University of Science, VNU-HCM
Faculty of Information Technology

# Introduction

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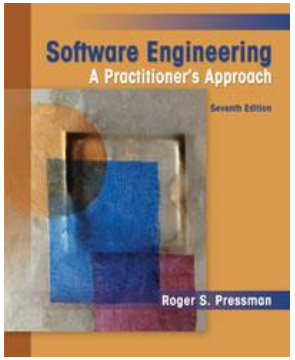
## Software Analysis and Design

# References

Software Engineering: A Practitioner's Approach (7th Edition)

by Roger S Pressman

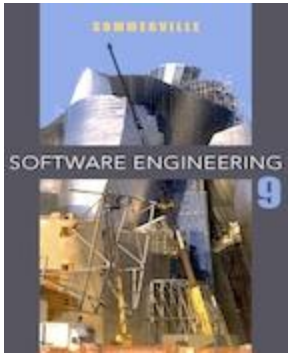
McGraw-Hill, 2009




Software Engineering (9th Edition)

by Ian Sommerville

Addison Wesley, 2010




Course “Mastering Object-Oriented Analysis and Design with UML 2.0”

by IBM Software Group

# What is software?

"Computer programs and associated documentation. Software products may be developed for a particular customer or may be developed for a general market."

*(Ian Sommerville, Software Engineering (9th Edition), Addison Wesley, 2010)*

"Software is (1) instructions (computer programs) that when executed provide desired function and performance, (2) data structures that enable the programs to adequately manipulate information, and (3) documents that describe the operation and use of the programs."

*(Roger S Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009)*

"Computer software is the product that software engineers design and build. It encompasses programs that execute within a computer of any size and architecture, documents that encompass hard-copy and virtual forms, and data that combine numbers and text but also includes representations of pictorial, video, and audio information."

*(Roger S Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009)*

# What is software?

What is the concept of software that I was taught when I was an undergraduate student?

> **"Chương trình** thực thi được trên **máy tính** nhằm **hỗ trợ** cho các **nhà chuyên môn** trong từng **lĩnh vực chuyên ngành** thực hiện **tốt hơn** các thao tác **nghiệp vụ** của mình
>
> *(From the lectures on Software Engineering of Prof. NGUYEN Tien Huy, HCMUS, VNU-HCM, 1999)*

# What is software?

- Executing environment for software:
  - Traditional computing environment: mainframes, computers, laptops, …
  - Mobile devices: smart phones, PDAs, tablet PCs…
  - Other devices: set-top boxes, cameras, routers, firewalls…
- How to provide better services to users?
  - Computerize business processes that are being processed manually
  - Improve existing computerized functionalities of business processes
  - Propose and develop new functionalities for new/existing business processes

# Software applications

- Some types of software applications:
  - System software
  - Real-time software
  - Business software
  - Engineering and scientific software
  - Embedded software
  - Personal computer software
  - Web-based software
  - Artificial intelligence software
  - …

# What is software engineering?

"Software engineering is an engineering discipline which is concerned with all aspects of software production."

*(Ian Sommerville, Software Engineering (9th Edition), Addison Wesley, 2010)*

"[Software engineering is] the establishment and use of sound engineering principles in order to obtain economically software that is reliable and works efficiently on real machines."

*(Fritz Bauer, Software Engineering: A Report on a Conference Sponsored by the NATO Science Committee, NATO, 1969, Editors: P. Naur and B. Randall)*

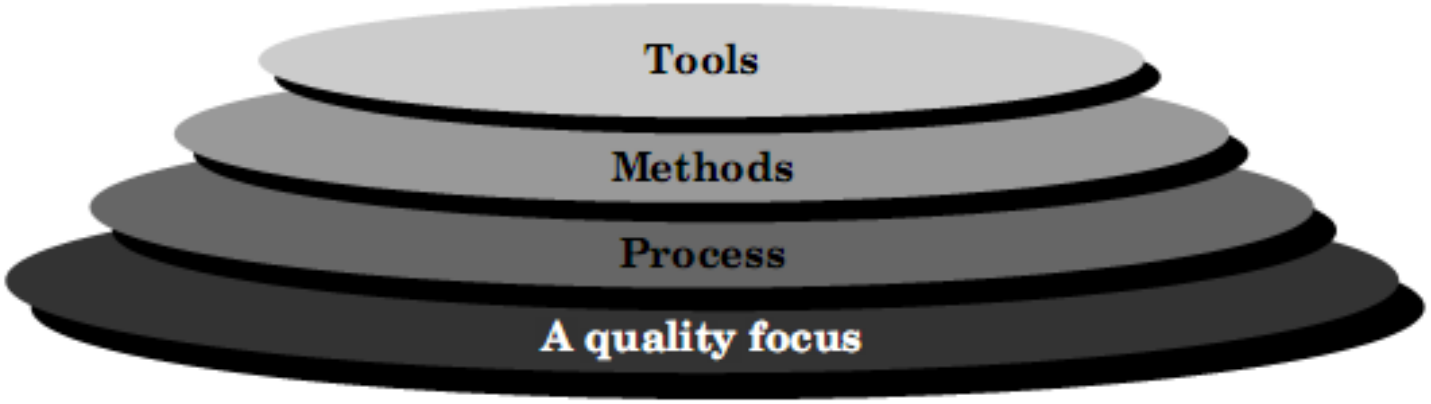
"Software Engineering:

(1) The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software.

(2) The study of approaches as in (1)."

*(IEEE Standards Collection: Software Engineering, IEEE Standard 610.12—1990, IEEE, 1993.)*

# Software engineering layers




Software engineering layers

*(Source: Roger S Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009)*

- Process defines a framework for a set of key process areas that must be established for effective delivery of software engineering technology.
- Software engineering methods provide the technical how-to's for building software.
- Software engineering tools provide automated or semi-automated support for the process and the methods.

# Software production lines

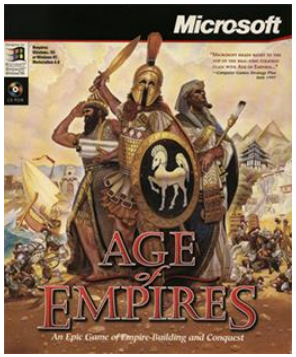
- Software product lines or application families:
  - A product line is a set of applications with a common application-specific architecture. Each specific application is specialised in some way
  - An application type is generalised around a common architecture so that it can be adapted for different customers.

*(Ian Sommerville, Software Engineering (9th Edition), Addison Wesley, 2010)*

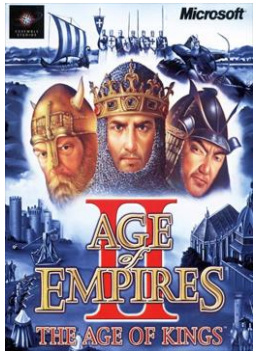
  - Some types of specialisation of a software product line:
    - Platform specialisation
    - Environment specialisation
    - Functional specialisation
    - Process specialisation

