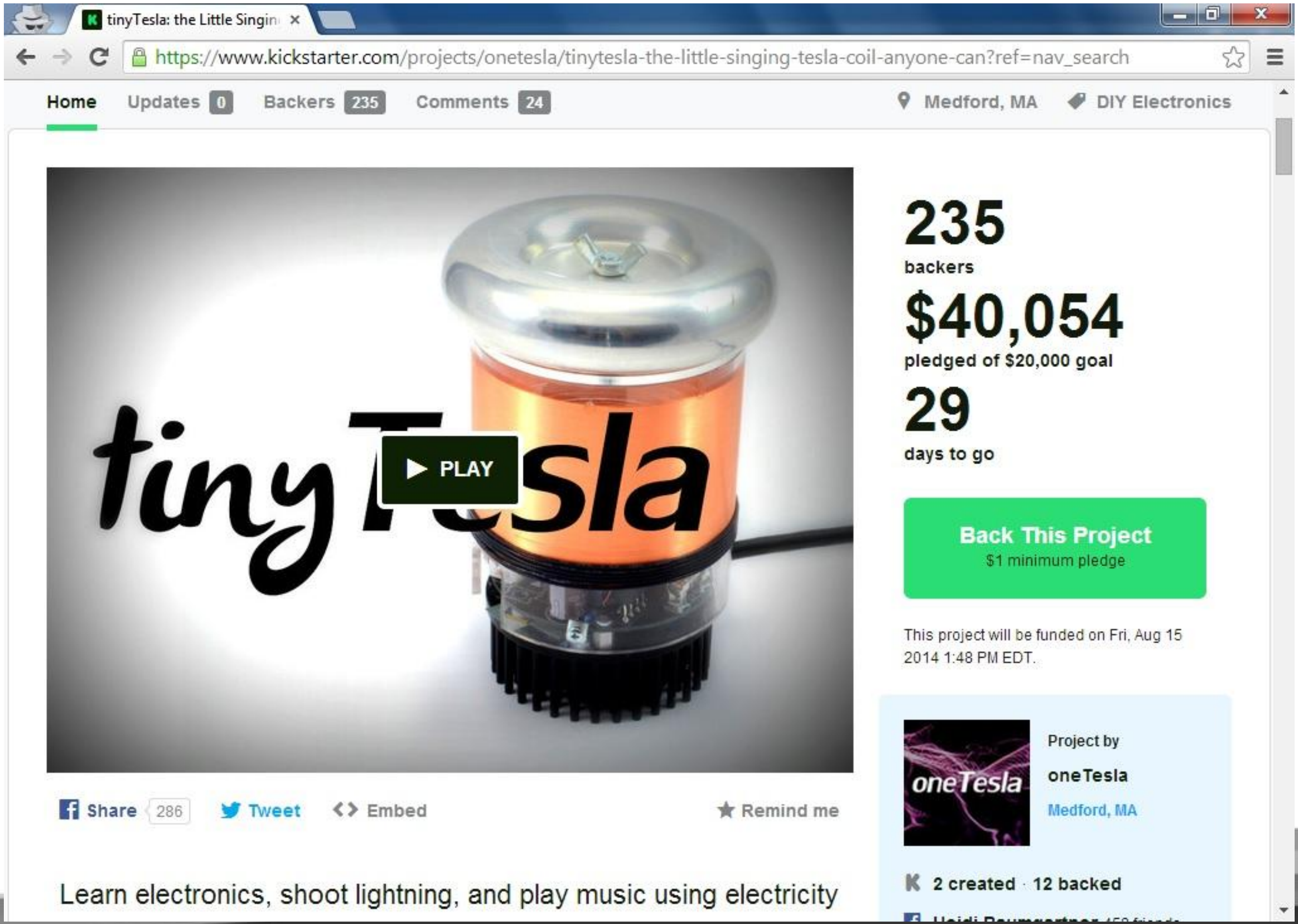
Software Development Life Cycle

Lecture 6
GSL Peru 2014

Housekeeping

- Friday’s are not optional.

