Course "Spezielle Themen der Softwaretechnik"

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

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http://www.inf.fu-berlin.de/inst/ag-se/

- Scrum
  - The daily scrum
- The Crystal Light family
  - Crystal Clear
- Feature-Driven Development (FDD)
- Lean Software Development (Lean SD)
- Adaptive Software Development (ASD)
- Rational Unified Process (RUP)
- Dynamic Systems Development (DSDM)
- 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

More agile methods

- Scrum
  - Ken Schwaber
- Crystal
  - Alistair Cockburn
- Feature-Driven Development (FDD)
  - Coad, Palmer, Felsing
- Lean Software Development
  - Mary and Tom Poppendieck
- Adaptive Software Development (ASD)
  - Jim Highsmith
- Rational Unified Process (RUP)
  - Philippe Kruchten, Ivar Jacobsen, et al.
- Dynamic Systems Development Method (DSDM)
  - DSDM consortium
- Agile development in the large
  - Jutta Eckstein
- The Pragmatic Programmer
  - Andrew Hunt, David Thomas

(in a rather random order)

Source

- For an overview and comparison of several agile methods, see Pekka Abrahamsson, Outi Salo, Jussi Ronkainen, Juhani Warsta:
  "Agile Software Development Methods: Review and Analysis", VTT Publications 478, 2002.

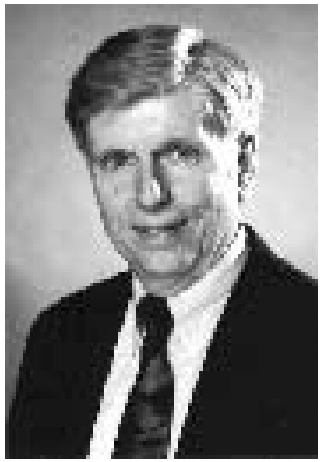
- A 112-page technical report that describes several methods
  - XP, Scrum, Crystal, FDD, RUP, DSDM, ASD, and Open Source development,
- in a somewhat uniform way:
  - Process, Roles and responsibilities, Practices, Adoption and experiences, Scope of use, Current research
  - Much of the following (including several graphics) is taken from this report
- Very useful reading!

P. Abrahamsson

Scrum

- 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:
  "Agile Project Management with Scrum",
  Microsoft Press 2004
- http://www.controlchaos.com/

Ken Schwaber



Jeff Sutherland

Mike Beedle

Scrum? What a strange word!

'scrum' is a standard situation in Rugby

Scrum basics

- 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 roles

- 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 5-9), 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

- 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 review meeting***
  - A postmortem for process and approach adaptation

