An Introduction to Software Engineering

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- Some Definitions
  "Science"

  "Engineering"

- Some Questions
  What have you learned so far in your Computer Science course(s)?

  Have you been studying science, engineering, both, or neither?

- Origins

  Mathematics Departments

  Electrical Engineering Departments

- Departments Today

  Computer Science – Science and Engineering

  Computer Engineering – Engineering

  Information Technology/Systems - Neither

What is Software?

- ## To the Hardware

  A collection of instructions to be executed by a computer/processor

- ## To the Developer

  A collection of human-readable statements (in a language) that can be converted to a collection of instructions to be executed by a computer/processor

What is Software Engineering?

- Defined

  The application of (scientific) theories, methods and tools to the specification, design, creation, verification, validation, deployment, operation, and maintenance of software products

- Scope

  From specification to maintenance

  Involves theories/methods from psychology, mathematics/statistics, computer science, and management (of people and resources)
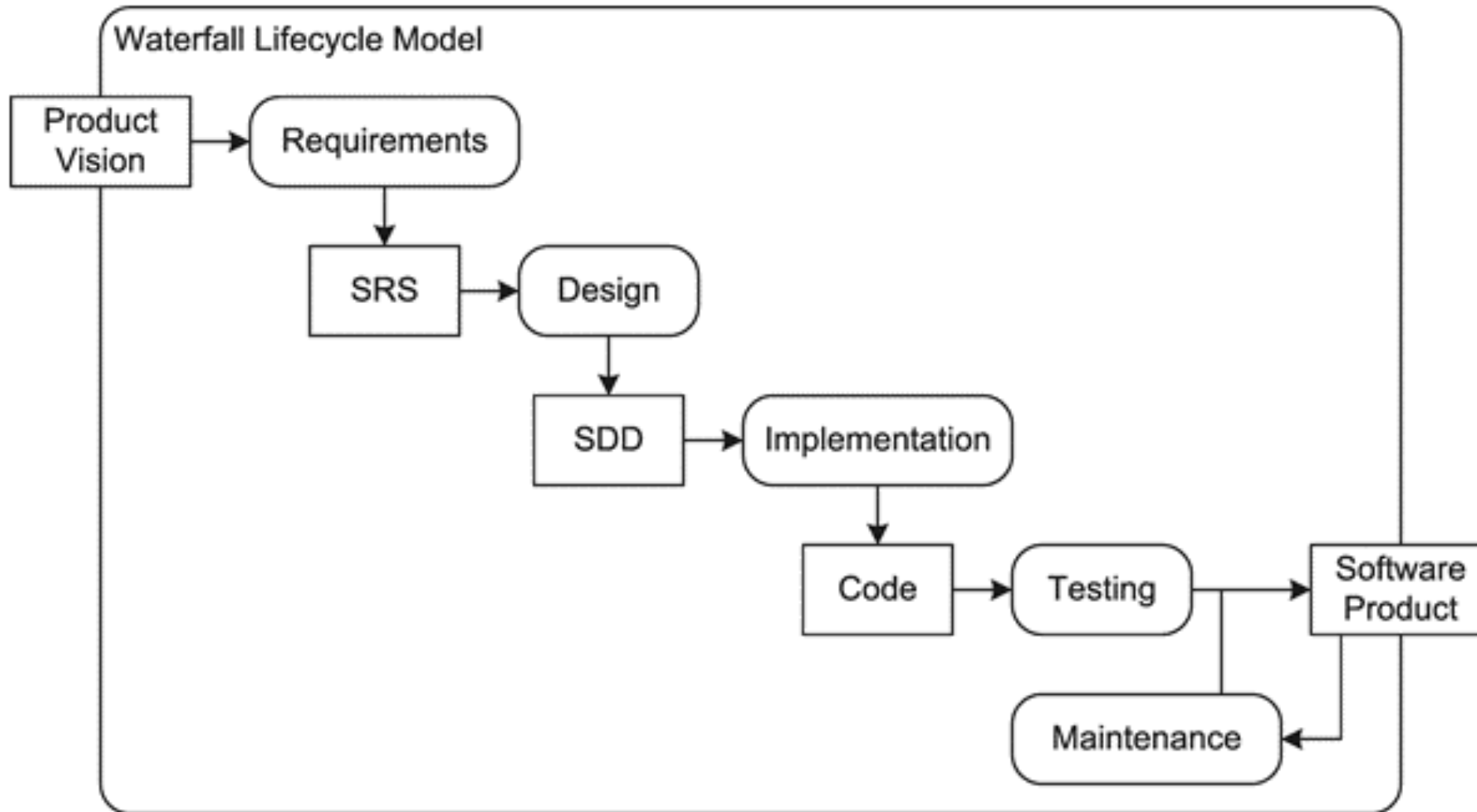
- Definition

