Agile and Lean in Safety-critical Software Development

XP2013 PhD Symposium, Wien
June 3th, 2013

MÄLARDALEN UNIVERSITY
SWEDEN

Etteplan 30 1983–2013

About Myself

- +12 year industrial experience of software development projects
- Industrial PhD Student
  - employed by Etteplan
  - Finnish company
- Advisors from Mälardalen University, Västerås
  - Sasikumar Punnekkat
  - Stig Larsson

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The world is full of challenges

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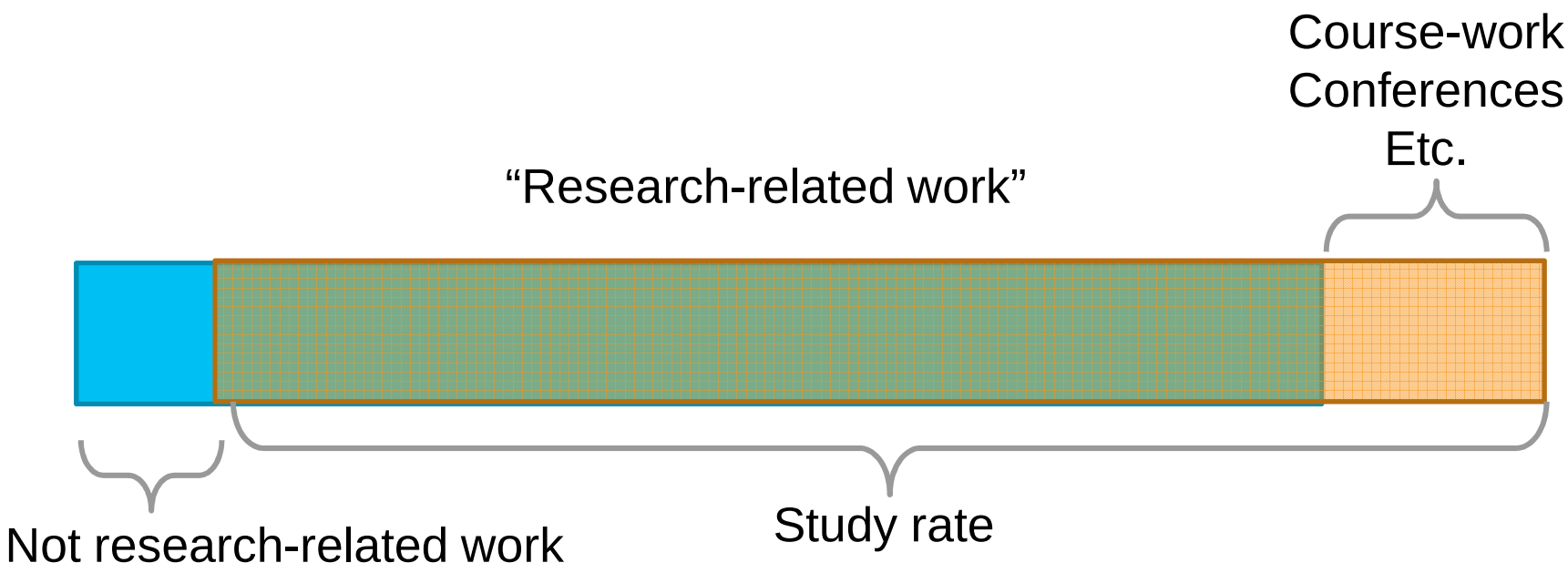
Challenge #1: Being an “Industrial PhD”

Company	Academia
Earn money Find improvements	Scientific contribution Papers, papers and papers



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Our customers' challenges

Our customers' customers want

More intelligent / automated solutions

More complex software

Safe products

Must fulfill international standards

Increased development time and cost

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Why not look at Agile and Lean?

