

PRACTICAL ROADMAP TO GREAT SCRUM

SYSTEMATICALLY ACHIEVING HYPERPRODUCTIVITY

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Jfocus, Stockholm 27 Jan 2009



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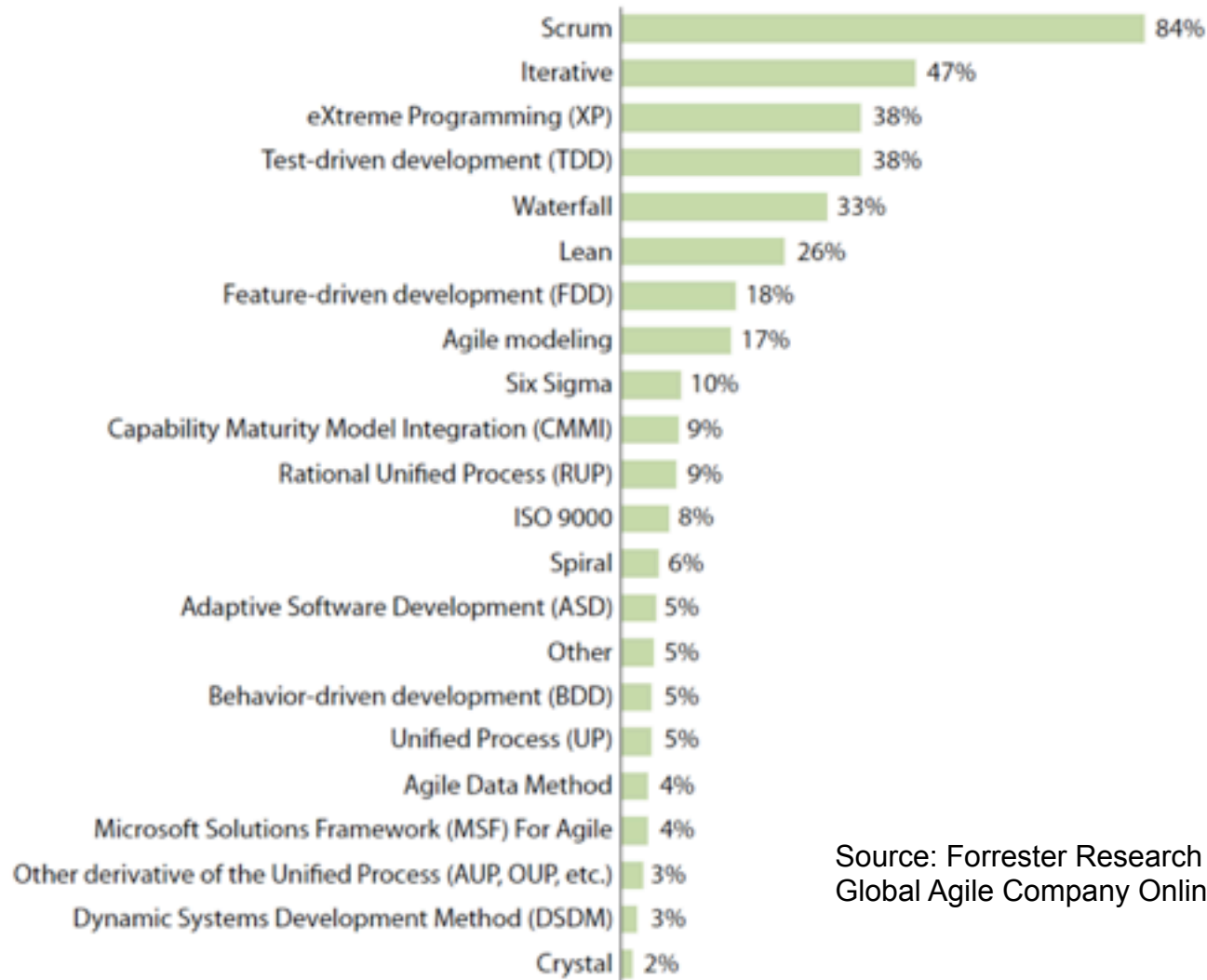


- **Chairman, Scrum Training Institute**
- **CEO Scrum, Inc. and Senior Advisor, OpenView Venture Partners**
 - **Agile coach for OpenView Venture Partners portfolio companies**
 - **Chief engineer for 11 software companies**
 - **Created first Scrum at Easel Corp. in 1993. Rolled out Scrum in next 5 companies**
 - **Achieved hyperproductive state in all companies. Signatory of Agile Manifesto and founder of Agile Alliance**
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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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The Kanban Dilemma

- **84% of surveyed companies are doing “Scrum”**
 - Only 47% say they are doing iterative development
 - This implies 37% are doing Scrum without iteration - maybe some form of continuous flow?
- **Closing stories within a Sprint is designed to force incremental development with fast feedback from customer**
 - This doubles productivity, reduces defects by 40%, and radically improves the fit of the product to customer needs
 - Failing to do this will cripple hyperproductivity

Heard on the street - *“If you can’t get the teams to work together you have to whip them. It’s called Kanban.”*

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Venture Capital Strategy: Follow the money

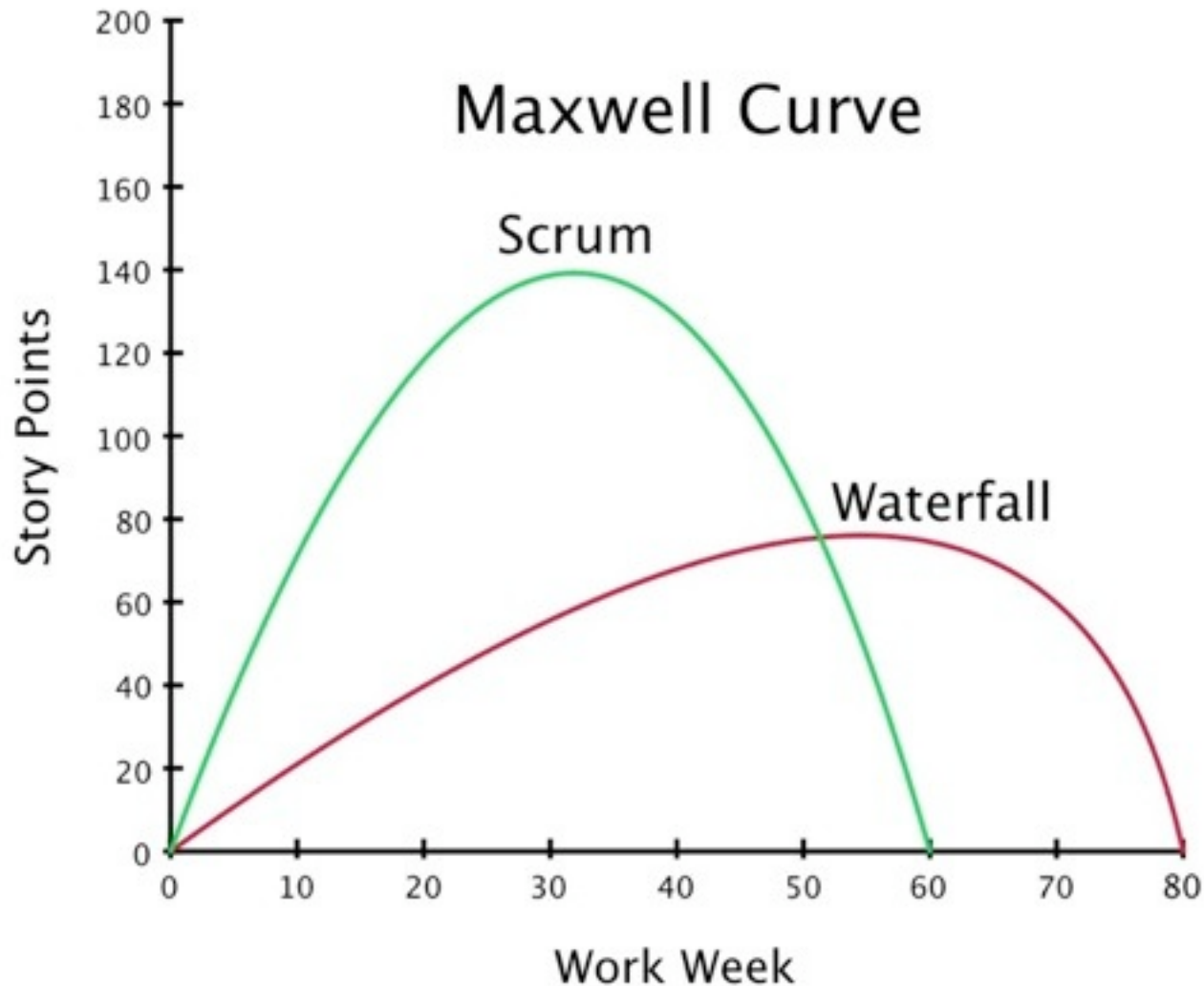
- **Invest only in Agile projects**
 - One hyperproductive company out of 10 might meet investment goals for a venture group
 - Two or more hyperproductive could alter the market
- **Invest only in market leading, industry standard processes – Scrum with XP engineering practices**
- **Ensure teams implement basic Scrum practices**
 - Everyone passes the Nokia test
 - Management held accountable at Board level for removing impediments
 - Generate hyperproductive Scrum



