Software Engineering

Week # 1

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Product Specification

Generic products

- The specification of what the software should do is owned by the software developer and decisions on software change are made by the developer.

Customized products

- The specification of what the software should do is owned by the customer for the software and they make decisions on software changes that are required.

Frequently asked questions about software engineering

Question	Answer
What are the attributes of good software?	Good software should deliver the required functionality and performance to the user and should be maintainable, dependable and usable.
What is software engineering?	Software engineering is an engineering discipline that is concerned with all aspects of software production.
What are the fundamental software engineering activities?	Software specification, software development, software validation and software evolution.
What is the difference between software engineering and computer science?	Computer science focuses on theory and fundamentals; software engineering is concerned with the practicalities of developing and delivering useful software.
What is the difference between software engineering and system engineering?	System engineering is concerned with all aspects of computer-based systems development including hardware, software and process engineering. Software engineering is part of this more general process.

Frequently asked questions about software engineering

Question	Answer
What are the key challenges facing software engineering?	Coping with increasing diversity, demands for reduced delivery times and developing trustworthy software.
What are the costs of software engineering?	Roughly 60% of software costs are development costs, 40% are testing costs. For custom software, evolution costs often exceed development costs.
What are the best software engineering techniques and methods?	While all software projects have to be professionally managed and developed, different techniques are appropriate for different types of system. For example, games should always be developed using a series of prototypes whereas safety critical control systems require a complete and analyzable specification to be developed. You can't, therefore, say that one method is better than another.

General issues that affect most software

Heterogeneity

- Increasingly, systems are required to operate as distributed systems across networks that include different types of computer and mobile devices.

Business and social change

- Business and society are changing incredibly quickly as emerging economies develop and new technologies become available. They need to be able to change their existing software and to rapidly develop new software.

Security and trust

- As software is intertwined with all aspects of our lives, it is essential that we can trust that software.

