Extreme Manufacturing
Taking Scrum Back to its Roots

Hosts: Alex Brown, Jeff Sutherland
Presenter: Joe Justice

scruminc.: Who We Are

Scrum Inc. is the Agile leadership company of Dr. Jeff Sutherland, co-creator of Scrum. We are based in Cambridge, MA.

We maintain the Scrum methodology by:
• Capturing and codifying evolving best practices,
• Conducting original research on organizational behavior
• Adapting the methodology to an ever-expanding set of industries, processes and business challenges

We also help companies achieve the full benefits of Scrum through our full suite of support services:
• Training (Scrum Master, Product Owner, Agile Leadership, webinars, etc.)
• Consulting (linking Scrum and business strategy, customizing Scrum)
• Coaching (hands-on support to Scrum teams)
• Publishing and new content development

We run our services company using Scrum as the primary management framework, making us a living laboratory on the cutting edge of "Enterprise Scrum"

Find out more at www.scruminc.com.

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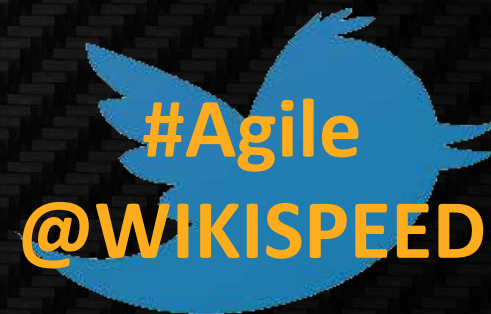# Wikispeed: Who We Are
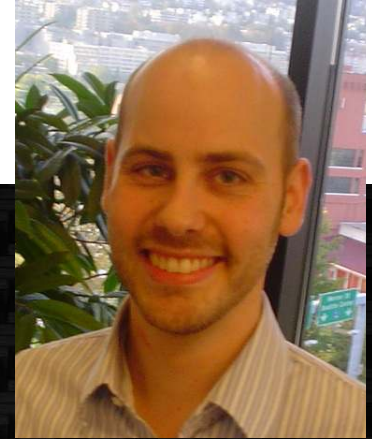
Joe Justice, Team Lead of Wikispeed
info@wikispeed.com

MY NEXT CAR GETS 100 MPG. U.S. EPA

WIKISPEED

158 IMPERIAL. 1.5 l / 100KM.

www.WIKISPEED.com

#Agile
@WIKISPEED

Agenda

- Motivation: the Team Wikispeed story

- What is Extreme Manufacturing? (XM)

- Why are these concepts important?

- Parting thought: the future of manufacturing

Wikispeed and the Automotive X-Prize

- Automotive X-Prize created in April 12 2007 with stated objective to build street legal car that:
  1. Achieved 100+ mpg fuel economy
  2. Produced less than 200 g/mi of CO_2 emissions
  3. Could be built for the mass market

- At the time, most efficient gas car only got 42mpg
  - Cars that achieved 100mpg existed…but were "bobsleds"

Astounding Results

- Wikispeed placed 10th in mainstream class, out of 136 competitors

- Developed lightest frame to ever receive a five-star crash equivalency rating (124lbs)

- Accomplished all of this in only 3 months with an all volunteer team!

Rapid Evolution of the Wikispeed Car

2009

2010

Only 3-months after team is formed, early version of Wikispeed car places 10th in mainstream class at Automotive X-Prize
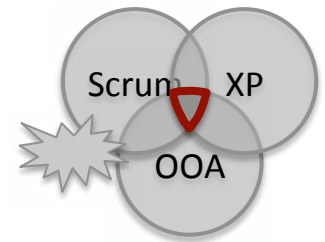

Enhanced version of Wikispeed car shown at Detroit Auto Show and featured on Discovery Channel

2011

2012

Production version of Wikispeed car commercially available for purchase

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How Wikispeed Did It: Extreme Manufacturing (XM)

Scrum   XP

OOA

I. Scrum Organization

a. Roles and Responsibilities
b. Sprints/Iterative Design
c. Make Work Visible
d. Measure Velocity
e. Continuous Improvement (Lean)

II. XP Engineering Principles

a. User Stories
b. Pairing and Swarming
c. Test Driven Development

"XM"

Morale is a multiplier for Velocity!