# Software production lines

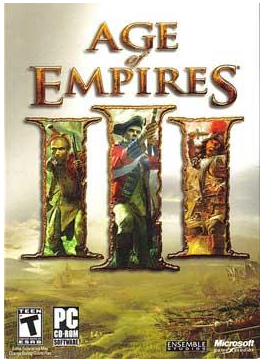
Age of Empires



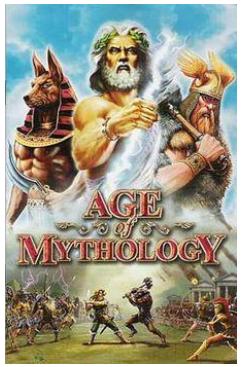

Age of Empires II

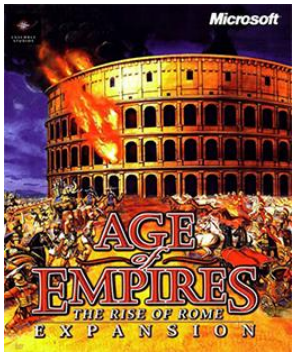



Age of Empires III

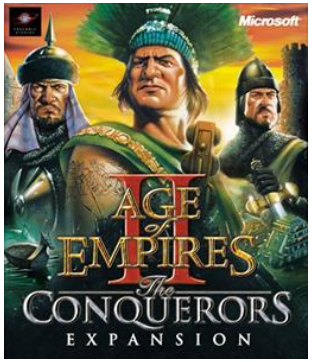



Age of Mythology

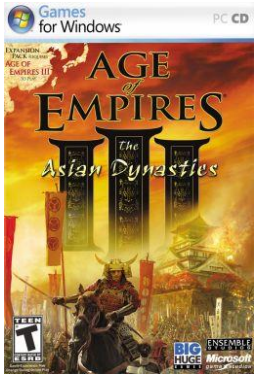


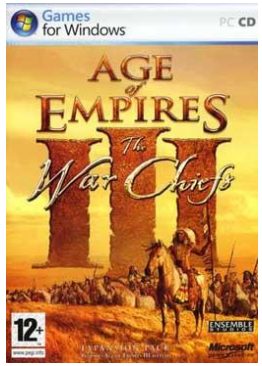

The rise of Rome



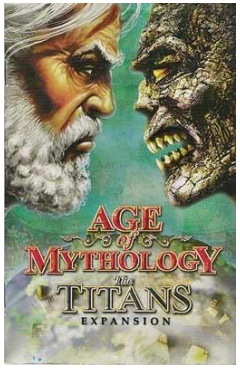

The Conquerors




The Asian Dynasties




The WarChiefs




The Titans

# What are the attributes of good software?

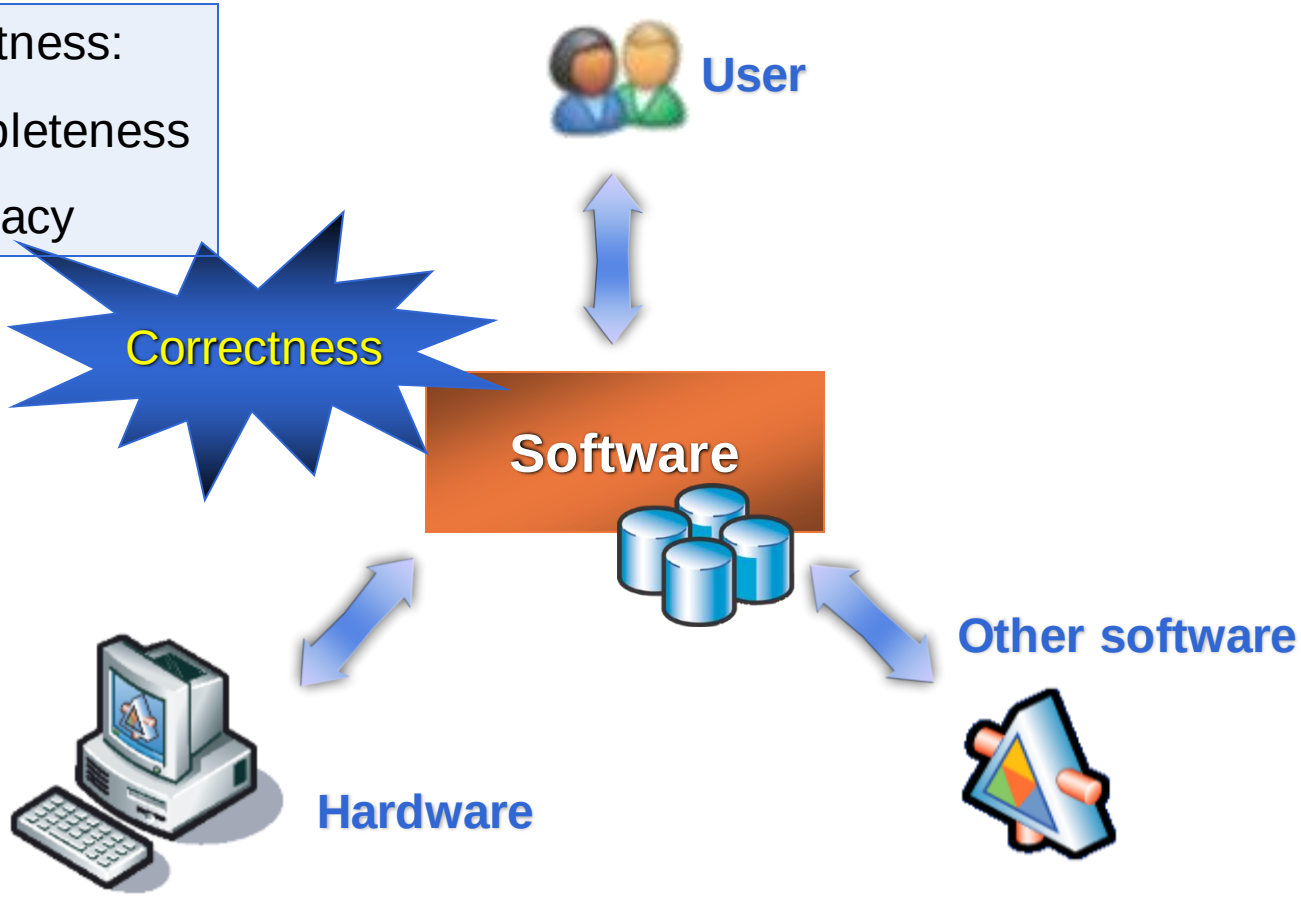
- The software should deliver the required functionality and performance to the user and should be maintainable, dependable and usable.

  *(Ian Sommerville, Software Engineering (9th Edition), Addison Wesley, 2010)*

# Characteristics of a good software?

Correctness:

- Completeness
- Accuracy

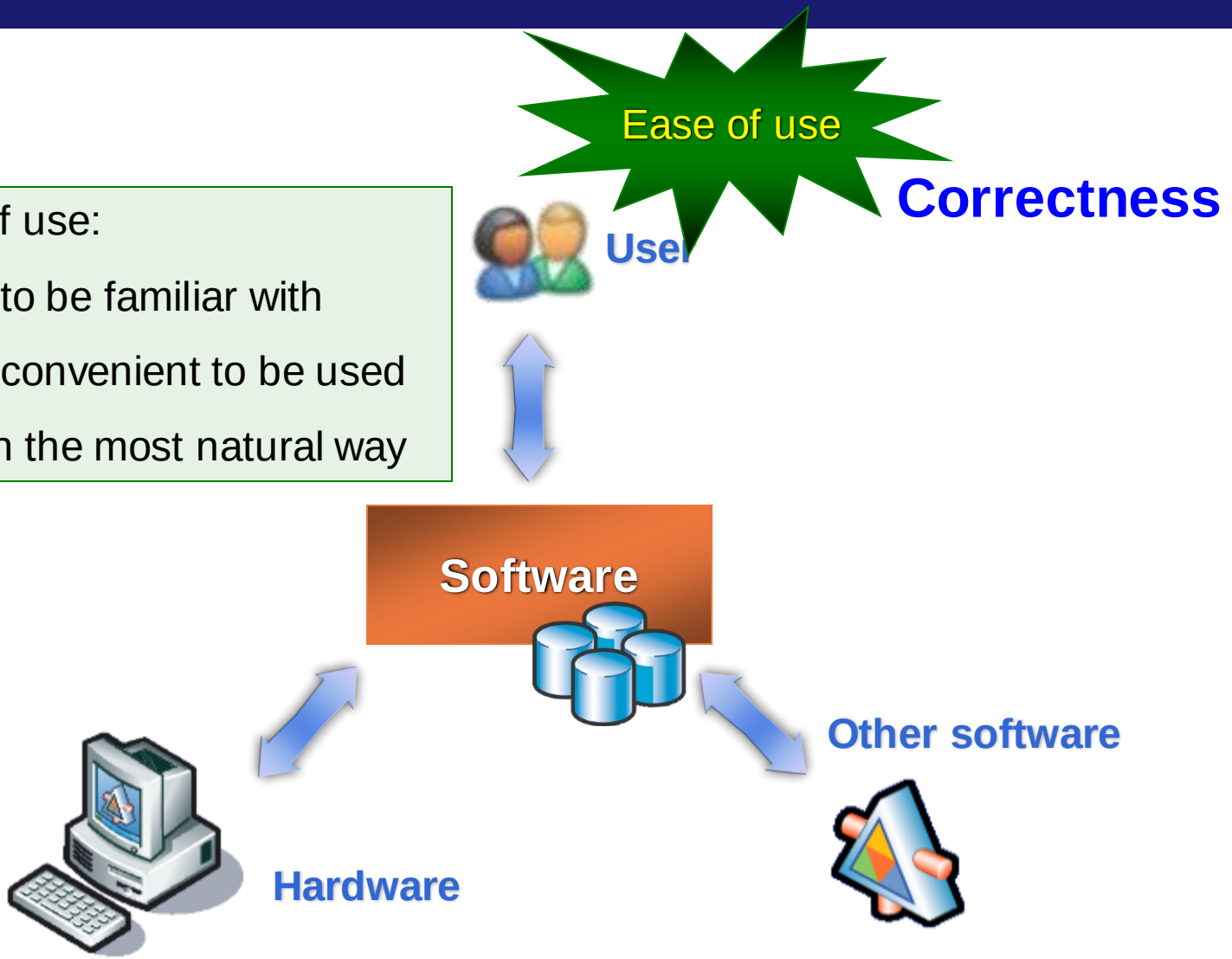



From a user's view point

# Characteristics of a good software?

Ease of use:

