Software Development (Chapter 7)

CSE 1020

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November 3, 2009

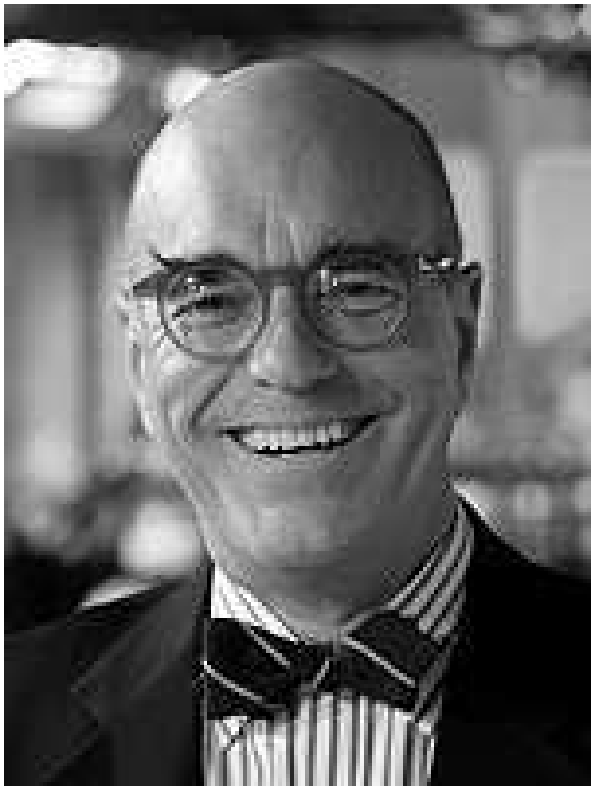
As we have already seen in Chapter 3, the process of software development consists of several phases including

- analysis
- design
- implementation
- testing
- maintenance

Analyst

An analyst is responsible for translating the requirements of the customer into a specification.

Software Engineering Requirements (CSE4312)



Stephen LeDrew

(political analyst)

Designer

A designer/architect is responsible for developing a plan/algorithm to fulfill the specification.

Fundamentals of Data Structures (CSE2011) and Design and Analysis of Algorithms (CSE3101)

Karl Lagerfeld

(fashion designer)

Developer

A developer/implementer is responsible for writing code that implements the algorithm.

Introduction to Computer Science I and II (CSE1020 and CSE1030)

Donald Trump

(real estate developer)

Developer

- databases
  Introduction to Databases (CSE3412)
- networks
  Computer Network Protocols and Applications (CSE3214)
- applications
  Introduction to Computer Science I and II (CSE1020 and CSE1030)

Tester

A tester is responsible for checking whether the code satisfies the specification.

Software Engineering Testing (CSE4313)