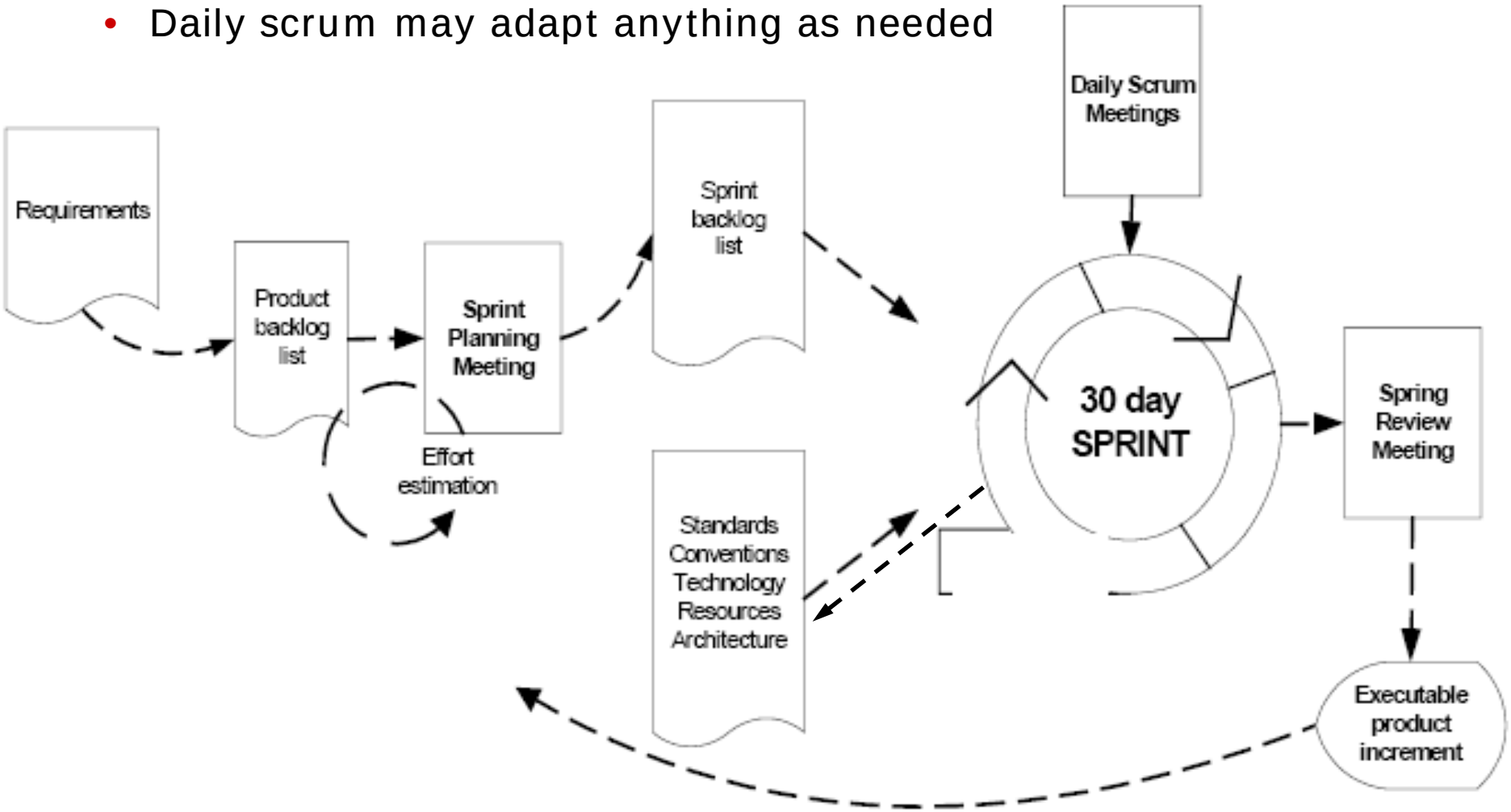
Scrum process elements: The Daily Scrum

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

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



Scrum engineering techniques

- 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 XP practices
  - Scrum replaces/extends the planning game

Scaling Scrum

- Ken Schwaber 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.

The Crystal Light family

- 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)
  - Other books may or may not be forthcoming

- *Crystal Light* is a family of methods for different project sizes and criticalities
  - Each tries to be as concrete as possible to be used as a template
  - Project size is measured by the number of people required
  - Criticality is measured by the loss incurred if requirements or implementation are not correct