III. Object-Oriented Architecture

a. Modular Components
b. Contract-First Design
c. Design Patterns
d. Re-use and Inheritance

Scrum Organization:
Roles and Responsibilities
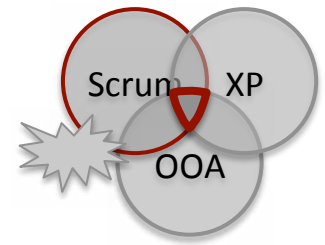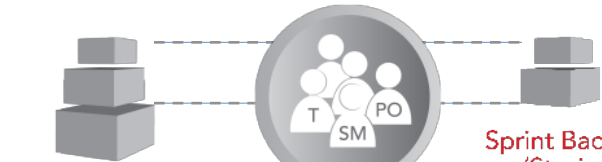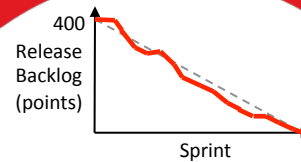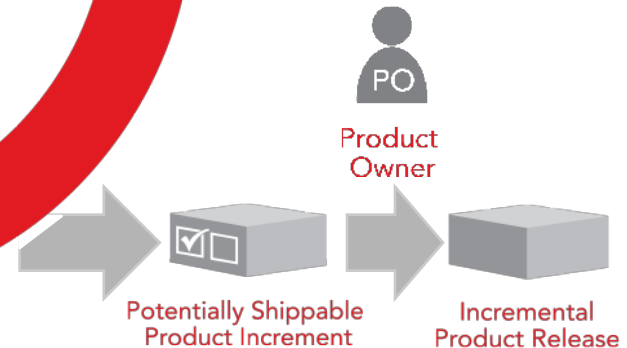
Scrum Organization:
Sprints and Iterative Design
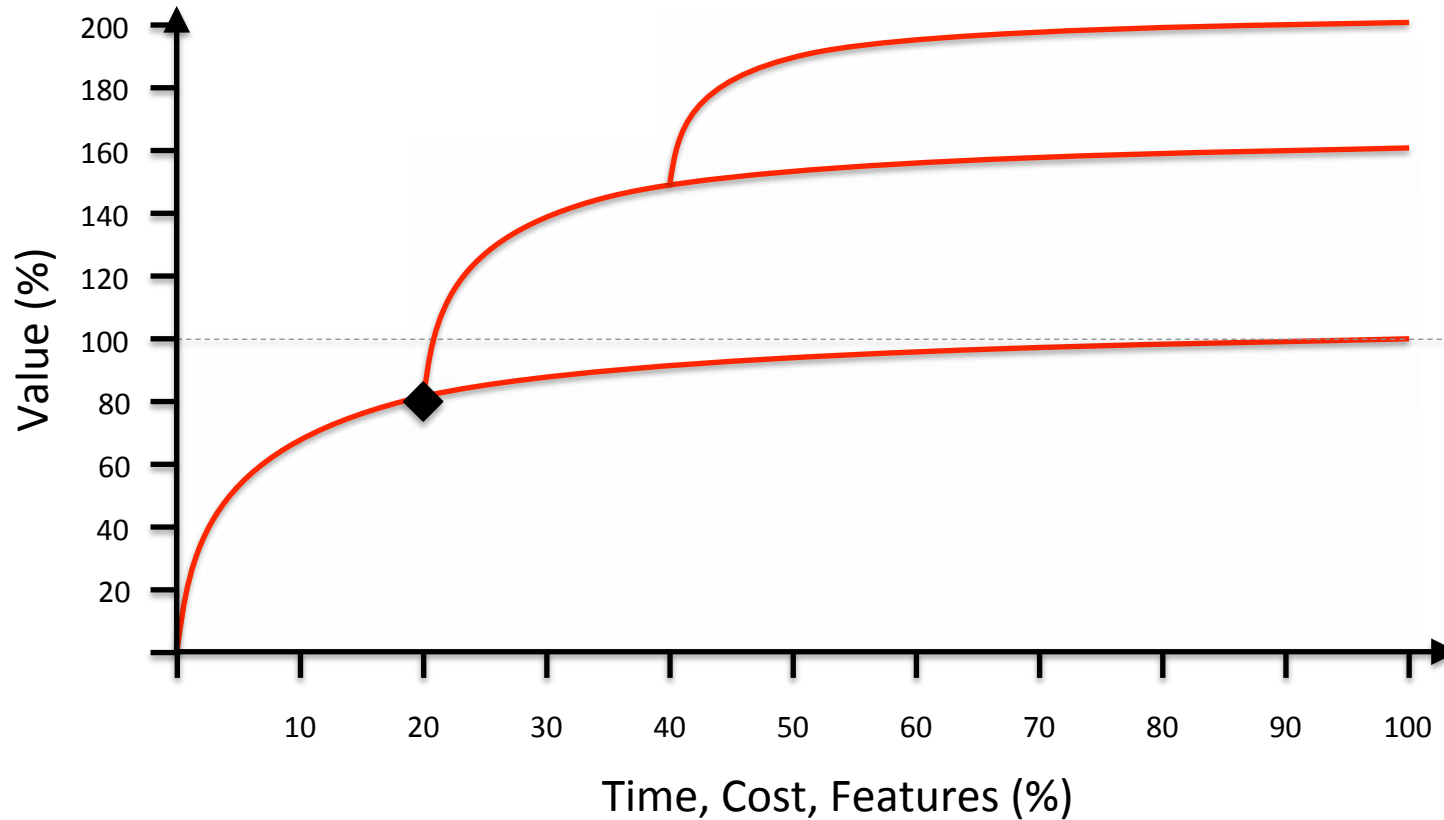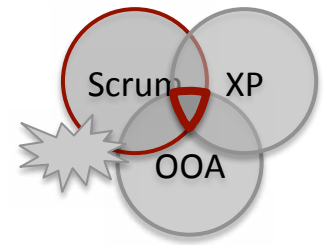
