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Course "Softwareprozesse"

Agile Methods: Crystal, Scrum, Lean SD, Kanban, ...

Lutz Prechelt
Freie Universität Berlin, Institut für Informatik
http://www.inf.fu-berlin.de/inst/ag-se/

- Crystal Clear / The Crystal Light family
- Scrum
  - The daily scrum
- Lean Software Development (Lean SD)
- Kanban
- Rational Unified Process (RUP)
- Agile Development in the Large
- Pragmatic Programmer

Learning objectives

- Understand the basic ideas, strengths, and application scope of several other agile approaches

- Thereby get an overview of the methods space of agile methods overall

Chrystal Clear, The Crystal Light family

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- Alistair Cockburn: *"Crystal Clear: A Human-Powered Methodology for Small Teams"*, Addison-Wesley 2004
- Alistair Cockburn: "Surviving Object-Oriented Projects", Addison-Wesley 1997
  - Contains a sketch of *Crystal Orange* (in Ch.4)

- *Crystal Light* is meant to be a family of methods for different project sizes and criticalities
    - Clear, Yellow, Orange, Red, Blue, "and so on"
  - Only Crystal Clear has been spelled out
    - and can be taken seriously
  - Other books may or may not be forthcoming
    - probably not

Crystal Clear
Goals and Practices

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http://alistair.cockburn.us/index.php/Crystal_Clear_distilled

- "Crystal Clear is a highly optimized way to use a small, colocated team,
  - **prioritizing for safety in delivering a satisfactory outcome,**
  - efficiency in development, and
  - habitability of the working conventions."
- Brief description of Crystal Clear:
  - "The lead designer and two to seven other developers
  - ... in a large room or adjacent rooms,
  - ... using information radiators such as whiteboards or flip charts,
  - ... having easy access to expert users,
  - ... distractions kept away,
  - ... deliver running, tested, usable code to the users
  - ... every month or two (quarterly at worst),
  - ... reflecting and adjusting their working conventions periodically"

Crystal Clear
Project Safety "Properties"

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http://alistair.cockburn.us/index.php/Crystal_Clear_distilled

- The people set in place the safety properties below using the techniques they feel appropriate.
  - The first three properties are required in Crystal Clear;
  - the next four get the team further into the safety zone.

1. **Frequent Delivery**
2. **Reflective Improvement**
3. **Osmotic Communication**
4. Personal Safety
5. Focus
6. Easy Access to Expert Users
7. A technical environment with Automated Tests, Configuration Management, and Frequent Integration

sort of a bare-bones summary of Agile

Crystal process improvement technique: Reflection workshop

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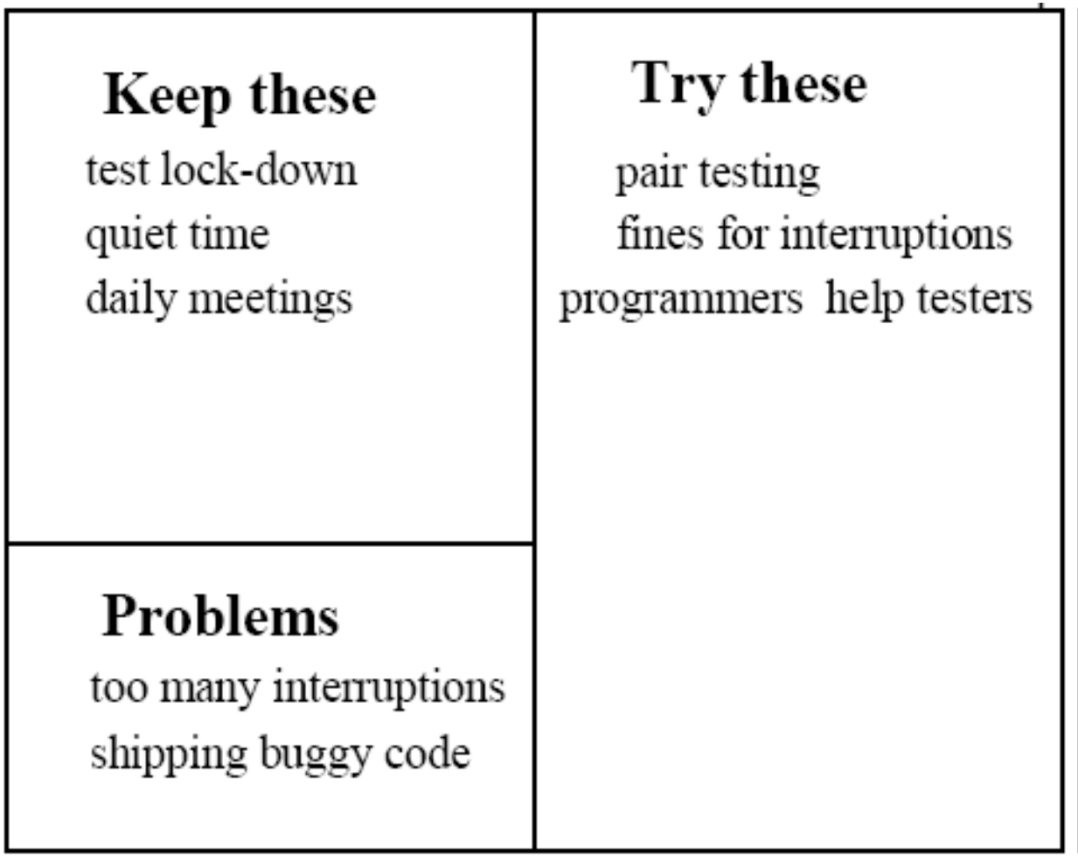
- Hang a flipchart
- Fill in the chart
  - 30 minutes
- Hang the chart in a public, visible, frequently seen place !

