Hasso Plattner Institut
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In-Memory Technology for Life Sciences
Scientific Working/Writing/Presenting

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April 9, 2014

Agenda

- Scientific Working
- Scientific Writing
- Scientific Presenting

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- **Scientific Working**
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Aims of Research

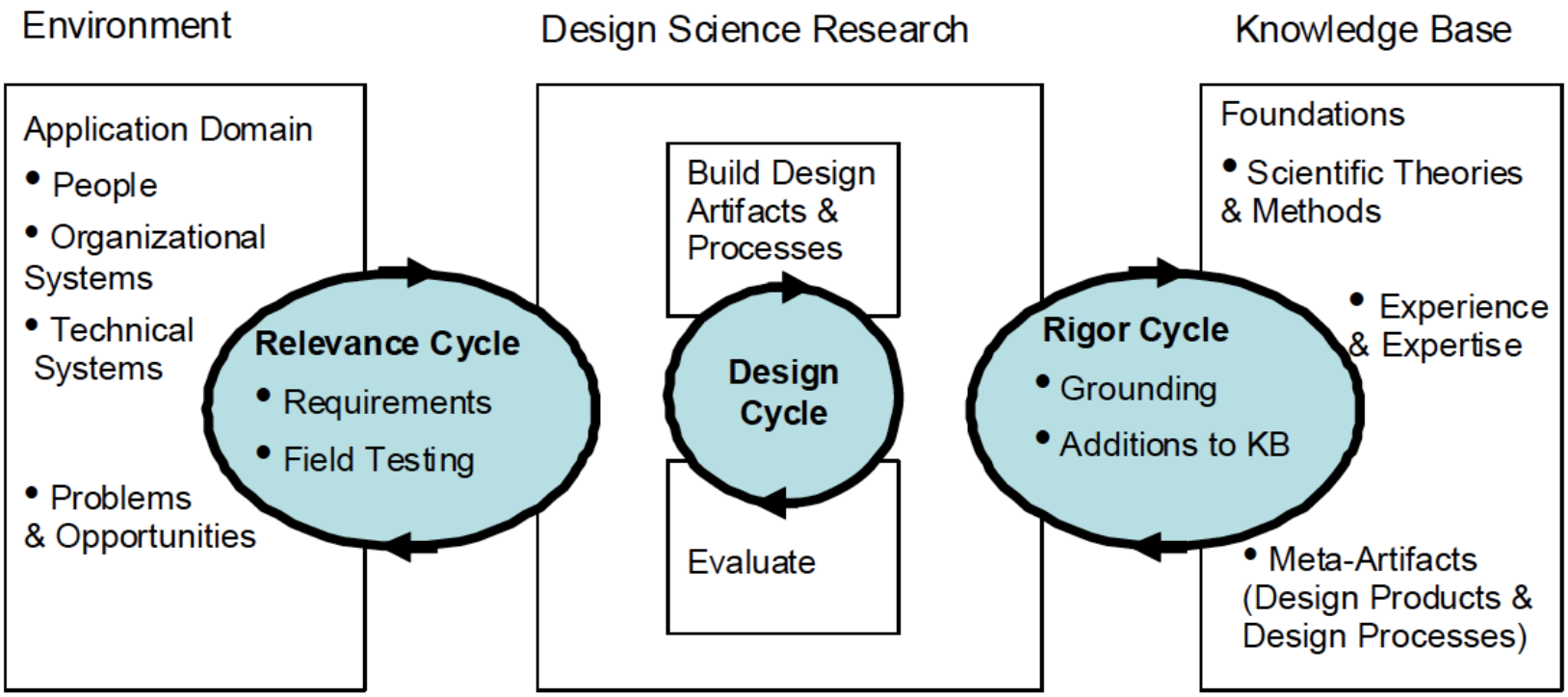
- Extend knowledge of mankind
  - Identify a problem that has not been solved yet
  - Formulate the problem or a question
  - Solve the problem/answer the question
- Have an overview of existing approaches, literature, and related issues
- Organize your arguments and results to be
  - Short,
  - Profound, and
  - Expressive

Feynman's Algorithm for Problem Solving

1. Write down the problem.
2. Think very hard.
3. Write down the solution.

Design Science

- Proactive approach
- Development of new IT solutions
- Creation and evaluation of models, methods, systems



http://www.wedesignict.org/?q=DSR

Hints for Literature Review

- Search for publications in online archives
  - IEEE: http://www.computer.org
  - ACM: http://www.acm.org
  - Google Scholar: http://scholar.google.com
  - Citeseer: http://citeseer.ist.psu.edu/
  - Uni Potsdam Library: http://info.ub.uni-potsdam.de/
- Identify relevant literature (Journals, Proceedings, …)
  - Backward search – Whom does the current paper cite?
  - Forward search – Who cites the current paper?
- Subscribe to mailing lists

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Types of Scientific Publications

- Methodical paper: new algorithms, systems, etc.
- Review paper: short description of current status of a research area (status quo)
- Concepts paper: new ideas, theories etc. without concrete realization
- Evaluation paper: quantitative comparison of different approaches
- Technical Report: Notification of current status of an approach within organization, usually no review

Writing Procedure

- Every paper tells a story
  - What: What you want to find, the problem being solved
  - Why: Purpose and justification
  - How: Your approach
- Write for reader, not for yourself!
- Plan your document with a clear structure
- Create an outline with bullet points
- Discuss your outline with other persons
  - Remove redundancies
  - Add missing information

Example Structures of a Paper

- Title
- Abstract
- Introduction
- (Background)
- Related Work
- Methods/Main Part
- Conclusion
- References

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Abstract

- Reflects the main story of the research paper
- Calls attention
- Short and concise sentences
- Narrow your focus
  - Scope – What is the general context?
  - Problem – What is the problem?
  - Significance – Why is it a problem?
  - Solution – How do I solve it?
  - Evaluation – Does my solution fulfill expectations?

