

# AGILE SOFTWARE DEVELOPMENT IN THE ENTERPRISE

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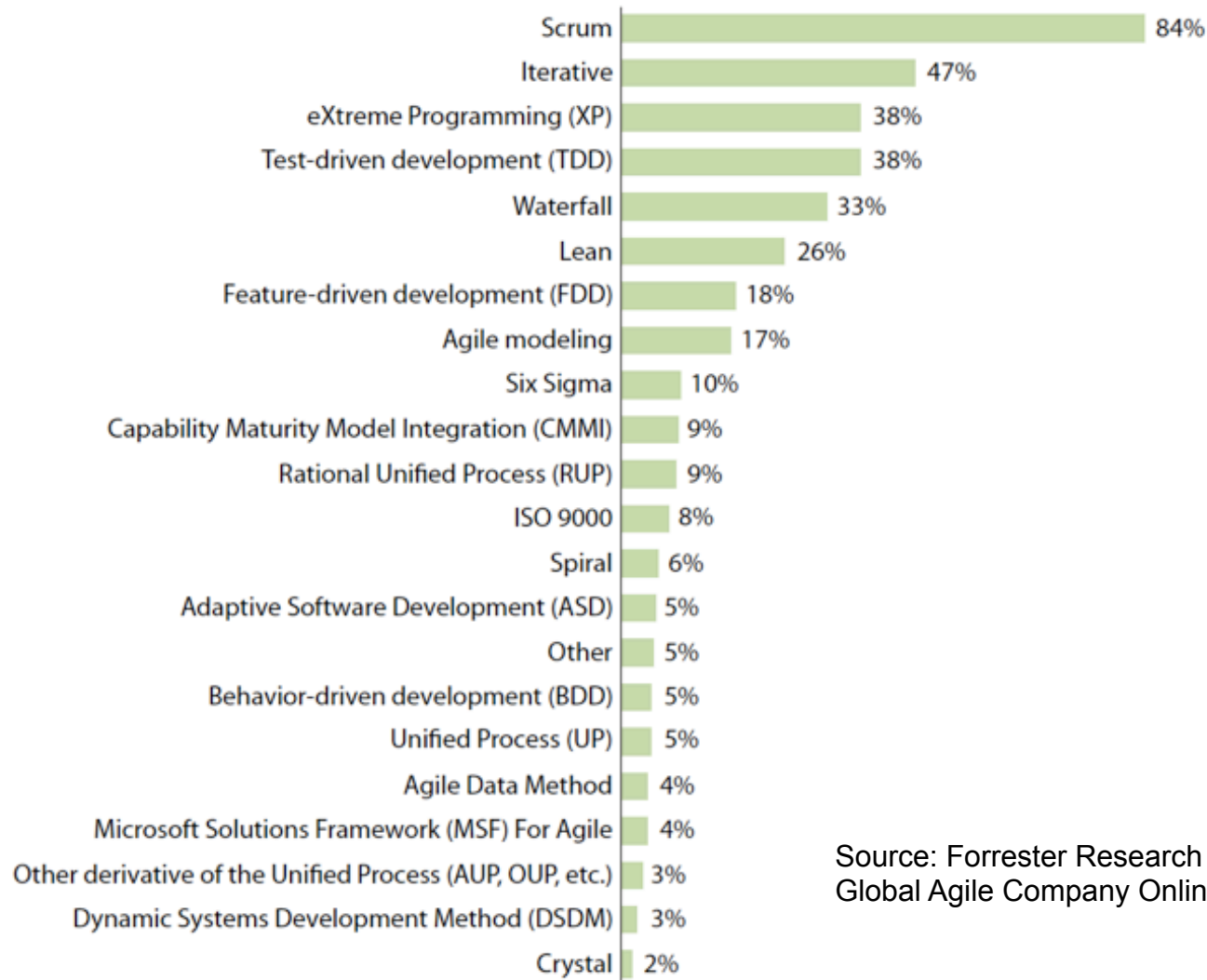
# Jeff Sutherland, Ph.D.



- Chairman, Scrum Training Institute
- CEO Scrum, Inc. and Senior Advisor, OpenView Venture Partners
  - Agile coach for OpenView portfolio companies
  - CTO/VP Engineering for 9 software companies
  - Created first Scrum at Easel Corp. in 1993. Rolled out Scrum in next 5 companies
  - Achieved hyperproductive state in all companies
  - Signatory of Agile Manifesto and founder of Agile Alliance
- <http://jeffsutherland.com/scrum>
- [jeff.sutherland@scruminc.com](mailto:jeff.sutherland@scruminc.com)



# Techniques or Methodologies Used



Source: Forrester Research December 2008  
Global Agile Company Online Survey

Base: 241 technology industry professionals in a variety of roles, including but not limited to development  
(numbers have been rounded)

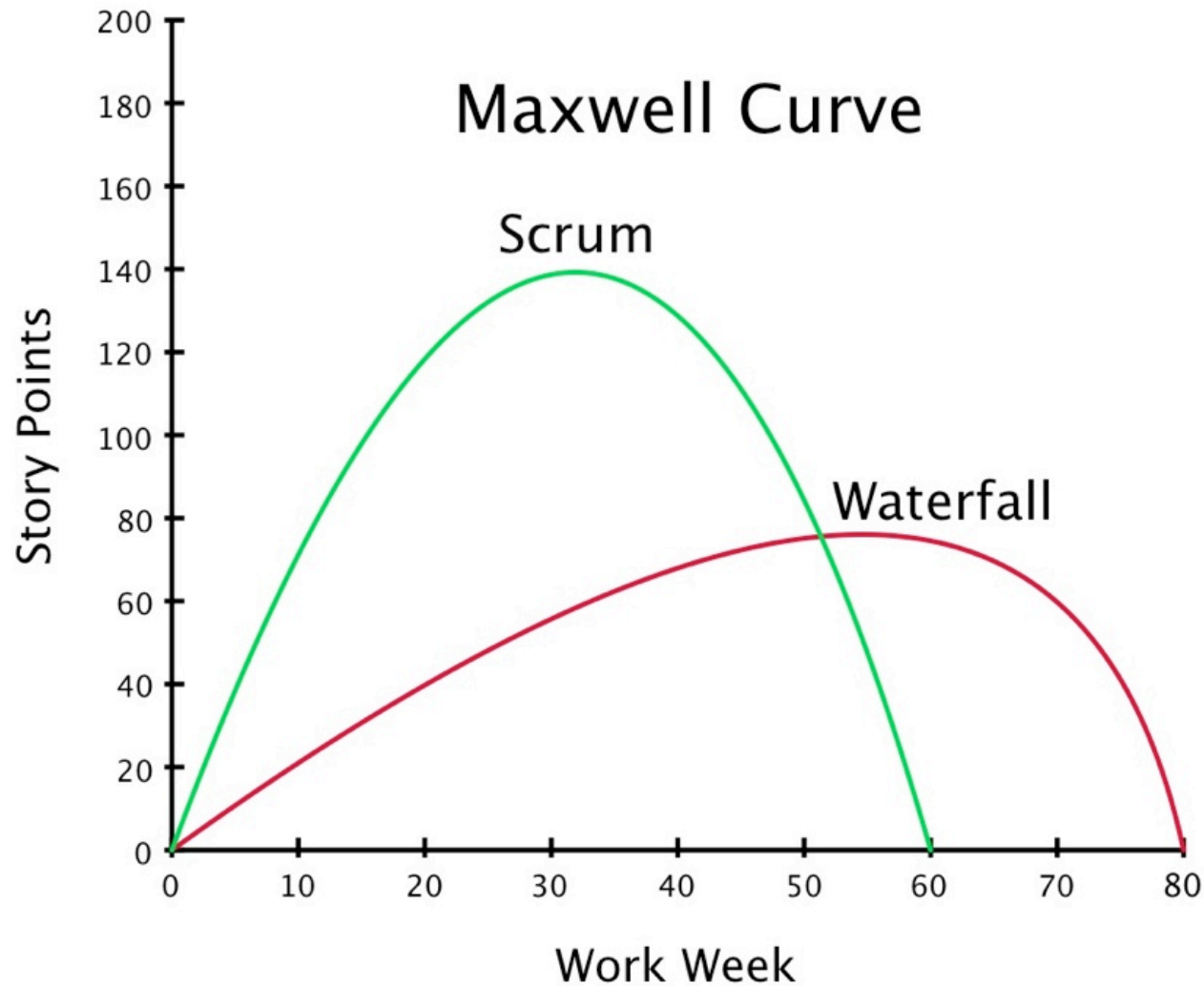
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# Openview Venture Partners

- We invest in organizations deploying Scrum
  - one hyperproductive company out of 10 might meet investment goals for a venture group
  - two or more hyperproductive could change investment practice
- We invest in market leading, industry standard processes
  - this means Scrum and XP
- We insure the entire company implements basic Scrum practices
  - Teams pass the Nokia test
  - Management is held accountable at Board level for removing impediments
  - Maturity level assessment for management, product marketing, and development organization



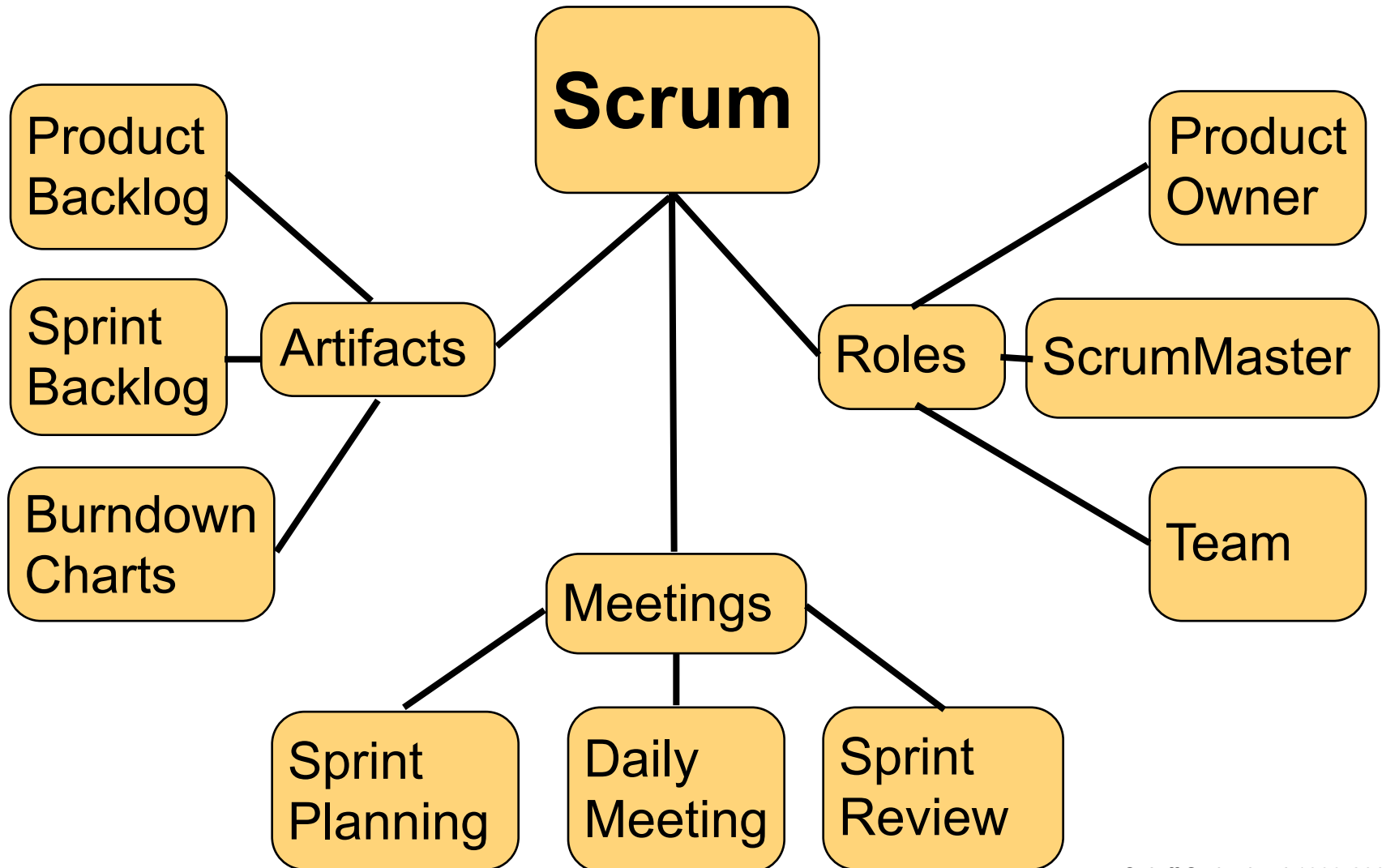
# Double output and cut workload in half



