CP317 Software Engineering

week 8-2 – Iterative models

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Agenda

- Review waterfall model
- Introduction
  - The disadvantage of waterfall model
- Iterative model
  - Concept
- comparisons
  - Iterative model vs. waterfall model
  - Iterative model vs. incremental model
- Prototype model
  - Prototype model vs. iterative model
- Summary

Review week 8-1 topics

- Software engineering process models
- Software development life cycle
- Predictive model vs. adaptive model
- Waterfall model
- Waterfall with feedback model
- Sashimi model (waterfall with overlapping phase)
- Incremental waterfall model
- V-model

Introduction

- Disadvantages of waterfall model
  - Inflexible
  - No working software is produced until late during the life cycle.
  - High amounts of risk and uncertainty.
  - Poor model for long and ongoing projects.
  - Cannot accommodate changing requirements.
  - Integration is done at the very end, which doesn't allow identifying any technological or business bottleneck or challenges early.
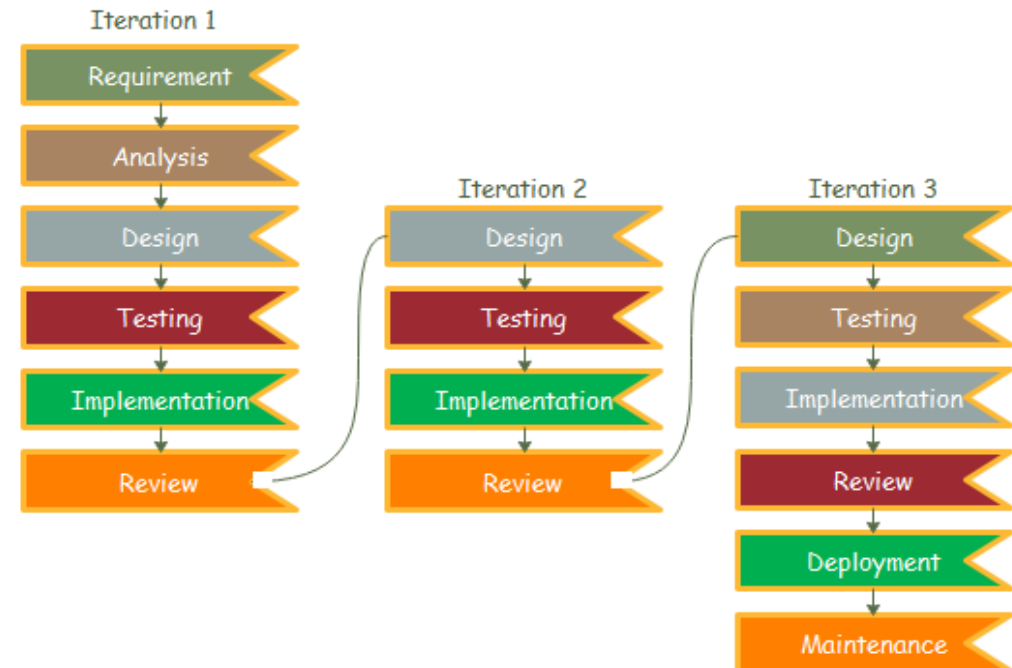
Iterative model