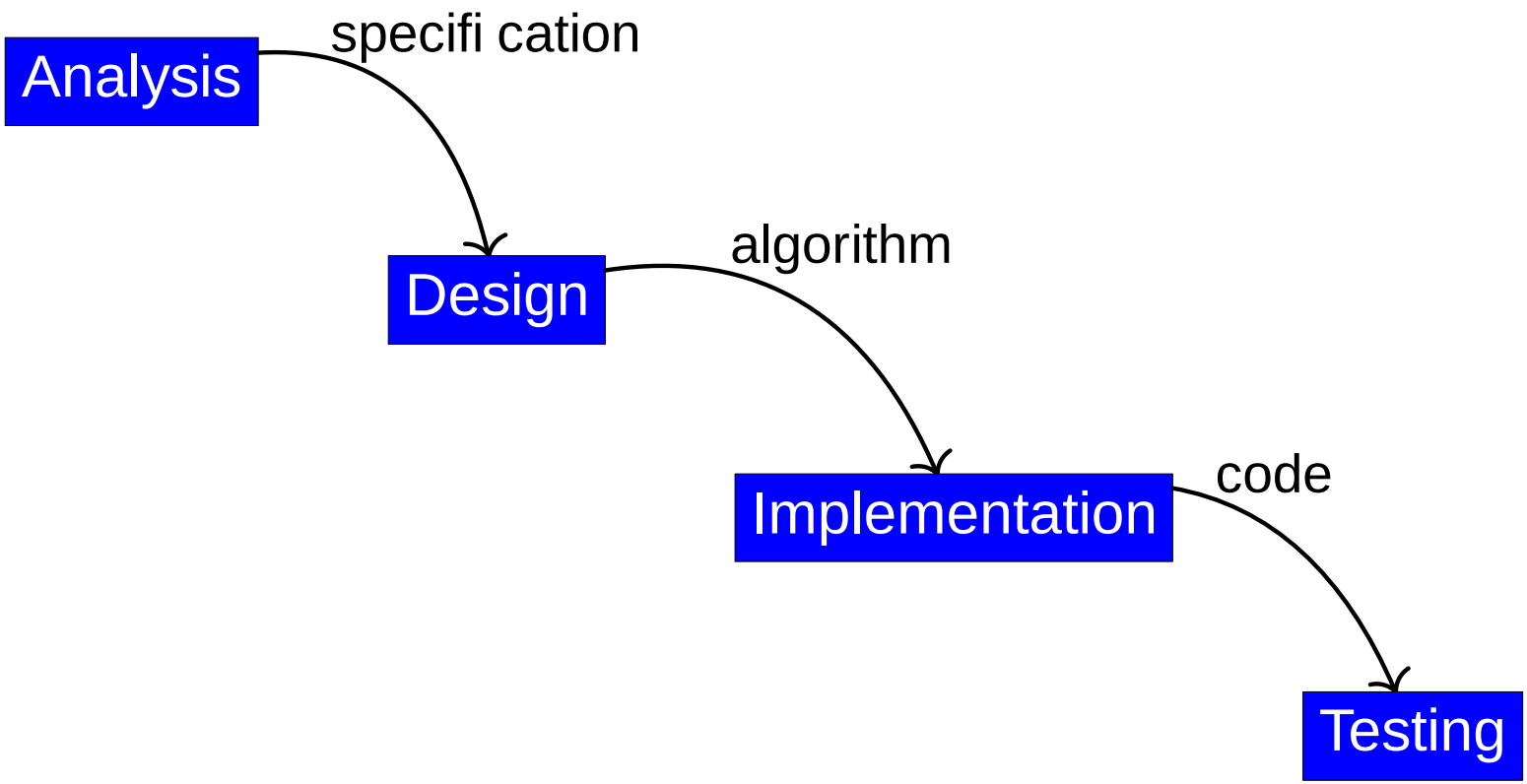
Jon Tester

(senator from Montana)

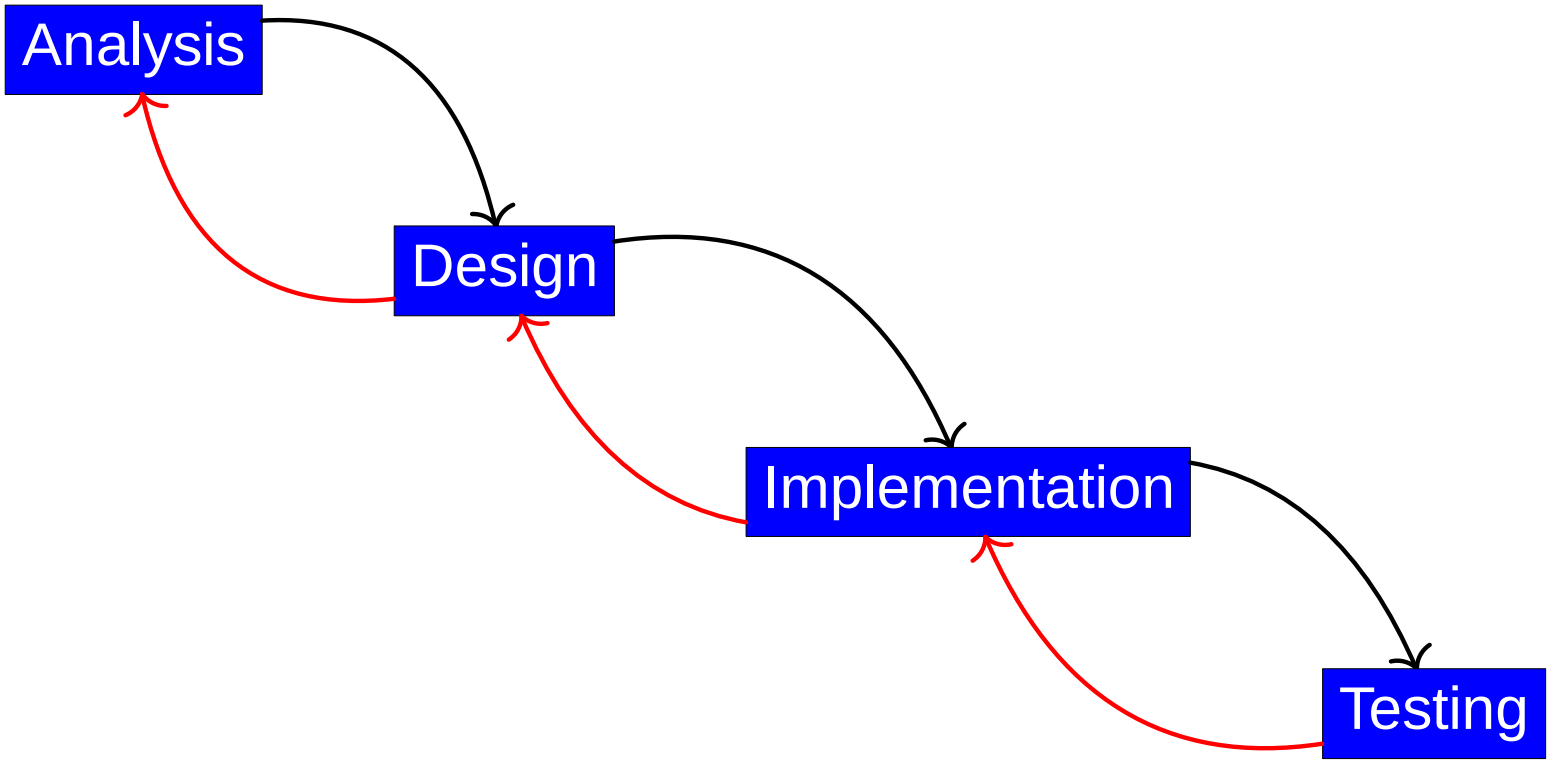
Team Composition

analysts	25%
designers	10%
developers	40%
testers	25%

How does the information flow?

