

REAL-TIME VALUE DELIVERY IN SOFTWARE ENGINEERING

SEMINAR 58314109 (3 CR) - SPRING 2014

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AGENDA TODAY

- Goals
- Guidelines for Scientific Writing
- Discussion



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GOALS OF THE SEMINAR

- Written Scientific Communication
 - Uses exact and understandable language according to the scientific convention and solid argumentation without unnecessary reliance on the source materials
 - Produces independently a well-formed and finished written report that concentrates on the essential with proper emphasis.
 - Can use versatile search strategies and databases when acquiring information
 - Evaluates published information and its significance in the field critically
 - Is familiar with ethical and professional conduct within the scientific community
- Oral Scientific Communication
 - Next week



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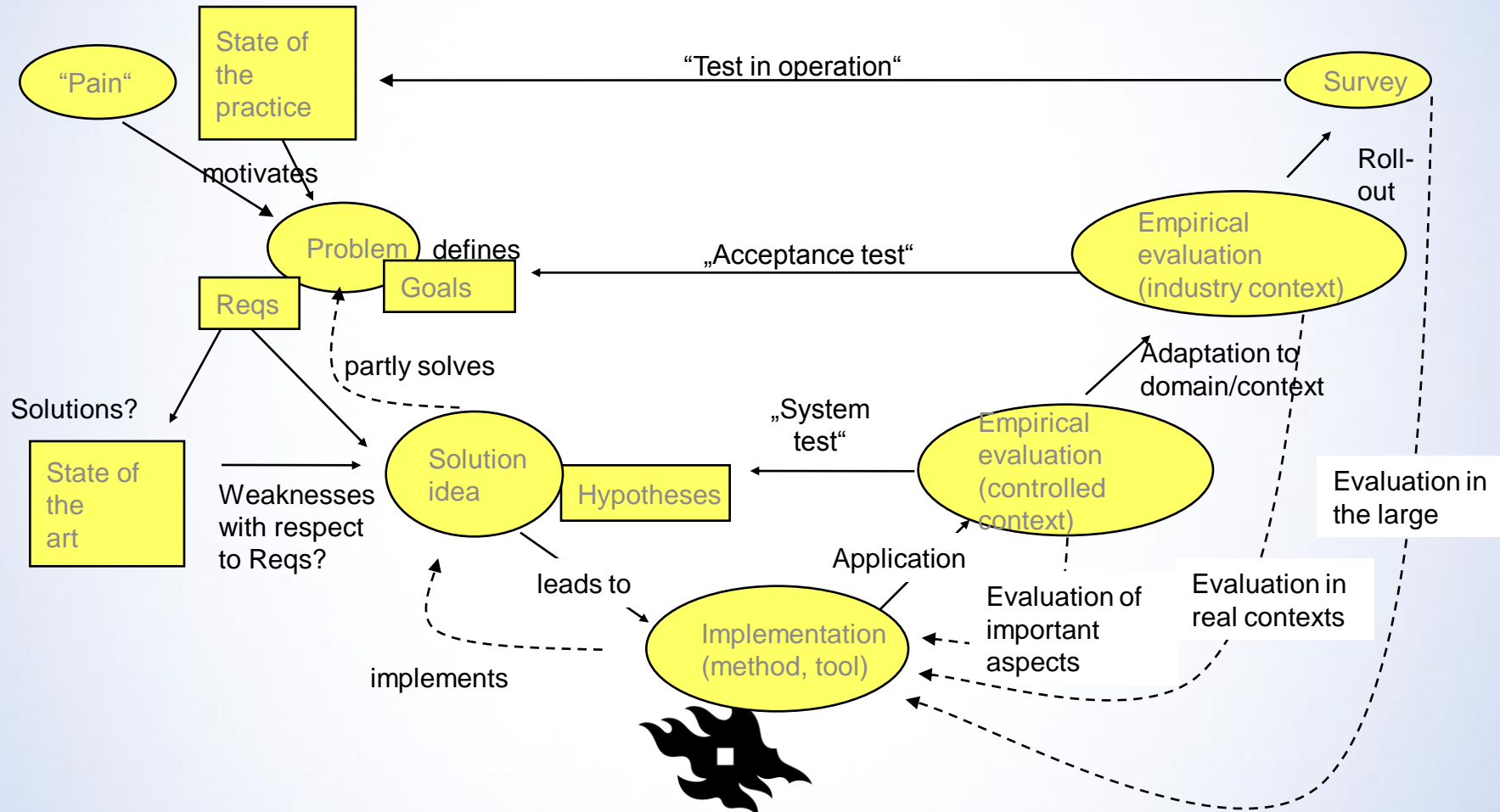
MAIN GOAL

