PFH | PRIVATE UNIVERSITY of Applied Sciences

**Guide to the Preparation of Scientific-Technical Documents According to Nunamaker**
Valid for term papers, project reports, practical reports, bachelor's and master's theses
*Version: 14 August 2025*

Writing **scientific-technical** documents differs slightly, in terms of the aspects to be considered, from "classic" documents that must be written during your study. This applies regardless of whether this is in the form of a document, a presentation, or a chartbook. As soon as scientific-technical aspects are at the centre of the work, the work should also follow an **appropriate methodology.** The most common and most suitable methodology is that of J. Nunamaker[1] and is the recommended methodology in the department. The following briefly summarizes the most important key points of the methodology to help you get started in preparing scientific-technical documents. Further information can also be found online[2].

In your **introduction**, you should first introduce the reader to the problem domain. State the context in which your work takes place and, if applicable, illustrate the relevance of the work through statistics, case studies, or specific practical problems. In this context, you should also already describe the problem (the so-called "**problem statement**") that you intend to address in your work. Based on the problem statement, the **research question** then emerges. This research question is the central and most important element of your work, because everything that follows must be able to be examined against the research question and should serve to answer it. You should, in any case, coordinate the exact definition of the research question with your supervisor.

To fully answer the research question, you now need a **methodology** – and this is where the Nunamaker methodology comes into play. This methodology stipulates that you can solve any scientific-technical problem (including your research question) by addressing four sub-aspects: Observation (which we will call "*State of the Art and Technology*"), Modeling, Implementation (which we will call "*Prototype Implementation*"), and Experiment (which we will call "*Evaluation*"). If you choose Nunamaker as your methodology, you can already directly derive the approach to your work by deciding to treat each of these four aspects in a separate chapter. This results in an initial minimal structure of your work:

*1. Introduction*
*Introduction to the subject area*
*Statistics*
*Case studies*

*1.1. Problem Statement and Research Question*
*Formulation of the actual problem statement*
*Formulation of the research question*

*1.2. Methodology and Approach*
*Selection of the Nunamaker methodology (including explanation)*
*Presentation of the approach of the work (which chapters, which contents): here you will state that you will address the Nunamaker phase "Observation" in your Chapter 2 entitled "State of the Art and Technology," the phase "Modeling" in Chapter 3, the phase "Implementation" in your Chapter 4 entitled "Prototype Implementation," and in your fifth chapter, the "Evaluation."*

*1.3. Summary*

[1] Nunamer J-F, Chen M, Purdin T-D. System development in information system research. In: Twenty-Third Annual Hawaii International Conference on System Sciences; 1990. Kailua-Kona, HI, USA: IEEE; 1990. pp. 631–640. DOI: 10.1109/HICSS.1990.205401
[2] http://www.stefan-wagenpfeil.de/nunamaker

**Prof. Dr.-Ing. Stefan Wagenpfeil**
Software-Engineering | IT-Management
Steinbrink 3
58509 Lüdenscheid

Steuer-Nr.: 332/5774/0567
Tel.: +49/2351/8959895
E-Mail: sw@stefan-wagenpfeil.de
www.stefan-wagenpfeil.de

Sparkasse Lüdenscheid
IBAN: DE36 4505 0001 0000 4303 89
BIC: WELADED3HXXX

If you wish to address more extensive issues or multiple research questions in one document, it is advisable to make a further subdivision in the form of research objectives. In this case, the rule is that each research question must have four research objectives in accordance with the Nunamaker methodology. Without the use of research objectives, which will typically be the case, a possible structure of your work is as follows:

*2. State of the Art and Technology*
*Introduction and overview of the structure of the chapter*

*2.1. Literature review*
*2.2. Related work*
*2.3. If applicable, surveys relating to the current situation*
*2.4. Summarizing and classifying the findings in relation to the research question*