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

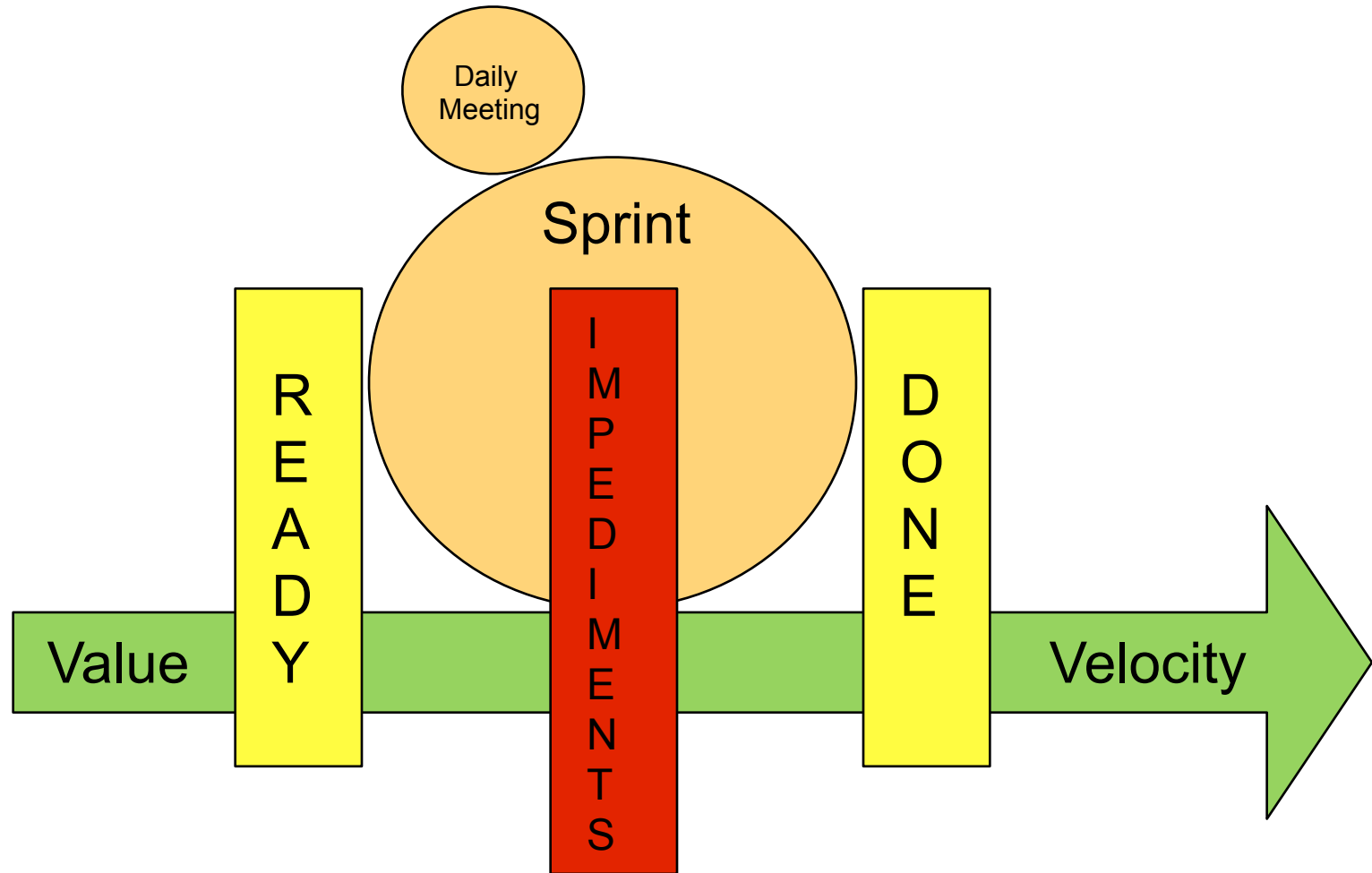
"FÅ GJORT DOBBELT SÅ MYE TIL HALVE PRISEN!"



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Keys to high performance Scrum ...



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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)**
- **But outside this company: 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.**
- **Hitting READY state is indicated by the process efficiency of story execution.**
- **When they are DONE and double story process efficiency, they are running at four times waterfall performance.**
- **OUTSIDE: 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**
- **Collaborative approach as opposed to authoritative approach**
- **Flat organizational structure**

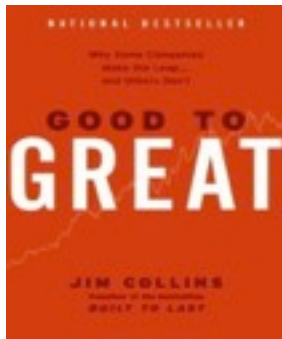
Russian vs. Dutch Velocity

Distributed/outsourced teams

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




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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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.



Going from Good to Great with Scrum

Are you **READY READY** to be **DONE DONE**?

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Wednesday, January 27, 2010

Systematic Experience Reports

<http://jeffsutherland.com/scrum>

- **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.**
- **C. R. Jakobsen and K. A. Johnson, "Mature Agile with a Twist of CMMI," in Agile 2008, Toronto, 2008.**
- **J. Sutherland, C. Jakobsen, and K. Johnson, "Scrum and CMMI Level 5: A Magic Potion for Code Warriors!," in Agile 2007, Washington, D.C., 2007.**

Download papers at jeffsutherland.com/scrum
Click on "Jeff Sutherland's Papers"

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How can we systematically go hyperproductive?



Mission Critical



Systematic Software Engineering A/S

- Established in **1985** and now Denmark's **largest privately-owned** software and systems company
- **500+ employees**; 71% hold a MSc or PhD in software engineering
- High **employee satisfaction** – attractive **workplace** for **ambitious** software engineers
- Dun & Bradstreet credit rating: **AAA**
- **CMMI Maturity Level 5 and ISO 9001:2000 and AQAP 2110 + 150**
- **Supplier of products and projects to more than 27 countries, export share is 60%**

Systematic used Scrum to implement Lean

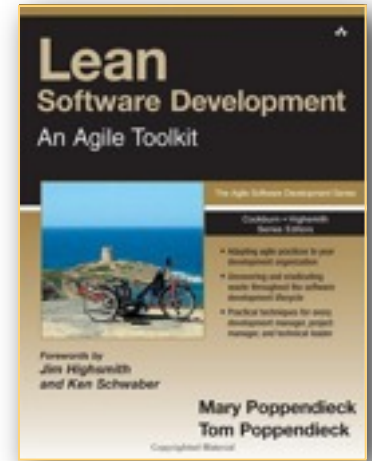
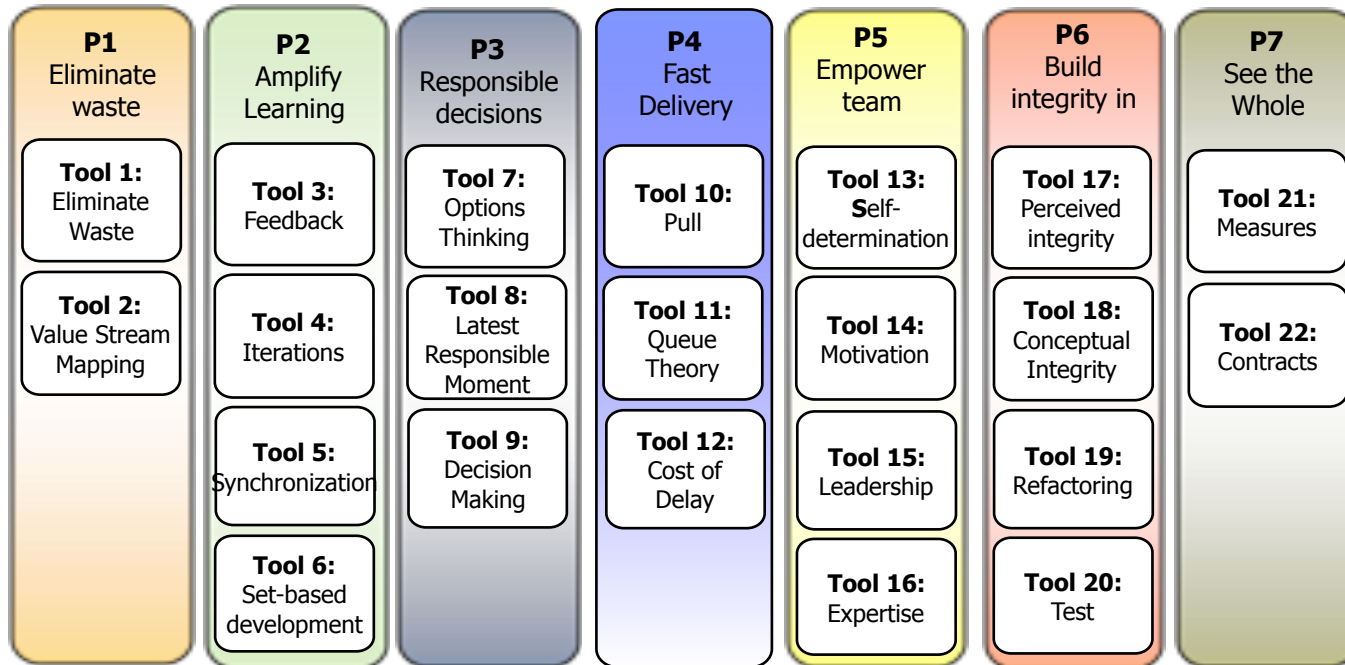


Directive from Strategic Planning Session in summer 2005:
Future Improvements should be primarily based on Lean

Customers demand more complexity and more speed

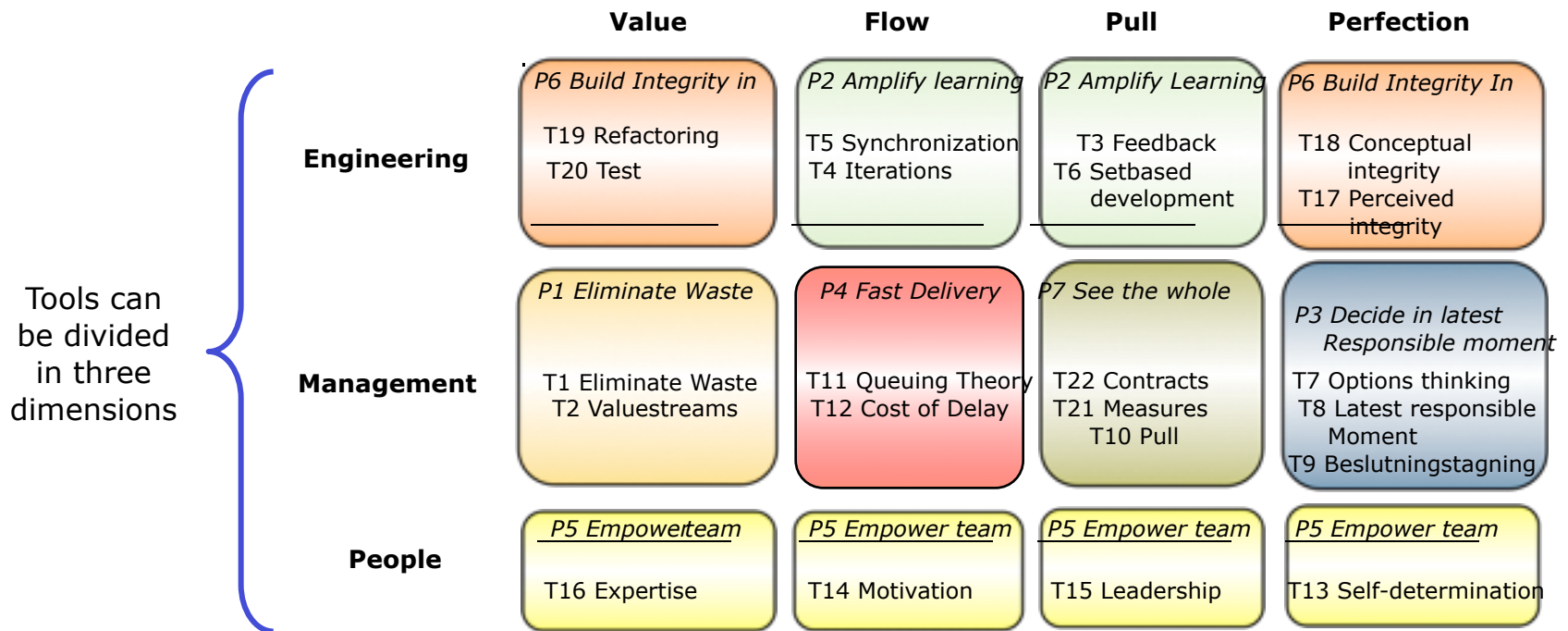
- **Management of complexity requires process discipline, and management of increased speed of change requires adaptability.**
- **CMMI primarily provides process discipline and Scrum enhances adaptability.**
- **Is it possible to integrate CMMI and agile practices like Scrum to achieve the benefits from both – or even more?**