Introduction

- Structure of abstract also applicable here in more detail
- Introduces the topic and defines the terminology
- Indicates the focus of the paper and research objectives
- First paragraph important: Reader decides here to continue reading or not!
- What is the problem you specifically consider
- Do not present your results here
- Last paragraph outlines the structure of the paper

Related Work

- Purpose: help understanding the field and the problem
- What is outside – Compare your work with the state of the art
- Strategies of the different approaches
- Where are their strengths and weaknesses
- How do we address potential shortcomings? (Contribution!)
- Useful instrument: Comparison table with your important criteria

	Approach A	Approach B	Approach C	Approach D	Our Approach
Criteria 1	x	x	-	x	x
Criteria 2	x	-	-	x	x
Criteria 3	x	x	x	x	x
Criteria 4	-	-	x	-	x

Main Part

- Use simple(st) and consistent examples to explain methodology
- Conceptual part, e.g. particular algorithm
- Implementation part – Architectural aspects of your prototype
- Benchmarks with setup (data and experiments) and results (what have we observed?)
- Evaluation – What are the reasons for our observations?
- Discussion – What do these findings mean for our approach?

Conclusion

- NOT a summary - Sum up your findings, not what you have done
- Answer research questions/objectives
- State the importance of discovery and future implications
- Strong statements should be made (avoid “it may be concluded…”)

Figures

- Good figures can make a paper come alive
- Good figures communicate ideas, patterns in the data better than big tables of numbers
- Choose reasonable captions
- Be aware of printing resolutions
- Prefer shadings over colors

Tables

- Same with Figures: Choose reasonable captions
- Captions should not be too long
- Explain content in the text
- If some content is not worth explaining → do not put it in the table

Footnotes

- NOT for parenthetical comments - Important things must be in the text
- Footnotes should be used for things that the typical reader genuinely can skip
- Footnotes stop readers, so better try to avoid

Citing

- Direct speech
  - “With method … we achieve …”
  - X claims he “… has developed a methodology …”
- Indirect speech
  - X has developed a method …
- Reference is not a subject of sentence – List it at the end of sentence

General Writing Hints (1/2)

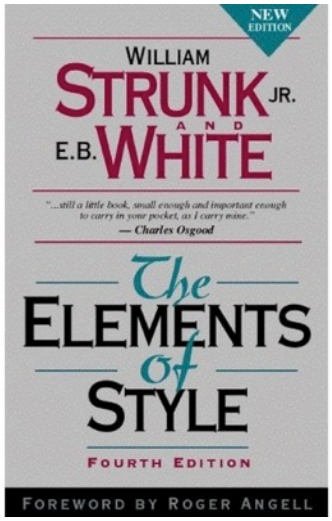
- Use active and present tense
- Try to keep sentences short
- Avoid (self) assessments - “groundbreaking”, “good”,…
- Avoid vague statements - “possibly/probably”, …
- Do not use “one”
- Do not describe circumstances - “after eight hours we realized …”
- Avoid technical jargon whenever possible
- That and which: If you can put a comma before it, use which
- Choose the way of your parenthesis according to importance
  - Important: Comma
  - Good to know: Hyphen
  - Actually not important at all: Braces (avoid these!)

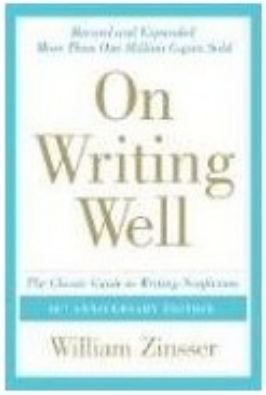
General Writing Hints (2/2)

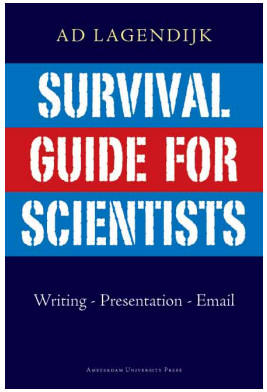
- Absolute statements: Always relate to units
- Consistent spelling throughout the text, i.e. American vs. British English
- Think about what to highlight: no exclamation marks, use italic
- Do not continuously refer to earlier pages
- Add paragraphs between section headline and first subsection

Useful Links for Writing/Additional Reading

- Academic Phrasebank: http://www.phrasebank.manchester.ac.uk/
- The Purdue Online Writing Lab - http://owl.english.purdue.edu/
- Ad Lagendijk: Survival Guide for Scientists: Writing - Presentation – Email
- ftp://fast.cs.utah.edu/pub/writing-papers.ps
- http://www.itc.nl/library/Papers/hengl_rules.pdf
- http://www-net.cs.umass.edu/kurose/talks/top_10_tips_for_writing_a_paper.ppt
- http://www.cs.columbia.edu/~hgs/etc/writing-style.html
- http://www.phrasebank.manchester.ac.uk/sources.htm







Before Submitting - Checklist

- Are headlines uniformly formatted, e.g. capitalized?
- Are proper tenses and voices used?
- Are all equations mathematically correct and explained in the text?
- Are all abbreviations explained/introduced?
- Are all figures/tables relevant and of good quality?
- Are all figures, tables, and equations listed and mentioned in the text?
- Are all references relevant, up to date and accessible?
- Are the references structured in a uniform format?

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Scientific Presenting

- Do not under- and overestimate your audience
- Know your topic and background
- Paper structure vs. presentation structure
- Prepare your presentation

→ Part of grading