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Agile and Lean promises

Shorter time to market

Managing change better

Higher productivity

Less documentation

Team satisfaction

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Overall research question

- How can **agile** **and** **lean thinking** improve the efficiency of developing **software for safety-critical systems**?
  - Which benefits?
  - Which barriers?
    - How can we overcome them?
- Constraints:
  - Under current regulations
  - In context X (domain)

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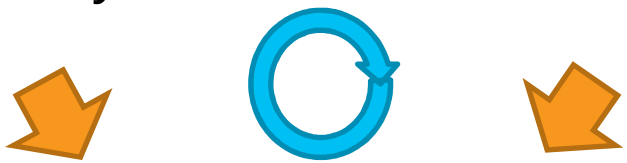
Research approach

A. What is the problem?

- The standards?
- The current way of working?

B. What is the potential solution?

- What is Lean Sw. dev?



C. What happens when we combine them?

- Adapted safety development life-cycle models?
- Empirical evidence

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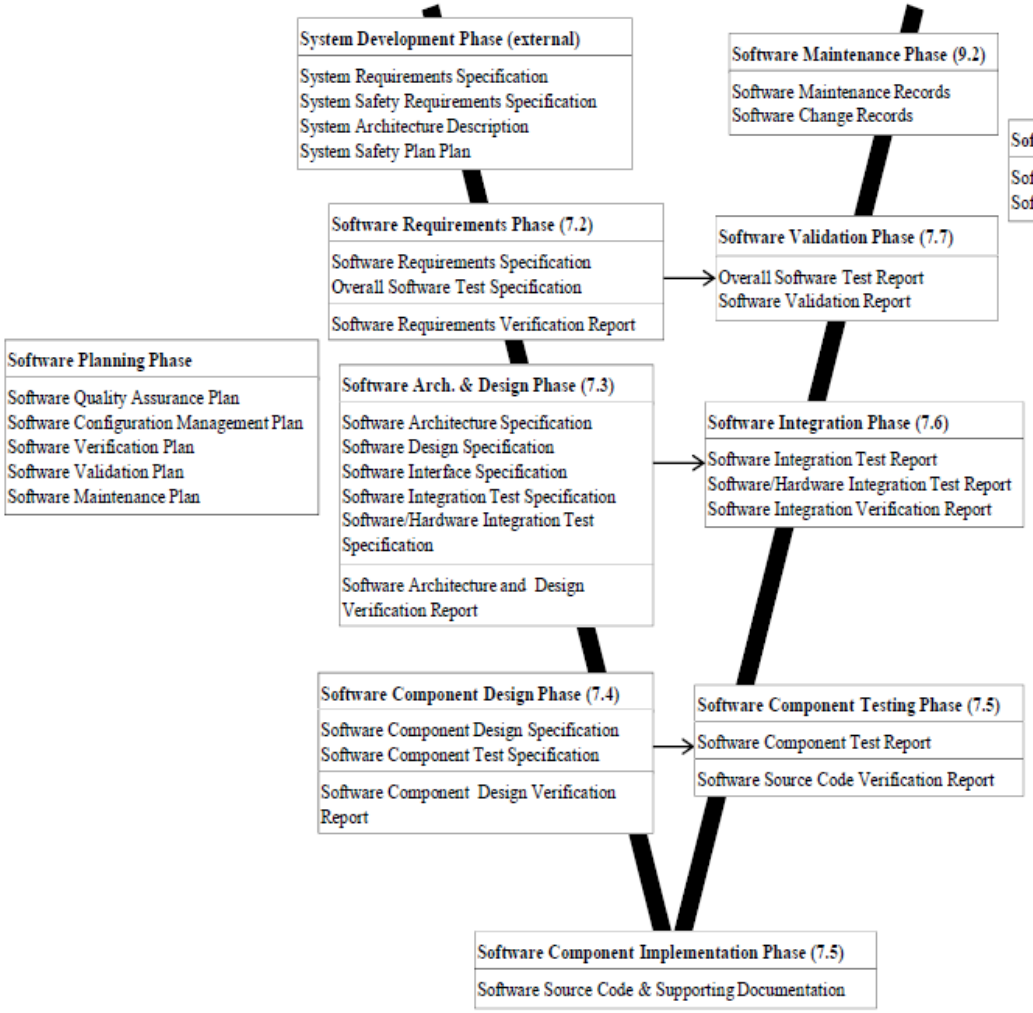
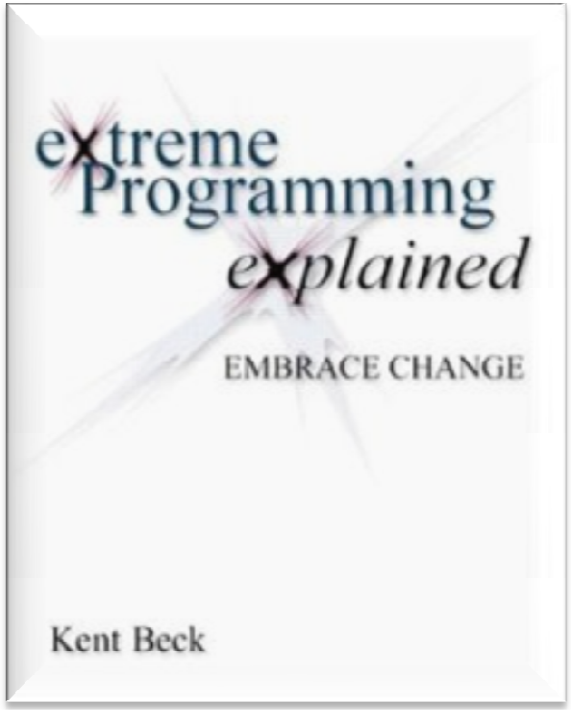
A. The problem: Current standards?