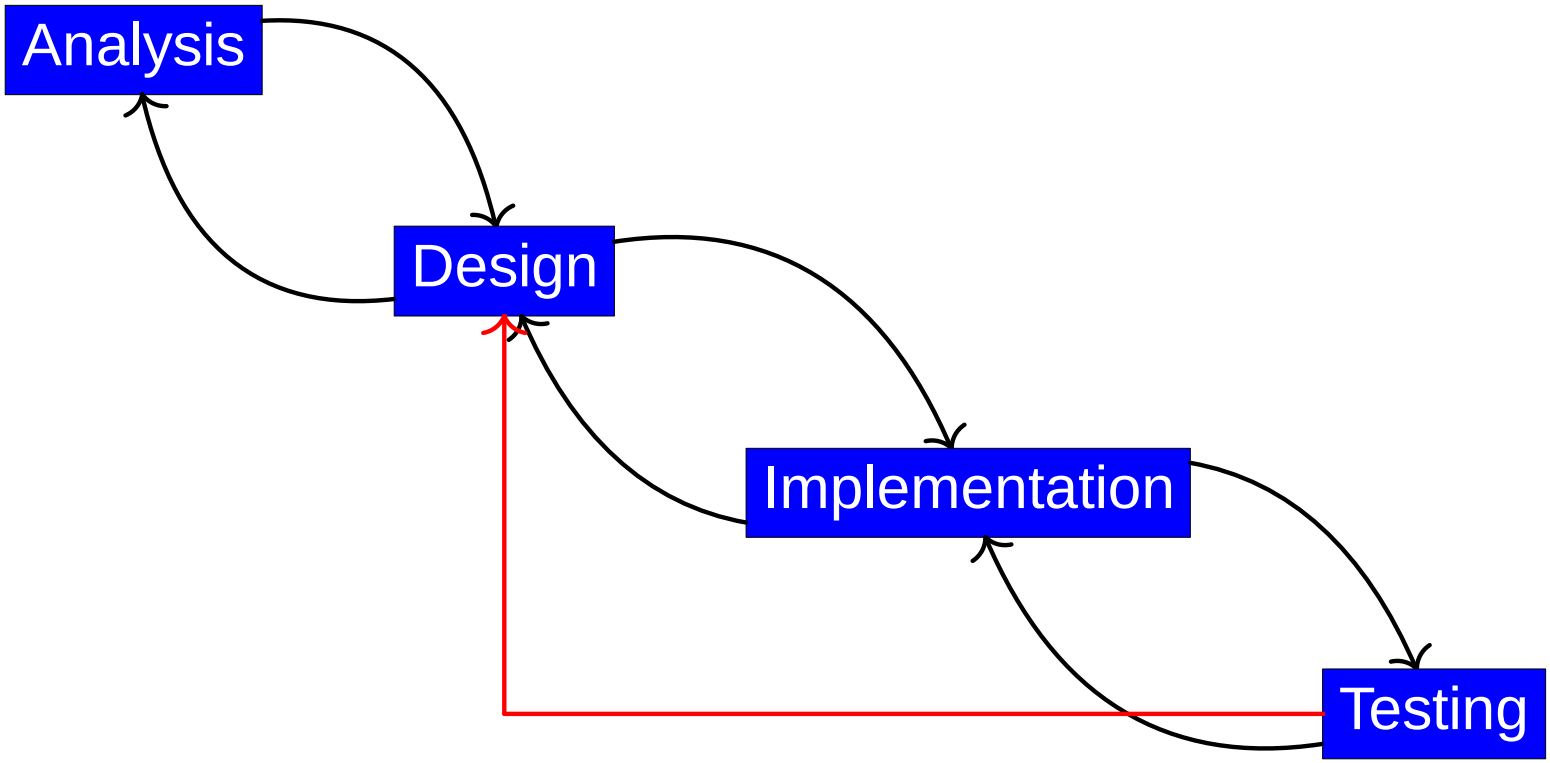


How does our team collaborate?



