Course "Softwareprozesse"

Agile Technical Practices: eXtreme Programming (XP), Part I

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- Structure of agile methods
  - values, roles, technical practices, mgmt. practices
- eXtreme Programming (XP)
  - XP1 vs. XP2 vs. Jeffries
  - Values, roles
  - Management practices

  Technical practices:
- Continuous Integration
  - Ten-minute Build, Feat. Toggle, C. Delivery, C. Deployment
- Test-first Programming
  - Testing, TDD, ATDD

Learning objectives (for parts I & II together)

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- Understand
  - the structure of methods,
  - the role of practices, and
  - the difference between management practices and technical practices
- Roughly understand the practices that make up XP and how they play together
  - including pros and cons (including some research results)
- Roughly understand when to and when not to use XP

XP sources

- Kent Beck, Cynthia Andres: "*Extreme Programming Explained: Embrace Change*", Addison-Wesley, 2004
  - 2nd edition (XP, XP2); complete rewrite of 1999 1st edition
    - See article on 1st edition (XP1)
    - Different set of practices!
  - Worth reading!
- Ron Jeffries (xprogramming.com) uses a still different mix
    - Beck and Jeffries are the co-inventors of XP

- See also other books and articles, c2.com XP roadmap, Agile Alliance summary, …

https://live.staticflickr.com/73/199247208_e4eb15c076.jpg
https://www.ecured.cu/Ron_Jeffries

Methods vs. practices

- "method": a systematic procedure for attaining something
  - states how to do it (e.g. a cooking recipe, an algorithm)
  - Most so-called "methods" are hardly methods
    - e.g. Scrum states what to achieve, but rarely *how* to do it

- "practice": *"[What] one does as a habitual or customary action or act"*
    - https://wiki.c2.com/?ApproachesMethodsAndPractices
  - XP explicitly consists of values, principles, and practices

Methods vs. practices (2)

- Methods have a positivist touch
  - "This is how to do it!"
  - "If you don't do it like this, you are a fool/outlaw"
    - There is a lot of such thinking in would-be agile circles

- Practices have a humanist touch
  - "Here is something we tend to do because it is a Good Idea"
  - "Feel free to deviate if needed. If *really* needed."

- XP, Chapter 3:
  - *"Practices are evidence of values."; "Practices are clear"*
  - *"Bridging the gap between values and practices are principles. […] Principles are domain-specific guidelines for life."*
    - Many so-called methods would better be called principles or sets of principles
    - Scrum's Sprint Review & Retrospective can be considered principles.

XP values

- Communication
- Simplicity
  - *"Simplicity is the most intensely intellectual of the XP values. To make a system simple enough to gracefully solve only today's problem is hard work."*
- Feedback
  - "we use feedback to get closer and closer to our goals."
- Courage
  - "Courage is effective action in the face of fear."
  - "Sometimes […] manifests as a bias to action. […] Sometimes courage manifests as patience."
- Respect
  - "I am important and so are you."

A very interesting take on SW development!

(Scrum's values are Commitment, Focus, Openness, Respect, and Courage but Scrum has almost no explanation what they mean. XP does.)

XP principles

"Principles are domain-specific guidelines for life."

- Too many to discuss here:
  - Humanity, Economics, Mutual benefit, Self-similarity, Improvement, Diversity, Reflection, Flow, Opportunity, Redundancy, Failure, Quality, Baby steps, Accepted responsibility
  - Many we already know, e.g. Humanity, Economics, Improvement, Diversity, Reflection, Flow, Quality
- Some are really interesting:
  - Opportunity: *"see problems as opportunities for change."*
  - Failure: *"If you're having trouble succeeding, fail. […] Isn't failure waste? No, not if it imparts knowledge."*
  - Baby steps: *"What's the least you could do that is recognizably in the right direction? […] [The] overhead of small steps is much less than when a team wastefully recoils from aborted big changes."*
    - Could almost be considered a technical practice