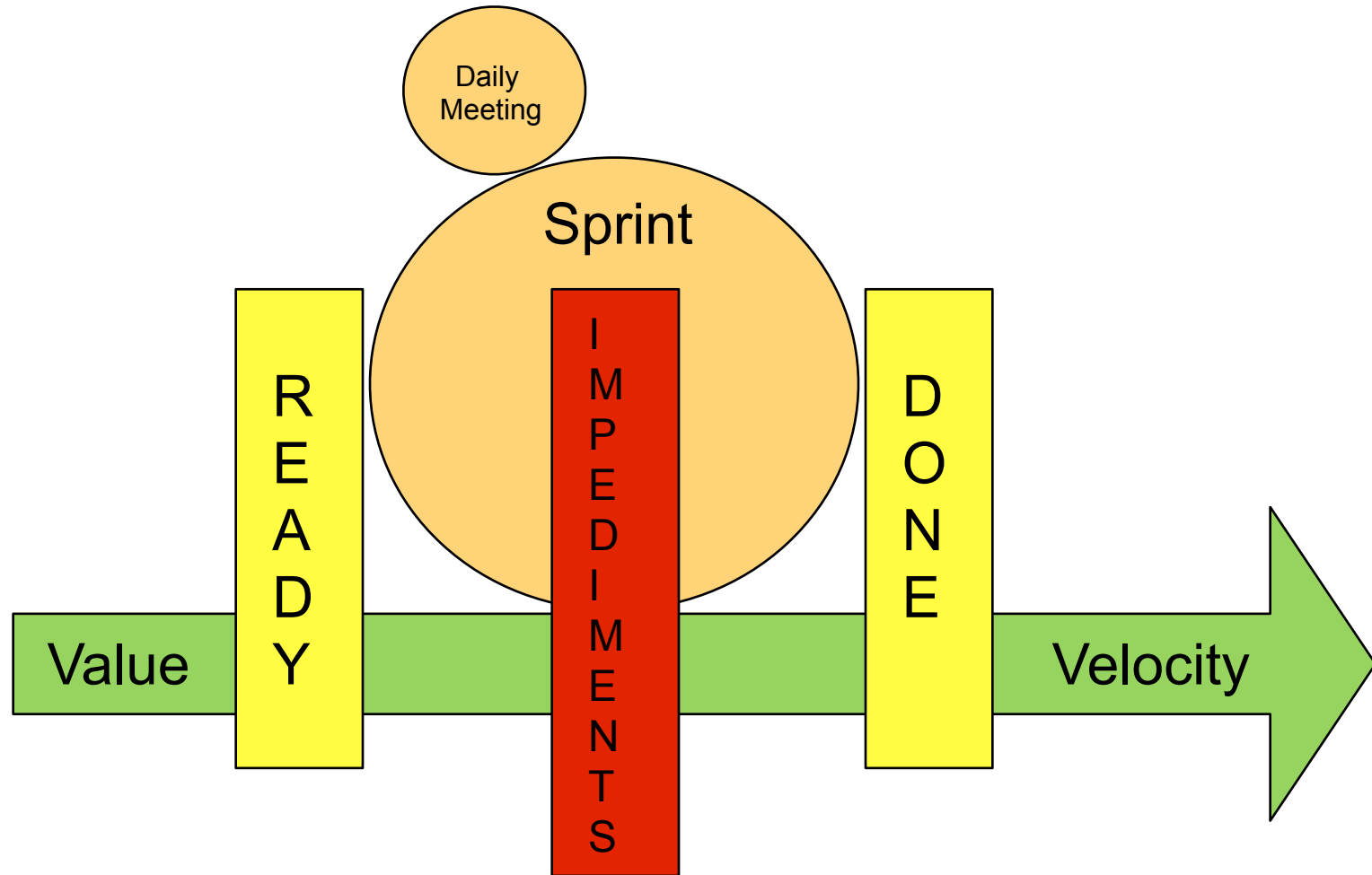
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# Scrum is a Simple Framework







# Scrum Dynamic Model



# **DONE - the key to doubling performance**

-  **The best data in the world on doubling performance by focusing on DONE at the end of a Sprint comes from a CMMI 5 company.**
-  **Hundreds of teams run the same process and they all double productivity and cut defects by 40%.**
-  **All Scrum teams can do this easily (if they remove impediments).**
-  **Outside this firm: 50% of Scrum teams worldwide don't do this.**

# **READY - the key to the second doubling of performance**

-  **The Product Owner can easily double the velocity of a Scrum team by getting Product Backlog to a high READY state.**
-  **READY state can be measured by the process efficiency of story execution.**
-  **When you add READY to DONE you will be running at four times waterfall performance.**
-  **Outside this firm: Less than 1% of Scrum teams worldwide do this.**

# **SELF-ORGANIZATION - the third doubling**

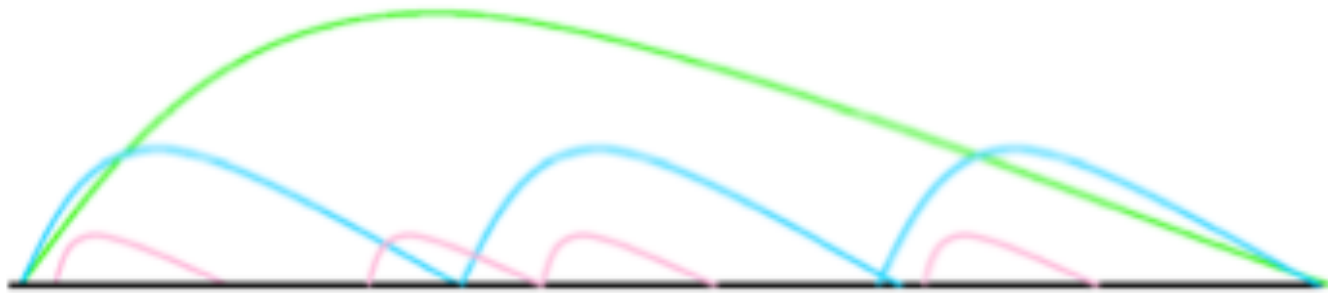
- **Individuals self-organize work to maximize team velocity**
- **Team self-organizes around goals**
- **Architecture self-organizes around working code**
- **Product emerges through iterative adaptation**
- **Doing this well leads to third doubling and we see the best teams consistently running at 8x waterfall performance**

# Future of Agile - the Scrum company

- **Focus is on dominating a market and quadrupling revenue**
- **Entire company does Scrum - senior management, sales, marketing, development, support, admin, etc.**
- **MetaScrum drives sprint planning**
  - Led by Chief Product Owner, includes all stakeholders, Product Owner team, ScrumMasters
  - Sets product strategy, commits resources, starts and stops sprints
  - Radical removal of impediments

# Every Sprint is a Release

- Multiple overlapping Sprints pipelined through multiple teams
- Requires self-organizing across teams and advanced tooling



Red - weekly release

Blue - monthly release

Green - quarterly virtual release

# Future of Scrum

- J. Sutherland, "Future of Scrum: Parallel Pipelining of Sprints in Complex Projects," in **AGILE 2005 Conference Denver, CO: IEEE Digital Library, 2005.**
- J. Sutherland, "Future of Scrum: Parallel Pipelining of Sprints in Complex Projects with Details on Scrum Type C Tools and Techniques." In *The Scrum Papers*, Scrum Training Institute, 2007. <http://jeffsutherland.com/scrum/scrumpapers.pdf>



# Many Agile wannabes ...

- **Kanban, swarming teams, etc.**
- **None have the sophistication or discipline to systematically achieve 10 times the productivity and quality and quadruple the revenue of a company in a year.**



# How we invented Scrum:

## Learning about innovation from Xerox Parc



Personal Workstation



Mouse (SRI)



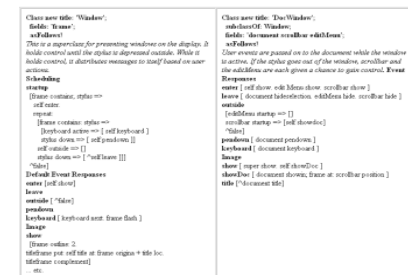
Ethernet



Windows Interface



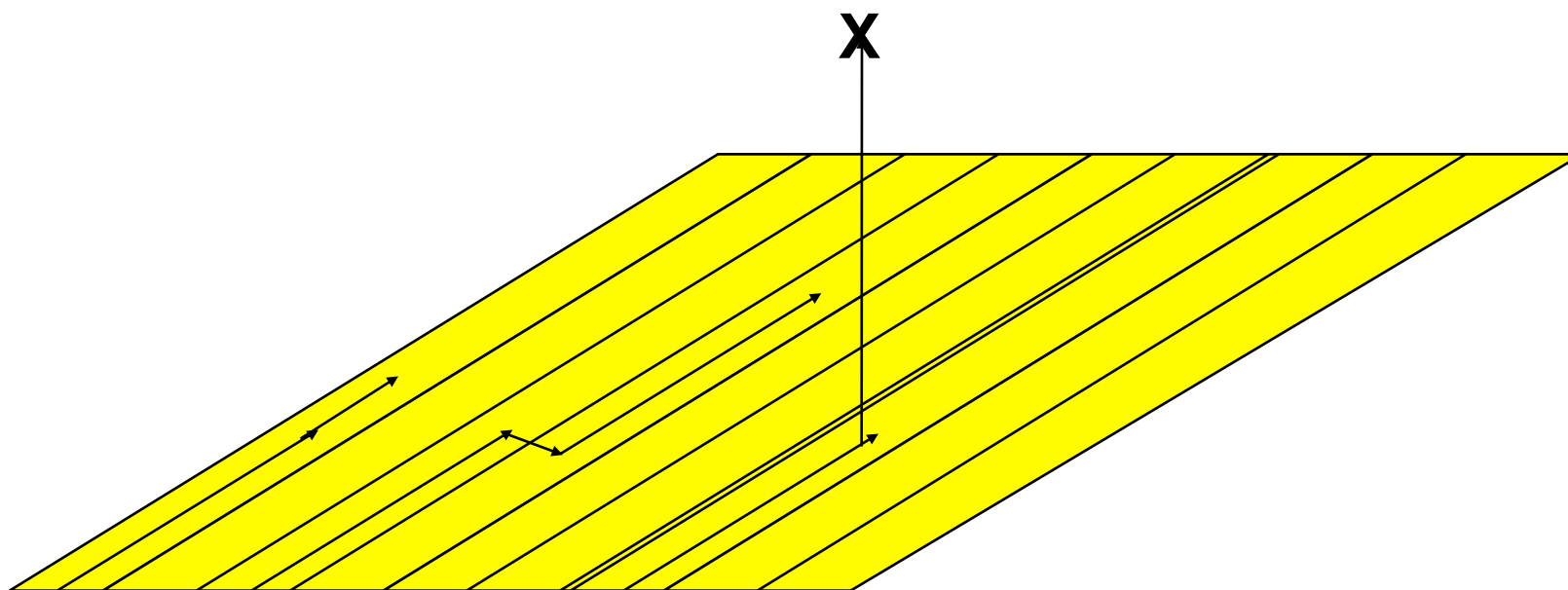
Laser Printer

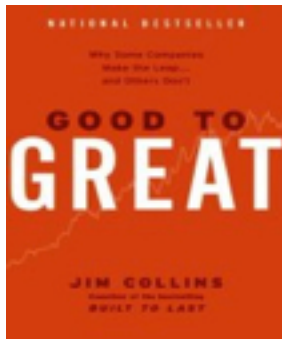


Smalltalk

# Alan Kay's Innovation Strategy




- Incremental - No
- Cross Discipline - Nyet
- Out of the Box - Yes






# Benchmarked Out of the Box



## Scrum looked at projects off the chart

-  (IBM Surgical Team) F. P. Brooks, *The Mythical Man Month: Essays on Software Engineering*: Addison-Wesley, 1995.
-  Takeuchi and Nonaka. [The New New Product Development Game](#). Harvard Business Review, 1986
-  J. O. Coplien, "Borland Software Craftsmanship: A New Look at Process, Quality and Productivity," in 5th Annual Borland International Conference, Orlando, FL, 1994.