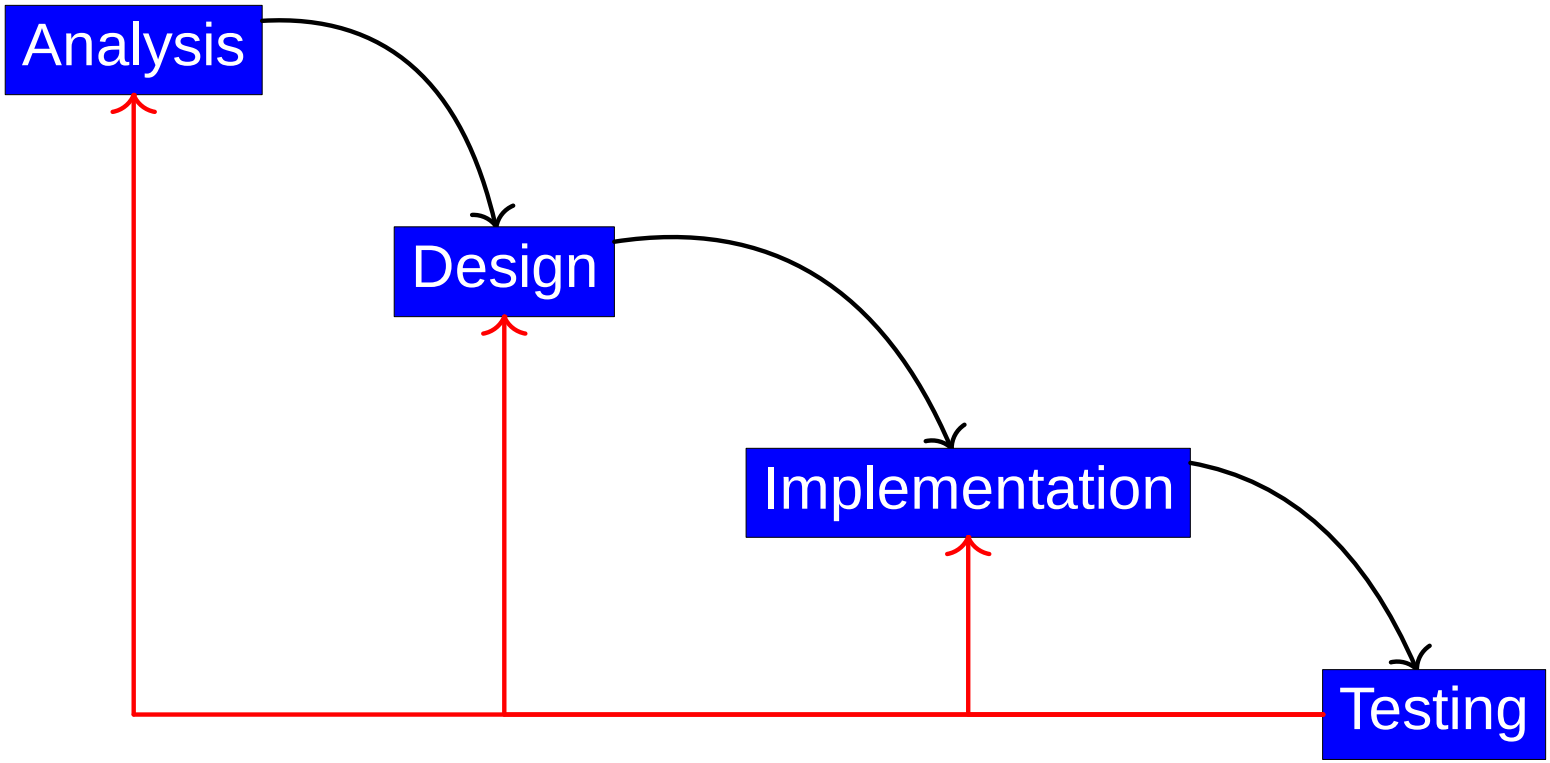
In an ideal world, a phase only has impact on the ones immediately before and after it. However, . . .