- Easy to be familiar with
- Easy/convenient to be used
- Use in the most natural way

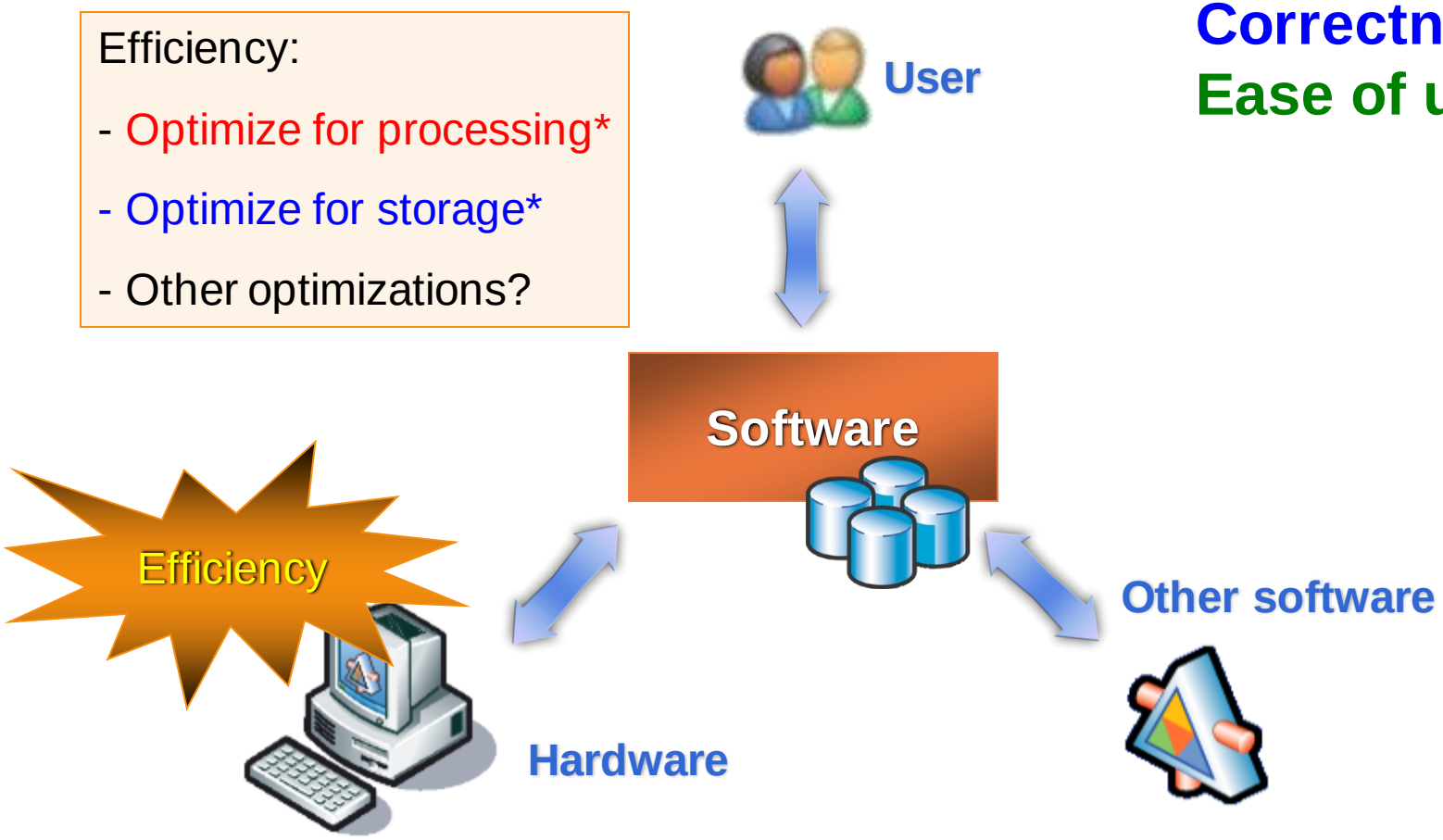



From a user's view point

# Characteristics of a good software?

Efficiency:

- Optimize for processing*
- Optimize for storage*
- Other optimizations?




**Correctness**
**Ease of use**

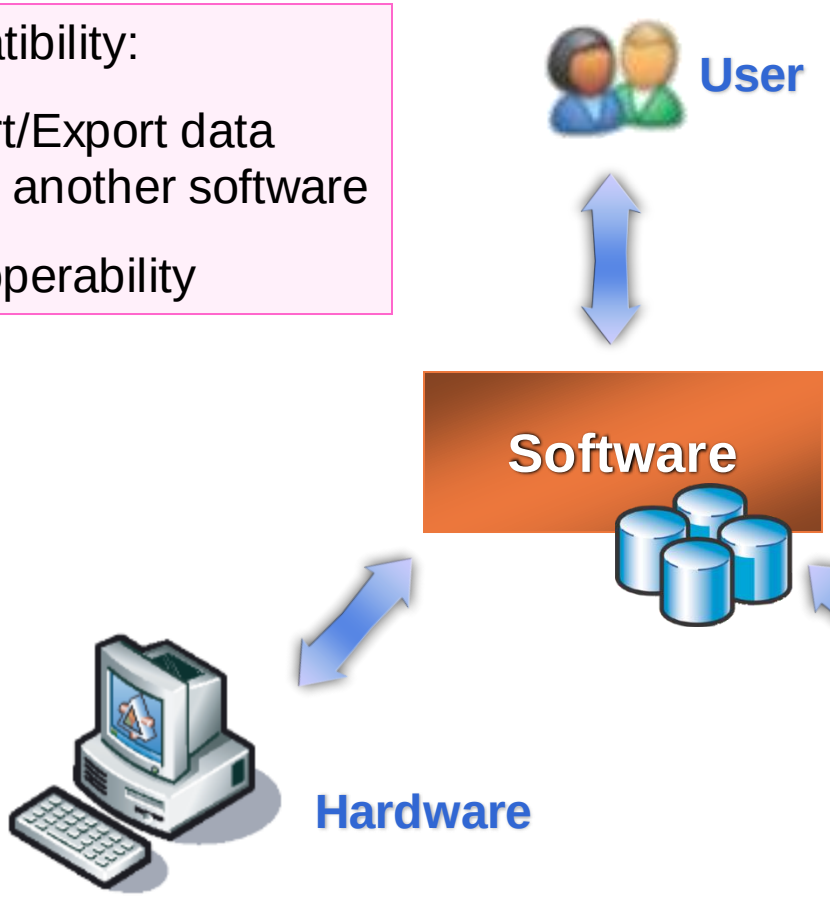
From a user's view point

# Characteristics of a good software?

Compatibility:

- Import/Export data from/to another software

- Interoperability

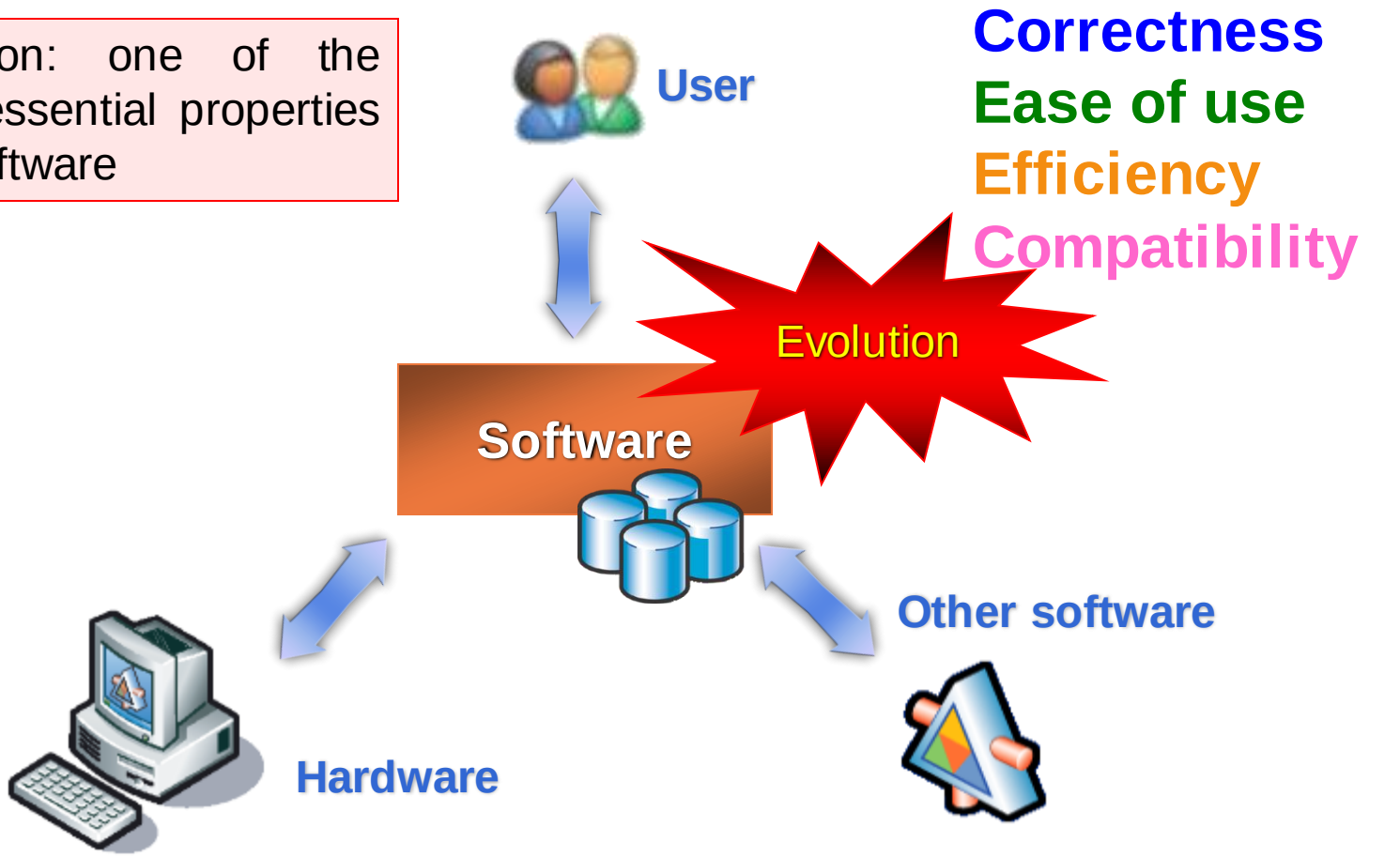



**Correctness**
**Ease of use**
**Efficiency**

From a user's view point

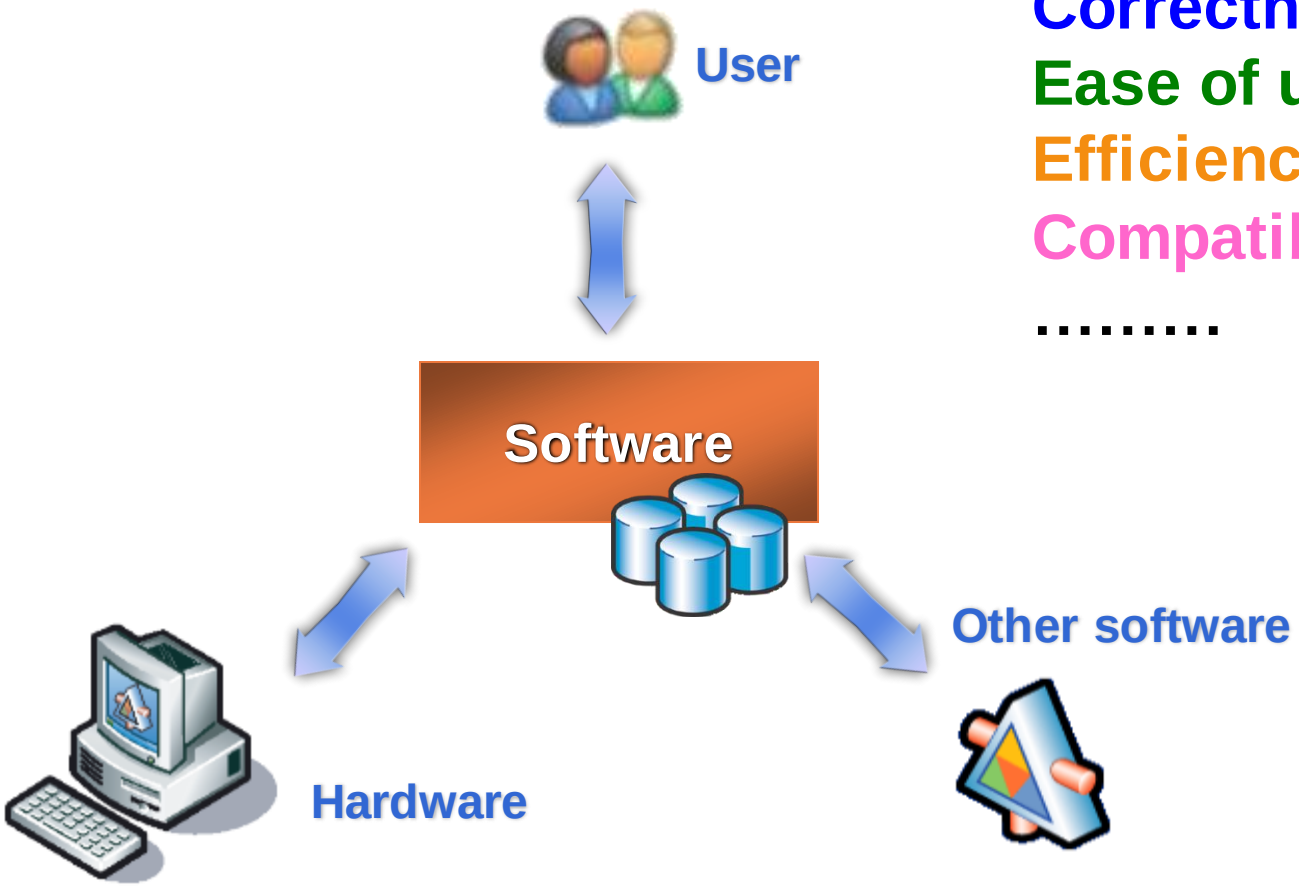
# Characteristics of a good software?

Evolution: one of the most essential properties of a software




From a user's view point

# Characteristics of a good software?




**Evolution**
**Correctness**
**Ease of use**
**Efficiency**
**Compatibility**
**.....**

From a user's view point

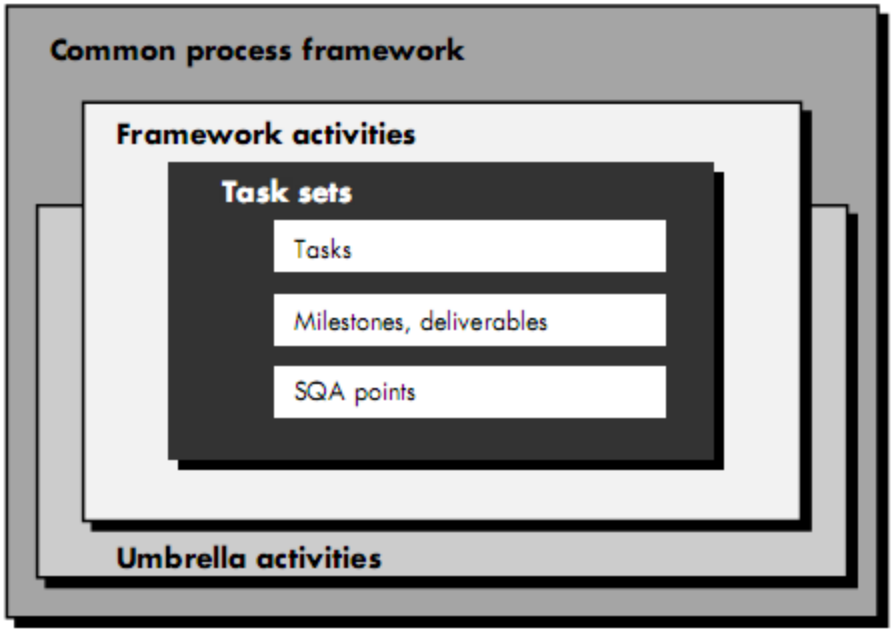
# Characteristics of a good software?