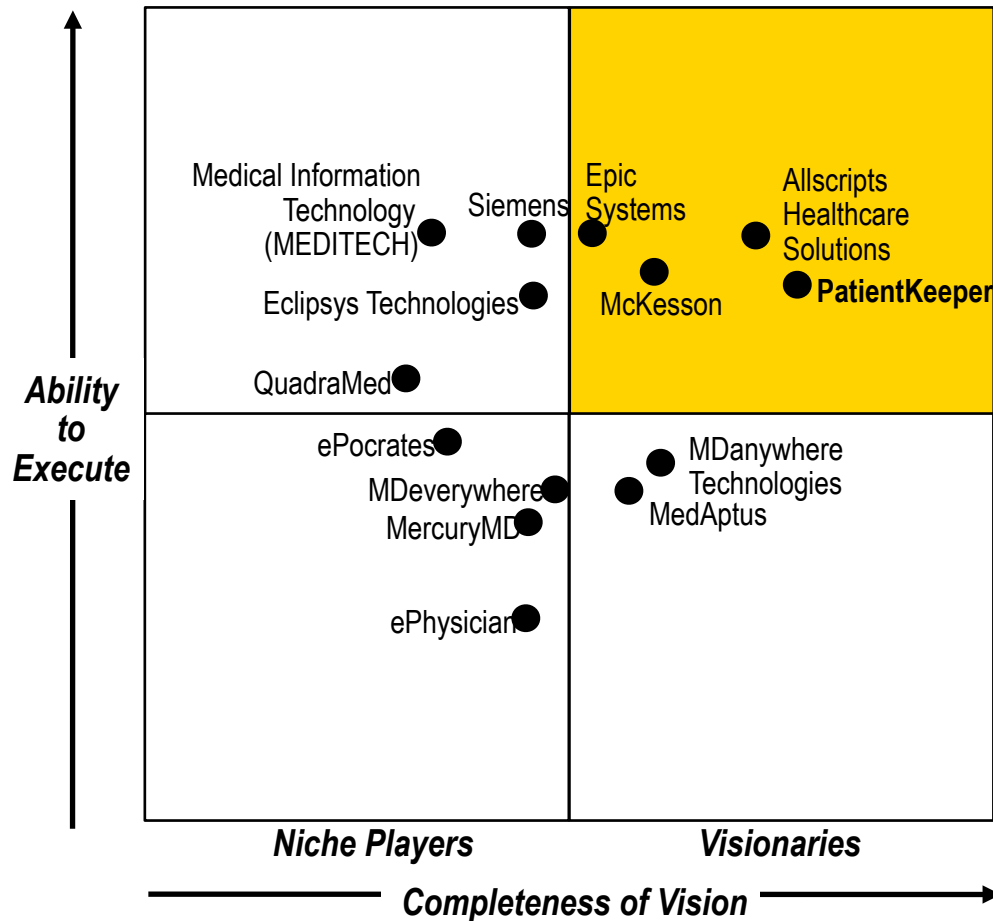
## Scrum: A Pattern Language for Hyperproductive Software Development

-  By M. Beedle, M. Devos, Y. Sharon, K. Schwaber, and J. Sutherland. In *Pattern Languages of Program Design*. vol. 4, N. Harrison, Ed. Boston: Addison-Wesley, 1999, pp. 637-651.

## Every team can achieve hyperproductivity

-  J. Sutherland, S. Downey, and B. Granvik, "[Shock Therapy: A Bootstrap for a Hyper-Productive Scrum](#)" in *Agile 2009*, Chicago, 2009.
-  C. Jakobsen and J. Sutherland, "[Scrum and CMMI – Going from Good to Great: are you ready-ready to be done-done?](#)," in *Agile 2009*, Chicago, 2009.

# PatientKeeper All-at-Once Scrum

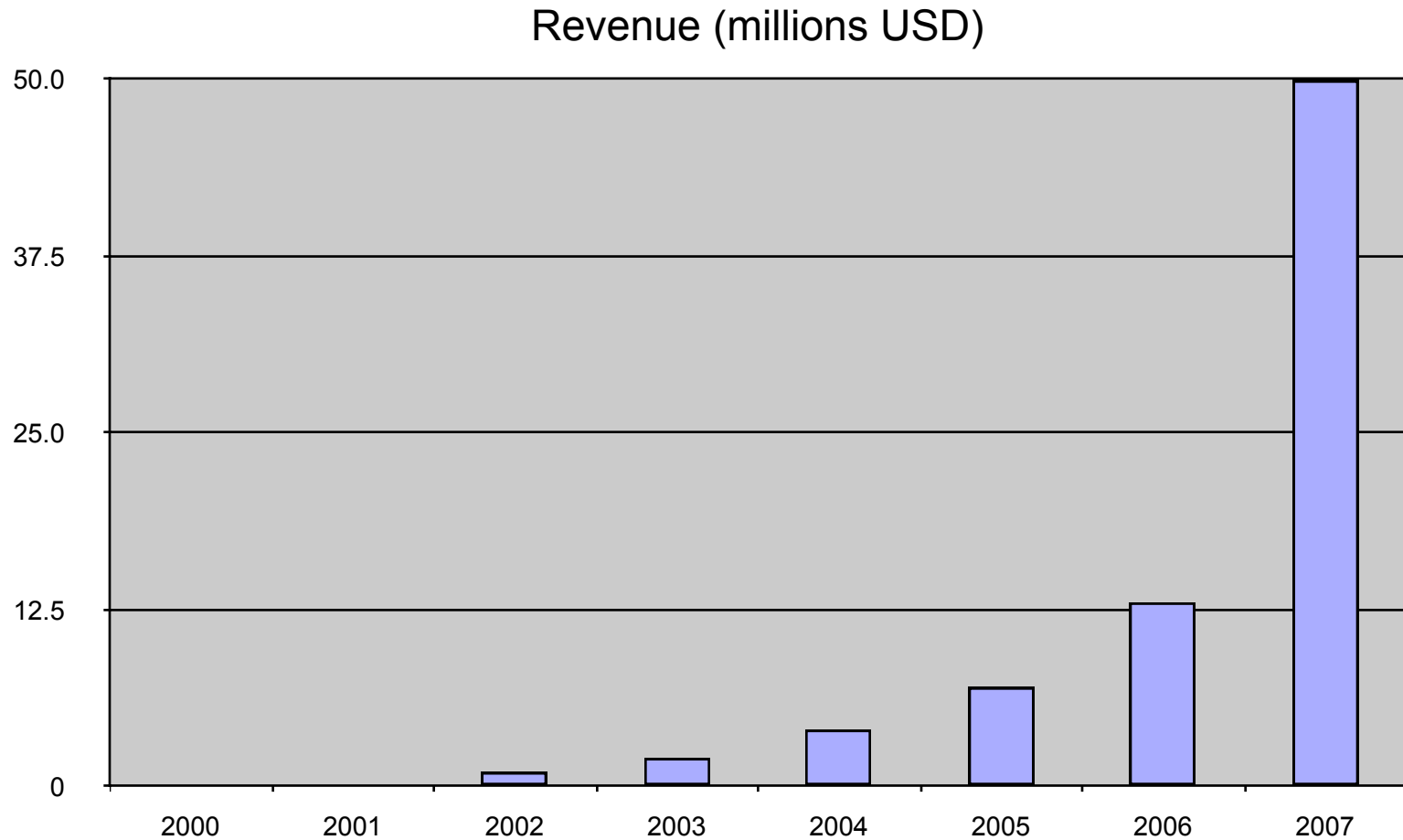


*I find that the vast majority of organizations are still trying to do too much stuff, and thus find themselves thrashing. The only organization I know of which has really solved this is PatientKeeper. Mary Poppendieck*

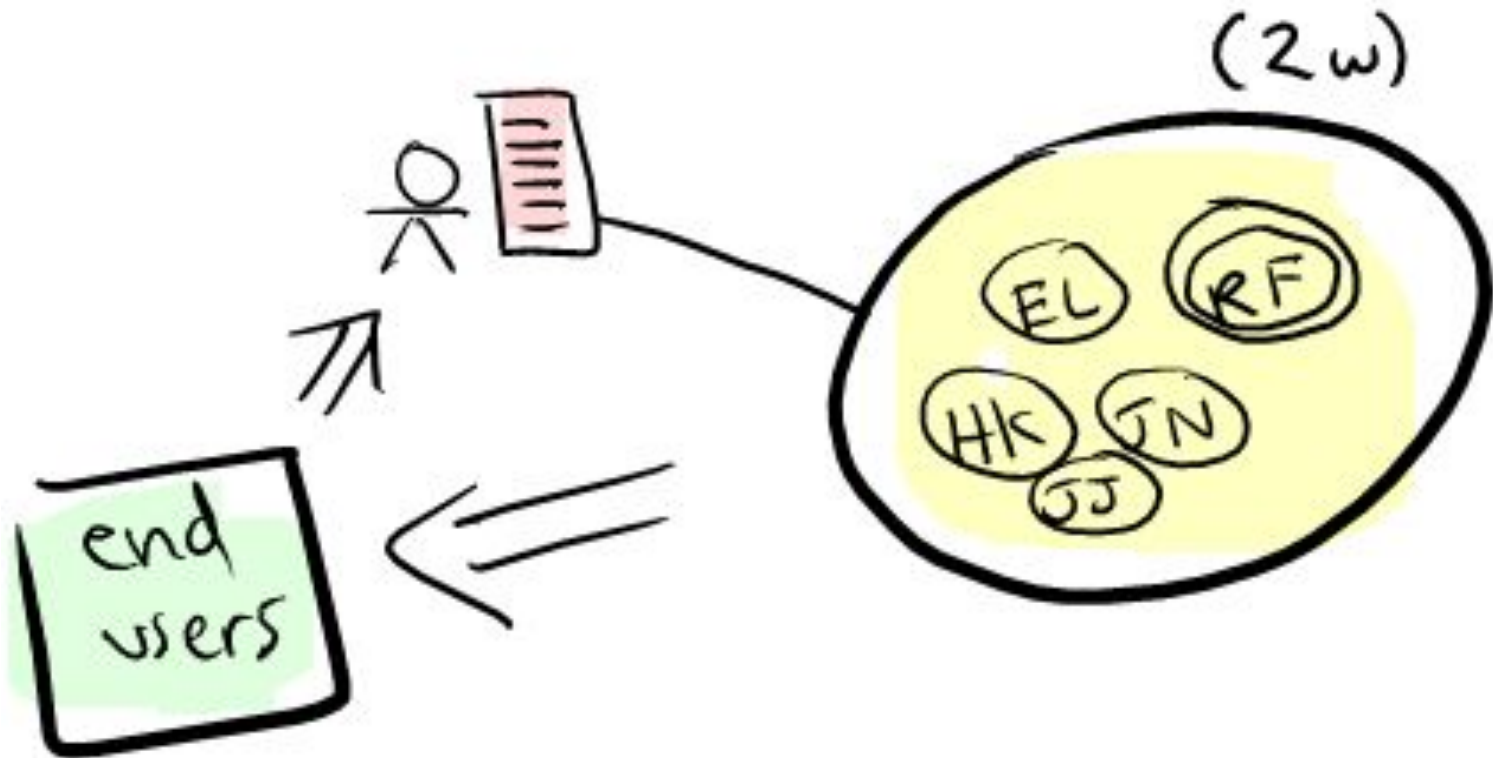
# PatientKeeper's Agile Architecture

- Service oriented architecture at multiple levels
  - mobile device framework
  - application server components
  - adapters to turn any healthcare system into a backend set of services
- Delivered a new release of the product multiple times per month (45 releases in one year)
- Incremental evolution of SOA dominated their market space
- Adopted as fundamental tooling by leading healthcare systems providers (GE Healthcare, Cerner, etc.) and by largest and best hospital systems (HCA, Partners, etc.)
- All driven by Scrum

# PatientKeeper Revenue



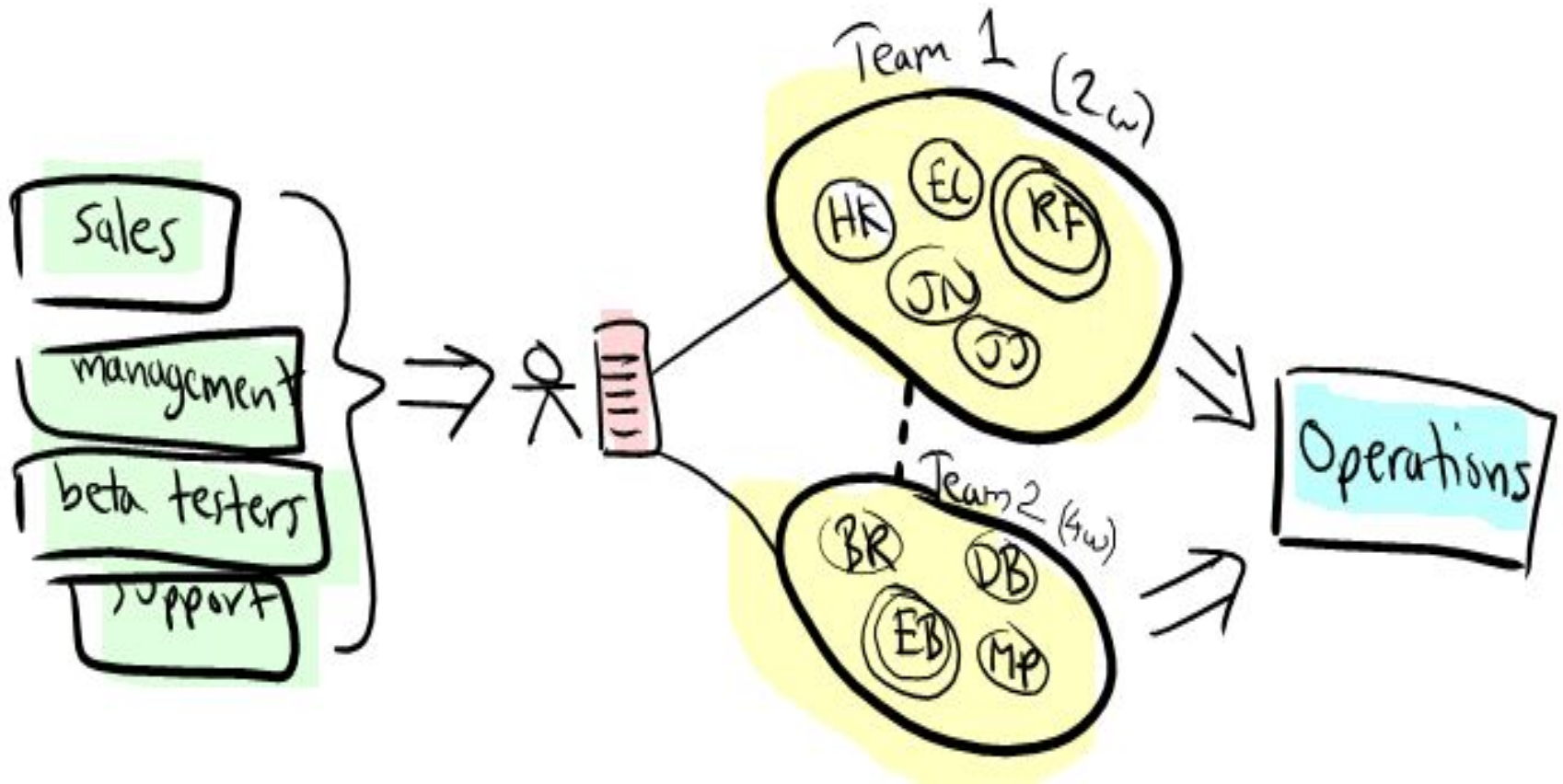
# What's happening with Scrum?



