Joint Degree Program of Fudan University and University College Dublin (UCD)

SOFT620020.01
Advanced Software Engineering

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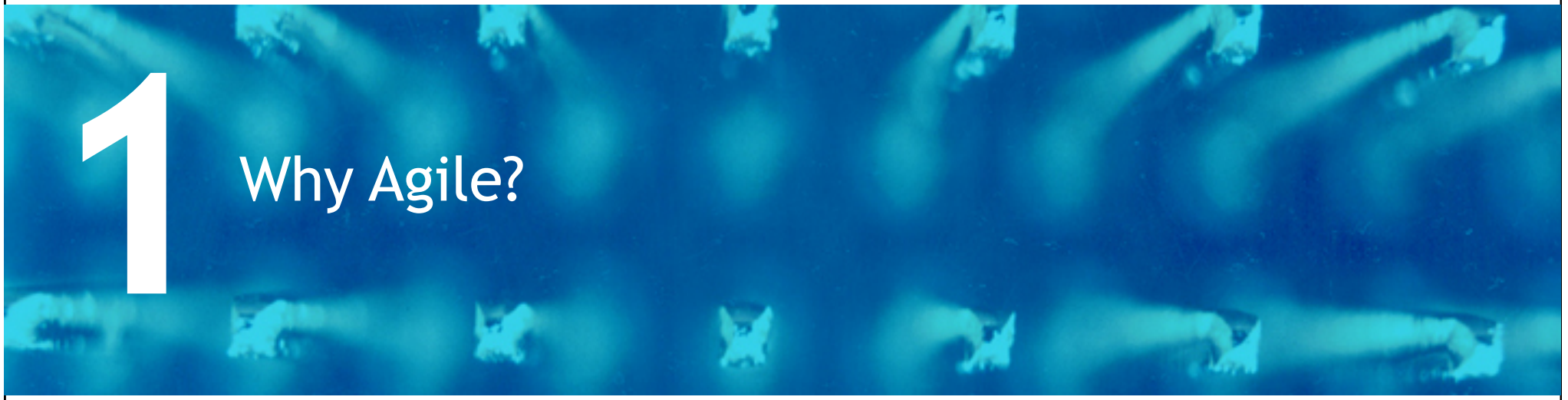
Course Outline

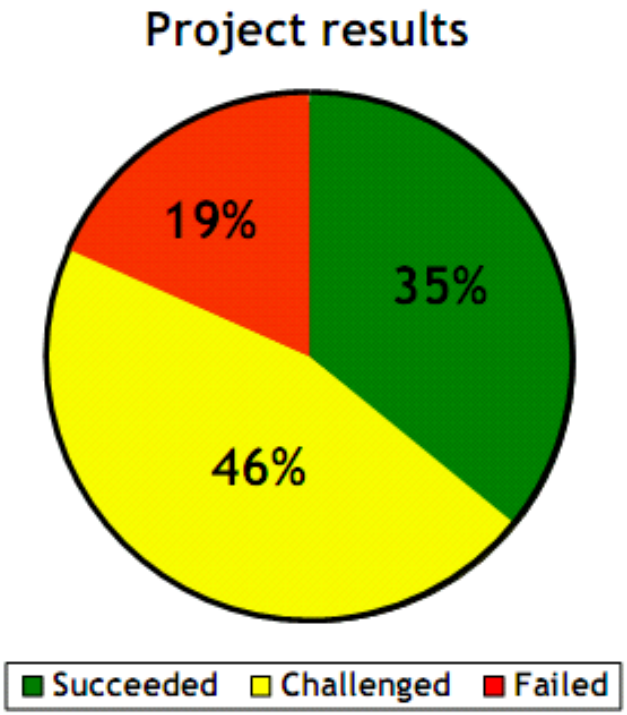
Date	Topic
Sep. 09	Introduction
Sep. 16	Testing Overview
Sep. 23	Guided Random Testing
Sep. 30	Search-Based Testing
Oct. 12	Performance Analysis
Oct. 14	Presentation 1
Oct. 21	Security Testing
Oct. 28	Compiler Testing

Date	Topic
Nov. 04	Mobile Testing
Nov. 11	Delta Debugging
Nov. 18	Bug Localization
Nov. 25	Presentation 2
Dec. 02	Automatic Repair
Dec. 09	Symbolic Execution
Dec. 16	**Scrum**
Dec. 23	Presentation 3



1 Why Agile?

Facts



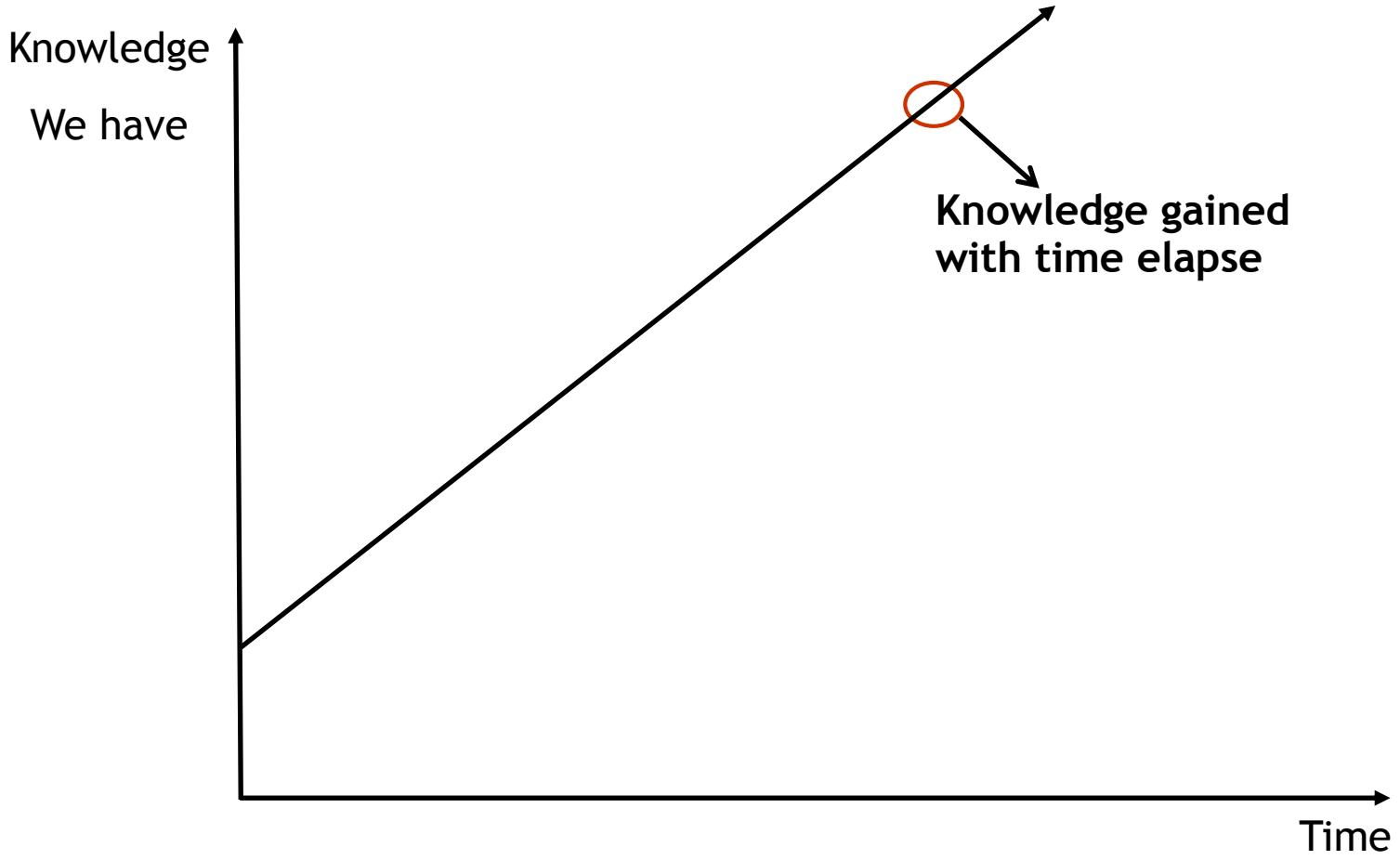
From 2006 Standish Report: Based on analysis of more than 40,000 Projects over 10 years

Facts

	2011	2012	2013	2014	2015
SUCCESSFUL	29%	27%	31%	28%	29%
CHALLENGED	49%	56%	50%	55%	52%
FAILED	22%	17%	19%	17%	19%

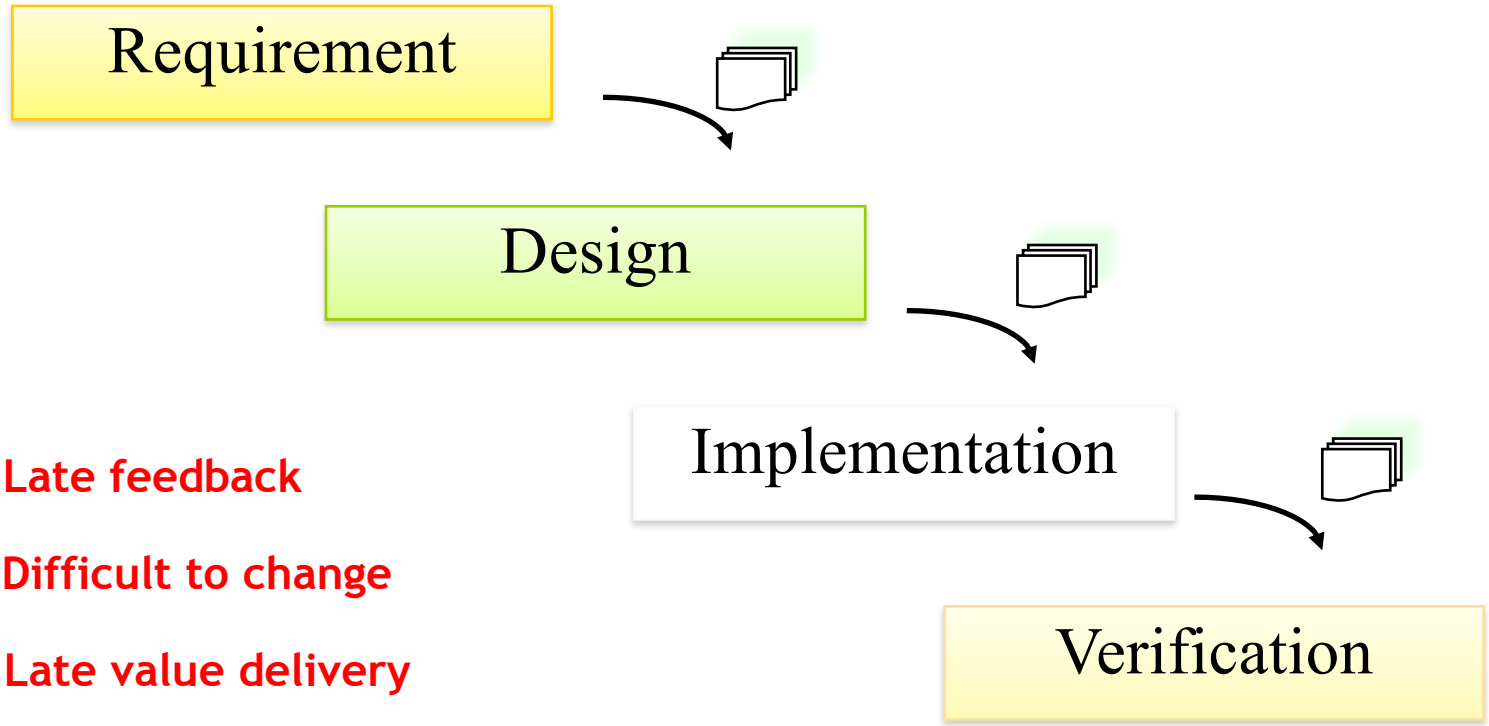
Standish Group CHAOS Report 2016

Why software development is so difficult



Software development is discovery

Waterfall – what we following before…



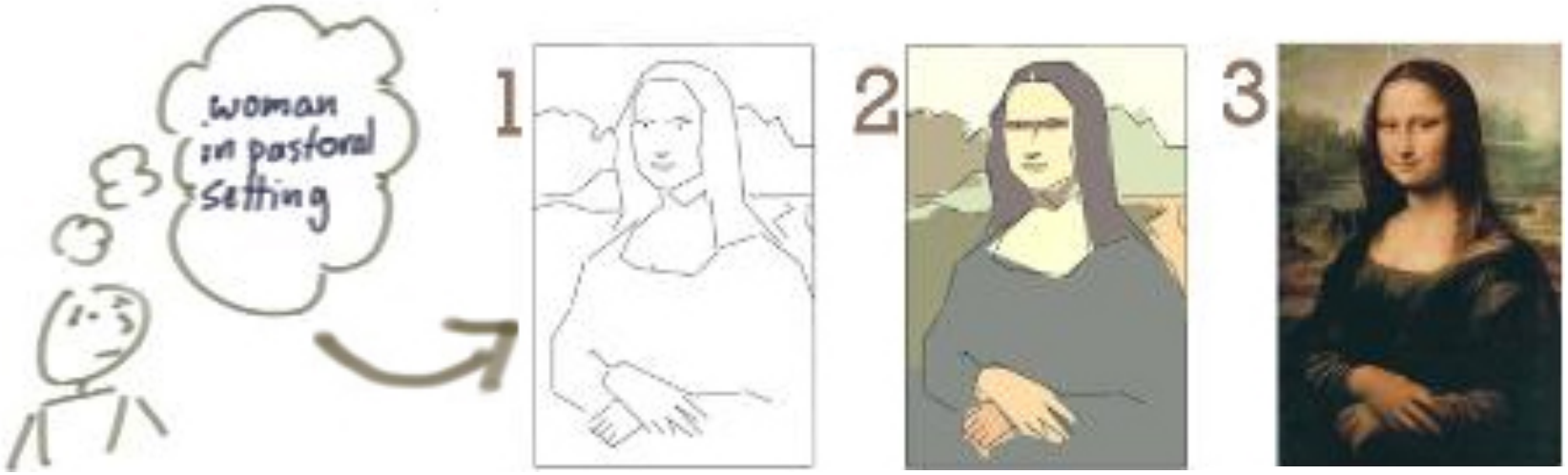
Late feedback

Difficult to change

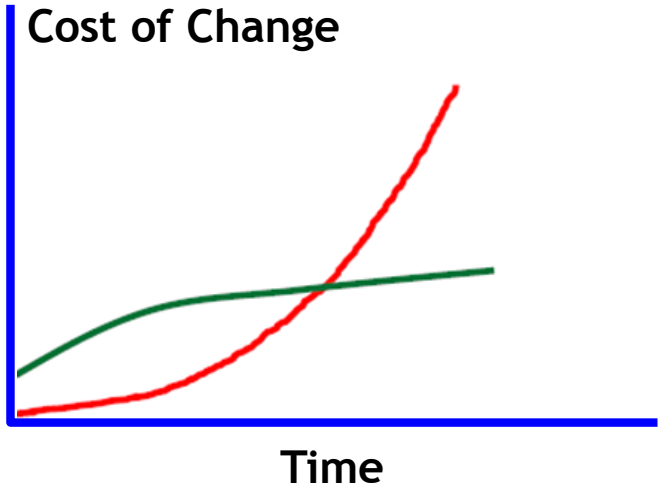
Late value delivery

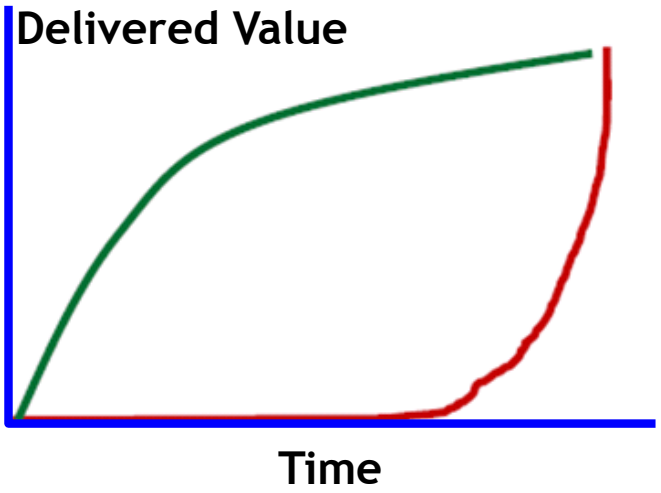
Iterative development

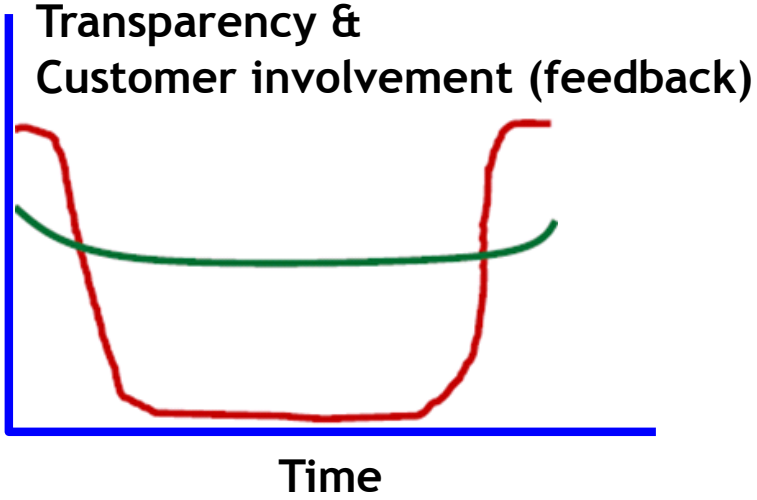
Iterative development



Iterative development vs. waterfall







Software development

"Software is the most complex task ever undertaken by humanity..."