Announcements


tinyTesla: the Little Singin

https://www.kickstarter.com/projects/onetesla/tinytesla-the-little-singing-tesla-coil-anyone-can?ref=nav_search

Home | Updates 0 | Backers 235 | Comments 24 | Medford, MA | DIY Electronics

235 backers

$40,054 pledged of $20,000 goal

29 days to go

Back This Project
$1 minimum pledge

This project will be funded on Fri, Aug 15 2014 1:48 PM EDT.

Project by oneTesla, Medford, MA

2 created · 12 backed

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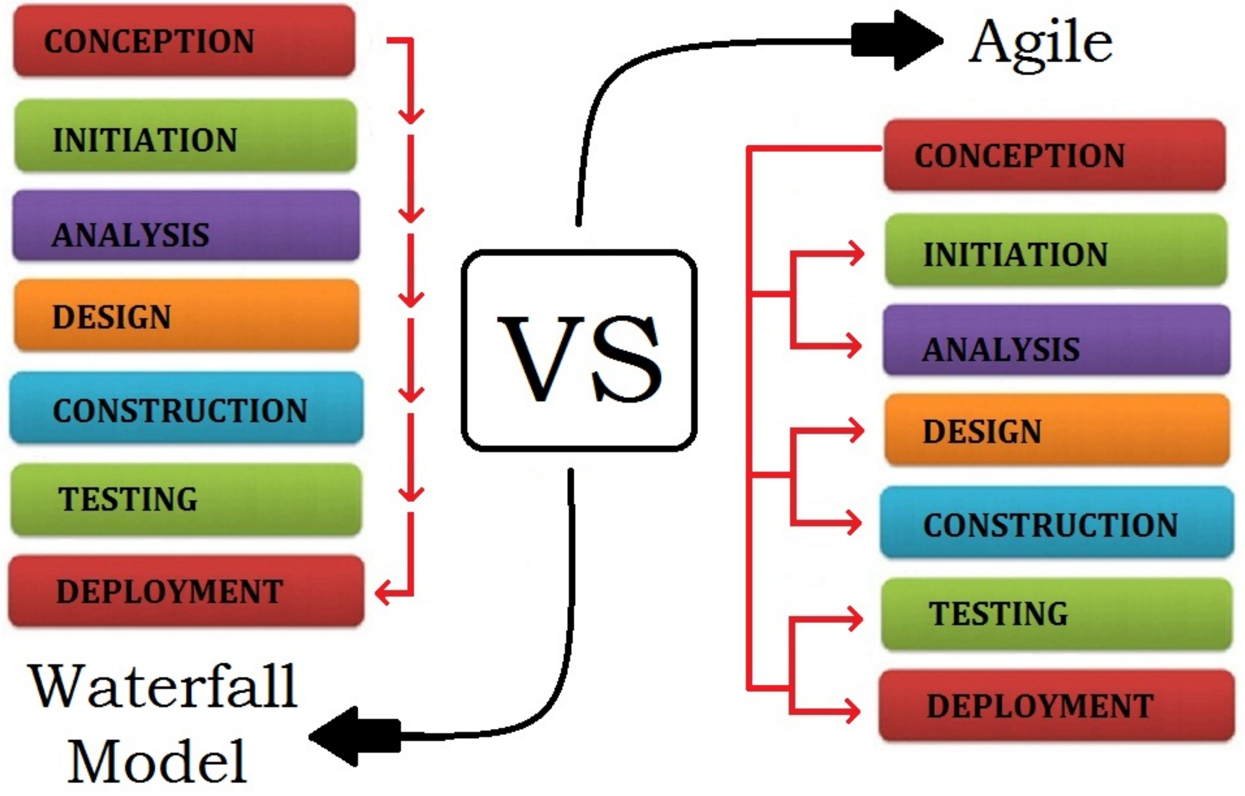
Learn electronics, shoot lightning, and play music using electricity