- Try the ideas
- Repeat each month or after each iteration



(Headings are part of the chart.
Entries are **example**s only.)

Crystal Clear vs. XP

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http://alistair.cockburn.us/index.php/Crystal_light_methods

- Crystal is based on developers' maximum individual preference
- XP is based on having everyone follow disciplined practices

- XP pursues greater productivity through increased discipline, but is harder for a team to follow:
  - Crystal Clear permits greater individuality within the team, and more relaxed work habits, for some loss in productivity.
  - Crystal Clear should be easier for a team to adopt, but XP produces better results if the team can follow it.
  - A team can start with Crystal Clear and move up to XP later.
  - A team that falls off XP can back up to Crystal Clear.

Scrum

- Ken Schwaber, Jeff Sutherland:
  "The Scrum Guide",
  www.scrum.org, 1991-2011
- H. Takeuchi, I. Nunaka:
  "The New Product Development Game",
  Harvard Business Review, January 1986
- Ken Schwaber, Mike Beedle:
  "Agile Software Development with Scrum",
  Prentice Hall 2001
- Ken Schwaber, Jeff Sutherland:
  "Software in 30 Days",
  Wiley 2012
  - targeted at managers
- http://www.controlchaos.com/

Ken Schwaber

Jeff Sutherland

Mike Beedle

Scrum? What a strange word!

'scrum' is a standard situation in Rugby

Scrum basics

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- Scrum is an approach for managing a development process
  - not only for software development
- It does not describe technical development activities

- Scrum's goal is *facilitating the self-organization of the team* so that it can adapt to
  - the specifics of the project and
  - their changes over time

- Scrum is currently the most-used agile method

Scrum roles

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- Product Owner
  - Represents all customers, manages the *Product Backlog*
  - Sets priorities, selects requirements for a *Sprint*
- Scrum Master
  - Responsible for ensuring a smooth execution of the Scrum process (as teacher and coach, not as a manager)
    - This role targets both Team and Product Owner
  - Responsible for removing organizational obstacles
  - *Master* and *Team* together are responsible for product delivery
- Team
  - The developers (typically 3-9), viewed as a self-organizing group of technical and process experts
    - Note the role is team, not developer!
  - Larger projects can use multiple teams
- Sometimes, the *Scrum Master* will be *Product Owner* or *Team member*, too. This produces conflict, but is possible.

Scrum process elements

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- Product: ***Product Backlog List***
  - Collects all requirements that are currently known
    - Including priorities and effort estimates
  - Can be updated at any time (by any stakeholder)
- Activity: ***Sprint***
  - The unit of iterative development, addressing
  - usually 2-5 customer-chosen requirements (→ Product Backlog)
  - and taking a fixed time (usually one month)
  - for doing analysis, design, implementation, testing
- Product: ***Sprint Backlog List*** (fine-grained task list)
- ?: ***Current Approach***
  - Technology, Architecture, Conventions, Resources
  - Can be modified at any time, typically before a Sprint
- Activity: ***Sprint retrospective***
  - A postmortem for process and approach adaptation

Scrum process elements: The Daily Scrum

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A (perhaps the) key feature of the Scrum process:

- A Scrum Team holds a daily meeting to say and hear
  - what has been done,
  - what is to be done,
  - what is problematic and who could help,
  - what adjustments might be needed to succeed with the Sprint.
- The meeting is strictly limited to 15 minutes
  - and is performed standing up rather than sitting down

