



FACULTY OF
ECONOMICS AND MANAGEMENT

Chair of Operations Management

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*Guidance for the preparation of a seminar paper,
a Bachelor's thesis, or a Master's thesis*

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II List of abbreviations

MRP Material Requirements Planning

III List of symbols

- d Demand rate [units per time unit]
- F Fixed cost for ordering [monetary units]
- h Holding cost rate [monetary units per unit and unit time]
- q_t Lot size in period $t \quad t=1 \dots T$ [units]
- T Planning horizon [time units]

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1 Introduction

These guidelines are intended to provide students with a working set of rules that may assist them in writing both a seminar paper and a Bachelor's or Master's thesis which are in line with the expectations of the Chair of Operations Management. Seminar papers and Master's theses are to be written in a scientific manner, for which several important but sometimes ignored rules hold. Being aware of these rules will allow students to successfully put forth ideas on the subject, while correctly crediting previous work by others, and allowing others to follow their ideas.

This document is structured as follows. In the second section, we describe the general appearance of a document and specify its necessary contents. Section 3 answers basic questions of scientific writing, for instance how to cite and how to prepare a bibliography. The fourth section deals with some rules regarding the assistance provided by chair. Section 5 focuses on the specifics of a thesis that is to be written in cooperation with a company and the last section draws some conclusions.

Since we can only discuss some of the most important points, references are provided in the bibliography, which will help to answer questions that are more detailed. In addition to this document we provide both a Word template as well as a LaTeX template. The latter is recommended for documents including a large number of formulas.

2 General appearance and structure of a paper

The length of a Master's thesis is recommended to be 15.000-20.000 words. For a Bachelor's thesis the word count should be between 5.000 and 6.000. The length of seminar papers is individually specified in each seminar (master seminar usually 5.000-6.000, bachelor seminar 3.500-4.500). Make sure your thesis/paper is focused, well-structured and has a common thread. The aim is not to write as much as possible but as much as necessary. Submitting more than the maximum number of words is possible but can lead to downgrading if the supervisor of your thesis does not consider the extra space necessary. Please, contact your supervisor in case you intend to exceed the maximum length of your paper. Separate necessary from unnecessary content and keep to the point. Please follow the subsequent formatting:

- Paper size: A4

- Margins: Left 4 cm, Right 2 cm, Top 2 cm, Bottom 2 cm.
- Format: justified
- Font and font size: Times New Roman, 12 point
- Line spacing: 1.5
- No new page for a new headline necessary unless there are less the 2 lines left on the current page

We recommend font sizes of 14 point for large headlines, and 10 point for footnotes. Footnotes are to be avoided if possible. Printing should be single-sided. Pages are to be numbered. Anything before the first page of the main body is referred to as 'front matter' and should receive Roman numerals (I, II, ...), noting that the cover (or title) page is counted as I, but is not actually numbered. The main body starts with Arabic numerals (1, 2, ...). Back matter (part of the paper that follows the last page of main body) will also receive Arabic numerals as page numbers.

2.1 Structure

The following structure is recommended for a seminar paper and thesis respectively.

- Empty cover page (only for Bachelor's and Master's thesis)
- Title page
- Table of contents
- List of abbreviations (if necessary)
- List of symbols (if necessary)
- List of figures (if necessary)
- List of tables (if necessary)
- Main body
- Bibliography
- Appendices
- Confirmation (only for Bachelor's and Master's theses)

In case no abbreviations, symbols, figures, or tables are used, the respective list can be omitted.

2.2 Headings

Headings are used to structure a scientific work and separate the main parts. They must be brief, but nevertheless should give information about the content of the section they relate to.

Headings should be assigned Arabic numerals, and numbered in ascending order. When using subheadings (e.g. 4.1, 4.2, 4.2.1, 4.2.2), they must follow some structural logic. In particular, a heading 4.1 is not necessary without a heading 4.2 following it. Appendices are numbered by using upper case letters (e.g. Appendix A.1, A.2, B.1, and B.2). Too many levels of headings have to be avoided with usually 3 levels sufficing. Also, thought should be given to the amount of text under a heading. A section should cover between slightly less than one but not more than five pages (including at least two paragraphs). These guidelines should not be considered to be strict rules, and some discretion is given to the author. The table of contents should include all headings with page numbers and preferably is done by using automation provided by Word or LaTeX.

2.3 Use of abbreviations and symbols

Abbreviations are used in scientific work as a way to shorten long and often used terms. Since there are abbreviations that are common in one field of research (like MRP for Material Requirements Planning) but not generally known, their meaning should be clearly and unambiguously defined when being used for the first time, and they should be added to the List of Abbreviations. General abbreviations (e.g. etc.) which appear in the Webster's dictionary (for English) may be excluded from the above rule, and need neither to be defined nor placed into the List of Abbreviations. Abbreviations used only once in a work are superfluous and should be avoided.