Martin Fowler on XP

- *"To make agile work, **you need solid technical practices**.*
- *A lot of agile education under-emphasizes these, but if you skimp on this you won't gain the productivity and responsiveness benefits that agile development can give you (stranding you at level 1 of the agile fluency model.)*
- *This is one of the reasons that I still think that **Extreme Programming** **is the most valuable of the named agile methods** as a core and starting point."*

  - http://martinfowler.com/agile.html

Practices of XP, XP2, Jeffries' XP

(furthermore, XP2 has 11 "Corollary Practices")

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XP1 practices ("traditional"):

1.	The Planning Game	M ✓
2.	Small Releases	M ✓
3.	40-Hour Week	M ✓
4.	On-Site Customer	M ✓
5.	Pair Programming	T
6.	Collective Ownership	T
7.	Metaphor	T
8.	Simple Design	T
9.	Refactoring	T
10.	Testing	T ←
11.	Continuous Integration	T ←
12.	Coding Standards	T

M: Mgmt, **T**: Technical

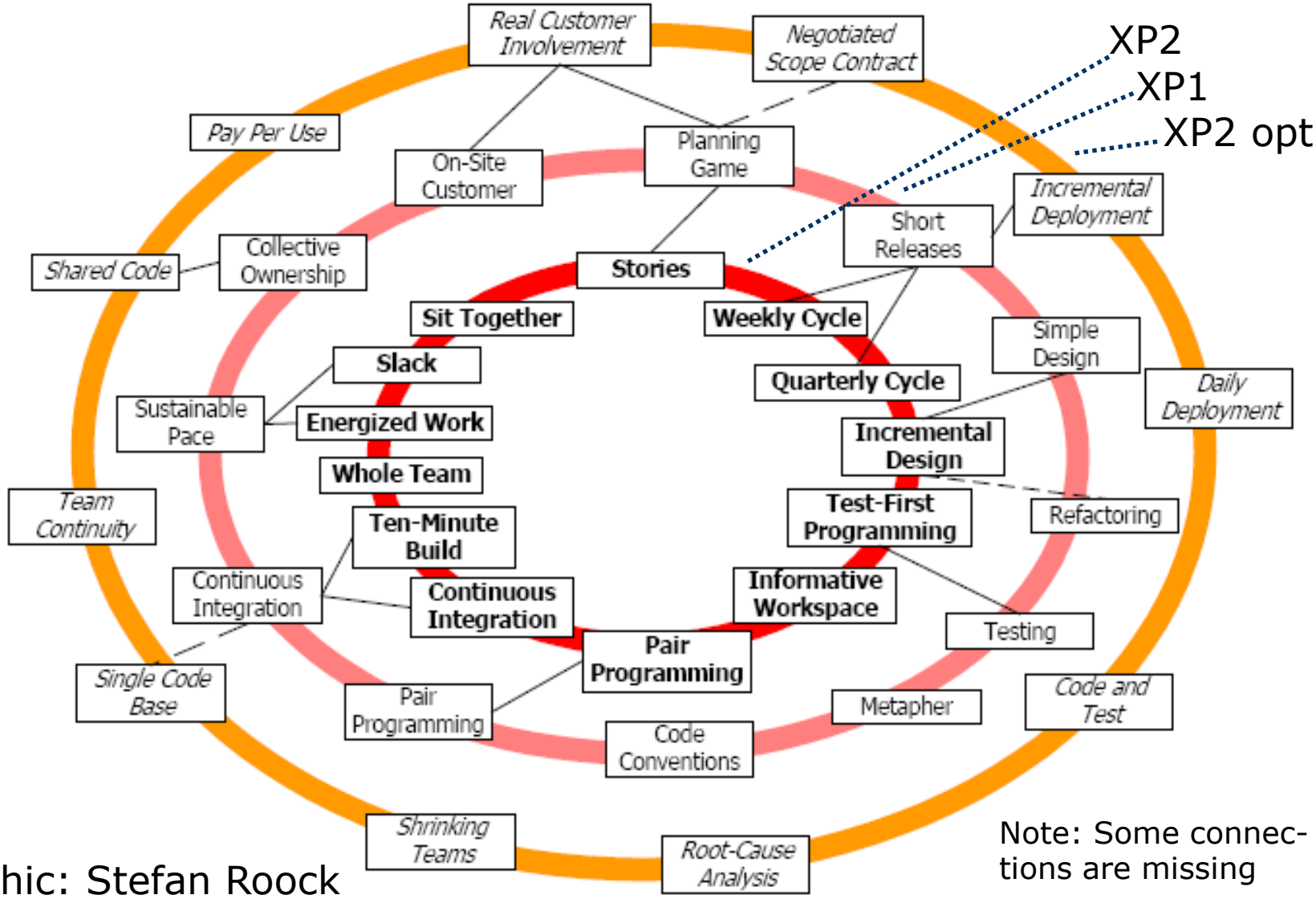
XP2 practices ("evolutionary"):