Scrum Organization:
Make Work Visible
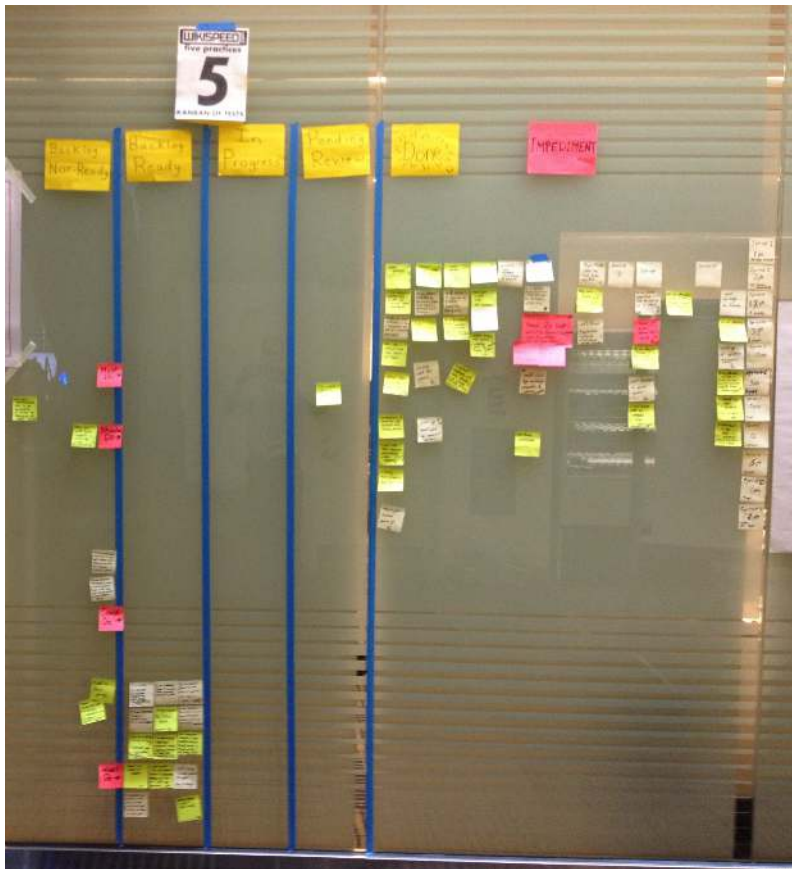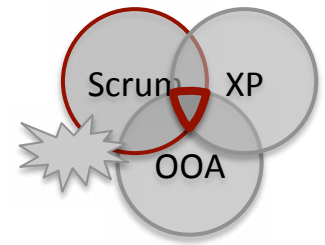
Visualizing workflow:
- Keeps the team aligned
- Allows them to make better decisions independently
- Avoids hidden delays
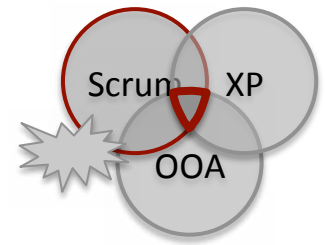
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Scrum Organization:
Continuous Improvement (Lean)