EN 50128 for Railway

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Extreme Programming (XP) vs EN 50128

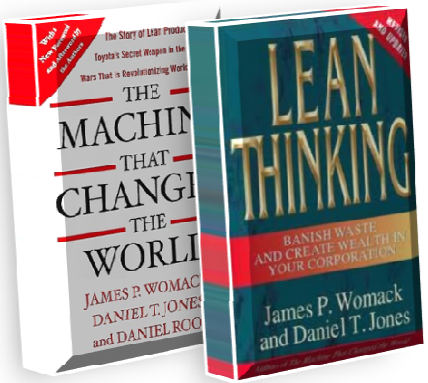
- Both **supporting** and **conflicting** features
- XP does not address all
  - planning,
  - hazard/risk analysis,
  - documentation,
  - verification and validation activities

B. The solution? Lean?

- Larger improvement framework
- Starts from existing process
  - Thinking, then Doing
  - Quality focus all the time
  - Visualize and optimize flow
  - Eliminate waste to increase productivity

- But how to define it for, and apply it to, software development?
  - Systematic Literature Review

Seminal Lean Sources Identified



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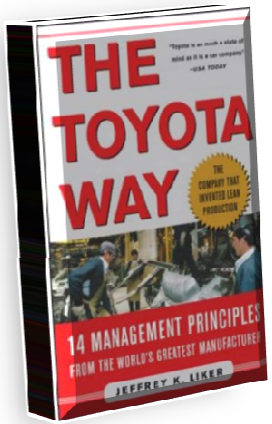

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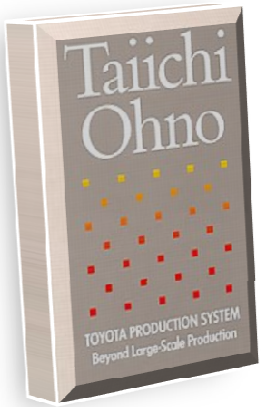

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Lean production in general

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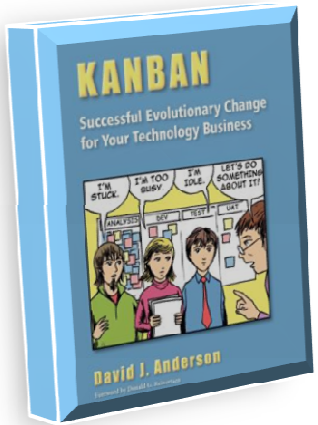

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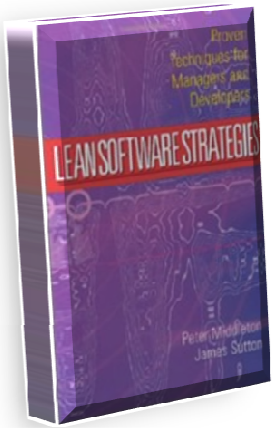

