Self-Evaluation of the Dissertation: Guidance and Checklists

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Abstract
The International Doctoral Workshop for Logistics, Supply Chain and Production Management offers a good and proven presentation and reflection platform for the presentation and discussion of your own research work with international colleagues, both in the early stages of your doctorate and in the development process up to the preparation of your degree. In addition to coaching and valuable advice, the aim is to establish new international contacts and initiate networking, e.g. for the development of joint research work and subsequent publications. In addition, it aims to sharpen the focus on quality criteria for evaluating the dissertation and the entire doctoral process. This is to enable and encourage self-evaluation and thus targeted improvement by the doctoral candidate prior to the assessment by the examiners at the end of the doctoral phase. This paper qualifies and complements the publications [1] & [2] from 2011 and 2018.

1. Introduction and Motivation
First, two short and simple definitions:
- 'Doctorate' refers to the whole process of obtaining a Ph.D. degree, while
- Dissertation' refers to the written work that forms part of a doctorate.

When you start a doctoral project, you initially have an infinite number of tasks ahead of you.
A structured way of working and the ability to organise yourself helps to keep track and minimise the workload, even when interrupted.

This paper provides:
- the assessment criteria for a doctoral thesis / dissertation
- the principles of scientific work
- tips for efficient self-organisation
- different formats of a dissertation (classical monograph, cumulative dissertation) and
- a general overview of a structured doctoral process and relevant research activities.

2. Forms of doctorate / dissertation
We (Otto-von-Guericke-University Magdeburg & Universities in Saxony-Anhalt / Germany) currently offer two different forms of dissertation for doctoral programmes in our subject areas (cf. [3] & [4]):

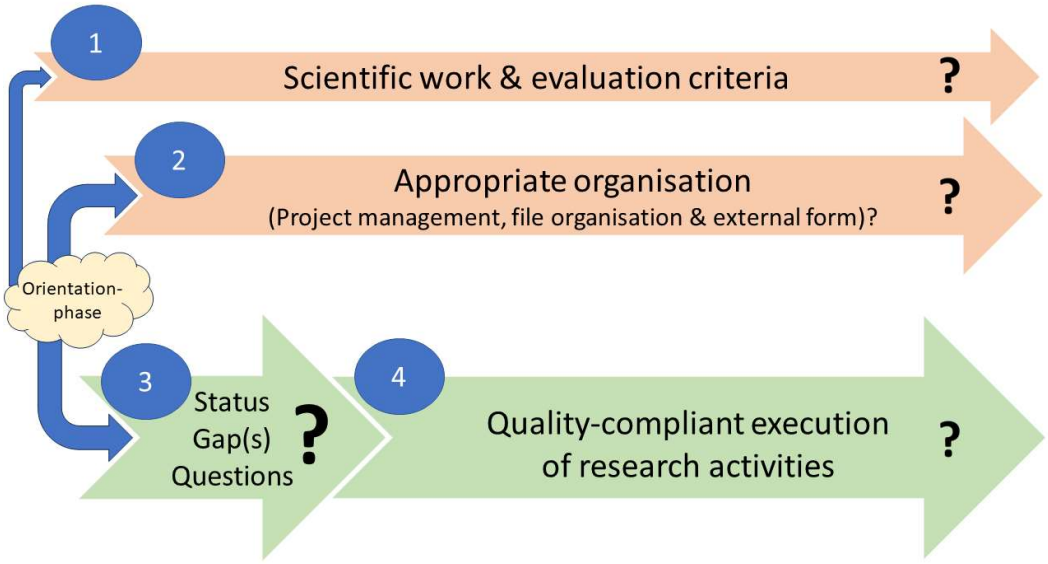

Figure 1: Content focus of this paper with regard to the dissertation

Form A: Doctorate with a classical dissertation:

- Monograph of about 120 pages in the main part (plus appendices),
- additional publications and discussions at internationally recognised conferences and doctoral workshops,
- optional journal publications.

Form B: Doctorate with cumulative dissertation:

- At least 3 publications in high-impact, peer-reviewed journals.
- A manuscript of about 40 pages

Both forms A and B have in common that high quality scientific work is practised and that written work must be produced during the doctoral process. After a positive assessment of the written work, a colloquium with a presentation and discussion takes place. For details on this and on the overall assessment, see e.g. [3], [4].

The process that accompanies the publication is of enormous importance, as it iteratively publishes the research gap(s) and the methods for solving them, in order to ensure the quality assurance of the thesis and to avoid the submission of a thesis that has been worked on in the meantime, e.g. by someone else using a similar methodology.

This generally leads to the following questions for the doctoral candidate:

1. What are the important criteria for scientific work? When am I working in a recognised scientific way?
2. What formal mistakes can I avoid in my written work?
3. How can I identify a research gap?
4. When have I carried out each research activity to a high standard? What is assessed?

Figure 1 shows the focus areas of this paper as a timeline to illustrate their categorisation and context within the overall dissertation project.