- A software should be:
  - Easy to be tested/verified
  - Easy to be debugged
  - Easy to find and fix bugs
  - Easy to add/modify functionalities
  - Ease to be (partially/entirely) reused

……

From a software engineer's view point

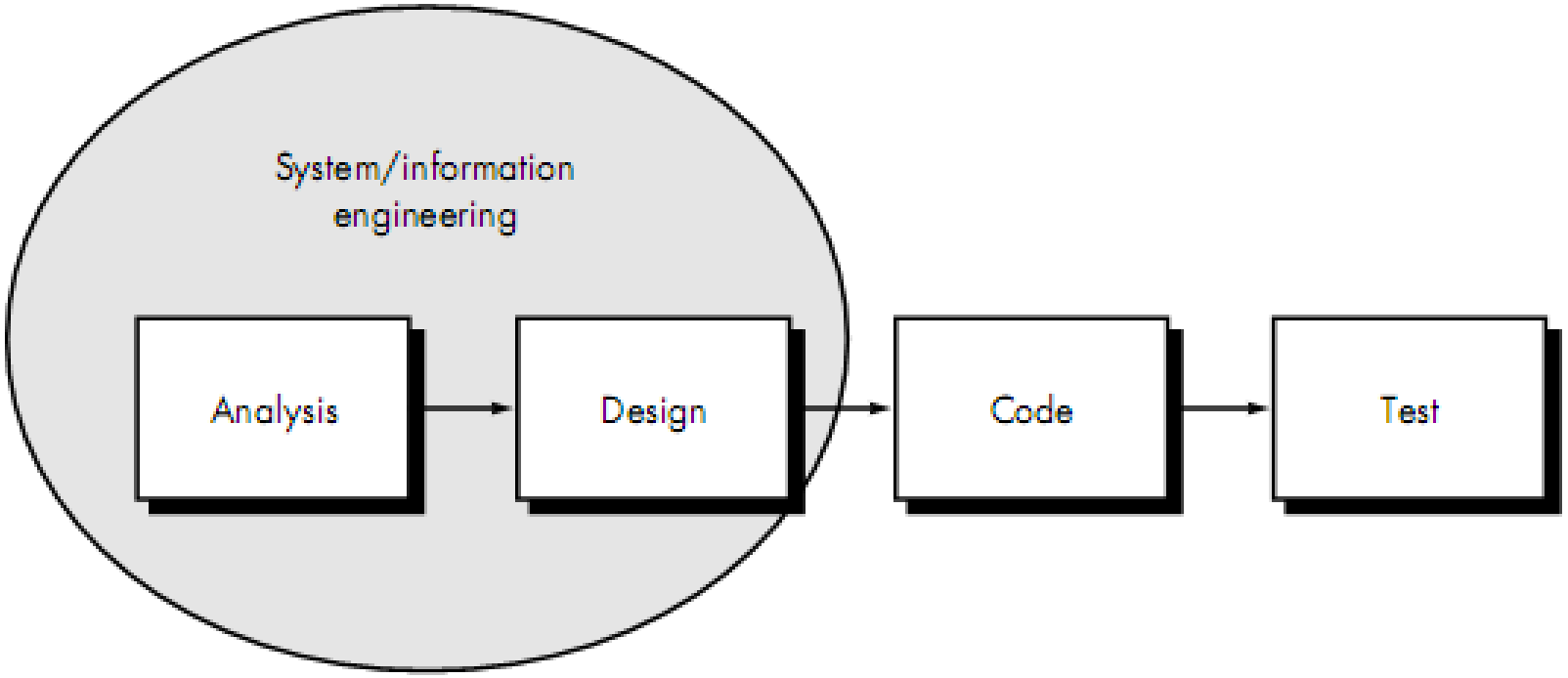
# Software process




Software process

*(Source: Roger S Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009)*

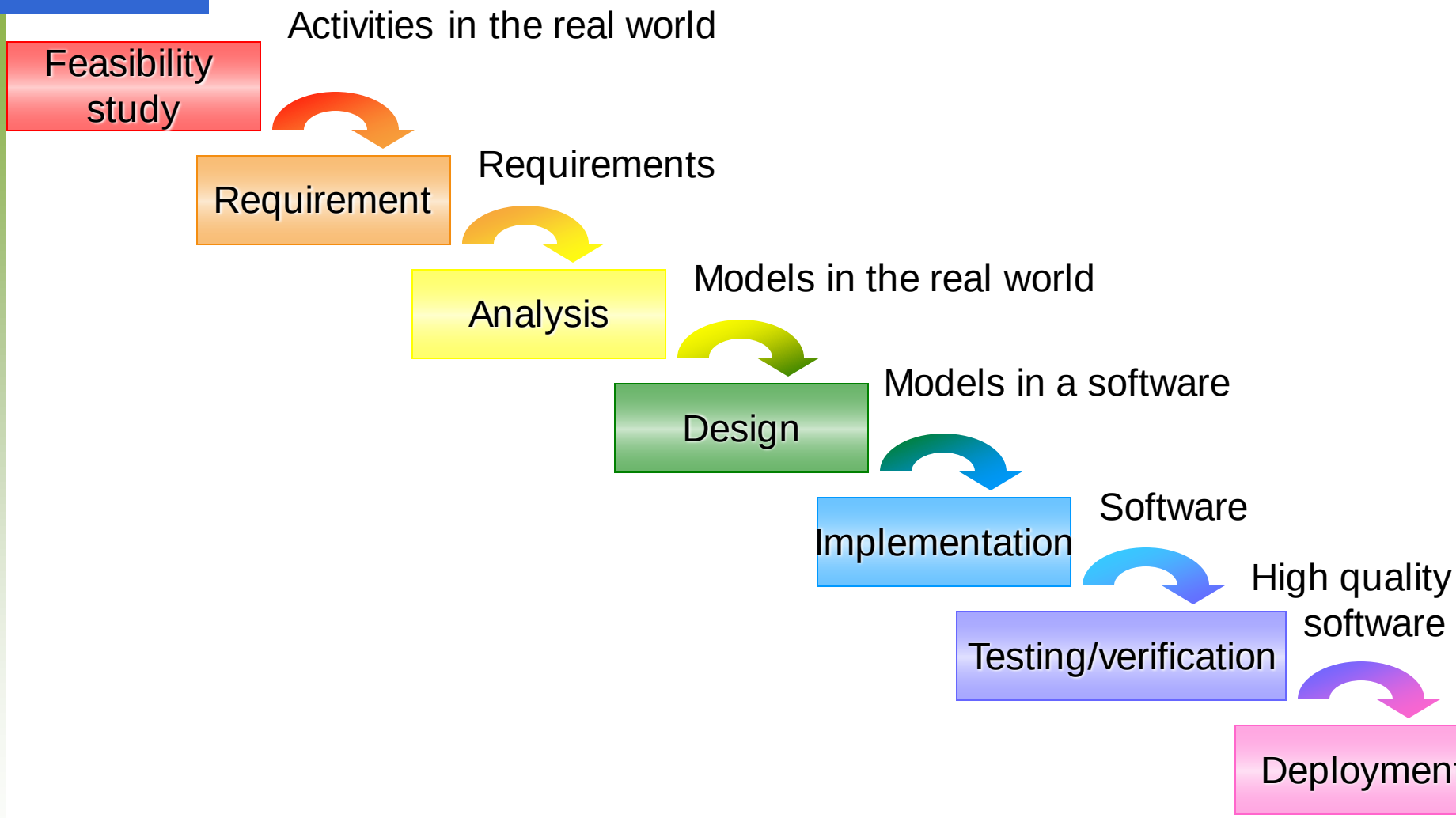
# Waterfall model (linear sequential model)