- Definition: Iterative model is a process model of software engineering that focuses on initial, simplified software implementation, which then progressively gains more complexity and a broader feature set until the final system is complete.
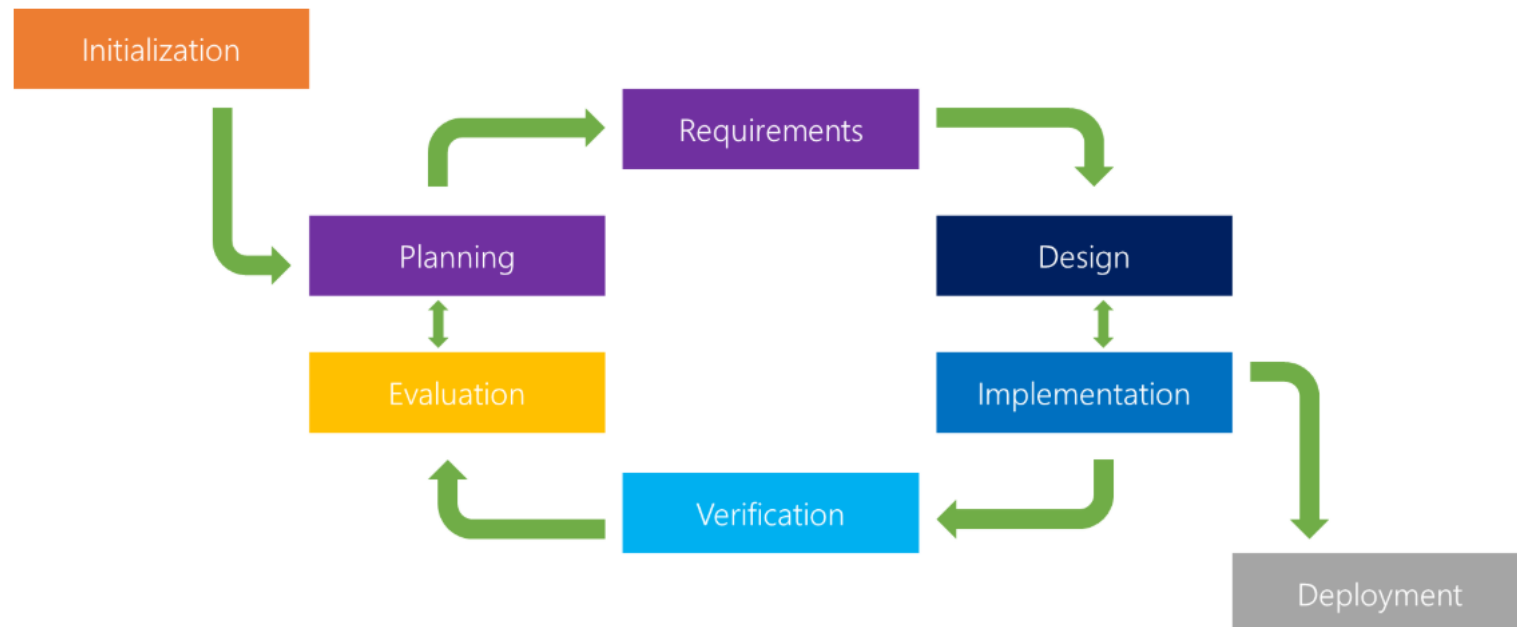
Iterative model example

- An online banking system
  - Data communication and authentication (login and view information only)
  - Online money transfer (from one account to others)
  - Online investments (buy and sell stocks)
  - ……

Iterative model

- Advantages of iterative model
  - Generates working software quickly and early.
  - More flexible – less costly to change scope and requirements.
  - Easier to test and debug during a smaller iteration.
  - Easier to manage risk because risky pieces are identified and handled during its iteration.
  - Each iteration is an easily managed milestone.
- Disadvantages of iterative model
  - Each phase of an iteration is rigid.
  - Problems may arise pertaining to system architecture because not all requirements are gathered up front for the entire software life cycle.

Iterative model vs. waterfall model

Waterfall	Iterative
Subjective measurement of progress	Objective measurement of progress
Delays integration and testing	Continuous integration and testing
Nothing runs until the end	Something "runnable" produced every iteration
Difficulties at the end of the project	Difficulties at the start of the project

- Subjective: based on personal opinion, assumptions, interpretations.
- Objective: based upon observation of measurable facts

Iterative model vs. incremental model

- Incremental: initially provides fewer features with full fidelity
- Iterative: initially provides all features with low fidelity