Scrum center of attention: The Sprint

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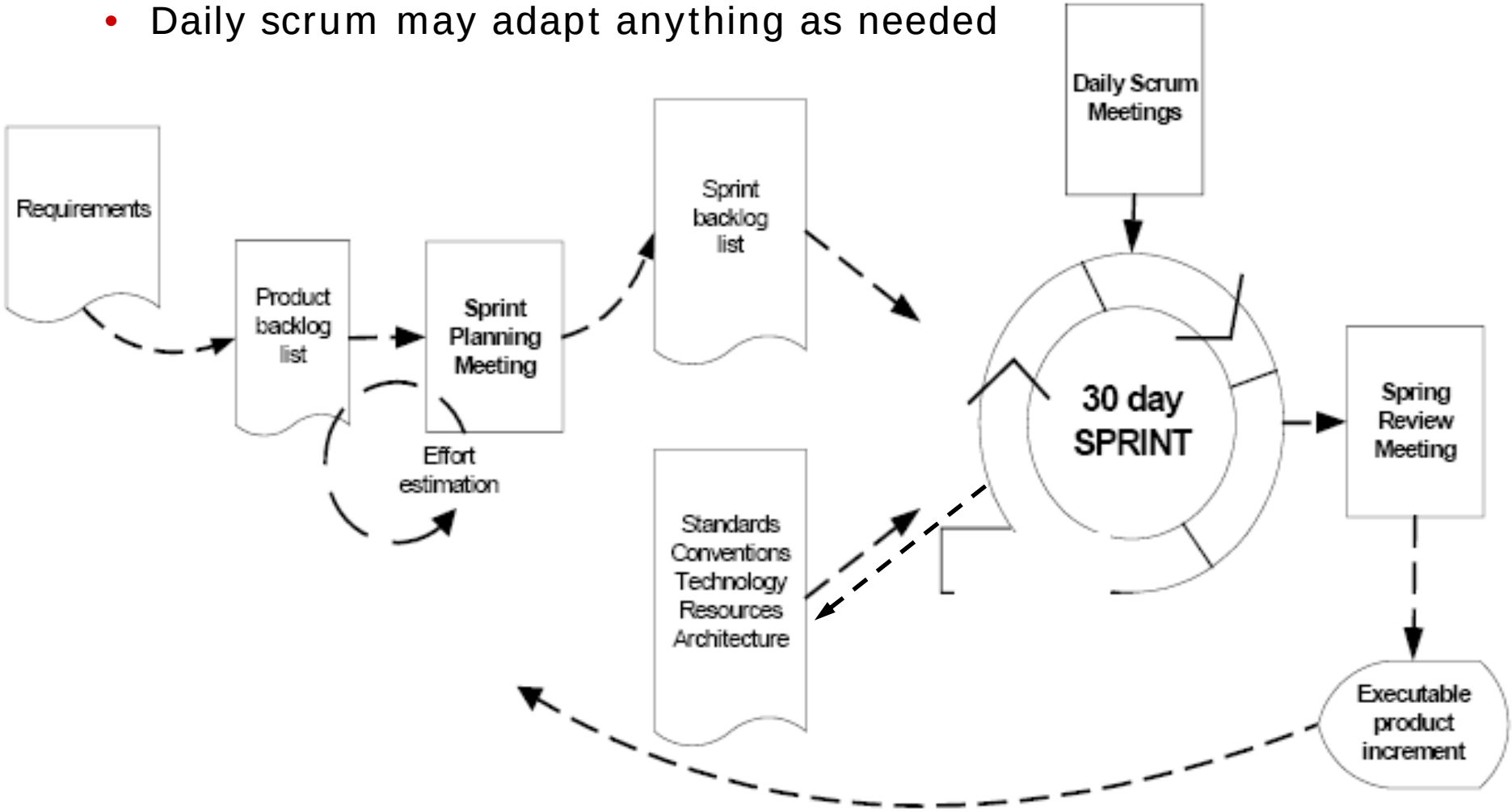
- During a Sprint, requirements are fixed, but the process it not
  - Daily scrum may adapt anything as needed



Scrum engineering techniques

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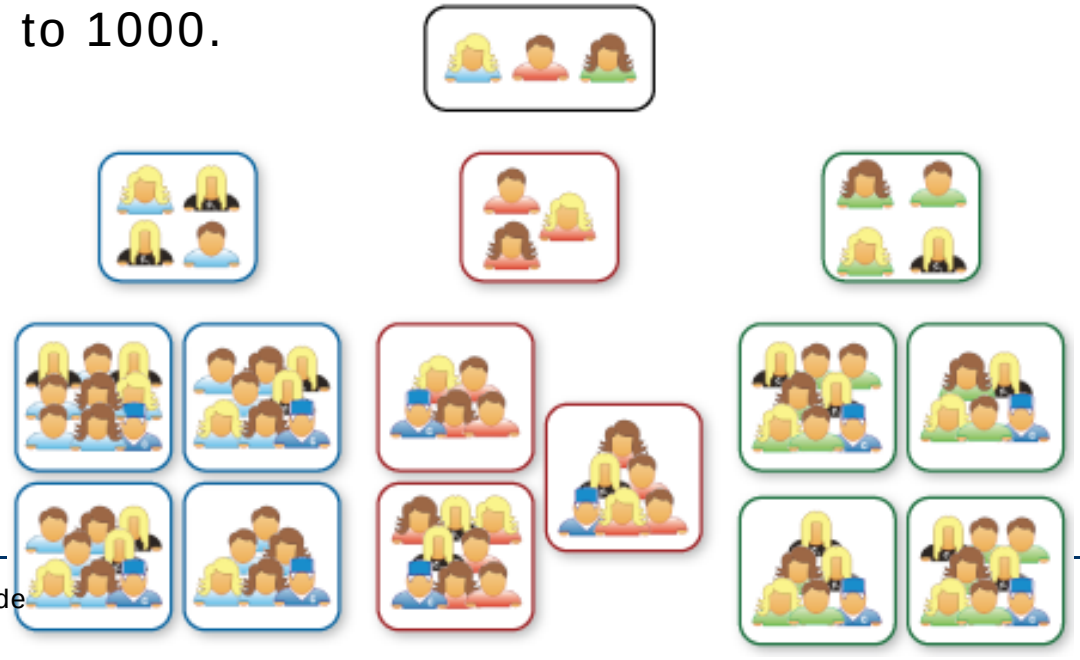
- Scrum itself is a management method, not an engineering method
- However, it is compatible with any engineering approach that can be applied in monthly iterations
- Scrum is often combined with (some) XP practices
  - Scrum replaces/extends the planning game

