`, which provides examples on how to use words in the right context.
- The way you write strongly affects how your text is interpreted. Therefore, we recommend you read *"The Science of Writing"* by George Gopen (`http://www.docstyles.com/library/ascience.pdf`) carefully and to follow all suggestions closely.
- Read `http://www.docstyles.com/library/ascience.pdf` on how you can help readers by adding commas. Here is a rather short summary, i. e., `http://englishplus.com/grammar/00000074.htm`. In addition, we recommend that adverbs at the beginning of a sentence are followed by a comma, e. g., *"Interestingly, this helps readers to understand your writing"*.
- Within your document, we recommend that each section is introduced by a few sentences as it guides the reader.
- In most cases, a footnote at the end of a sentence follows the punctuation, as this example shows.[1]
- Check the number of decimal places. A number such as 1.23456 might be correct, but given possible noise and errors in the original data, it is common to restrict oneself to roughly one to three decimal places (e. g., 1.23). This is ideally achieved by rounding before copying R/Python output into your document.
- Use capitalization in your headlines consistently. Either **always** use initial capital letters, such as *"Table of Contents"*, or **always** an initial capital letter followed by small ones, such as *"Table of contents"*.
- Avoid the use of contractions. Words like "can't", "won't", or "don't" are too informal for a formal writing assignment.
- Be careful of abbreviations. Do not expect the reader to be familiar with them. The first time you use an abbreviation, provide the full word(s). Also do not use an acronym unless it is very common without first spelling out the full name.
- Avoid starting too many sentences with adverbial or adjectival clauses or phrases. These are the short phrases (such as "In the later stage of the life cycle, the firm is exposed ...") that are often followed by a comma. It should be particularly avoided when starting a new paragagraph.

7.2 Structure

As a sample structure, we recommend the following. Please keep in mind that you need to adapt this to your specific setting.

- **Abstract** A short summary of your topic in a nutshell. Should be not more than 150 words as a single paragraph without any references. First, describe the motivation for your topic and then name the methodology, summarize the outcome and give quantitative results.
- **Introduction** Discuss the relevance of your topic, state the problem briefly and repeat the contribution, e. g., as research questions. Give an outline of your thesis.

[1] This is a footnote

- **Related Work** What are the differences/similarities to the existing literature? Summarize the findings and identify differences to your own study.
- **Methods** How is the problem solved? Introduce your methodology.
- **Results** What are the findings? Find appropriate visualization (e. g., tables, charts).
- **Discussion** What does it mean? Point out limitations and e. g., managerial implications or future impact.
- **Conclusion & Outlook** Repeat the problem and its relevance, as well as the contribution (plus quantitative results). Provide an outlook for further research steps.
- **Bibliography** What research is referred to?
- **Appendices (optional)** Additional information, such as charts and tables.

Make sure you have a common thread recognizable throughout your work. For this purpose, we strongly recommend to structure your thesis top-down:

- Discuss this structure early with your supervisor.
- In the beginning, structure your thesis by writing one sentence for each paragraph summarizing the content that should be covered in the paragraph.

7.3 Figures and Tables

- Check your captions beneath figures. Make sure the text starts with a capital letter and the sentence is accompanied by punctuation. Correct examples are:

  Fig. 1. Some text.

  Figure 2. Some other text.

- Each figure and table must be referenced with a number in the text. Most authors spell *"Figure 1"*, *"Table 2"*, *"Equation (3)"* and *"Section 4.1"* with a capital letter when accompanied by a number.
- Highlight column names (i. e., the first row of your table) in bold.
- You should not copy output of the analysis (e. g., of linear regressions) from R/Python as graphics, but add a table of your own by selecting the most relevant values (e. g., t-values, estimates or standard errors).
- Pay attention to the quality of your graphics. Make sure you use a high resolution so that graphics are not pixelated. If you make your own graphics, we recommend Microsoft Visio for procedural/flow diagrams.
- Guidelines on plotting can be found here: Rougier, Droettboom, Bourne (2014). *Ten simple rules for better figures*. In: *PLOS Computational Biology*, 10(9):e1003833. DOI: `https://doi.org/10.1371/journal.pcbi.1003833`
- Make sure that all figures can be understood properly when printed in black/white.

7.4 Formulae

- Formulae are always followed by a punctuation, e. g.,

$$2+2=4. \tag{1}$$

  At the same time, you do not use a colon before a formula.

- Explain all the variables (especially in formulae) you use. For example, $F = mg$, where F is force, m mass and g the gravitational constant.
- Variables must be in italic, such as x instead of x.
- Longer equations should be placed in a separate line – either aligned to the left or centred. Also consider using equation numbers.
- Use your variable names coherently, e. g., a variable e cannot be used as an error term and then as a time series.

7.5 Programming

- Your code should be executable and reproduce the results reported in the document. To ensure this, you should set random seeds and random states in the beginning of your code (ask your supervisor how to do this).
- Comment your code properly!

8 Submission

- You must submit your thesis in time as defined by the deadline.
- Final Submission: at or before the fixed deadline, you have to send a PDF of your final thesis to our secretary (Ms Martina Wenger), as well as to your supervisors (in CC). We refrain from a hard copy for the sake of the environment. The grade will be based on the final submission.
- However, we need the official *Declaration of Originality of ETH* in printed form. Please submit it to our secretary (Ms Martina Wenger). You can hand it in personally or by mail.

9 Grading

The grade for your thesis is predominantly based on your performance and complexity, but be aware that style and form also affect your grade.