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

Systematic's new model for Lean SW development



These are thinking tools – Projects and employees know best how to transform themselves

Systematic Pilot – Small Project

- **First pilot was initiated on a request for proposal**
 - Systematic, inspired by Lean principles, suggested a delivery plan with bi-weekly deliveries
 - Stated explicit expectations for customer involvement and feedback
 - The project had a team size of 4 and built software for a customer in the Danish Government
- **Key reasons for Systematic award:**
 - commitment to deliver working code bi-weekly
 - provided a very transparent process to the customer

Small Project Success Factors

- **Delivery plan and customer involvement resulted in early detection of technology issues.**
 - Had a traditional approach been used these issues would have been identified much later with negative impacts on cost and schedule performance.
- **Productivity of small project was at the expected level compared to the productivity performance baseline for small projects.**
- **Another small project with a team size of 5 working for a Defense customer using Scrum showed a similar productivity and the same indicators of high quality and customer satisfaction.**

Pilot of Larger Project

- **Team of 10 worked on a military messaging system.**
 - This project was inspired from the Lean thinking tool “Build Integrity In” to investigate how to do early test, and as a result they invented a story-based approach to early testing in software development.
 - The name “Story-based” development was inspired from XP, but the approach included new aspects like: short incremental contributions, inspections and was feature-driven.
- **The idea of story-based development was to subdivide features of work, typically estimated to hundreds of hours of work into smaller stories of 20-40 hours of work.**
- **The implementation of a story followed a new procedure:**
 - first: decide how the story could be tested, before any code is written.
 - test(s) could then be used as the exit criteria for implementation of the story.

New Approach to Testing Reduced Defects by 38%

- **Many benefits from story-based development were immediately apparent.**
 - The combination of a good definition of when a story was complete, and early incremental testing of the features, provided a very precise overview of status and progress for both team and other stakeholders.
- **Developing a series of small stories rather than parts of a big feature is more satisfactory**
 - creates a better focus on completing a feature until it fulfills all the criteria for being “done”.
- **This project finished early, and reduced the number of coding defects in final test by 38% compared to previous processes.**

A Larger Project

- **Group of 19 working on a module to a electronic patient record system, also worked with early testing.**
- **They ensured that test activities were integrated into development, with a strong focus on “seeing the whole” and understanding how the solution fit into the customer’s domain.**
- **For each week the project defined a goal to be achieved. The project ensured that test and domain specialists were co-located with the developers.**
 - This caused discussion and reflection between testers, developers, user experience engineers and software architects, before or very early in the development of new functionality.
- **As a consequence the amount of remaining coding defects in final test were reduced by 42% compared to previous processes.**

Conclusions from Larger Projects

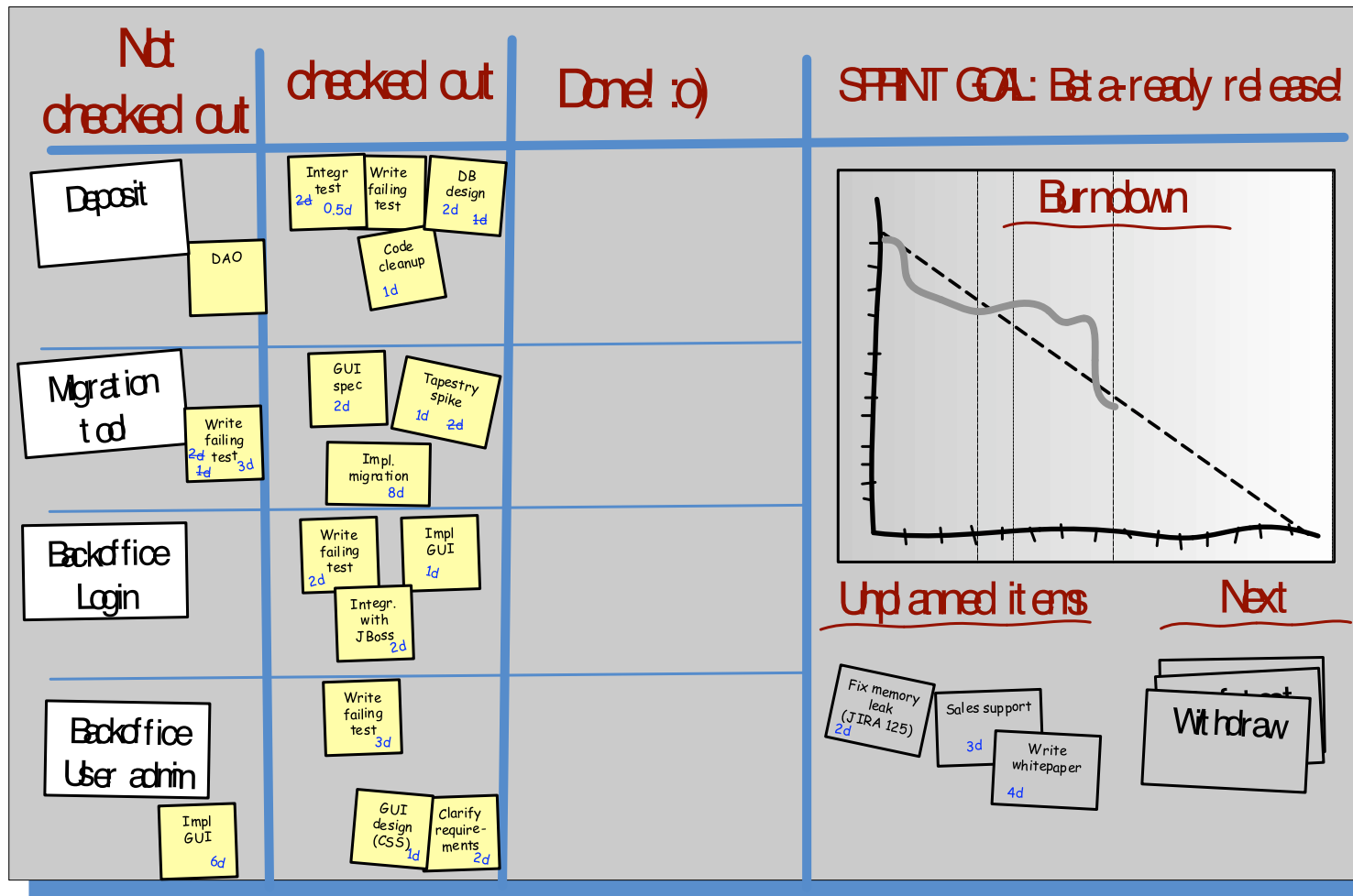
- **Test activities should be an integrated activity throughout the project's lifetime.**
 - 🌐 Scrum inherently supports this, through cross-functional teams and frequent deliveries to the customer.
- **Story-based software development method should be the default recommended method for software development in projects.**
- **This strategy is commonly known as "Acceptance Test Drive Development"**

Challenges:

Developer's self-interest

- **Many developers see it as against their self-interest to optimize for team performance**
- **They will often try to optimize for personal efficiency or personal interest and generate repeated Sprint failure, or significantly sub-optimize team performance**
- **This is not "self-organization"**
- **ScrumMaster must coach team to move beyond mediocrity**

Typical crash and burn Sprint



- 3 roles**
- Product owner
 - Scrum master
 - Team
- 3 artifacts**
- Product backlog
 - **Sprint backlog**
 - Sprint burndown
- 3 activities**
- Sprint planning
 - Daily scrum
 - Sprint review
 - Demo
 - Retrospective

WAIT A SEC
 How is that burndown calculated?