Crystal Light criticality levels

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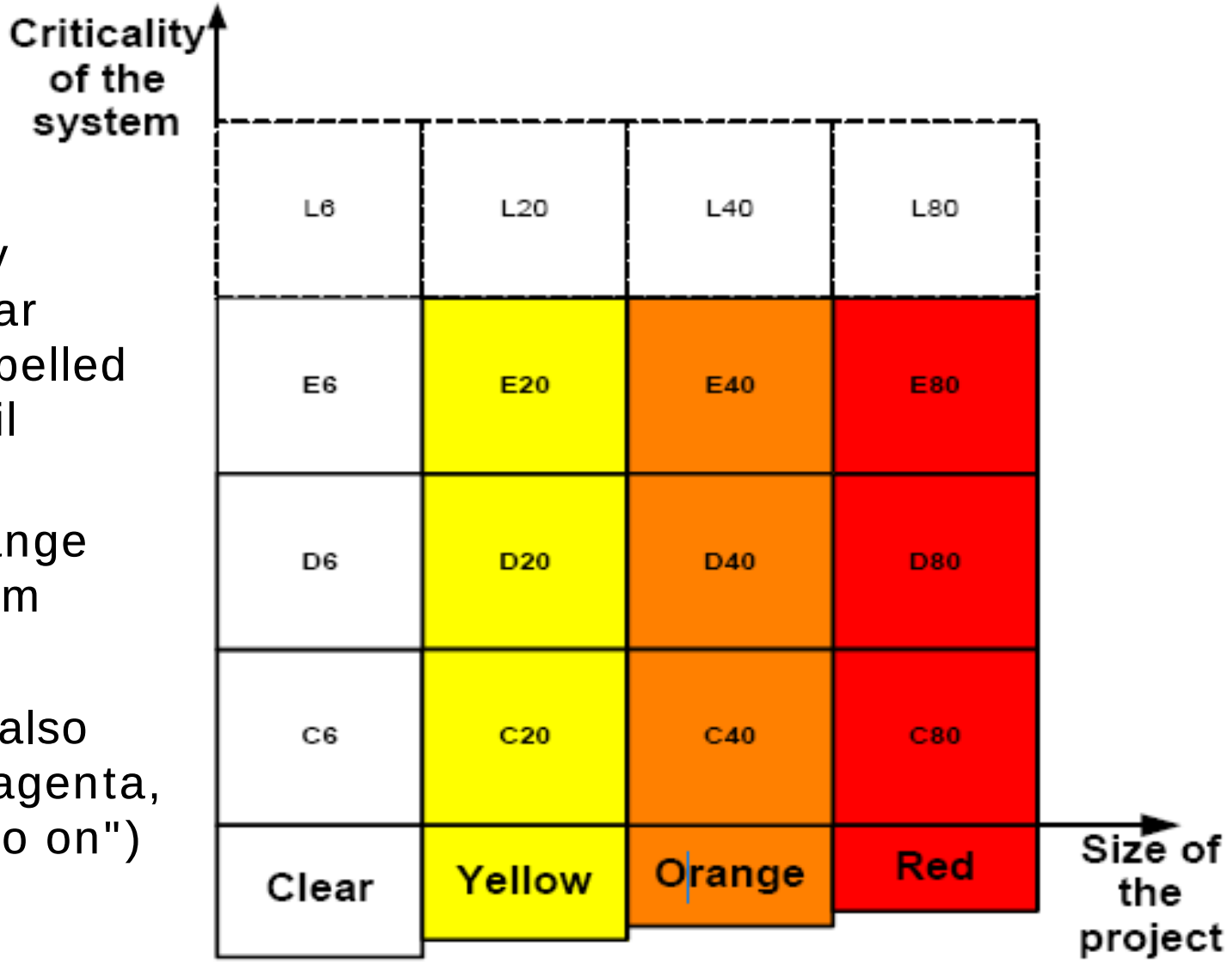
- Criticality is measured by possible loss incurred by a failure:
  - **C (Comfort):**
    A mere nuisance; will not do harm
    - e.g. a failure in a one-person game
  - **D (Discretionary money):**
    Significant monetary loss, but bearable
    - e.g. a customer is lost due to bad service
  - **E (Essential money):**
    My enterprise may go bancrupt
    - e.g. huge loss due to an incorrect financial transaction system
  - **L (Life):**
    Somebody may be injured or may even die
    - e.g. vehicle control systems
- For each Crystal variant, different behaviors are described depending on criticality level
  - Cockburn does not claim Crystal to be suitable for criticality L

Crystal variants

- So far, only Crystal Clear has been spelled out in detail
- and Crystal Orange in short form
- (Cockburn also talks of "Magenta, Blue, and so on")



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"

