CISC/CMPE 327 Software Quality Assurance

Queen's University, 2020-fall

Lecture #5/6

Agile development - XP

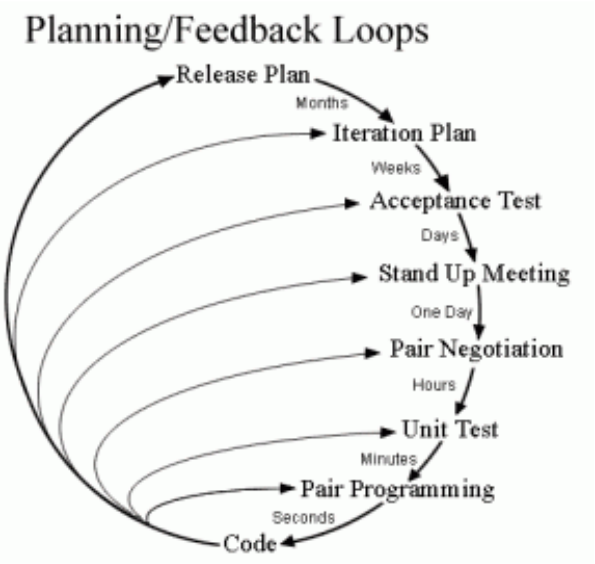
eXtreme Programming

eXtreme Programming

EXTREME PROGRAMMING

Expectation

Reality



Agile Development

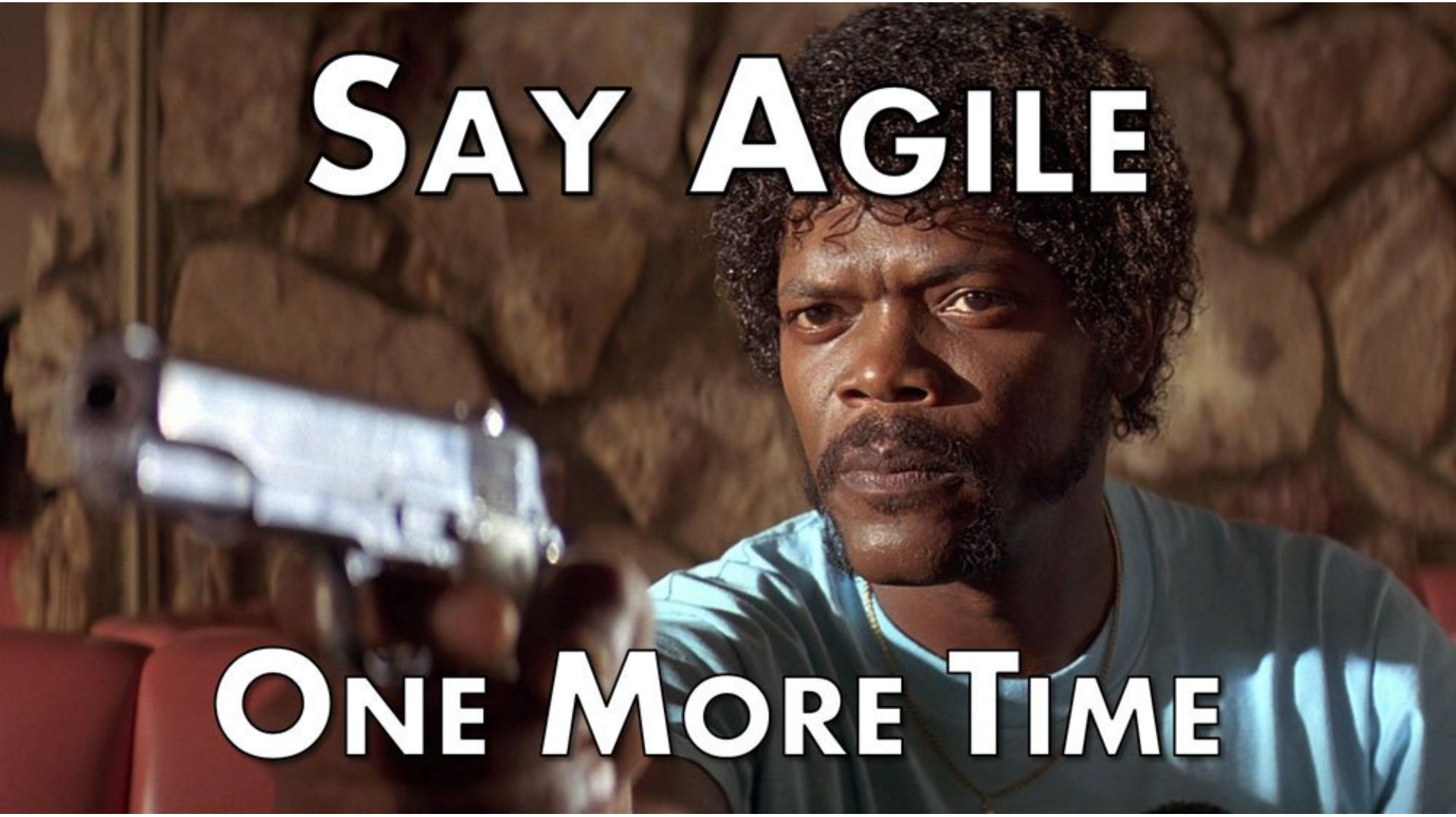
- A group of software development methods
  - Early and continuous delivery of software
  - Welcome changing requirements, even late in development
  - Business people and developers must work together
  - Working software is the primary measure of progress
  - Self-organizing teams produce the best architectures, requirements, and designs
  - Reflect and tune behaviour at regular intervals to become more effective