SDLC

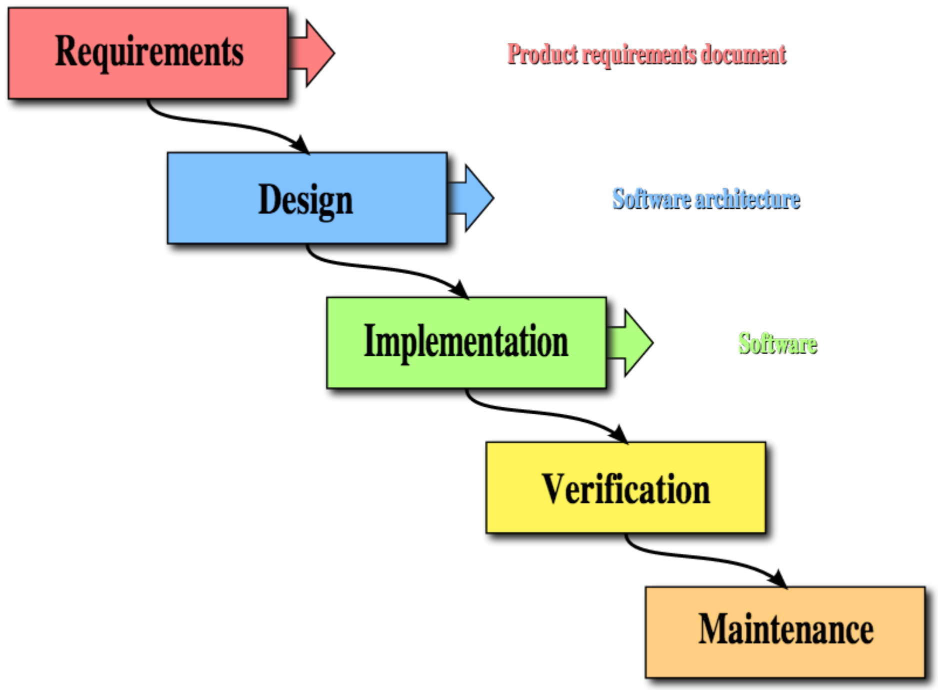
Software Development Life Cycle

Software Development Life Cycle



Source: sdlc.wc

Waterfall Model



- Sequential design process
  - Scheduled stages of development in strict order
- Does not accommodate changes to requirements during project
- Integration done at the end

Breakdown of Process

- Step 1: Requirements
  - Description of product/system behavior
  - Includes the **use cases**/interactions between the users and product
  - Establishes what the product should and should not do (functional and non-functional)

Requirements Documents

- Business Requirements Document (BRD)
- Marketing Requirements Document (MRD)
- Functional Requirements Document (FRD)
- Product Requirements Document (PRD)

Engineering Requirements Documents

- User Interface Requirements Document (UIRD)
- Interface Requirements Document
- Technical Requirements Document (TRD)
- Design Requirements Document
- Engineering Requirements Document
- Development Requirements Document

Breakdown of Process

- Step 2: Design
  - Create the specification of the software architecture
  - Low-level algorithm design and high-level architecture design
  - Things to consider with software design:
    - Compatibility
    - Extensibility
    - Maintainability
    - Modularity
    - Performance
    - Scalability

Design Documents

- Data Design
- Architecture Design
- Interface Design
- Procedure Design

Breakdown of Process

- Step 3: Implementation
  - Constructing or coding based on the design from step 2, resulting in software
  - Keep in mind how to create good software (future lecture material)
  - Take into account user-knowledge
    - Product is for the users--implement a product suitable for their needs!

Breakdown of Process

- Step 4: Verification
  - Consists of testing and debugging
  - Don’t rely on Quality Assurance (QA) to find all the product defects!
  - Developers should test their code.
  - QA will not have time to test all of the features on all of the platform. The hours required to test manually will be 100+ years depending on complexity
  - QA uses 80/20 rule to test.

