New Media
Data Analytics and Application

Lecture 4: Software Engineering

Ting Wang

- The Process of Software Development
- Python Programming Environment

a management approach to software engineering

The Process of Software Development

Software Crisis

– The First NATO Software Engineering Conference in 1968, Germany.

– How to cope with the difficulty of writing useful and efficient computer programs in the required time.

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Difficulties in Software Development

1. Projects running over-budget
2. Projects running over-time
3. Software was very inefficient
4. Software was of low quality
5. Software often did not meet requirements
6. Projects were unmanageable and code difficult to maintain
7. Software was never delivered

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What is Software Engineering

– Software engineering is the application of engineering to the **design**, **development**, **implementation**, **testing** and **maintenance** of software in a systematic method.

From Wikipedia

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The Process of Software Development

Basic Elements in Software Engineering

- Development Stages
- Management Pipeline
- Demands Changing
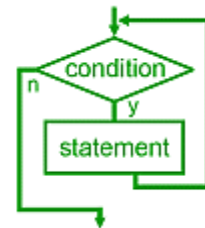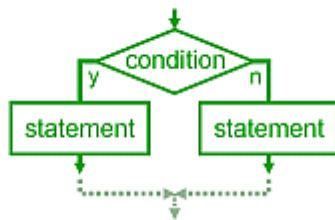- Cooperative Team Work
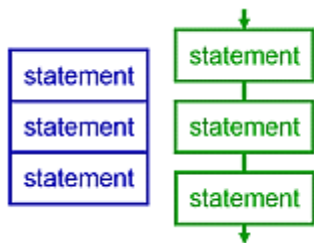- Professional Expert Participation

Programming Paradigm 编程范式

- Structured Programming (1)结构化编程
  - Control Structure
    1. Sequence
    2. Selection: *if..then..else..endif, switch*
    3. Iteration: *while, repeat, for, do...until*
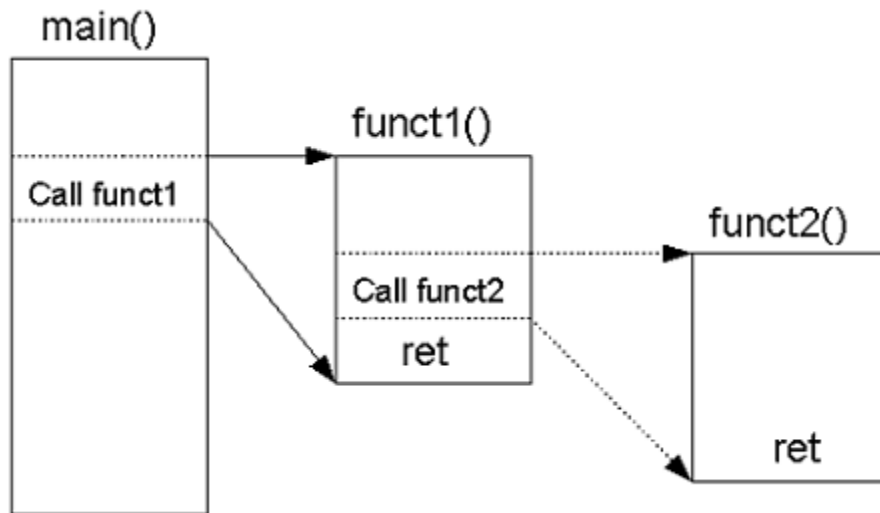

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Programming Paradigm 编程范式

- Structured Programming (2) 结构化编程
  - Subroutines

    子程序

Programming Paradigm 编程范式

- Object Oriented Programming(1)
  面向对象编程　针对物件的编程
  - Object 对象
  - Class 类
  - Attribute 属性
  - Method 方法

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Programming Paradigm 编程范式

- Object Oriented Programming(2)
  面向对象编程
  - Encapsulation 封装
  - Inheritance 继承
  - Polymorphism 多态