3. Note 1: General criteria for scientific work

A short definition of scientific work is: "Scientific work is the search for reliable knowledge." [5]

This is not the place for a full scientific discussion of this topic.
This paper is limited to providing important information and food for thought. Each doctoral programme also formulates its own quality criteria for the doctorate and the dissertation. Merseburg University of Applied Sciences (Germany) [6], for example, specifies these criteria:

- Quality during the preparation of the dissertation at all stages of the research process (e.g. topic identification, research gap, method selection and implementation).
- Relevance of the topic
- Methodology (descriptive statistics, independent familiarisation)
- Duration of the doctoral project
- Quality of results

- Degree of independence (especially for cumulative dissertations)
- Type and size of sample for empirical studies
- Acceptance at prestigious conferences (with a high rejection rate, well-known keynote speakers and organised by scientific associations)
- Good ratings in submissions and reviews, and de facto acceptance in high-impact journals (for cumulative theses)

These individual quality standards are initially based on the quality criteria for scientific work with a high degree of general validity. (cf. e.g. [5])
Based on [5], Table 1 characterises twelve important quality criteria of a scientific paper from [5], which are summarised and visualised in Figure 2.

Table 1: Checklist of important scientific quality criteria (extract from [5], see also Figure 2)

A General ethical criteria:
Honesty
• No plagiarism, deception, manipulation of data, fabrication of results
Objectivity
• Independent of personal preferences and attitudes, free from political and economic influences and interests • Be objective and neutral! • Choose your sources impartially! • Quote accurately and completely!
• **Fairness and fair play**
• Collegiality, mutual respect and recognition of others' achievements, teamwork, interdisciplinary exchange, global cooperation • Open communication
Responsibility
• Personal responsibility, responsibility to the team, to science and to the consequences of knowledge, • Measuring the impact of research
Requirement for novelty and importance of the topic & the results:
Originality
• What's new? How much is new? • New concept, new model, new solution, new method, new field of application to be developed? • Creation of new knowledge, linking of knowledge, lateral thinking? • Originality and quality take precedence over quantity!

First continuation of table 1:

Relevance
• **Scientific relevance:** Content with high informational value for basic, hybrid and applied research in my field or possibly other fields • **Practical relevance:** Solving practical problems • **Social relevance:** Solving problems with a social dimension (e.g. energy, climate**)** • **Personal relevance:** Relevance in terms of my development and building my own expertise
Ensuring traceability as an overall quality criterion:
Validity
• Checks whether what is to be measured (researched) is being measured (researched): • Clearly defined and delimited research question, • Representative samples • How meaningful are the results?
Reliability
• The same results should be obtained if the test is repeated! • Suitability of the measurement/test method, • Are the results stable and reliable?
Comprehensibility
• Scientific papers are published so that others can inform themselves and examine and utilise the new knowledge. This requires • Completeness • Systematic structure • Clear linguistic design, • = simple, short, concise, structured • Definition of important and new terms • Clear layout • Appropriate visual aids (headings, bulleted lists, illustrations, tables, formulae) • Explanation of abbreviations, symbols, formulae and illustrations
Logical argumentation
• Structuring arguments • Link arguments logically • Draw conclusions • Deductive arguments (the conclusion follows from the reasoning) • Inductive arguments (one infers the whole from individual observations) • Testing: Is the reasoning sufficient to draw conclusions? • Have I avoided wrong conclusions?

Second continuation of table 1:

Verifiability
• Something that cannot be verified cannot be confirmed or refuted => • Sources, solutions, evidence and results must be clearly disclosed and documented. • Courage to make mistakes: Mistakes and errors are part of the cognitive process and progress

4. Note 2: Projectmanagement and external form of the font

The efficiency of the process is also important for the success of the dissertation.

Project management: A doctoral project is an individual research project and therefore all project management methods and approaches known from the programme or new ones to be developed can and should be used.

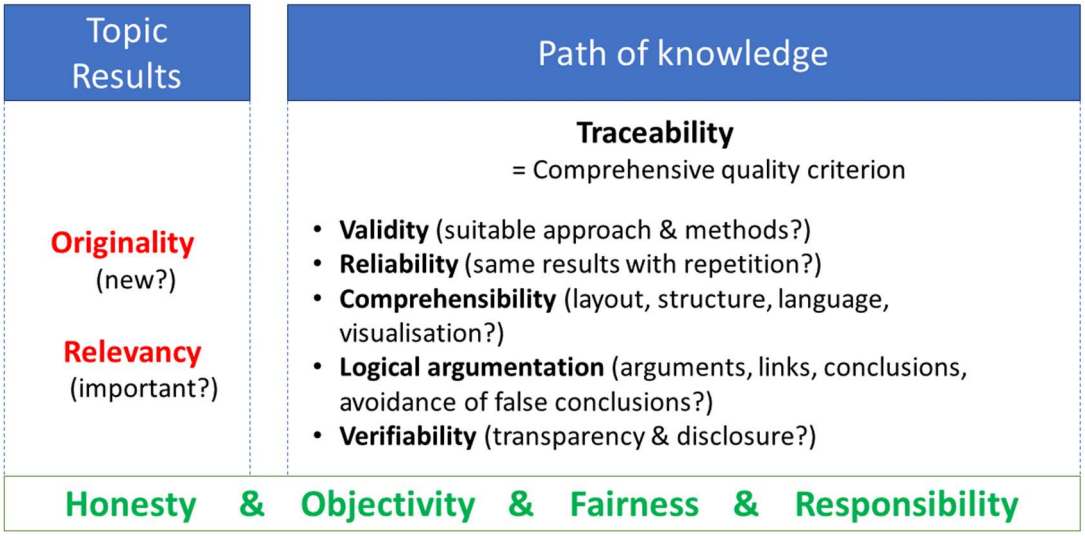

Figure 2: Scientific quality criteria (Own design using terms from [5])