147_1.jpg

- Build time in to improve the <u>Process</u>, not just the <u>Product</u>

- Set up a process around minimizing the cost of change

- Always try to use less stuff

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XP Engineering Principles:
Pairing and Swarming
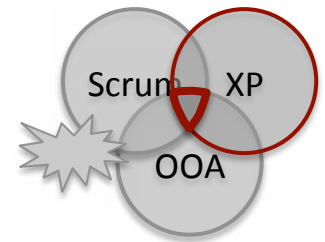
By working together, two colleagues….
- Build quality control into the process
- Share knowledge
- Collaborate to develop more creative solutions

XP Engineering Principles:
Test Driven Development (TDD)
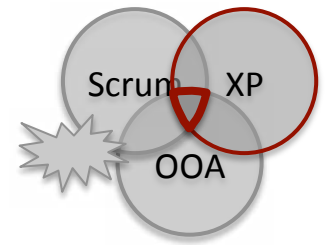
1. Before designing a part, specify the key performance attributes it needs to have, and a way to test them

2. Build the <u>minimum</u> amount needed to pass the tests

3. If needed, refine the design to make it more straightforward (while still passing all tests)
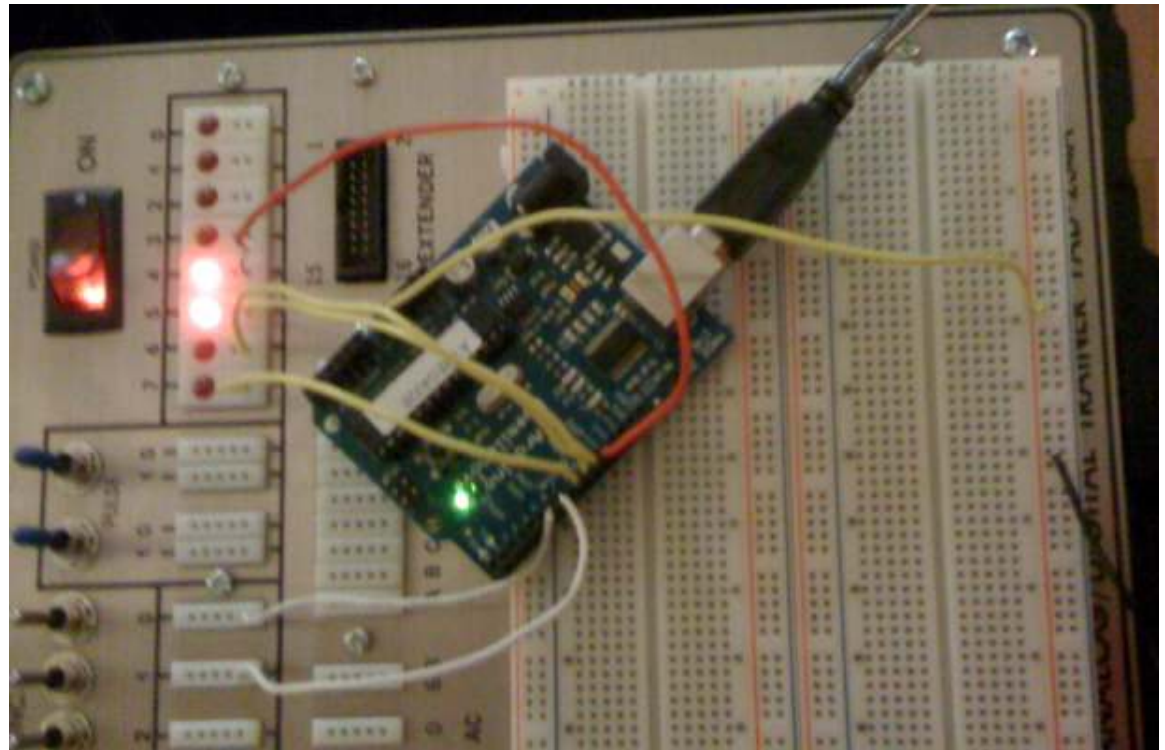
Object Oriented Architecture:
Modular Components