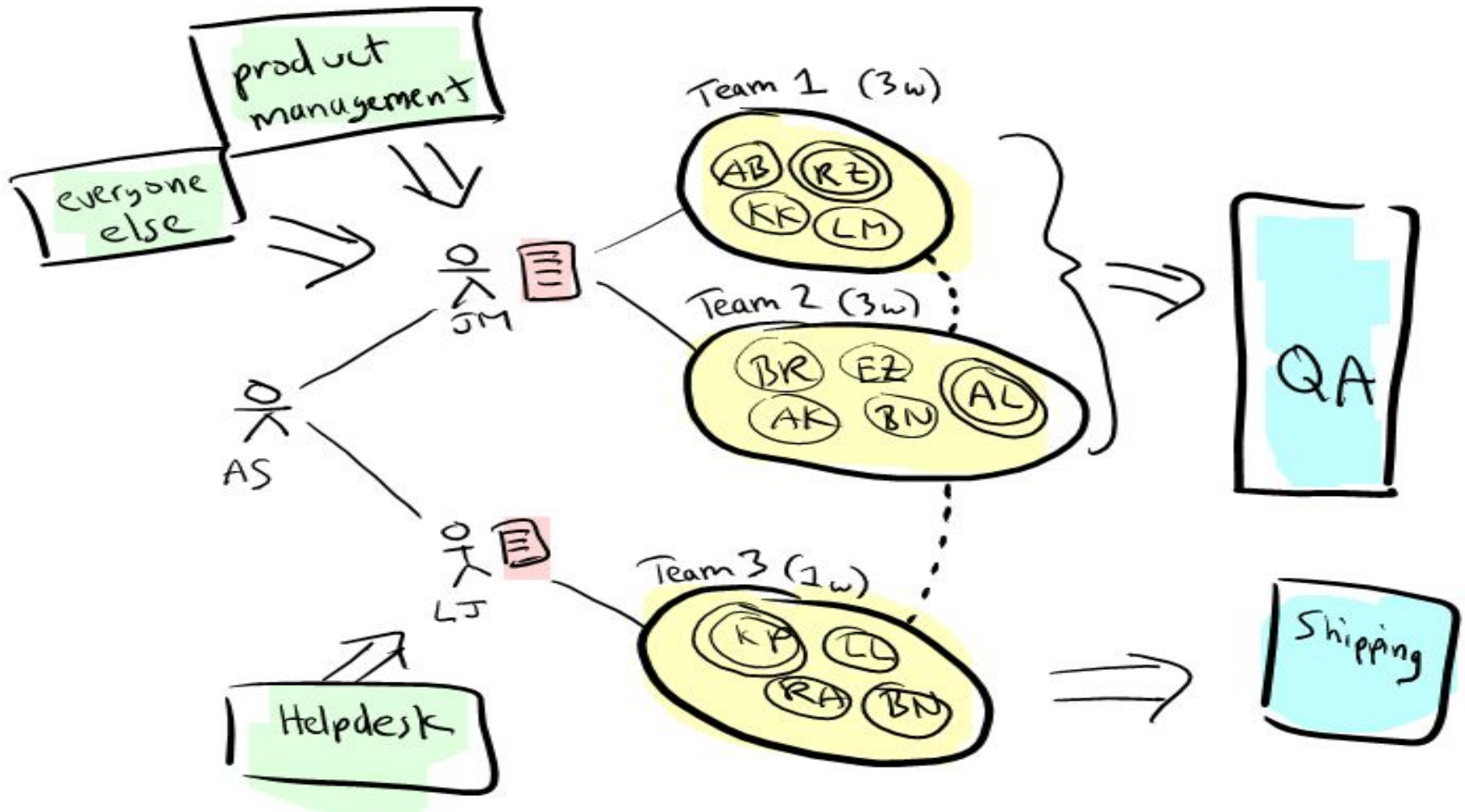
ScrUML by Henrik Kniberg

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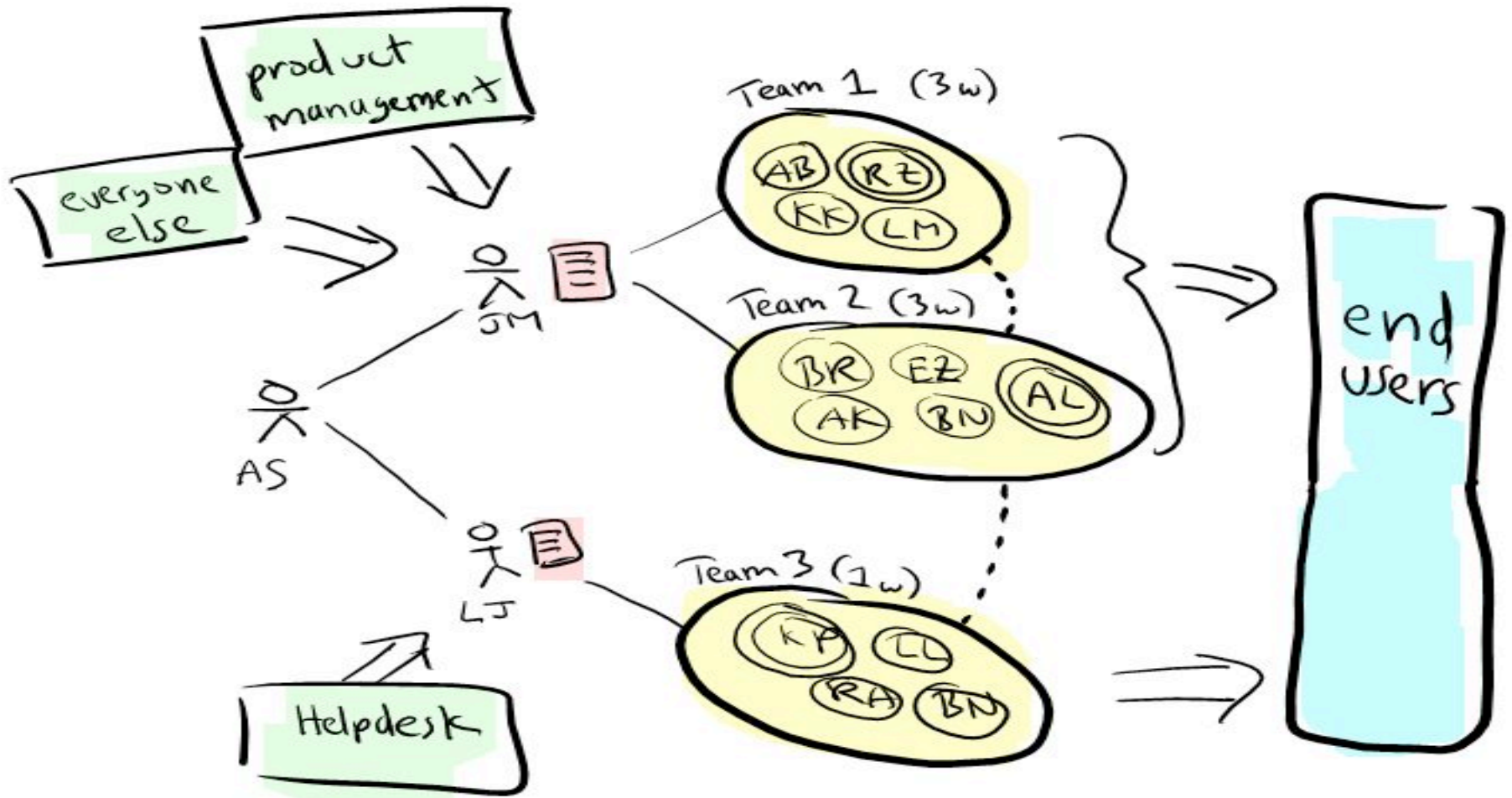
# Multiple Team Scrum



# Scrum in Transition



# Delivering to End Users



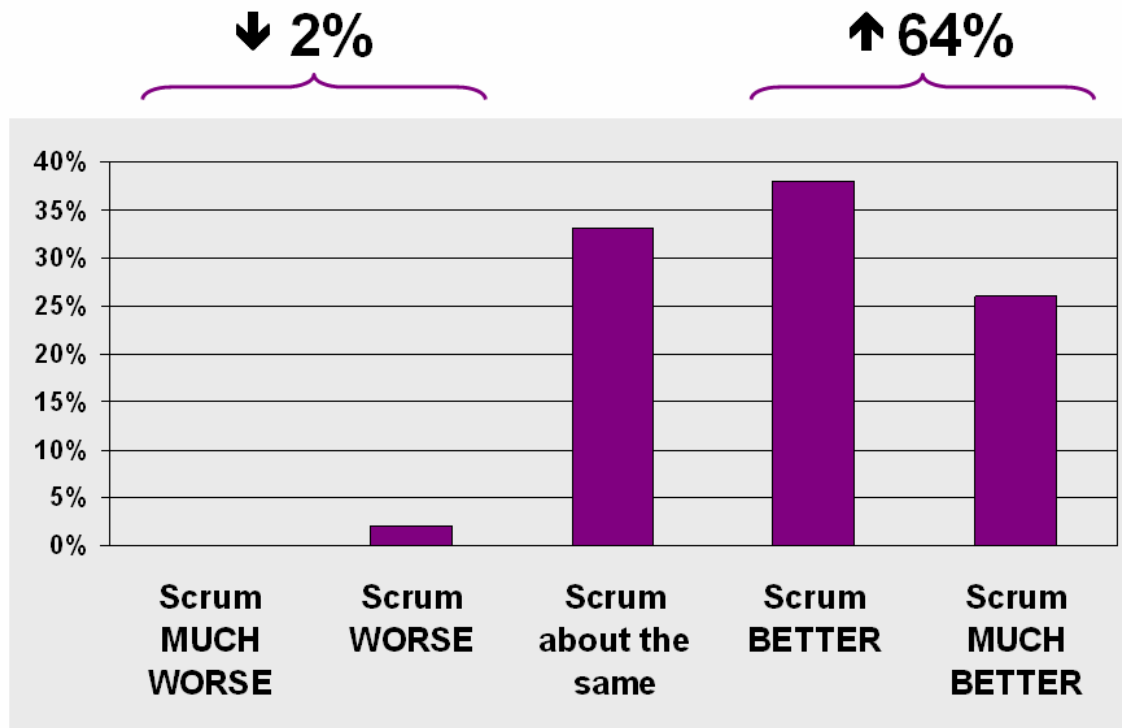
# How do you scale Scrum to thousands of developers?