Testing may have impact on design



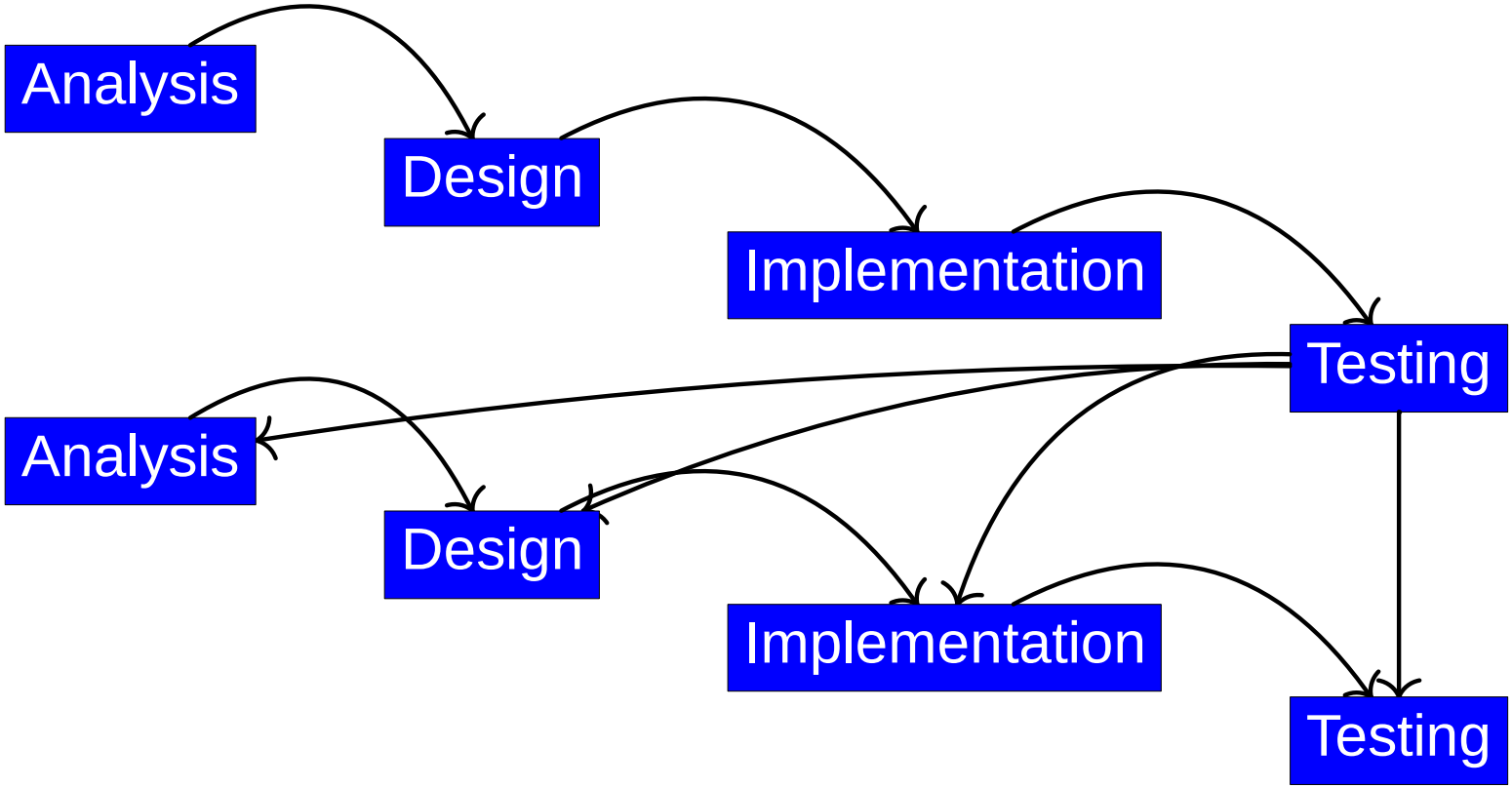
Winston W. Royce. Managing the development of large software systems. In *Proceedings of WESCON*, pages 1–9, Los Angeles, CA, USA, August 1970. IEEE.

Waterfall model



Although the waterfall model is often attributed to Royce, neither the above diagram nor the term “waterfall model” can be found in his paper.

Royce's model



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Overview of development methodologies

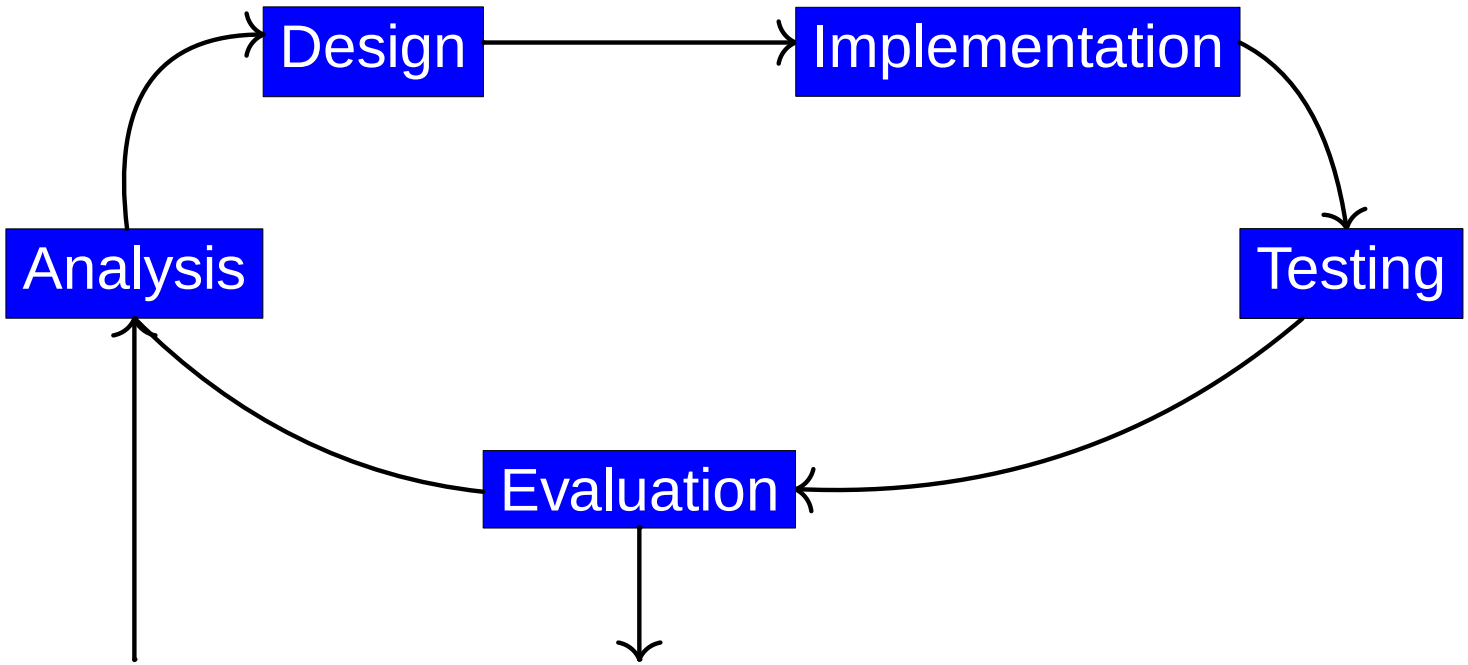
waterfall model	do it once	risky
Royce's model	do it twice	less risky
	do it ...	even less risky