AEROSHELL

DRIVE TRAIN MODULE

INTERIOR MODULE

REAR CRUSH STRUCTURE

CHASSIS

PEDAL PLATE

SUSPENSION MODULE

FRONT CRUSH STRUCTURE

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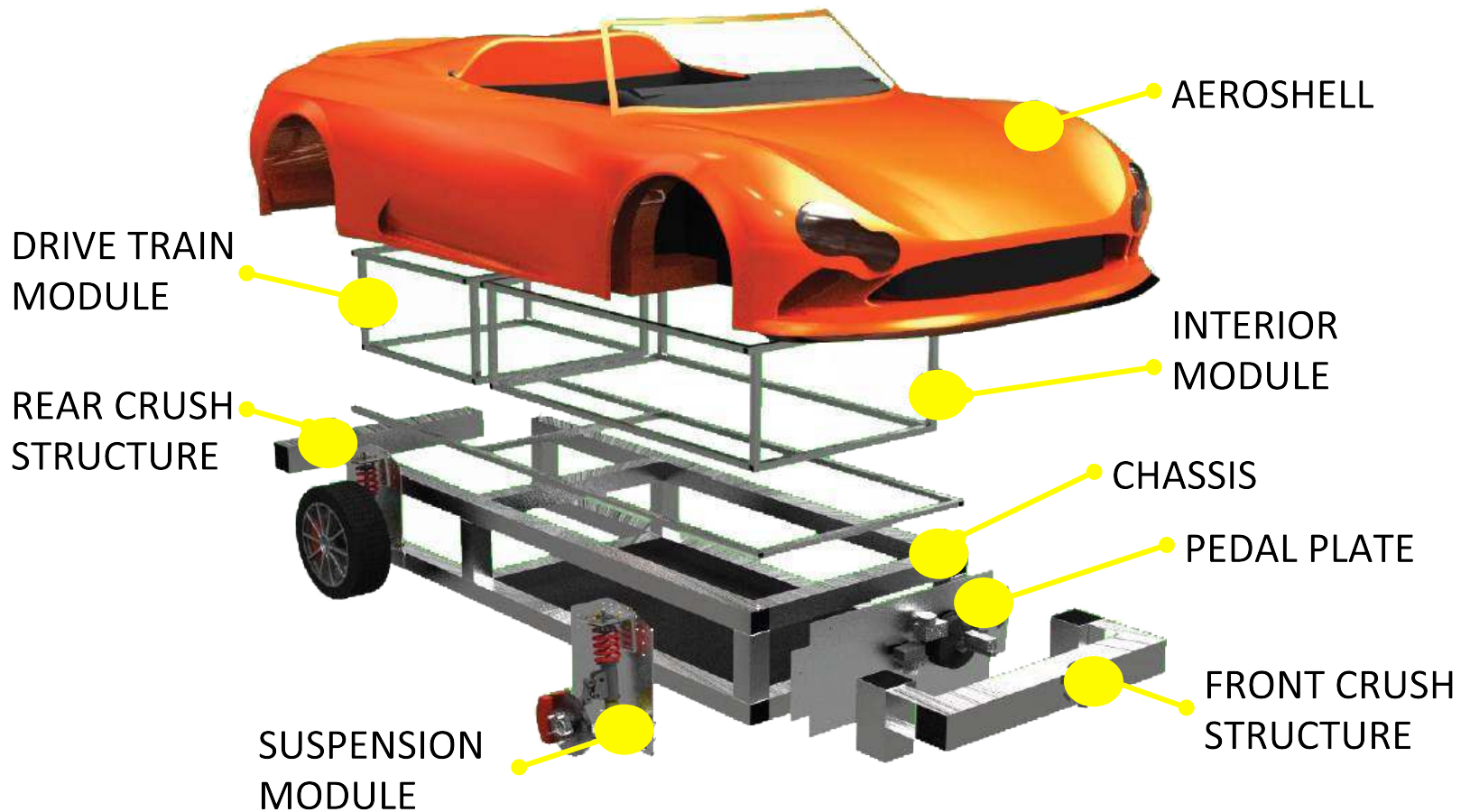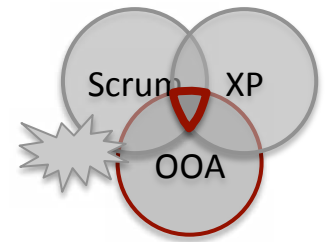
