TDD = Too Dumb Developers?
Implications of Test-Driven Development on maintainability and comprehension of software

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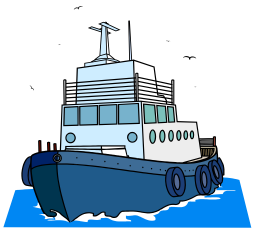
Outline

- Introducing TDD & Agile
  - Just in case...
- Working

Software Development



Building a ship?

Growing a garden?

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Traditional development

- ..or heavyweight

- Emphasis on documentation, process
  - Waterfall, prototyping, iterative,
  - Iso 9000, Vision, CMM

- Still, some projects fail (do they?)

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Agile

- .. Or lightweight

- Individuals and interaction over process and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to change over following a plan

- Actually, nothing really new, but mix is innovative

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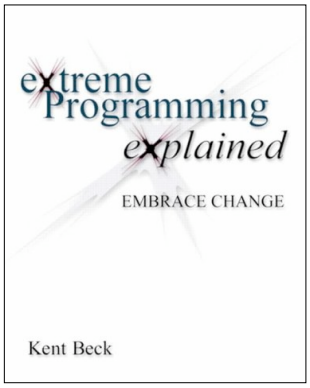
Extreme programming

- Kent Beck: Extreme Programming Explained Addison-Wesley, 2000



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12 practices

- Customer satisfaction
  - On-site customer
  - Small releases

- Software quality
  - Metaphor
  - Simple design
  - Refactoring
  - Pair programming
  - Testing

- Project management
  - Planning game
  - Sustainable development
  - Collective code ownership
  - Continuous integration
  - Coding standards

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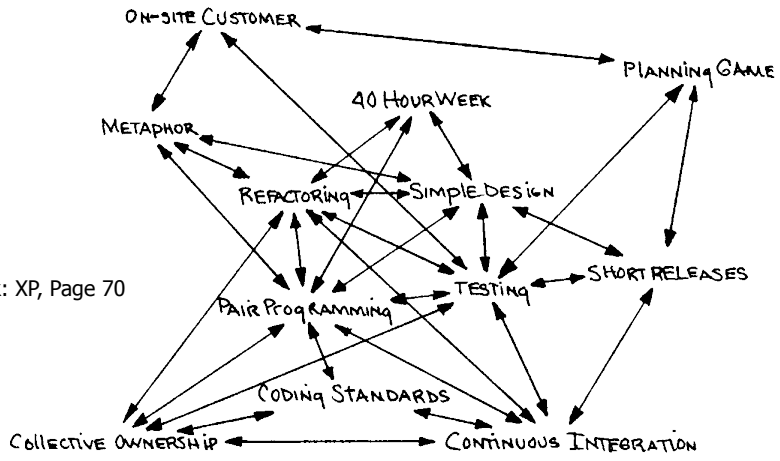
How everything fits together



From Beck: XP, Page 70

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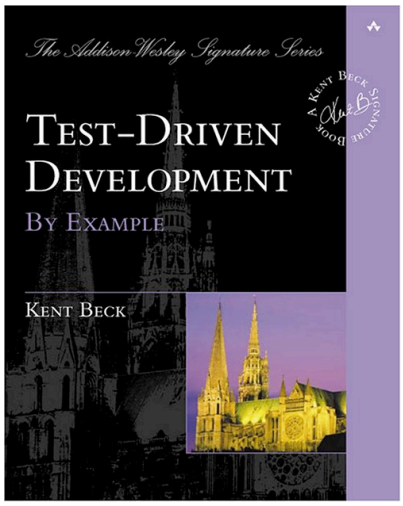
Test-Driven Development

K. Beck, *Test-Driven Development: by Example*: Addison Wesley, 2003.



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TDD in XS

- TDD in eXtreme Synthesis:
  - Pick a piece of story/requirement/feature
  - Write a test code for it
  - See it fail
  - Write the relative production code
  - Run the test and fix until a green bar
  - Add further tests until enough
  - Possibly refactor

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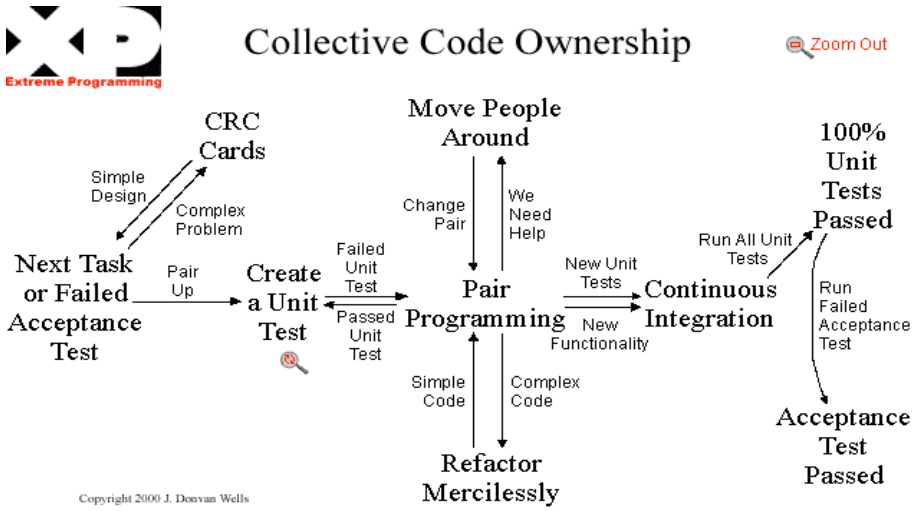
TDD in context



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80-20 rule…

- Pareto
  - You know it, do you?
- Beck
  - If you apply even 80% of the XP practices you won't get more that 20% of the potential benefits
- Focusing on single technique (TDD) makes no sense
  - According to Kent Beck….