This includes both the classical methods and procedures as well as agile methods and procedures.
For example, agile project management keeps the planning process open and changeable, dividing work packages into 'planned', 'in progress' or 'completed', define short deadlines (e.g. 4 weeks) after which a specific result should be available, and build in evaluation loops to improve this result. Individual universities, colleges and doctoral centres provide support for project management. One example is the model plan of the Doctoral Centre of the Universities of Saxony-Anhalt (H2, Anhalt, Harz and Merseburg) (cf. [7]), which contains, among other things, work steps, forms of work and milestones and thus ensures a goal-oriented, continuous processing of the individual within a defined framework.

A second important point concerns the **organisation of writing** and includes one's own data management. By organising your own writing efficiently, you can avoid data loss, unnecessary rework, unnecessary errors and unnecessary unproductive search time.

In particular, it is always important to focus on the desired result.
This concerns the form of the dissertation with a systematic basic layout, the definition of the structure and lists, the figures, tables, enumerations and formulae, the linguistic design, etc.

This paper discusses this **form of written work** in more detail:
For publications in conferences, journals and books, templates are usually provided by the organiser or publisher and must be followed.

For a dissertation, there are usually no such specifications in the form of templates. Therefore, recommendations for the overall layout of the dissertation and for working with enumerations, figures, tables, formulae and references, as well as all lists, should be given here.

It is advisable to define an individual, outwardly appealing format template at the beginning of the dissertation and to edit and file all resulting work results in the correct format of the dissertation or manuscript in a structured manner, in addition to the publication of individual contributions.

This will allow you to work efficiently and save a lot of time and revision work, especially in the final stages.

It is recommended that figures, tables, formulae, etc. in the originals are clearly organised as individual folders and are correctly numbered and clearly labelled in the file name. For example, create a separate folder for original illustrations and a separate folder for original tables, etc.
It is also important to make permanent **backup copies** of the entire thesis to prevent data loss!

Defining your own format template for a dissertation includes:

- **Defining the document format**
  (e.g. paper format, margins, single or double sided, font, line spacing, 1st to maximum 4th order headings, spacing between text and headings, indentations)
- **Layout of lists** (table of contents, list of figures, list of tables, list of formulae, list of abbreviations, glossary, bibliography)
- **Standardised design of bulleted lists**
  (standardised indentation, only one, maximum two indentation characters)
- **Standardised layout of figures***
  In scientific texts, the term 'figure' is preferred. The term 'figure' includes illustrations, diagrams, graphics and photographs.
  (Font type and sizes, preferred shapes, colours used and their meaning, figure designation)
  Figures are usually given a figure number, a figure caption, relevant literature sources, do not forget the figure references if applicable)
- **Standardised design of tables**
  (e.g. table template, fonts and font size, table designation), tables are usually given headings, don't forget the table references!
- **Standardised design of formulas**
  (font, font size, formula number and explanation of all formula symbols with indication of the unit, if necessary also with reference to literature)
- **Standard formst of references and bibliography**
  (choose a common citation style, e.g. APA 7, and collect <u>all</u> necessary references in full).
  Wherever possible, collect the relevant pdf files in a separate folder so that you can quickly access this literature source again without having to search for it again.

The following recommendations apply to spelling and expression:

- For all non-native speakers, we recommend automatic checking with a word processor.
- The following applies to everyone: simple, clearly formulated sentences without any reinforcing words increase comprehensibility and make it easier to place commas.
- When expressing yourself, make sure that you use technical language and not 'corporate language' or 'colloquial language', e.g. do not use the term 'ant' but 'hand pallet truck'!
- Furthermore, one and the **same technical term** should always be used. You can refer to it in the introduction when you use the term for the first time, e.g: 'The Ishikawa diagram is also known as a fishbone diagram or cause-effect diagram. In the following, the term Ishikawa diagram is used exclusively in the dissertation.' In the following, the term 'Ishikawa diagram' will always be used in the dissertation. Terms that have different meanings in different contexts should be briefly defined in the text or in a glossary. (e.g. Kanban in logistics, Kanban in IT) to prevent misunderstandings and misinterpretations.
- The **labelling of figures, tables and formulae** should always reflect the content clearly and unambiguously. The aim should be to use short designations! To ensure clarity, identical designations should not be used.
- **Abbreviations** should be used sparingly. Nowadays, word-processors make it easy to replace an abbreviation originally used in writing with the full term. This significantly improves readability and at the same time increases comprehensibility! Abbreviations from the "Duden" dictionary do not belong in the list of abbreviations.
- When you create an **outline**, there must always be at least two subsections. Chapter 5, for example, is divided into 5.1. and 5.2. If there is only '5.1', then there is only chapter 5, without any further subdivision.

In summary, the authors' many years of practical experience have resulted in the tips in Table 2 for avoiding common formal errors.