Object Oriented Architecture:
Contract First Design
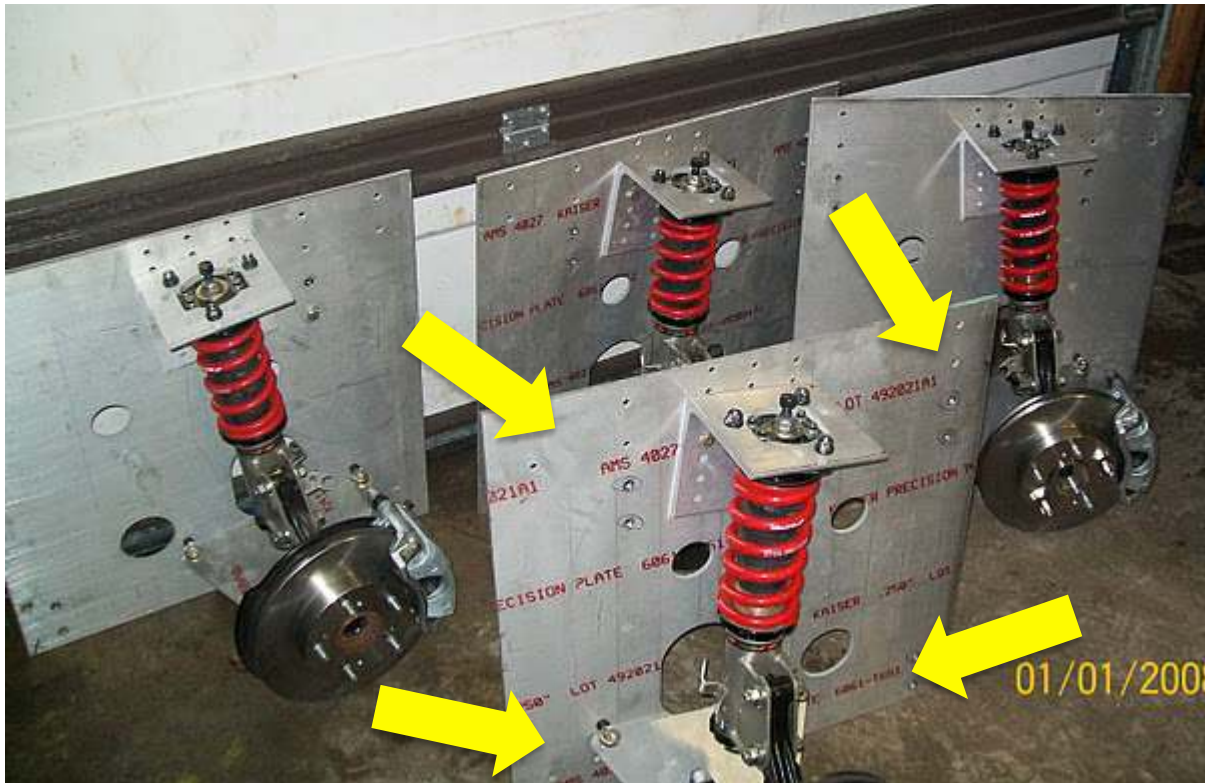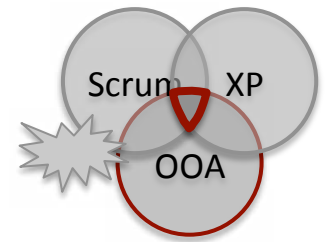
Pre-negotiated physical and data connections permit greater design versatility