Overview of development methodologies

waterfall model	do it once	risky
Royce's model	do it twice	less risky
IID	do it many times	even less risky

IID = iterative and incremental development

Iterative and Incremental Development



Examples of IID projects

project: command and control system for submarine
decade: 1970s
iterations: four iterations of six months each

Craig Larman and Victor R. Basili. Iterative and incremental development: a brief history. *IEEE Computer*, 36(6):47–56, June 2003.

Examples of IID projects

project: light airborne multipurpose system
decade: 1970s
iterations: 45 iterations of one month each

Craig Larman and Victor R. Basili. Iterative and incremental development: a brief history. *IEEE Computer*, 36(6):47–56, June 2003.

Examples of IID projects

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Different IID methodologies

- extreme programming (XP)
  Software Design (CSE3311)
- rational unified process (RUP)
- . . .

Meet Our Customer

Our customer is visiting Brigus, Cupids, Gatineau, Hamilton, Montreal, Niagara on the lake, Ottawa, Petawawa, St. John's, Toronto, Vancouver and Victoria. He would like an app that provides the current temperatures of those cities.

Analysis

customer: Can you develop such an app for me?

analyst: To limit our risks, we can start with an app that reads the web page of the Weather Network that contains the current temperature of Toronto and prints the HTML of that web page on the screen.

customer: This better be cheap.

analyst: How about a cup of coffee?

customer: Deal.

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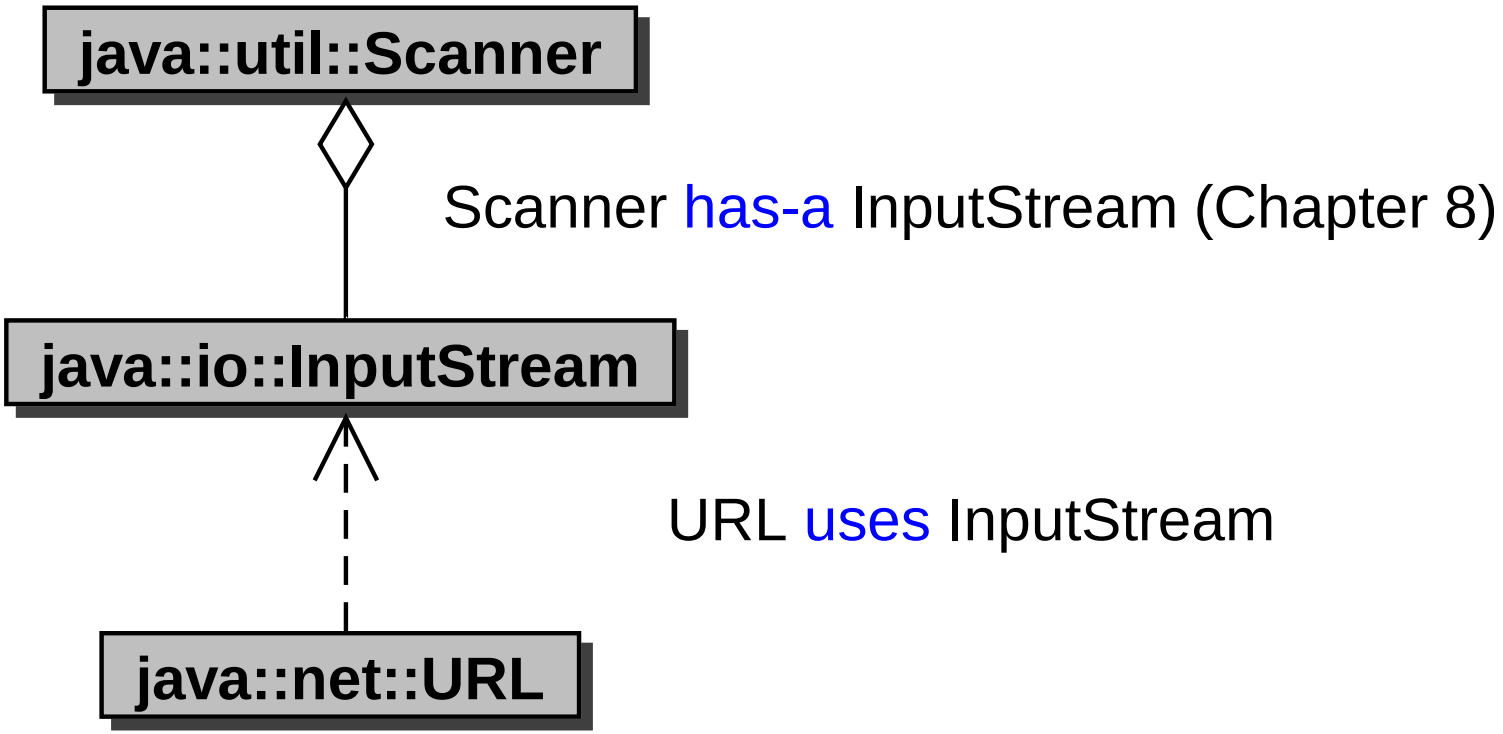
designer: Search the Java standard library.
designer: I have found the classes `Scanner` and `URL`. Which constructor do I use to create a `Scanner` that reads from a `URL`?

