8. Writing the Thesis

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Structure and Content of the Thesis

Based on:

Hofstee, E. (2006). Constructing a Good Dissertation. EPE. Part 2 (pp 81-164)

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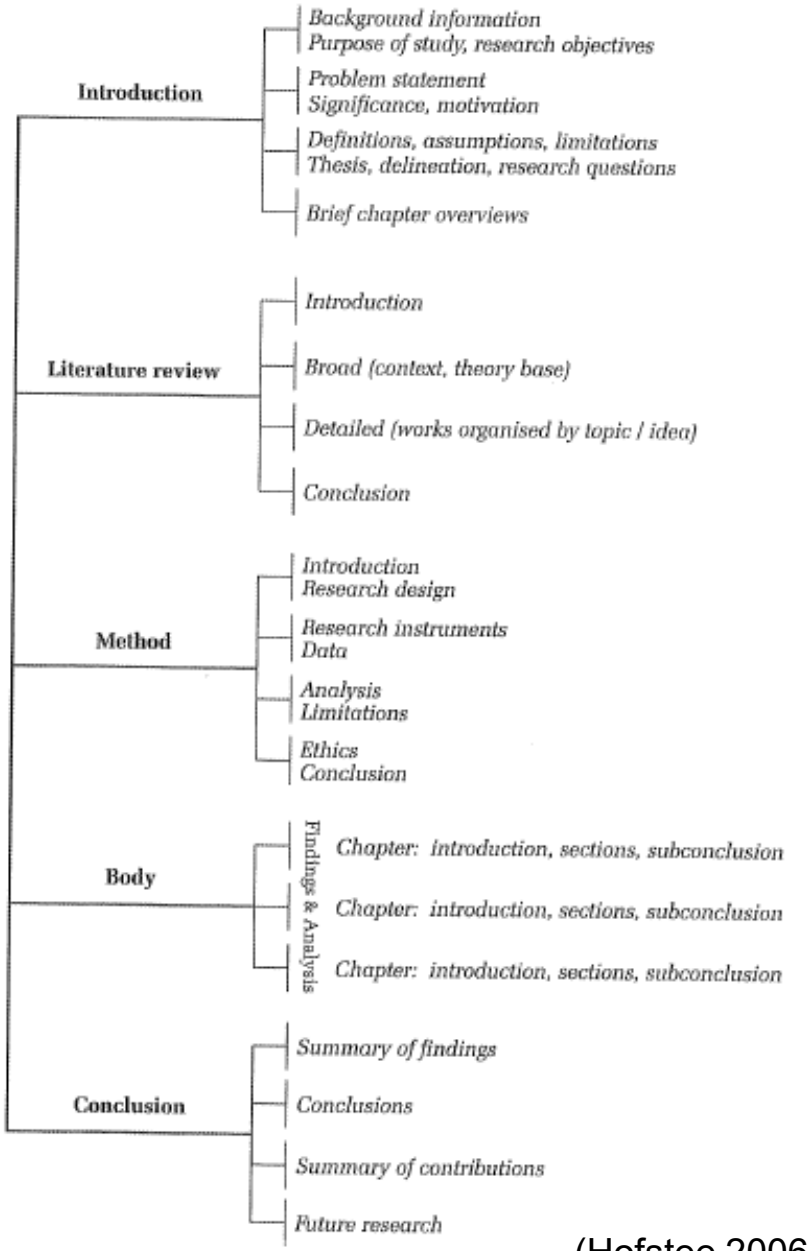
General Thesis Structure (1)

- **Introduction:** *What do we want to know?*
- **Literature Review:** *What do we know?*
- **Method:** *How are we going to find it out?*
- **Body:** *What did we find and how? (Results and Evidence)*
- **Conclusion:** *What did we add to the pool of knowledge?*

General Thesis Structure (2)