  A set of activities/tasks (and corresponding inputs and outputs) that results in the specification, development, validation, and/or evolution of a software product
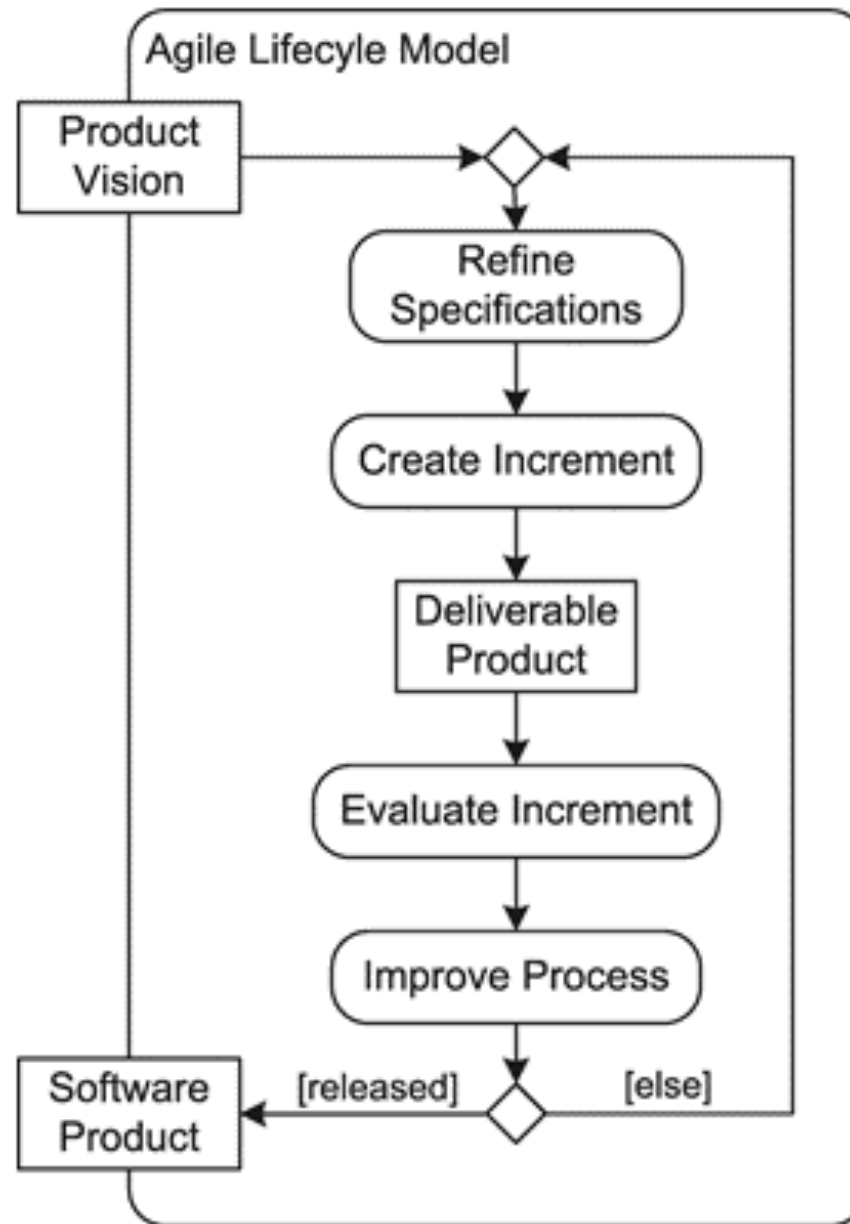
- Categories

  Traditional/Heavyweight (e.g., Waterfall)

  Agile/Lean (e.g., Scrum)

A Model of a Traditional Process

A Model of an Agile Process

- Product Design
  Needs Elicitation
  Interaction Design

- Engineering Design
  Architectural Styles
  Design Patterns

- Construction
  Idioms
  Debugging

- Quality Assurance

  Verification

  Validation

- Deployment

  Physical Architectures

- Maintenance and Support

  System Classification

Software Engineering Skills

- Programming Languages
- Integrated Development Environments
- Debuggers
- Unit Testing Frameworks
- Coverage Tools
- Profilers
- Static Analysis
- System Testing Frameworks
- Bug and Issue Tracking Tools
- Deployment Tools