Scaling Scrum

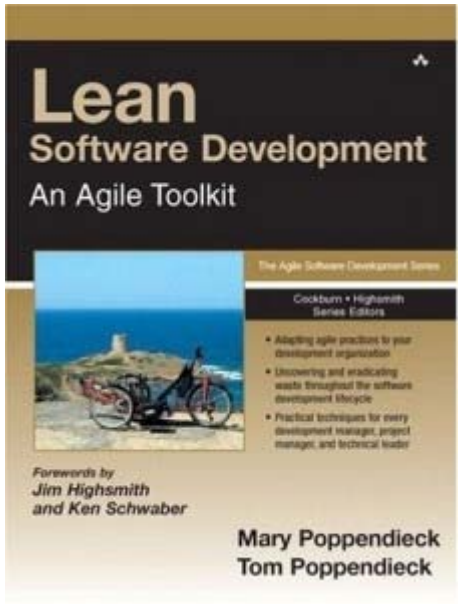
- Ken Schwaber claims he has coached a project using Scrum that took 2,5 years and had 3500 participants overall

- The technique to do this is the "Scrum of Scrums":
  - One participant of each daily Scrum is sent of the daily Scrum-of-Scrums on a second project-level
  - This scales Scrum from 10 up to 100 participants
  - If necessary, a third level could scale up to 1000.



Lean Software Development

- Mary and Tom Poppendieck:
  "Lean Software Development: An Agile Toolkit",
  Addison-Wesley 2003
- http://www.poppendieck.com



Mary Poppendieck Tom Poppendieck

Lean SD principles

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- Based on Toyota's principles of Lean Production
  - a holistic approach to optimizing cost and quality:
    - a philosophy and set of principles
    - a set of more-or-less concrete techniques
    - but not a complete, prescriptive method

- Principles of Lean Software Development:
  1. Eliminate waste
  2. Build quality in
  3. Create knowledge
  4. Defer commitment
  5. Deliver fast
  6. Respect people
  7. Optimize the whole

Lean SD:
Eliminate Waste, Build Quality In

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- **Eliminate Waste.** The three biggest wastes in SW dev. are:
  - **Extra Features**: We need a process which allows us to develop just those 20% of the features that give 80% of the value.
  - **Churn:** If you have requirements churn, you are specifying too early. If you have test and fix cycles, you are testing too late.
  - **Crossing Boundaries:** Organizational boundaries typically increase cost by over 25%; they interfere with communication.

- **Build Quality In.** If you routinely find defects during verification, your development process is defective.
  - **Mistake-Proof Code with Test-Driven Development:** Write executable specifications instead of requirements.
  - **Stop Building Legacy Code:** Legacy code is code that lacks automated unit and acceptance tests.
  - **The Big Bang is Obsolete:** Use continuous integration and nested synchronization.

Lean SD:
Create Knowledge, Defer Committment

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- **Create Knowledge.**
  Planning is useful. Learning is essential.
  - **Use the Scientific Method:**
    Teach teams to establish hypotheses, conduct many rapid experiments, create concise documentation, and implement the best alternative.
  - **Standards Exist to be Challenged and Improved:**
    Embody the current best known practice in standards that everyone follows.
    Encourage everyone to challenge the standards.
  - **Predictable Performance is Driven by Feedback:**
    A predictable organization does not guess about the future and call it a plan; it develops the capacity to rapidly respond to the future as it unfolds.

Lean SD:
Defer Commitment

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- **Defer Commitment:**
  Abolish the idea that it is a good idea to start development with a complete specification.
  - **Break Dependencies:**
    System architecture should support the addition of any feature at any time.
  - **Maintain Options:**
    Think of code as an experiment – make it change-tolerant.
  - **Schedule Irreversible Decisions at the Last Responsible Moment:**
    Learn as much as possible before making irreversible decisions.