- Step by step
- Training and coaching is critical
  - A internal trainer at Yahoo can train, launch, and coach about 10 new teams a year
  - Teams that are not coached do not do as well. Average increase in productivity is 35% company wide
  - Coached teams get 300-400% improvement
- Yahoo launched over 200 teams in three years in Silicon valley where they have 2000 developers



Rate Scrum relative to how the team was building products previously:

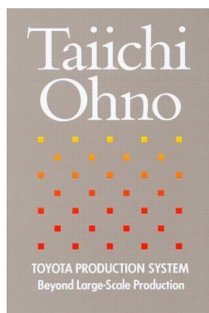
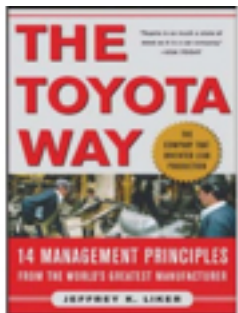
**Business value of what the team produced in 30 days?**



# Yahoo Return on Investment

- Each Scrum trainer starts up and coaches 10 new Scrum teams a year
- Coached velocity increase is 200-400%
- Uncoached average increase is 35%
- Conservative cost reduction per trainer is over \$1M/yr

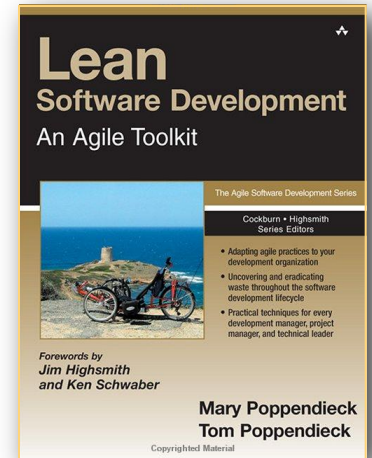
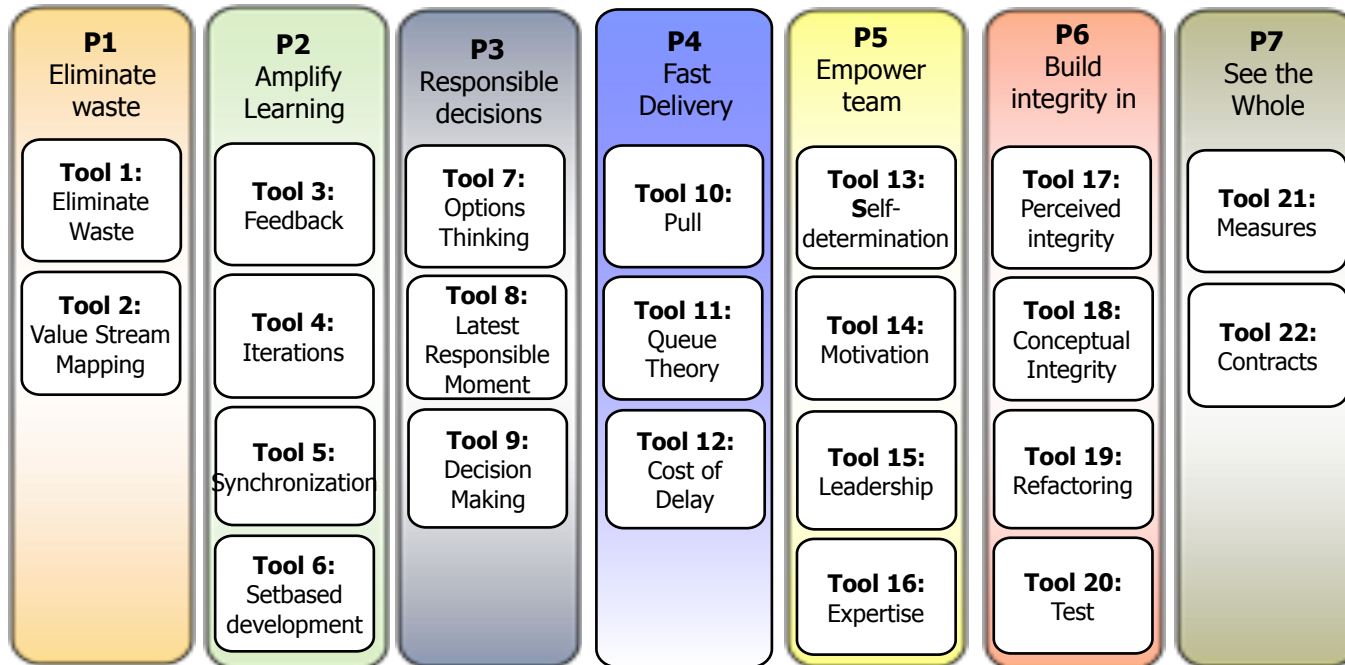
G. Benefield, "Rolling Out Agile at a Large Enterprise," in *HICSS'41, Hawaii International Conference on Software Systems*, Big Island, Hawaii, 2008.



# Scrum and Lean

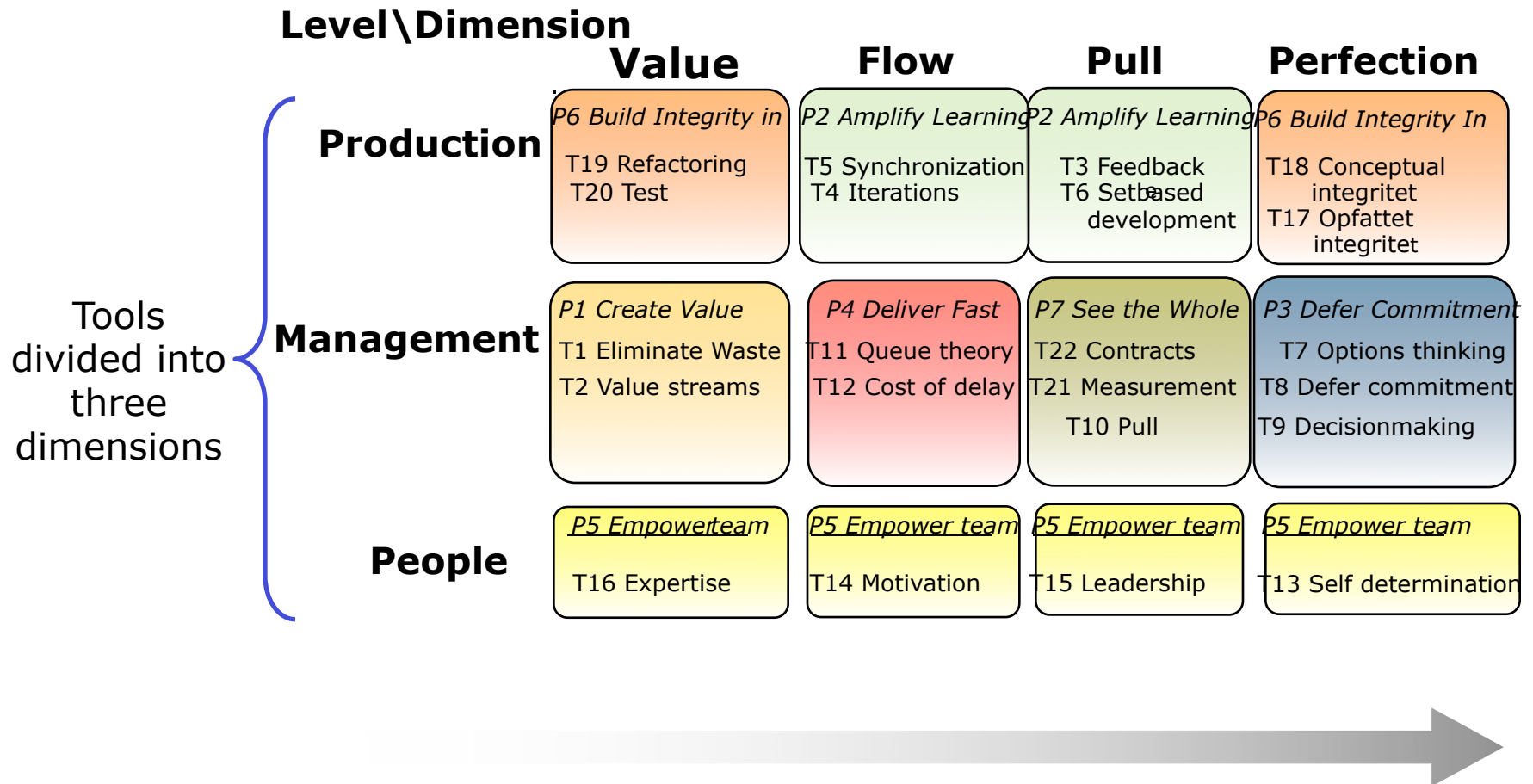
- Management cannot understand Scrum without understanding Lean
  - Taiichi Ohno. *Toyota Production System: Beyond Large Scale Production*. Productivity Press, 1988
- Lean is not effectively implemented without Scrum
  - Johnson Controls reports 6 months of Scrum implemented more Lean than 3 years of Lean programs.
- The ScrumBoard is a Kanban Board with iteration constraints and team process
  - Agile Kanban enforces only WIP. This will not consistently produce hyperproductive teams.
- A lean Scrum is good Scrum. Any other Scrum is ScrumBut (they are slow and quality is poor).

# Lean Thinking Tools



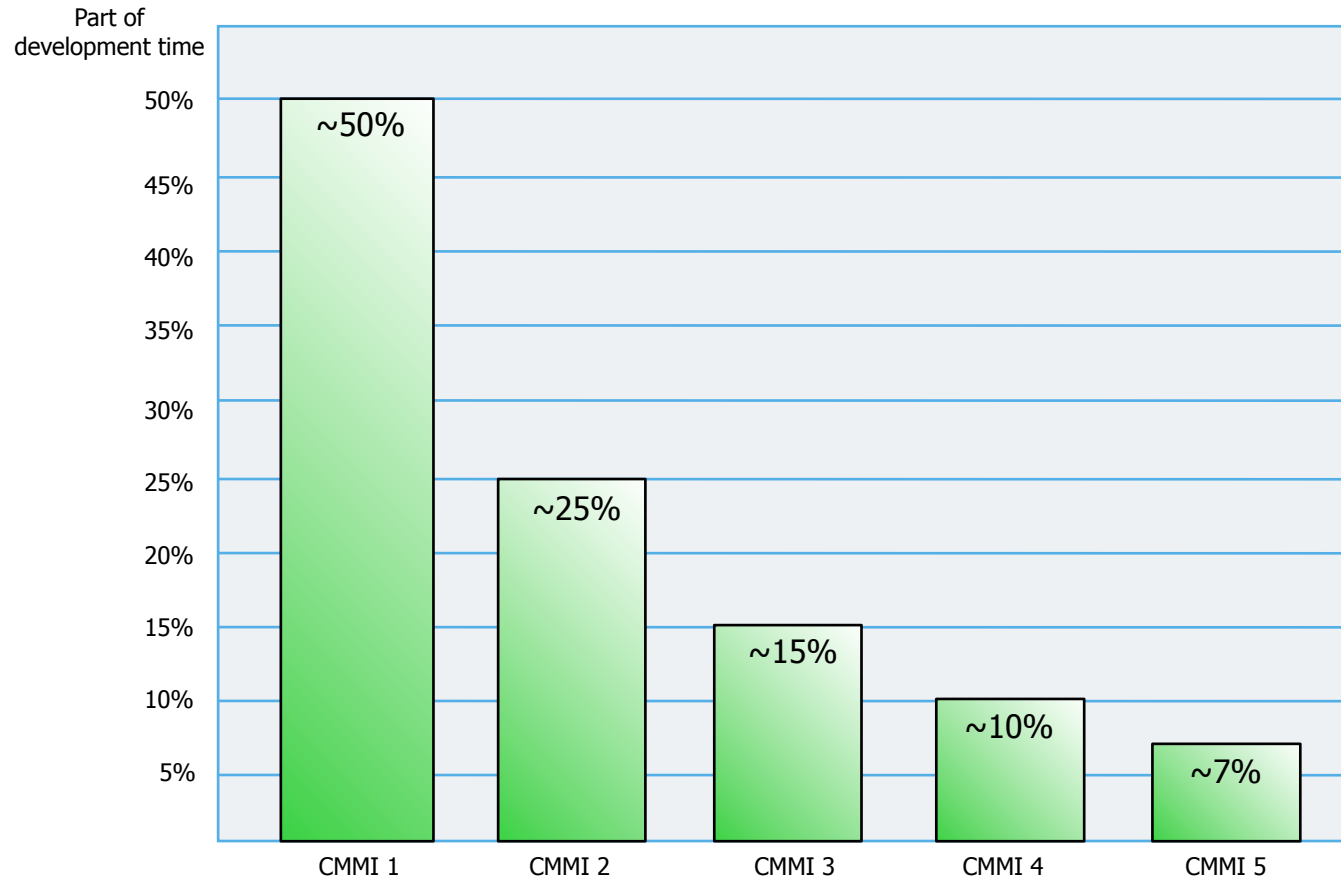
- Systematic Software Engineering used the tools from Lean Software Development to develop their Scrum implementation
- Analyzing dependencies, they produced a strategy for ordering the implementation of Lean.