*3. Modeling*
*Choosing a modeling approach, e.g., user-centered*
*3.1. User stories*
*3.2. Personas*
*3.3. Wireframes*
*3.4. UML diagrams, BPMN diagrams*
*3.5. Summarizing and classifying the findings in relation to the research question*

*4. Prototype Implementation*
*4.1. Framework conditions of the prototype implementation*
*4.2. Description of the prototype implementation (screenshots, source code)*
*Relation to the modeling, in particular UML and BPMN diagrams*
*4.3. Summarizing and classifying the findings in relation to the research question*

*5. Evaluation*
*Selection of a suitable evaluation methodology, e.g., quantitative, qualitative, or cognitive walkthrough*
*5.1. Description of the evaluation by defining the expectations (target specification)*
*5.2. Verification of the current situation*
*5.3. Discussion of deviations*
*5.4. Summarizing and classifying the findings in relation to the research question*

*6. Summary*

If you wish to integrate research objectives, then for example you have two research questions (RQ1 and RQ2) and obtain the following structure in each chapter (here using Chapter 2 as an example):

*2. State of the Art and Technology*
*Introduction and overview of the structure of the chapter*

*2.1. Research Objective 1 for Research Question 1*
*2.1.1. Literature review, related work, if applicable surveys relating to the current situation*
*2.1.2. Summarizing and classifying the findings in relation to the research question*

*2.2. Research Objective 1 for Research Question 2*
*2.2.1. Literature review, related work, if applicable surveys relating to the current situation*
*2.2.2. Summarizing and classifying the findings in relation to the research question*

*2.3. Overall summary and classification*

**Prof. Dr.-Ing. Stefan Wagenpfeil**
Software-Engineering | IT-Management
Steinbrink 3
58509 Lüdenscheid

Steuer-Nr.: 332/5774/0567
Tel.: +49/2351/8959895
E-Mail: sw@stefan-wagenpfeil.de
www.stefan-wagenpfeil.de

Sparkasse Lüdenscheid
IBAN: DE36 4505 0001 0000 4303 89
BIC: WELADED3HXXX

Within the scope of the different types of work, it is also possible to omit individual chapters of the Nunamaker methodology. This can then be explained in the approach of the work: "*In the context of this work, no prototype implementation will be carried out, as this will be implemented by the development team,*" or "*In the context of this work, only the analysis of the state of the art and technology as well as the modeling of the system will be carried out. Prototype implementation and evaluation are part of future work.*" In any case, you should discuss the scope of the work with your supervisor. However, bachelor's and master's thesis projects are always complete in scope.

The procedure proposed here is a recommendation, not an obligation. In addition, the rules of good scientific practice naturally apply, i.e., you must support your statements with sources, cite correctly and conscientiously, ensure that the formatting complies with the specified requirements, and be aware that you are responsible for all content that you include in your work. You may use AI, but its use must be documented transparently (AI directory in the appendix of the work).

You have the option of sending me each completed chapter of the work or discussing it with me. To do this, send me an email at **s.wagenpfeil@pfh.de** with the respective chapter, or book an appointment for a consultation on my website: **http://www.stefan-wagenpfeil.de/termine**. I will be happy to provide feedback on the current status of your work. As a general rule, we also proceed sequentially here: once a chapter has been discussed, we will—if possible—no longer revise it. This means that from the very beginning, starting with the introduction, you are already writing your later, final work. **Have fun and good success!**

Prof. Dr.-Ing. Stefan Wagenpfeil

**Prof. Dr.-Ing. Stefan Wagenpfeil**
Software-Engineering | IT-Management
Steinbrink 3
58509 Lüdenscheid

Steuer-Nr.: 332/5774/0567
Tel.: +49/2351/8959895
E-Mail: sw@stefan-wagenpfeil.de
www.stefan-wagenpfeil.de

Sparkasse Lüdenscheid
IBAN: DE36 4505 0001 0000 4303 89
BIC: WELADED3HXXX