Interfaces deliberately over-designed to reduce need for disruptive re-negotiation

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Object Oriented Architecture
Design Patterns and Inheritance
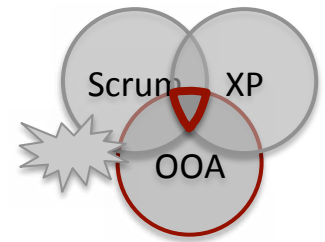
- Don't re-invent the wheel
  - If a proven solution has worked well in the past, start with that and modify as needed

- Reduce complexity – Find solutions that work for multiple aspects of the problem
  - Eg. If a particular bolt works as a fastener in one location, use the same bolt in all similar situations

Morale is a Multiplier for Velocity!

People having fun and following a sense of purpose get more done

Why this is Important:
The Corporate Strategy Implications of XM

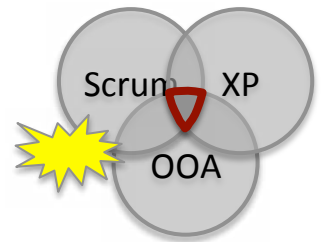**1** "Customer-centric development" = build products that your customers want to buy

2 "Use less stuff" = lower the cost to produce

3 "Reduce the cost of change" = Bring innovative products to market faster than the competition

+ As an added bonus, happier employees are more productive and have lower turnover

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Why this Is Important:
Move Faster than you Thought Possible
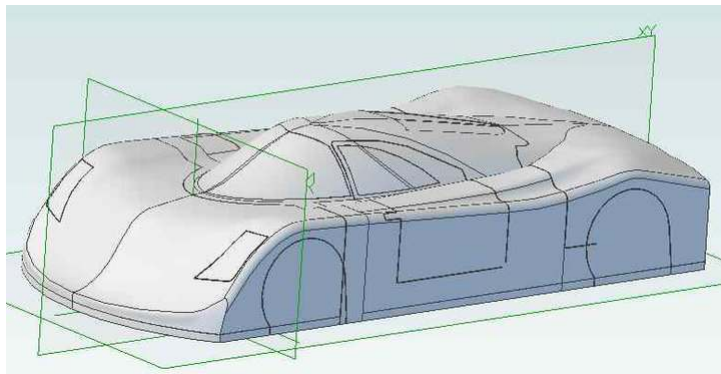
Day 1: Develop new Aeroshell CAD design
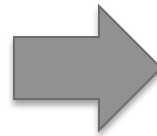
Day 2: Automated CNC router creates foam mold

Day 5: Demonstrate new LeMans exterior at Detroit Auto Show

Day 3: Team lays up carbon-fiber composite shell to cure on mold

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Why this Is Important:
Leading Manufacturers Already Moving this Way

Parting Thoughts:
Scaling "Out" Rather Than "Up"

- Consumers increasingly expect more product customization in response to local needs
- This leads to smaller production runs
- Will manufacturing <u>scale</u> remain important as this trend advances?

- If not, are Container-based Micro-factories the future of manufacturing?
  - Consistent, local fabrication in all markets
  - Easily re-deployable anywhere in the world

Conclusion

- Extreme Manufacturing combines elements of Scrum, XP, and Object-Oriented Architecture <u>back</u> into a manufacturing and hardware environment

- Wikispeed has been an early proof-of-concept on the effectiveness of this approach

- Forward-looking manufacturers are already starting to move in this direction. Is your competitor one of them?

Questions?

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