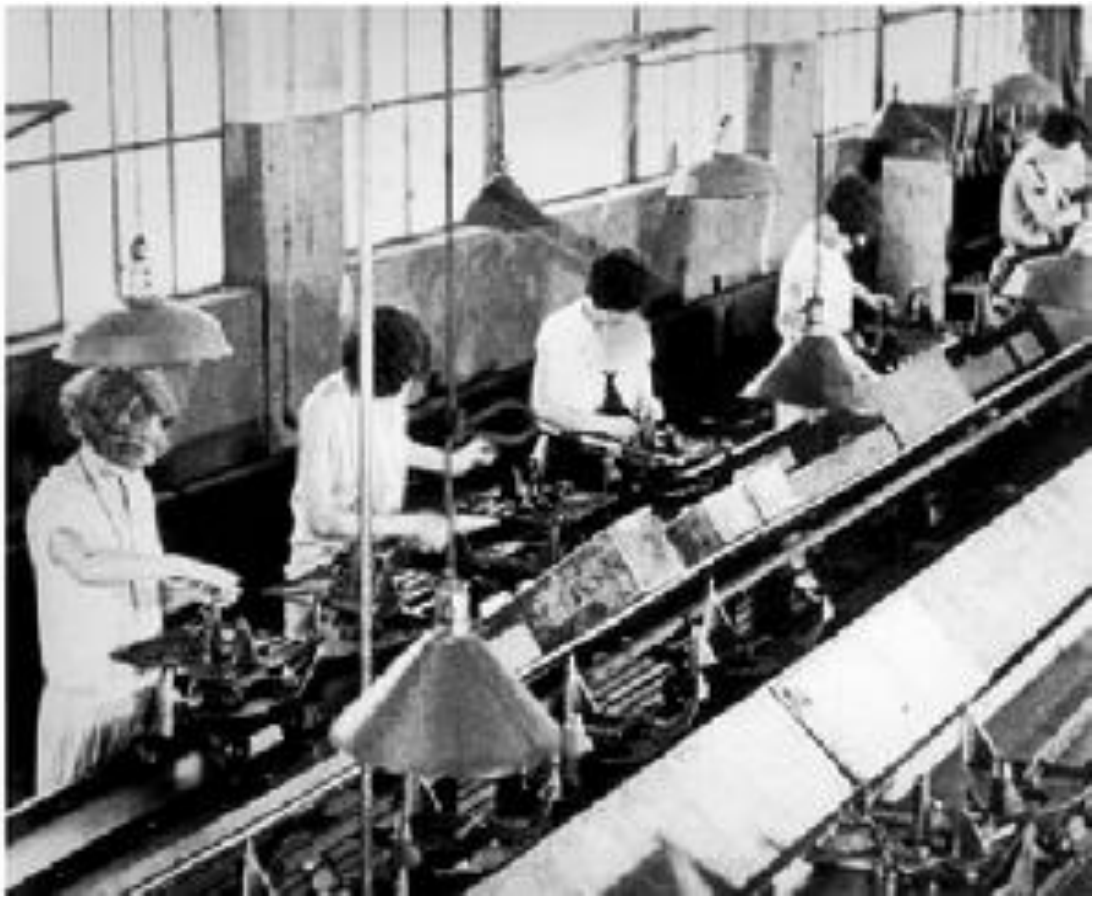
- Dr. Frederick Brooks
(recipient of the ACM Turing award)

Software development is an R&D activity with high levels of inherent variability, creativity, and knowledge creation. It is not predictable, repeatable manufacturing.

Challenge of Defined Process

Plan the work

Work the plan



Empirical Process Thrives

Control vs. Self-Organize

It’s All about People

- Top three factors in software development

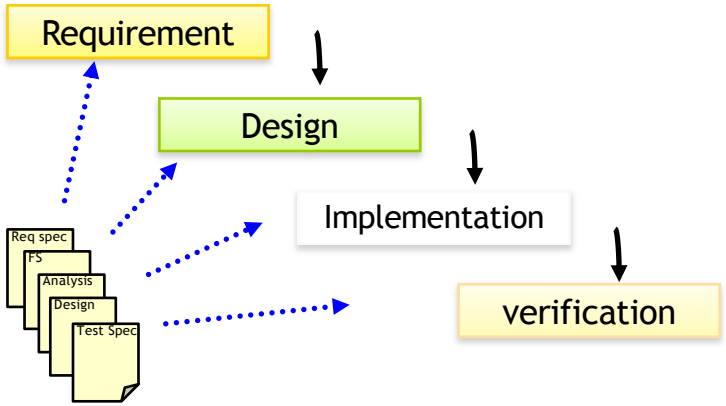
People

People

People

- Tom Demarco on Peopleware

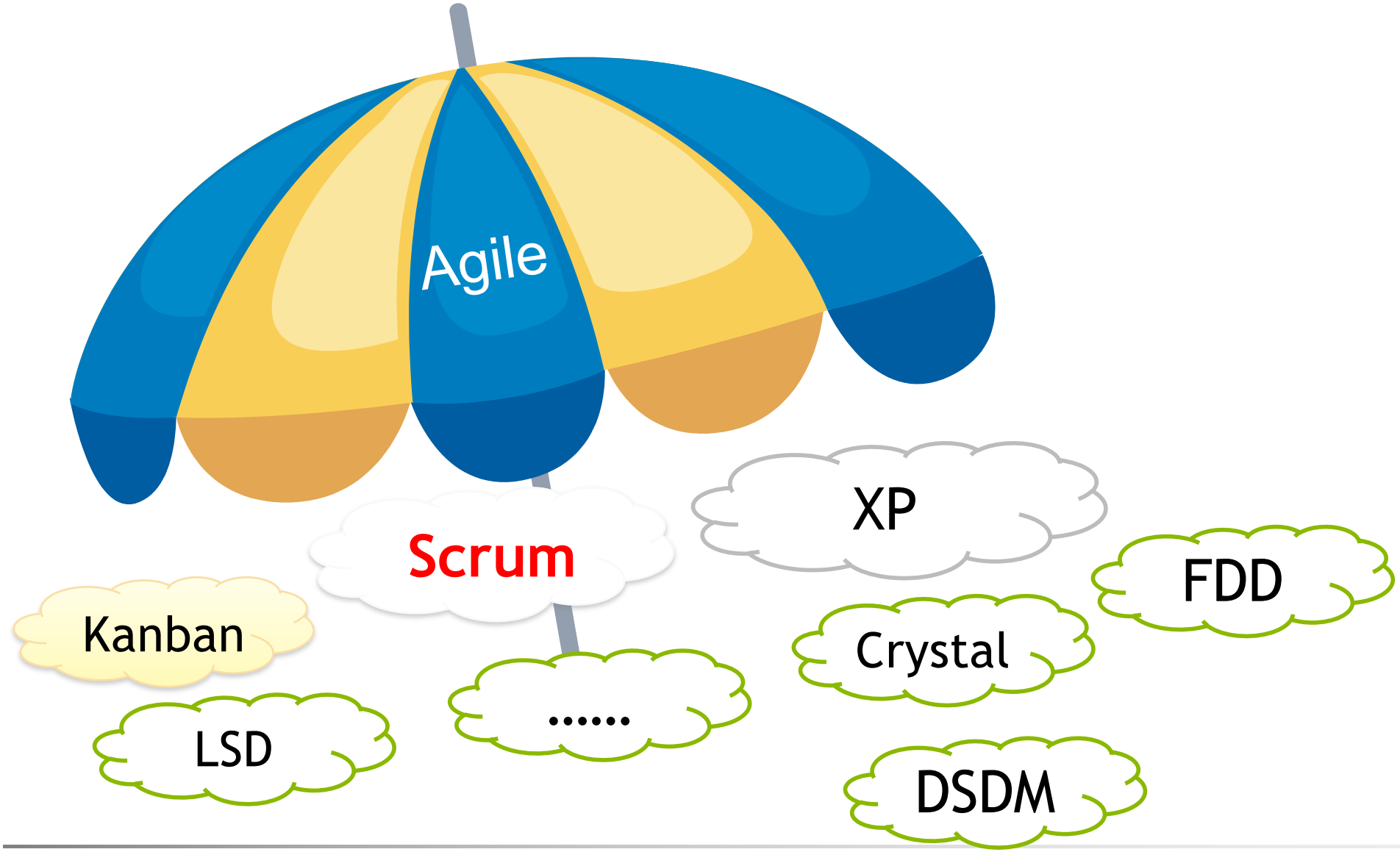
“Why agile?”



Challenge of waterfall

Difficulty of knowledge worker motivation

Agile is a Umbrella Term



Agile Manifesto

www.agilemanifesto.org

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

Individuals and interactions over **processes and tools**

Working software over **comprehensive documentation**

Customer collaboration over **contract negotiation**

Responding to change over **following a plan**

That is, while there is value in the items on the right, we value the items on the left more.

2 Scrum Basic

Scrum

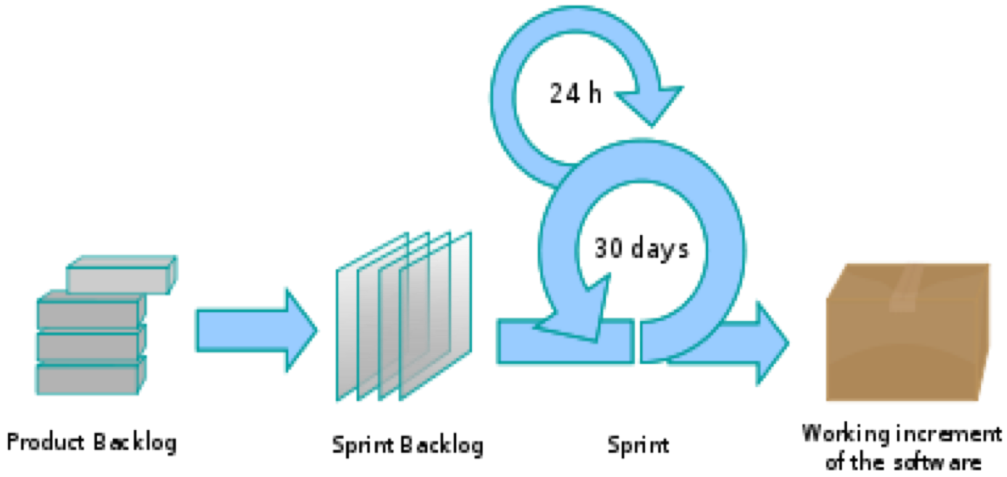
http://en.wikipedia.org/wiki/Scrum_(rugby)

Scrum, in the sports of rugby union and rugby league, is a way of restarting the game, either after an accidental infringement or when the ball has gone out of play

Scrum

http://en.wikipedia.org/wiki/Scrum_(development)

Scrum is an iterative incremental framework for managing complex work (such as new product development) commonly used with agile software development.



Scrum overview

- time box
- 3 roles
- 3 meetings
- 3 artifacts

Vision, *ROI*

Scrum Master

Daily Scrum Meeting

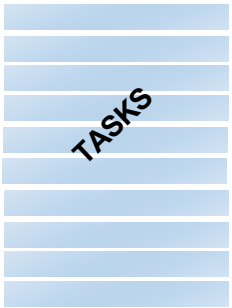
Product Owner

Team

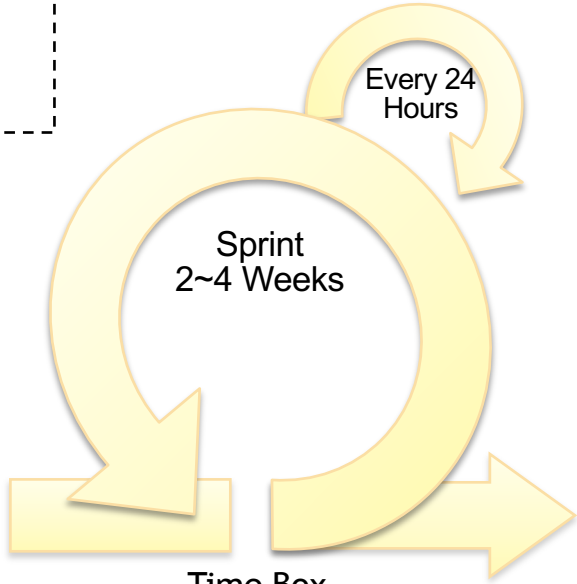
Product backlog

Team Selects how much commit to do

Sprint planning Meeting



Sprint Backlog



Time Box

Demo

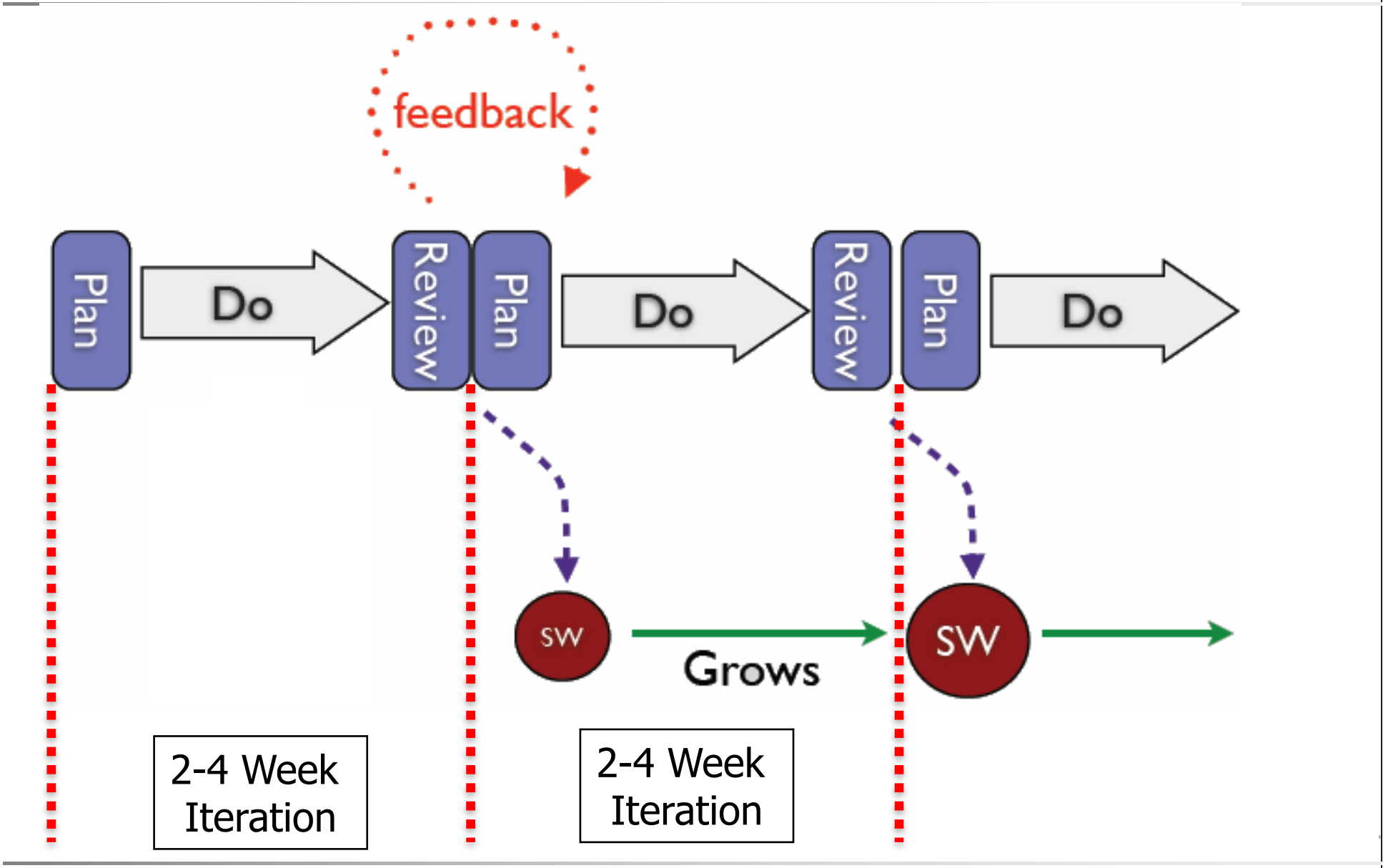
Retrospective

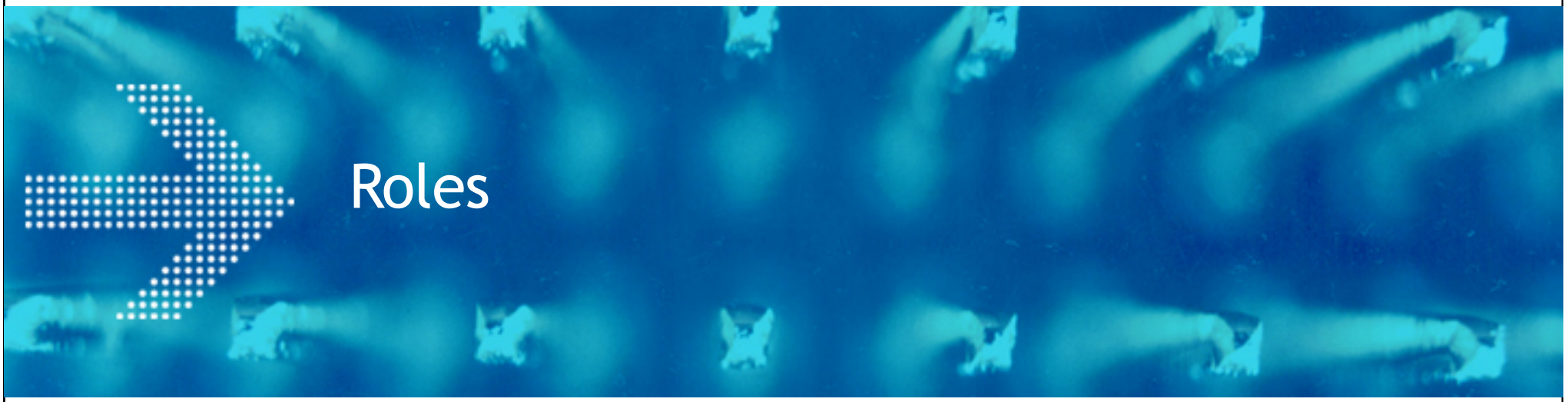

Time box

Time box


Time
Iteration 1
Iteration 2
Iteration 3
Iteration ...
Iteration n
Value delivered at
each iteration