# Causal Dependencies



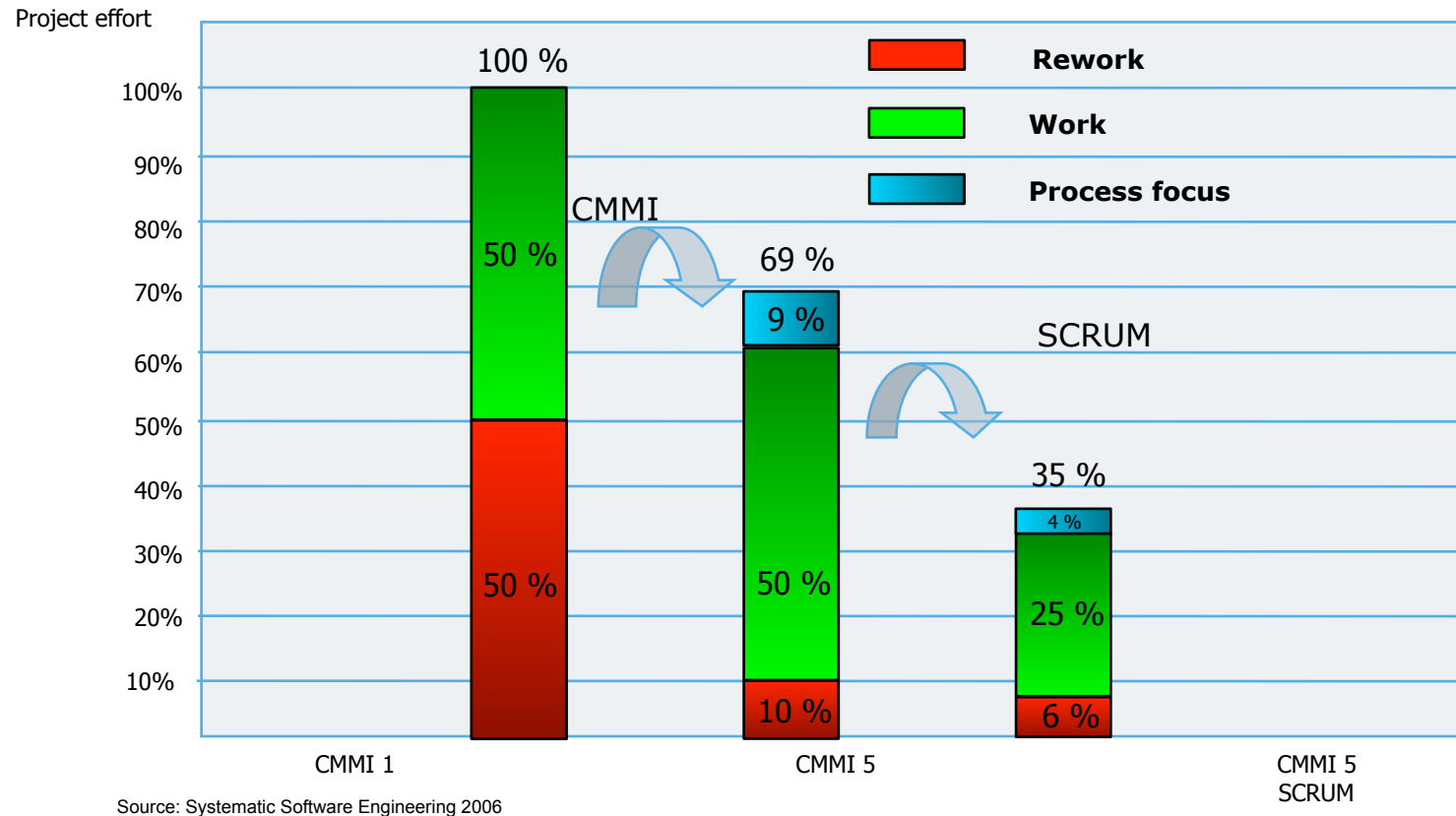
Thinking tools are best transformed by people and projects

# Published experiences with "rework"



Source: Krasner & Houston, CrossTalk, Nov 1998  
Diaz & King, CrossTalk, Mar 2002

# CMMI/SCRUM Performance analysis



# **Systematic CMMI 5 Analysis**

## **First six months of Scrum**

- 80% reduction in planning cost
- 40% reduction in defects
- 50% reduction in rework
- 100% increase in overall productivity
- Estimation error < 10%
- Project completion on time > 95%
- Waterfall projects (required by some defense and healthcare contracts) are now contracted for twice the cost of Scrum projects (and produce lower quality).

# **Systematic is going from “beginners Scrum” to hyperproductive Scrum**

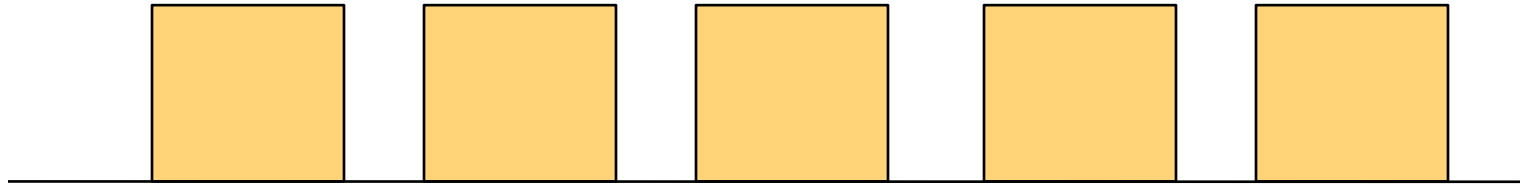
- First doubling of velocity comes from software DONE at the end of the sprint.
- Second doubling come from product backlog READY at the beginning of the sprint.
- Systematic now has several teams executing the second doubling model successfully
- Will roll this out to whole company

Carsten Jakobsen and Jeff Sutherland. Scrum and CMMI - Going from Good to Great: are you ready-ready to be done-done? Agile 2009, Chicago.

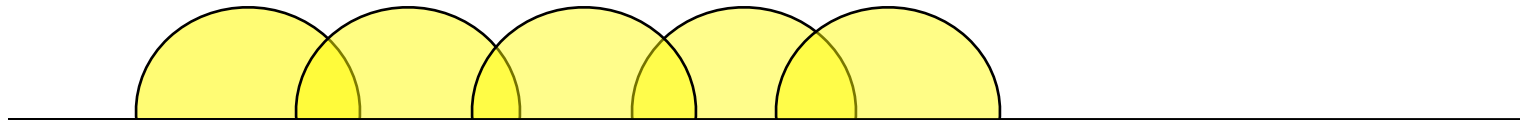
# Case Study: Scrum and XP

- The very first Scrum used all the XP engineering practices and set-based concurrent engineering.
- Most high performance teams use Scrum and XP together.
- It is hard to get a Scrum with extreme velocity without XP engineering practices.
- You cannot scale XP without Scrum.

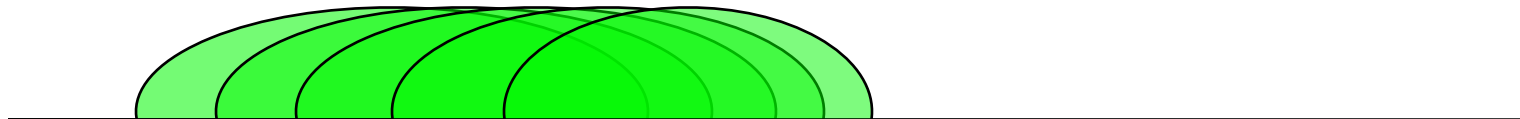
# Distributed/Outsourcing Styles



**Isolated Scrums**



**Distributed Scrum of Scrums**



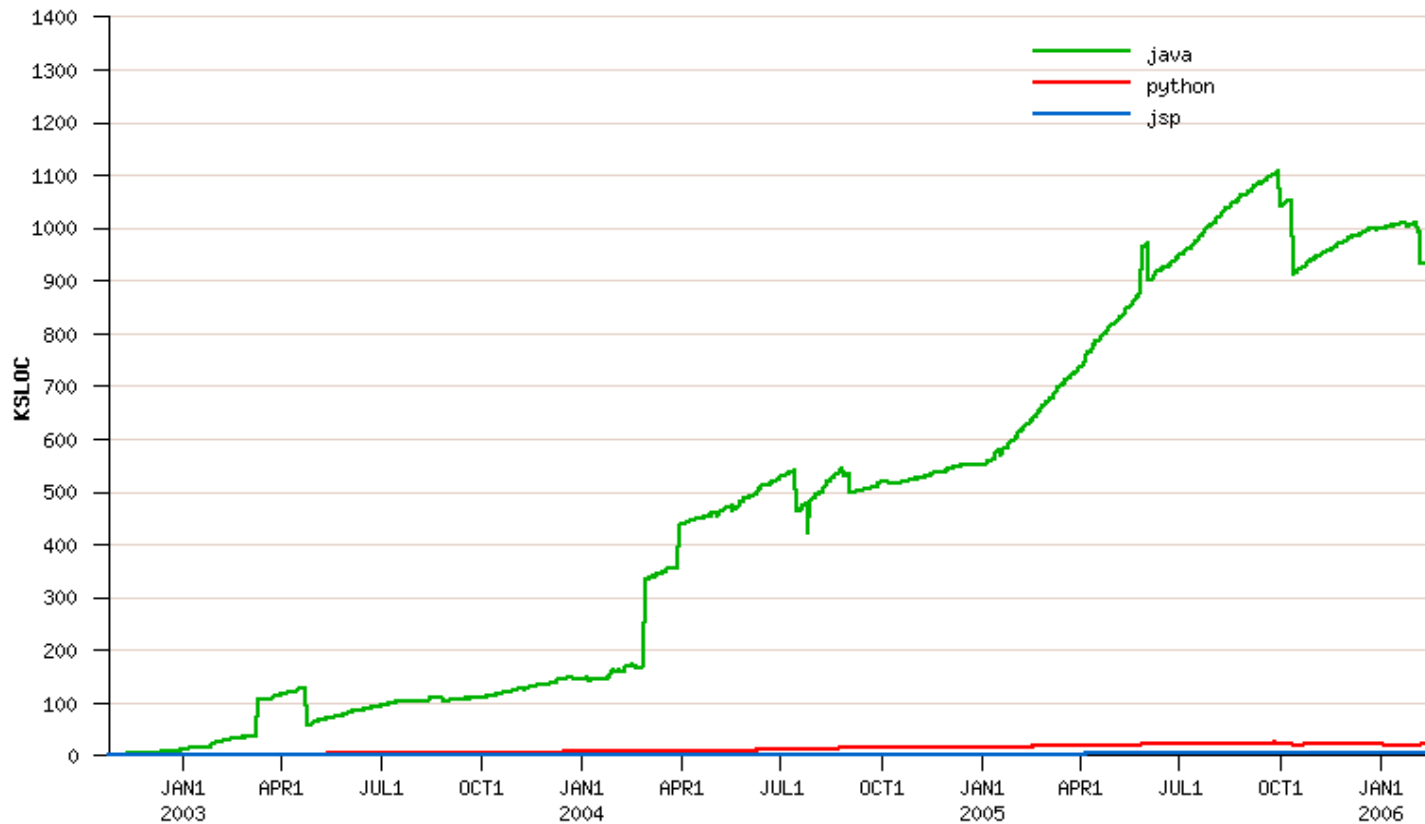
**Totally Integrated Scrums**

# Outsourcing: The bad example

- What happens if you outsource \$2M of development?
  - Industry data show 20% cost savings on average
- Outsourcing from PatientKeeper to Indian waterfall team:
  - Two years of data showed breakeven point occurs when Indian developer costs 10% of American Scrum developer
  - Actual Indian cost is 30%
- \$2M of Scrum development at my company costs \$6M when outsourced to waterfall teams
- Never outsource to waterfall teams. Only outsource to Scrum teams.