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The Process of Software Development
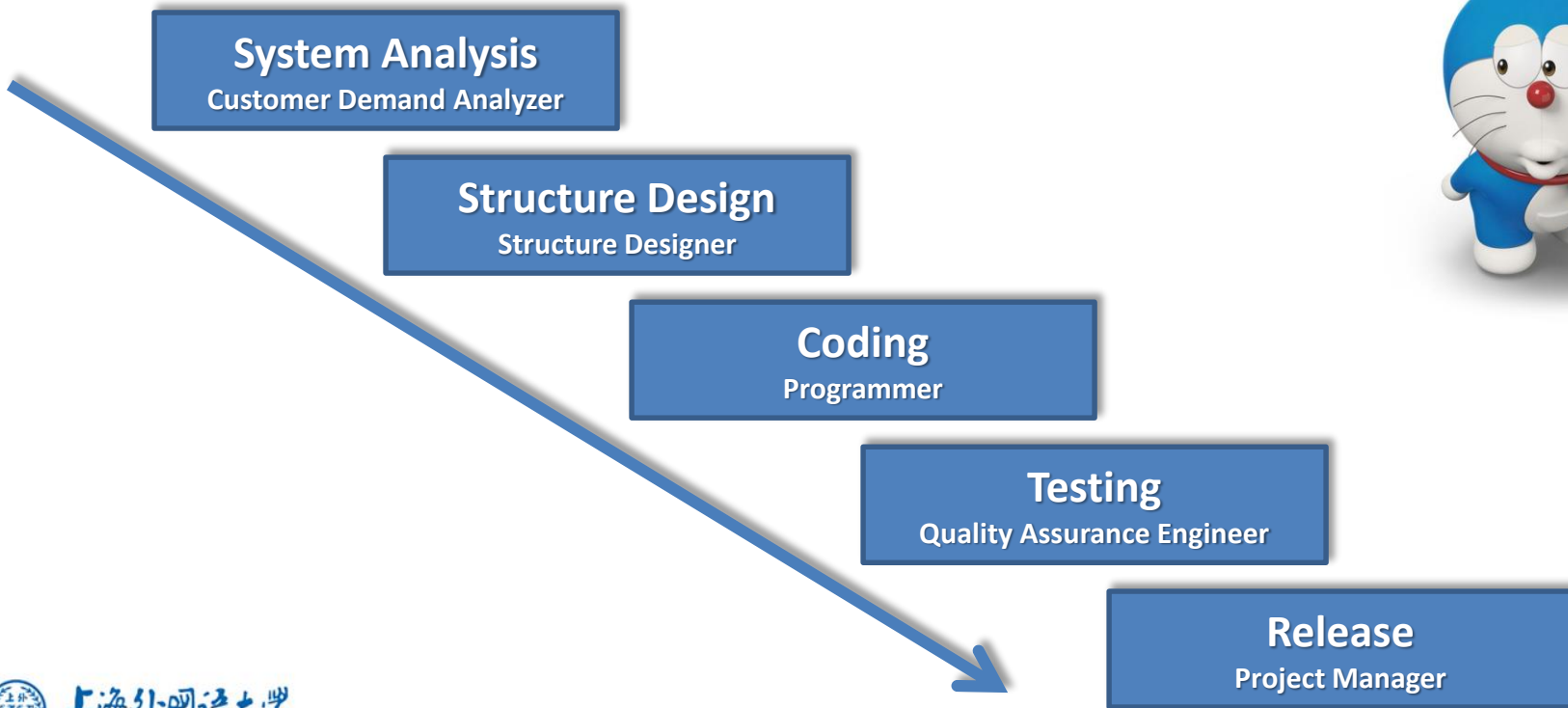
EXAMPLE 1:
Class
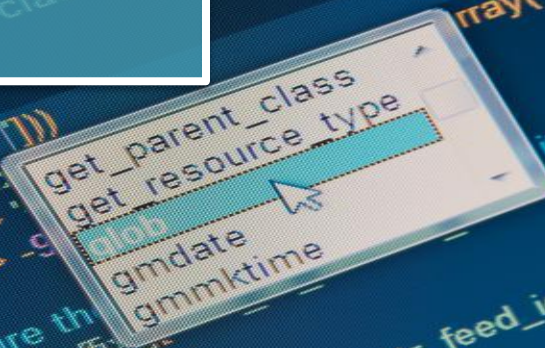
The Process of Software Development

```python
class Customer(object):

    name =''
    password =''

    def __init__(self, name, password):
        self.__name = name
        self.__password = password
        print ('Name: %s' %self.__name)

    def get_validation(self, password):
        if password=='sisu':
            return 1
        else:
            return 0

class Student(Customer):

    name =''
    password =''
    studentID = ''

    def __init__(self, name, password, studentID):
        Customer.__init__(self, name, password)
        self.studentID = studentID

    def print_studentID(self):
        return self.studentID

    def get_validation(self, password):
        if password=='shisu':
            return 'Passed'
        else:
            return 'Failed'

Thomas = Customer('Thomas Edison', 'sisu')
print('Thomas.get_validation() =', Thomas.get_validation('sisu'))
Albert = Student('Albert Einstein', 'sisu', '20160001')
print('Albert.print_studentID() =', Albert.print_studentID())
print('Albert.get_validation() =', Albert.get_validation('sisu'))
```