Time box


feedback
Plan
Do
Review
Plan
Do
Review
Plan
Do
SW
Grows
SW
2-4 Week Iteration
2-4 Week Iteration


Roles

3 Roles


Product Owner
Manage the vision
Manage the ROI
Collaborate with team


Scrum Master
Manage the process
Shield the team
Remove obstacles


Team
Self organized
Cross functional
Commit for the result

3 Roles

Define the features of the product, decides on release date and content
Is responsible for the profitability of the product (ROI)
Prioritize features according to the market value
Can change features and priority every sprint
Accept or reject work result

Product Owner

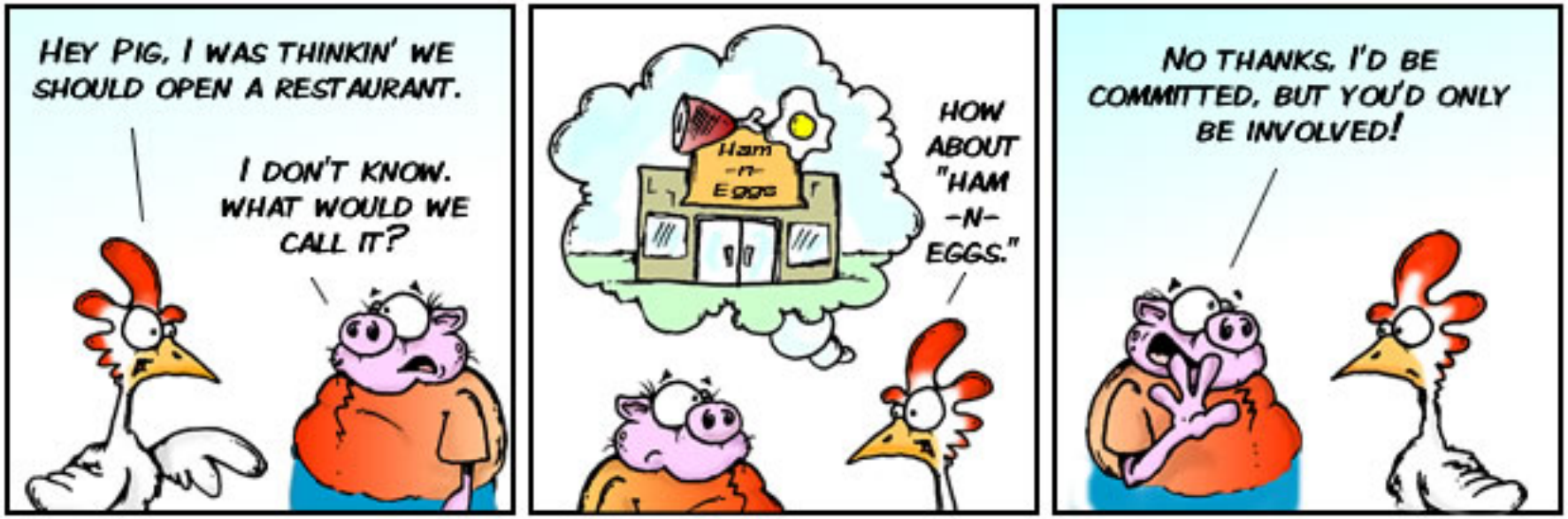
Team

Cross-functional, 7+/-2 members
Has the right to do everything within the boundaries to reach goal
Organize and manage itself and its work
Review work results with the product owner

Ensure that the team is fully functional and productive
Enable close cooperation across all roles and functions, and remove barriers
Shield the team from external interferences

Scrum Master

Roles in Scrum



The Scrum world is divided into Pigs and Chickens

Definition of Done

Team together with product owner defines what “done” means

Examples of “done”

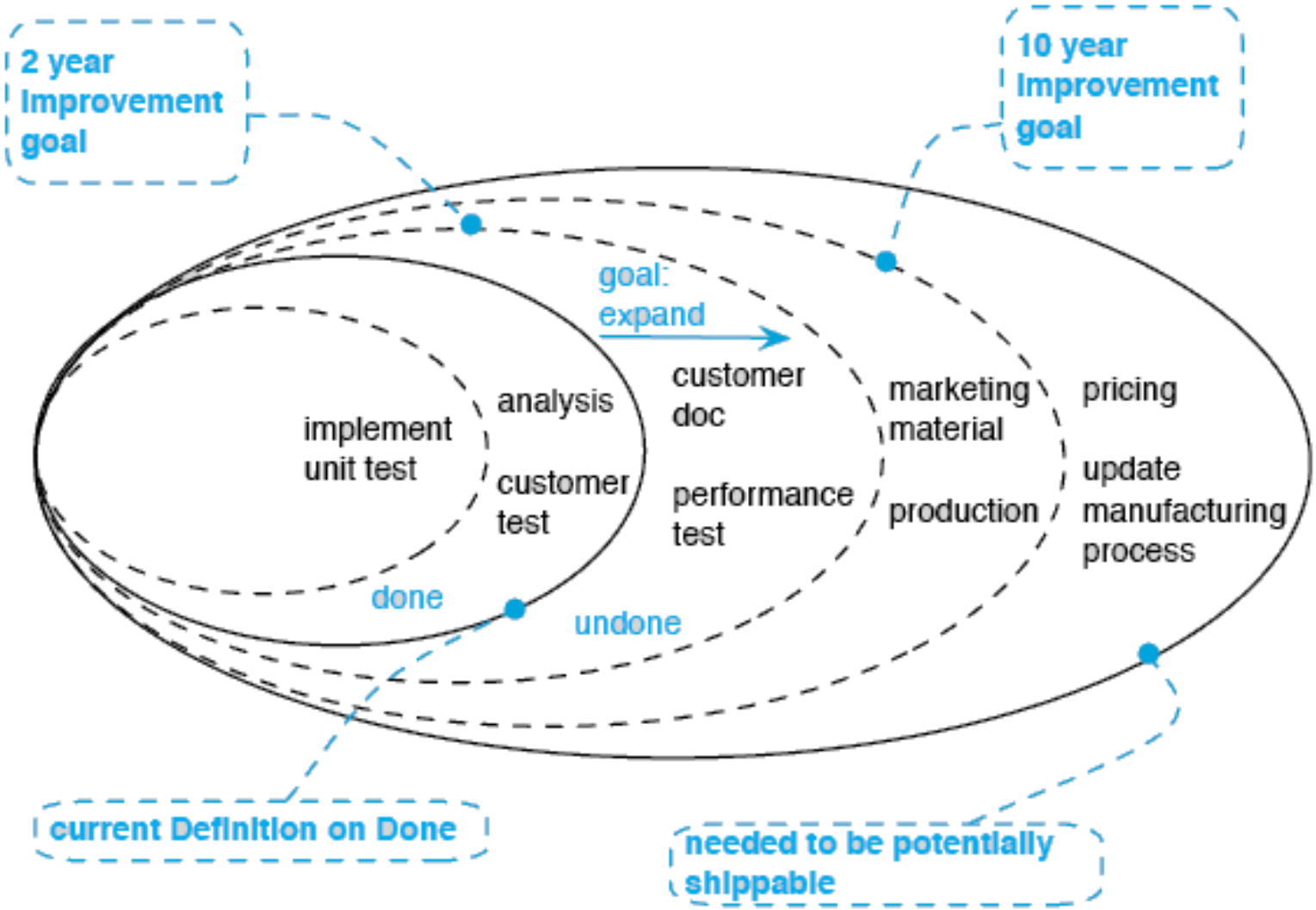
- Design, coding, unit testing, integrated
- Static analysis, refactored
- Acceptance tested, deployable

Done defines the current technical capability of the team

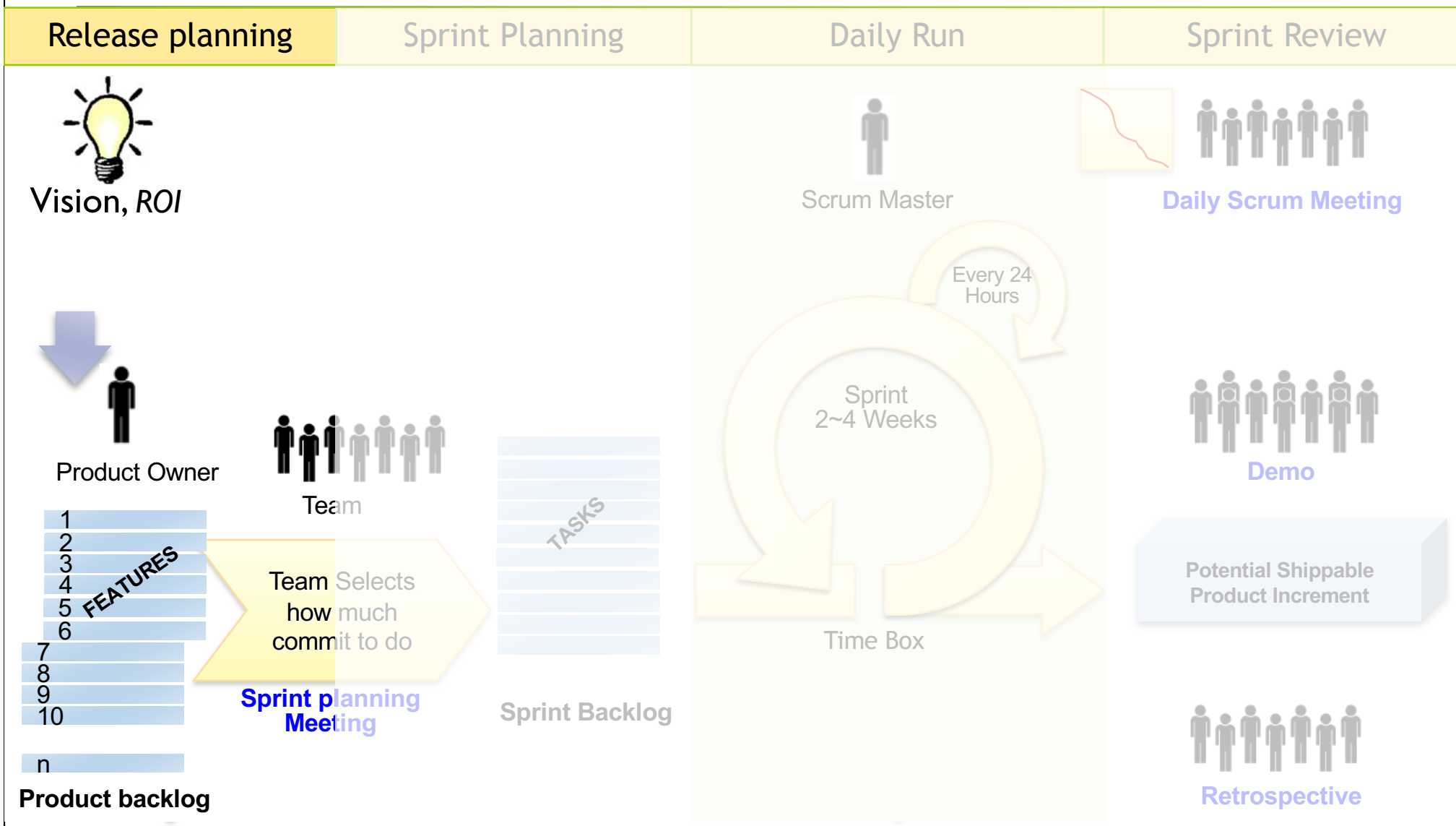
- Over time Done should include everything needed before deployment

Not done backlog items should not be reviewed

Extending DoD




Product backlog


Release planning
Sprint Planning
Daily Run
Sprint Review
Vision, ROI
Product Owner
Team
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Potential Shippable Product Increment
Retrospective

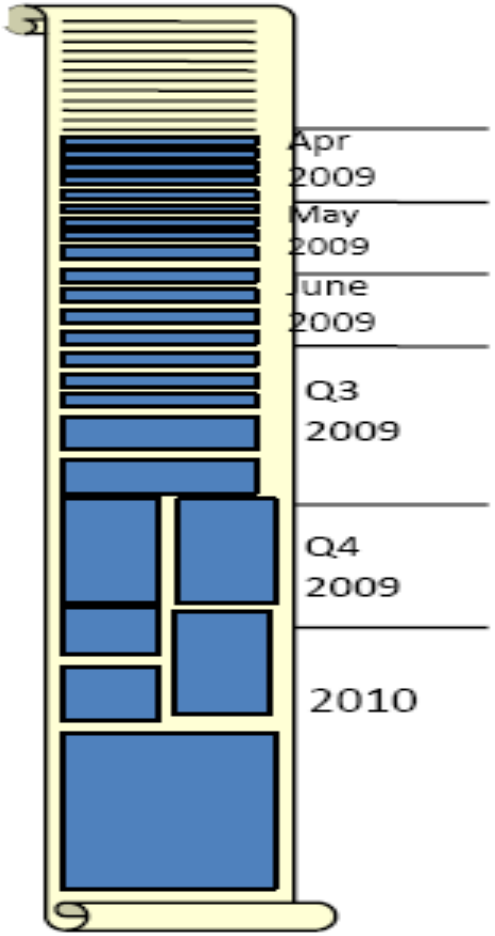
Product Backlog

Detailed Properly

Estimated

Emergent

Prioritized



User Story

Card

Conversion

Confirmation

User Story

Front Side

As an **<type of user>**

I can/I want to **<some goal>**

So that **<some reason>**

Est: xx Pri: xx

"As a system admin, I want to see the alarm being reported when board is missing, so that I can know when certain board signal is lost"

Acceptance Criteria *Back Side*

.
.
.

Notes

.
.

Alarm reported with right slot ID

Know the time the alarm happen

Alarm be reset when board is re-plugged in

Severity of the alarm can be configured from 1~5

Release Planning - What is Good Story

Independent: *Implement in any order, no overlap in primary concepts*

Negotiable: *Possibly more or less of a feature*

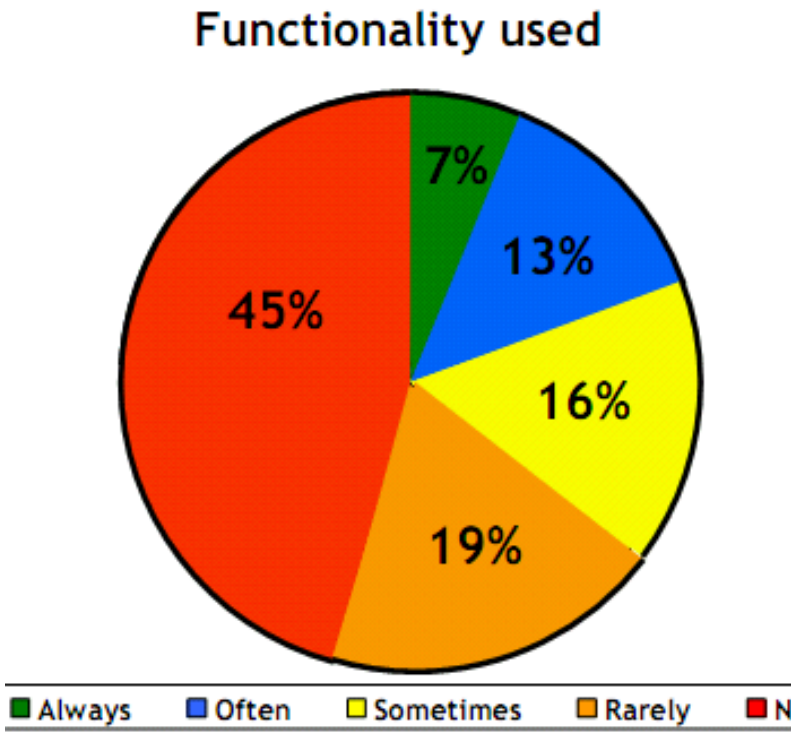
Valuable: *Story needs to be valuable to the customer*

Estimable: Understood well enough to be estimated at the level required

Small: *If too large, scope, deliverability, and testability risks incurred*

Testable: *Must have a verifiable definition of done—executable requirements are a best practice*

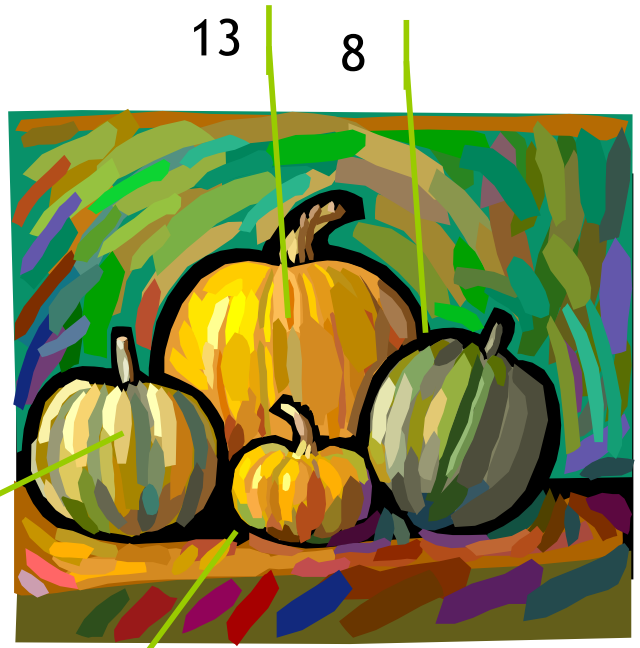
Valueable



From 2006 Standish Report: Based on analysis of more than 40,000 Projects over 10 years

Story Size Estimation

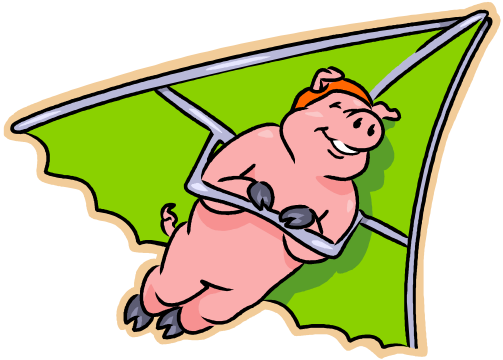
Comparative to one base point



Release Planning – Planning Poker

- Product Owner explains story
- Team discusses work involved
- Everyone estimates individually
- Everyone reveals estimates simultaneously
- Lowest and highest estimates are justified
- Repeat until estimates converge

Why does Planning Poker work



Those Who Do the Work

Make the Estimates

Confirmation

Independent

Conversation

Acceptance testing user story

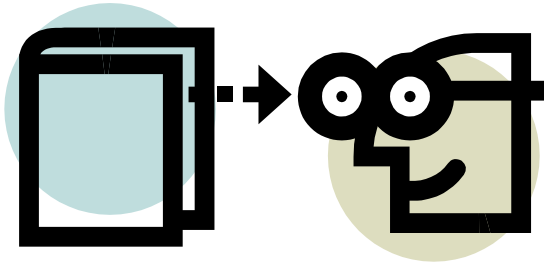
DS bit rate L2	US bit rate L2	DS bit rate L3	US bit rate L3	L1 state	L2 state	L3 state	BG init time	DS actual intlv delay L1	US actual intlv delay L1	DS actual intlv delay L2	US actual intlv delay L2	DS actual intlv delay L3	US actual intlv delay L3	alarms	comment
40 Mb/s	10 Mb/s	40 Mb/s	10 Mb/s	part of BG	part of BG	part of BG	90s	5ms	8ms	5ms	8ms	5ms	8ms	none	typical success case
40 Mb/s	10 Mb/s	40 Mb/s	10 Mb/s	part of BG	part of BG	part of BG	>150s	5ms	8ms	5ms	8ms	5ms	8ms	none	not acceptable because out of spec (init time)!