1.	Stories	M ✓
2.	Weekly Cycle	M (✓)
3.	Quarterly Cycle	M ✓
4.	Energized Work	M ✓
5.	Slack	M
6.	Whole Team	M ✓
7.	Sit Together	M
8.	Informative Workspace	M (✓)
9.	Pair Programming	T
10.	Incremental Design	T
11.	Test-First Programming	T ←
12.	Continuous Integration	T ←
13.	Ten-Minute Build	T ←

J: Jeffries' additional practice:

- Customer tests T ←

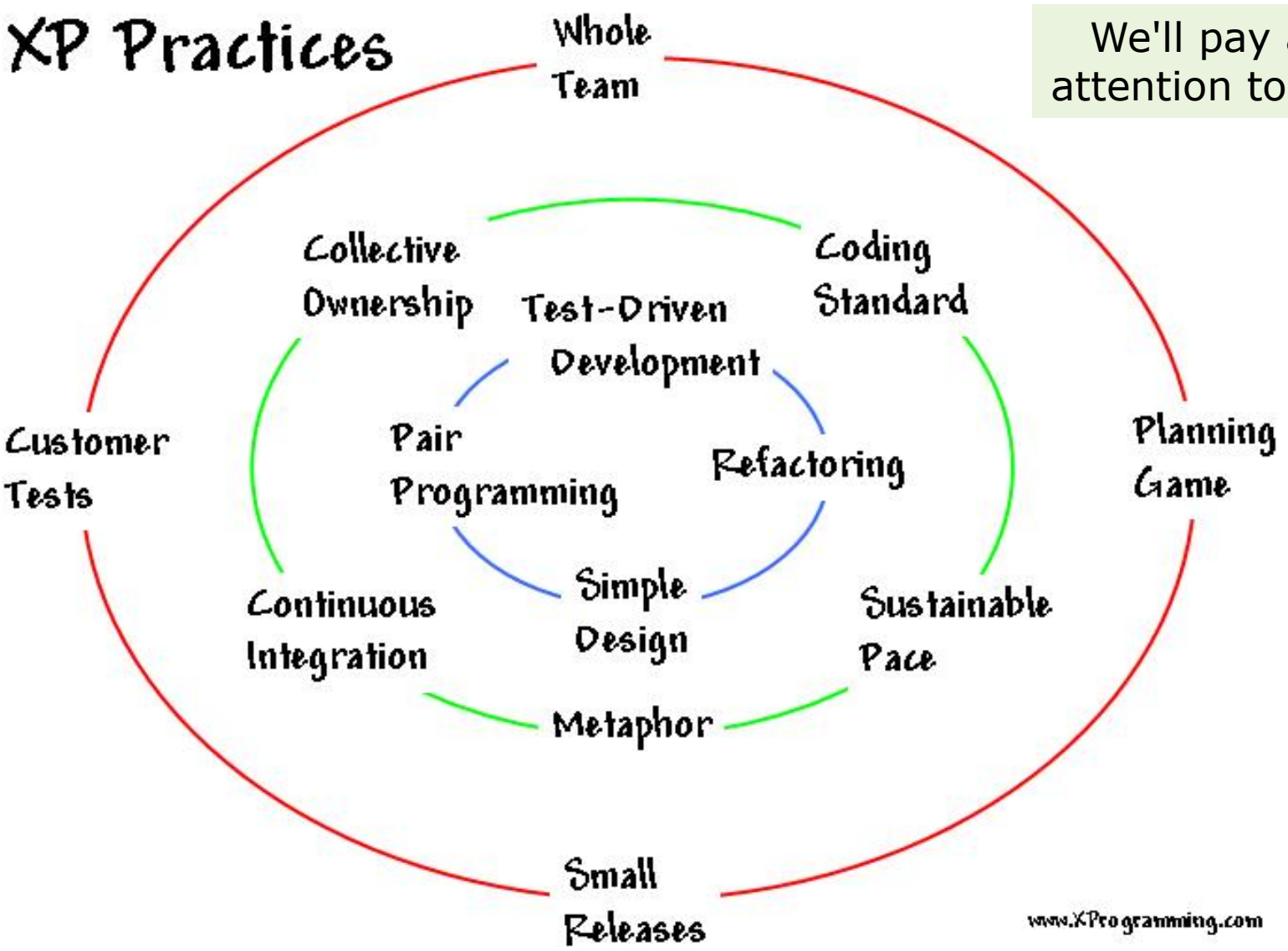
XP practices: XP2, XP1, XP2 "corollary" (optional)