Source: Henrik Kniberg

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Properly executed Sprint

3 roles

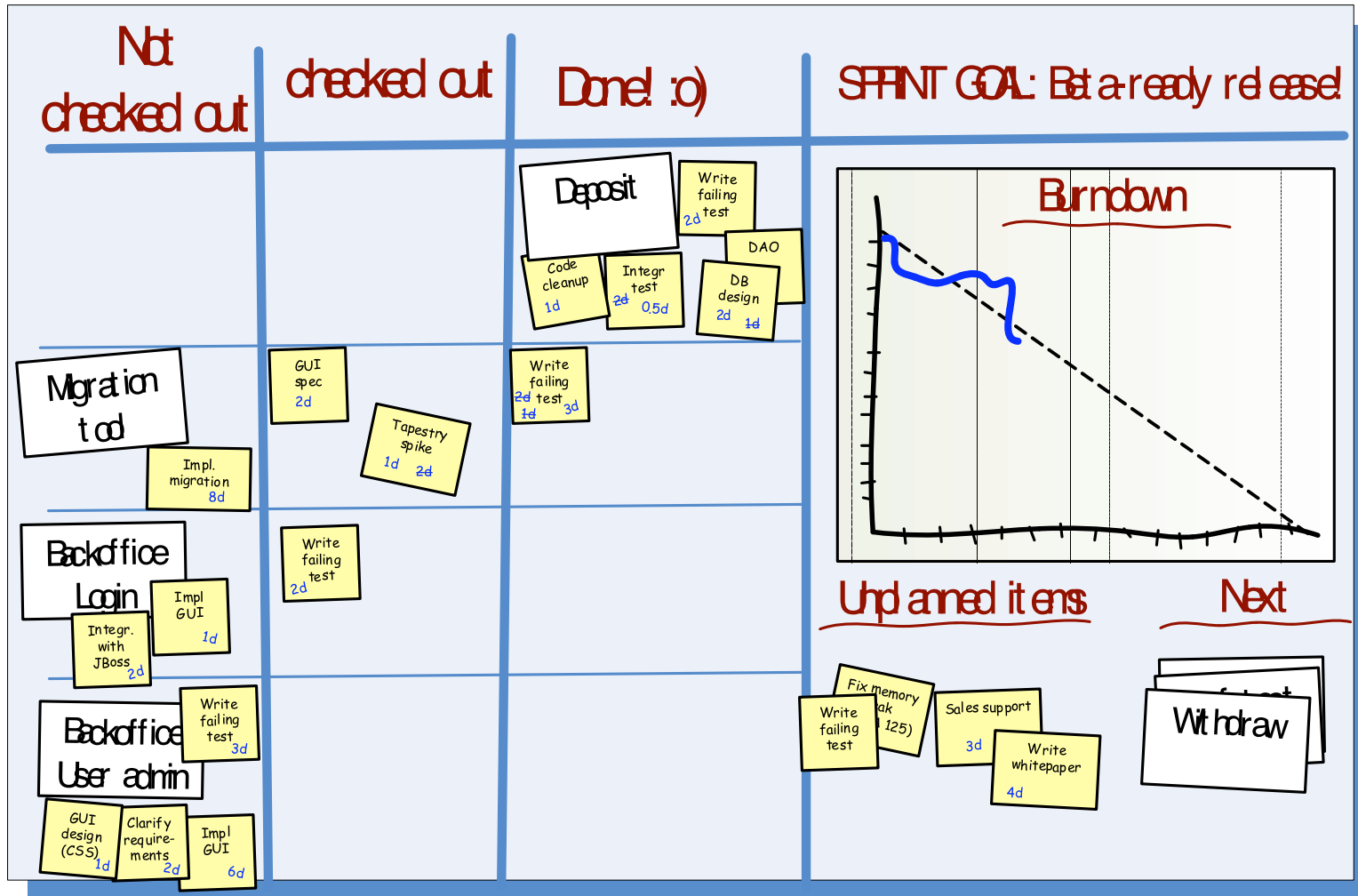
- Product owner
- Scrum master
- Team

3 artifacts

- Product backlog
- **Sprint backlog**
- Sprint burndown

3 activities

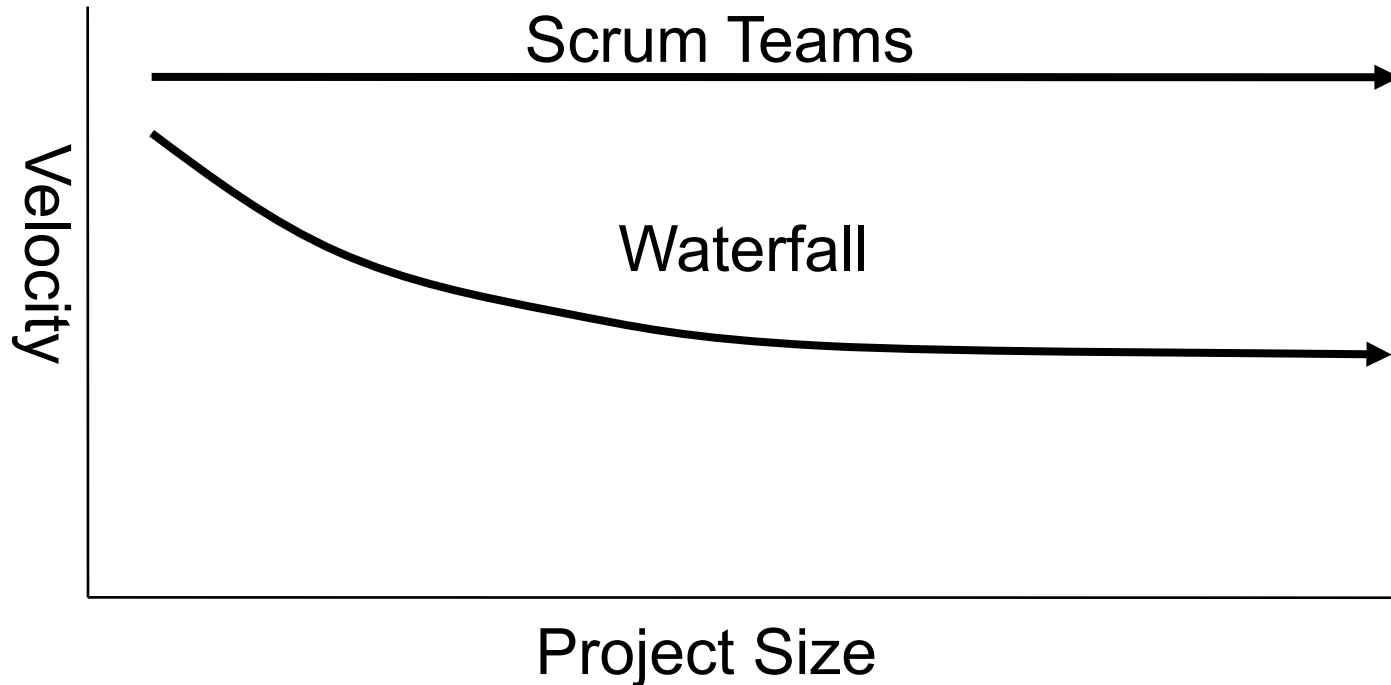
- Sprint planning
- Daily scrum
- Sprint review
 - Demo
 - Retrospective



Source: Henrik Kniberg

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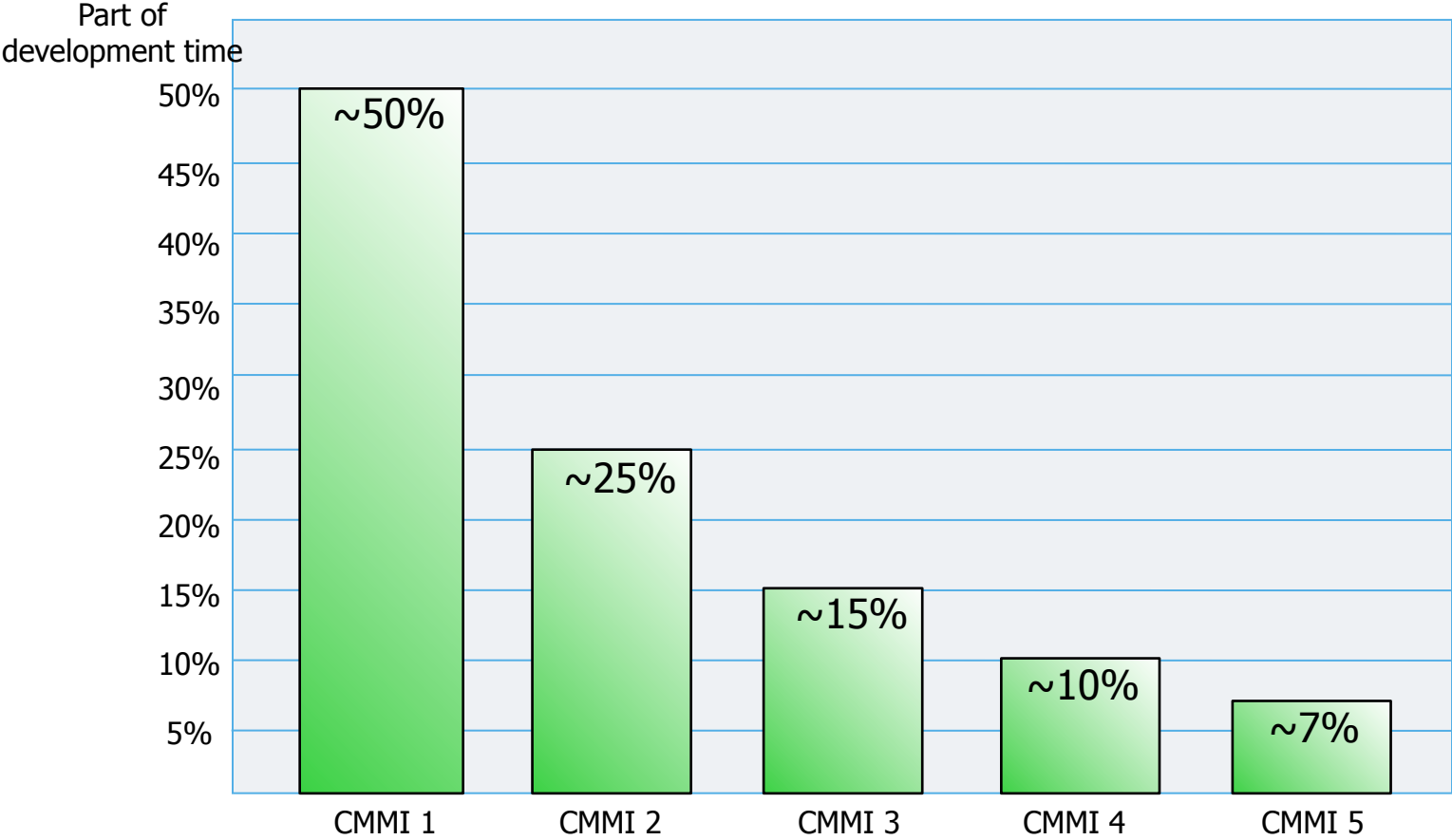
Systematic noticed linear scalability



- 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.