Agile Development Values

Individuals and interactions *over* processes and tools
Working software *over* comprehensive documentation
Customer collaboration *over* contract negotiation
Responding to change *over* following a plan

- Although there is value in the items on the right, agile software developers value the items on the left more

http://agilemanifesto.org


SAY AGILE
ONE MORE TIME

eXtreme Programming

- A Modern, Lightweight Software Process
  - Extreme Programming, or XP, is a modern lightweight process suitable for small to medium-sized software projects
  - Designed to adapt well to the observed realities of modern software production
    - short timelines
    - high expectations
    - severe competition
    - unclear and rapidly changing requirements

eXtreme Programming

- A Modern, Lightweight Software Process
  - Based on the idea of continuous evolution
  - Very practical, based largely on simplicity, testing
  - In spite of its brash, undisciplined, "fun" presentation, solidly based on the software disciplines and processes of the past

What's So eXtreme About It?

- Why is it called Extreme?
  - When first conceived, the idea was to take the best practices of good software development to the limit
    - if code reviews are good, review code all the time
    - if testing is good, test all the time
    - if design is good, design all the time
    - if simplicity is good, always use the simplest solution possible
    - if architecture is important, refine architecture all the time
    - if integration is important, integrate all the time
    - if short iterations are good, use shortest iterations possible
  - Clearly this can only work for relatively small projects

Great, Another Process...

- Why make a different approach?
  - XP was born from the dissatisfaction of programmers with the actual situation in most software development environments
  - Frustration with the lack of time to test adequately because of the rush to get new software and new versions out quickly

Great, Another Process...

- Why make a different approach?
  - Dissatisfaction with the lack of ongoing advice and social support for difficult technical decisions, and management blame for decisions that do not turn out well
  - Worry about lack of connection between planning and design activities and actual source code
    - Working software is the primary measure of progress
  - Worry about the communication gap between management and technical staff

eXtreme Programming Properties

- Characteristics of XP
  - In many ways, XP is a philosophy rather than just a process
  - It is characterized by:
    - continuing feedback from short cycles
    - incremental planning that evolves with the project
    - responsive flexibility in scheduling
    - heavy and continuous use of testing and test automation

eXtreme Programming Properties

- Characteristics of XP
  - emphasis on close and continuous collaboration and communication
  - use of tests and source code as primary communication media (communication at programmer's level)
  - evolutionary model from conception to retirement of system
  - emphasis on small, short-term practices that help yield high quality long-term results