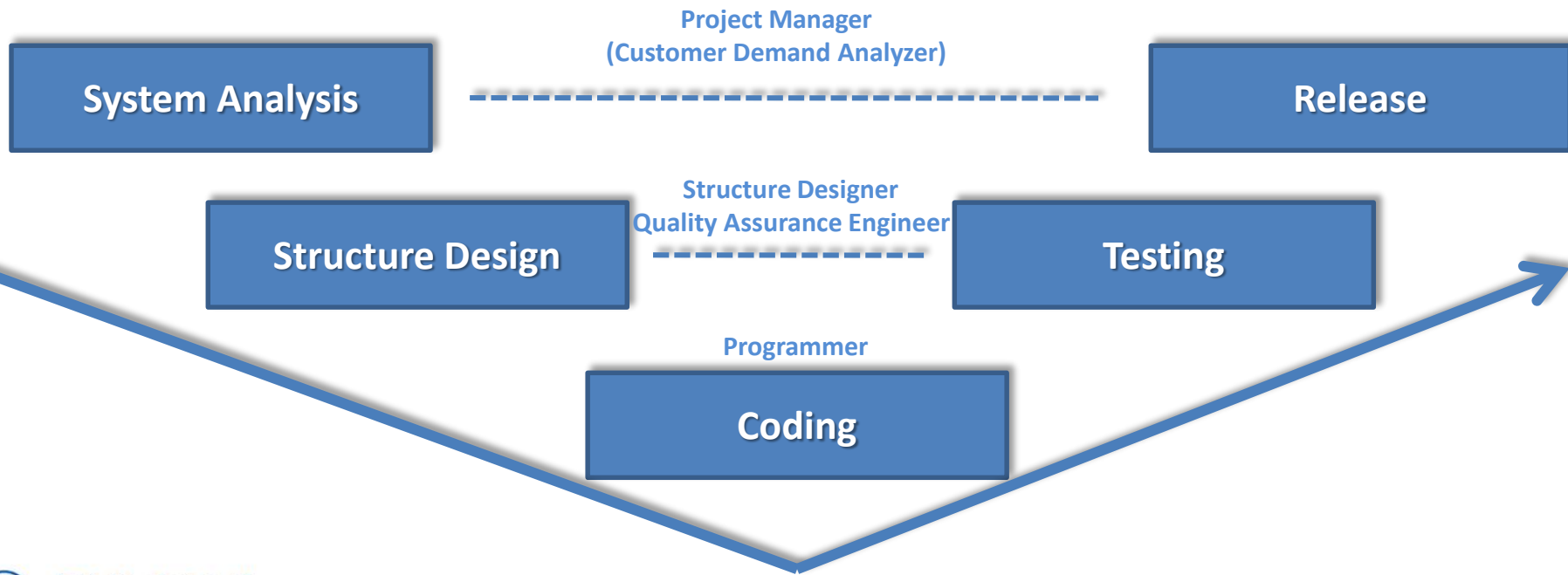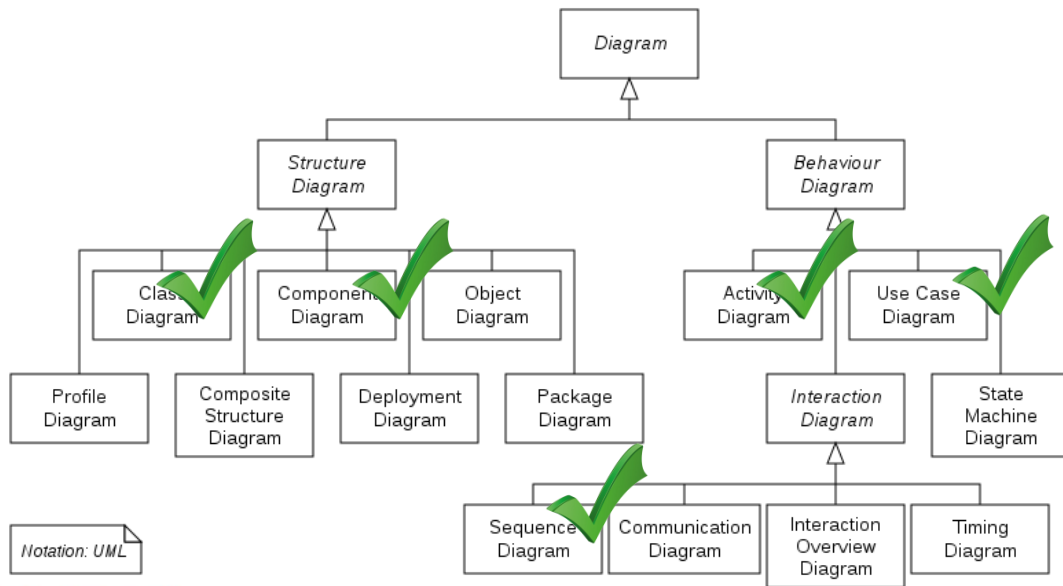# The Process of Software Development