Table 2: Checklist of typical formal errors in dissertations (author's research)

Aspect of form	Typical mistakes
Layout	• No standardised layout • Obvious impression of lack of accuracy and cleanliness • Numbering errors
Table of Contents	• Bullet points are not linguistically identical (sometimes verbs, sometimes nouns, sometimes short, sometimes long). • A bullet point has only one sub-point, i.e. there is only 3.1. and no 3.2.
List of figures	• Unclear figure captions • Figure caption does not reflect the content of the figure • Not properly indented
List of tables	• Table names not clear • Not all tables begin with capital letters
List of abbreviations	• Dictionary abbreviations included
References	• Missing references to figures, tables, formulae or literature
Figure design	• Inconsistent design (fonts, sizes, colours) • Poor legibility • Missing legends • Captions not always used • No clear explanation of figures
Table layout	• Inconsistent design (fonts, sizes, colours where appropriate) • Poor legibility • Missing legends • No table headings used • Unclear design

Continuation of Table 2

Aspect of form	Typical mistakes
Formulas	• Formulas not numbered • Missing legend with explanation of the formula symbols and indication of the formula units • Formulas
Enumeration in the text	• Use of different bullet characters • Different indentation
Expression	• No use of standardised terms • Synonymous terms used • Colloquial language used • Operational expressions used • Nested sentences • Reinforcing words • Subjective opinion • No clear statement in the sentence
Spelling	• Incorrect comma placement
Bibliography	• Inconsistent style • Individual, missing information
Glossary	• Glossary or definitions are missing, although necessary

These notes can be used as a checklist for possible formal errors before submission of the thesis/manuscript.

5. Note 3: Procedure and some hints for identifying the state of knowledge and the research gap

Researching the state of knowledge, identifying research gaps and formulating research questions are crucial for the quality of the doctorate. (e.g. [8])
The research should be comprehensive, but at the same time efficient.

Recognised potential research gaps should be listed in a table to accompany the analysis process and roughly evaluated using an ABC classification according to the criteria of

novelty and importance. A short verbal description is also helpful.

This combination of collection, evaluation and characterisation saves you from having to constantly rethink the facts.

The search should initially be somewhat broader in order to be narrowed down again as a result of the cognitive process.
The aim of this step is to subsequently select a research gap (or possibly several related gaps) for your own dissertation.

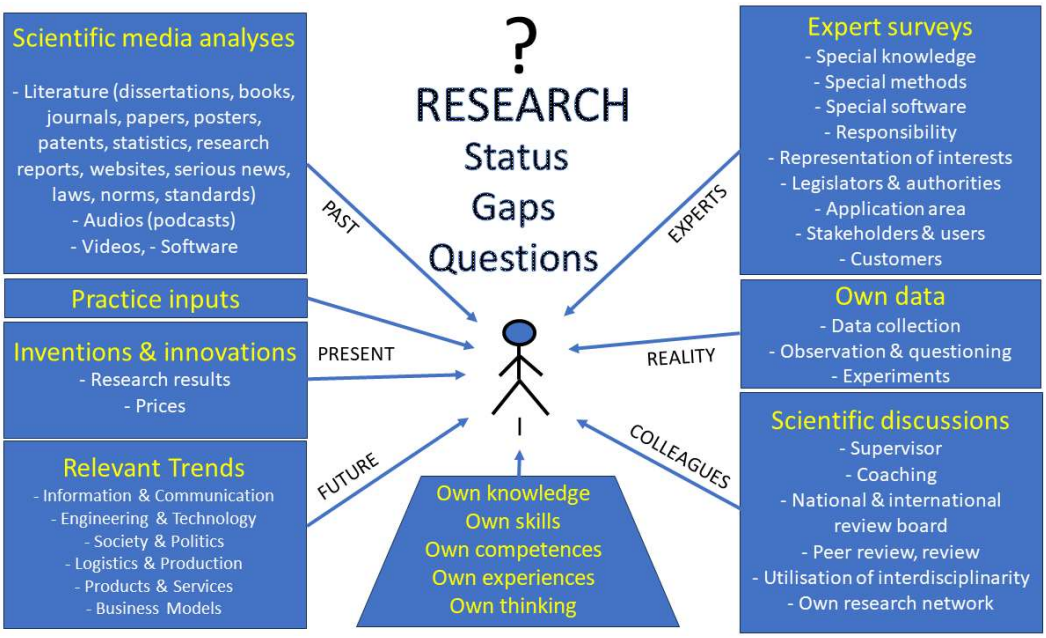

Figure 3: Holistic research to uncover the state of knowledge, identify a research gap(s) and formulate research questions

Ideally, this should be:

- in the A-range in terms of degree of novelty, i.e. new and at the same time
- in the A-range in terms of importance, i.e. very important.