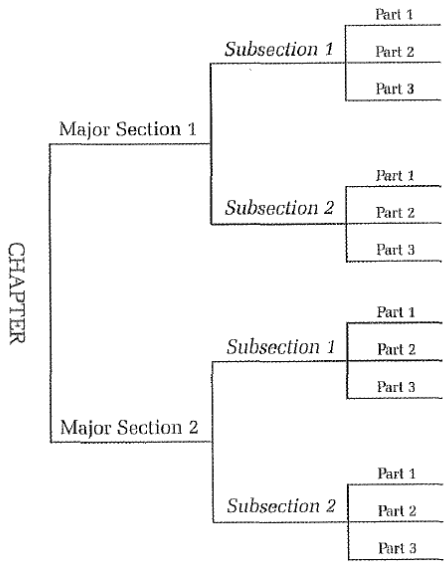
- Body consists of several chapters
  - Typically one chapter per phase or research question

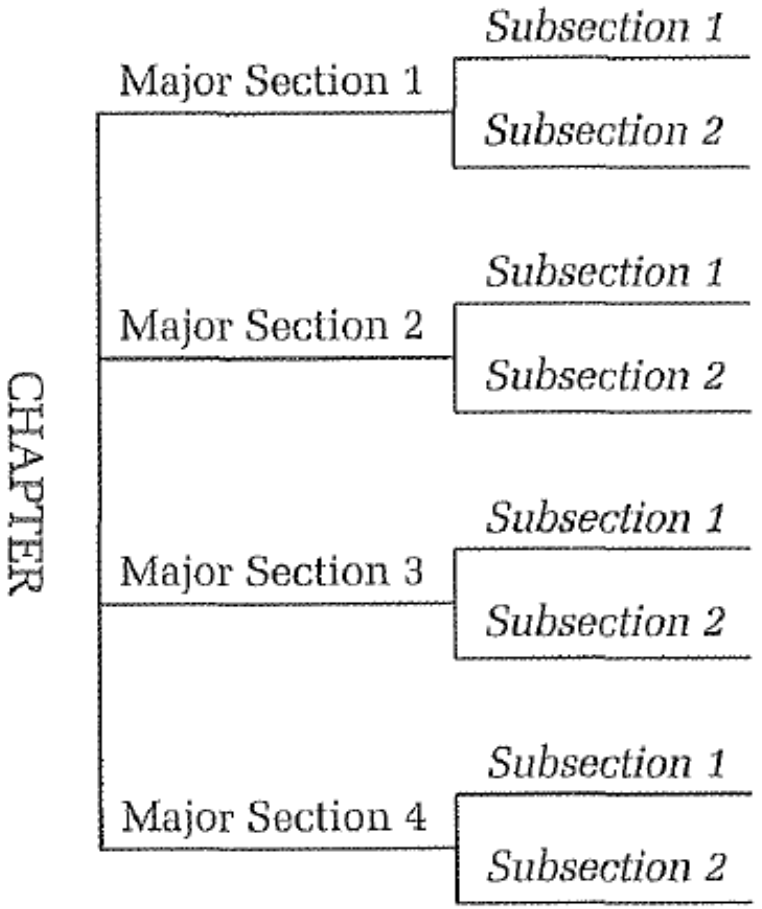


(Hofstee 2006, p. 36)

General Thesis Structure

- Level 1: **Chapter**
  - ♦ Level 2: **Section**
    - ● Level 3: **Subsection**
- Typically not more than three or four levels





(Hofstee 2006, p. 142f)