- ## Water Fall Model

System Analysis
Customer Demand Analyzer

Structure Design
Structure Designer

Coding
Programmer

Testing
Quality Assurance Engineer

Release
Project Manager

The Process of Software Development

- ## V-Model

Project Manager
(Customer Demand Analyzer)

| System Analysis | - - - - - - - - - - - - - - - - - - | Release |

Structure Designer
Quality Assurance Engineer

| Structure Design | - - - - - - - - - | Testing |

Programmer

| Coding |

Unified Modeling Language (UML)

A general-purpose, developmental, modeling language in the field of software engineering, that is intended to provide a standard way to visualize the design of a system

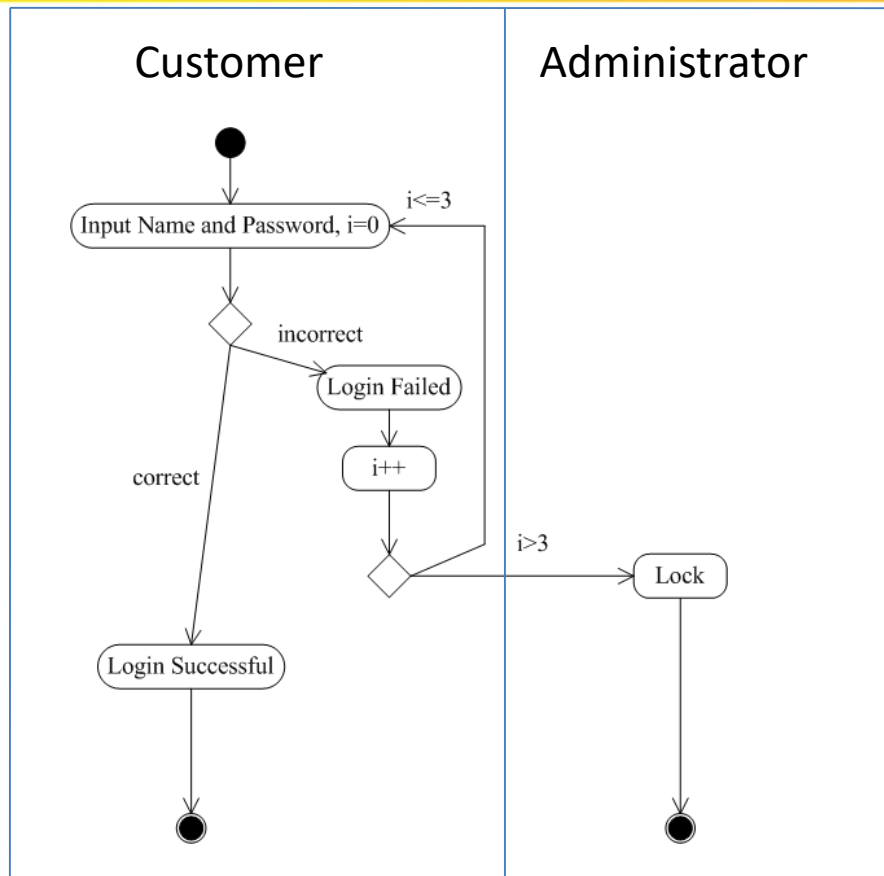# The Process of Software Development

- ## Use Case Diagram
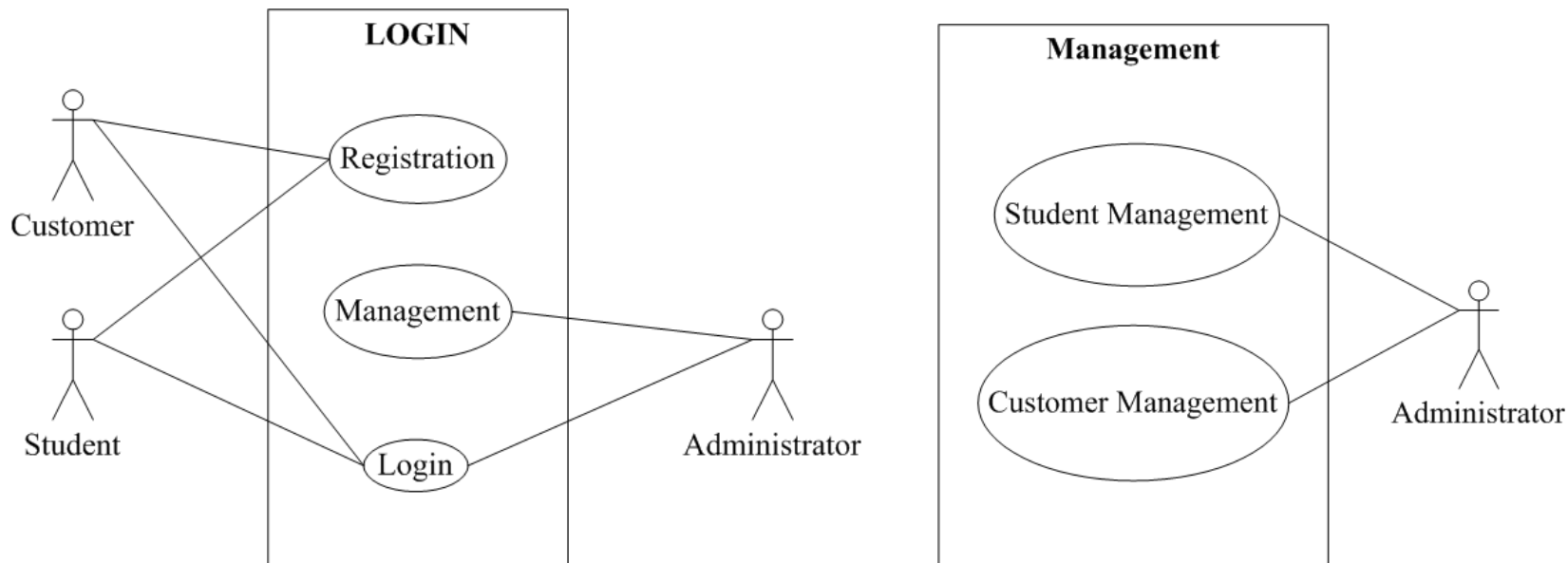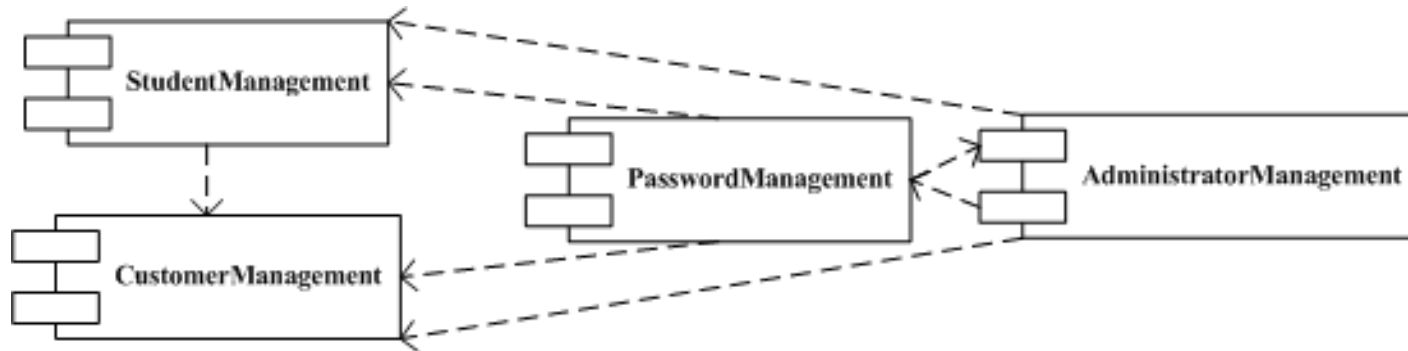
- Class Diagram
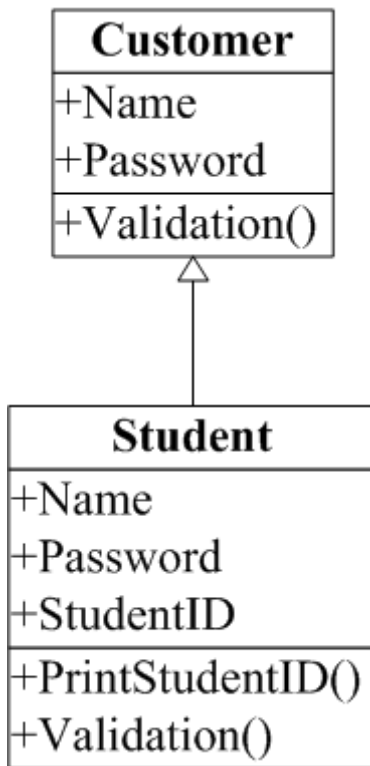
The Process of Software Development