Given… When… Then

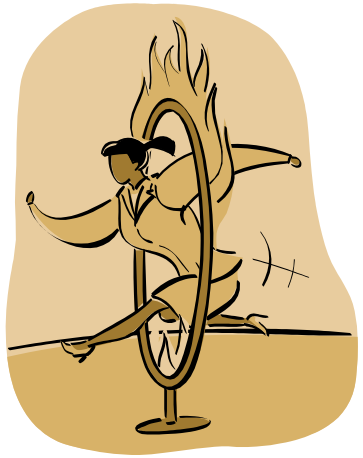
Prioritize the Product Backlog - How

Financial Value

Cost of Development

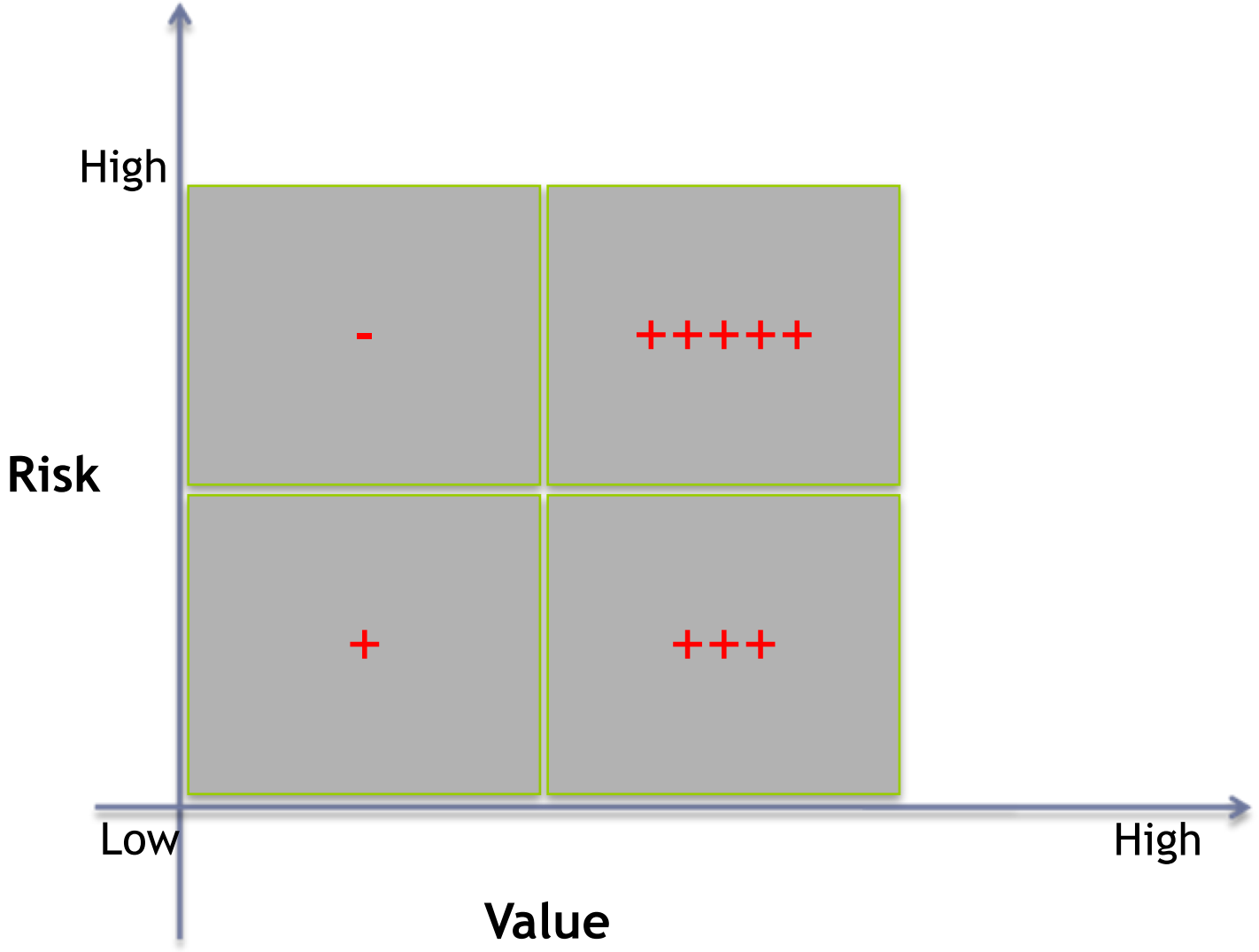


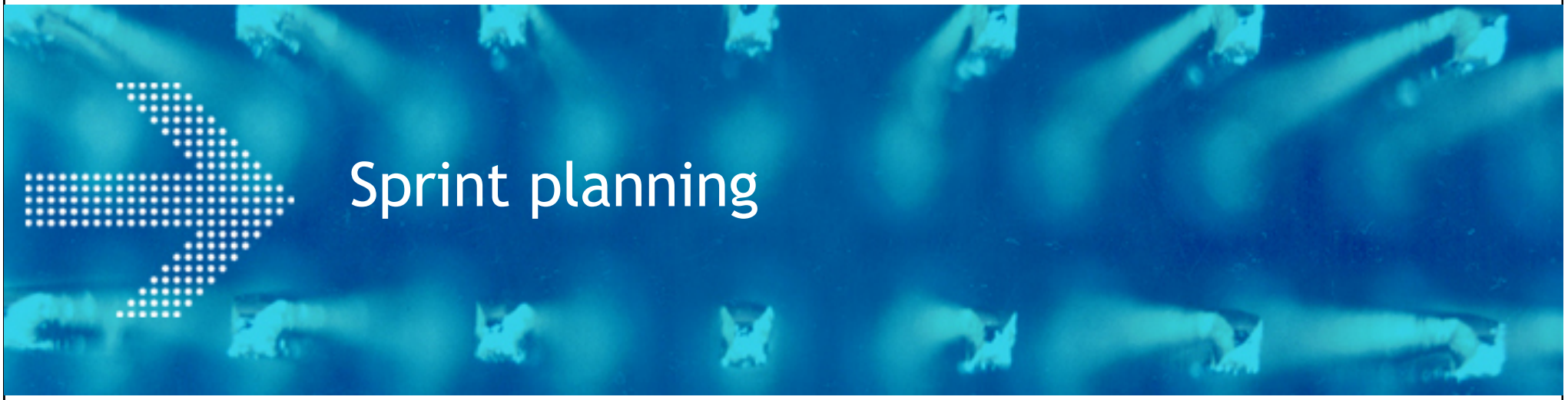
Knowledge Gained



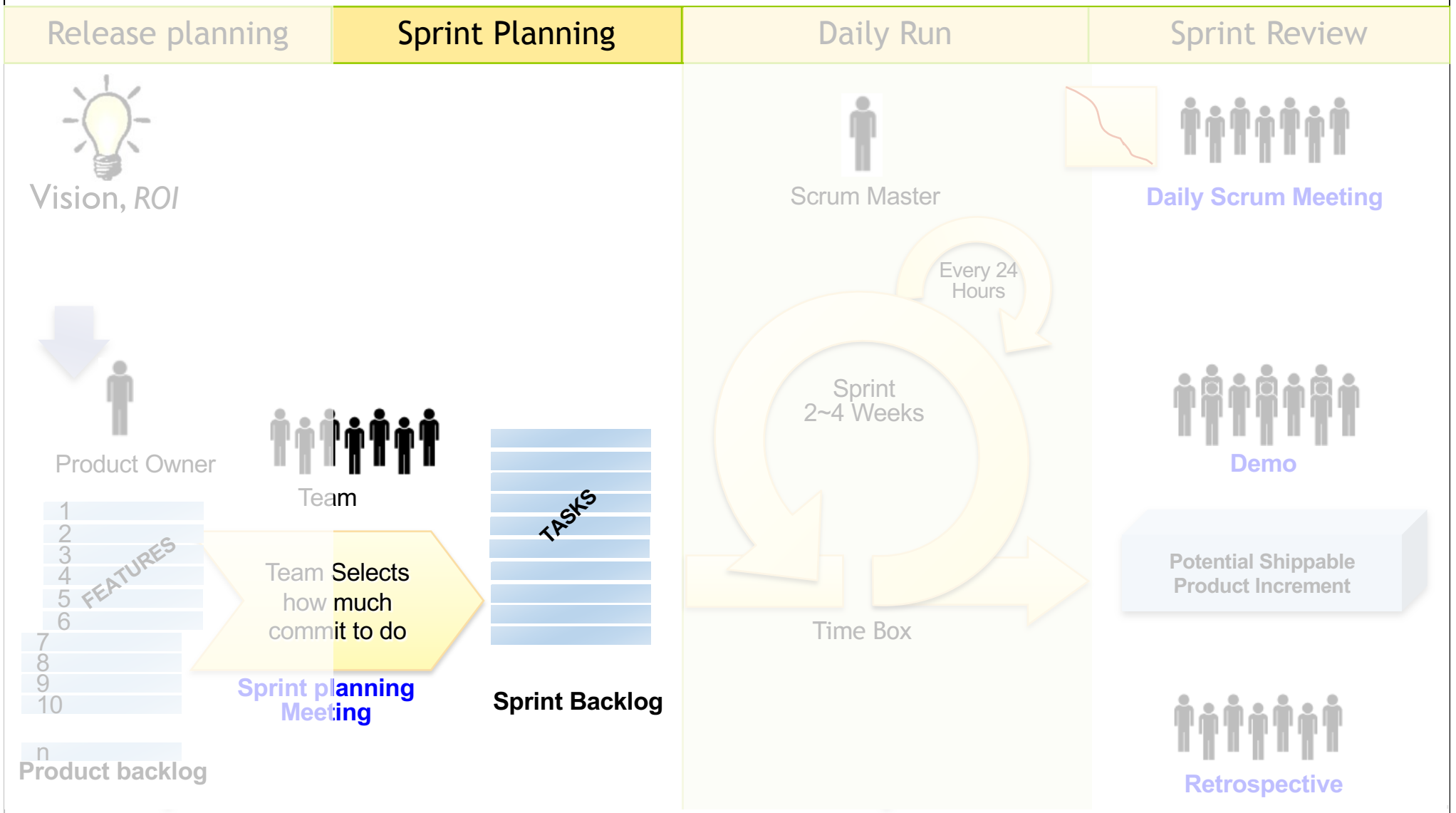
Risk Removal

Prioritize the Product Backlog




Sprint planning

Sprint Planning



Sprint Planning - Target

Target defined

- Stories committed for the sprint Decided
- Sprint Goal composed

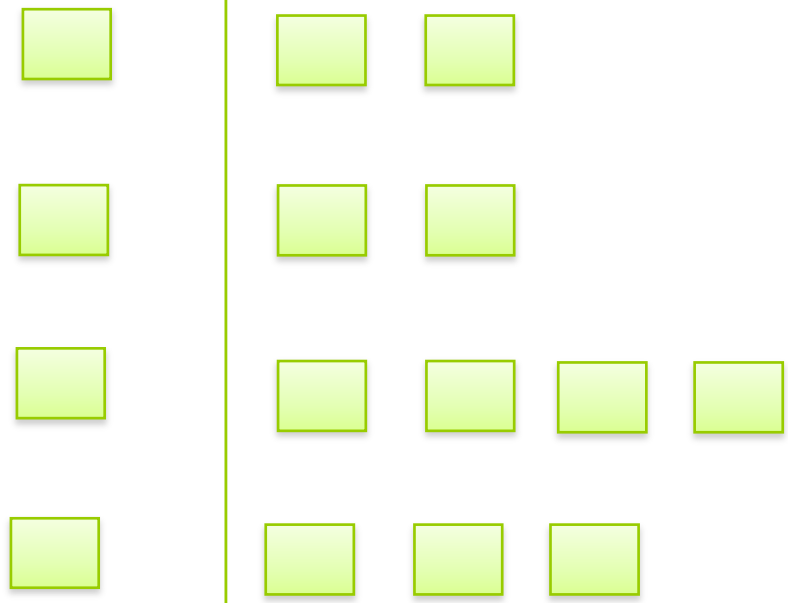
Break down into detail plan

- Tasks (with idea hours) to get each story done defined
- Team commit to the plan

Informative Radar created

Sprint Planning - Informative Radar

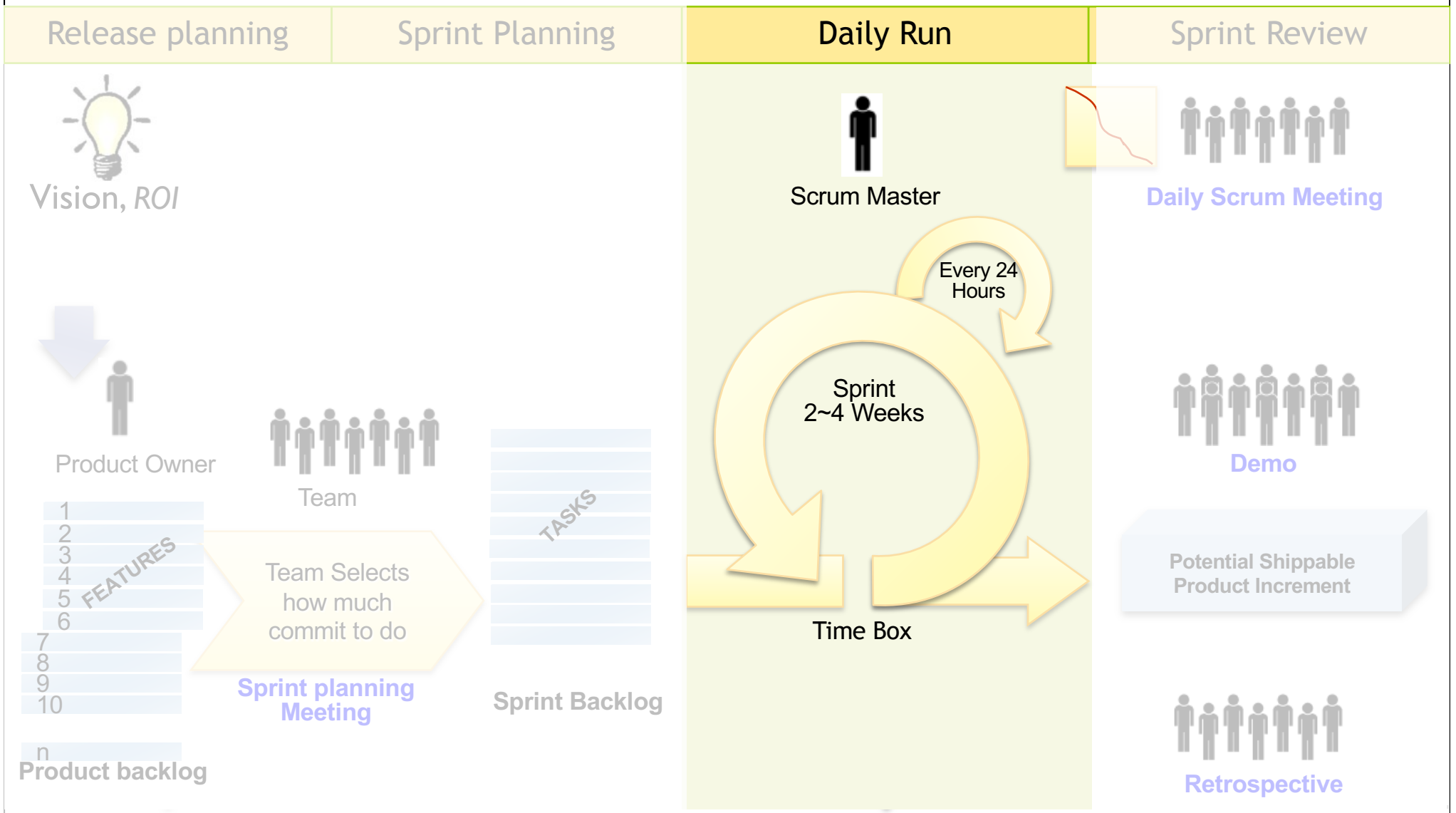
Stories	Tasks (To be done)	On-going	Done	Approved