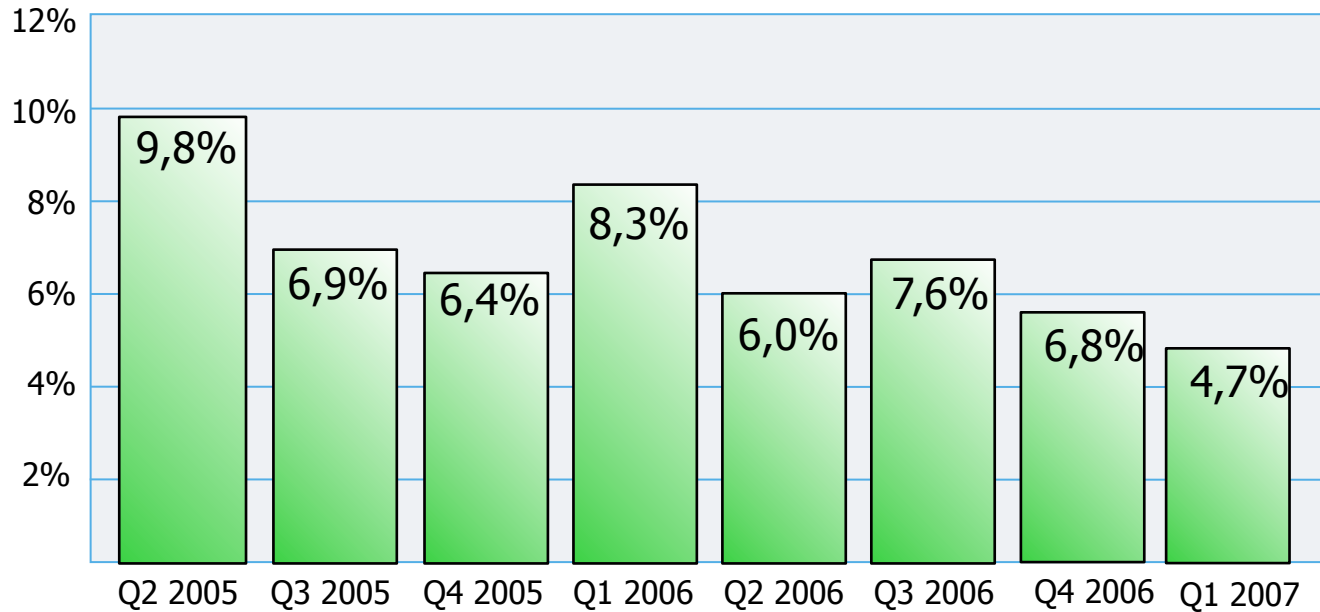
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Published experiences with "rework"



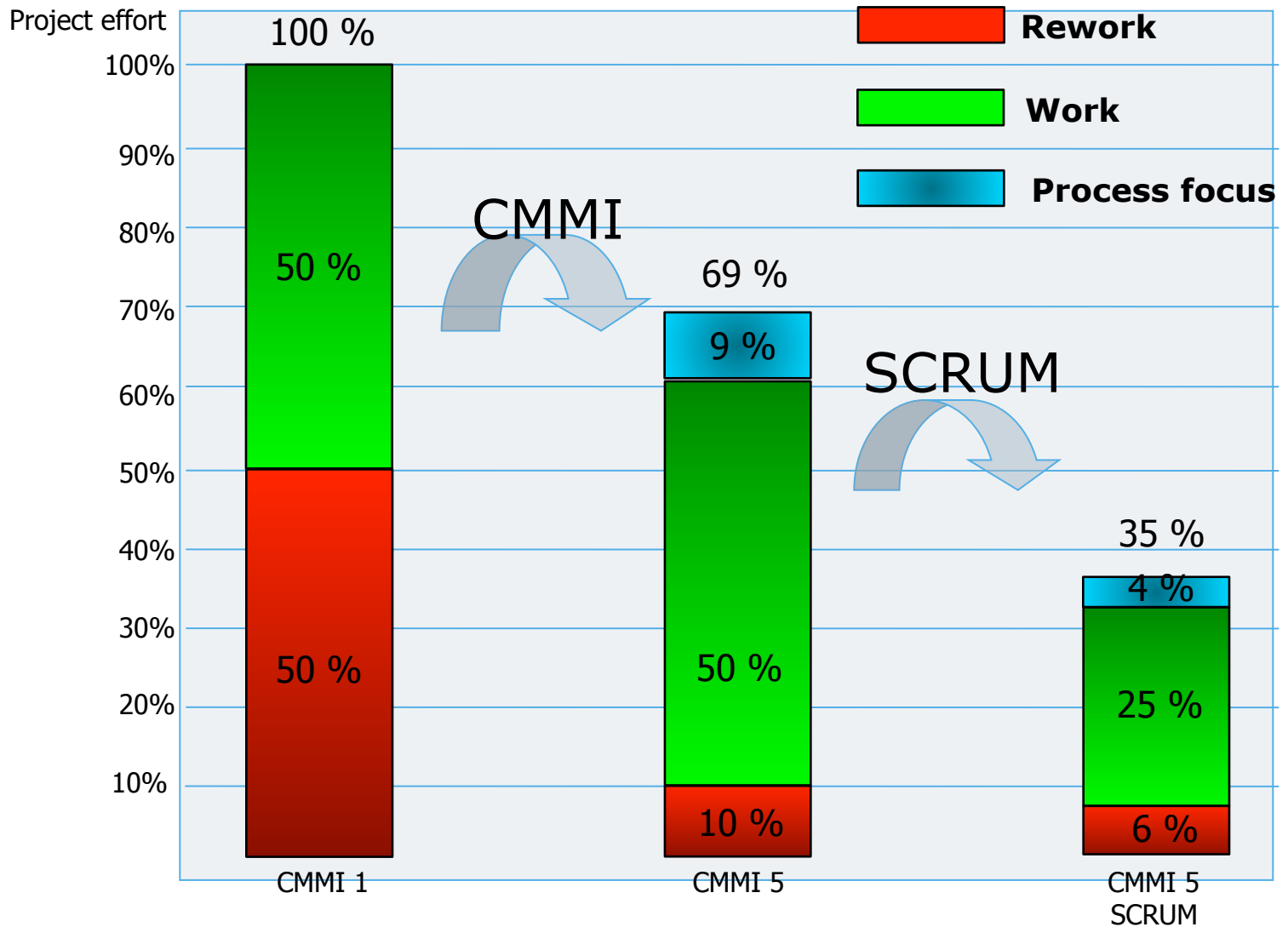
Source: Krasner & Houston, CrossTalk, Nov 1998
Diaz & King, CrossTalk, Mar 2002

Rework at Systematic



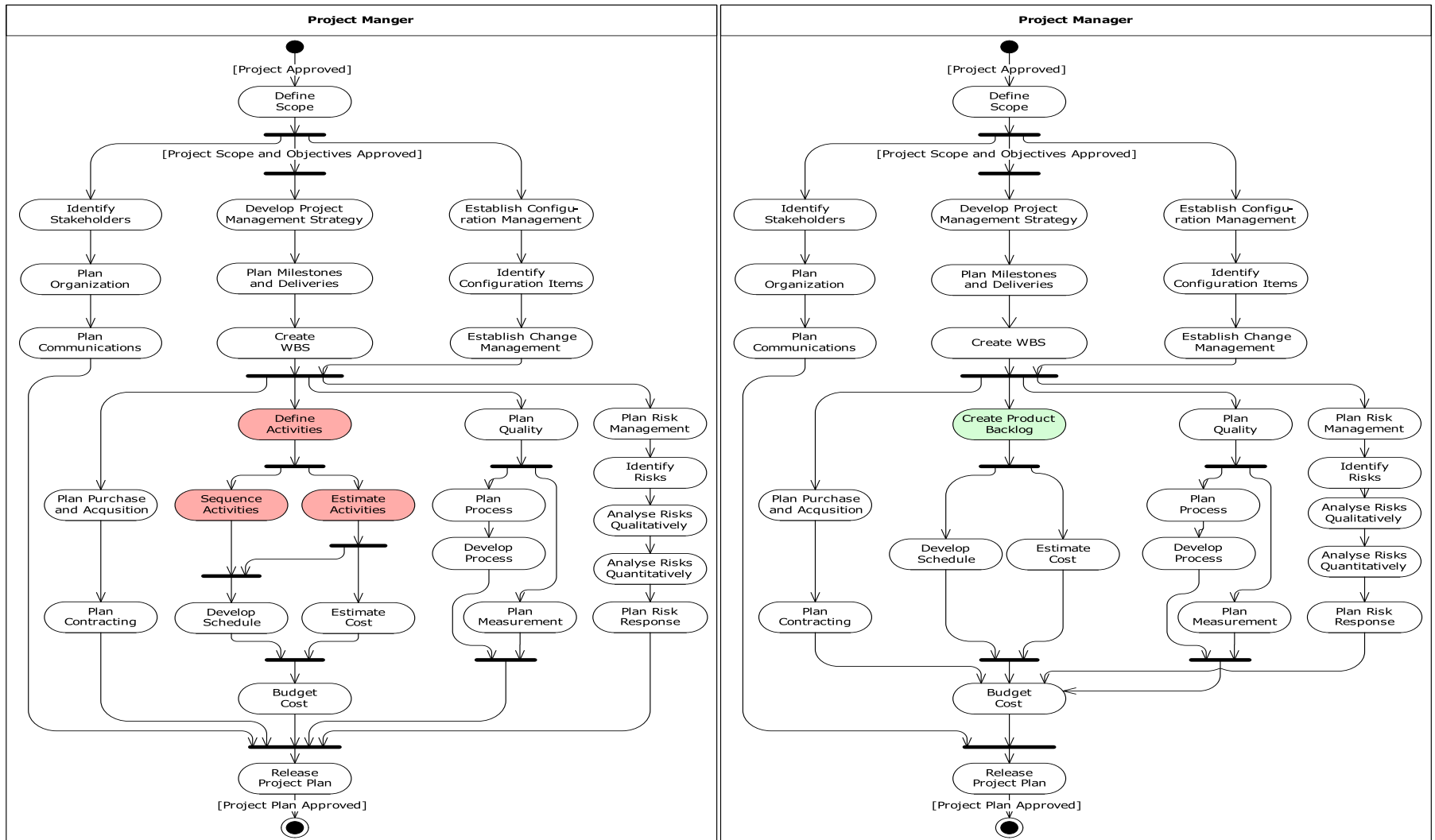
Scrum applied to CMMI Level 5 company

— 6 month results for Scrum



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SCRUM and PDP-Common

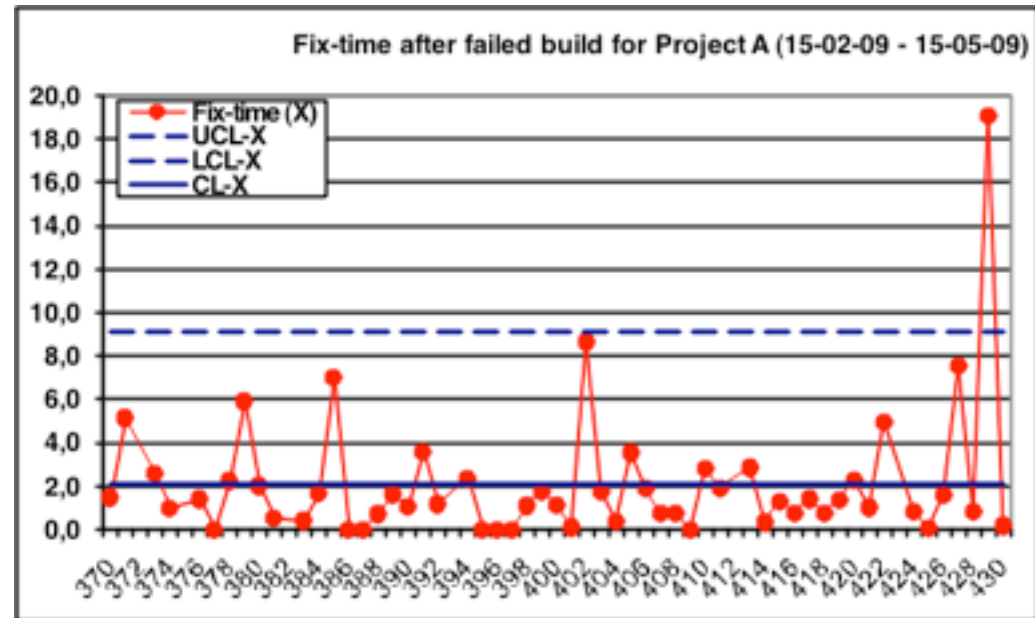


Impediments

Data driven removal of impediments using control charts from 11/2007

Examples on causes:

- Special competences
- Disk full
- Setup misunderstood
- COTS failed



Root cause analysis of time to fix automatically generates ScrumMaster's impediment list.