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According K.B.

- We should stop here an have a walk in the Stanley park….

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Empirical findings

- In the last 5-6 years some empirical work has been done
  - In the Agile area
  - About TDD
- No conclusive findings

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TDD and Maintainability

- 20 empirical studies
  - From 2001 to 2008
  - Different types
  - Most performed with studets
- Meta-analysis
  - Effect on code quality
  - Effect on understandability

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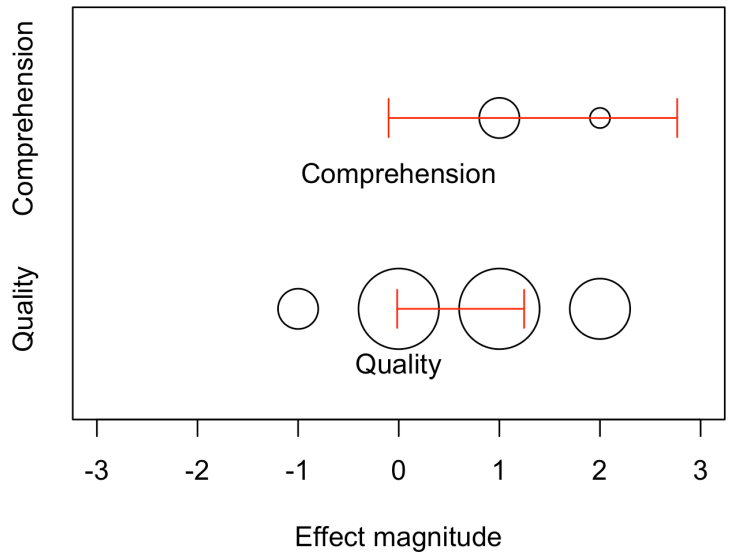
TDD and Maintainability



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Today

- Brainstorming
  - Main problems
  - Research questions
- Empirical design
  - Definition of experiments
- Presentations
  - And commitments

- Homework: execution

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Brainstorming

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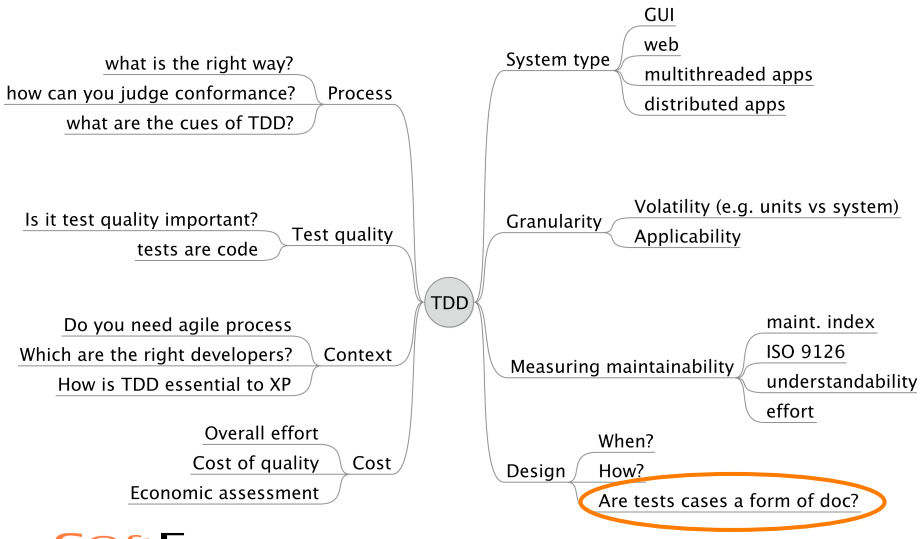
Open questions



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Empirical design

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Experiment

- GOAL: evaluate usefulness of TDD test cases as design documentation for the purpose of perfective and corrective maintenance.
- Type of design
  - Comparative design:
    - 2 groups (experimental, control)
    - experimental group vs. baseline

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Objects

- Exp objects
  - real world projects
    - Hard to find 2 comparable systems
  - 2 small toy (1 person) projects
    - Can be developed by researchers following either a TDD or a Traditional approach
  - 2 student groups
    - Developing TDD or traditional
  - 2 classes (n + m groups) screened
    - Same as above but select best pair

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Objects

- Threats:
  - professional vs. students developers
  - process conformance
  - what is traditional? w/fall, iterative, RUP
    - define list of artifacts
    - same set of defects?
    - defect seeding (may be incompatible with process)
    - perfective maintenance
    - evolution: adding a new feature

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Measures

- dependent variable:
  - # fixed bugs
  - # added features
    - acceptance test suite
- independent variables:
  - group (control, experimental)
  - bug category

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Population and design

- Subjects:
  - students <
  - Professionals
- Design:
  - 2 groups 2 treatments 1 object
  - factorial design (2x2x2)

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Hypotheses

- Hypotheses:
  - mean(# fixed defects | TDD) != mean(# fixed defects | traditional)
  - mean(# fixed defects | TDD) > mean(# fixed defects | traditional)
- Practical relevance

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Presentation

Actually we worked all together so…

Follow up

- Publish documents
  - Research questions
  - Experiment design
- Open comments
- Possible cooperation
  - Benchmarks
  - Detailed design
- Contact us for further work

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