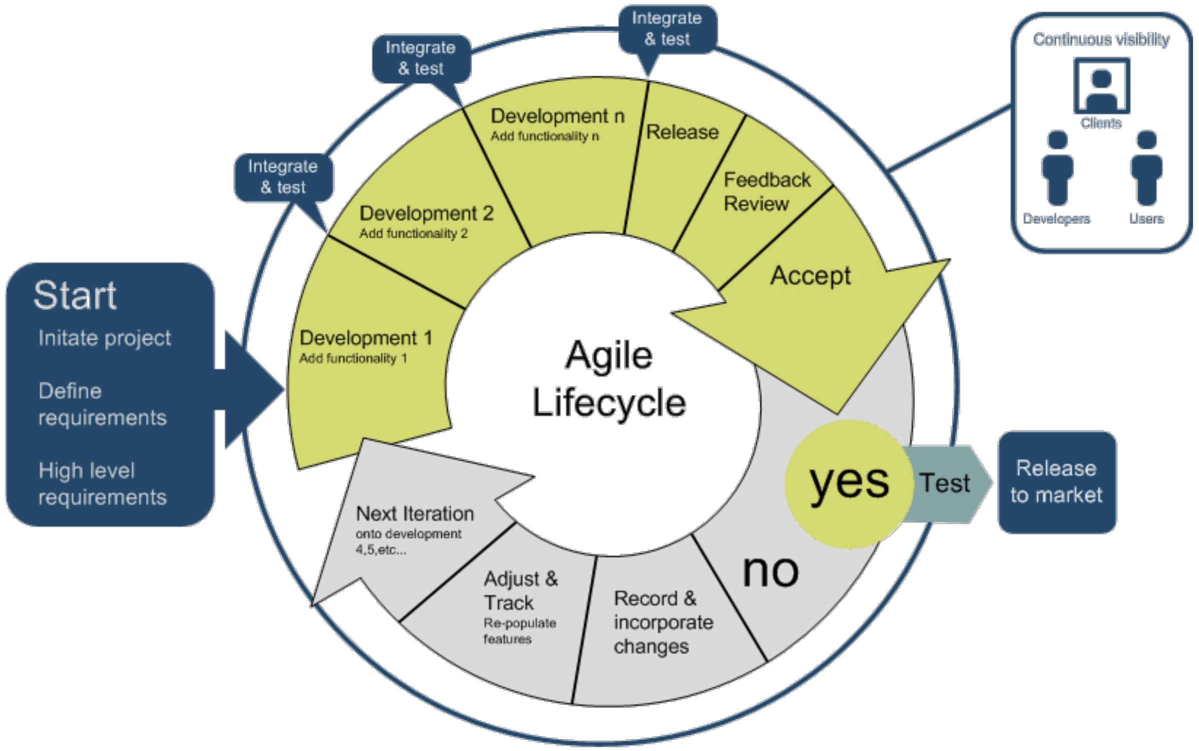
Breakdown of Process

- Step 5: Maintenance
  - Future modifications to remove issues, improve performance, etc.
  - Have a method for users to report bugs or request modifications
  - If defects are found here, it is very time consuming and distruptive to fix.

Additional Facts

- Design up front model - need to know all the facts ahead of time. Cannot learn as you go.
- Can fall apart when all the facts are not available ahead of time or when requirements change
- Requirements defect that is left until construction or maintenance will cost 50-200 times as much to fix as at requirements stage.
- More than source code for documentation.

Agile Model



- ❖ Assess direction through development process
- ❖ Continuous replanning
- ❖ Iterative and incremental
  - ➢ Repetition of work cycles and product yield analysis

Source: agilemethodology.org, sdc.net.au

12 Principles of Agile Manifesto

1. Customer Satisfaction from rapid delivery of useful software
2. Welcome to changes in requirements, even later in the development process
3. Working software is delivered frequently (weeks rather than months)
4. Close, daily cooperation between business-side and developers

Beck, Kent 2001

12 Principles of Agile Manifesto

5. Projects are built around motivated individuals, who should be trusted
6. Face-to-face conversation is the best form of communication (co-location)
7. Working software is the measure of progress
8. Sustainable development at a constant pace
9. Continuous attention to technical excellence and good software