Learn to solve and document a scientific software/systems engineering problem by oneself and independently



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SCIENTIFIC STRUCTURE



PROBLEM (1)

- Finding the right problem is highly important
 - Parnas: “Successful Software Engineering Research”
 - Problem should stem from practice (this requires an understanding of problems of practitioners) in software and systems engineering (i.e., in applied research fields)
 - The problem needs to be confirmed by practitioners
 - The problem should address an underlying research question (not only an implementation issue)
- Identifying the problem
 - Problems can be found in the “open research questions” sections of papers
 - Empirical observations typically reveal a lot of problems
 - Asking experts can help to identify problems
 - Getting feedback from practitioners/researchers is important



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PROBLEM (2)

- Problem needs to be described in a straightforward, easy to grasp, and plain-spoken way
 - A broader audience should understand the description
 - The description should be precise and short
 - The description should be reviewed by persons not familiar with the topic
- The description of the motivation is important!
 - Problem in a larger context (indirect effects)
 - Problem in a narrow context (direct)
- Typical danger:
 - Scope too wide
 - Scientific theses are narrow and deep, e.g., master/PhD thesis
Exceptions might be habilitation, magazine articles, broad literature reviews



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FROM THE PROBLEM TO THE APPROACH

- Analyze state of the practice
 - E.g., with a survey or interview study
- Specify problem and goals
 - Refine problem into subproblems and derive testable requirements for a solution (sometimes from different perspectives), refine goal into subgoals
- Analyze state of the art
 - Systematic study with clear focus and scope (i.e., a systematic literature review)
 - Describe related approaches in an understandable and comparable way
 - Assess related approaches with respect to the requirements
- State hypotheses
 - I.e., the developed method is better than ... with respect to ... in the context of ...
- Derive solution idea



THE WAY TO THE SOLUTION IDEA

		Goal 1				Goal 2			Goal 3			
Research approaches		Req 1.1	Req 1.2	Req 1.3	Req 1.4	Req 2.1	Req 2.2	Req 2.3	Req 3.1	Req 3.2	Req 3.3	Req 3.4
A	A1	-	-	-	-	0	0	0	+	+	+	+
	A2	+	+	+	+	-	-	-	0	0	0	0
	A3	-	-	-	-	+	+	+	-	-	-	-
B	B1	+	0	-	+	-	-	+	-	-	-	+
	B2	-	-	+	-	+	-	-	0	+	0	-
	B3	-	+	-	-	-	+	-	+	0	+	-
C	C1	-	-	-	-	-	-	-	+	-	0	-
	C2	+	+	+	+	0	-	0	-	?	-	+
D	C3	-	?	0	-	Approaches can not be assessed with respect to this goal			?	?	-	-
	C4	-	-	?	?				0	?	?	?