Lean SD: Deliver Fast

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- **Deliver Fast.**
  Lists and queues are buffers between organizations that simply slow things down.
  - **Rapid Delivery, High Quality, and Low Cost are Fully Compatible:**
    Companies that compete on the basis of speed have a big cost advantage, are more attuned to their customers' needs, and deliver superior quality.
  - **Queuing Theory Applies to Development, not Just Servers:**
    Focusing on utilization creates a traffic jam that actually reduces utilization.
    Drive down cycle time with small batches and fewer things-in-process.
  - **Limit Work to Capacity:**
    Establish a reliable, repeatable velocity with iterative development.
    Aggressively limit the size of lists and queues to your capacity to deliver.

Lean SD:
Respect People

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- **Respect People.**
  Engaged, thinking people provide the most sustainable competitive advantage.
  - **Teams Thrive on Pride, Commitment, Trust, and Applause:**
    What makes a team?
    Members mutually committed to achieve a common goal.
  - **Provide Effective Leadership:**
    Effective teams have effective leaders who bring out the best in the team.
  - **Respect Partners:**
    Allegiance to the joint venture must never create a conflict of interest.

Lean SD:
Optimize the Whole

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- **Optimize the Whole.**
  Brilliant products emerge from a unique combination of opportunity and technology.
  - **Focus on the Entire Value Stream:**
    from concept to cash,
    from customer request to deployed software.
  - **Deliver a Complete Product:**
    Develop a complete product, not just software.
    Complete products are built by complete teams.
  - **Measure Up:**
    Measure process capability with cycle time.
    Measure team performance with delivered business value.
    Measure customer satisfaction with a net promoter score.

Kanban

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- Kanban: Japanese for "signboard" (i.e. a kanban is a card)
- Originates from Toyota Production System ca. 1950
  - is an application of Lean principles

- The core principle is evolutionary improvement in small steps
  - valid for both process and product
- The core metaphor is the work-flow
  - from upstream to downstream

- War cry:
  - Waterfall: "Never change a running system"
  - Kanban: **"Always run a changing system"**

- http://www.infoq.com/articles/hiranabe-lean-agile-kanban

Kanban principles

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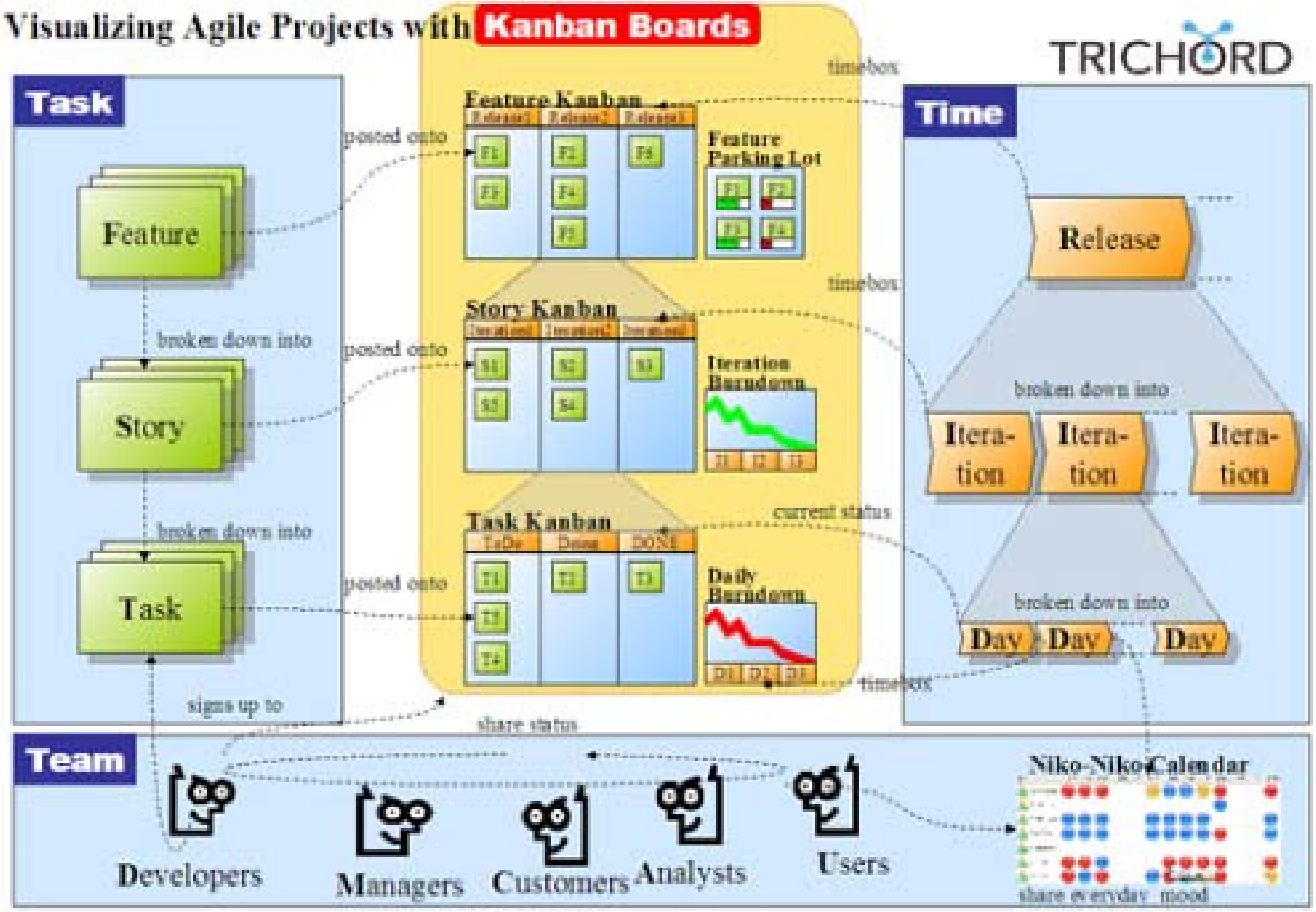
1. **Visualize the workflow**
   - because good overview is needed for efficient improvements
2. **Limit work-in-progress**
   - to limit complexity, minimize waste, reduce cycle time, and establish a predictable development speed (velocity)
   - buzzword: "**pull**, not push" (the crucial point is a limited buffer)
3. **Manage flow**: monitor, measure, report
   - to evaluate process improvements