Beck, Kent 2001

12 Principles of Agile Manifesto

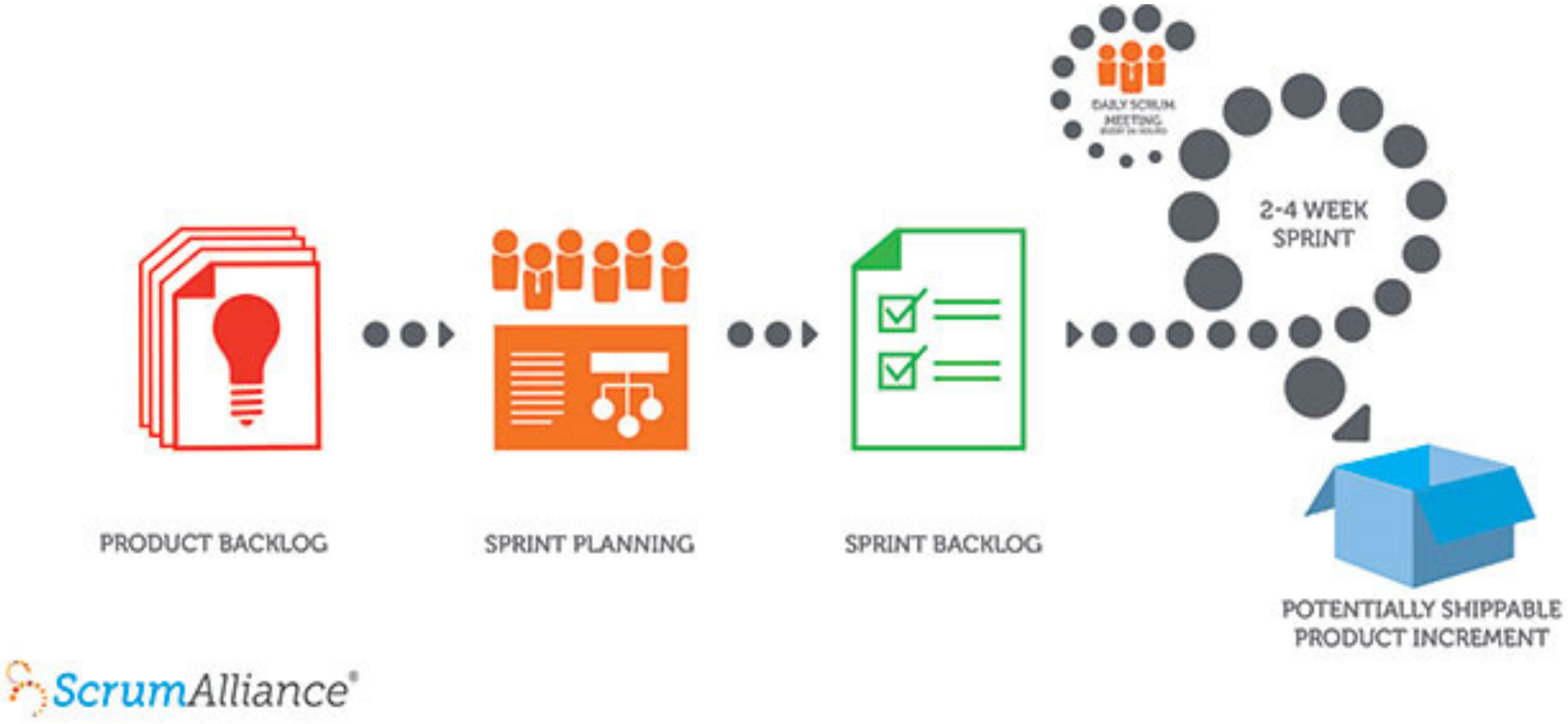
10. Simplicity—the art of maximizing the amount of work not done—is essential
11. Self-organizing teams
12. Regular adaptation to changing circumstances

Beck, Kent 2001

Additional Facts

- Short, adaptive cycles
- Criticized for code focus and lack of documentation
- Inefficient in large organization
- Adapted to processes outside of software

Scrum


PRODUCT BACKLOG
SPRINT PLANNING
SPRINT BACKLOG
DAILY SCRUM MEETING
2-4 WEEK SPRINT
POTENTIALLY SHIPPABLE PRODUCT INCREMENT
ScrumAlliance®

Scrum

- Focus on common goal
- Flexible, quick delivery
- Requirements can change (“requirements churn”)

Roles

- Product Owner - represent stakeholders, creates backlog items from user stories
- Development Team - responsible for producing potential shippable increments
- Scrum Master - enforcer of the scrum rules and removes obstacles from the team to deliver the product goals

