Agile Hardware and Co-Design

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Agenda for today:
What is happening in R&D
Benefits of agile co-design
What enables agile co-design?
Advice to Agile/Scrum ceremonies

#1: Speed of Change
#2: Innovation accelerated by 360

#3: Software Development Changes
Benefits of Agile Hardware and Co-Design
• Avoiding the big surprises using Up-front Prototyping
Alternative: Cross-Disciplined Up-front prototyping:

“Experimenting, not validating”

What enables agile hw and co-design?

• Vertical slicing
• Cross disciplined Whole Team
• Customer team
• Economics of prototyping
• HW Unit Tests
Vertical Slicing

Think Big, Think Horizontal

Design for manuf.
Mechanics
PCB layout
Electronics/schematic

Vertical Slicing

Implement Small, Implement Vertical

Power and buses  Uncertain blocks  Full Solution  Optimize

Adapted from Doing Hard Time, Bruce Douglas
Serial in large, incremental in small

Demonstrate progress
Get and act on feedback

Proof of Concept  Architecture  Verify for Production

Schematics
3d models
Simulation
Bread board prototypes
Re-usable generic prototypes
Evaluation boards
Partial prototypes
FPGA
3d printers
Flexible Architecture

1. Identify and prioritize uncertainties

2. Deal with it:
   1. Use focused prototypes to buy uncertainty down
   2. Keep options and defer decisions
   3. Isolate uncertainty

Remember to learn from prototypes!
Cross-Disciplined Whole Team approach

Schematics
PCB layout
Mechanics
Industrial design
Supply chain
Industrialization
Launch
Software
Customer Team

Domain experts:
  Other disciplines
  Technical lead
  Novel technology provider
  EMC test lab
  Industrialization

No Free Prototypes?

[Diagram of the prototyping process with steps labeled: Design, Review, Manufacture, Prepare, Testing, Rework, Material, Labor]
(Imaginary) True Cost of Prototyping

Multiply of cost of labor day

Hardware Unit Tests
Hardware unit tests

> set led on
OK.
> start serial_port_test
(ctrl-c to quit)
Sent 1C, received 1C (100%);

Positive reinforcing loop of agile co-design

Innovating to bring testing and automation forward

Co-Design

Diminishing difference between disciplines

Up-Front Testing

Iterative Hardware

Reducing the ‘get it right the first time’ attitude
Tips for ceremonies
• Planning
• Daily Scrum
• Review

Planning

<table>
<thead>
<tr>
<th>Release Goal</th>
<th>Proof of Concept [technology]</th>
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<tbody>
<tr>
<td></td>
<td>* [technology] Prorotype w/ ceiling mounted relay</td>
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<tr>
<td>Acc. Criteria</td>
<td>Be able to start performance testing</td>
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<table>
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<th>Block diagram for ceiling mounted relay</th>
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<tr>
<td>Acc. Criteria: Draft (block diagram) to identify the job to be done.</td>
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<tr>
<th>Schematics of [technology]</th>
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<td>Acc. Criteria: Schematic enabling PCB work</td>
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Daily Scrum

- 3 pieces of information create agenda for latter part
- Find appropriate level of detail
- Creates shared sense of direction
Review

IKIWITI
Books

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Software plane: cyanocorax
Question marks: immrchriss
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