# SirsiDynix - Anatomy of a “failed” project

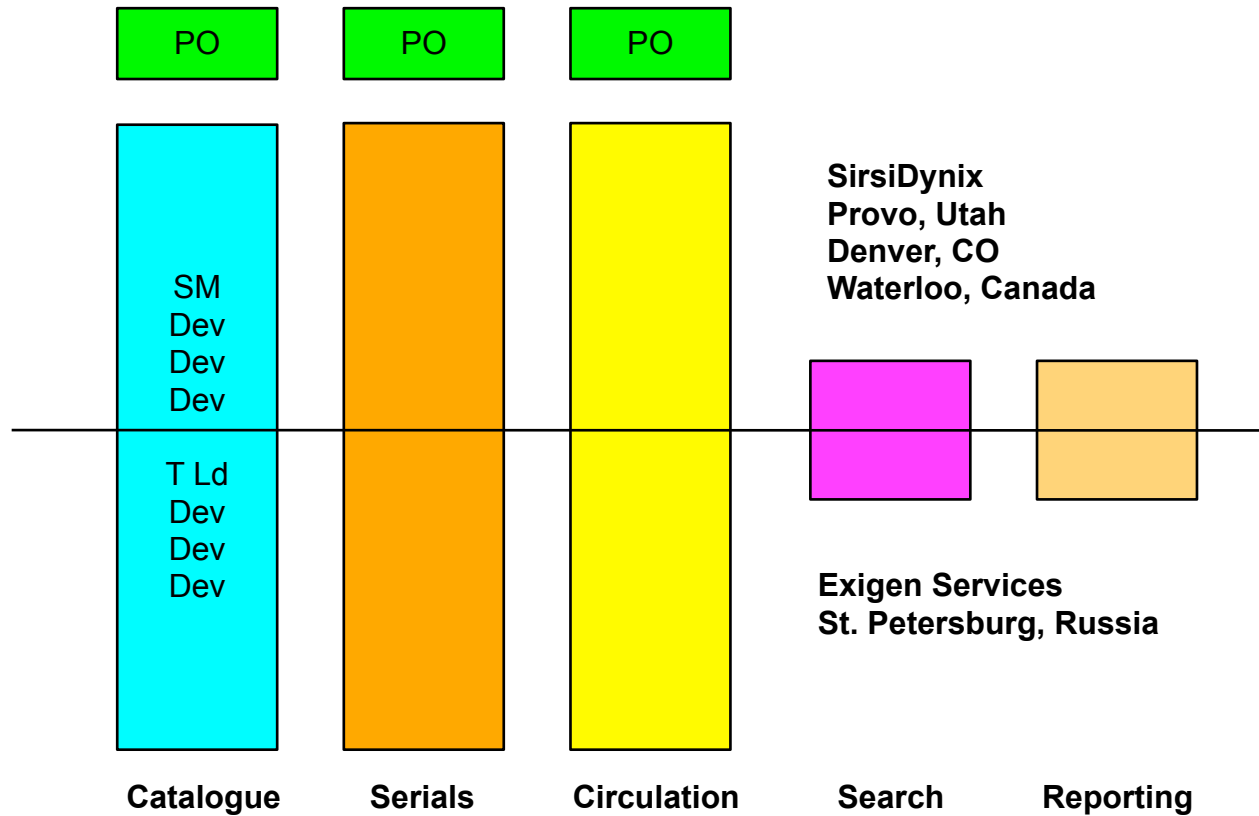
- Over a million lines of Java code



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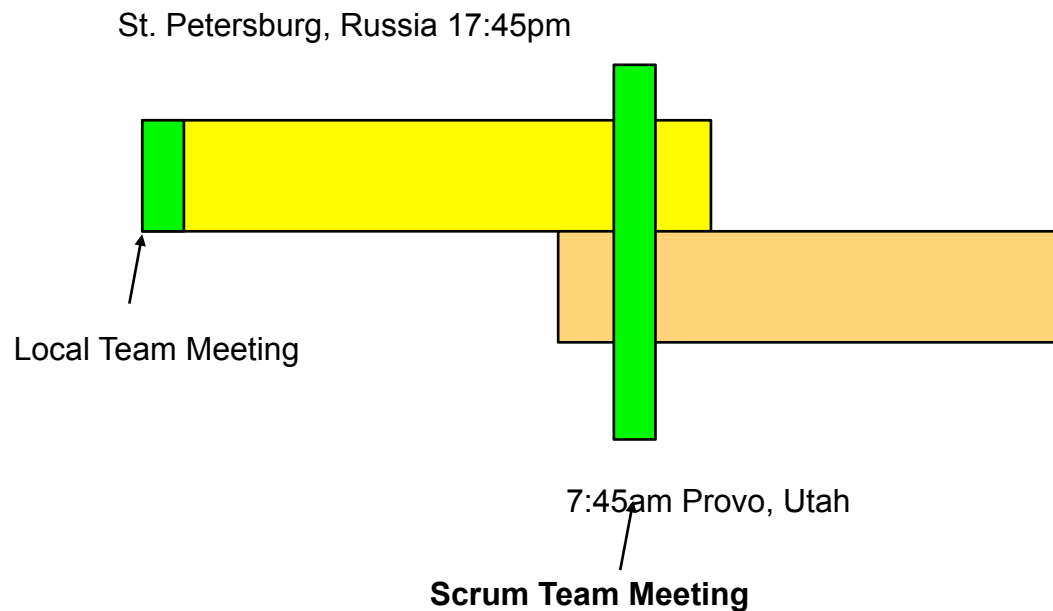
# SirsiDynix Distributed Scrum

56 developers distributed across sites



# SirsiDynix Distributed Scrum

## 🌐 Scrum daily meetings

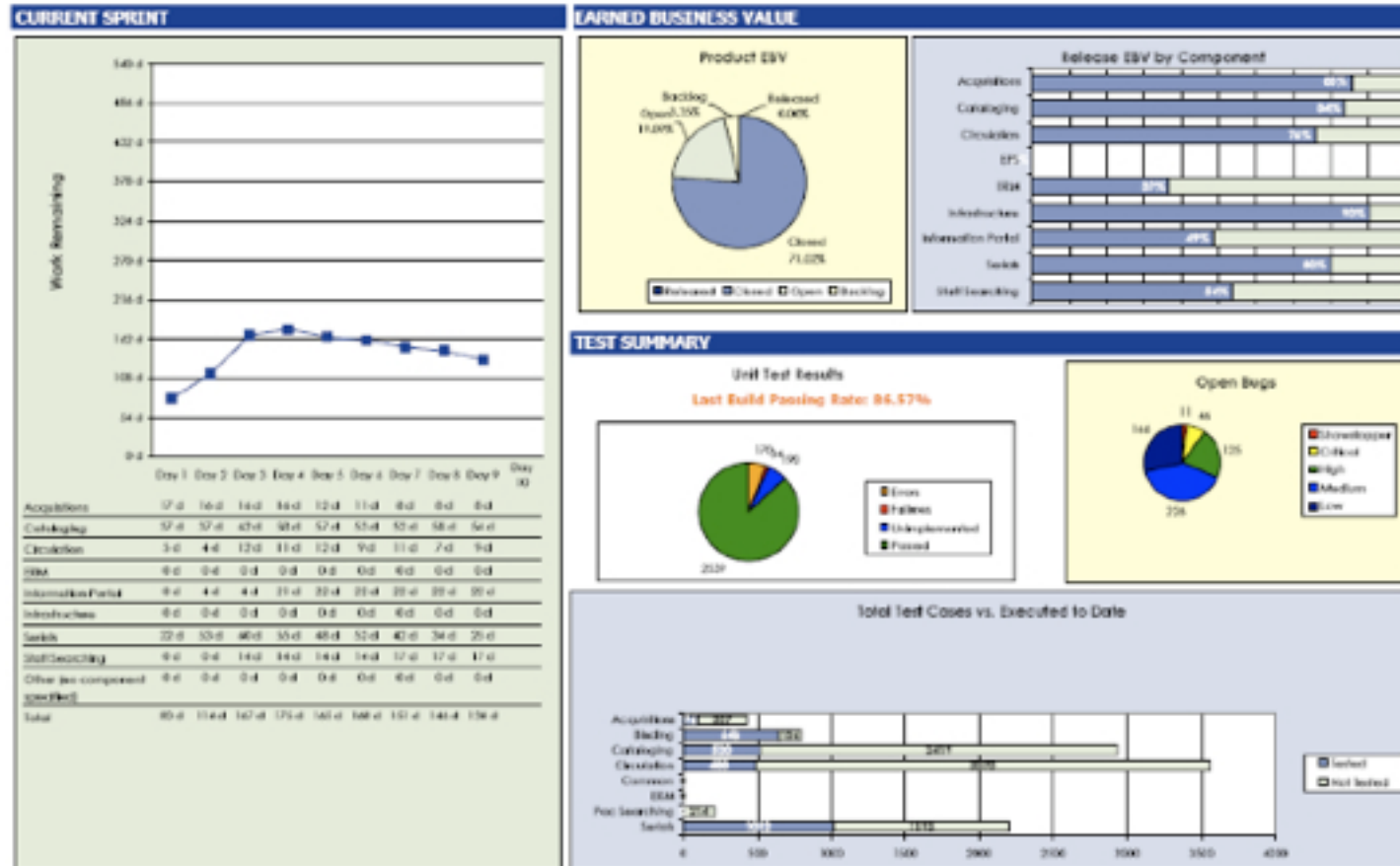


# SirsiDynix Distributed Scrum



Horizon 8.0

Report Ending: Monday, 17 Oct 2005



## Velocity in Function Points/Dev month

	Scrum[1]	Waterfall[1]	SirsiDynix[2]
Person Months	54	540	827
Lines of Java	51,000	58,000	671,688
Function Points	959	900	12673
Function Points per Dev/Mon	17.8	2.0	15.3

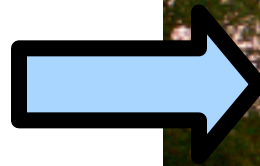
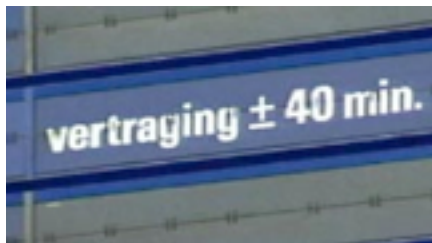
1. M. Cohn, User Stories Applied for Agile Development. Addison-Wesley, 2004

2. J. Sutherland, A. Viktorov, J. Blount, and N. Puntikov, "Distributed Scrum: Agile Project Management with Outsourced Development Teams," in HICSS'40, Hawaii International Conference on Software Systems, Big Island, Hawaii,

# Can you replicate SirsiDynix model?

- Define the distributed team model before projects start
- Assure consistent talent, tools, process, and organization across geographies
- Establish high quality data gathering techniques on velocity, quality, cost and environmental factors.
- Run a consistent team model on a series of projects and look for comparable results
- Demonstrate that local velocity = distributed velocity
- Demonstrate that local quality = distributed quality
- Demonstrate linear scaling at constant velocity per developer

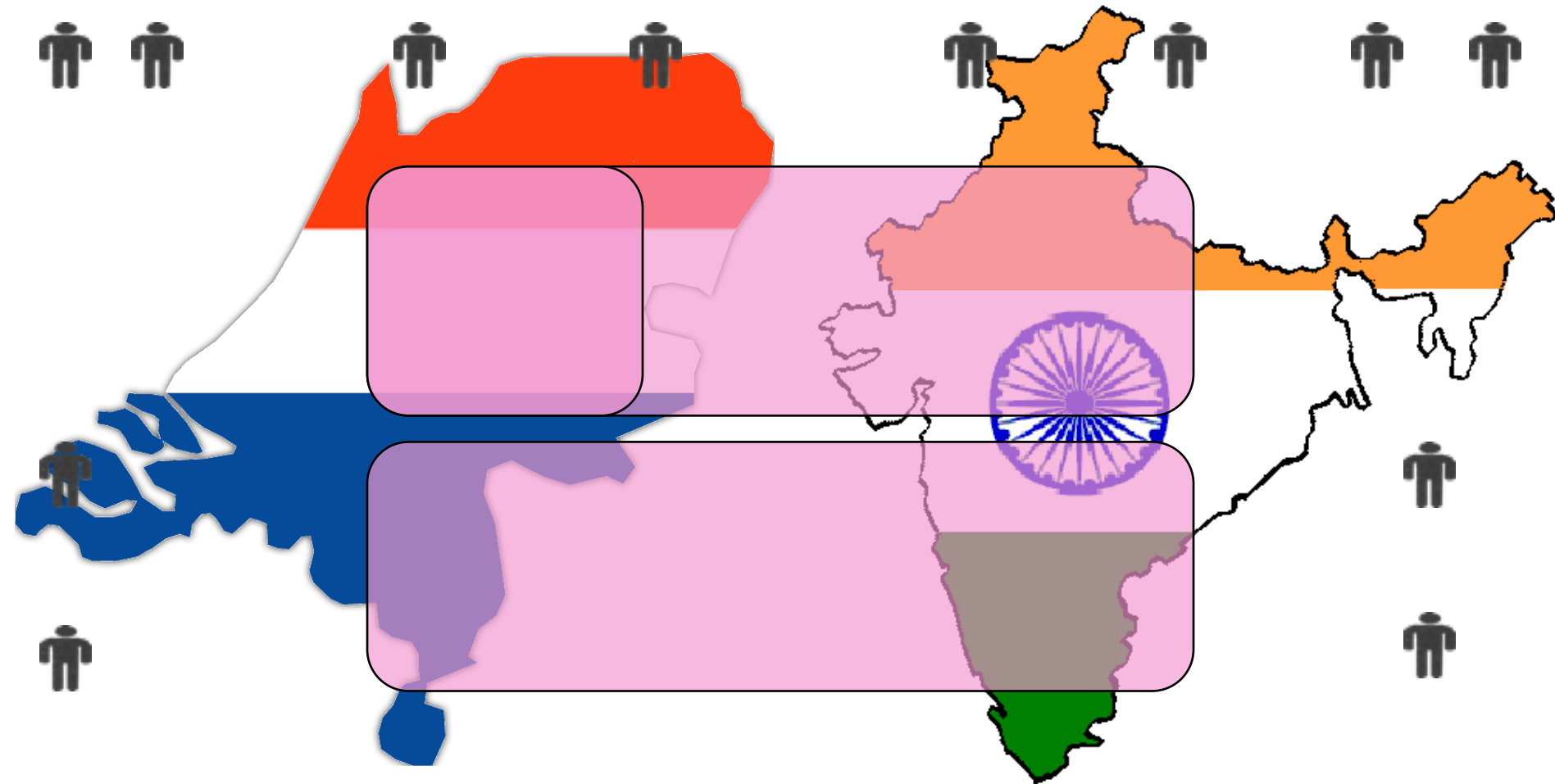
# Case study: Building a new railway information system



