Extreme Programming

Best Practices, Tradeoffs, and Variants

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Recommended XP Books

The basic XP book

- ***Kent Beck, Extreme Programming Explained: Embrace Change, 1999.***
- ***Kent Beck and Cynthia Andres, Extreme Programming Explained: Embrace Change, 2nd Edition, 2004.***

The anti-XP book (not anti-agile!)

- ***Matt Stephens and Doug Rosenberg, Extreme Programming Refactored: The Case Against XP, 2003.***

Other Books on Agile Methods

Viewing agile methods from a risk management perspective

- ***Barry Boehm and Richard Turner, Balancing Agility and Discipline: A Guide for the Perplexed, 2004.***

Comparing agile methods

- ***Craig Larman, Agile and Iterative Development: A Manager's Guide, 2004.***

Feature Driven Development (FDD)

- ***David J. Anderson, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, 2004.***

Topics

Extreme Programming Practices

Planning game

Small releases

Metaphor

Simple design

Testing
- **(test-driven development)**
- **(customer tests)**

Refactoring
- **(design improvement)**

Pair programming

Collective (code) ownership

Continuous integration

40-hour week
- **(sustainable pace)**

On-site customer
- **(whole team)**

Coding standard

Kent Beck, Extreme Programming Explained: Embrace Change, 1999.
(http://www.xprogramming.com/xpmag/whatisxp.htm)

The 2004 XP Practices

Primary Practices
- **Sit together**
- **Whole team**
- **Informative workspace**
- **Energized work**
- **Pair programming**
- **Stories**
- **Weekly cycle**
- **Quarterly cycle**
- **Slack**
- **Ten-minute build**
- **Continuous integration**
- **Test-first programming**
- **Incremental design**

Corollary Practices
- **Real customer involvement**
- **Incremental deployment**
- **Team continuity**
- **Shrinking teams**
- **Root-cause analysis**
- **Shared code**
- **Code and tests**
- **Single code base**
- **Daily deployment**
- **Negotiated scope contract**
- **Pay-per-use**

K. Beck and C. Andres, Extreme Programming Explained: Embrace Change, 2nd Edition, 2004.

The Sweet Spot for XP

Very volatile (emergent) requirements

Small to medium sized systems

Small teams of highly competent generalists

Co-located with empowered customer

Not life-critical or essential moneys systems

Topics

An Overview of XP

→ **XP Management Practices**

XP Design Practices

XP Code and Test Practices

Summing Up Agile and XP

XP: On-Site Customer (Whole Team)

A real, live user on the team full-time to answer questions.

An on-site customer, or some reasonable proxy, is a prerequisite for the planning game and small releases to work – an implementation prerequisite.

Antecedents

- ***Joint Application Design (Davidson 1999)***
- ***end-user development (Janvrin 1996; Burnett 2004)***

XP: Planning Game

Quickly determine the scope of the next release, combining business priorities and technical estimates.

The customer decides scope, priority, and dates from a business perspective.

Technical people estimate and track progress.

Antecedents

- ***JAD***
- ***Quality Factor Development (Zultner 1995)***

XP: Small Releases

Put a simple system into production quickly.

Release new versions on a very short (two-week) cycle.

"If you can't plan well, plan often."
- ***Watts Humphrey***

An implementation decision on the right kind of life cycle.

Small Release Antecedents

Iterative / incremental / evolutionary life cycles
- ***Mills 1976***
- ***McConnell 1996***
- ***Larman 2003***

evo (Gilb 1988)

Prototyping (Baskerville 2006)

Rapid Application Development (Beynon-Davies 1999)

XP: 40-Hour Week (Sustainable Pace, Energized Work)

Work no more than 40 hours per week as a rule.

Never work overtime two weeks in a row.

Work only as many hours as you can be productive and only as many hours as you can sustain.