Graphic: Stefan Roock

Note: Some connections are missing

Ron Jeffries' view: core, infrastructure, customer interface



We'll pay a lot of attention to the core

https://ronjeffries.com/xprog/what-is-extreme-programming/

Kent Beck's stance on practices

- Chapter 6 "Practices":
  - *"Applying a practice is a choice.*
  - *I think the practices make programming more effective.*
  - *This is a collection of practices that work and work even better together. They have been used before.*
  - *Experiment with XP using these practices as your hypotheses. For example, let's try deploying more frequently and see if that helps."*

- Chapter 7 "Primary Practices":
  - *"Practices are theories, predictions."*
    - About what behaviors are useful and what they achieve.
    - Such predictions can be wrong, given a team or situation!

XP1/2/J: Continuous Integration (CI)

- *"Integrate and test changes after no more than a couple of hours."*
  - An automated process (1) builds the system, (2) runs the automated tests, (3) logs results
- This *build* represents the project state
  - The build must be fully functional at almost any time
    - A build that remains broken for some time is an indicator of bad project health
    - Teams without a healthy CI cannot be agile

- Version-management branches make CI difficult
  - How many different builds are you willing to run?
  - How will developers understand which ones to pay attention to?
  - How often are you willing to modify your CI setup?

Continuous Integration: Feature Toggles

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- Use feature toggles instead and run two builds:
  - Production-like settings
  - All features "on"

- Feature-toggle practices [MahDreWil21]:
    - practitioner survey & literature study
  - Have a toggle mgmt system:
    - consciously decide each toggle introduction
    - metadata (documentation: owner, status, …)
    - naming convention, default value
    - change log
  - Group toggles, manage dependencies
  - Expiration date (e.g. as an automated test)
    - limit number of toggles

XP2: Ten-minute build

- *"Automatically build the whole system and run all of the tests in ten minutes."*
  - If it takes longer, it will be used less ➔ reduced feedback
    - making repairs more costly
  - So when the build gets slower, optimize it, e.g.
    - find a tool that runs only those tests that execute changed code
    - but make sure to run tests relying on external services
  - For large systems, modularize more
  - Replace individual integration tests if they are slow

- GUI-based system tests make this difficult
  - Why do you need so many of them?
    - → Incremental Design, Test-First Programming

Beyond CI: Continuous Delivery (CD)