and also:

- Spell out process rules
  - a corollary of "visualize the workflow":
    agreeing on changes requires a common process view
- Improve the process by using the scientific method
  - theorize, predict, experiment, validate

Visualize the workflow



http://www.infoq.com/articles/agile-kanban-boards

Visualize the workflow: A real Kanban board

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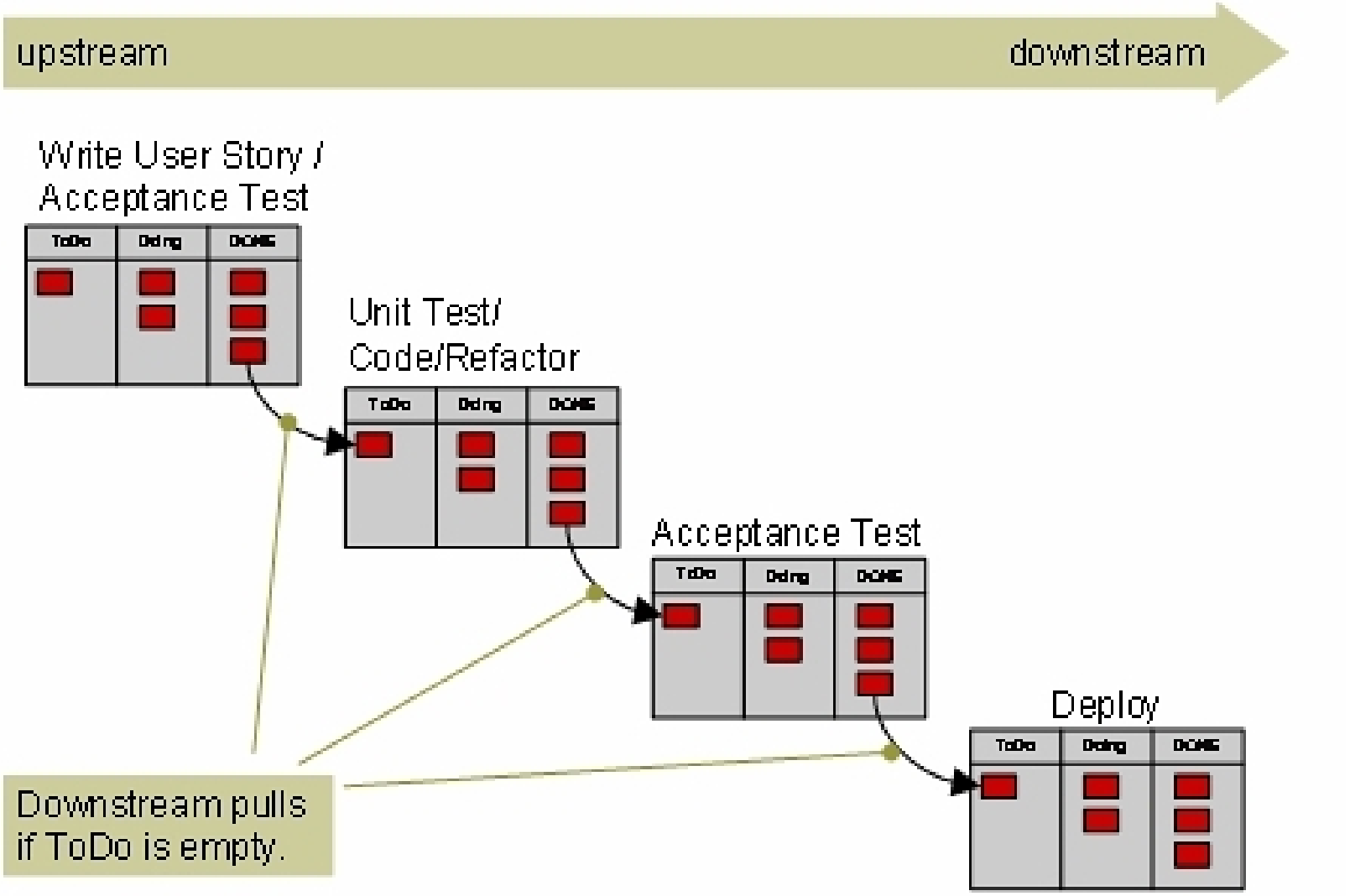
Limit work-in-progress