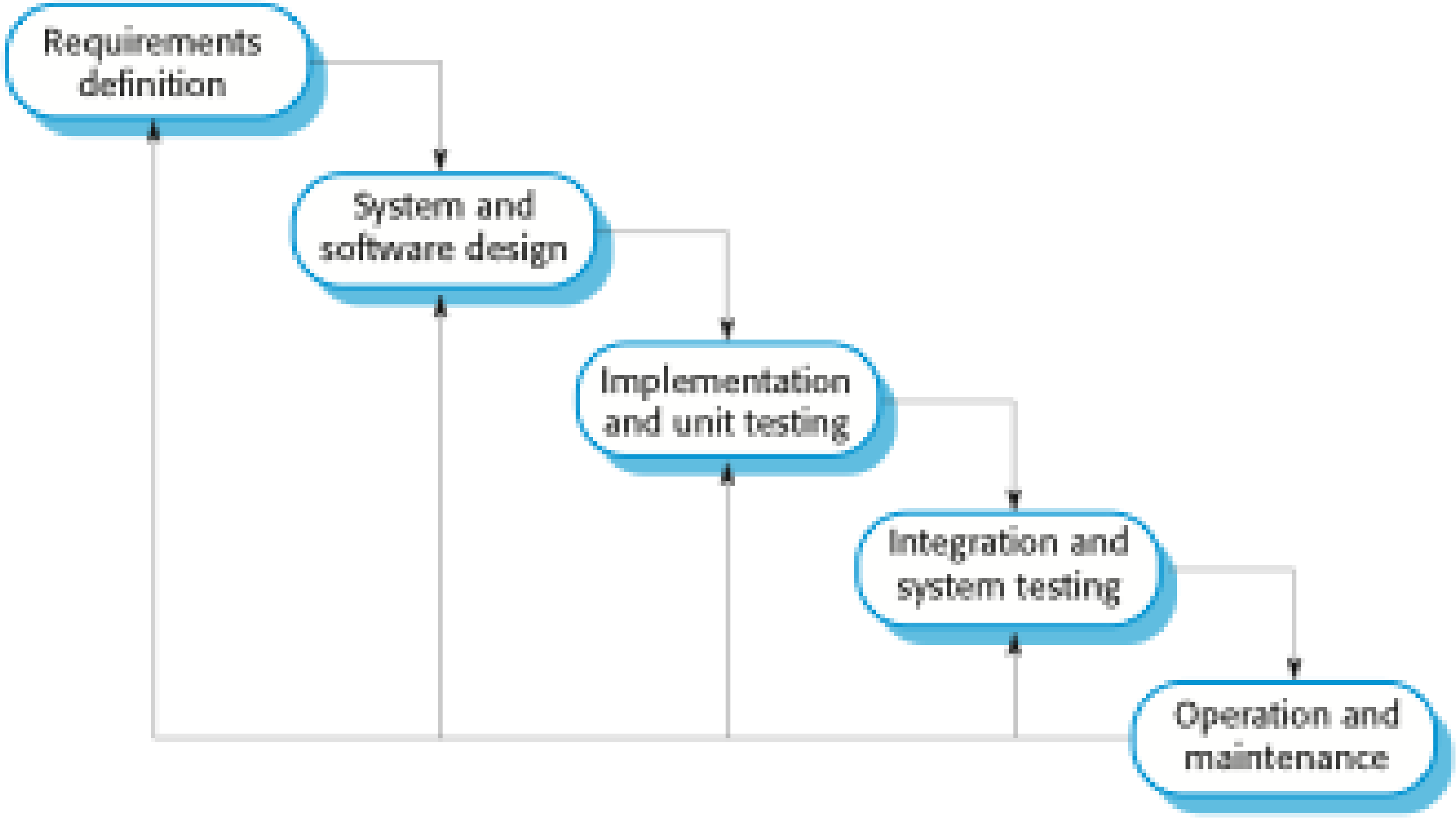
Software Process

A structured set of activities required to develop a software system.

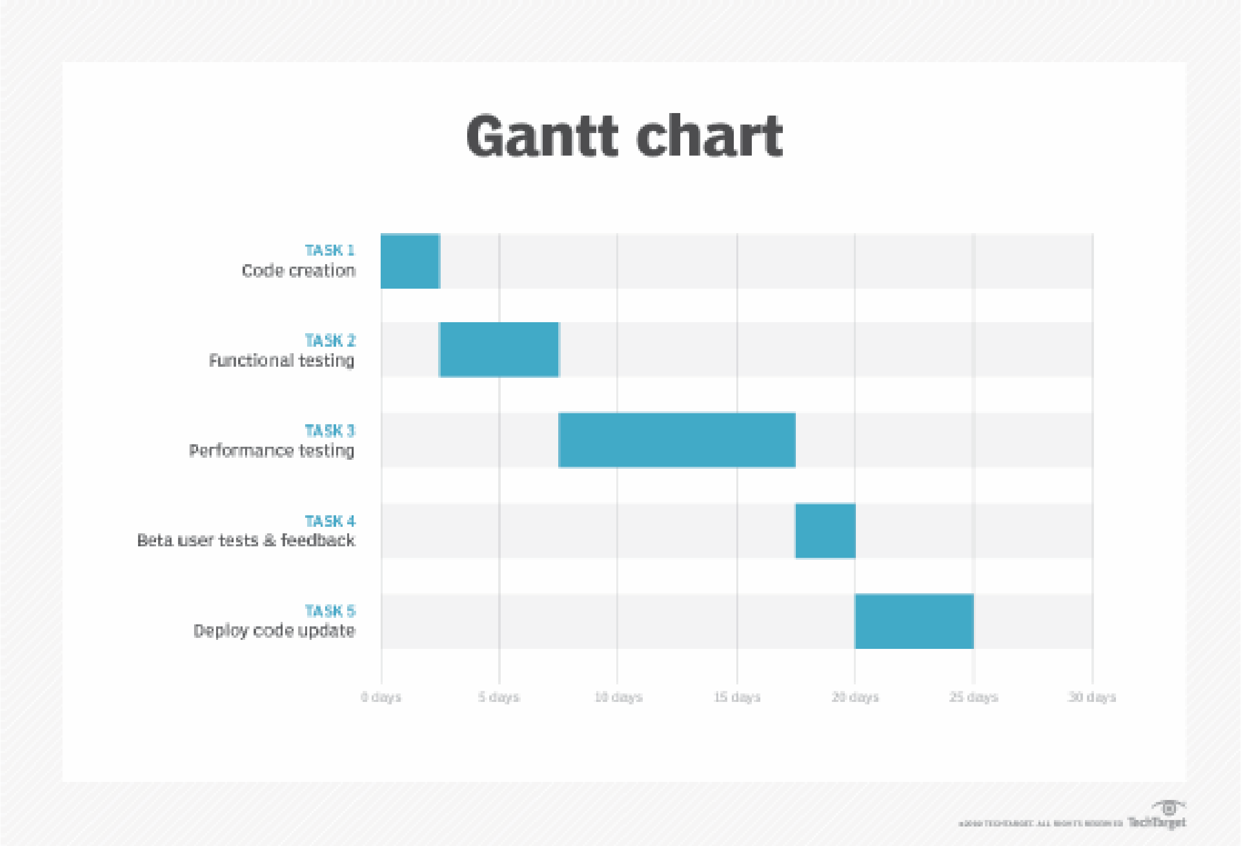
Many different software processes but all involve:

- Specification – defining what the system should do;
- Design and implementation – defining the organization of the system and implementing the system;
- Validation – checking that it does what the customer wants;
- Evolution – changing the system in response to changing customer needs.