Symbols are used in mathematical models. They have to be used in a single sense (unambiguously) within the whole paper, i.e. two different symbols should not have the same meaning and only one symbol is to be used for the same meaning (even in different models). In analogy to abbreviations, symbols have to be explained at their first use and be added to the List of symbols. All symbols have to be defined in the text when they occur the first time. Additionally they have to be mentioned in the list of symbols.

2.4 Figures, tables and formulae

Figures and tables can transfer information to the reader in a compressed and clear way. A numbered caption should be added and titled, and the figure or table must be introduced

in the text. This introduction should make it very clear to the reader what information is being conveyed by the figure or table, but not every element (like all numbers) needs to be explained individually. Sources should be credited in the caption of the figure. Excessive use of tables and figures is to be avoided, as they use up a lot of space. Colored figures should be made such that their interpretation is also possible when being printed in greyscale.

Formulae used in a work should be done using an appropriate software tool (e.g. Microsoft Formula Editor). They must be numbered and their meaning is to be explained in the text.

Example: Equation (1) describes how the economic order quantity q^* depends on the demand rate d , the fixed cost F as well as on the holding cost rate h :

$$q^* = \sqrt{\frac{2 \cdot d \cdot F}{h}} \quad (1)$$

Do not insert figures, tables, or formulas as low quality graphics or scans.

2.5 Electronic version of the thesis and literature

The submitted seminar papers or theses always have to be accompanied by an electronic version of the paper/thesis. This version can be handed in via Email (e.g. as a zip file) or submitted on a storage device such as a CD or USB device directly to the Chair at the submission date. Furthermore, all available sources that were used have to be submitted as a pdf file. All calculations made and referred to in the thesis should be added to the medium, e.g. as an Excel file. If a thesis is written in cooperation with a company, all data contained on the storage medium will be handled according to the same level of confidentiality that applies to the thesis.

3 Scientific writing

Papers should be written using an objective **style**, thereby avoiding slang and superficial opinion. Value judgments should be well grounded and justified. The intended reader of a work is a student in a management program at the same level as the author. Technical terms must be defined if they are potentially ambiguous. If, however, you are certain that these terms will be understood by the reader, they need not be defined. Even when using a spell check (provided by any word processor like Word) rereading your paper is absolutely necessary.

The **introduction** should briefly indicate the motivation for the choice of the subject, distinguish it from related problem-areas, provide two or three research questions, and summarize the train of thought (structure) which runs through the chapters to follow. The **conclusion** should summarize the main results of the work and furthermore indicate the starting points for further research (outlook).

The **main body** should follow a common thread and focus on answering the research questions. The aim is not to write as much as possible but as much as necessary. Distinguish between import and not important information and avoid meandering to unrelated topics because of potential interest. The main body should begin with a detailed discussion of the problem to be solved. If the work deals with solution methods for some problem, a verbal problem description precedes the mathematical model presentation before describing actual solution methods. Mathematical methods should be accompanied by numerical examples. The best way of writing the thesis is to start with the main body, especially with the results. This is the most important part of your thesis. Introduction and conclusion follow later.

Scientific papers must appropriately consider the work of other scientists' on some specific area. In order to get an overview of the topic, it is useful to consult subject-specific dictionaries and encyclopedias, **literature** reviews or state-of-the-art articles. A thesis for a Master's degree contains a survey of both the relevant fundamental and current literature on the topic under consideration. To find recent research, we recommend the search of scientific literature data bases (e.g. www.scopus.com, www.webofknowledge.com, or www.ebscohost.de) for relevant key words. Non-scientific journals and publications must be avoided, except for motivating research by citing industry or business periodicals (e.g. The Wall Street Journal, Harvard Business Review, etc.). For information on the overall quality of publications in some specific journal we refer to journal rankings (e.g. JOURQUAL 3 published by the German Academic Association for Business Research, VHB, <http://vhbonline.org/service/jourqual/>).

Depending on the specific topic, it may be useful to consider articles published in the Operations Management area in the following journals:

- Annals of Operations Research
- Business Research
- Computers & Operations Research
- Decision Sciences

- European Journal of Operational Research
- IIE Transactions
- International Journal of Physical Distribution & Logistics Management
- International Journal of Production Economics
- International Journal of Production Research
- Journal of Business Economics
- Journal of Operations Management
- Journal of Supply Chain Management
- Journal of the Operational Research Society
- Management Science
- Manufacturing & Service Operations Management
- Naval Research Logistics
- Omega
- Operations Research
- Operations Research Letters
- OR Spectrum
- Production & Operations Management
- Transportation Research Part A, B, E
- Transportation Science
- Zeitschrift für betriebswirtschaftliche Forschung

The internet provides an important source of latest research (e.g. working papers) and empirical data. However, material from the internet is only to be used if the author clearly is applying scientific methods and if the information cannot be found in books or journal articles. Since material from the internet can vanish quickly, the date at which the webpage has last been accessed must be provided in the bibliography.