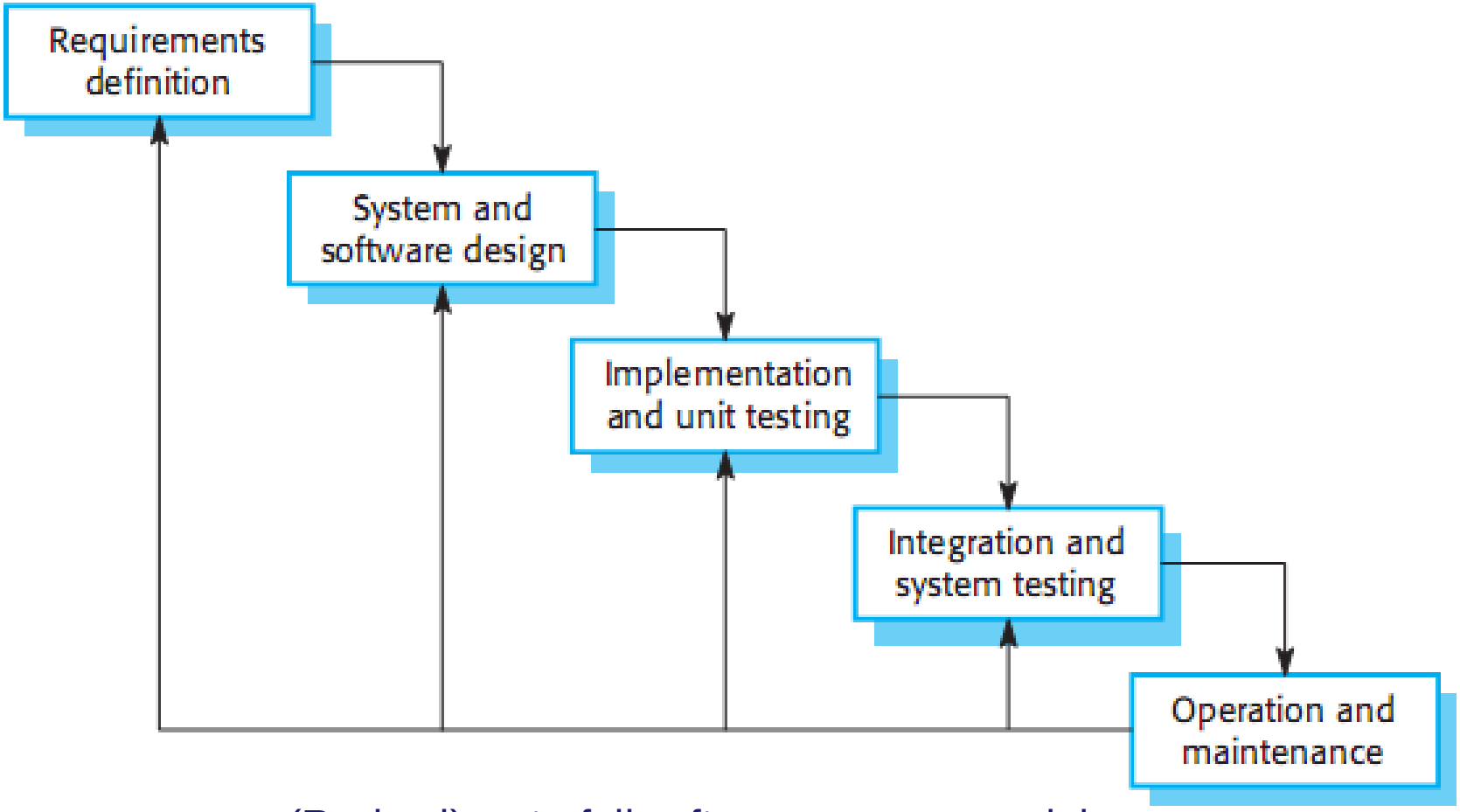

Linear sequential model

*(Source: Roger S Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009)*

# Waterfall model (linear sequential model)

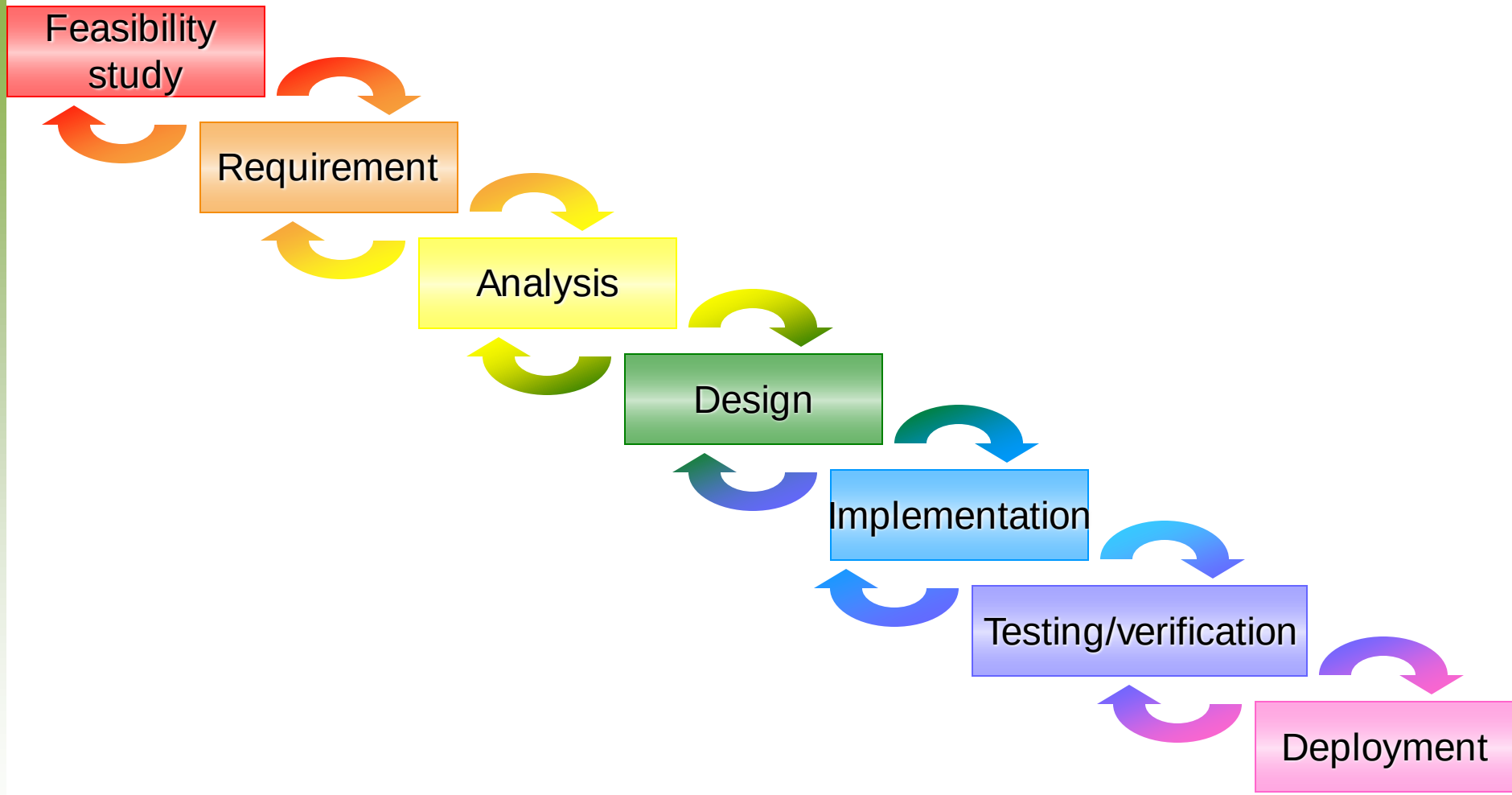


# Waterfall model (linear sequential model)

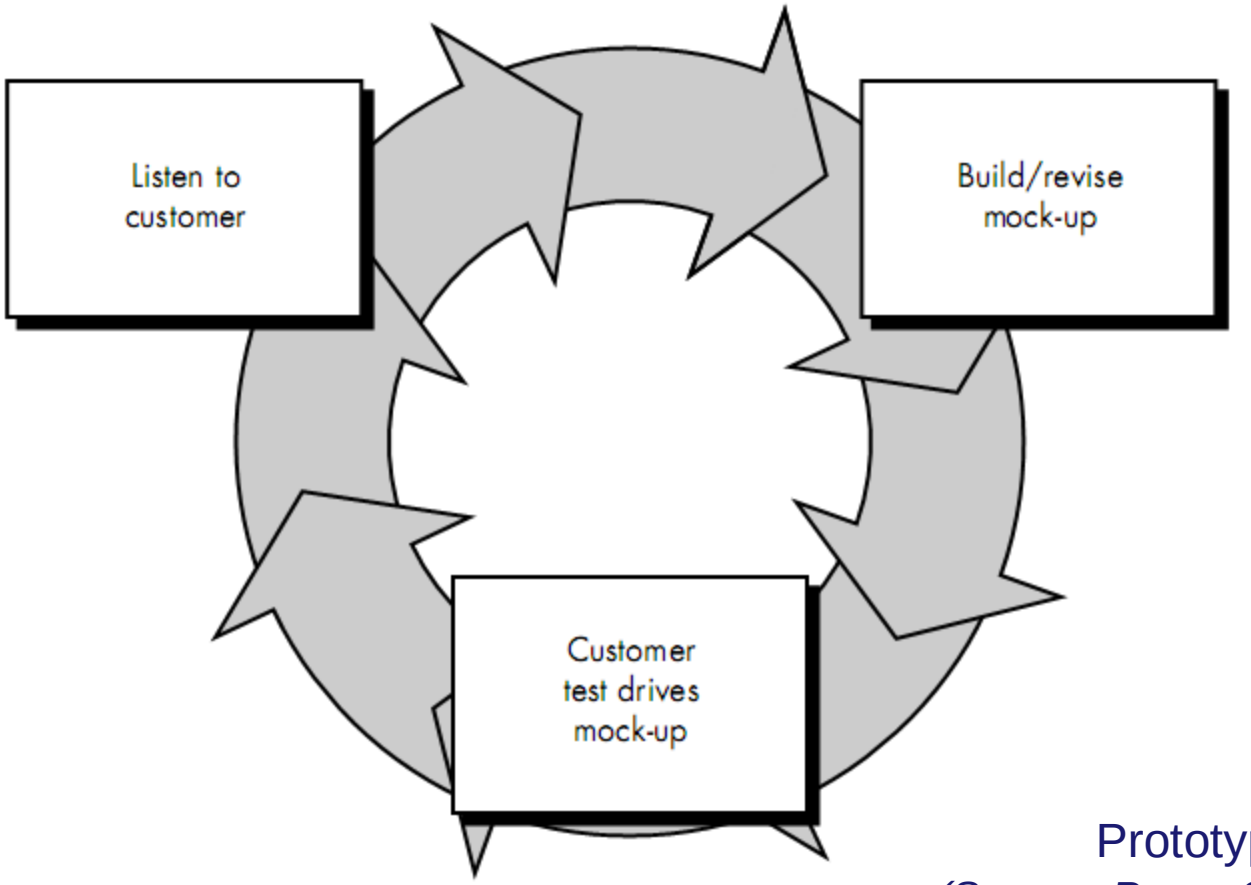



(Revised) waterfall software process model