Sustainable Pace Antecedents

Peopleware (DeMarco 1999)

Multitasking, fragmentation (Constantine 1995)

Slack (DeMarco 2001)

Critical chain project management (Goldratt 1997)

People CMM (Curtis 2001)

2004 Additions

Sit together
- **develop in an open space big enough for the whole team**

Informative workspace
- **make your workspace about your work… big, visible charts**

Weekly cycle
- **plan work a week at a time**

Quarterly cycle
- **plan work a quarter at a time**

Slack
- **in any plan, include some minor tasks that can be dropped if you get behind.**

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XP Code and Test Practices

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XP: Metaphor

Guides all development with a simple, shared story of how the whole system works.

Antecedents

- ***Unique to XP as far as I know!***
- ***Not another name for architecture…***

"Few practitioners claimed to understand the intent of metaphor as a practice, how to devise and evaluate metaphors, or the relationship of metaphor to design and the other XP practices. As XP evolved metaphor was demoted and is no longer a separate practice. Most agile proponents mention metaphor and acknowledge minor uses. This paper argues that XP was wrong to abandon metaphor and advocates a more systematic discussion of how metaphor informs development." (West 2005)

XP: Simple Design

Design as simply as possible at any given moment.

An implementation philosophy on how to design.

Antecedents

- ***Structured programming: information hiding, abstraction, high cohesion, low coupling, …***
  - ***Pressman 2004***
  - ***plus Dijkstra, Mills, Constantine, Knuth, etc.***

"… resolution of these design issues was based on

XP: Refactoring (Design Improvement)

Restructure the system without changing behavior to remove duplication, improve communication, simplify, or add flexibility.

An implementation philosophy on how to design.

Antecedents

- ***No antecedents that I am aware of!***
- ***Refactoring: Improving the Design of Existing Code (Fowler 1999)***

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XP: Coding Standards

Rules emphasizing communication throughout the code.

Antecedents

- ***DOD, IEEE, ISO standards…***
- ***Programming Proverbs (Ledgard 1975)***
- ***Programming Pearls (Bentley 1986/8)***
- ***Literate programming (Knuth 1984)***

XP: Pair Programming

All production code is written by two programmers at one machine.

An implementation philosophy – and a culture shift! – on how to continuously do peer reviews.

Antecedents

- ***Walkthroughs (Weinberg 1971/98)***
- ***Dynamic duos (Constantine 1995)***
- ***Peer reviews (Paulk 1995)***
- ***Pair Programming Illuminated (Williams 2002)***

XP: Collective (Code) Ownership

Anyone can improve any code anywhere in the system at any time.

An implementation philosophy – and a culture shift! – on how to address problems (and make improvements) that depends on "continuous integration" to work.

Antecedents

- ***Unique to XP as far as I know…***
- ***Worker empowerment conceptually…***
- ***Depends on continuous integration as an enabling practice!***

XP: Continuous Integration

Integrate and build the system many times a day, every time a task is finished.

Continual regression testing means no regressions in functionality as a result of changed requirements.

Integrate and test changes after no more than a couple of hours.

Antecedents

- **Daily build and smoke test**
  - **Cusumano 1995**
  - **McConnell 1996**
- **Compile and smoke test frequently**
  - **SPMN critical software practice, Lochner 1999**

XP: Testing (Test-Driven Development; Test-First Programming; Customer Tests)

Continually write unit tests that must run flawlessly.

Customers write tests to demonstrate functions are finished.

"Test, then code" means a failed test case is an entry criterion for writing code.