story task New task


Daily running

Daily Run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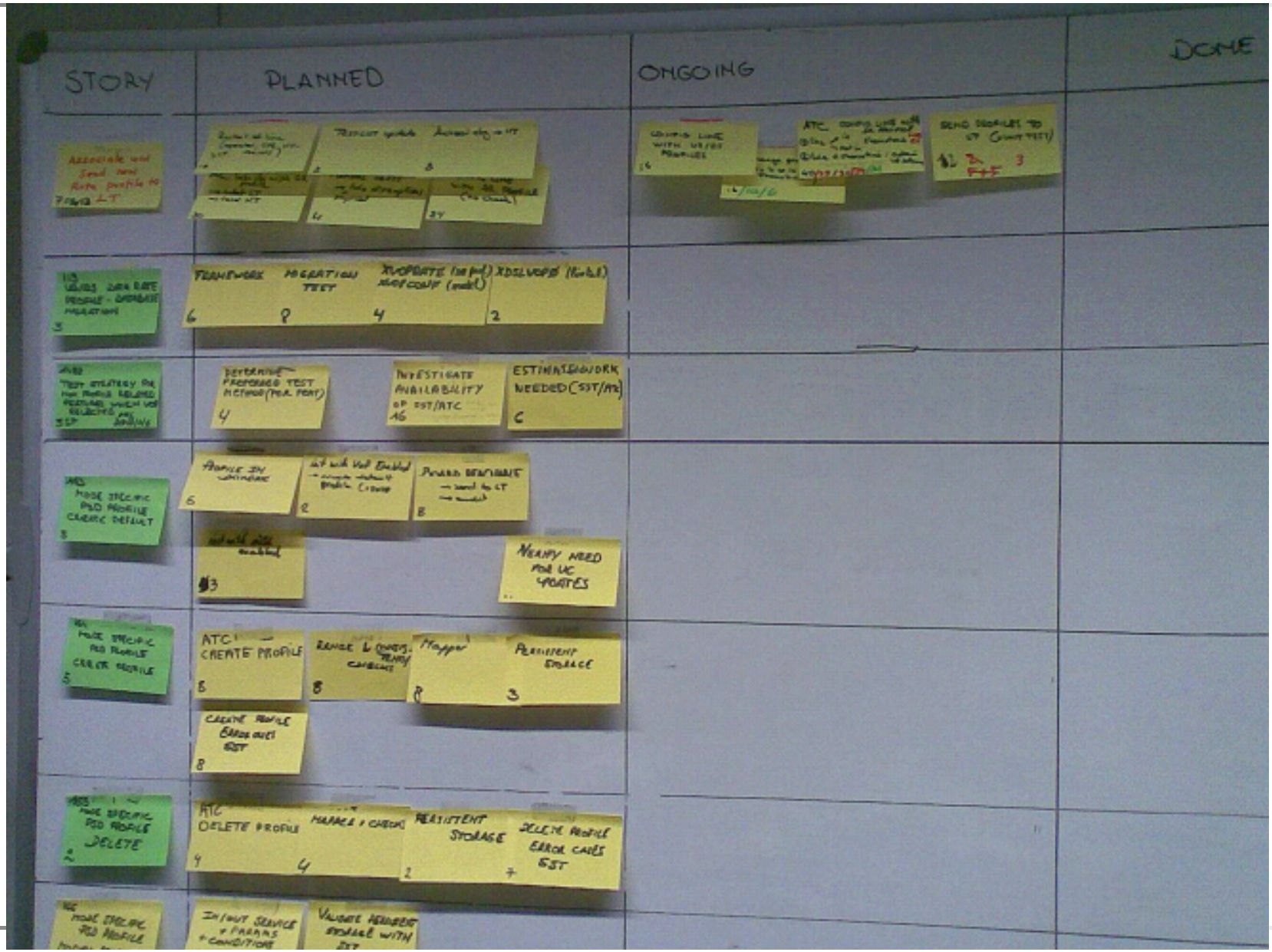
Daily Running

- Ruler
  1. Same Time, Same Place, Every Day
  2. Chickens must be quiet
  3. 15 minutes or less, No solutions debate!

- Provide answers to team for 3 questions
  1. What did I complete yesterday?
  2. What are I committing to today?
  3. Do you have any roadblocks?

Sprint backlog




Sprint review

Sprint Review

Release planning	Sprint Planning	Daily Run	Sprint Review

Vision, *ROI*

Scrum Master

Daily Scrum Meeting

Product Owner

Team

1
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4
5 FEATURES
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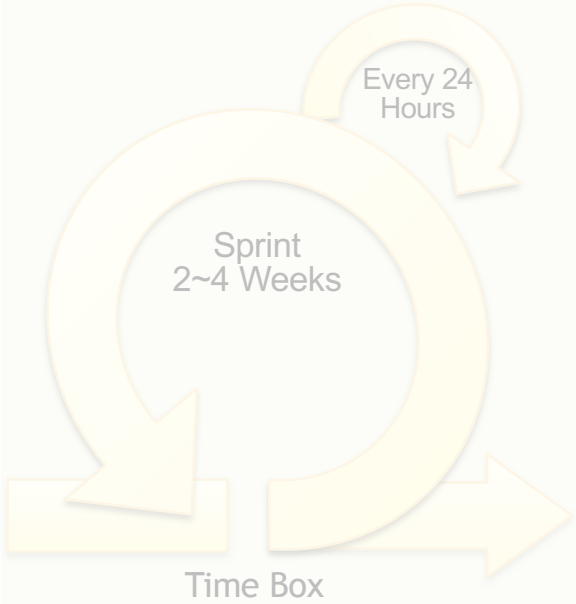
Product backlog

Team Selects how much commit to do

Sprint planning Meeting

TASKS

Sprint Backlog



Demo

Potential Shippable Product Increment

Retrospective

Sprint Review – Demo

- Invite the whole world
- Team presents what was accomplished during the Sprint
  - Make it Informal and fun
  - Demo not selling or presenting impressive “slide ware”
  - Stakeholders are encouraged to provide feedback and suggest priorities for the next iteration
- Outcome
  - Knowledge sharing
  - Get feedback
  - Input for planning the next Sprint
  - Motivated team

Making good teams Great

Sprint Review – Retrospective (cont.)

- Who
  - Team，Scrum Master，PO (depends)
- Steps
  - Recall: Gathering Information
  - Brainstorming: Generate Insight
  - Decide what to do (identify solution, improvements)
- Why it works
  - Short feedback time
  - Short feedback loop
  - Detailed information, deployable
  - For my team

Sprint Review – Retrospective (cont.)

Key success factors

- Concrete action
- Engaged people
- Focus topic
- Uncover root cause

Three legs of Scrum

Scrum But - a Path to Fail

- No stand up
- No test for each sprint
- Still control rather than self-organize
- No retrospective
- No product backlog
- No Product owner
- Done is not Done
- No timeboxing
- ….

Summarize – what is scrum about (1/2)

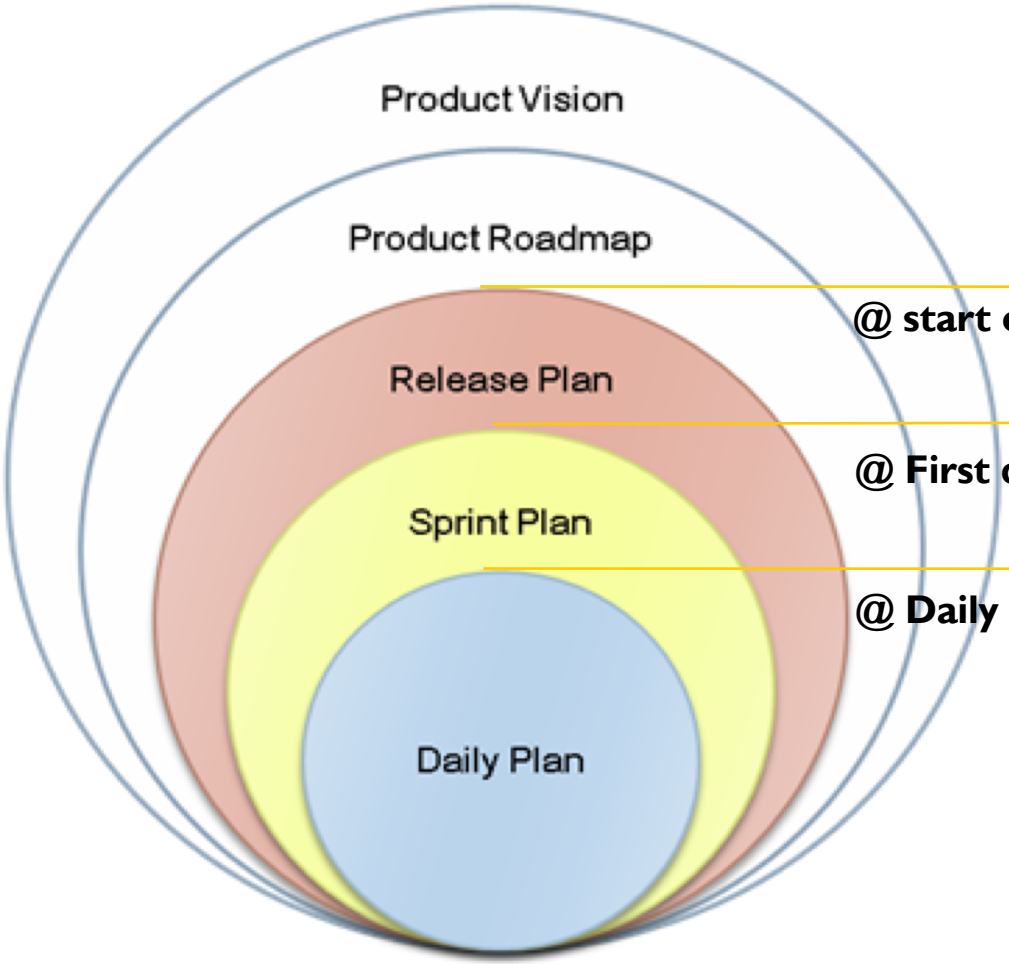
- Doing right things
  - Requirement are described in the view of customer by PO -- User story
  - Run time feedback for the work done
    - Daily collaboration, clarification and confirmation
    - Feedback are highly appreciated, e.g. story approving, Demo, etc.
  - Valid change to adapt to reality are welcome
  - Doing right things @ right time/ sequence
    - Requirement are sorted in priority
    - Development are in the sequence of priority defined

Summarize – what is scrum about (2/2)

- Doing things right (by self organized team)
  - Team collaborate in the most efficient way
  - Team make decision on how to get things done
  - Team commit for the result
- Continuous improving
  - Get every thing visible
  - Shortest feedback loop
  - Clear and strong accountability
  - Regular retrospective

3 Release Planning

Mike Cohn's "Planning Onion"



@ start of each release by PO and Team

@ First day of each sprint by team

@ Daily scrum meeting by team members

Team’s Speed - Velocity

Velocity is the amount of story points a team can deliver in a sprint

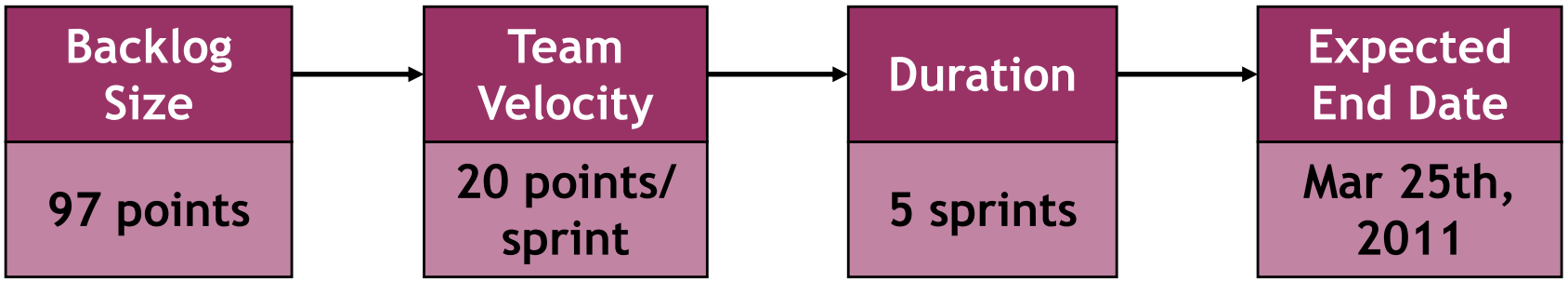
To estimate velocity:

- use historical values, if available
- run a few sprints, if possible
- break down a few items into tasks and make educated guess

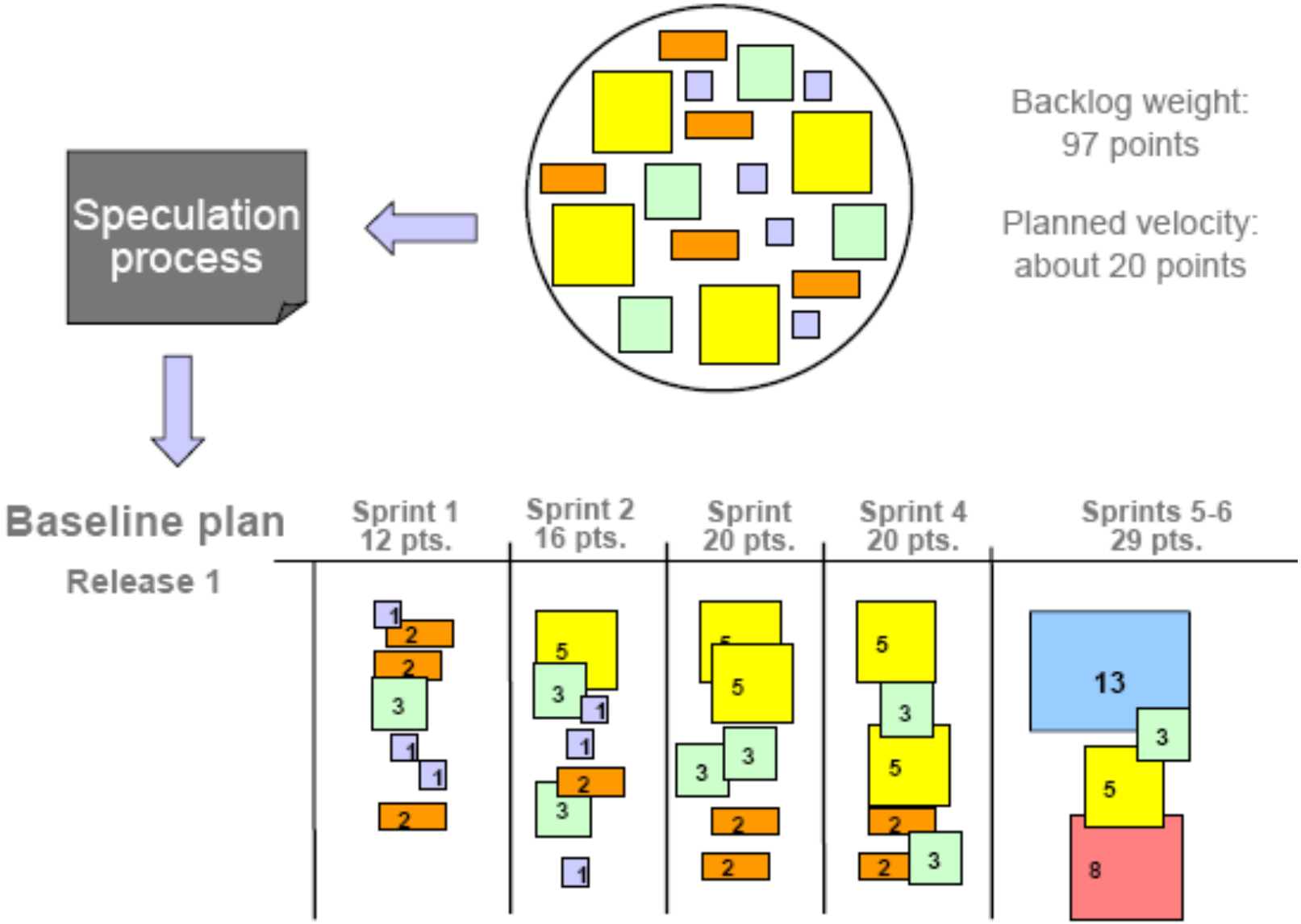
The pace is planned but it will change during the project lifetime