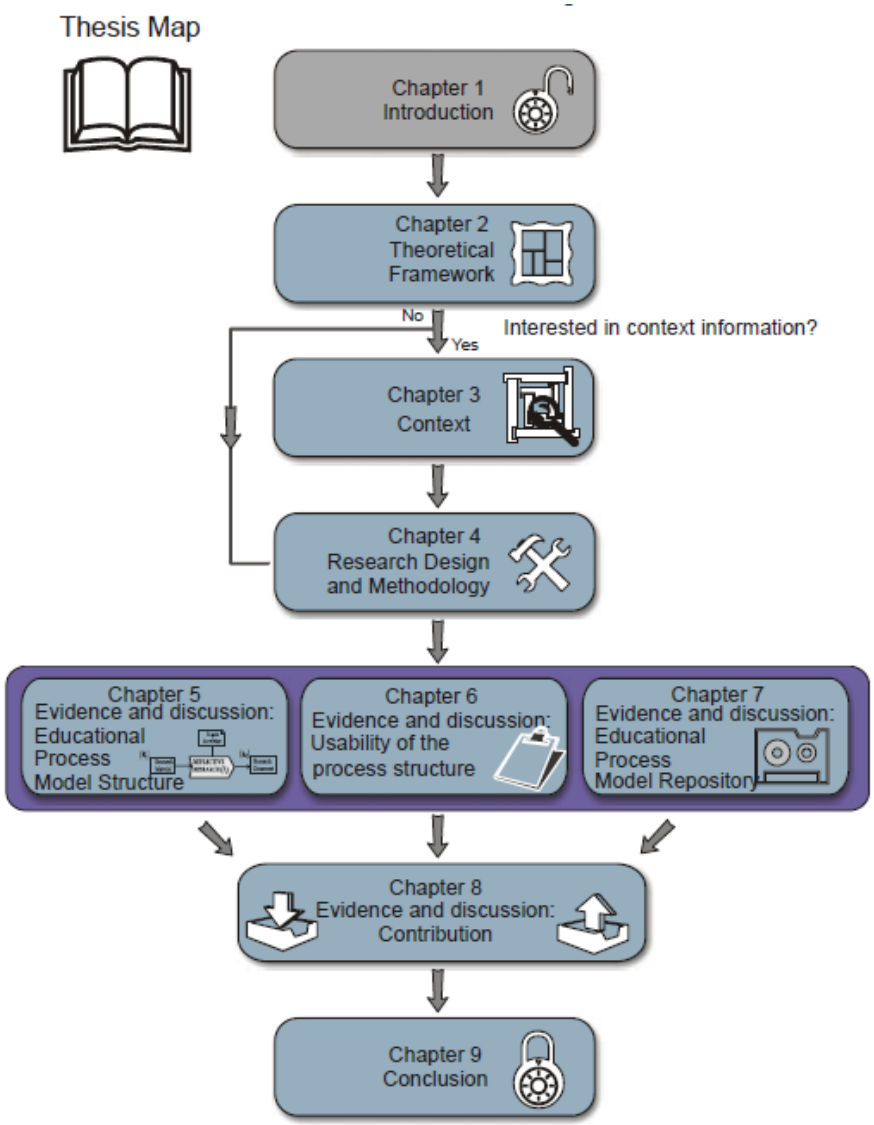
Chapter 1 - Introduction

- Background information/topic introduction
- **Problem statement:** What is the research problem in general?
- Research objective/purpose of the work
- Thesis statement explanation
- Research questions and objectives
- Significance: Why is this research relevant?
- Delineation and limitations
- Brief chapter overview