In the search and identification of the research gap, several perspectives must be combined (see Figure 3 and the following list and explanations in Table 3):

(1) Past: Literature and media analysis: The already published knowledge that is externalised and accessible through a scientific literature & media analysis. (see additional references at the end of the paper)

(2) Current expert knowledge (cf. Figure 3): This expert knowledge is usually only available in an internalised form and can only be accessed via specific expert discussions & expert interviews. Experts can be identified, e.g. with regard to certain procedures:

- **Procedures** (e.g. Business reengineering experts),
- **Methods** (e.g. simulation experts),
- **Tools** (e.g. SPSS experts)
- **Expertise** (e.g. business insiders)
- **Industry experts**, application experience),
- **Responsibilities** (e.g. ministries, authorities),
- **Interest groups** (e.g. ADAC, ADFC)

(3) Specialist discourse and change of perspective: Conscious use of the interdisciplinary nature of logistics and supply chain management (cf. [9])

(4) Current status quo of the application area, current objectives, current contexts (e.g. laws, general environment, competition, etc.). As a rule, this involves analysing operational data and key figures, as well as making your own observations and notes. If necessary, the 'hard' data should be supplemented with 'soft' data.

(5) Future: Record and list trends and developments from publications, expert discussions, current daily news.

The recorded data, information and the researched knowledge gathered must always be critically examined! (e.g. truthfulness, up-to-dateness, etc., cf. the comments on data quality criteria in Table 4 - 'perceive' row).

The following Table 3 contains some advice on conducting scientific research.

Table 3: Notes on holistic, scientific research

Search focus	**Important notes on research**
Overall overview of the research	Draw up a table with the following information in it: • What need to be researched & • What types of research should be used?
The past: scientific literature & media analysis	• Where: Research locations: Internet + Scientific databases (e.g. Google scholar, Researchgate, Statista, IEEE, Scopus, Web of Science Core Collection, Emerald. SciELO, DOAJ) + Search engines (e.g. Google, Bing, MetaGer)+ Chatbots (AI) + Library databases + Publishers (e.g. Springerlink)
	• What: prompts, search terms and search strategies: 'playing' with search terms: e.g. abbreviations, synonyms and close terms, English terms, superordinate and subordinate terms, combinations of terms.
	• Classic term entry (e.g. *; ''; Boolean operators; exclusion of irrelevant knowledge areas, desired file type).
	• Restrictions - Temporal limitation - Language area - Application area • Use of different search strategies (broad search, deep search)
	• Examples of scientific approaches, e.g. Webster & Watson and many others.

First continuation of table 3

Search focus	• **Important notes on research**
	• Document the search clearly. It must be comprehensible! • 'View' at least the first 100 references, compile a bibliography
	• Try to map the structure of knowledge, try to identify "experts" and institutions, journals etc. that make comparisons and evaluations
	• Extract the most important knowledge, always 'clean' with the (multiple) literature references => choose the most appropriate form of presentation!
	• Use all media appropriately!
Experts	• Draw up a list of experts, depending on the context, your own company, universities and colleges, research institutes etc.
	• Fill in the expert profiles
	• Prepare interviews
	• Focus and establish appropriate contacts
	• Prepare documentation and evaluation
Experts Professional discourse and other perspectives	• Professional discourse with e.g. peers, other doctoral candidates, the supervisor, colleagues etc.
	• Discussing research with others, arguing professionally (use the team effect!)
	• Consciously adopt and obtain other perspectives (e.g. information technology, economics, environment, technology, social, maintenance, (cf. [9])
Analysis of the current situation	• If necessary, a separate analysis of the current situation in the company, in the process or in the environment is required

Second continuation of table 3

Search focus	• **Important notes on research**
Trends	• Research current trends, e.g: DHL, BVL, SCM, manufacturing trends
	• Think about the impact of trends and new developments on your own topic and record and consider your thoughts in writing

The knowledge gathered according to Table 3 should then be related to your own knowledge and experience.
Apply, include daily news
=> Supplement search results from (1) with own knowledge, categorise, develop own ideas etc., establish references.

The authors recommend preparing the research results in such a way that ideas and suggestions (possibly with references) are first collected and localised in a portfolio. See Figure 4 for an illustration.