Unifi ed Modeling Language (UML)

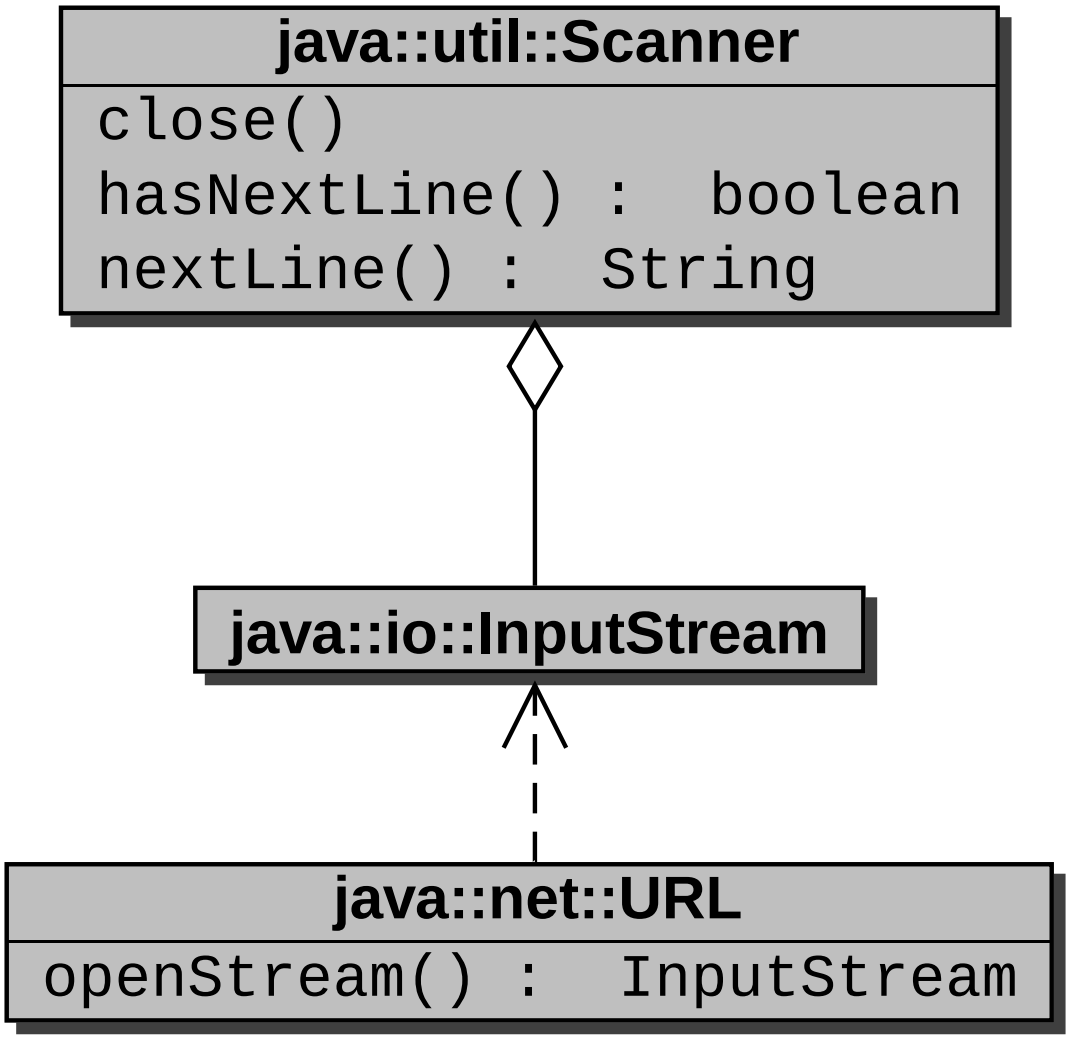
UML was designed by “the three amigos” Grady Booch, Ivar Jacobson and James Rumbaugh in the mid 1990s.

UML provides a large variety of different types of diagrams. These diagrams can be used to model software.