Antecedents

- ***Early reference in NASA's Project Mercury***
  - ***Williams 2003***
  - ***Larman 2003***

2004 Additions

Incremental design

- **invest in the design of the system every day**
- **the question is not whether or not to design, the question is when to design**

Ten-minute build

- **automatically build the whole system and run all of the tests in ten minutes**

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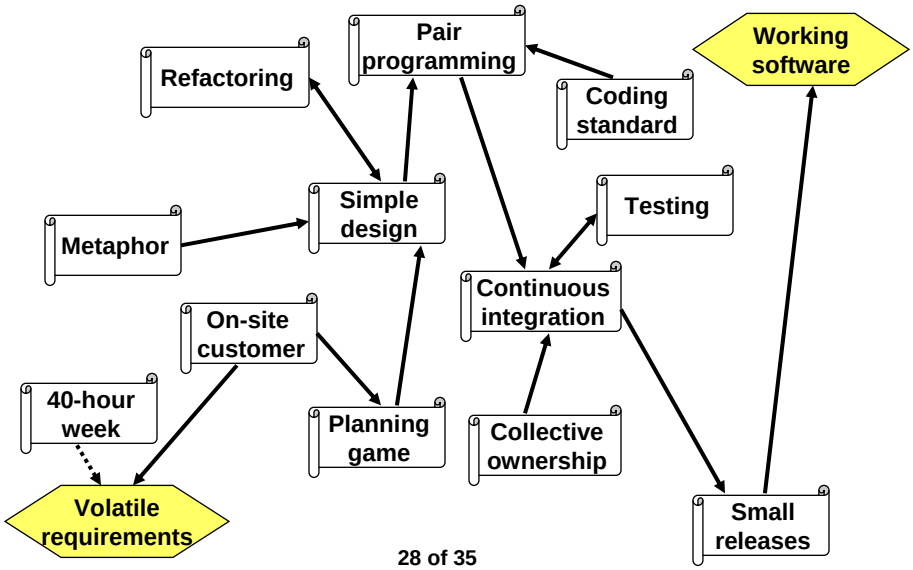
(Some) XP Practice Relationships



Principles of Agile Software Development

A. Cockburn, "Learning From Agile Software Development," Crosstalk: The Journal of Defense Software Engineering, October & November 2002.

1) **Different projects need different methodology trade-offs.**
2) **A little methodology does a lot of good; after that, weight is costly.**
3) **Larger teams need more communication elements.**
4) **Projects dealing with greater potential damage need more validation elements.**
5) **Formality, process, and documentation are not substitutes for discipline, skill, and understanding.**
6) **Interactive, face-to-face communication is the cheapest and fastest channel for exchanging information.**
7) **Increased communication and feedback reduces the need for intermediate work products.**
8) **Concurrent and serial development exchange development cost for speed and flexibility.**
9) **Efficiency is expendable in non-bottleneck activities.**
10) **Sweet spots speed development.**

Tacit vs Explicit Knowledge

"The difference between agile methods and the Unified Process is knowledge management – agile is tacit, UP is explicit."

"80% of software work is no-brain work."

"60% of change requests for MS-Word are for features that are already there."

- ***Ivar Jacobson, Software Engineering Conference (Russia), 27-28 October 2005.***

Aligning Agility and Discipline

- **Early and continuous delivery**
- **Changing requirements, even late in development**
- **Work with business people (customers and end users)**
- **Motivated individuals with support they need** *. . . People CMM*

Face-to-face conversation

- **Working software**
- **Sustainable development, constant pace**
- **Continuous attention to technical excellence and good design**
- **Simplicity**
- **Self-organizing teams** *. . . CMMI / IPPD*
- **Reflect on how to become more effective, then adjust behavior**

Barriers to the Success of XP

A customer who insists on the big specification…

A culture that requires long hours to prove commitment…

Projects that are too big (more than about ten programmers)…

An environment with a long time to gain feedback (e.g., realistically test the software)…

The wrong physical environment (e.g., team members on different floors, not co-located)…

We do XP, just not most/any of the practices…

Cultural Misfits (Using the DoD as an Example…)

Regulatory requirements for a level playing field raise challenges for evolutionary and incremental development…

The need by the contracts officer for a requirements specification…

Progress payments defined from a waterfall mentality…

Barriers – regulatory and cultural – to a collaborative customer relationship…

Protests from competitors…

Questions and Answers

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