Turun yliopisto
University of Turku

Business and Innovation Development BID

Agile in Embedded: Mission Accomplished?

Turku Agile Day – 15.5.2013

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Who we are?

Agile and embedded systems,
piece of cake, right?

So... Is the mission accomplished?

What are the next steps?

Challenge us!

We challenge you to think and discuss!

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Speakers

- Ville Rantala
  - D.Sc.(Tech.), Senior Research Fellow*
  - Hardware design

- Tuomas Mäkilä
  - D.Sc.(Tech.), Senior Research Fellow*
  - Software engineering

* In Finnish: Vanhempi tutkimuskamunen

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Project: AgiES

- Two-year, TEKES-funded research project.
- Agile methods for embedded systems development.
  - Improving efficiency and well-being at work.
- University of Turku, Finnish Institute of Occupational Health.
- BA Group, FiSMA, Lindorff, Neoxen Systems, Nextfour Group, Nordic ID, ST-Ericsson.

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Embedded Systems?

Systems consisting of
software, **hardware** and **mechanics**.

Challenges in Embedded Agile

Multi-viewpoint development beyond software engineering.

- Hardware, electronics, FPGA, mechanics...
- Added restrictions and limitations.

Are these the essential challenges?

Safety-criticality and authoritative regulations.

- Forcing into waterfall.
- Real-time requirements.
- Traceability.

Are we missing some challenges?

Agile Principles in Embedded Systems Development

Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.

Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.

Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.

Working software is the primary measure of progress.

Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.

The best architectures, requirements, and designs emerge from self-organizing teams.

?

At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.

Business people and developers must work together daily throughout the project.

Continuous attention to technical excellence and good design enhances agility.

Simplicity--the art of maximizing the amount of work not done--is essential.

Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.

Is this analysis relevant?

Four Real-life Impediments to Embedded Agile

1. Chicken or egg dilemma
2. Unaligned gears
3. Apples and oranges
4. Software black box

..to begin with..

1. Chicken or Egg Dilemma

Hardware is needed to write the software.

Software is needed to test the hardware.

- Usually software team can begin the work only after the first proto-boards are ready
- Hardware team has to wait for the software before they can begin the testing

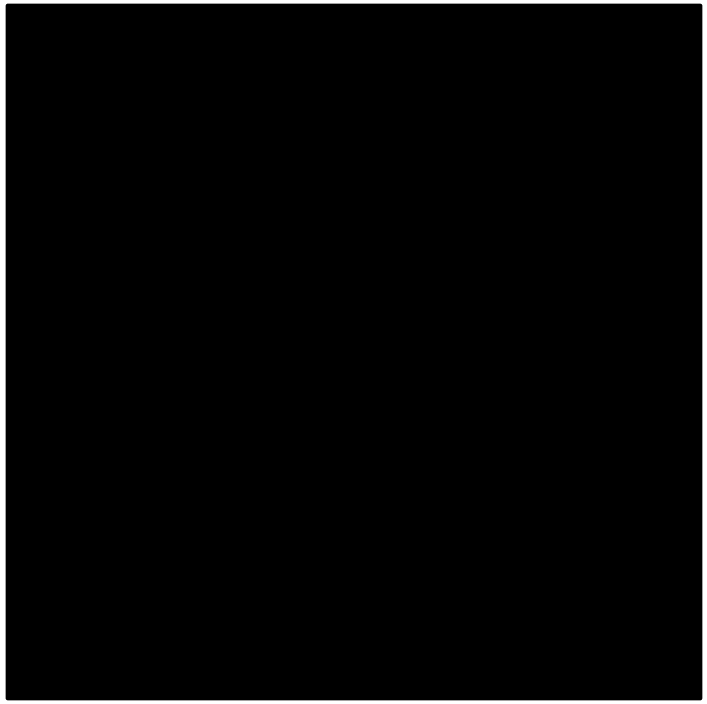
2. Unaligned Gears

3. Apples and Oranges

Hardware and software engineers have different work methods and culture.

- Hardware engineers are more conservative, which leads to change resistance
- Software engineers are more "artistic", which leads to wrong kind of self-organization

4. Software Black Box



BONUS. Cultural Shock

*Many embedded systems companies haven't **really** thought about using agile methods .*

Do the impediments sound familiar?

What is the most difficult impediment?

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What has been Done?

Agile methods for embedded software development.

- Taking into account the restrictions and limitations of multi-viewpoint development.
- "Hardware and mechanics are as they are and software adapts itself."

Do you know embedded agile cases?

AgiES: Literature Review

Agile methods and Embedded systems.

- What is currently known?
- Are agile methods suitable?
- Evidence to support the findings?

Review on academic and non-academic publications on agile and lean methods for embedded systems development.

AgiES: Literature Review - Results

Research is scattered and isolated and mainly driven by industry reports.

Nothing prevents the utilization of agile methods in embedded systems development.

- Existing methods should not be followed dogmatically.
- Some modified methods have been presented.

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What Needs to be Done?

Agile practices for development of "the rigid parts".

- Practices for hardware and mechanics development.
- Handling the safety-critical and authority regulated requirements in agile development.
- Orchestrating distributed development teams.

Early Findings

- Embedded systems companies, even the big ones, do not have fixed development methods or at least they are not followed.

- Agile methods have been already utilized in some form in many companies but the information is not shared.

Solutions

- Easy to use, clear guidelines for SME embedded systems companies.
  - AgiES Embedded Agile Handbook?
- Community for agile methods tailored for the embedded systems context.
- Hope to provide these to you in TAD'14 :)

What is your solution?

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Are these the essential challenges?

Are we missing some challenges?

Do the impediments sound familiar?

What is the most difficult impediment?

Do you know embedded agile cases?

What is your solution?

Does our work sound sane?

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Thank you!

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