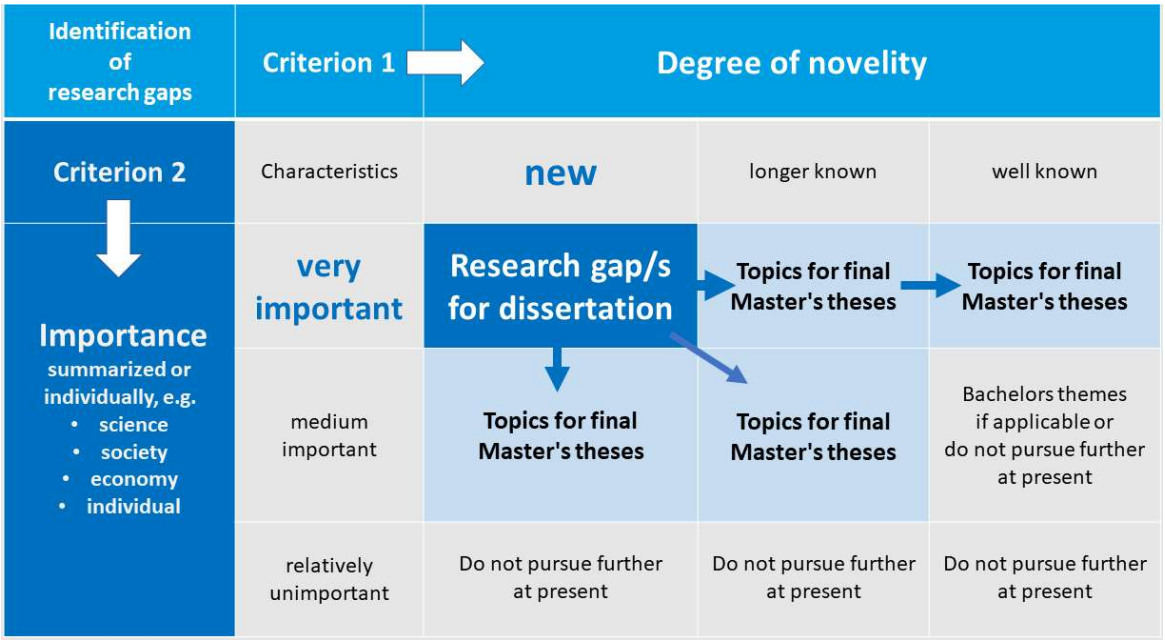

Figure 4: Portfolio for prioritising research topics and research questions

The two key criteria here are the degree of novelty and importance (relevance). The authors' recommendations for the other areas are shown in Figure 4.

The ideas for research gaps that fall into the 'A-A field' (area new & very important) are characterised in a table below. Importance can be demonstrated by verbal or quantified values (statistics, metricsm, arguments). The degree of novelty should be proven by reference to the research findings.

The topics of the secondary fields may play a role in rounding off Master's theses or Bachelor's theses.In order to increase the efficiency of the research process, the authors encourage students not only to find, substantiate and argue the importance of their own dissertation topic in a self-serving manner, but also to evaluate and develop the research area they have researched in a generally beneficial manner. In this way, a much greater contribution to research can be made through the use of accompanying, deliberately designed theses (Master's theses, Bachelor's theses and Master's project theses) than is possible and achievable through a single, focused dissertation.

In this sense, this perspective enables a broadening of the perspective in such a way that the dissertation not only demonstrates one's own ability to carry out independent, scientific work, but also develops strategic competences in the sense of research management in parallel.

6. Note 4: Good scientific practice for conducting research

Logistics as an applied research discipline comprises typical research activities that are used in a doctorate phase and dissertation.

These research activities are:

- Perceiving
- Informing
- Describing
- Inventing
- Analysing
- Modelling
- Planning
- Optimise
- Improve
- Explain
- Carry out / Execute
- Evaluate
- Reflect
- Recognise / Understand
- Decide
- Self-learning (is also an important component.)

Table 4 provides information on when these research activities are carried out correctly in terms of good scientific practice.

Table 4 can serve as a useful checklist and basis that can and must be adapted and expanded for your own dissertation.
If you look at each row in Table 4 below, you will see that the specific assessments in each table row can be generalised,
e.g. like this:

- Current overview knowledge researched and prepared?
- Objectives defined and prioritised qualitatively and quantitatively?
- Tasks defined and delimited?
- Targeted, well-founded selection of procedures and methods?
- Efficient way of working?
- Technically correct use of the methods (modification and improvement if necessary)?
- Comprehensible documentation of the path of knowledge?
- Reasoned, correct conclusions?
- Documentation of errors and mistakes?
- Holistic evaluation of the results?
- Generalisation of possible uses and initiation of appropriate communication channels for the dissemination of research results to other knowledge domains?
- Relevance: scientific, economic, societal, social, personal?
- Self-checking: Consistently scientific work?

Each row of the table can and must be completed with these questions in mind.

For the sake of clarity and simplicity, this has been omitted in this paper.

However, if these Tables 4 are to be re-used by universities, colleges and doctoral centres, these above-mentioned aspects should be added.

However, the focus points should remain clearly visible. This could be achieved by prioritisation or colour grading (e.g. black-grey).

Table 4: Quality-orientated execution of research activities:

Research activity	Methods Category	Evaluation
Perceive & inform	- Training the senses - Scientific literature analysis - Internet research & Chatbots (AI) - Data collection (technics) - Data collection (humans) - Experimentation	- Data quality criteria (including relevance, scope, representativeness, completeness, accuracy, consistency, unambiguity, comparability, authenticity, availability, comprehensibility, integrity, validity, traceability, data protection, scalability, etc.). (Cf. also [10]) - At least three perspectives: - **Past** (evaluation of publications, historical data), - **Present** (current news, expert knowledge, own (current) data collection, practical input) and - **Future** (trends and developments, visions) - Type and extent of data collection and / or data gathering - Correctness of the experiment (planning, structure, implementation, evaluation)
Describe	- Technical language - Formulas - Symbols - Key figures - Special description models	- Adequacy of terminology, including categorisation and hierarchy of terms as well as definition of terms - Appropriateness of the forms of presentation and their correct use - Completeness of the explanations of figures and formulae - Correctness of the illustrations - Correct and justified choice of the model
Invent	- Creativity techniques - TRIZ - Chatbots like ChatGPT	- Originality and potential significance of the new ideas - Proven own contribution - Effort versus potential benefits, risks, protection of inventions
Analyse	- Statistics - Stochastics - Classification - Algorithms - Pattern recognition	- Selection of the right analysis objectives and aspects (e.g. sustainability (economic, environmental, social), errors, flexibility, time, security, transparency, agility, scalability) - Correct prioritisation - Mathematical correctness - Adequate presentation, correct conclusions
Modeling	- Holistic logistics models - Customised logistics models: > Customer requirements & constraints > Business models > Object models > Process models > System models > Infrastructure models > Key figure systems and individual key figures - Drawings - Graph theory - Operational models - Structural models - Simulation models - Reliability theory - Visualisation - Animations - Digitisation	- Objectivity and quality of mapping - Sound justification for model selection - Assessment of model suitability - Correct use of the model - Use of appropriate key figures - Appropriate visualisation (VR, AR, 3D, 2D, digital twin)