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

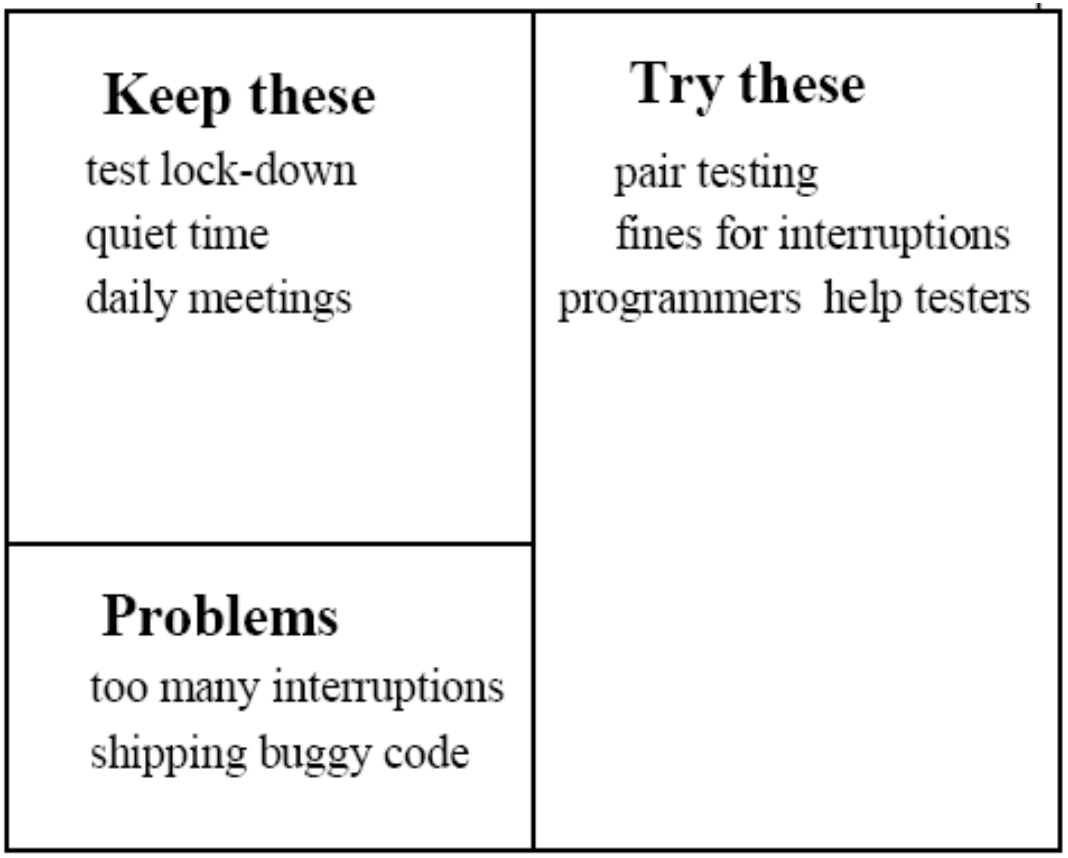
- The people set in place the safety properties below using the techniques they feel appropriate.
  - The first three properties are required in Crystal Clear;
  - the next four get the team further into the safety zone.

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

Crystal process improvement technique: Reflection workshop

- 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

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

- If a team can increase its discipline and consistency of action, they can lighten their methodology even more
  - 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.