Sprints

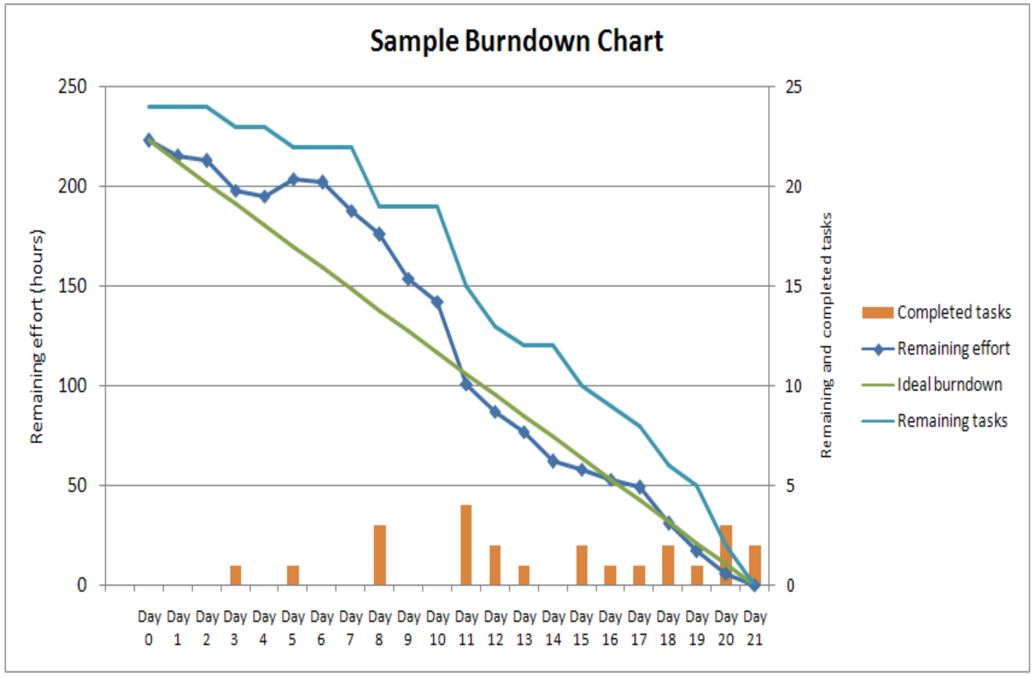
- Basic unit of development time
- “timeboxed” effort - scope based on time
- Duration is fixed from 2 weeks to 1 month
- Product must be in working condition at the end of the sprint. i.e. integrated, fully tested, end-user documented, and potentially shippable

Meetings

- Sprint planning meeting
- Daily Scrum meeting (status)
  - 15 mins/standing
  - same location/same time
  - development status
    - What have you done since yesterday?
    - What are you planning to do today?
    - Any impediments/stumbling blocks?
- End meeting
  - Sprint Review
  - Sprint Retrospective