A → Combination of approaches
 B → New technique (partial reuse)
 C → Extension of a technique



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D → Evaluation of techniques
 E → Combination of A-D

SOLUTION IDEA AND APPROACH

- Should have a scientific basis
 - Theory $\geq 25\%$
- Should be defined in such a way that it can be evaluated
 - Evaluation $\geq 25\%$
- Should be unique in the sense that no similar solution exists already
- Should make use of working environment and networks
 - Use competencies of the research group or organization
 - Align work with higher-level research roadmaps
 - Align with research and/or industry projects
 - Discuss in the respective research community



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EVALUATION

- Validation against requirements
- Empirical evaluation against hypothesis:
 - (Existence proof)
 - Controlled experiment
 - Case study
 - (Simulation)
 - Series of studies
- Definition of sound empirical studies
 - Books by Wohlin, Runeson, Juristo



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REVIEW CRITERIA

- P (Problem)
 - Is it a real problem?
 - Is it seen as such by practitioners?
 - Is it quantitatively verifiable?
- I (Idea)
 - Is the core idea recognizable?
 - Is the scope appropriate?
 - Is it plausible and justified according to the state of the art?
 - Are the goals and hypotheses quantitatively measurable and can they be evaluated?
 - Are the goals and hypothesis related to the problem?
- B (Benefits)
 - Are the benefits for practitioners (perhaps with different perspectives) clear?
 - Are the scientific contributions clear?



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WRITING GOOD SOFTWARE ENGINEERING RESEARCH PAPERS

- Precise description of the goal
 - Which question do you answer?
 - What is your research goal
 - What larger question does this address
- What is your new result?
 - New knowledge & where/how to use it
 - Relation to previous work
 - Difference to previous work
 - What precisely, in detail, is the new result
 - **What research method did you apply to create/evaluate the result?**
- Why should the reader believe you?
 - How to evaluate the result?
 - What evidence shows that your research result satisfies your claim?



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LOGICAL STRUCTURE FOR THE ARTICLE

- Introduction
- Background
- Related Work
- Research Method
- Approach
- Evaluation
- Limitations
- Conclusions
- Summary
- Future Work



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REFEREEING SCIENTIFIC PAPERS

- Refereeing, peer review of the work of others, is central to scientific publishing
- Referees help the field of science and eases the burden of readers
 - Ensuring the quality of publications
 - Filtering out inessential research material
 - Feedback and review comments to the authors
 - Different viewpoints and publication recommendations for the editor
 - Good referees critical but open-minded as well



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REFEREE GUIDELINES

- Reviews should start with a short, few sentence, summary of the work
- Referees are to evaluate the scientific content and its relevance as well as the presentation style of the publication
- Research methods should comply with sound scientific principles
- Relation to previous work to be shown
- Scientific writing style, well written and error-free text
- Title and abstract precise and matching the content of the publication
- Citations properly used and in place, text not borrowed from others



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PREPARATION FOR NEXT WEEK

- Read
 - <http://www.st.cs.uni-saarland.de/zeller/GoodTalk.pdf>
- Find a topic for the seminar



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LITERATURE: SCIENTIFIC WRITING

- Mary Shaw: [Writing Good Software Engineering Research Papers](#), International Conference on Software Engineering, 2003
- Melinda Kramer, Glenn Leggett, C. David Mead, Prentice Hall [Handbook for Writers](#), Prentice Hall, 0-13-149618-2, 1995.
- Lyn Dupre, [Bugs in Writing](#), Addison Wesley Publishing Company, ISBN 0-201-60019-6, 1995
- Mike Markel, [Writing in the Technical Fields](#). A Step-by-Step Guide for Engineers, Scientists, and Technicians, IEEE Computer Society, New York 1994.
- Elements of Style, <http://www.bartleby.com/141/>



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LITERATURE

- David Lorge Parnas: [Successful Software Engineering Research](#), ACM SIGSOFT Software Engineering Notes, Vol. 23, No. 3
- B. Kitchenham, S. Charters, Guidelines for Performing [Systematic Literature Reviews in Software Engineering](#), Technical Report EBSE-2007-01, School of Computer Science and Mathematics, Keele University, 2007.
- A. J. Smith: [The Task of the Referee](#), Computer, Vol. 23, No. 3, 1990, pp. 65-71.



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