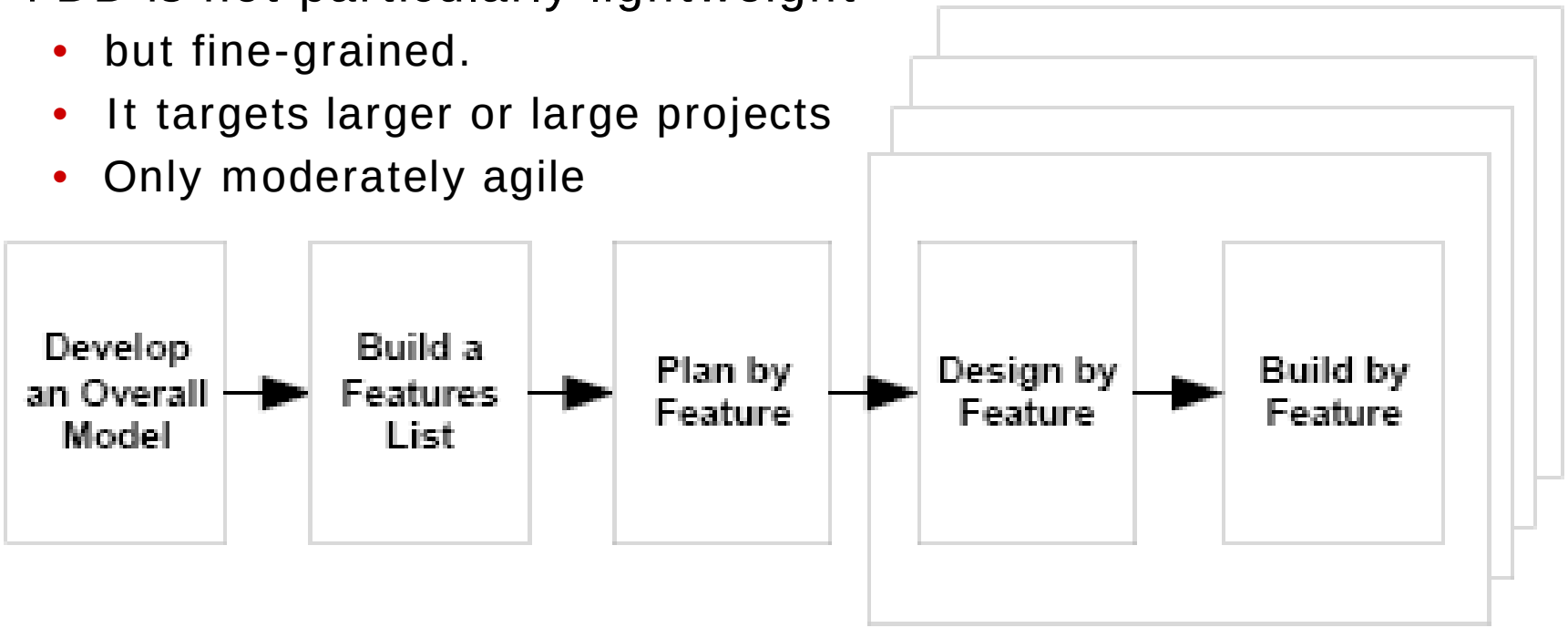
Feature-Driven Development (FDD)

- Stephen Palmer, John Felsing:
  "A Practical Guide to the Feature-Driven Development",
  Prentice-Hall 2002
- http://www.featuredrivendevelopment.com/

Stephen Palmer

Feature-Driven Development (FDD)

- FDD is a classical incremental development process
  - In each iteration (about 2-10 days), one or several features are built,
  - each by a feature team, headed by a Chief Programmer.
- FDD is not particularly lightweight
  - but fine-grained.
  - It targets larger or large projects
  - Only moderately agile



FDD Roles

FDD defines a multitude of different roles:

- Project Manager
  - Administrative and financial leader
- Chief Architect
  - Rules in all design issues
  - Sometimes separate technical and domain architects
- Chief Programmer
  - Leads a feature team
  - Coordinates with other CPs
- Class Owner
  - Developer in a feature team: designs, codes, tests, documents
  - Individual code responsibility
- Development Manager
  - Solves conflicts, manages resources
- Domain Expert
- Domain Manager
  - Resolves conflicts among Domain Experts
- Release Manager
- Technology/Language Guru
- Build Engineer
- Toolsmith
- System Administrator
- Tester
  - For customer-level validation
- Deployer
  - e.g. for data conversion
- Technical Writer

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

- Based on Toyota's principles of Lean Production
  - a holistic approach to optimizing cost and quality

- 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

- **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.

- **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.

Lean SD: Deliver Fast

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- **Defer Commitment (cont'd)**
  - **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.

- **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.