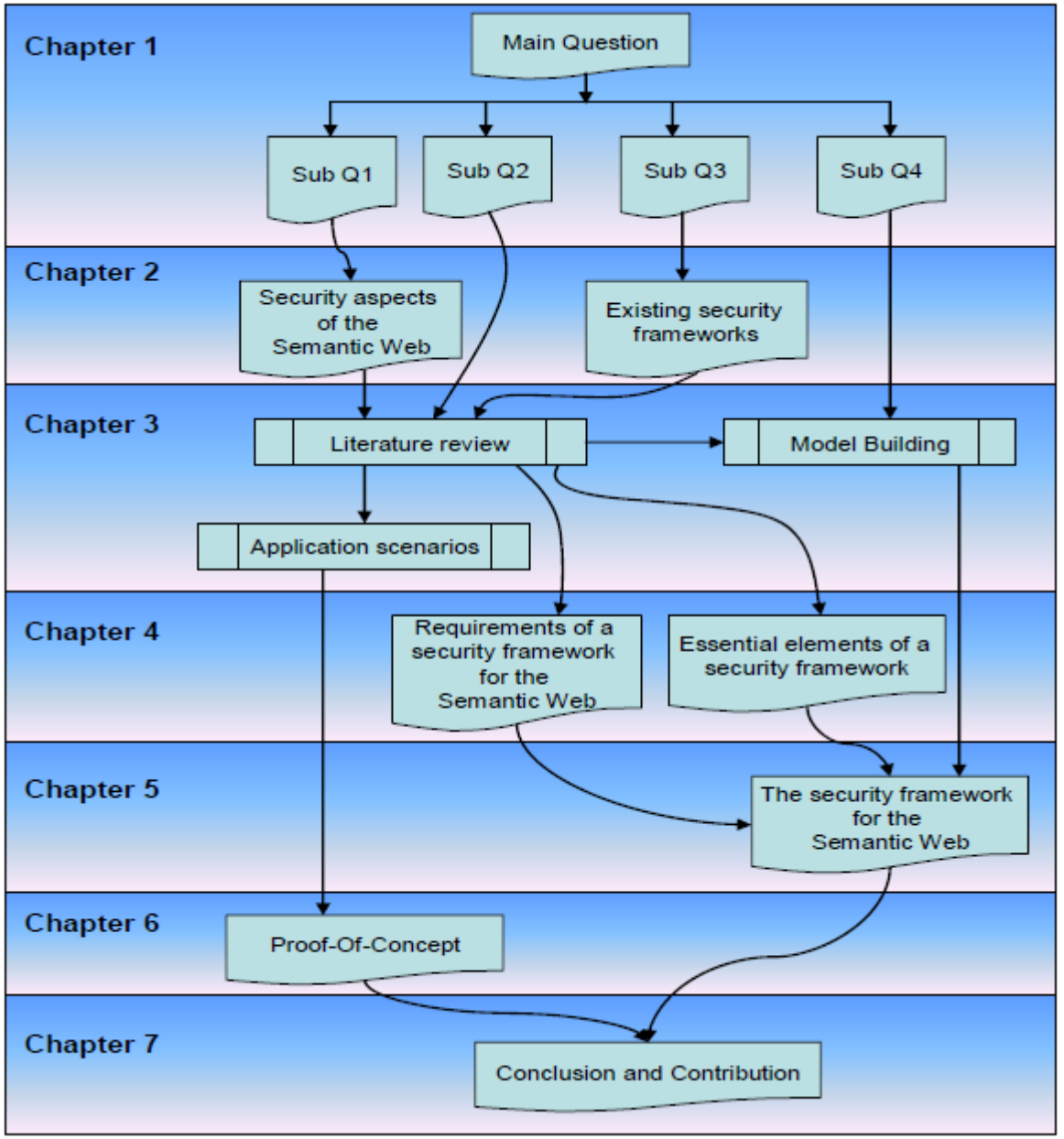
1. **Introduction**
   (Background information)
2. Literature Review
3. Method
4. <Body>
   ….
n. Conclusions

Chapter Overview: Thesis Map

- Practical: Draw a conceptual map of your thesis.
- A thesis map guides the reader through the work
- It can be repeated at the beginning of each chapter highlighting the current state



Thesis Map


Chapter 1
Main Question
Sub Q1
Sub Q2
Sub Q3
Sub Q4
Chapter 2
Security aspects of the Semantic Web
Existing security frameworks
Chapter 3
Literature review
Model Building
Application scenarios
Chapter 4
Requirements of a security framework for the Semantic Web
Essential elements of a security framework
Chapter 5
The security framework for the Semantic Web
Chapter 6
Proof-Of-Concept
Chapter 7
Conclusion and Contribution

The introduction sets up the criteria by which the reader will judge your work, so losing them here is an absolute guarantee of trouble down the road.