*(Ian Sommerville, Software Engineering (9th Edition), Addison Wesley, 2010)*

# Waterfall model (linear sequential model)

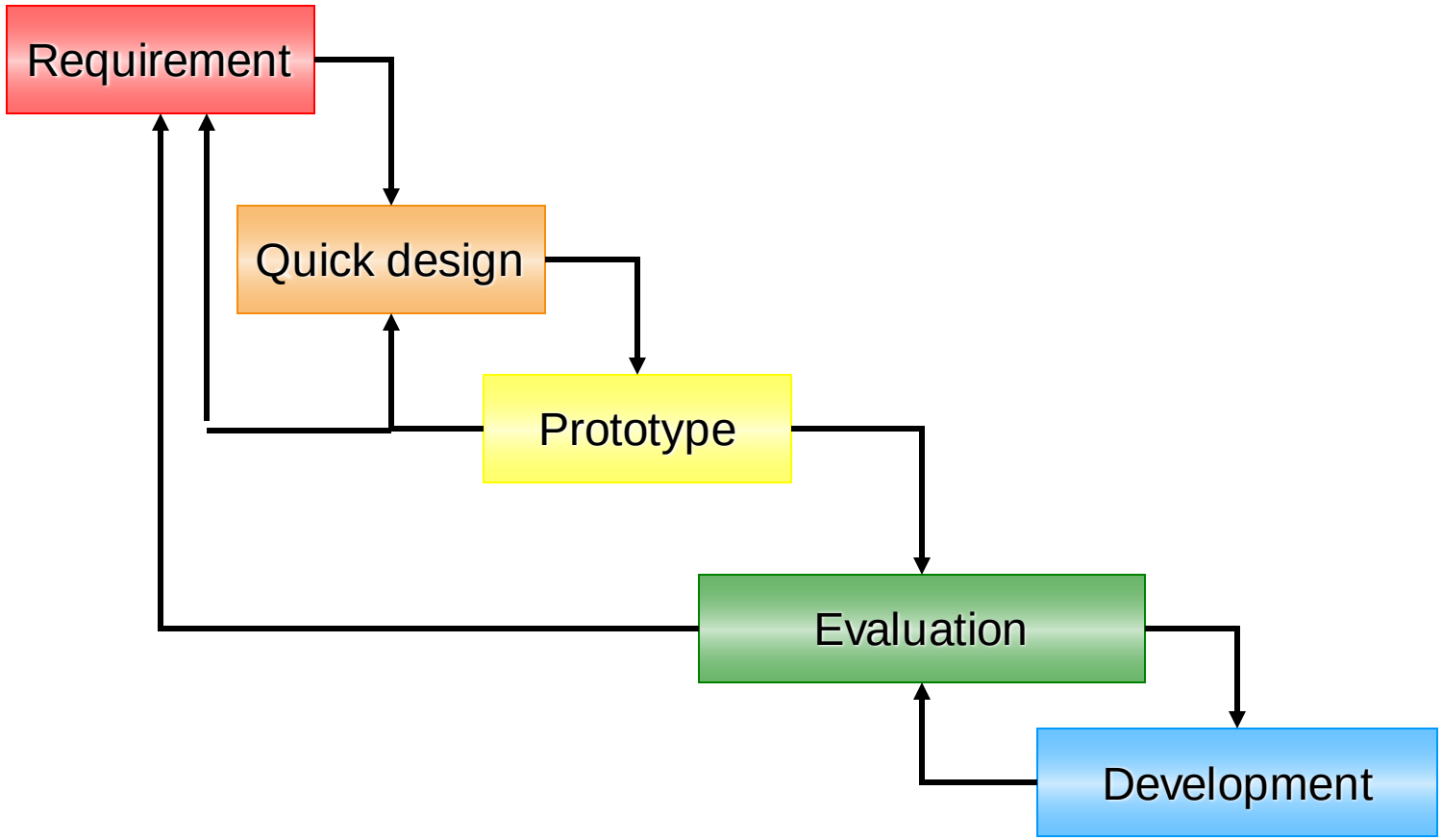


# Prototyping model

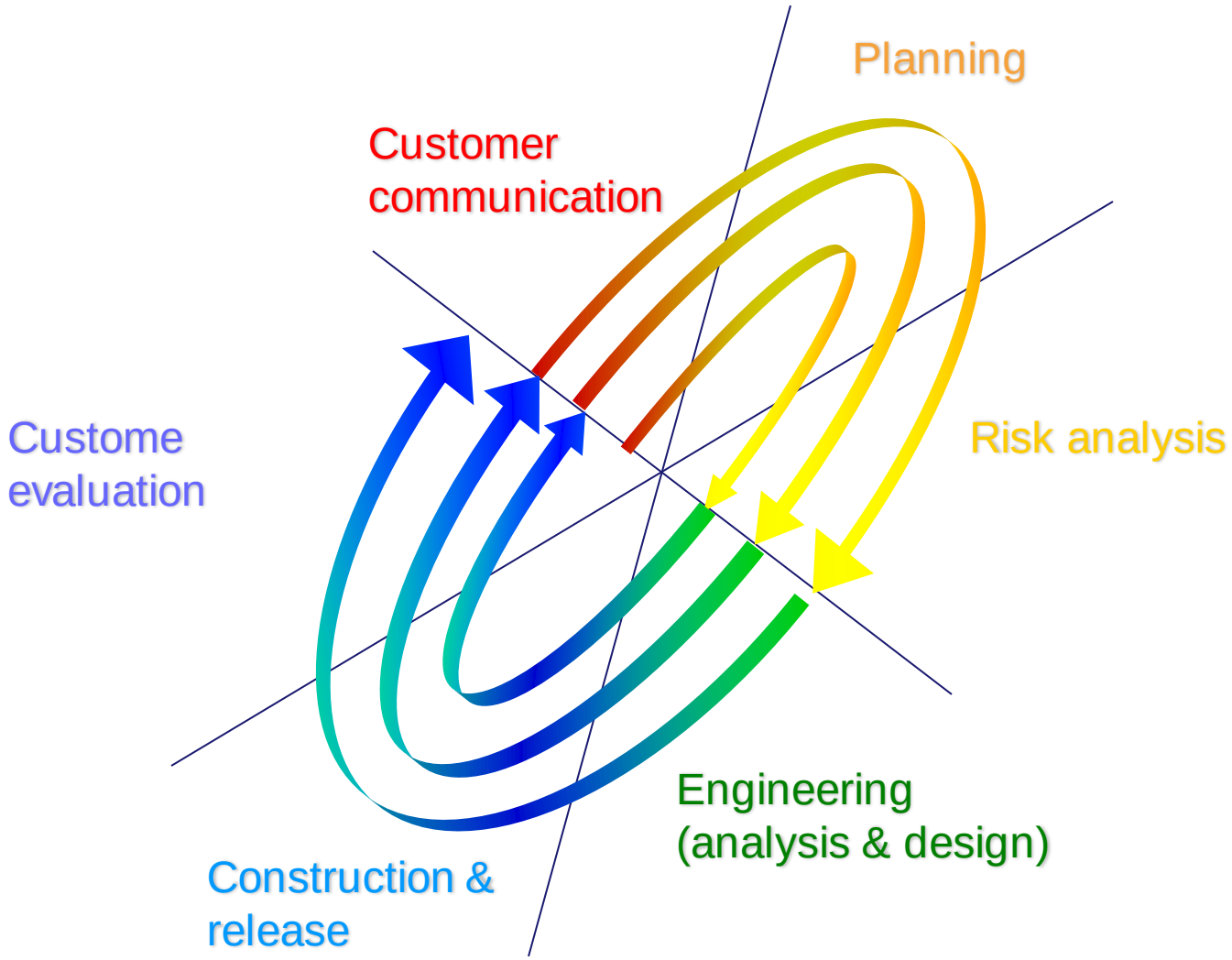



Prototyping model
*(Source: Roger S Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009)*