Attacking Risks Before They Arise

- Addressing Risk
  - XP tries to explicitly address the greatest risks to software development projects actually observed in practice

Attacking Risks Before They Arise

- 1) Schedule Slips
  - Software isn't ready on the scheduled delivery date
  - Addressed in XP by short release cycles, frequent delivery of intermediate versions to customers, customer involvement and feedback in development of software

Attacking Risks Before They Arise

- 2) Project Cancellation
  - After several schedule slips, the project is cancelled
  - Addressed in XP by making the smallest initial release that can work, and putting it into production early, thus establishing credibility and results

Attacking Risks Before They Arise

- 3) System Defect Rate Too High, or Degrades with Maintenance
  - Software put in production, but defect rate is too high, or after a year or two of changes rises so quickly that system must be discarded or replaced
  - Addressed in XP by creating and maintaining a comprehensive set of tests run and re-run after every change, so defect rate cannot rise
  - Programmers maintain tests for each function, users maintain tests for each system feature

Attacking Risks Before They Arise

- 4) Business Misunderstood
  - Software put in production, but doesn't solve the problem it was supposed to
  - Addressed in XP by making customer an integral part of the team, so team is continually refining specification to meet expectations

Attacking Risks Before They Arise

- 5) Business Changes
  - Software put in production, but business problem it is designed for changes or is superseded by new, more pressing business problems
  - Addressed in XP using short release cycles and by having customer as an integral part of the team
  - Customer helps team continually refine specification as business issues change, adapting to new problems as they arise - programmers don't even notice

Attacking Risks Before They Arise

- 6) Featuritis
  - Software has a lot of potentially interesting features, which were fun to implement, but don't help customer make more money
  - Addressed in XP by addressing only the highest priority tasks, maintaining focus on real problems to solve

Attacking Risks Before They Arise

- 7) Staff Turnover
  - After a while, the best programmers begin to hate the same old program, get bored and leave
  - In XP, programmer make their own estimates and schedules, get to plan their own time and effort, get to test thoroughly
  - Less likely to get frustrated with impossible schedules and expectations
  - In XP, emphasis is on day to day social human interaction, pair and team effort and decisions
  - Less likely to feel isolated and unsupported

Criticisms of XP

- Introduction of XP resulted in immediate criticism
  - Insufficient software design
  - Lack of structure and documentation
  - Only as effective as the people involved
    - Agile methods like XP often require senior developers
  - Can be inefficient
  - Pair programming can be difficult and expensive, although rewarding

XP in Practice

- Outline
  - Here we look at the actual practices of the XP process, and how they can be applied in the context of our project
  - The key ideas to keep in mind at all times are:
    - metaphor
    - simplicity
    - testing
    - automation
    - collective work
    - standards

XP 1: The Planning Game

- Refers to the practice of having a continuous dialog between business and technical people on the project
  - Often in the form of weekly meetings, where business people bring business constraints, and technical people bring technical constraints
    - Business people bring issues of scope, priority, releases
    - Technical people being estimates, consequences, scheduling
  - Forces the project members to continually balance what is possible (the technical aspects) with what is desirable (the business aspects)
    - Unfortunately we won't really be able to practice this in the project, the closest we come is our dialog in class and email

XP 2: Small Releases

- Refers to the practice of addressing only the most pressing business requirements, and getting them addressed by releasing a new version quickly
  - Means that we should bring the first version into production as quickly a possible
  - Means that we should shrink the cycle to the next version as much as possible
  - In practice this means shrinking software cycles to a month or two instead of six months or a year
    - In our project, we will shrink to quick releases at roughly two week intervals