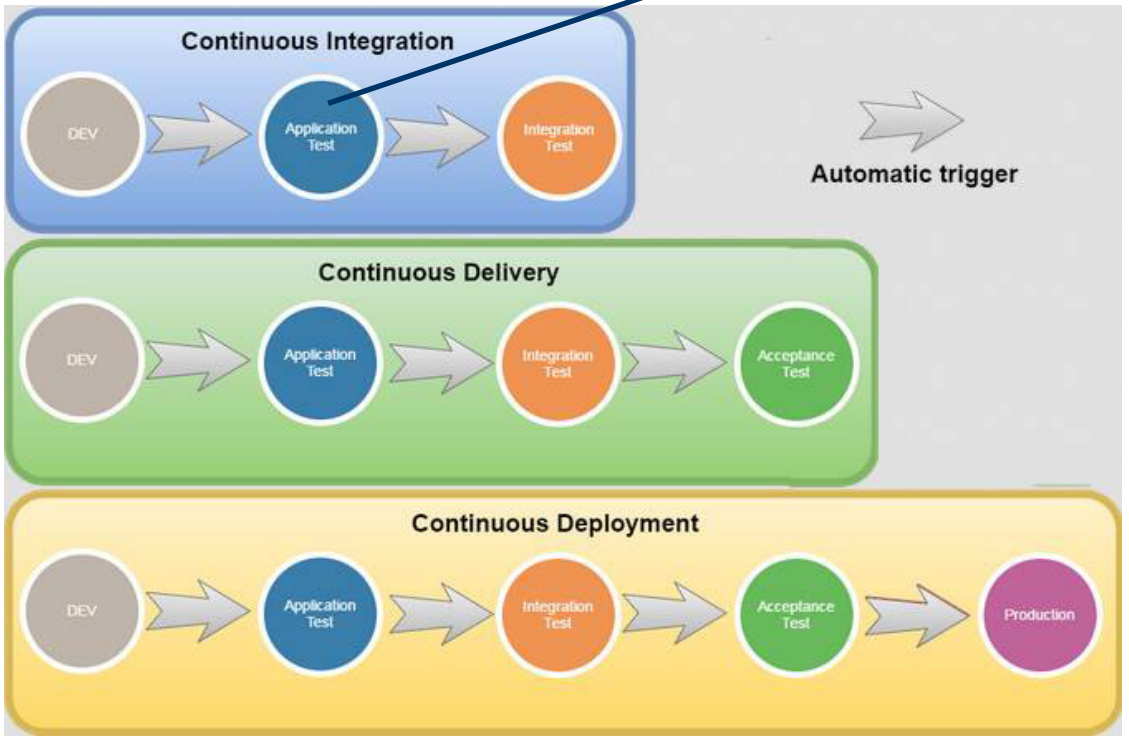
- *"Continuous Delivery is a SW development discipline where you build software in such a way that the software can be released to production at any time."* [Fowler13]
  - Having a CI is not enough! One needs to
  - prioritize keeping-it-deployable over
    - working on new features
    - long-running restructurings;
  - have a DevOps culture (no silos, autonomy) [Wilsenach15];
  - have fully automated "push-button" deployment

- Kanban demands Continuous Delivery; Scrum & XP do not

- Beware of confusing Continuous Delivery (CD) with Continuous Deployment (CD):

Beyond CI: Continuous Deployment (CD)

- When a build is successful, it will automatically and immediately be deployed to the production system
  - So effectively iterations become *extremely* short
  - Only possible for web-based and similar systems
  - Precondition: Continuous Delivery
- An ambitious goal!
  - high risk of breaking something
  - some top companies did or do this (e.g. Amazon, Facebook)



https://www.agilealliance.org/glossary/continuous-deployment/

XP1: Testing, J: Test-driven development
XP2: Test-First Programming

- *"Write a failing automated test before changing any code."*
  - Write test; see it fail; write code; see test succeed; repeat
- *"Test-first programming addresses many problems at once:*
  - *Scope creep [by having to stay focused]*
  - *[Low] Coupling and cohesion* [or else testing is difficult]
  - *Trust […] [G]ive your teammates a reason to trust you*
  - *Rhythm: […] [Develop in] a natural and efficient rhythm --*
    - *test, code, refactor, test, code, refactor."*
- *"As your experience grows, you'll be able to squeeze more and more reassurance into these tests."*