- The Incremental model uses a set number of steps and development goes from start to finish **in linear paths of progressions**.
- The Iterative model has **no set number of steps**, rather development is done **in cycles (loops)**.
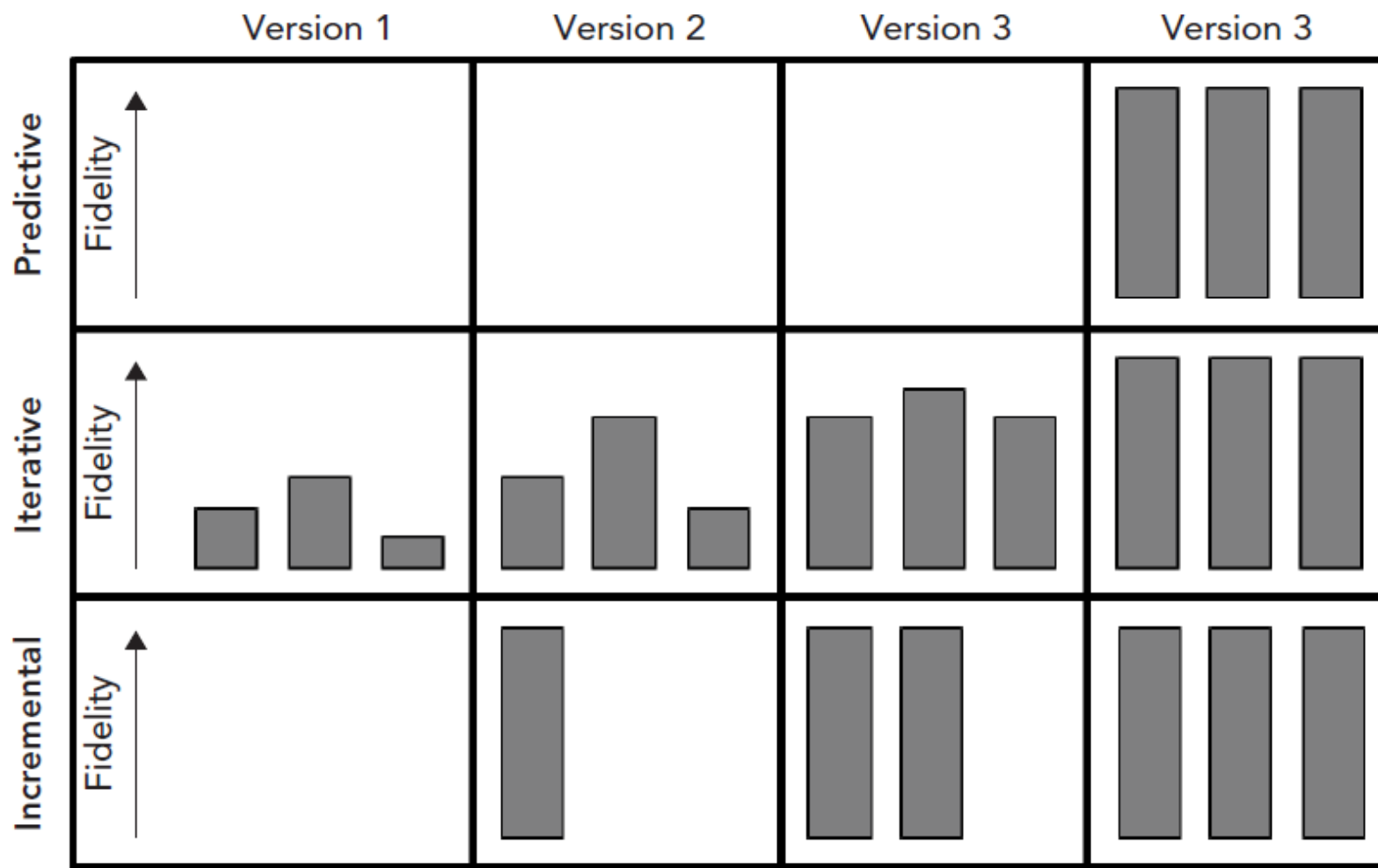
Iterative model vs. incremental model

Comparison

Iterative model vs. incremental model – cont.

- **Increment** is all about making something bigger through accretion.
- **Iteration** is all about making something better through repetition.
- Dictionary:
  - Increment is an increase or addition, especially one of a series (Google, Cambridge Dictionary, Dictionary.com).
  - iteration is the process of doing something again and again, usually to improve it (Cambridge Dictionary).
- Examples:
  - **Scrum** is incremental because Scrum guide uses the word increment.
  - **Lean** is Iterative
  - Agile?