Rational Unified Process (RUP)

- Philippe Kruchten, Ivar Jacobson, et al.
- http://en.wikipedia.org/wiki/RUP
- There is a substantial number of books about RUP
- A number of RUP variants exist

Philippe Kruchten

Ivar Jacobson

Rational Unified Process (RUP)

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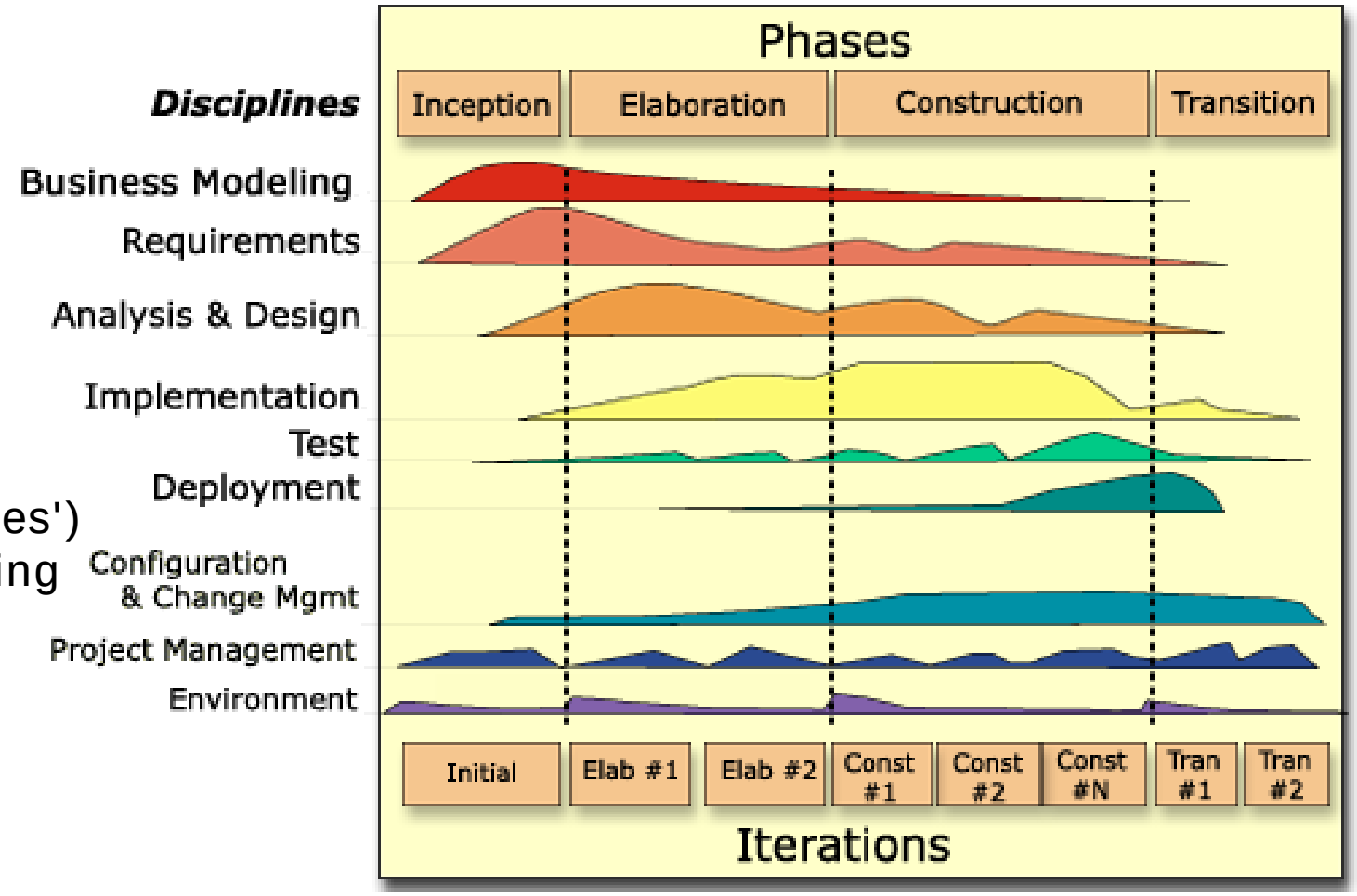
- RUP is a huge process
  - targeted mainly at large projects
- It is built around modeling (using UML) and tool-centric, object-oriented, component-based software construction
  - and other "best practices"
- It is normally considered a rather heavyweight process, but can be instantiated as an agile one
  - (appropriate when substantial upfront design is needed)
  - RUP is inherently iterative in any case
  - Full RUP has more than 100 different product types
  - Tailoring is left to the user (but supported by tools)