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Lean software development

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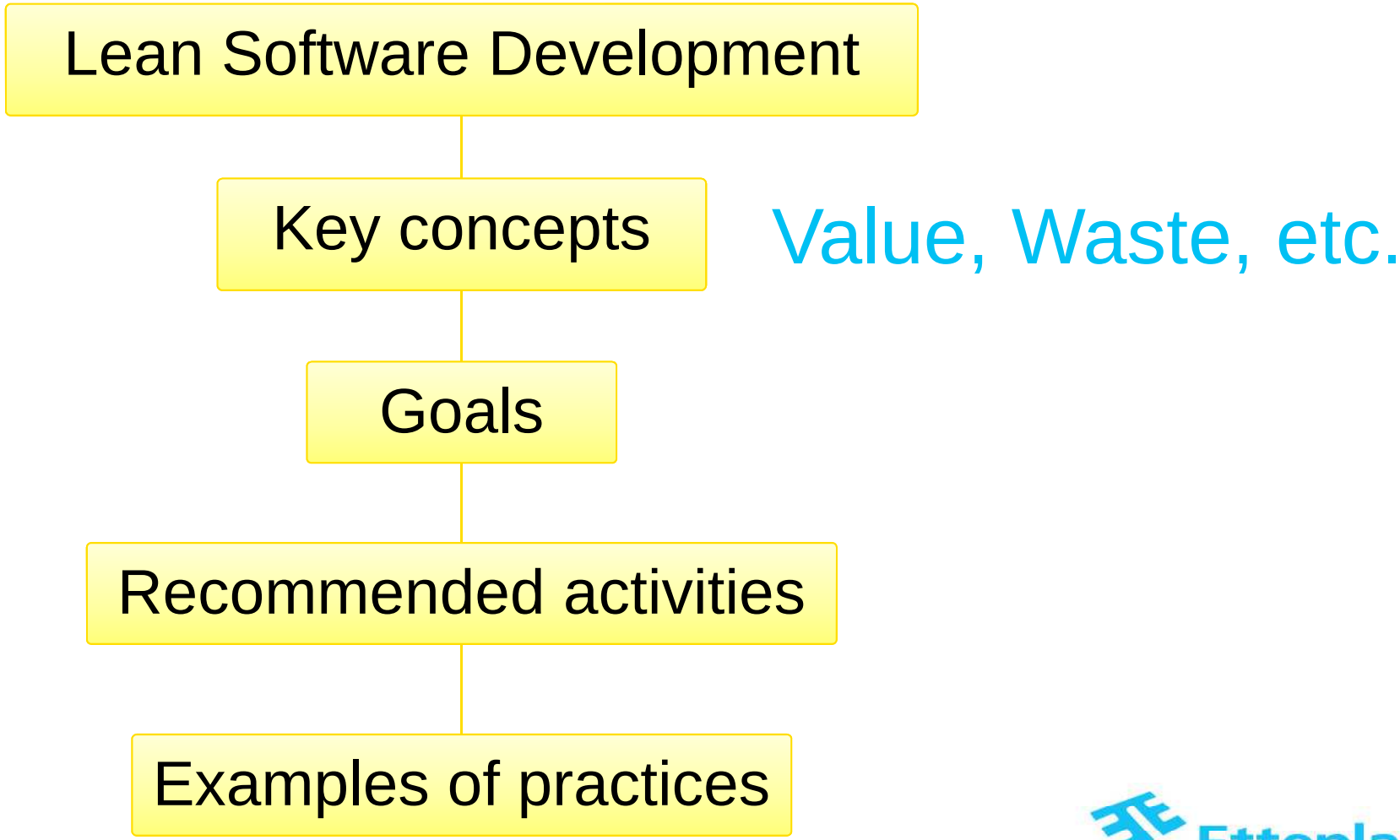
2nd paper: A comprehensive framework for Lean software development



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A. The problem: Current way of working

- Paper C: Which waste can observed by looking at assessment data?
- Analysis of reports from audits

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C. Upcoming research

- Empirical investigations
- Application of selected agile and lean principles and practices
- In the safety-critical software domain
- Solve real-world problems
- Contribute to “general knowledge”