- Beck does not discuss granularity
  - but implies a fine granularity:
  - *"Because of their limited scope, these tests tend to run very fast.*
  - *You can run thousands of them as part of the Ten-Minute Build."*

Test-first programming: Discussion

- Oft-claimed advantages:
  - Clarifies the requirements for the element before coding it
  - Defines the interface
  - "First": helps keeping up the discipline
  - Provides rapid and constant feedback
  - Thus allows courage during refactoring

- Suitability depends on a suitable granularity of "changing any code"
  - A too-small granularity may be exaggerated
    - Some people insist on iterations of ~1 minute length

Test-first programming: How much?

Kent Beck (on stackoverflow 2008):

- *"I get paid for code that works, not for tests,*
  - *so my philosophy is to test as little as possible to reach a given level of confidence […].*
  - ***If I don't typically make a kind of mistake […], I don't test for it.***"

- David Heinemeier Hansson (author of Ruby on Rails, 2012)
  - *"Testing just what's useful takes nuance, experience, and dozens of fine-grained heuristics."*

➔ A difficult question!

Test-first programming/TDD: Personal experience?

If you do serious SW development:

- Do you use thorough automated testing?
  - Often? Nearly always?
- Did you ever try test-first programming/TDD?
  - Did you try to make it a habit?
  - Pros of it? Cons?
  - When and where?
    - Logic? GUI? Integration?
    - New vs. existing code?
- Do your colleagues use it?
- How good is the test suite overall?
  - Code coverage?
  - How much confidence does it provide?

Research: What limits industrial TDD adoption?

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CauSunPun11: "Factors limiting industrial adoption of TDD: a systematic review"

- based on 48 empirical studies on TDD, mostly case studies or experiments

- Dev. time often increased
  - sometimes decreased
- Many industrial devs lack TDD knowledge
  - Or generally lack skill to find good test cases
- Sometimes architecture problems
    - (the article is vague here)
- Technical/tool problems
  - esp. for GUI testing, network testing
- Lack of discipline
  - e.g. time pressure, no obvious benefits
  - two studies found low TDD correlated with low quality
    - in orgs that prefered TDD
- Legacy code
  - (near-)lack of test suite
    - and testable structure

Successfully using TDD is difficult!

Research: Effects from TDD

- BisSerFig16: "The effects of TDD on internal quality, ext. qual. & productivity: A systematic review"
  - based on 27 studies: 57% using experiments, 32% using a case study
  - comparison to test-last
- Trends:
  - Academic environments: Productivity increases
  - Industrial environments: Productivity decreases
  - 76% of studies report better internal SW quality
    - e.g. lower coupling
  - 88% report better external SW quality (reliability)
- Conclusion:
  - TDD tends to help, but is not free.

J: Customer Tests (ATDD)

- Write automated tests at the story-level
  - testing relevant, user-visible, valuable functionality directly
  - ideally in a form the end user can read (for validation).
  - They then serve as always up-to-date documentation.
    - Very useful for user support.
  - a.k.a. ATDD: Acceptance-Test-Driven Development

- These add confidence beyond what unit tests and integration tests can provide
  - balance with the unit and integration tests, limit redundancy
  - write more of them if you often break stories

https://ronjeffries.com/xprog/xpmag/problems-with-acceptance-testing/
https://ronjeffries.com/xprog/blog/automating-story-tests/

Summary

- The "technical excellence" so important for Agile requires technical practices
  - Scrum and Kanban do not offer any; XP does (based on values)
- Continuous Integration, Ten-Minute Build
  - are important foundations for agile work
  - are the basis for Continuous Delivery (Kanban), let alone Continuous Deployment
- Thorough automated tests are super important
  - for creating the confidence required for
    - making changes and
    - keeping the design structure intact
  - and a Test-First workstyle and Customer Tests can be helpful for creating them

Thank you!