Use velocity range to express uncertainty

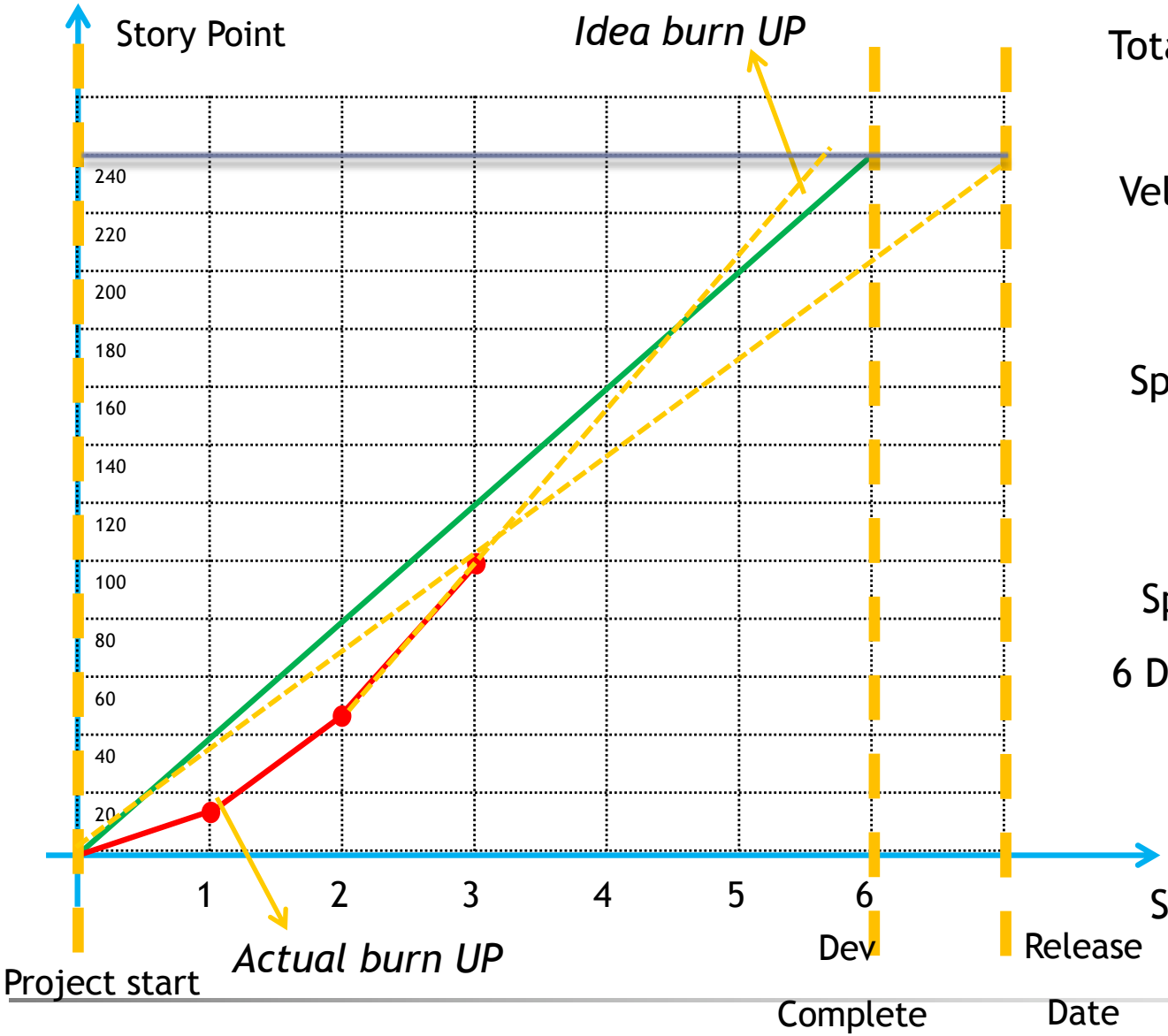
From Velocity to Duration



Release Plan



Release Burn Up (Forecast)



Total Story point = ~240

Velocity = ~40 points/ Sprints

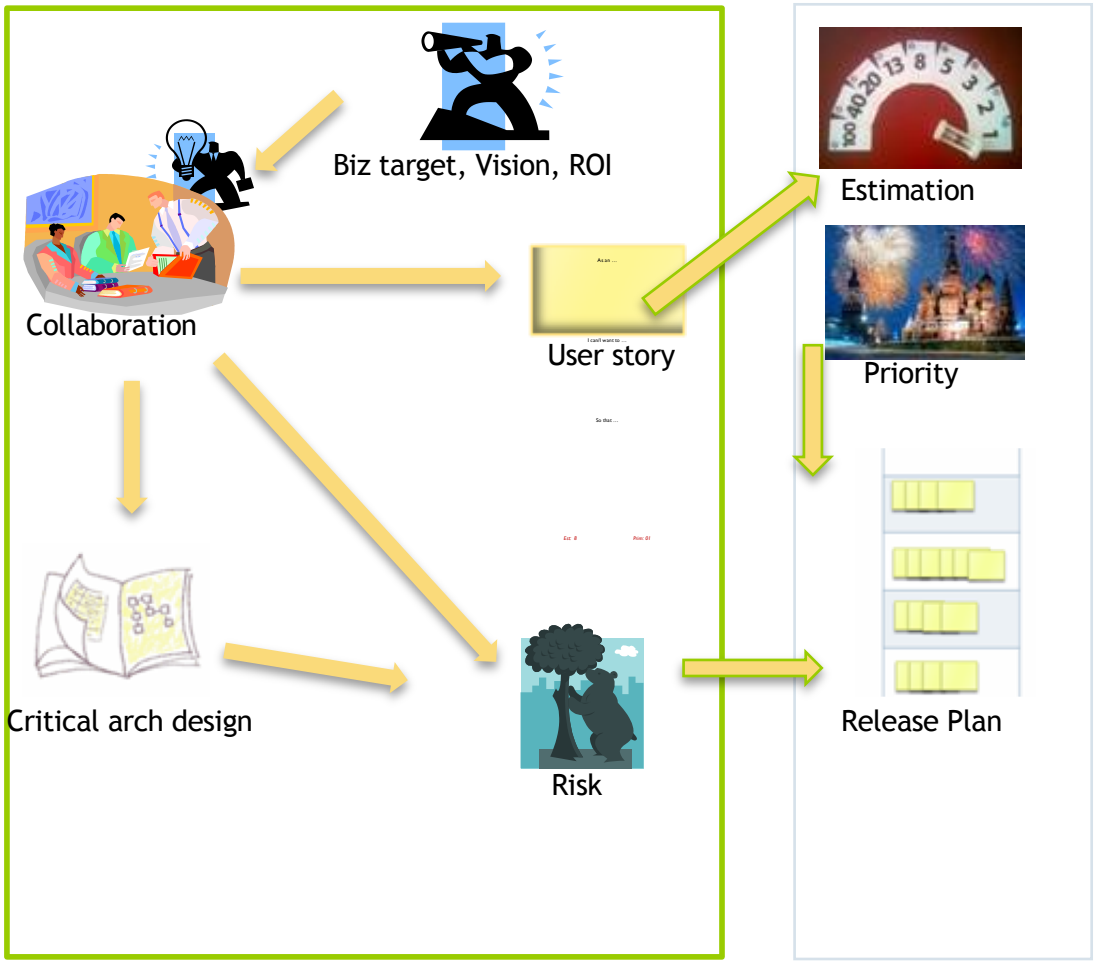
Sprints to get it Done

= 240/40 = 6

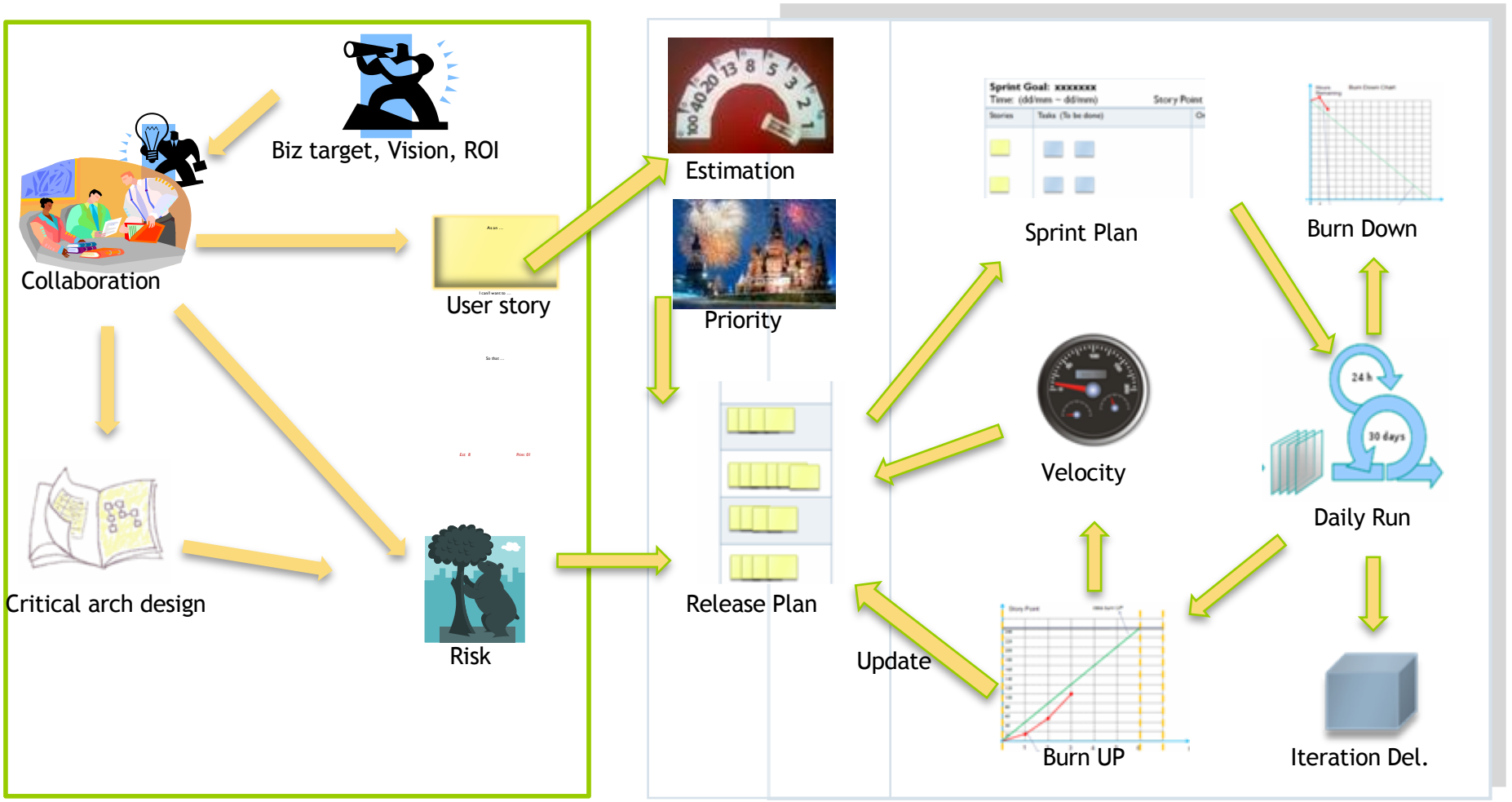
Sprint planned = 7 =

6 Dev sprints + 1 buffer sprint

Sprint 0


Biz target, Vision, ROI
Collaboration
User story
Critical arch design
Risk
Estimation
Priority
Release Plan

Try it All Together



Scrum is Simple

But ……

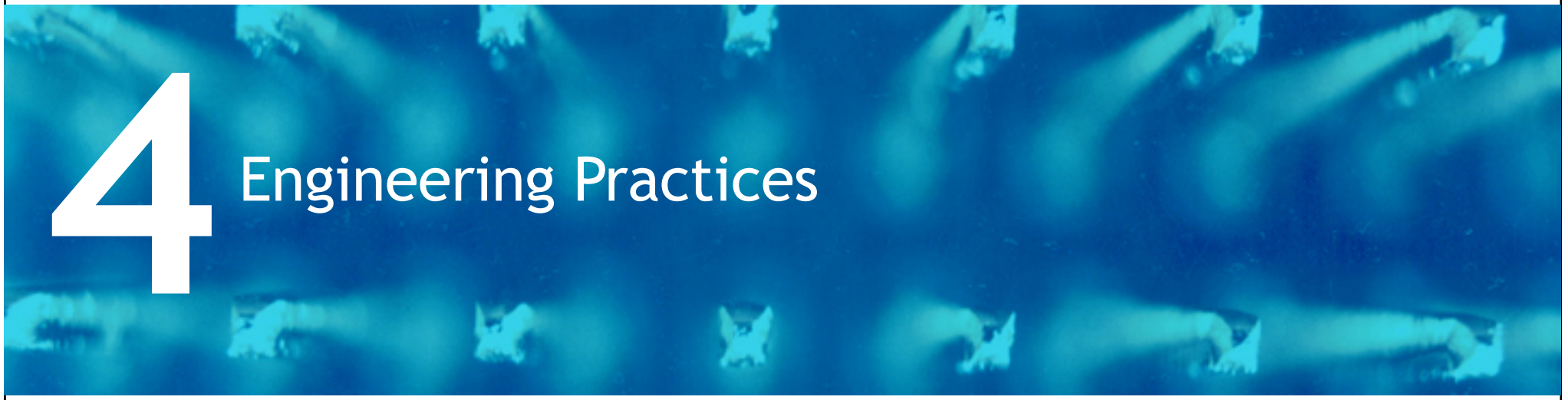
Simple does Not Mean Easy

It Needs ……

- Commitment of the organization
- Commitment of the team
- Highly self-disciplined
- Long time inspection and adaption
- Pursue of tech. excellence to sustain (Agile Engineering Practice)

Engineering Practice

- Test driven Development
- Pair programming
- Refactoring
- Simple Design
- Continuous Integration
- Acceptance Test Driven Development
- Emergent Design
- Agile Modeling
- ……



4 Engineering Practices

Individual Practices

- Test Driven Development
- Pair Programming
- Simple Design
- Refactoring
- Continuous Integration

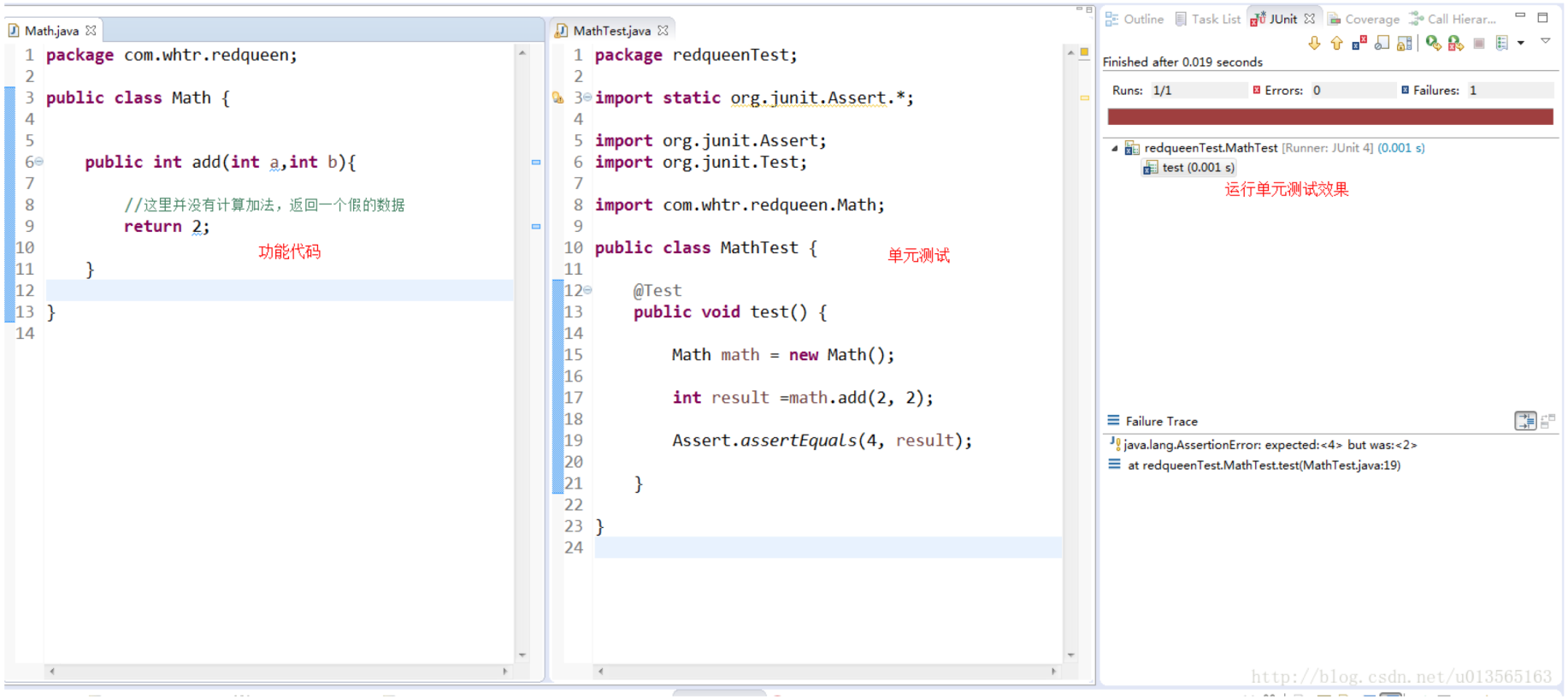
Test Driven Development – How It Works

- Write test code first. Write only enough test code to demonstrate a failure.
- Write code to make the failing test pass. Write only enough code to pass the test.
- Clean up the code and tests.