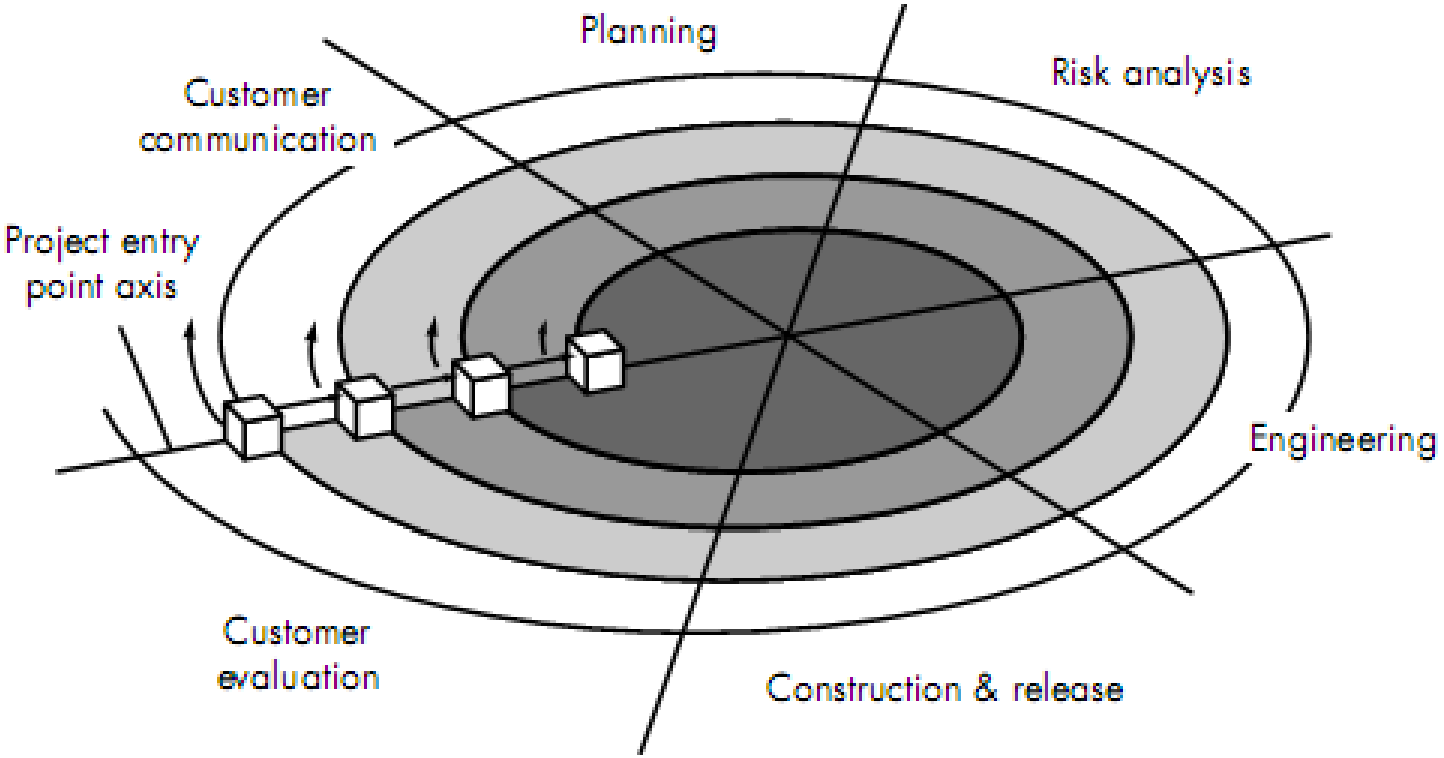
# Prototyping model



# Spiral model



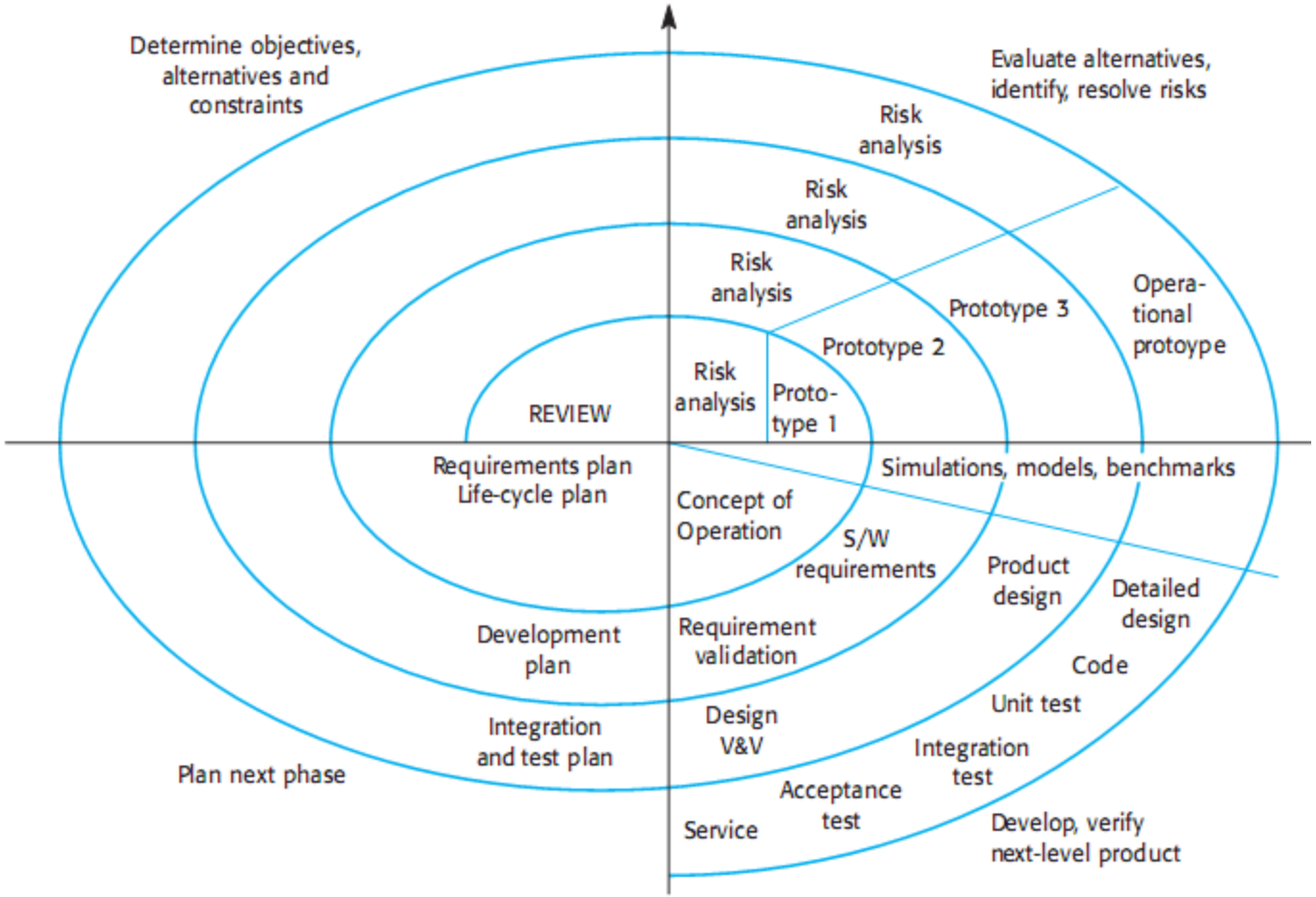
# Spiral model




Spiral model

*(Source: Roger S Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009)*

# Spiral model




Boehm's spiral model of the software process
*(Ian Sommerville, Software Engineering (9th Edition), Addison Wesley, 2010)*

# Development of software engineering

- Refer to textbooks…

# Problems in software development

- Refer to textbooks and Module 1: Best Practices of Software Engineering in the course Mastering Object-Oriented Analysis and Design with UML 2.0 by IBM Software Group