Lean SD: Respect People

- **Deliver Fast (cont'd)**
  - **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.

- **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

- **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.

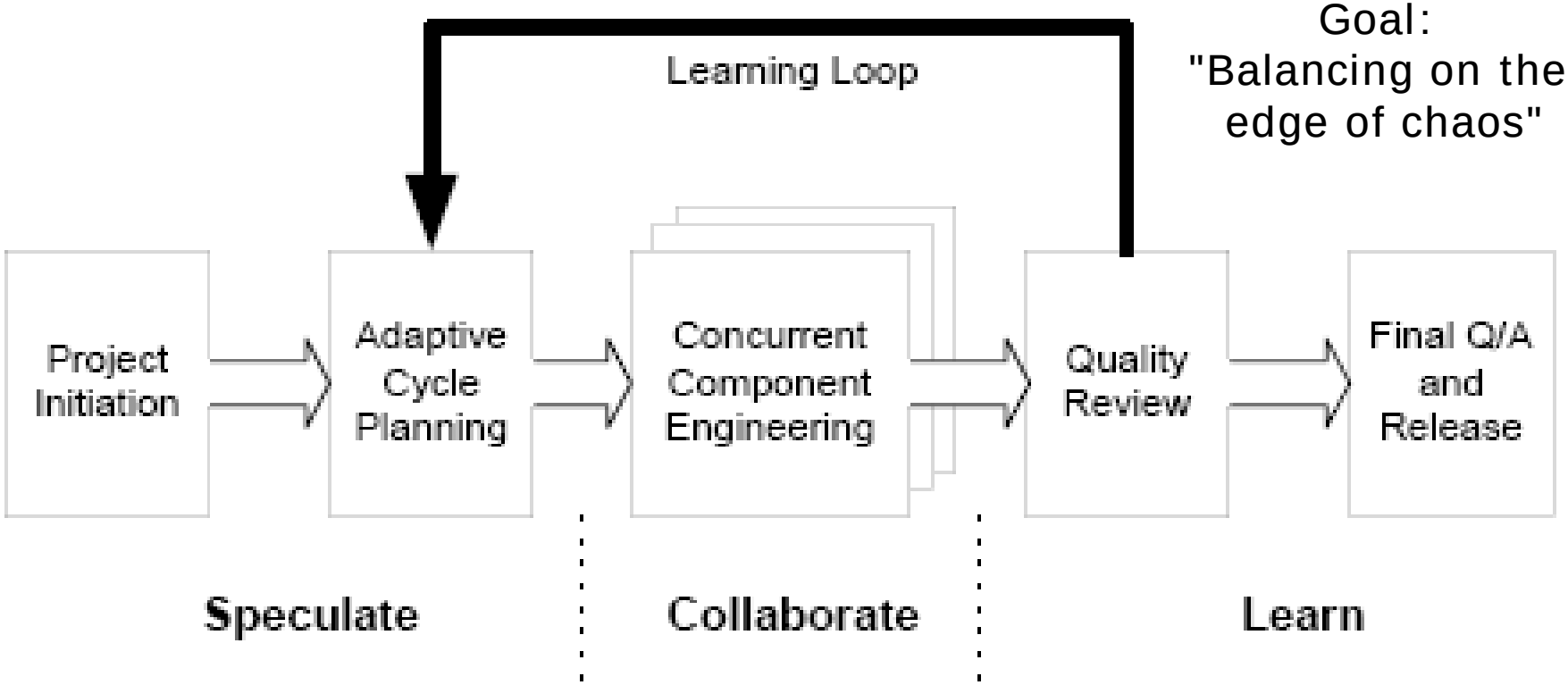
Adaptive Software Development (ASD)

- Jim Highsmith:
  "Adaptive Software Development:
  A Collaborative Approach to Managing Complex Systems",
  Dorset House 2000
- http://www.adaptivesd.com

Jim Highsmith

Adaptive Software Development (ASD)

- Targeted at large projects
  - concentrates on culture, not on techniques
- Component-centered, not task-centered



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)

- 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
  - 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