Systematic CMMI 5 Analysis

First six months of Scrum

- **80% reduction in planning and documentation costs**
- **40% reduction in defects**
- **50% reduction in rework**
- **100% increase in overall productivity**
- **Systematic decided to change CMMI Level 5 process to make Scrum the default mode of project management**
- **When waterfall project management is required, they are now contracted for twice the price of Scrum projects**
 - Required by some defense and healthcare agencies
 - Results are lower business value
 - Lower customer satisfaction
 - Lower quality
 - Twice the cost



Sutherland, J., C. Jacobson, et al. (2007). Scrum and CMMI Level 5: A Magic Potion for Code Warriors! Agile 2007, Washington, D.C., IEEE.

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Next steps for Systematic

- **Assure all teams run at 4x performance and 40% fewer defects while maintaining CMMI 5 compliance**
- **Use Function Point Analysis to improve data collection capability to research quality**
- **Execute the second doubling of performance of teams based on Function Point Analysis by focusing on READY state of Product Backlog**

Learn and improve from success

Q2 2008

Project	Performance	Deviation
A	192%	18%
B	76%	64%
C	86%	92%
D	54%	50%
E	258%	48%

Q3 2008

Project	Performance	Deviation
A	140%	44%
B	74%	64%
C	81%	83%
D	70%	59%
E	365%	75%

Performance data from pilot on use of function points were collected. Data are subject to high variance and uncertainty, because it is a new technology used for the first time – However ...

Data could indicate that A and E have good performance, which is also the gut feeling by senior management.

Investigate possible success and practices behind it

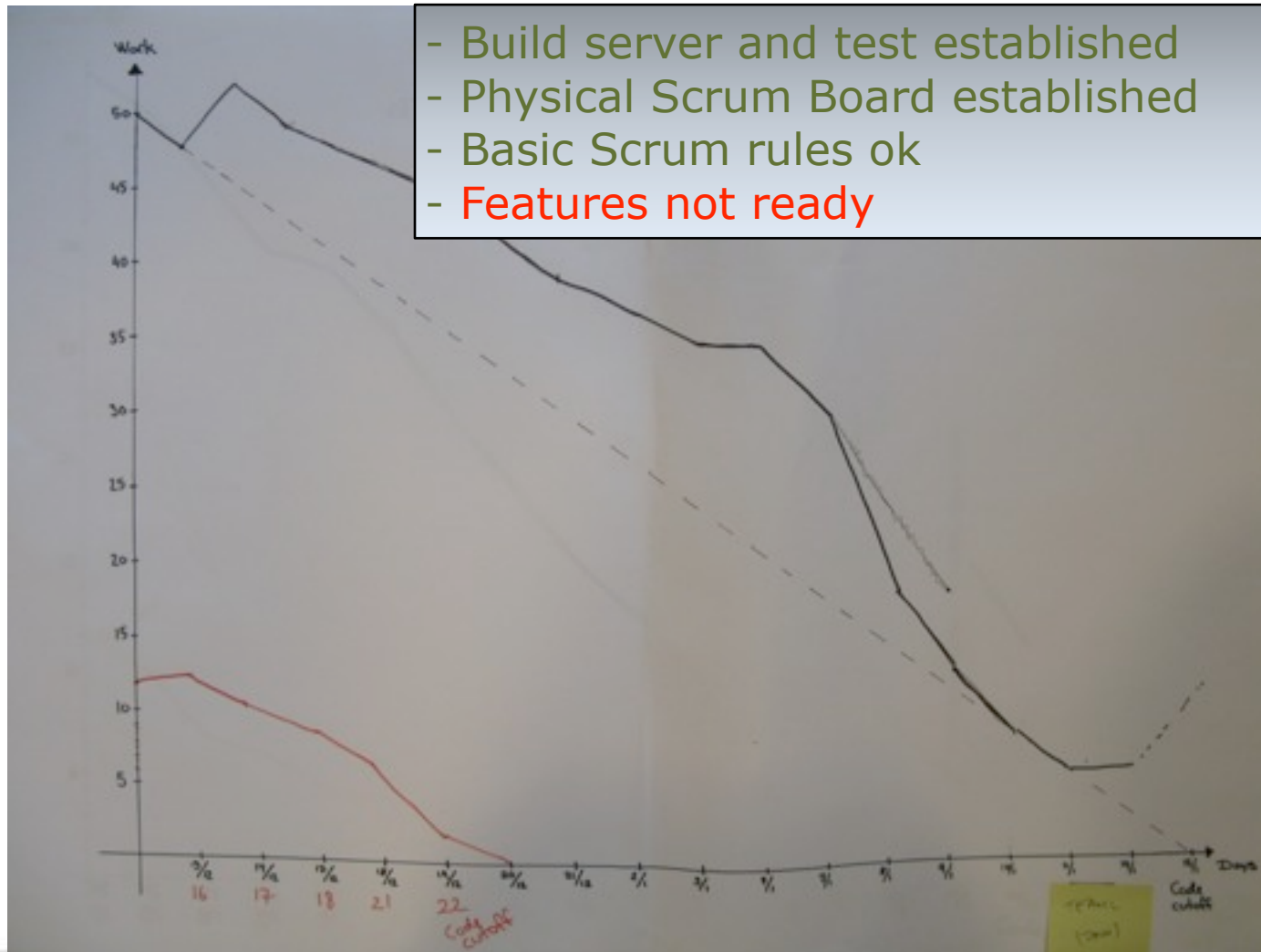
Projects investigated

8 interviews of 1 hour with project members

- **Questions for project A and E teams:**
 - Why high performance?
 - We spent time to prepare and groom our product backlog
 - We ensure that tasks for Sprint Planning are READY
 - How can other projects copy your success?
 - We document our practice in a READY checklist
 - Ready state determines process efficiency of a story
 - If story takes 1 ideal day of work and takes 4 calendar days to complete, process efficiency is 25%. We call this *FLOW*.
- **The story of project A ...**

First scrum ...

13/12-2007 – 22/1-2008 – Flow: 23%



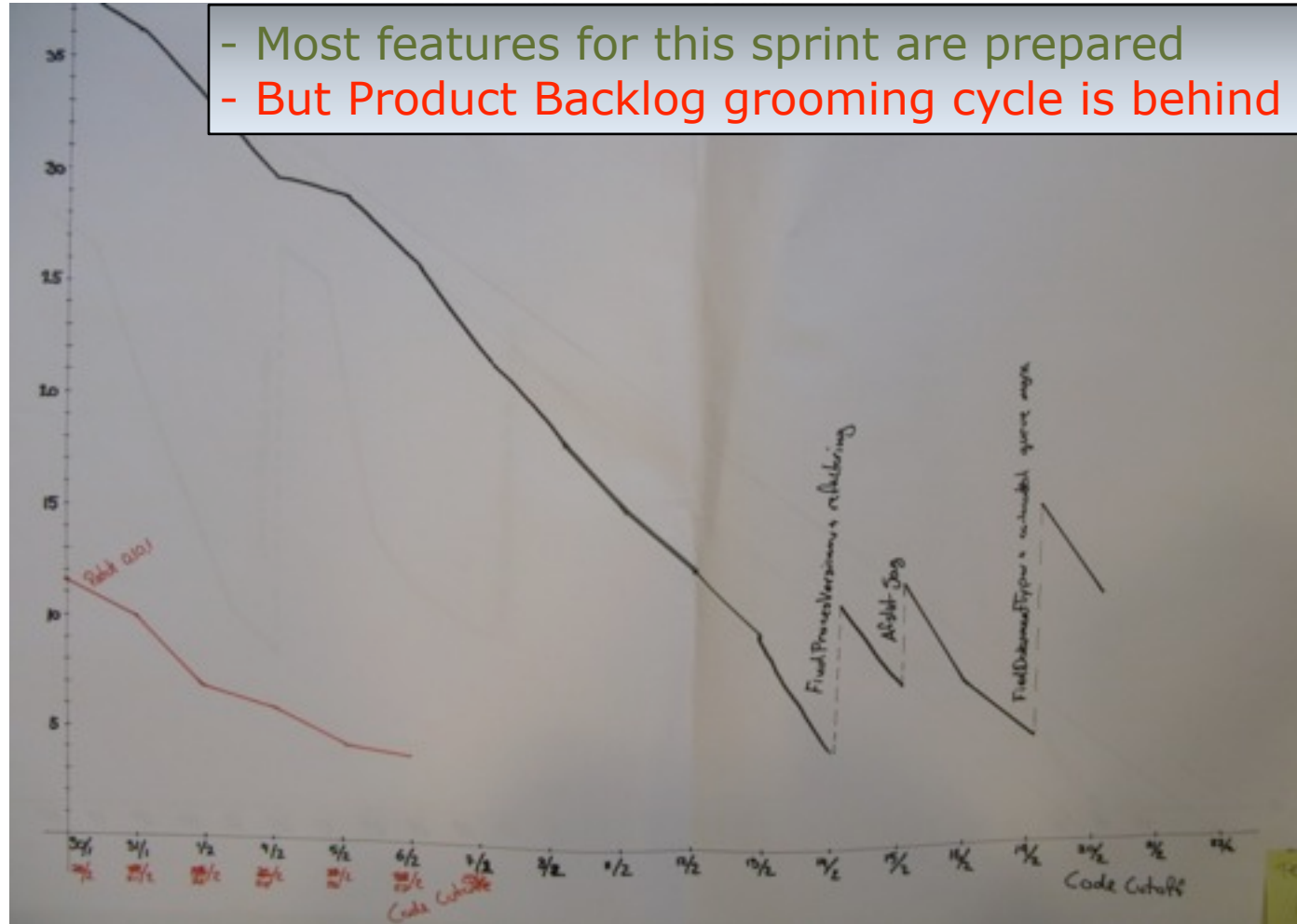
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Starting to insist on "well defined"