A Class Diagram



A More Detailed Class Diagram



Development

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Compile Time Error

Error message: unreported exception BlaBlaBlaException; must be caught or declared to be thrown

Quick fix: add throws BlaBlaBlaException to the header of the main method

Proper solution: will be discussed in Chapter 11 on exception handling

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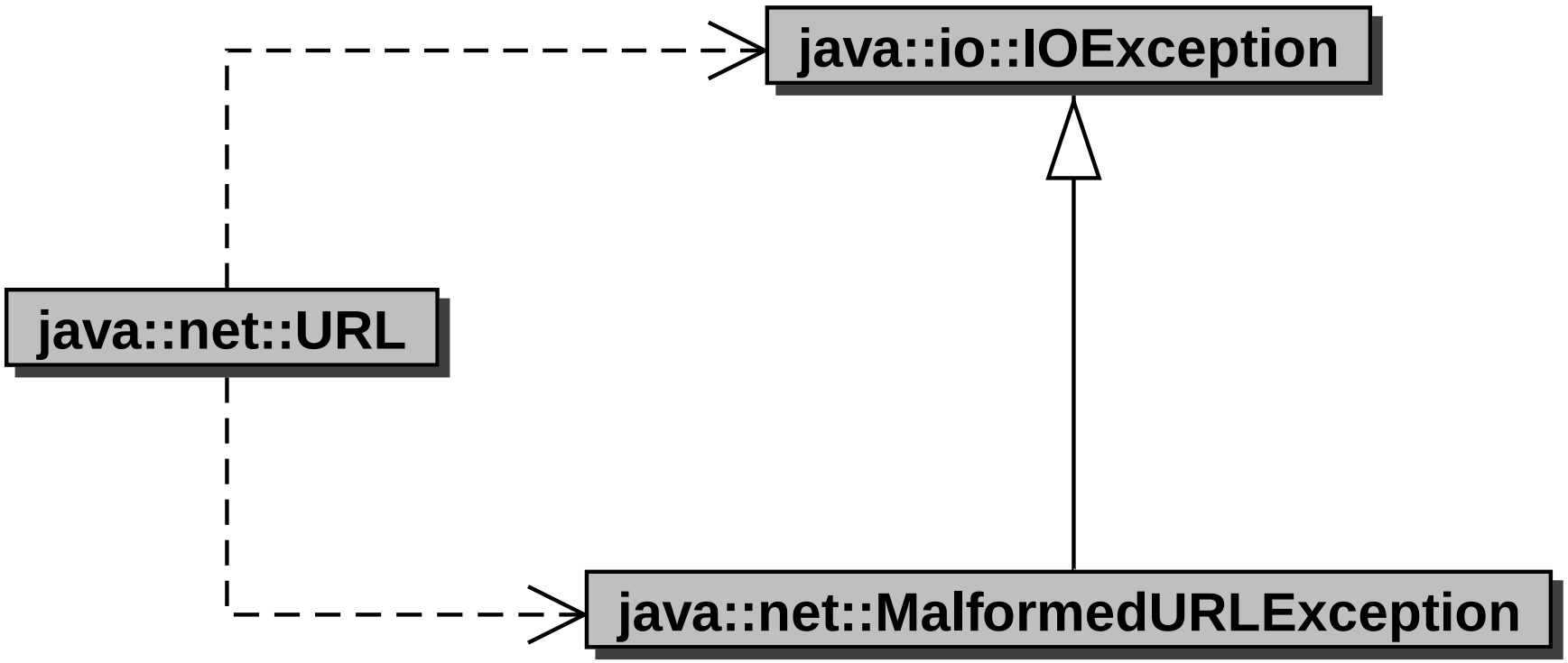
Why only “throws IOException”?



MalformedURLException is a IOException (Chapter 9)

Testing

Question: Should we test?

Based on the software developer and user surveys, the national annual costs of an inadequate infrastructure for software testing is estimated to range from $22.2 to $59.5 billion.

The Economic Impacts of Inadequate Infrastructure for Software Testing. Planning Report 02-3. May 2002.

Answer: Yes!

However ...

“Program testing can be used to show the presence of bugs, but never to show their absence!”

Edsger W. Dijkstra. Notes on structured programming. Report 70-WSK-03, Technological University Eindhoven, April 1970.

Edsger Wybe Dijkstra

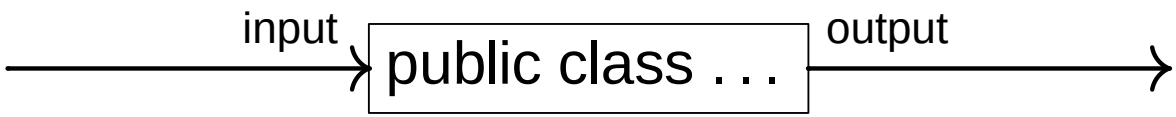
- Member of the Royal Netherlands Academy of Arts and Sciences (1971)
- Distinguished Fellow of the British Computer Society (1971)
- Recipient of the Turing Award (1972)
- Foreign Honorary Member of the American Academy of Arts and Sciences (1975)

Edsger Wybe Dijkstra

(1930–2002)

How to Test Code?

White Box Testing



Black Box Testing