Other terms

- Product backlog
- Sprint backlog
- Product increment
- Burn down chart

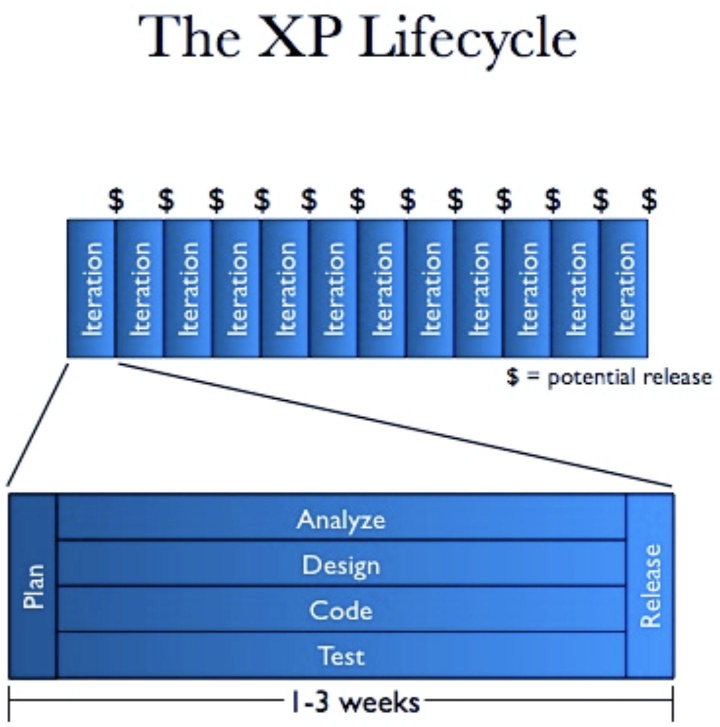


Overview

- ❖ Flexible and holistic product development strategy
- ❖ Recognizes that customers can change their mind about what they want or need
  - ➢ Focus is on quick delivery and responses to change
  - ➢ Empirical feedback
  - ➢ Team self-management

Source: agilemethodology.org

Extreme Programming (XP)



- ❖ XP teams performed analysis, design, coding, and testing every day
- ❖ Test-driven development
- ❖ Short iterations provided structure
  - ➢ Iteration started with planning, ended with product demo

Source: James Shore 2007

Pair Programming

What is Pair Programming?

Pair programming is an agile software development technique where two programmers **work together** at one workstation. One programmer writes code (driver) while the other reviews each line (observer). Both programmers **switch roles frequently**.

Pair Programming *Benefits*

Looking at benefits in the following categories:

- ❖ Economics
- ❖ Design Quality
- ❖ Satisfaction
- ❖ Learning
- ❖ Team Building & Communication

Pair Programming Benefits *Economics*

- ❖ Takes about 15% more time than working individually, but defects are 15% less
- ❖ Costs and quality assurance affect expenses
  - ➢ Reduce defects in program => expenses decrease
- ❖ Example: IBM spent $250 million repairing and fixing 30,000 customer-reported issues
  - ➢ Defects could have been reduced with pair programming

Pair Programming Benefits
Design Quality

- ❖ Greater potential for more diverse solutions
  - ➢ Programmers bring different prior backgrounds and experiences
  - ➢ Programmers have different perspectives of the problems presented
  - ➢ Programmers have different functional roles
    - ■ Coding vs. Reviewing
- ❖ Chances of selecting a poor method decrease with two programmers rather than one

Pair Programming Benefits
Satisfaction

- Online surveys show…
  - 96% of pair programmers enjoy pair programming more than working alone
  - 95% of pair programmers are more confident in their code when working together

Pair Programming Benefits *Learning*

- ❖ Constant sharing of knowledge between the programmers
  - ➢ Tips on coding rules
  - ➢ Tips on design skills
- ❖ Providing feedback increases knowledge for the reviewer as well, not only the coder
  - ➢ Programmer becomes more aware of monitoring code

Pair Programming Benefits
Team Building & Communication

- Programmers in a team naturally share problems and solutions quicker with pair programming
  - Time is saved
  - Hidden agendas amongst team members are avoided
- Communication is made easier
  - Information flow in the team increases

Waterfall vs. Agile Model *Pros and Cons*

Pros

- **Waterfall Model**
  - Strong documentation
  - Clients know what to expect
  - Meticulous records => easier to improve in future
- **Agile Model**
  - Changes can be made after initial planning
  - Testing and feedback at the end of each run
  - Product can be launched at the end of any cycle

Cons

- **Waterfall Model**
  - Initial requirements that can’t be changed
  - Testing only at the end
  - Doesn’t take into account client’s evolving needs
- **Agile Model**
  - Project can easily become a constant run of code cycles
    - Delayed & over-budget
  - No initial definite plan can result in very different end product

Waterfall vs. Agile Model *When to use Which*

Waterfall Model

- ❖ Clear picture of what the final product should be
- ❖ Clients don't have ability to change project scope after project has begun
- ❖ Definition, not speed, is key to success

Agile Model

- ❖ Unclear picture of what the final product should be
- ❖ Rapid production is of importance
- ❖ Clients can change the scope of project
- ❖ Product is for an industry with rapidly changing standards

Resources

- Wikipedia