XP 3: Metaphor

- Refers to the practice of understanding and speaking of the system in real-world terms independent of its programmed solution
  - An example of a metaphor is the "desktop" of modern operating systems
    - The goals in building such an operating system can be understood in terms of an office desk
  - The metaphor drives the design of the architecture and interfaces of the system
    - In our project, the metaphor is "native", that is, there is a natural physical understanding of what we are doing, our front end is simply a retail console

XP 4: Simplicity

- Refers to the practice of always using the simplest possible design and code that can handle the tests
  - Do not speculate or try to guess what will be needed in the future, address only the current test suite
  - Do not implement any features that do not affect the test results
    - In our project, the simplest, smallest solution will be considered the best

XP 5: Testing

- The only required program features are those for which there is an automated test
  - Always create tests first, and treat them as the goal (specification)
  - Programmers create unit tests (tests for each method or segment of code)
  - Customers create functional (acceptance) tests that check that the product has the required functionality
    - In our project, we will create explicit tests first as we go along, beginning with assmt. #1, and program to meet them

XP 6: Refactoring

- Refers to the practice of continually looking for ways to simplify the architecture and coding of the system as new features and changes are made
  - When a new feature or change is needed, we first look to see if there is a way to rearchitect the system to make it easier or simpler to add - if so, we rearchitect first
  - Once the new feature has been added or changed, we look to see if the resulting new program can be simplified by rearchitecting or merging similar code
    - In our project, we will face changes that may require refactoring

XP 7: Pair Programming

- Refers to the practice of having all production code written with two people working together on one terminal
  - One partner works tactically on the specific part of the code (e.g. method) being coded at the moment
  - The other partner works strategically, considering higher level issues such as:
    - is this approach going to work?
    - can we simplify this by restructuring?
    - what other tests do we need to address here?
  - In our project, we will do all programming in pairs

XP 8: Collective Ownership

- Refers to the practice of having everyone responsible for the quality of the software, and no one to blame for failures of the software
  - Everyone is responsible for identifying opportunities to improve things and to act upon them at any time
  - No one owns the code, it belongs to everyone together - there is no notion of "my code", only the universal notion of "our code"
    - In our project, all team members will be collectively responsible for all parts of all phases

XP 9: Continuous Integration

- In XP, new code is always integrated and tested within a day
  - Changes are not allowed to go on without being continually tested in context to catch integration failures before they happen
    - In our project, starting with assignment #2, we will model this by testing again immediately after each day's changes

XP 10: On-site Customer

- A real customer must be a part of the development team at all times
  - Must be available to answer questions, resolve disputes, set short-term priorities based on business knowledge
    - In our project, we will model this by having the customer (me) available by email
      (not quite right, but it will have to do!)

XP 11: Coding Standards

- Project-wide conventions about the coding of programs
  - Necessary since everyone is responsible for all of the code, and may have to read or change any part of it at any time
  - Usually specifies
    - Commenting standards, e.g., every method must have a comment of the form ...
    - Naming conventions, e.g., variables representing dates will always be named ending in "Date", all constant will be named with a two letter prefix indicating their business type
  - In our project, you will be required to specify your coding standards, and they will be judged according to the clarity, readability, and consistency of your code.

Summary

- eXtreme Programming
  - A new software process, programmer-centred
  - Strongly based on testing at every level
  - Designed to address usual project failure risks before they arise
  - We will revisit and attach our course material to eXtreme as we go along

Summary: XP Practices

- XP Practices
  - XP uses a set of standard practices that together form an easy to apply practical system for team development of software
  - Emphasis is on collective responsibility, continuous improvement, and high quality standards
  - We will try to apply these practices in the course project

Summary

- References
  - Beck, eXtreme Programming Explained, ch. 1 (1st ed.)
- Reading Assignment
  - Read Beck, eXtreme Programming Explained, ch. 2 (1st ed.)

Summary

- References
  - Beck chapter 10 (1st ed.)
- Reading Assignment
  - Beck chapters 11, 12 (1st ed.)