Any ideas or work which are either directly (through quoting) or indirectly (through paraphrasing) obtained from another source must be properly credited to that source by **citation**. This applies also to terms that are not common knowledge and lines of thought. As a general principle, all ideas and propositions that are attributable to others should be identified as such. Not every sentence needs to be supplemented with a citation, but it must be clearly recognizable for which part of your text a specific literature source was drawn upon. This also holds for figures and tables, i.e. a precise description of the source including page numbers is necessary. An exception of the citation rule holds for all terms and knowledge you have acquired in introductory lectures of bachelor/master study programs in economics and/or management.

To take words or thought into your own work without crediting its source is referred to as **plagiarism**, and plagiarism is entirely unacceptable in the academic community. If you plagiarize in (parts of) your work, you **will receive a failing grade**.

Quoting can be accomplished using one of several quotation methods (indirect quoting, direct quoting, or secondary quoting), being explained in the following.

Indirect quoting as the most commonly used way to repeat ideas by others consist of a paraphrased work, which means that the quoted information is given with the own words and embedded in the text of the author. Again: Just rearranging a sentence or replacing single words is not enough. The quote must be accompanied by a reference in the text (author(s) as well as year and page number in brackets) stating the source, for instance:

Following Lee et al. (1997, p. 93) the so-called bullwhip effect
was first mentioned by Procter & Gamble.

Direct quoting or translation of foreign language formulations should be used sparsely. It applies if superb phrases are repeated word by word. To quote directly, the phrase is inserted into quotation marks without any change in wording, and is followed with a reference in brackets naming the source like:

"P&G called this phenomenon the "bullwhip" effect." (Lee et al., 1997, p. 93)

Secondary quoting. Since quoting is a standard procedure in doing scientific work it may be that you would like to quote ideas in a paper that do not originate from the respective author of that paper but from another person, i.e. you want to quote a quotation. In such a case, you should try to get and read the original source in order to cite it. Only in case this paper is not possible to obtain due to time constraints or unavailability of the source it is permitted to do a secondary quotation. The citation of a secondary quote consists of the original source as well as the source where you found the expression connected by "cited using", e.g.

According to Lee et al. (1997, cited using Chopra and Meindl, 2012, S. 263) the so-called bullwhip effect was first mentioned by Procter & Gamble.

Of course, both sources must be added to the bibliography.

Lecture scripts or handouts are not to be used and cited in scientific writing.

The **bibliography** contains references to all sources that are cited in the text and only those. The entries have to be sorted by the last name of the first author. The second

criterion for alphabetizing the list of references is according to the name of the second (or following) author(s), and if all authors are the same, by year. If more than one publication per year for a particular author, the year should be followed by 'a', 'b', 'c', etc. The latest edition of textbooks should always be used for citation, provided that it is available. Above all, your citation style should be consistent throughout the work.

Several examples for different kinds of references along with information on how they should be referred to are provided in Appendix A.

4 Supervision

You are encouraged to ask your supervisor for an appointment in case of questions. In order to guarantee an efficient supervision it is required that you hand in a document (via email) containing reason and aim of your appointment at least 48 hours prior to an appointment (excluding weekends) with your supervisor.

Please note, that you are the project manager of your thesis or seminar paper and that you bear any responsibility for the progress of the supervision process. You are responsible for making appointments and for an on-time submission of your thesis to the examination office.

4.1 Bachelor theses

A bachelor topic includes a project description provided by the chair. The project description is not to be altered without explicit approval of the supervisor.

A first appointment is used to discuss your project plan. Provide your supervisor with a preliminary table of contents and a list of literature to be used to assist the discussion.

For Bachelor's students writing their Bachelor's thesis, we offer to **sample read** a small part of the thesis (2-3 pages) prior to final submission and give feedback on style and writing. Please make sure that the sample includes important material and that there is enough time left to implement the feedback from the supervisor.

4.2 Master theses

When writing a master thesis you will receive a topic which is set by the chair. During the reading time you are responsible to develop a single page project description that should include the following items:

- Short description of the problem

- 2-3 research questions that should be answered in your thesis
- At least 3 scientific articles that are important when working on the problem

The project description needs approval by the supervisor. A sample read is not offered.

4.3 Seminar paper

In contrast to Bachelor- and Master theses, the seminar paper is not handed in at the examination office. The seminar paper should be handed in with a filing stripe at the chair (consider office hours of the secretary) or via post box (building 22 part B).