Background Information (optional)

- Introduction of concepts and terms, sometimes needed to understand the following chapters

1. Introduction
   (Background information)
2. Literature Review
3. Method
4. <Body>
   ….
n. Conclusions

Chapter 2 - Literature Review

- Literature Review:
  - Show that you are aware what is going on in the field
  - What is already known about the problem in the theory base?
  - What is the current state of practice?
  - What other work exists? How is it relevant to the topics of this paper?
  - **Where is the gap? What is missing?**

1. Introduction
   (Background information)
2. **Literature Review**
3. Method
4. <Body>
   ….
n. Conclusions

Chapter 3 - Research Method

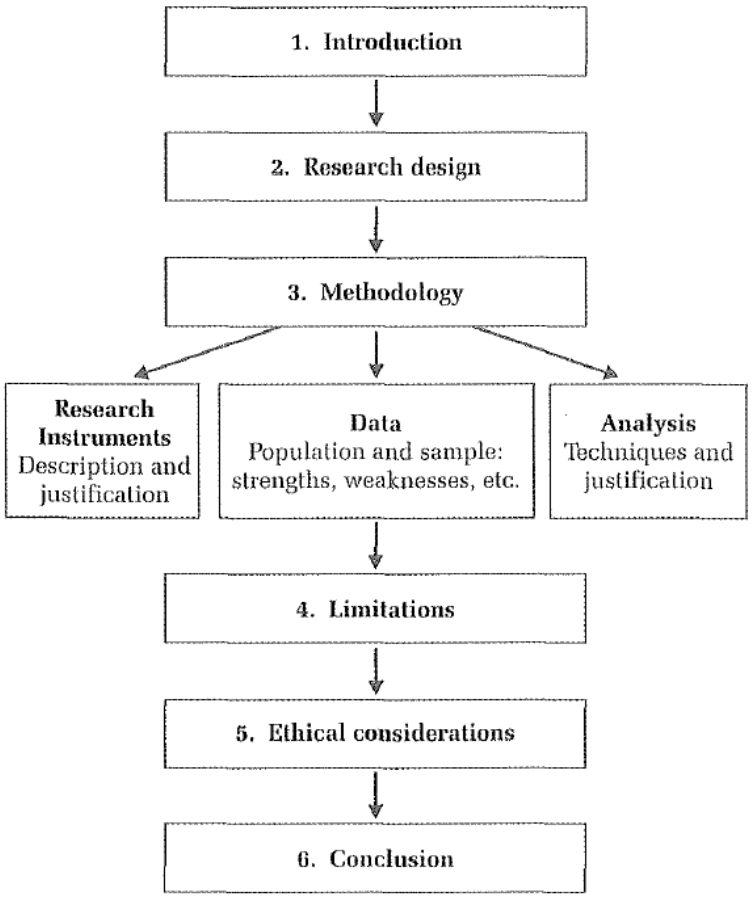
- What method has been chosen to answer the research questions? Why?
- How was the method applied / implemented? What data? How collected)

1. Introduction
   (Background information)
2. Literature Review
3. **Research Method**
4. <Body>
   ….
n. Conclusions

The Chapter on Research Methodolody

- Your thesis should contain a dedicated chapter about research methodology in which you explain and describe your research design
- The research design gives your choice of research philosophy and research approach
- For your research strategy you determine the data collection relevant to answer each research question

A Generic Layout for your Methodology Chapter



- Introduction:
  - Purpose of the study and results that the method was designed to provide
- Research design:
  - Overall approach you will use to test your thesis statement.
- Methodology
  - Explain, in detail, your particular use of the research design, in particular the data collection and analysis
- Limitations
  - Mention limitations and tell why your findings are still worthwhile