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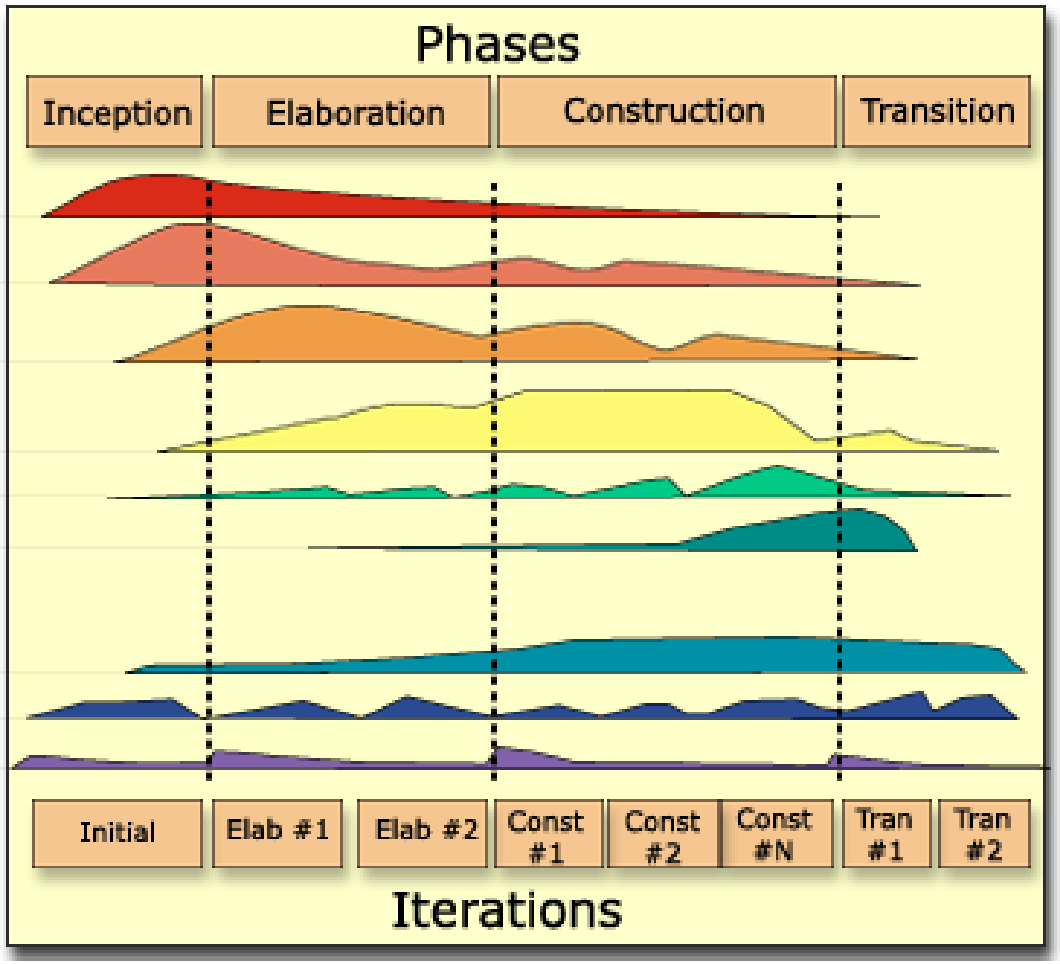
RUP has three dimensions:

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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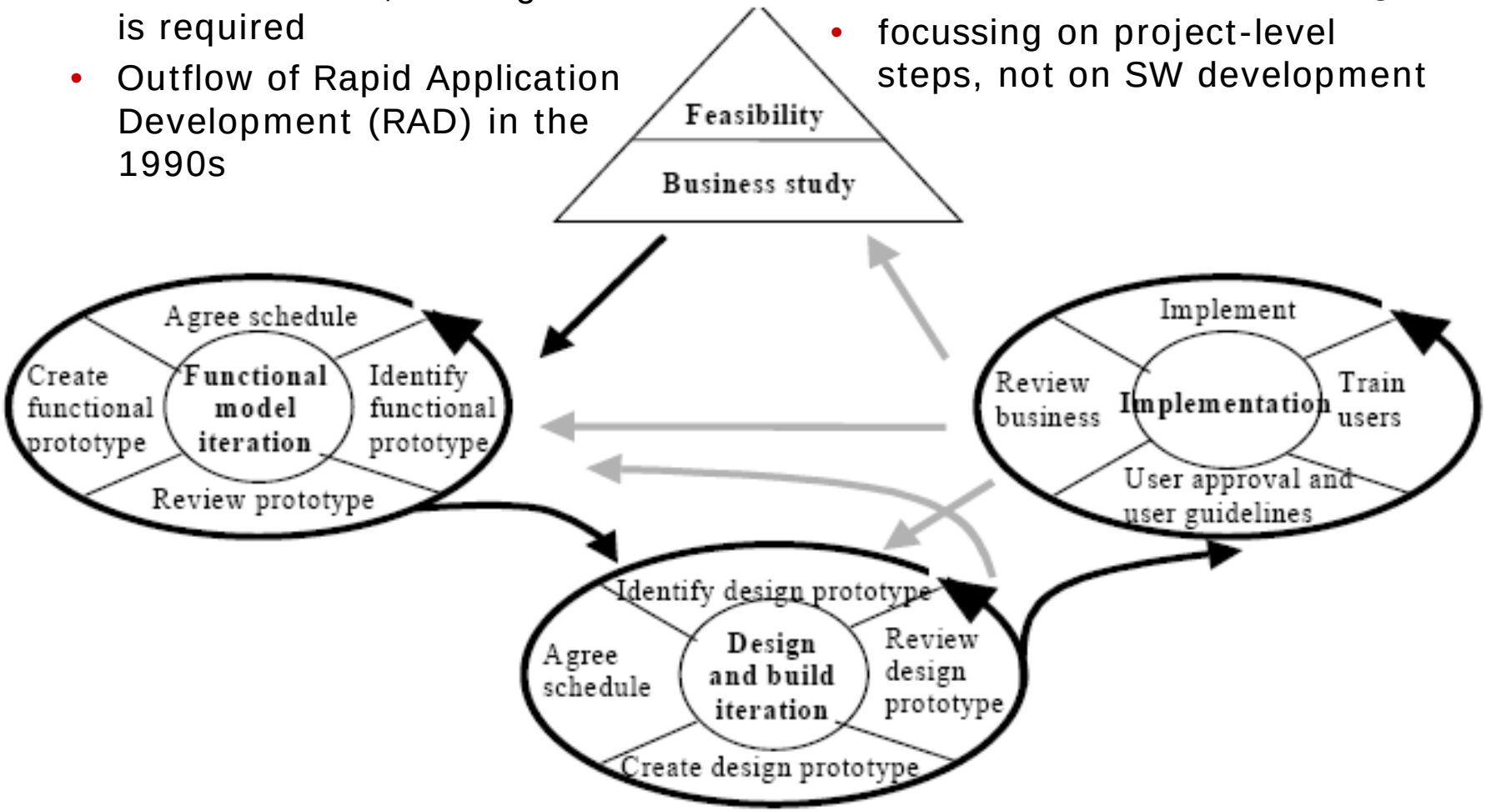
Agile variants of RUP:

- Project-specific variants
  - formed by leaving out many RUP process elements and executing the rest with an agile mindset
- dX
  - A minimal version of RUP very closely 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
- ...

Dynamic Systems Development Method (DSDM)

- www.dsdm.org
  - Public and free, but registration is required
  - Outflow of Rapid Application Development (RAD) in the 1990s
- A more heavyweight process, centered around time-boxing
  - focussing on project-level steps, not on SW development



Agile development in the large

- 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)

- 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)

- 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
  - 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)

- 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

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

- There is a broad range of methods that could be considered agile methods
- They range from the super-light (Crystal Light) 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!