Waterfall Model


Requirements definition
System and software design
Implementation and unit testing
Integration and system testing
Operation and maintenance

Waterfall Model



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Waterfall Model

There are separate identified phases in the waterfall model:

- Requirements analysis and definition
- System and software design
- Implementation and unit testing
- Integration and system testing
- Operation and maintenance

The main drawback of the waterfall model is the difficulty of accommodating change after the process is underway. In principle, a phase has to be complete before moving onto the next phase.

Waterfall Model Problems

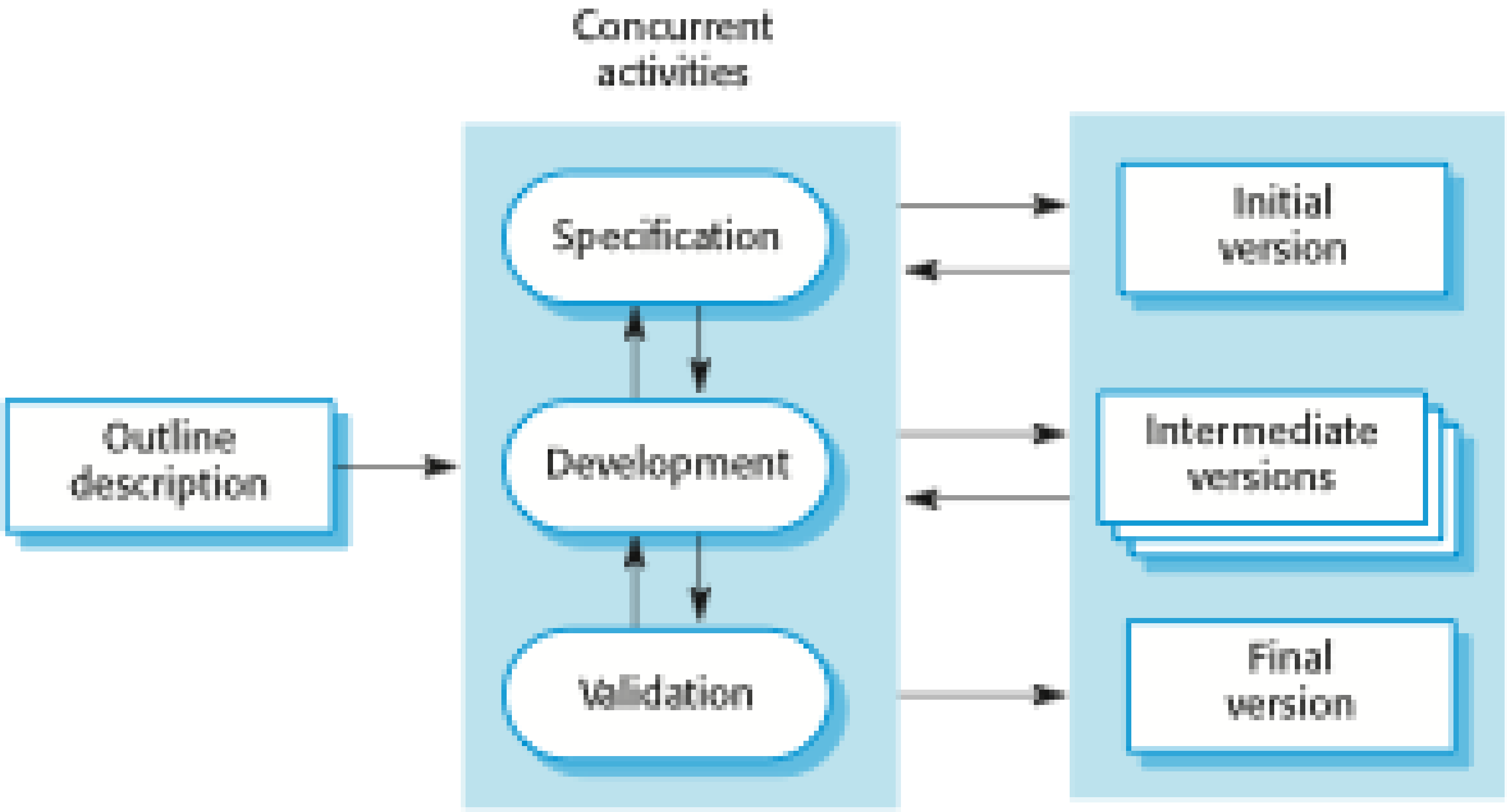
Inflexible partitioning of the project into distinct stages makes it difficult to respond to changing customer requirements.

- Therefore, this model is only appropriate when the requirements are well-understood and changes will be fairly limited during the design process.
- Few business systems have stable requirements.

The waterfall model is mostly used for large systems engineering projects where a system is developed at several sites.

- In those circumstances, the plan-driven nature of the waterfall model helps coordinate the work.