(Hofstee 2006, p. 112ff)

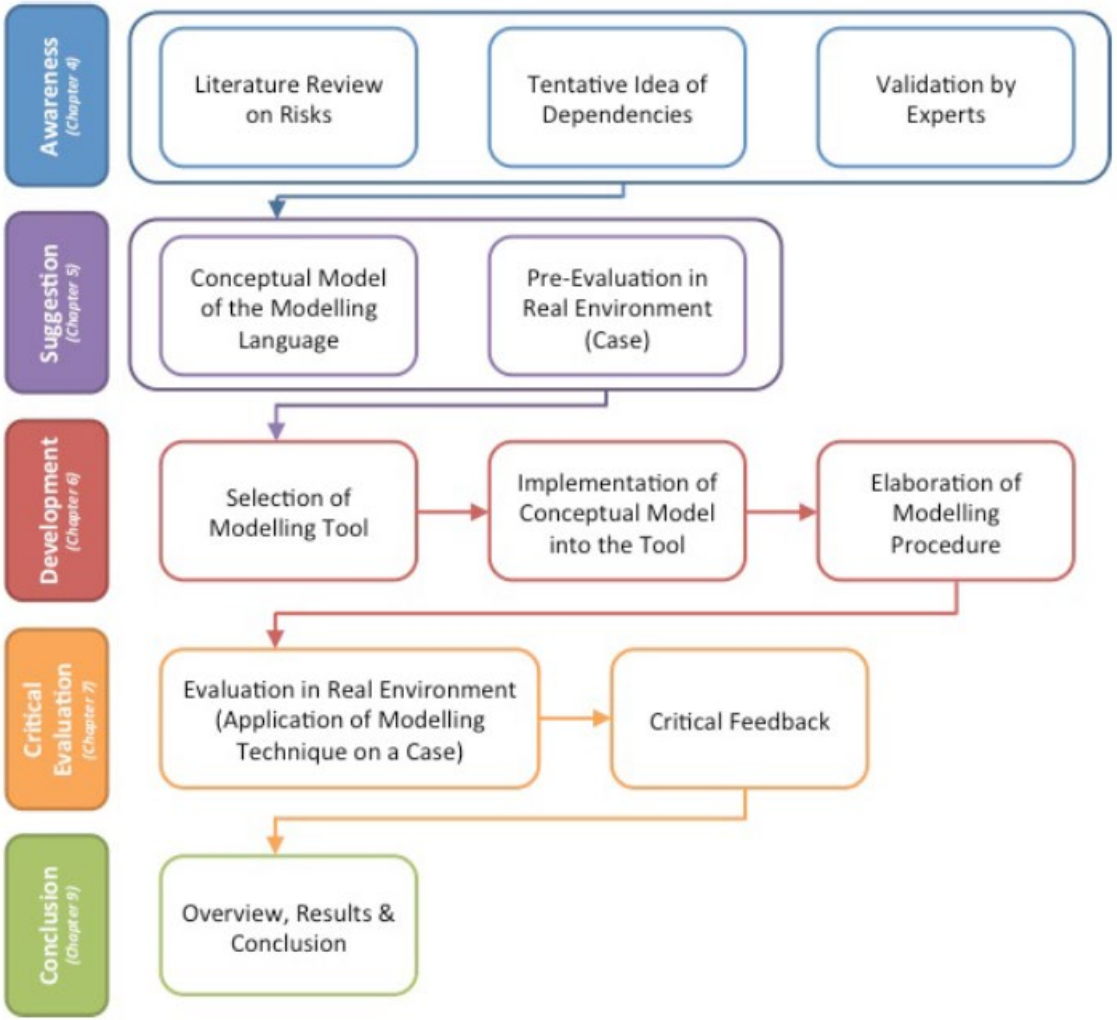
Design Science Research – specifying each phase

- In design science research you specify **for each phase** the way of data collection and analysis
  - What information and data is needed to understand the problem?
  - How can I make a good choice of the approach to be developed?
  - How can I develop the artefact?
  - How can I evaluate the artefact?
- Be aware to take into account for each phase
  - environment (relevance cycle)
  - body of knowledge (rigor cycle)

Design Research vs. Research Design

- Do not confuse design science research and research design
  - Design science research is a research modeling in which you develop artefacts
  - Research design is YOUR plan for doing research. It consists of choices for the layers of the research onion.