Rational Unified Process: Dimensions

RUP has three dimensions:

1. A set of best practices
2. 4 lifecycle phases
3. A number of process areas (called 'disciplines') and corresponding workflows



Rational Unified Process: Agile variants

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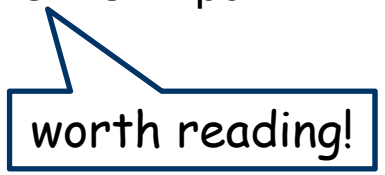
Agile variants of RUP:

- Project-specific variants
  - formed by leaving out many RUP process elements and executing the rest with an agile mindset
- dX
  - RUP in XP mode : A minimal version of RUP resembling XP
    - Grady Booch, Robert Martin, James Newkirk: *"Object Oriented Analysis and Design with Applications"*, 2nd ed., Addison-Wesley 1998, chapter 4
      - http://www.objectmentor.com/resources/articles/RUPvsXP.pdf
- Agile modeling
  - Not a full process, just an approach to modeling
  - Based on 11 practices in four categories: Iterative and Incremental Modeling, Teamwork, Simplicity, Validation
- ...



Agile development in the large

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- Jutta Eckstein: "Agile Softwareentwicklung im Großen: Ein Eintauchen in die Untiefen erfolgreicher Projekte", dpunkt Verlag 2004
  - "Agile Software Development in the Large: Diving into the Deep", Dorset House B&T 2004
- http://www.jeckstein.de/
- http://www.agilebuch.de/

Jutta Eckstein

Agile development in the large (2)

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- The book does not claim to present a 'method'
  - This is a German author after all...
- Has a discussion of scaling agile development to large projects (30-200 people)
- Discusses a number of aspects or techniques ignored by many of the other publications, such as:
  - Using explicit "communication teams"
  - Coping with virtual and distributed teams
  - Handling the surrounding organization (see next slide)

Agile development in the large (3)

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- Handling the surrounding organization:
  - Talk early to people unfamilar with Agile Development, such as
    - project planning and control departments,
    - the Method Police (process quality assurance group),
    - the Tool Support group
    - if relevant: Human Resources, Legal, Marketing
  - Integrate the QA department (if any) into the project
  - Integrate the Operations department into the project
  - Larger organizations tend to have higher fractions of below-average developers
    - To compensate for that, work towards a Learning Organization
  - Make learning materials part of the project deliverables
    - always to be kept consistent, part of acceptance testing
  - Handle insourcing, outsorcing, part-time employees
- The book ends with a case-story of a complex project
  - Perhaps the most useful part of the book!

The Pragmatic Programmer

- Andrew Hunt, David Thomas:
  "The Pragmatic Programmer: From Journeyman to Master",
  Addison-Wesley 1999
- http://www.pragmaticprogrammer.com

Andy Hunt

Dave Thomas

The Pragmatic Programmer (2)

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- Not really a method as such, but rather a book of good advice and useful attitudes
  - and a highly acclaimed one

- Framed in the form of 70 "tips", based on a few principles:
  - Take responsibility for what you do.
    - Think in terms of solutions, not of excuses.
  - Don't just accept bad design or coding – improve them
  - Actively introduce process changes where necessary
  - Create software that delights your customer – and then stop
  - Automate
  - Broaden your knowledge. Learn. Improve yourself.
  - Improve your self and your communication skills

  - http://pragprog.com/the-pragmatic-programmer/extracts/tips

The Pragmatic Programmer (3)

Fills in some details missing in other methods, such as:

- Some hints about HOW to keep a design simple
- Some hints about HOW to write sensible automated tests (e.g. assertions)
- Some hints about WHEN and HOW to use refactoring

Will be a useful companion no matter which method you are using, agile or other. (Just don't expect miracles...)

Summary

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- There is a broad range of methods that could be considered agile methods
- They range from the super-light (Crystal Clear) to the very complex (Rational Unified Process, RUP)
- They focus on different strengths, e.g.:
  - Communication and management (Scrum)
  - Simplicity (Crystal)
  - Comprehensiveness and scalability (RUP)
  - Holistic approach (Lean SD)
  - Individual-centered advice (Practical Programmer)

Thank you!