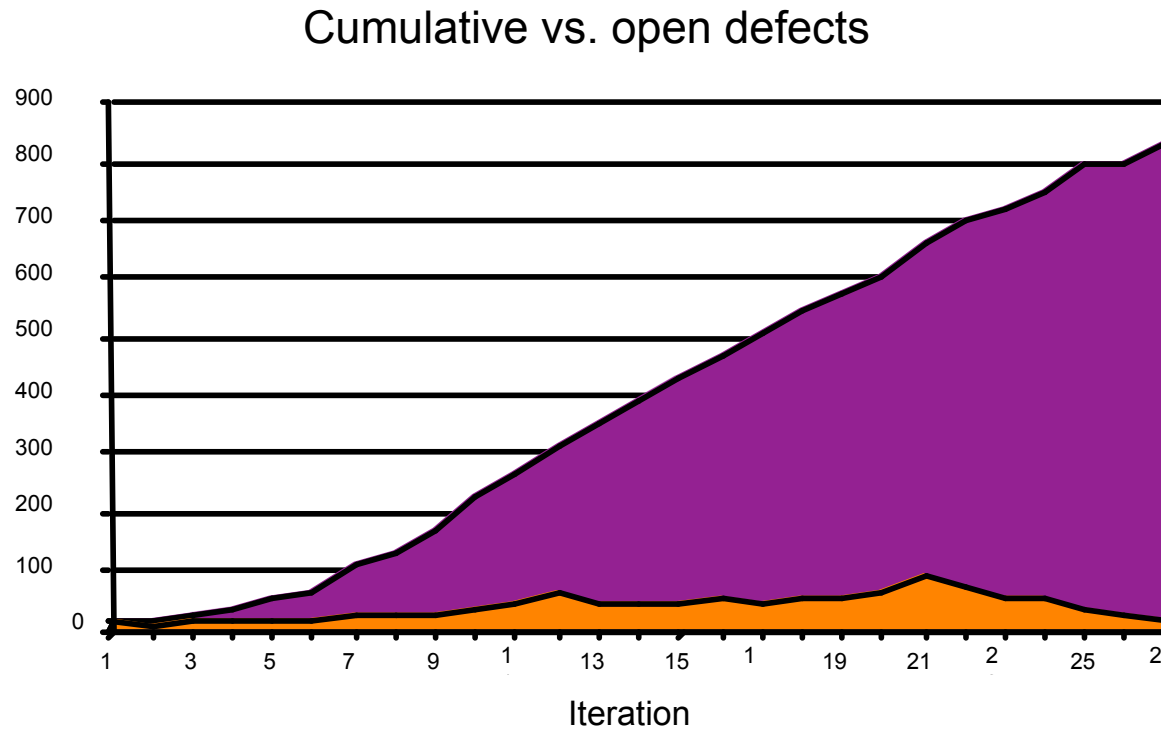
# ProRail PUB Example

- ProRail rescued a failed waterfall project to build a new scheduling system and automated railway station signs at all Netherlands railway stations
- An 8 person Scrum team started the project and established local velocity (half Dutch, half Indian).
- After establishing local velocity at 5 times other waterfall vendors on the project, the Indian half of the team went back to India

# Scaling Fully Distributed Scrum



# ProRail Defect Tracking



- Defect rate gets lower and lower as code base increases in size
- 95% of defects found inside iteration are eliminated before the end of the iteration

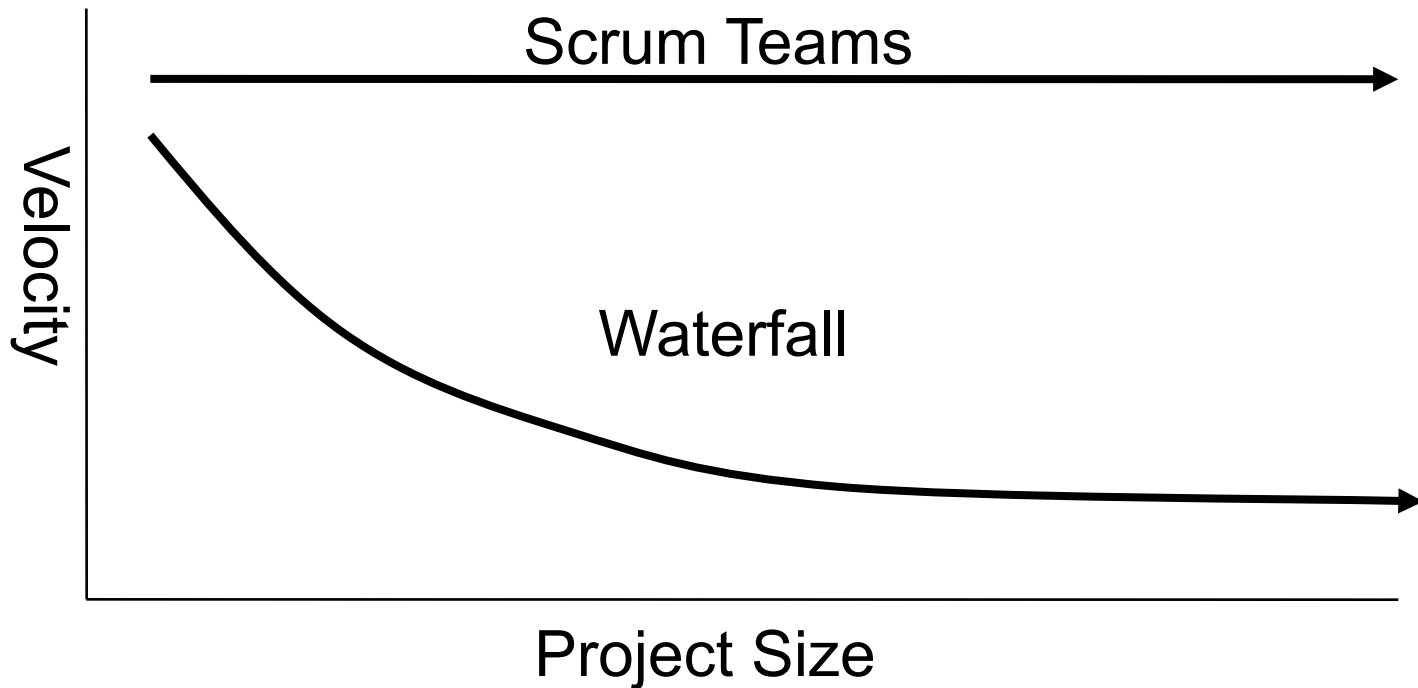
# Dutch Velocity vs. Russian Velocity

	SirsiDynix[2]	Xebia[3]
Person Months	827	125
Lines of Java	671,688	<b>100,000</b>
Function Points	12673	<b>1887</b>
Function Points per Dev/ Mon	15.3	<b>15.1</b>

1. M. Cohn, User Stories Applied for Agile Development. Addison-Wesley, 2004
2. J. Sutherland, A. Viktorov, J. Blount, and N. Puntikov, "Distributed Scrum: Agile Project Management with Outsourced Development Teams," in HICSS'40, Hawaii International Conference on Software Systems, Big Island, Hawaii,
3. J. Sutherland, G. Schoonheim, E. Rustenburg, M. Rijk. Fully Distributed Scrum: The Secret Sauce for Hyperproductive Outsourced Development Teams. Agile 2008, Toronto, Aug 4-8 (submission, preliminary data)

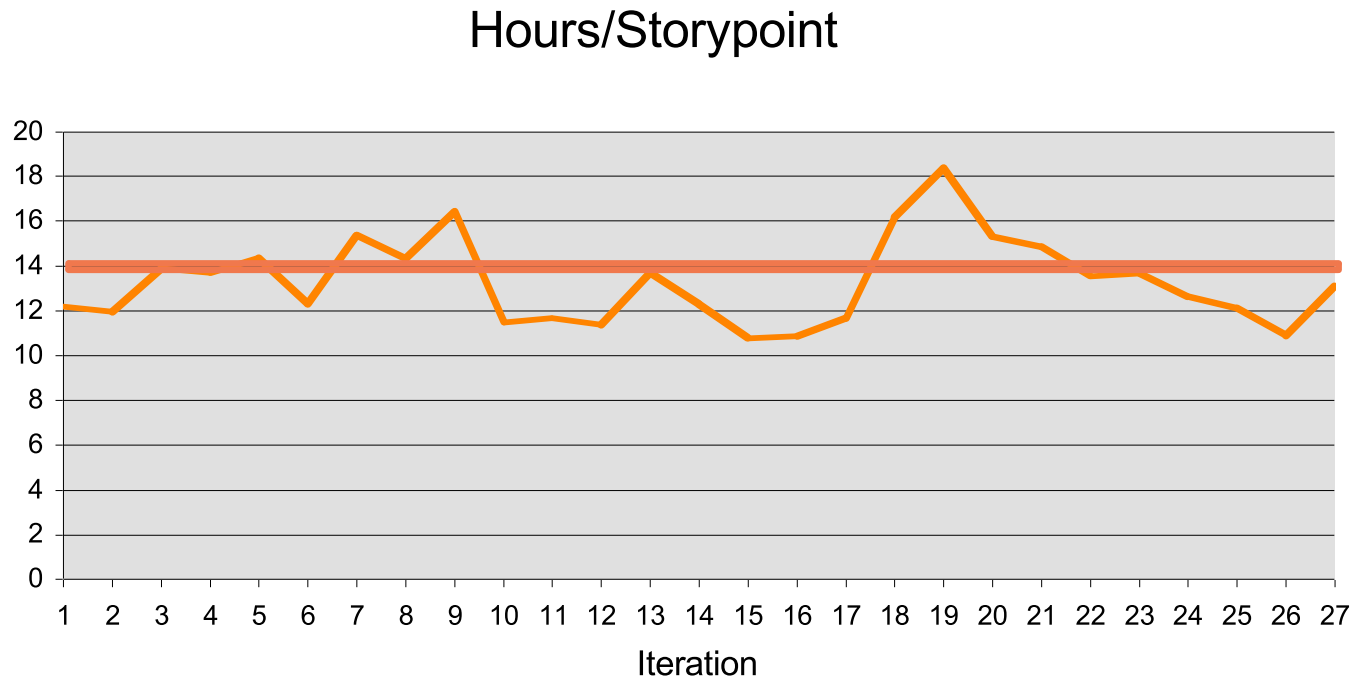
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# Linear Scalability of Large Scrum Projects



- J. Sutherland, A. Viktorov, J. Blount, and N. Puntikov, "Distributed Scrum: Agile Project Management with Outsourced Development Teams," in HICSS'40, Hawaii International Conference on Software Systems, Big Island, Hawaii, 2007.
- J. Sutherland, C. Jacobson, and K. Johnson, "Scrum and CMMI Level 5: A Magic Potion for Code Warriors!," in Agile 2007, Washington, D.C., 2007.

# Linear scalability



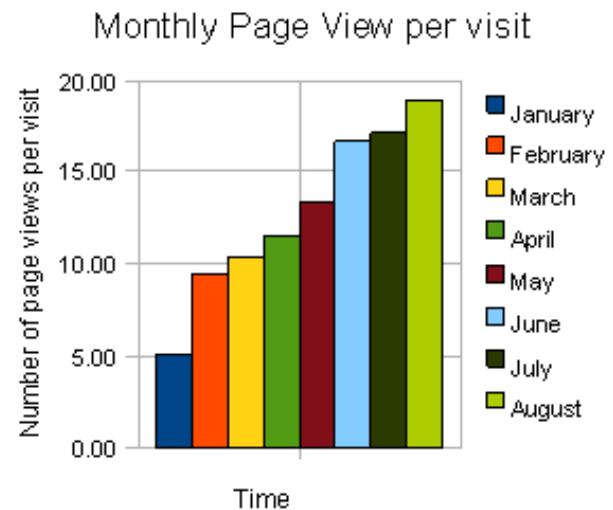
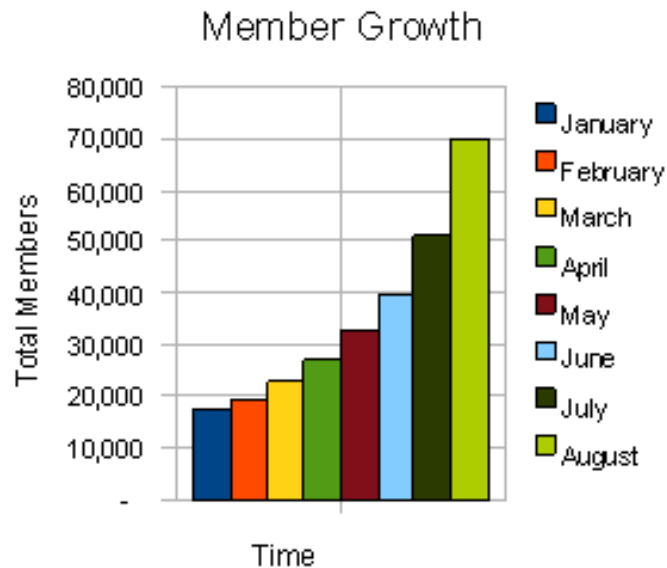
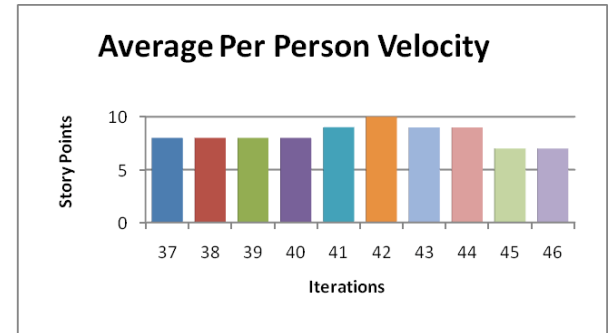
# Xebia's Conclusions

- Fully Distributed Scrum has the full benefits of both local hyperproductive teams and offshoring
- Fully Distributed Scrum has more value than localized Scrum
- All Xebia projects of more than a few people are fully distributed today

# Agile 2009

## TBD.com San Francisco - Xebia India

- All the benefits of ProRail plus
  - Quadrupled new user acquisition rate
  - Quadrupled web site page views



# Basic Truths about Hyperproductive Scrum

- Everyone must be trained in Scrum framework
- Backlog must be READY before taking into Sprint
- Software must be DONE at the end of the Sprint
- Pair immediately if only one person can do a task
- No Multitasking
- Physical Scrum Board
- Short sprints (often 1 week)
- Burn down Story points only
- Everything (including support) is prioritized by PO
- Top priority impediments must be removed
- Servant leadership – it's not about you

# Questions?



**Emergent Architecture**

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