Incremental development



Incremental development benefits

The cost of accommodating changing customer requirements is reduced.

- The amount of analysis and documentation that has to be redone is much less than is required with the waterfall model.

It is easier to get customer feedback on the development work that has been done.

- Customers can comment on demonstrations of the software and see how much has been implemented.

More rapid delivery and deployment of useful software to the customer is possible.

- Customers are able to use and gain value from the software earlier than is possible with a waterfall process.

Incremental development problems

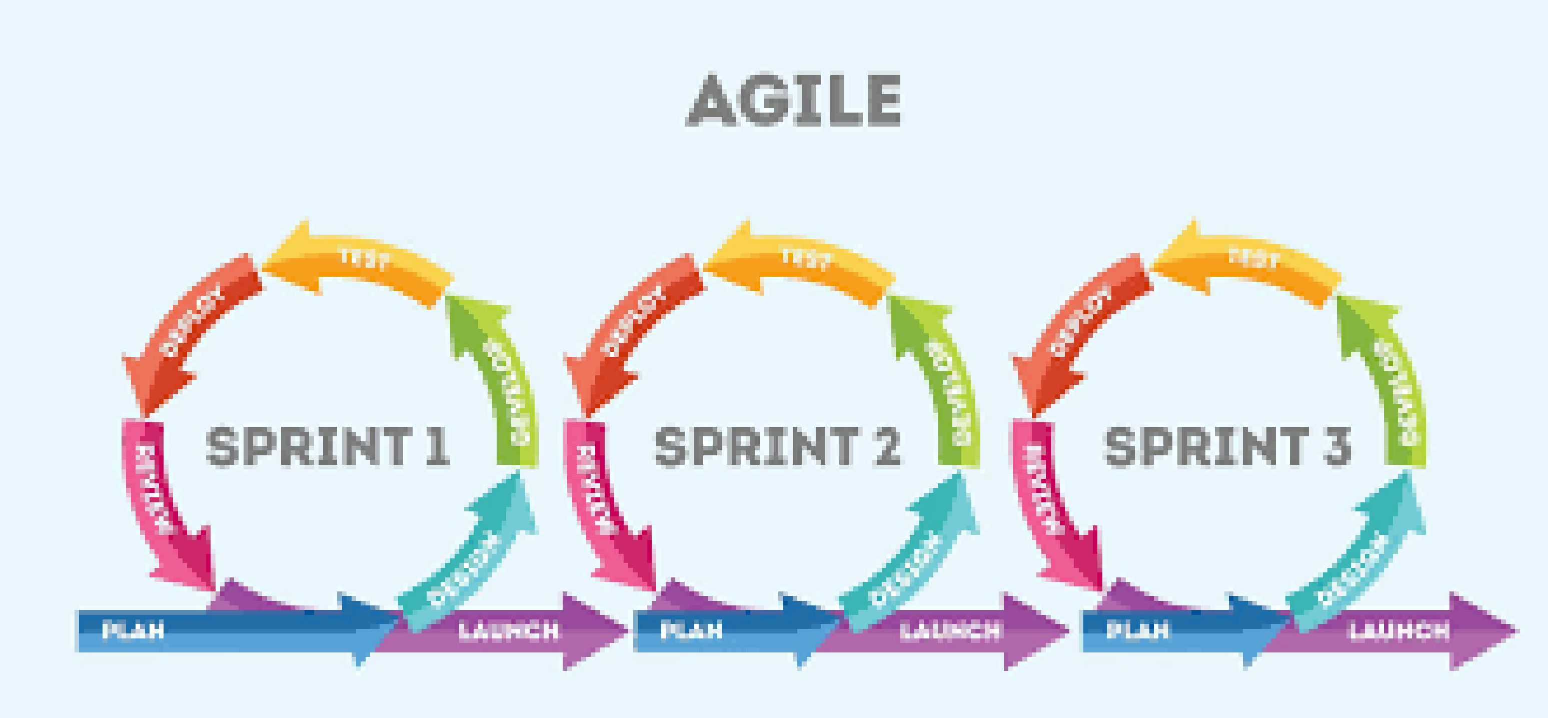
The process is not visible.

- Managers need regular deliverables to measure progress. If systems are developed quickly, it is not cost-effective to produce documents that reflect every version of the system.

System structure tends to degrade as new increments are added.

- Unless time and money is spent on refactoring to improve the software, regular change tends to corrupt its structure. Incorporating further software changes becomes increasingly difficult and costly.

Agile Development



Agile Development

Agile - able to move quickly and easily.

Agile term echoes flexibility and quickness

Customer Satisfaction

Projects are divided into small manageable parts known as iterations or sprints

Continuous Feedback

UML Diagrams

User Case Diagram

Sequence Diagram

https://circle.visual-paradigm.com/docs/uml-and-requirement-diagram/