First continuation of table 4:

Research activity	Methods Category	Evaluation
Plan	- Scenario technique - Forecasting methods - Estimation methods - Structural models - Process organisation - Calculation methods - Variant formation - Layout methods - Project management methods - Agile methods	- At least 3 scenarios considered? Best case, trend case, worst case - Calculation and estimation reasonable, correctly applied? - Reasonable selection and characterisation of the chosen structural model chosen (e.g. network, point, line, island, spine, matrix, ring) - Logical, functional, temporal, spatial - Reasoned choice and correct application of calculation methods - Reasonable creation of variants and evaluation based on the target variables - Evaluation of the overall solution
Optimize	- Inventory theory - Linear optimisation based on objective functions; often multi-criteria optimisation - Design of experiments (DoE)	- Correct task definition - Correct target functions and limits for non-involved target variables - Correct and efficient experimental design and execution - Holistic approach, seldom partial optimization
Improve	- Kaizen - Business Process Reengineering (BPR) - Lean practices - Standards - Benchmarking - Six Sigma - Reference solutions - Research work - Logistics 4.0	- Utilisation of all improvement approaches and conscious selection of relevant improvement methods - Evaluate the developed improvement solution - Define and, if possible, quantify of the results: Visions, strategies, trends, goals, models, procedures, reference solutions, prototypes, master plan for implementation, master plan for roll-out - Critical reflection on the solution - Development of tips for the broad use of the results
Explain	- Theorising - Formulate hypotheses - Define laws - Formulate rules - Designing case studies - Designing a sample solution	- Correct application of: - Empiricism, - Logical thinking - Induction, deduction - Language, concepts, expression - `Rules' for rules (as commandments, short, understandable) - Classification methods, selection of representative types - Ensuring representativeness, generalising - Given, sought, procedure, results and evaluation
Execute	- Supply chain network models - Sourcing methods - PPS - Traffic flow theory - Organisation theory - Control loops - Loops, cycles - Project management	Correct implementation in: - SCM models: design, plan, execute, control, improve, optimise, etc. - Sourcing methods: single sourcing, dual sourcing, modular sourcing, global sourcing - Classic PPS (MRP II, JIT, JIS, priority rules) or agile PPS - Simulation - Consideration of errors and exceptional situations - Scheduling, availability control, progress control, defect control, agile organisation

Second continuation of table 4:

Research activity	Method Category	Evaluation
Evaluate	- Valuation - Methods - Assessment objectives	Selection of the most appropriate evaluation (validation, verification, quantification) - Consideration and weighting of traditional, current and future objectives: Sustainability (economic, environmental, social), flexibility, etc.
Reflect	- Self-reflection - Team-reflection - Academic feedback - Theory-practice-reflection	Selection and correct use of evaluation methods: - Hand formula, spiral of reflection, funneling, - Presentation, argumentation, discussion - Conversation, workshop, presentation, interpretation - Theory-practice reflection model
Self-learning, self-study, Practice inter-disciplinarity	- Internet, all forms of media - Global literature and news - Experts - Practical experience - Interdisciplinarity	Utilise all opportunities to learn: - Chatbots - Scientific literature and media analysis - Perception from the real world (What do I see? What do I hear?) - Scientific discussions and chats - Tests, reference solutions, limits & rules of use - Synergetic linking of different sciences for the research of logistics

7. Results and discussion

This paper summarises four important tips for doctoral students:

1. Advice on how to practice academic writing
2. Advice on an accurate form as part of the self-organisation of writing
3. Tips on identifying the state of knowledge and the research gap
4. Tips for self-evaluation of the correct performance of typical logistics research activities.

The information has been systematised and explained in Tables 1 to 4 as an aid to subsequent use. Tables 1 to 4 can also be used as checklists:

Table 1: For self-assessment of consistent scientific work
Table 2: For checking form and avoiding formal errors
Table 3: For holistic research and identification of research gaps
Table 4: For self-checking the scientific accuracy of research activities

The research findings in this paper are largely based on our own practical experience of supervising more than 100 international doctorates. The value lies in the comprehensiveness of its findings, its summary nature and its rigorous systematic approach. Although the evaluation has not yet been completed, the research results can be assessed according to the following criteria and using the following methods:

- **Sufficient completeness** (through expert interviews),
- **Unambiguity** (by interviewing international doctoral students),
- **Comprehensibility** (through interviews with doctoral students),
- **Applicability** (validation & usefulness): through post-application survey
- **Proper prioritisation**/selection through professional advice and scientific debate
- **Accuracy** (verification) (by expert consultation and scientific discussion).

The limitations of these research results lie in the knowledge and experience of the authors.

What are the next steps in the research work?