30/1-2008 – 27/2-2008 – Flow: 48 %

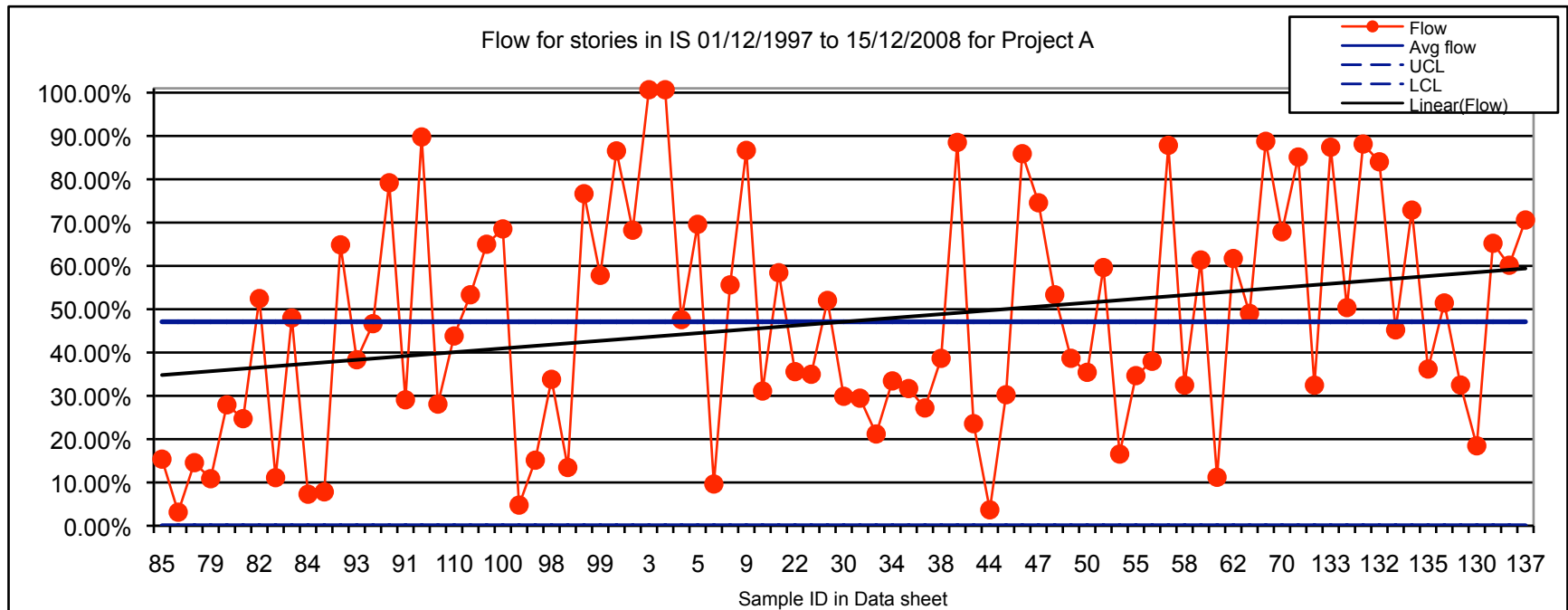
- Most features for this sprint are prepared
- But Product Backlog grooming cycle is behind



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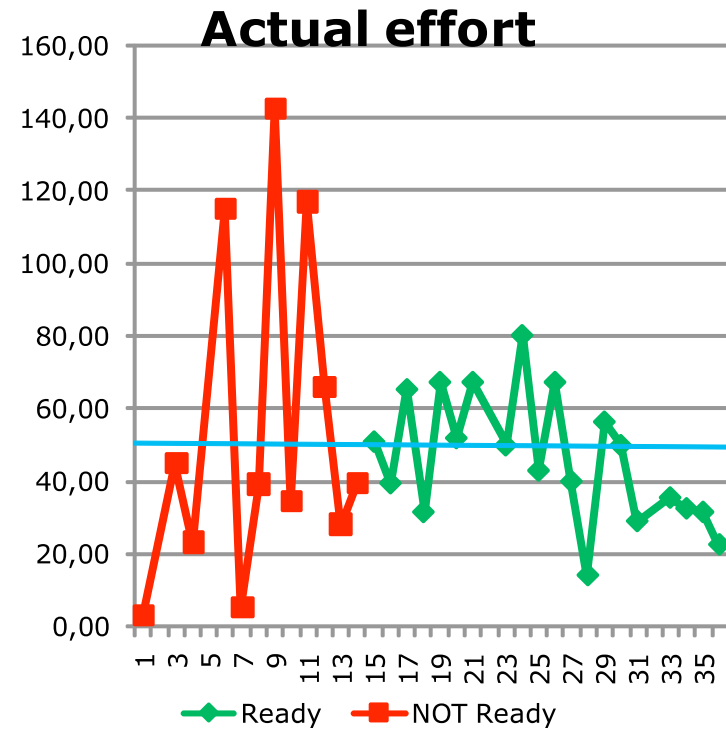
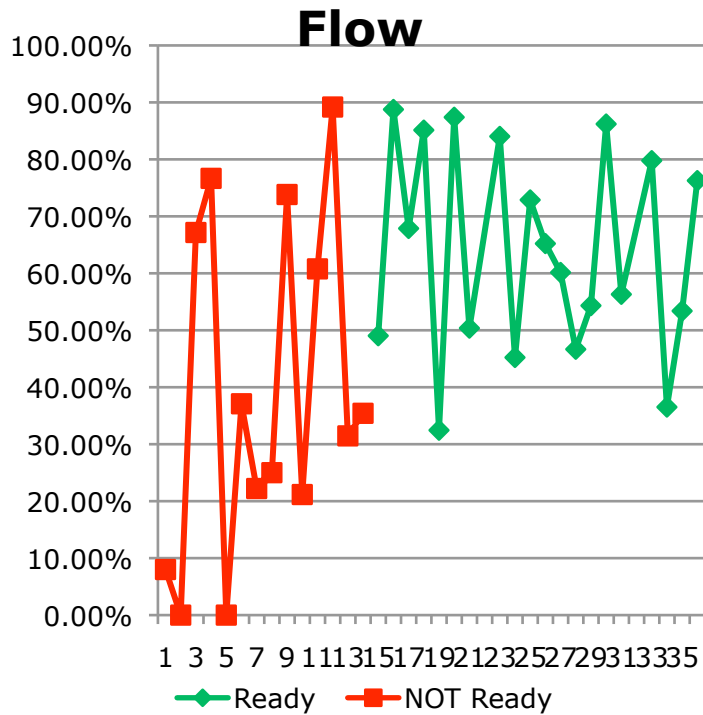
Result

Flow increased from appr. 30% to appr. 60% in 2008 for Project A



Effect

When work allocated to sprint is READY, flow and stability is achieved

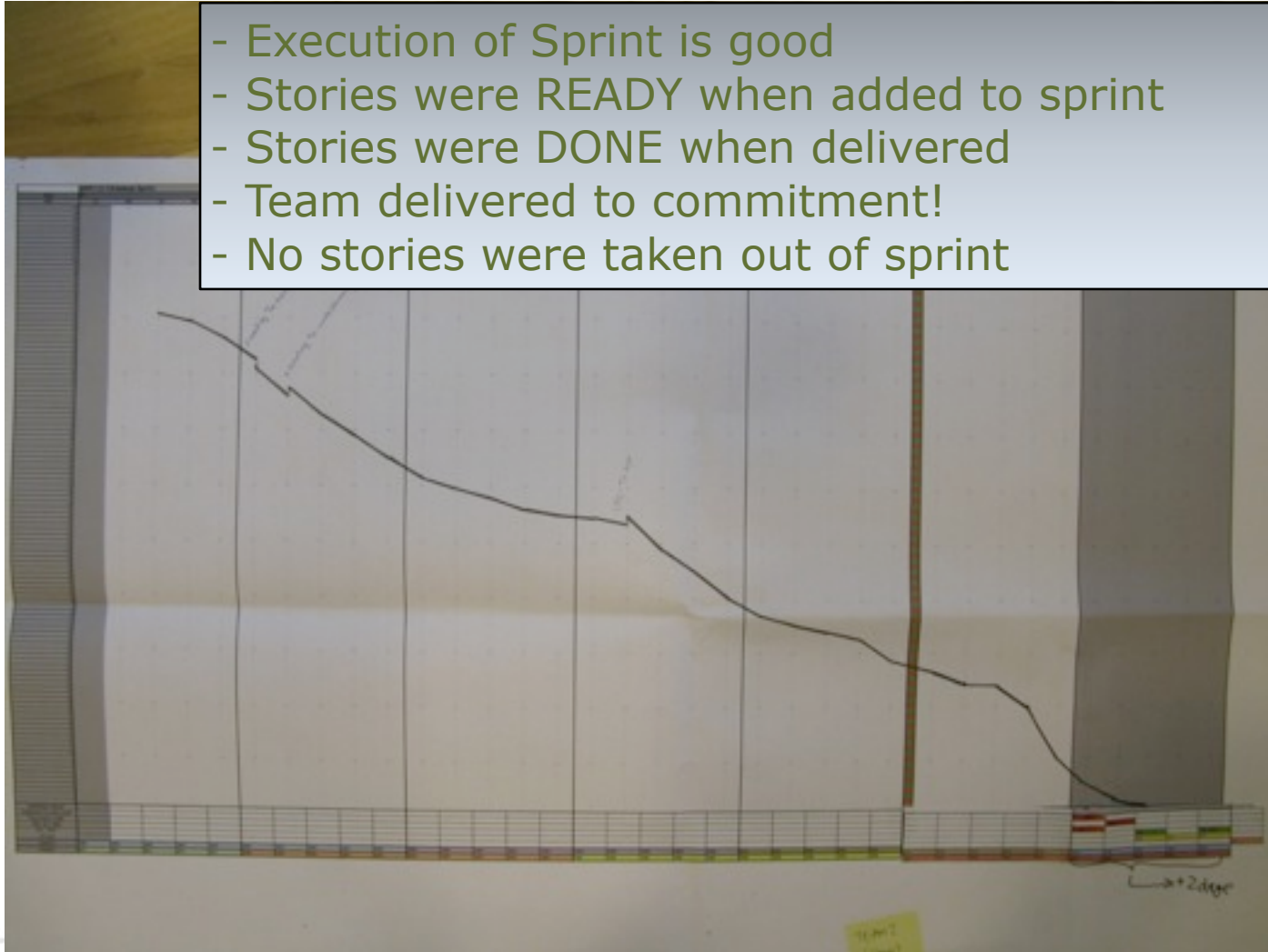


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READY means stable sprints

18/11-2008 – 14/1-2009 – Flow: 54 %

- Execution of Sprint is good
- Stories were READY when added to sprint
- Stories were DONE when delivered
- Team delivered to commitment!
- No stories were taken out of sprint