5 Specific proceedings for theses written in cooperation with companies

At the Chair of Operations Management, students have the opportunity to write their Master's thesis in cooperation with a company. However, the topics must fulfill the requirement of being interesting both from an academic as well as from the firm's point of view. As most companies in Germany require knowledge of German language, we do not provide a translated version of the detailed procedures. Please refer to the German version of this guidance for further details.

6 Conclusions

We hope that this guide will provide you with valuable assistance as you write your paper. In the event that a specific case was not covered, we would draw your attention to our references. Turabian (1996) should be used as the working reference, itself a short version of the Chicago Manual of Style (Grossman 2003) which will be considered the complete reference. The recommended dictionary for English is the Merriam Webster's Collegiate Dictionary. Lastly, if you have any questions, you are encouraged to contact a chair staff member.

Bibliography

Chopra, S., Meindl, P. (2013) *Supply Chain Management – Strategy, Planning and Operation*. 5th ed., Pearson.

Grossmann, J., ed. (2003) *The Chicago Manual of Style*. 15th ed., University of Chicago Press.

Lee, H.L., Padmanabhan, V., Whang, S. (1997) The bullwhip effect in supply chains. *Sloan Management Review* 38, pp. 93-102.

Mish, F.C., ed. (2003) *Merriam Webster's Collegiate Dictionary*. 11th ed., Merriam Webster.

Turabian, K. L. (1996) *A Manual for Writers of Term Papers, Theses, and Dissertations*. 6th ed., University of Chicago Press.

Appendix A

The following Table 1 contains guidelines for citing in the bibliography. Please note that the references in the bibliography have to be in alphabetical order. Different subsections for different types of source are not required.

	Reference in bibliography	Citation in text
Books	Author(s) (publishing year) title. edition (if > 1st), publisher.	Author(s) (publishing year, page number)
Single author	Nahmias, S. (2008) Production and Operations Research. 6th ed., McGraw-Hill.	Nahmias (2008, p. XY)
Two authors	Chopra, S., Meindl, P. (2013) Supply Chain Management - Strategy, Planning and Operation. 5th ed., Pearson Education.	Chopra, Meindl (2013, p. XY)
More than two authors	Silver, E.A., Pyke, D.F., Peterson, R. (1998) Inventory Management and Production Planning and Scheduling. 3rd ed., John Wiley & Sons.	Silver et al. (1998, p. XY)
Journal articles	Author(s) (publishing year) title of the article. Name of the journal and volume, pages (first-last).	Author(s) (publishing year, page number)
Several articles from the same authors in the same year	Kiesmüller, G.P. (2003a) A new approach for controlling a hybrid stochastic manufacturing/remanufacturing system with inventories and different leadtimes. European Journal of Operational Research 147 (1), 62-71. Kiesmüller, G.P. (2003b) Optimal control of a one product recovery system with leadtimes. International Journal of Production Economics 81-82, 333-340.	Kiesmüller (2003a, p. XY) Kiesmüller (2003b, p. XY)
	Inderfurth, K., Mukherjee, K. (2008) Decision Support Systems for Spare Parts Acquisition in Post Product Life Cycle. Central European Journal of Operations Research 16(1), 17-42.	Inderfurth, Mukherjee (2008, p. XY)
Articles in collections	Author(s) (publishing year) title of the article. in: Name of the editor(s), ed(s)., title of the collection and edition (if necessary), publisher, pages (first-last). As all required information regarding a collection can be found at their correspondingly cited articles, an entry to the list of references for the collection itself is not necessary.	Author(s) (publishing year, page number)
	Inderfurth, K., Langella, I.M. (2008) Planning Disassembly for Remanufacture-to-order Systems. in: Gupta, S.M., Lambert, A.J.D., eds., Environment Conscious Manufacturing. CRC-Press, 387-411.	Inderfurth, Langella (2008, p. XY)
Working papers	Author(s) (publishing year) title of the working paper. Publishing institution.	Author(s) (publishing year, page number)
	Inderfurth, K., Voigt, G. (2008) Setup Cost Reduction and Supply Chain Coordination in Case of Asymmetric Information. FEMM working paper 16/2008, Otto-von-Guericke-Universität Magdeburg.	Inderfurth, Voigt (2008, p. XY)
Internet sources and web page	Author(s)/editor(s)/enterprise (year) title. URL: address Last visit on: date.	Author(s)/editor(s)/enterprise (year)
	Oanda (2012) Currency Converter for 164 Currencies. URL: www.oanda.com/convert/classic Last visit on: 18.09.2012.	Oanda (2012)

Table 1: Guidelines for citing in scientific papers or theses