- Professional discussion & processing of the professional critique
- Completing the criteria and notes
- Application of the checklists in practice and their gradual improvement
- Realisation of a common online FAQ platform for knowledge transfer to all international doctoral students 24/7
- Make the paper available & publicise it in other countries
- (e.g. Austria, France, Italy, Slovakia, Hungary, Ukraine, Cuba)
- Sharing the paper with the BVL (German) & the ELA (German & English)

Topics for further work could include:

1. What is the recommended structure of a dissertation?
2. What have been the typical research topics and research questions of dissertations in the last five years?
3. How can the state of research be recorded efficiently? (interviews with experts, own data collection and experiments, media analyses)

8. References

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[8] Delfmann, W.; Kersten, W.; Stölzle, W.; ten Hompel, M.; Schmidt, T. (2017): Logistik als Wissenschaftzentrale Forschungsfragen in Zeiten der vierten industriellen Revolution. Positionspapier des Wissenschaftlichen Beirats der Bundesvereinigung Logistik (BVL). https://www.bvl.de/positionspapier-logistik40 Access: 5. March 2024.

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Appendix: Supplementary literature recommendations

Systematic literature analysis (SLA)

→ Guidelines:

Kitchenham, B.; Charters, S. M. (2007): Guidelines for performing systematic literature reviews in software engineering. Technical Report. Ver. 2.3. EBSE Technical Report. School of Computer Science and Mathematics. Keele University.

→ Procedure of the SLA:

Moher, D. et al. (2010): Preferred reporting items for systematic reviews and meta analyses: the PRISMA statement. In International journal of surgery (London, England) 8, Nr 5: pp.336 341. doi: 10.1016/j.ijsu.2010.02.007.

Mongeon, P.; Paul-Hus, A. (2015): The journal coverage of Web of Science and Scopus: a comparative analysis, Scientometrics, vol. 106, no. 1. pp. 213–228.

→ Emphasising the particular suitability of Scopus and Sciencedirect for economics and engineering:

Duong, L. N. K.; Chong, J. (2020): Supply Chain Collaboration in the Presence of Disruptions: A Literature Review. International Journal of Production Research 58:3488–3507, doi: 10.1080/00207543.2020.1712491.

→ Exemplary application of the SLA:

Schmidtke, N.; Behrendt, F.; Gerpott, F.T.; & Wagner, M. (2022): Integration of New Business Models in Smart Logistics Zones. International Journal of Supply and Operations Management 9 (1) p. 19.

Antons, O., Arlinghaus, J. (2022): Distributing decision-making authority in manufacturing – review and roadmap for the factory of the future, International Journal of Production Research, 60, no. 13:
doi: 10.1080/00207543.2022.2057255 pp. 4342-4360.

Scientific work (all in German)

Qualifizierung der Graduate Academy der OVGU Magdeburg. www.grs.ovgu.de
Access: 5. April 2024.

Leitfaden für wissenschaftliches Arbeiten.
www.spw.ovgu.de
Access: 5. April 2024.

Hinweise zum wissenschaftlichen Arbeiten – Cultural Engineering www.cult-eng.ovgu.de
Access: 5. April 2024.

Leitfaden zur Erstellung wissenschaftlicher Beiträge und Abschlussarbeiten für Studierende der Berufs- und Wirtschaftspädagogik. www.wp.ovgu.de
Access: 5. April 2024.

Expert interview (all in German)

Gläser, J; Laudel, G. (2010): Experteninterviews und qualitative Inhaltsanalyse. 4. Edition. VS Verlag. Wiesbaden. ISBN 978-3531172385.

Mayring, P. (2002): Einführung in die qualitative Sozialforschung. Weinheim, Basel: Beltz Verlag, 2002. 3-407-3-407-25252-8.

Agile project management (all in German)

Neumann, M. (2023): Projekt Safari 2: Das Handbuch für agiles Projektmanagement. Campus Publisher books.google.com.
ISBN 978-3593516844

Helbling, T. (2023): Agile Projektmanagement - Methoden. Einfluss auf die Kaufabsicht in der Vorkaufphase und auf die Kundenzufriedenheit in der Nachkaufphase. kumulative Dissertation of the University Freiburg / Schweiz. sonar.ch.
doi10.51363/unifr.eth.2022.007

Timinger, H. (2024): Modernes Projektmanagement. Mit traditionellem, agilem und hybridem Vorgehen zum Erfolg. 2. Edition. Wiley.
ISBN: 978-3-527-84163-9

Trends

Hint: The following organizations publish trends on an ongoing basis.

Please research the current links yourself on the following websites:

→ Logistics

Bundesvereinigung für Logistik (BVL).
www.bvl-trends.de.
Access: 5 April 2024

DHL (Abkürzung der Gründer Dalsey, Hillblom &Lynn) Logistics Trend radar
www.dhl.com
Access: 5. April 2024.

→ Technical logistics

WGTL. Jährliche Fachkolloquien der WGTL
www.wgtl.de
Access: 5. April 2024.

→ Production & production technology

Wissenschaftliche Gesellschaft für Produktionstechnik (WGP)
www.wgp.de
Access: 5. April 2024.

→ Supply Chain Management

TU Wien (2024): 23 Supply Chain Management Trends im Überblick. www.tu_wien.at/ace/news/news/supply-chain-management-trends
Access: 5. April 2024.