Graphical Representation of the Research Design



Example from (Sudakova 2014)

Body

- Typically one chapter per research phase or research question
- Results and discussion
  - Evidence: What data has been gathered?
  - Interpretation: How can we understand the data? What answer(s) does it give to our research question(s)?

1. Introduction
   (Background information)
2. Literature Review
3. Research Method
4. **<Body>**
   ....
n. Conclusions

see also: ***How to Organize your Thesis***
http://www.sce.carleton.ca/faculty/chinneck/thesis.html

Body – Guiding Principles

- Logical division: Your chapters, sections and subsections should be logically divided so that things that belong together are together
- Logical order: Your argument should be cumulative. Every point should build on what comes before
- No repetition: There should be no need to repeat yourself
- Keep it simple: The simpler you can keep your structure the better. Then your reader will have no problems to understand where he/she is.

(Hofstee 2006, p. 139)

The Body – Follow your Research Design

- Typical Structure: One chapter per research phase and/or research question
- This provides a logical Structure: Outcome of one phase is input for the next phase
- Example: Design Science Research
  - Chapter 4: Awareness of Problem
  - Chapter 5: Suggestion
  - Chapter 6: Development
  - Chapter 7: Evaluation
  - Chapter 8: Conclusion
- If a phase has several research questions, you might have also several chapters for that phase

Conclusions

- Summary of contributions
- Conclusions: what exactly is the value and (practical) implication of the research results?
- Future work: What other research can be done on top of them?

1. Introduction
   (Background information)
2. Literature Review
3. Research Method
4. <Body>
   ….
n. **Conclusions**

see also: ***How to Organize your Thesis***
http://www.sce.carleton.ca/faculty/chinneck/thesis.html

Writing Tips

Top-down writing

a) Insert the general structure into your paper, adapt as needed
   a) Structure the body according to your research questions/method
   b) For design research you can have a section per phase (problem awareness, suggestion, development, evaluation)

b) For each chapter:
   a) Use introduction to explain the purpose of the chapter and its structure to the reader. Introduction should deal with what is covered in the section and relate it to the thesis map
   b) collect the main thoughts / results / … → section headlines
   c) divide into subsections if necessary, be careful of too many levels, max. 3 to 4
   d) Summary section should without repetition pull together key points

Directing your Reader

- Help readers understand your points and how they all combine logically, is to give them directions.
- Give them a map wherever can and point them in the right direction.
  - Each chapter has an introduction (before the first section):
    - The purpose of the chapter
    - The role in the research design
    - The expected outcome
  - Every heading that you give to a chapter, section or subsection should be a compass that points them in the right direction.
  - The conclusion summarizes the outcome and points to the next chapter

(Hofstee 2006, p. 144)

Writing a paragraph

- A paragraph is a collection of sentences that form a logical unit.
- The main sentence in the paragraph is one that summarizes the whole paragraph. It is called the *topic sentence.* The topic sentence is usually found at the beginning or at the end of the paragraph.