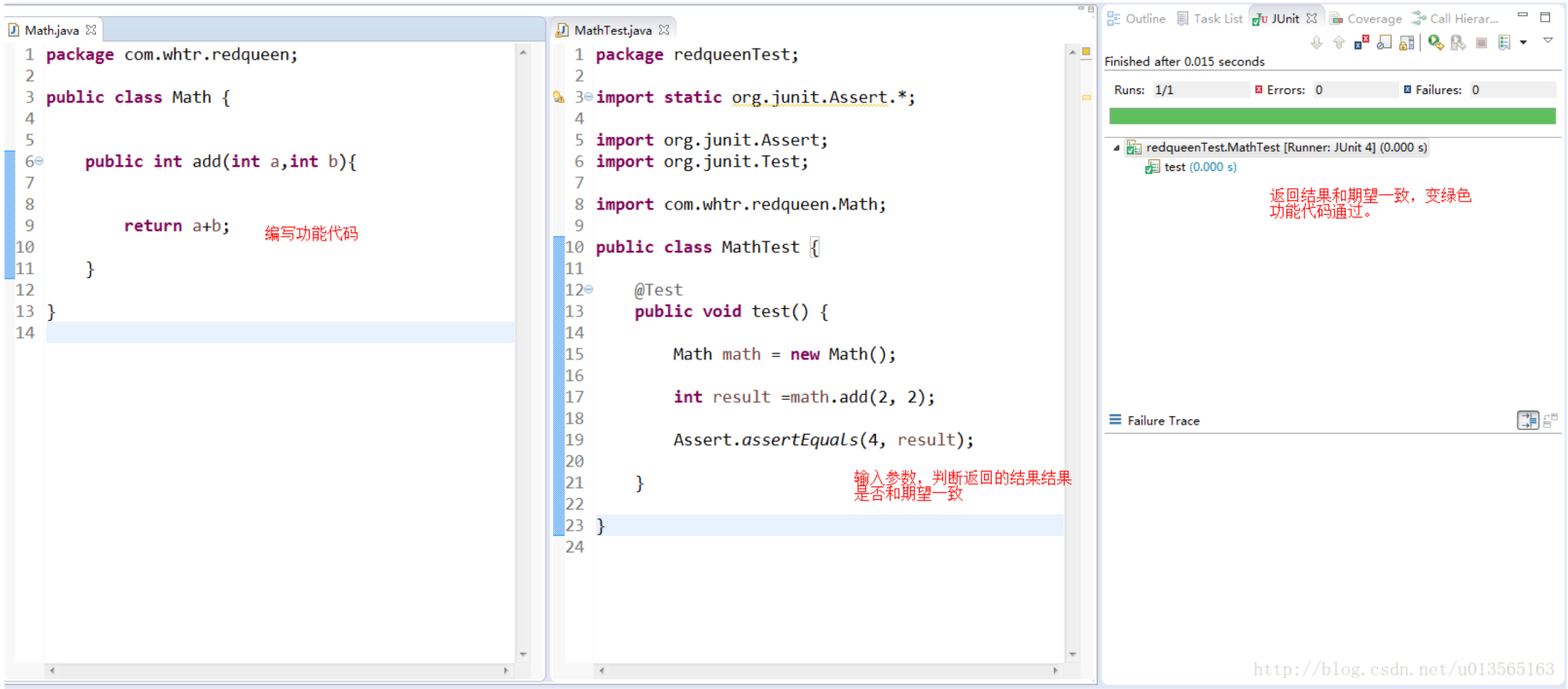
RED, GREEN, REFACTOR

... and with quick feedback loop

Test Driven Development – An Example



Test Driven Development – An Example



Test Driven Development – Why It Works

- Focus on external behavior
- Full automation test list
- No unused code
- With Pair Programming: Ping-pong work style
- Less test & function leak

Pair Programming – How It Works

- 2 people

Roles during pair: Driver & Navigator

- Environment:

Share 1 high performance work station

1 monitors, 2 keyboards, 2 mouse

Sit comfortably

Pair Programming – Why We Need It

- Continuous Review: fast feedback loop
- Continuous learning: study from people
- Less mistake, higher quality
- Pair programming is a thinking tool

Refactoring – How It Works

- Three strikes and you refactor
- Understand bad smells
- Build test system
- In small steps

Refactoring – How It Works (cont.)

- Bad smells example

  Duplicated Code

  Long method

  Large class

  Long parameter list

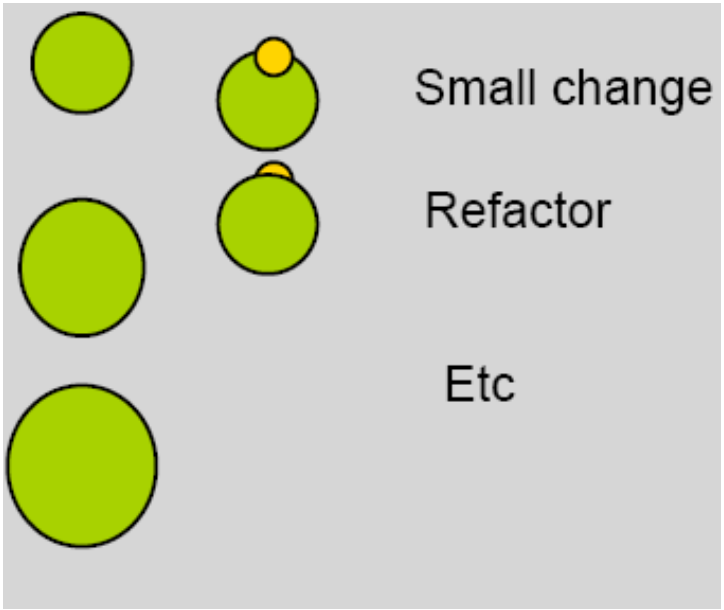
  High cyclomatic complexity

  ...

  Refer to 22 bad smells in Refactoring – Improving the design of existing code

Refactoring – Why We Need It

- Sustainable
- Easy for extension and maintenance
- Fix the broken window



Simple Design – How it Works

- What's simple

Work

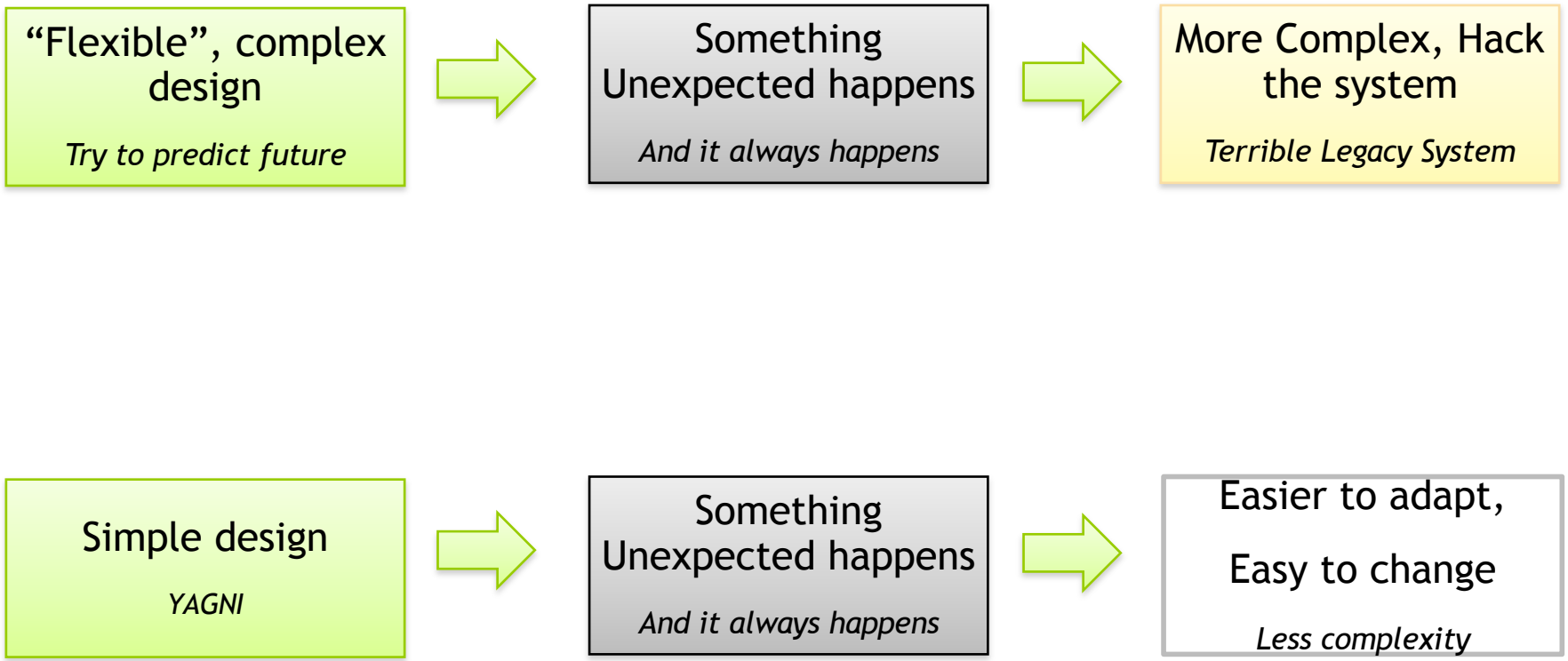
Communicative

No duplication

Minimal class and method

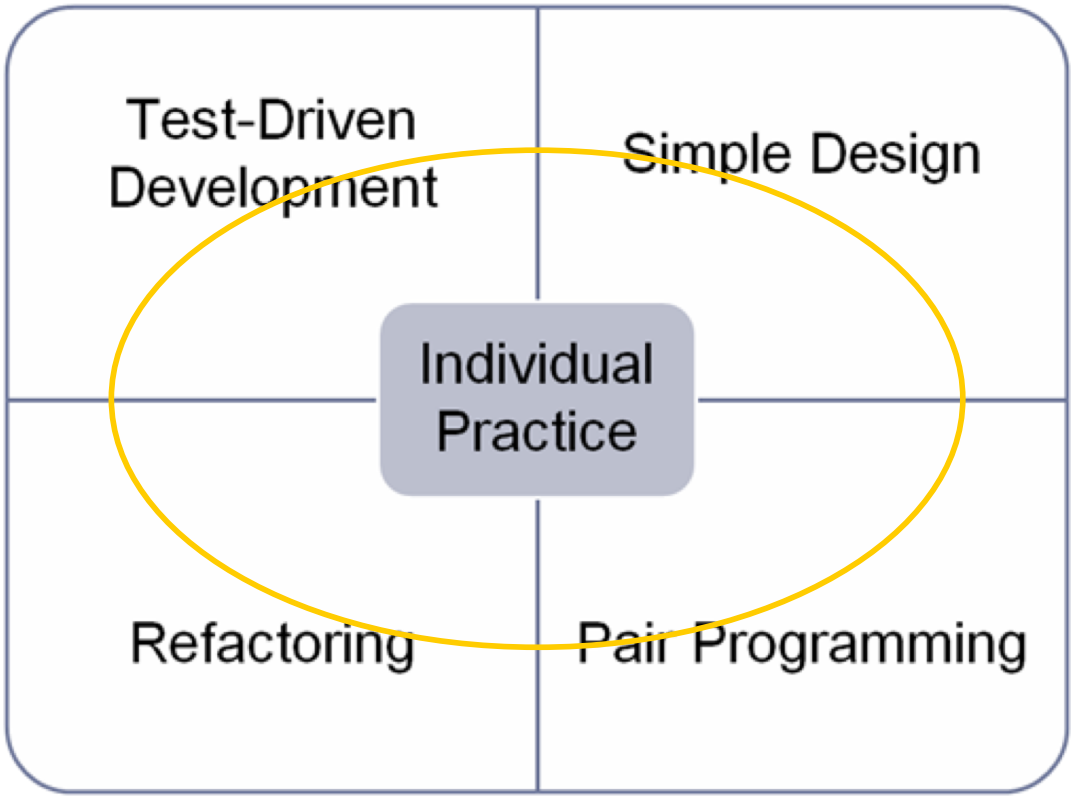
- Kent-Beck's definition

Simple Design – Why We Need It

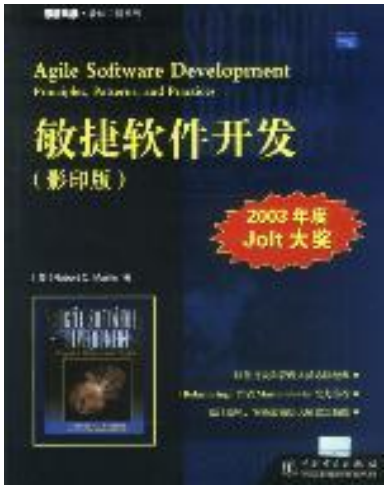


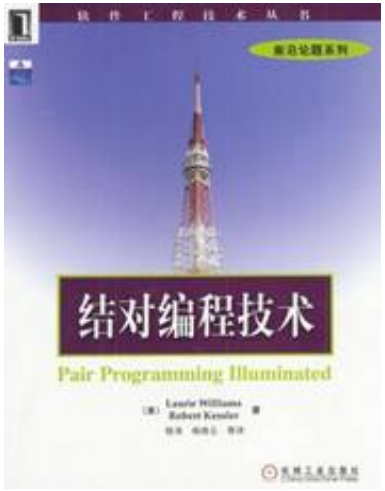
Simple design not simplistic

Engineering Practices Support Each Other

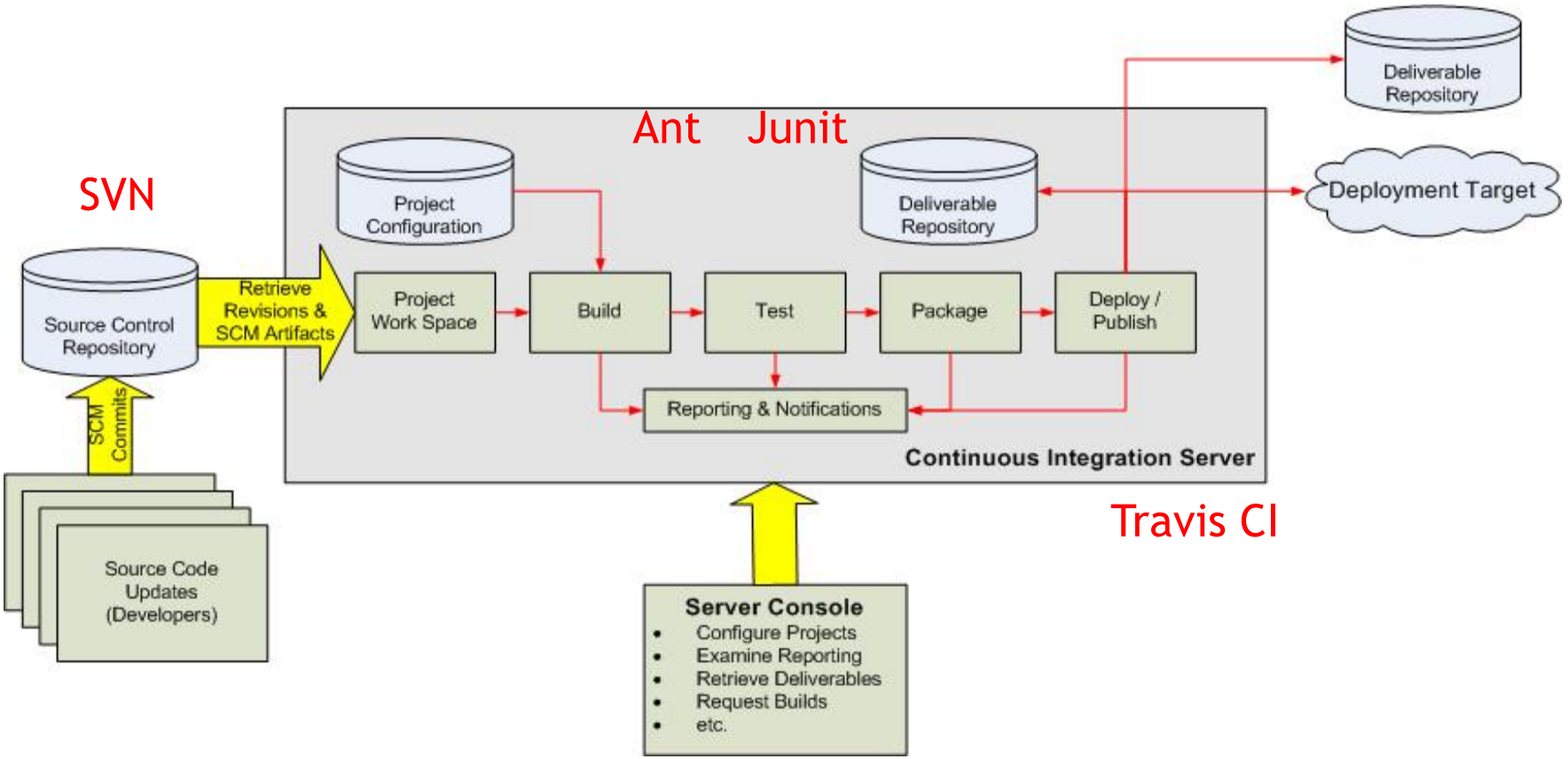


The weakness of one is covered by the strengths of others.