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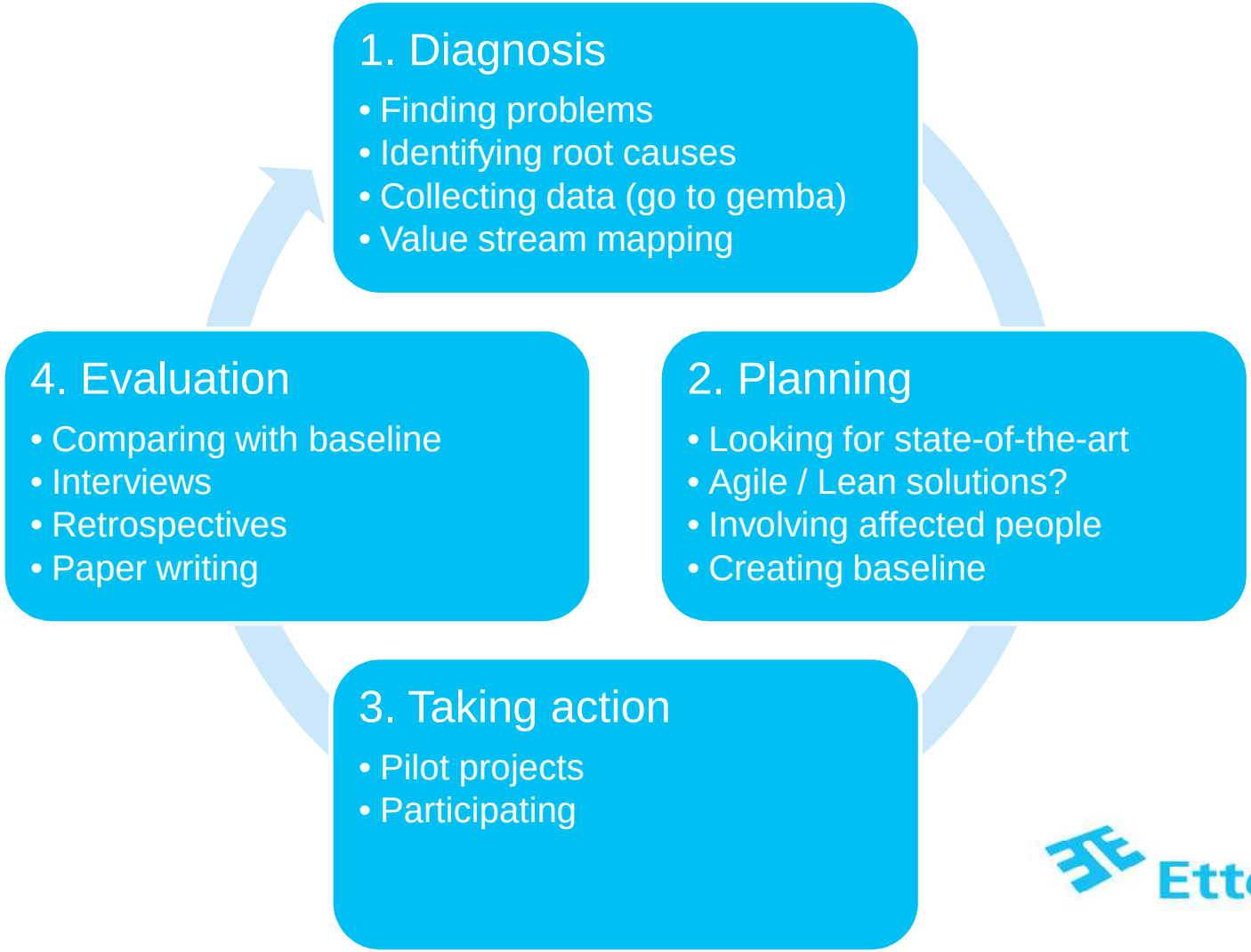
Participatory Action Research – Applying Lean A3 problem solving as research?



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Research Challenge Summary

- Getting time for research
- Combining complex software with safety
- Developing safe software efficiently
- Applying agile and lean in regulated environments
- Defining Lean software development
- Performing research at work

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Thanks for listening!

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