General rules for paragraphs

- One idea per paragraph
- Arranged in logical order
- Contains all information needed
- Contains no unnecessary information

How to structure paragraphs for easy reading

- Determine the main idea.
- Find supporting information
- Arrange in order

Writing a Paragraph

- "The whole thesis is an argument, it is not a report" (van der Merwe)
- Important for writing is the "Golden Thread"
  - The first sentence in a paragraph is the topic sentence. It is the most important sentence (a lazy reader will read only the first sentences of the paragraphs)
  - Take the concept of the first sentence and use it in the second sentence, the concept of the second in the third etc.
  - Make sure that the last sentence of a paragraph leads to the first sentence of the next paragraph

Evidence and Argumentation

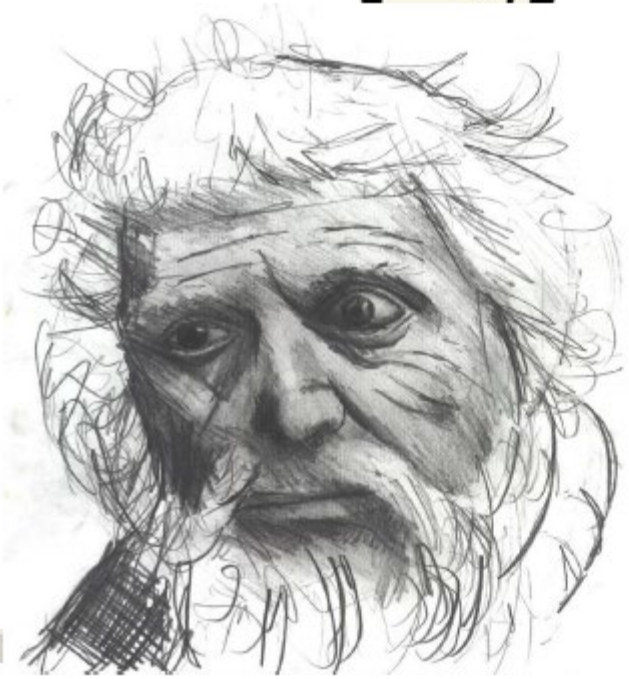
- Evidence is needed whenever you make an assertion that is not self-evidently true
- Arguments should be made in a logical order
- Standard sequence is to introduce your argument and then present and discuss the evidence for and against it
- Evidence is based on literature (other scholars) or data

Length of the Thesis

- The correct length for a dissertation is as long as it needs to be to contain all the required components and to arrive at a good conclusion, and no longer than that.
- Typical length:

Introduction	10%
Literature Review	20%
Method	15%
Body	45%
Conclusion	10%
TOTAL	100%
Appendices	User defined

YOUR MOST IMPORTANT TASK DURING WRITING IS TO WRITE WITH YOUR EXTERNAL REVIEWER / EXAMINER IN MIND



Simplicity

Keep your writing style simple and easy to understand ..

> Contrary to the expectations of many people, the idea is not to try impress your reader by sounding 'academic', 'weighty' or 'intellectual'. The idea is to get your thoughts, arguments and evidence across to the reader as clearly and painlessly as possible. Consequently, simple writing is more effective than complicated writing. Academics know that it is difficult to hide behind simplicity. They also know that it is easy to hide behind convoluted sentences, complicated phrases and long rambling paragraphs. To avoid giving the impression that you are trying to hide something, make whatever you're trying to get across *clear*.

(Hofstee 2006, p. 187)

Some more tips…

- explain the complicated
- say only what is necessary: don't explain the obvious, don't pump up minor arguments
- be careful with too much technical jargon: introduce all abbreviations
- avoid indeterminate language («it seems that…», «.. is becoming a big issue») and personal impressions («I felt»)
- Use active voice instead of passive: *A hit B* describes the event more concisely than *B was hit by A.*
- Using «I» and «we» makes reading easier (ask your supervisor if he agrees with it)
  - If you use passive language instead of "I" and "we" make sure it becomes clear who is meant ("the authors …", "it has been shown …")
- avoid absolutes («never », «completely», «must») unless proved

following (Hofstee 2006, p. 189)

Proof-reading and editing

- Checklist for proof-reading:
  - check that the structure is consistent
  - check the «flow» of your paper: do arguments follow each other naturally?
  - check formalities: general formatting, table of contents/figures/tables, …
  - check grammar and spelling