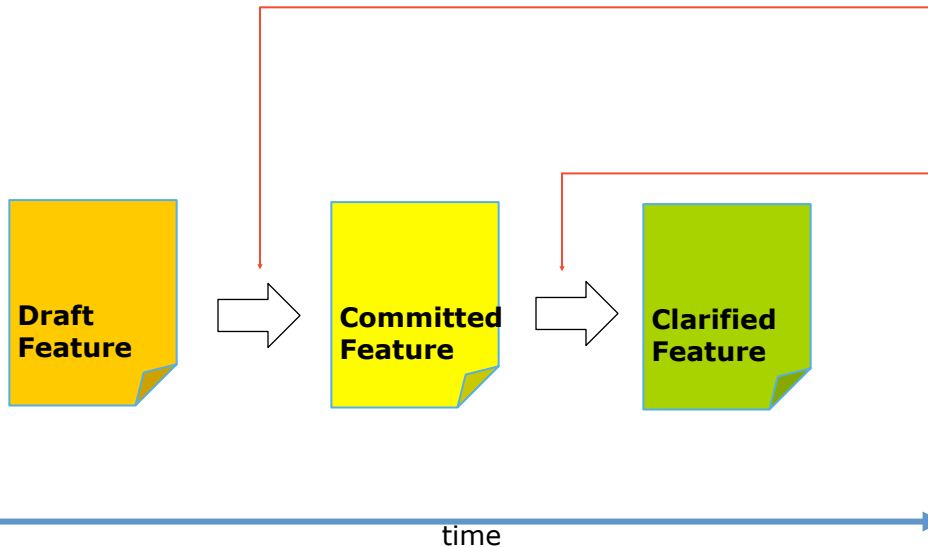


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Feature READY checklist

- Ensure that features are prepared properly before they are decomposed into stories that are committed to a sprint
- Preparation through states:
 - Prepare Feature for Commitment
 - Clarify Feature for Development
 - Prepare Feature for Implementation



Ready for Implementation Checklist			
Feature:	_____		
Product Owner:	_____		
Architect:	_____		
Lead Developer:	_____		
Procedure / Primary role	Activity	Work Product(s)	Completed
	Customer requirements approved and finalized	PSIA-095	<input type="checkbox"/>
Prepare Feature for Commitment / Product Owner	Customer requirements assigned to the feature	PSIA-098, FDD	<input type="checkbox"/>
	Customer requirements sufficiently understood	FDD	<input type="checkbox"/>
	Technical design drafted (focus - feasibility)	FDD, EST	<input type="checkbox"/>
	Risks identified	FDD, EST	<input type="checkbox"/>
	Test design drafted (focus - testability)	FDD, EST	<input type="checkbox"/>
	Unknowns, assumptions, constraints, concerns identified	FDD, EST	<input type="checkbox"/>
	ROM (effort, size) established	EST	<input type="checkbox"/>
	Concept review conducted	RDR	<input type="checkbox"/>
	FDD approved	DTS	<input type="checkbox"/>
	Clarify Feature for Development / Architect	Fit into sprint considered	FDD
Feature decomposed into fit-to-sprint features		FDD	<input type="checkbox"/>
Plan for unknowns/assumptions/concerns/constraints established		FDD, EST	<input type="checkbox"/>
Estimates (effort & size) updated		EST	<input type="checkbox"/>
Concept review conducted		RDR	<input type="checkbox"/>
Prepare Feature for Implementation / Lead Developer	Unknowns, assumptions, concerns resolved	FDD	<input type="checkbox"/>
	Product requirements developed	PSIA-098, FDD	<input type="checkbox"/>
	Test design drafted (no uncertainties)	FDD	<input type="checkbox"/>
	Technical design drafted (no uncertainties)	FDD	<input type="checkbox"/>
	Decomposition into stories performed	FDD	<input type="checkbox"/>
	Stories estimated (effort)	EST	<input type="checkbox"/>
	Concept review conducted	RDR	<input type="checkbox"/>
	FDD approved	DTS	<input type="checkbox"/>

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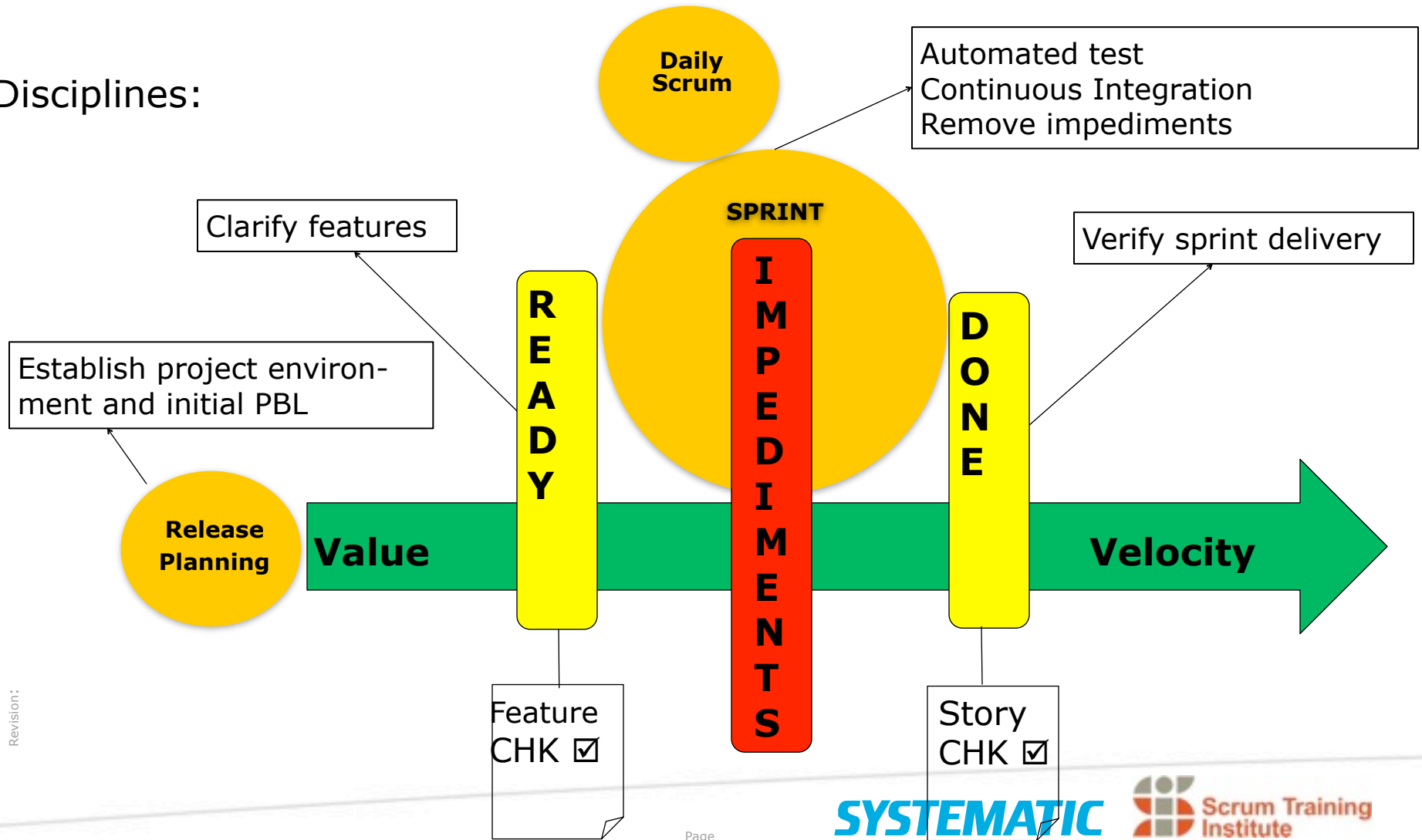
Continue to improve

Identifying root causes to stories not achieving desired flow (03/2009)

- **READY removed a major impediment**
 - Removed disruptions and waste caused by issues being clarified with customer or other
- **Data shows more impediments exist:**
 - Root causes for 10 stories with flow < 40%
 - Developer was shared between two projects
 - Final inspection completed too late due to support
 - Interrupted by fixing problems with build environment
 - Work on story stopped due to vacation (commitment?)
 - Lead developers typically assist on multiple stories
 - It's about focus, commitment and how to share knowledge

The Systematic Scrum model

Disciplines:



Revision:

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SYSTEMATIC

 Scrum Training Institute

Lessons learned

- **Make features READY before the Sprint**
 - Do not allow a feature to be included in sprint unless it is READY
 - Simple concept, depends on discipline and creates stability in sprint
 - Prepare PBL for stories to go into next sprint
- **Product Owner tasks are not part of Sprint Plan**
 - Clarification is a disruptive activity by nature
 - Make clear arrangements for how Product Owner activities are supported by team
- **Team both delivers sprints and supports Product Owner**
 - Balance is achieved by first ensuring that features and stories are prepared sufficiently using these objectives
 - A feature can be implemented by team in one sprint (<600h)
 - A story can be implemented by 1-2 people within 1-2 days (<50h)
 - Team proactively participated in workshops preparing sprint planning
- **Systematically remove impediments**
 - Sprint Retrospective at the core
 - Measure and analyze data, e.g., fix-time for broken builds or flow



Questions

before you parachute out yourself...