Prototype model

- A **prototype** is a rudimentary software product that is not complete, but is representational of the final product.

- A prototype model is a process model of software engineering in which a prototype is designed and built, then new features are added until an acceptable software product is achieved.

- Prototypes demonstrate the features of a proposed product, service, or system
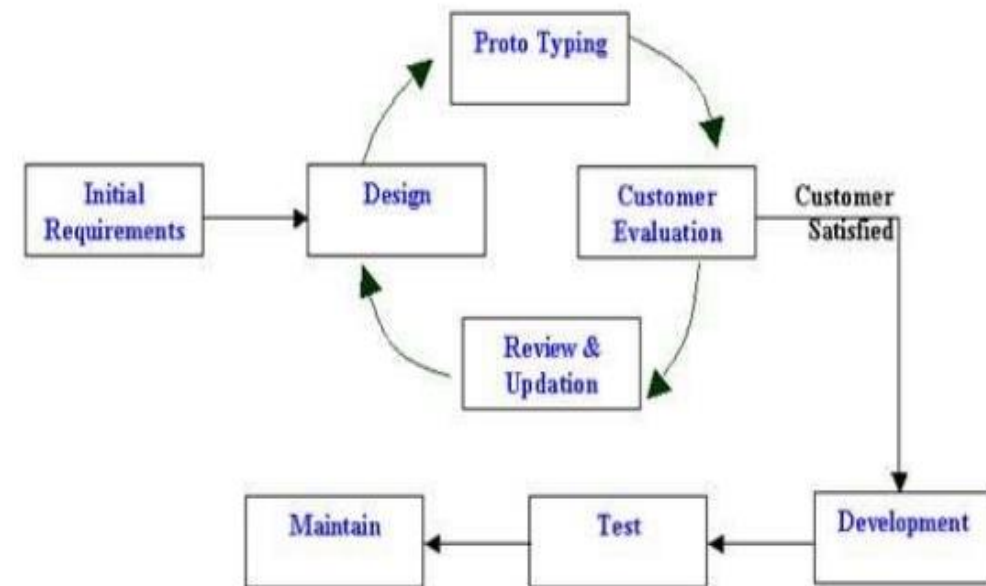
Advantages of prototypes

- Improved Requirements
- Encourages Active User Participation
- Common Vision
- Helps Resolve Discrepancies between the client and the company
- Gives Users a Feel for the Final System
- Helps Determine Technical Feasibility
- Helps Sell the Idea of a Proposed System
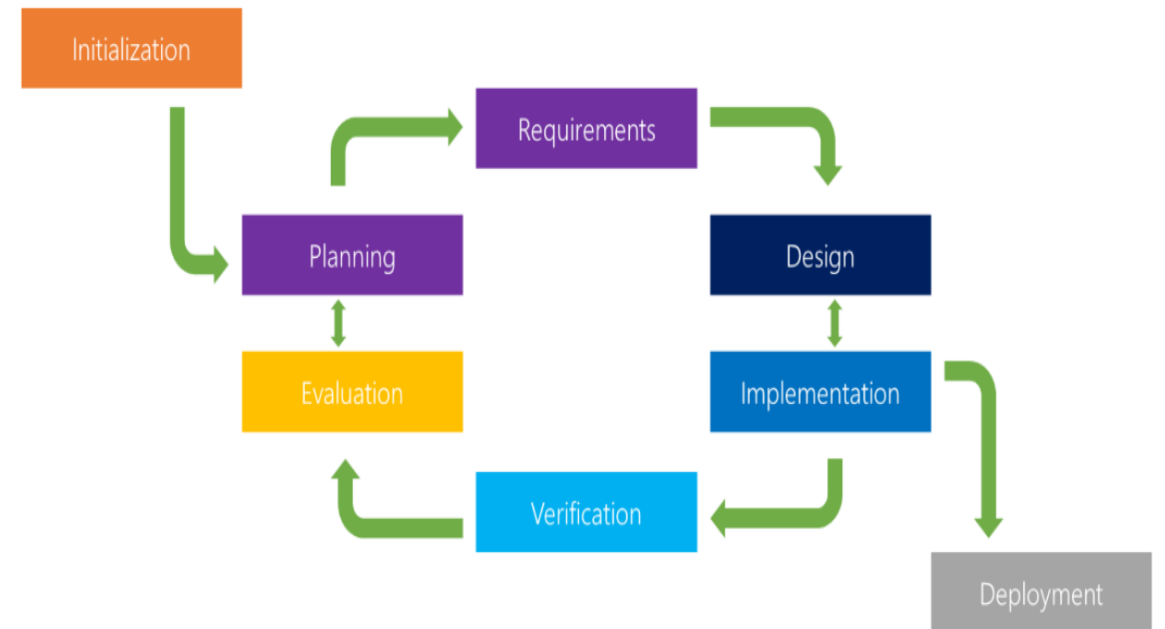
Disadvantages of prototypes