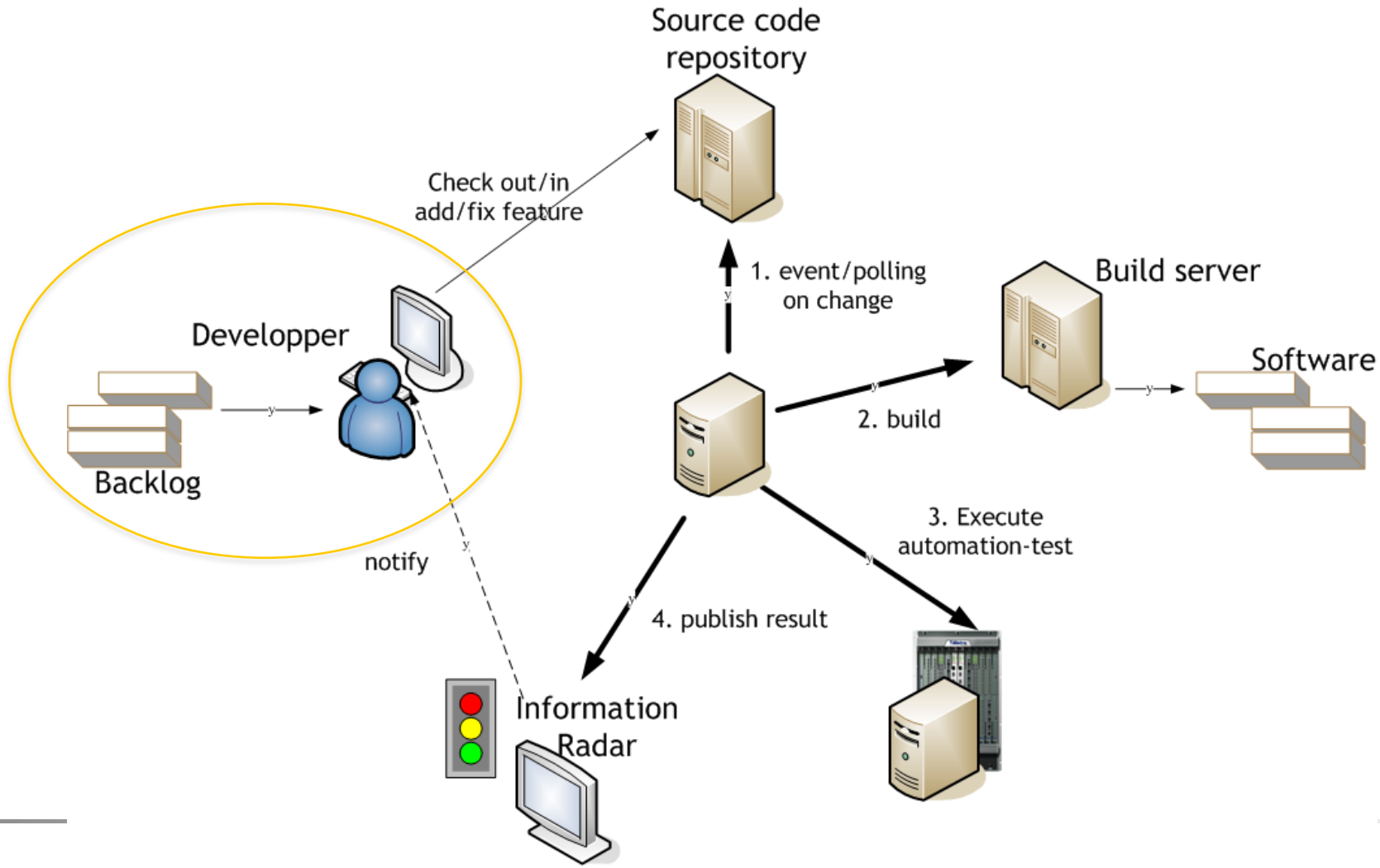


Continuous Integration – How It Works



Feedback Effectively

verified by an automated build (including test)



Continuous Integration – Why We Need It

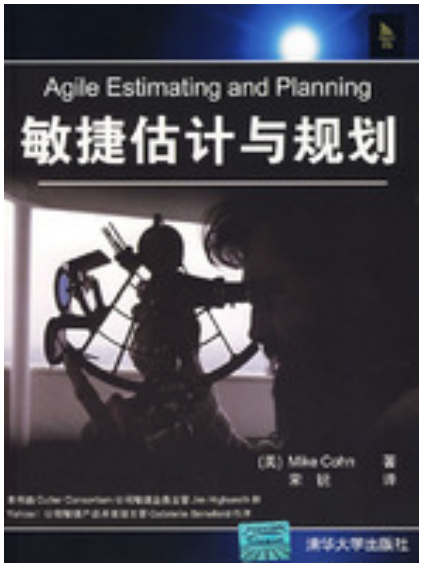
Continuous Integration is a **developer practice**
with the goal to always keep a **working system**
by making **small changes, slowly growing the system**
and **integrating them at least daily**
on the **mainline**
typically supported by a **CI system**
with lots of **automated tests**

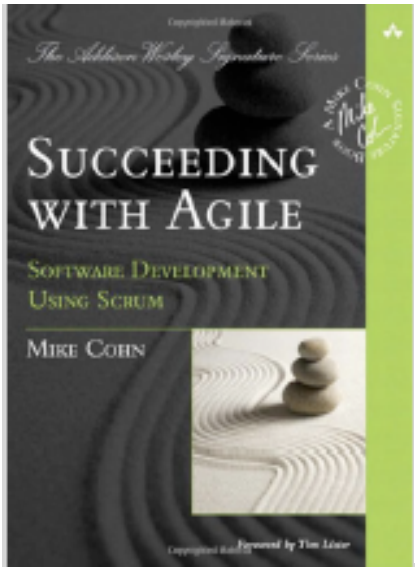
- From the Book “practices for scaling lean & agile development”

5 Reading

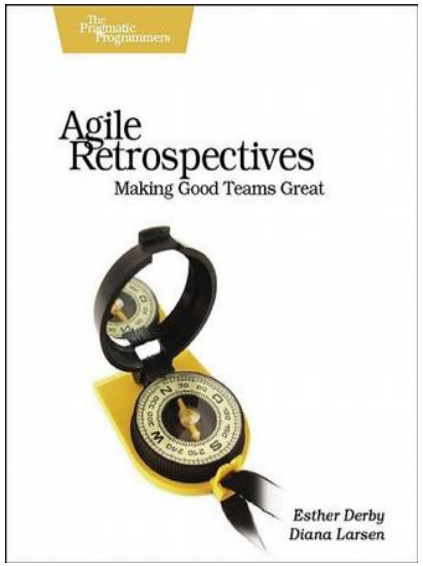
Reading Recommendations - for Start

Reading Recommendations - For Scrum Practitioner

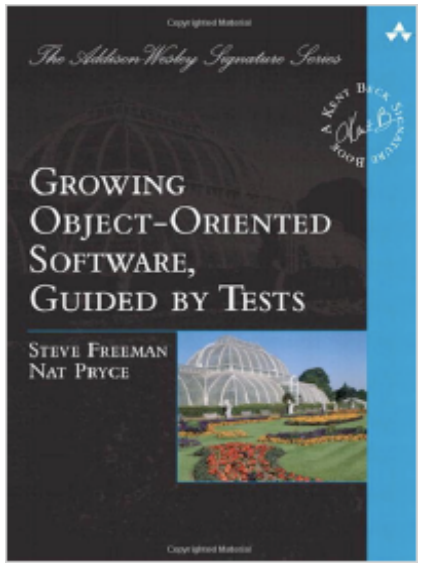


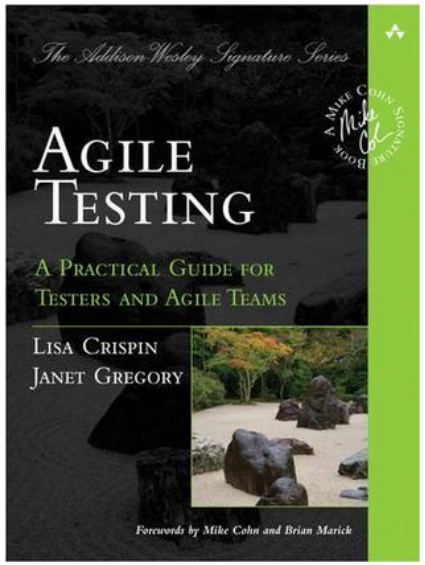


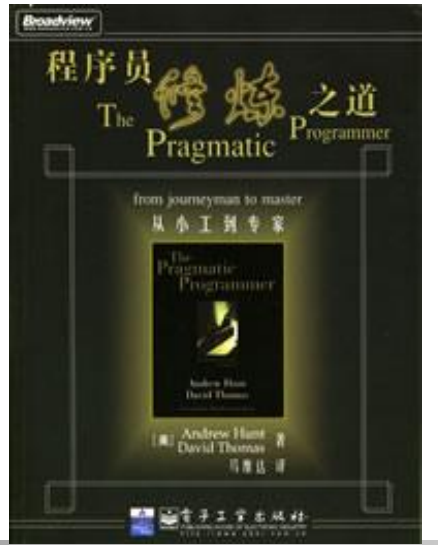
Reading Recommendations - For Agile Coaching



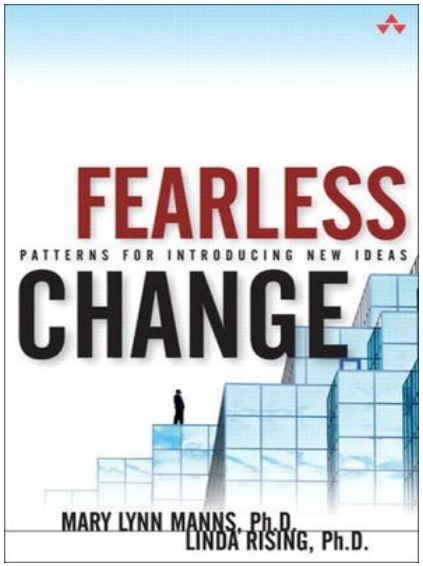
Reading Recommendations - For Programmer

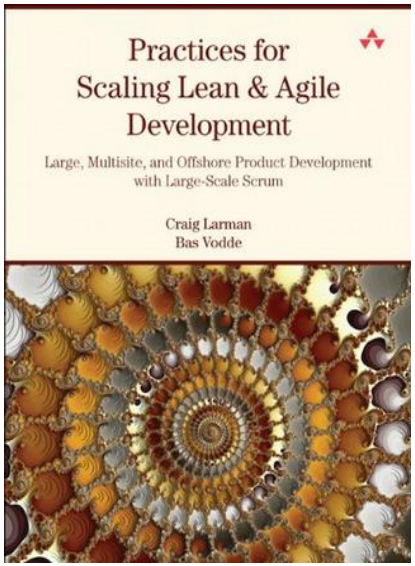




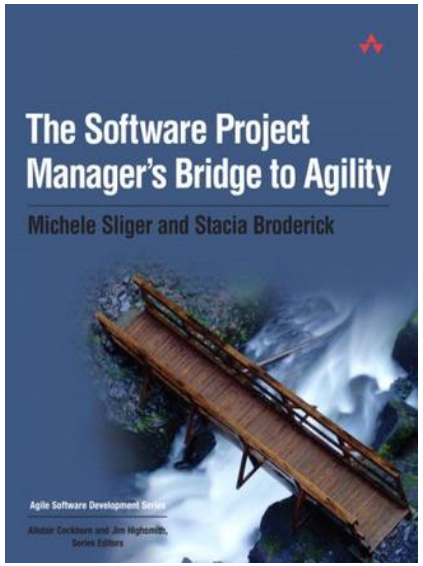


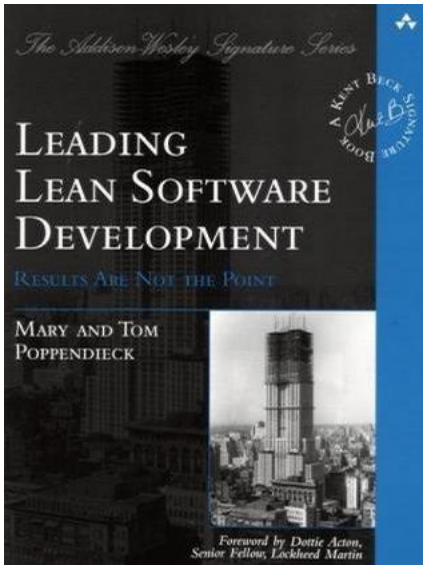
Reading Recommendations - For Organization Transformation

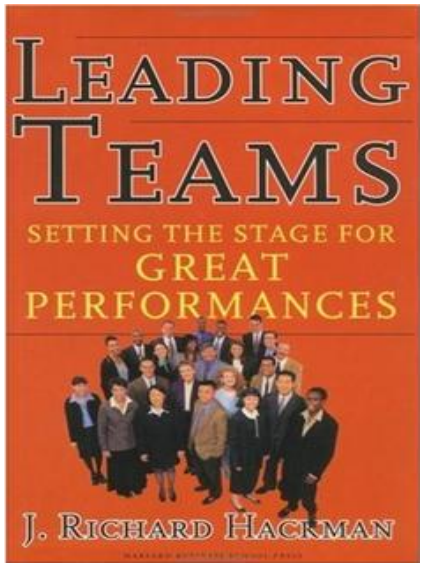




Reading Recommendations - For Project and Line Mangers







Internal Resource

CPG CTO Be Agile Website:

https://acos.alcatel-lucent.com/projects/be-agile/

CPG CTO Be Lean Website:

https://acos.alcatel-lucent.com/projects/lean/

CPG China Agile Community of Practice

Website: https://acos.alcatel-lucent.com/wiki/g/be-agile/China%20Agile%20Community

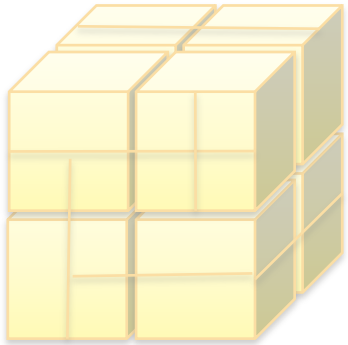
Mail List: be-agile-china@acos.alcatel-lucent.com

6 Summary – What Does It Mean for Us

Vision

ROI

Define & Split up the product



Large group spending a long time building a big thing

→

Small teams spending a little time building small things but doing integration regularly to see the whole

Kai Zen

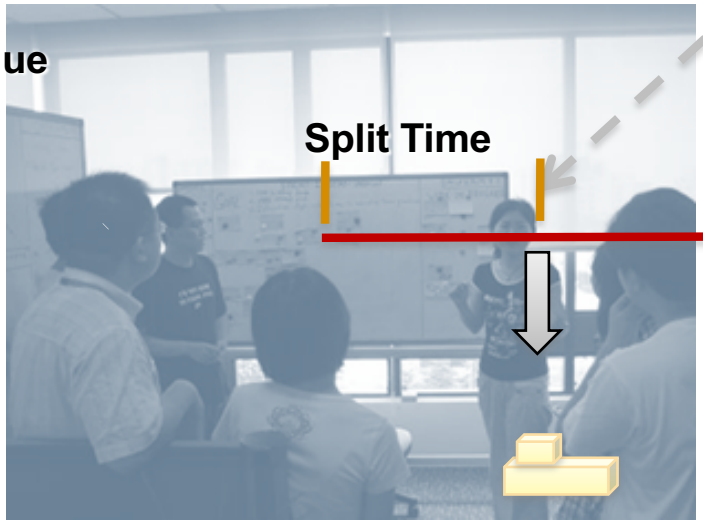
改 善

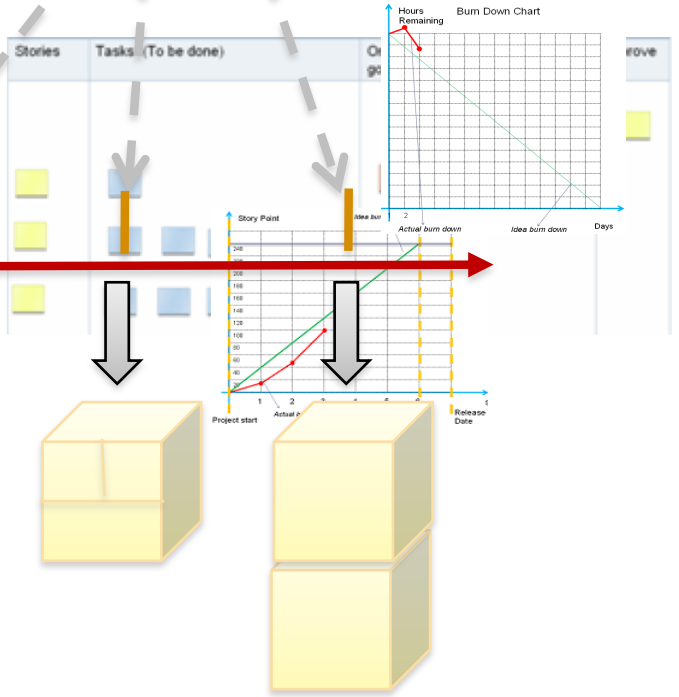
Change Good

Inspect & Adapt

Optimize Business Value

Split Time





Vision

ROI

Large group spending a long time building a big thing

→

Small teams spending a little time building small things

Define & Split

Close collaborative between team and product owner from business is key for customer value fulfillment and business success

Change

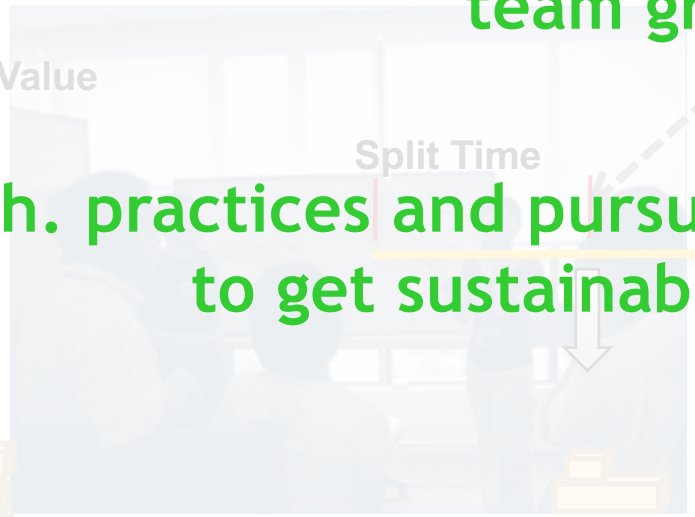
Good

Inspect & Adapt

Inspect and adapt is essential to make good team great

Optimize Business Value

Split Time



Tech. practices and pursuit of tech. excellence to get sustainable efficiency

Agile is a Tool Not a Goal

Q&A?