- Narrowing Vision
- Schedule Pressure
- Leads People to Believe the Final System Will Follow
- Gives No Indication of Performance under Operational Conditions
- Leads the Project Team to forgo Proper Testing and Documentation

Prototype model vs. iterative model

Prototype model
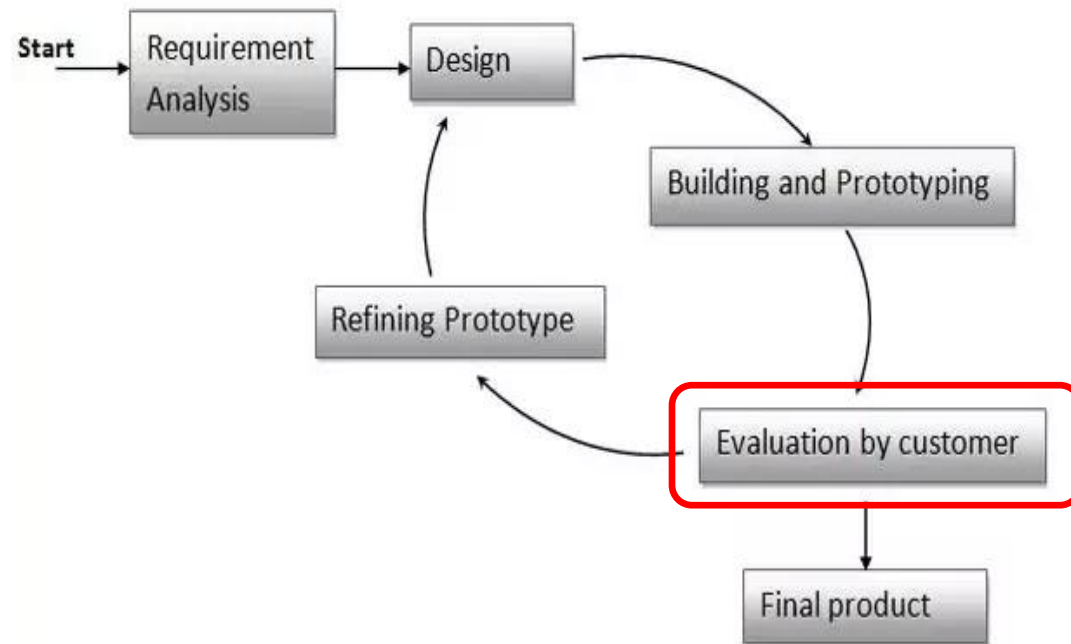
Iterative model

Prototype model vs. iterative model

- **Similarities**
- Initially provides all possible features with low fidelity
- Iterative processes
- **Differences**
- Prototype model: customers involves explicitly

Summary

- Iterative model
  - Concept
  - Advantages and disadvantages

- comparisons
  - Iterative model vs. waterfall model
  - Iterative model vs. incremental model

- Prototype model
  - Prototype model vs. iterative model

Announcement

- Test 2 next Tuesday (Nov. 12), cover week 5-8 topics. Please bring your laptop
  - Locations
    - BA208 (the first letter of your family name from A-H (42))
    - BA211 (the first letter of your family name from I-P (31))
    - BA112 (the first letter of your family name from Q-Z (28))

- Group project
  - Software design document – project report due date Nov. 22