- Activity Diagram

- ## Sequence Diagram
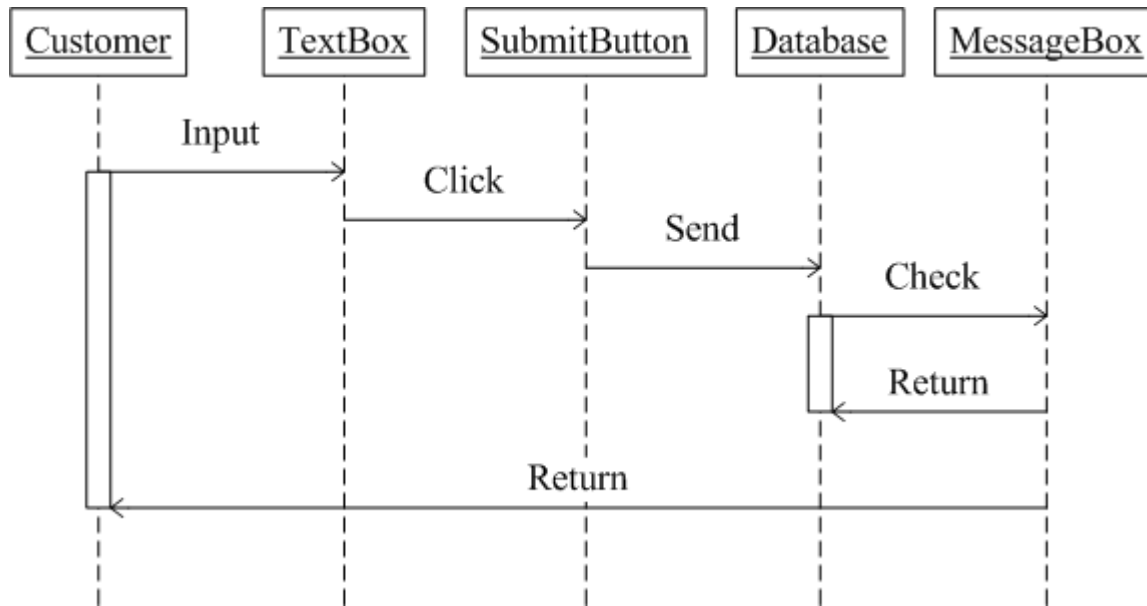
The Process of Software Development

- Component Diagram

The Process of Software Development

- Function Structure Diagram

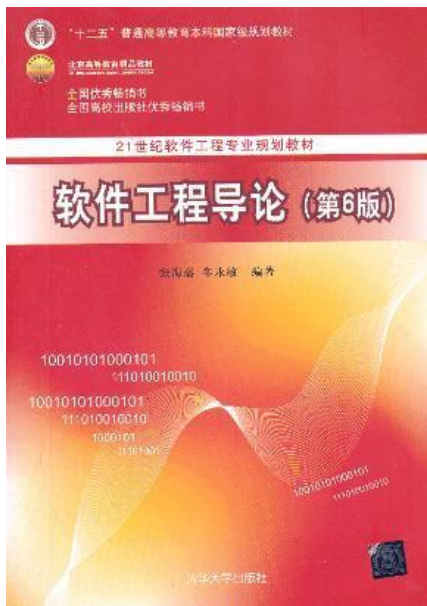## *Time Estimation for Software Projects*

- Man-Month

- Man-Day

- Basic Function: Insert, Delete, Update, Select
  - Slow: *1 Basic Function per day*
  - Common: *2 Basic Functions per day*
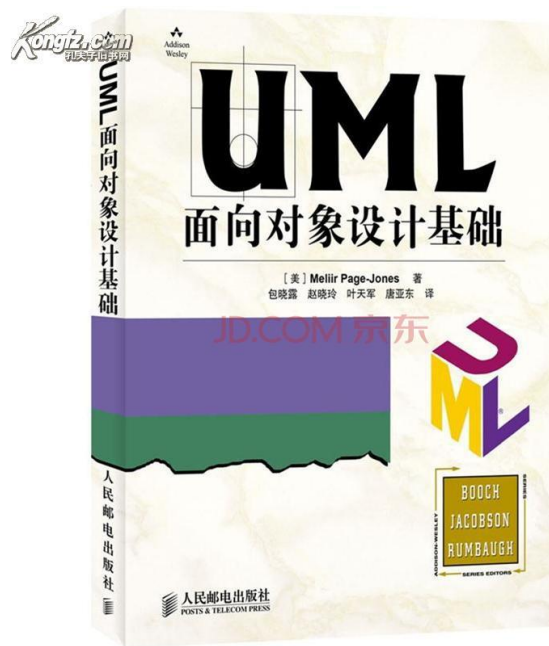 - Fast: *4 Basic Functions per day*

References

软件工程导论（第6版）

UML面向对象设计基础

The End of Lecture 4

Thank You

http://www.wangting.ac.cn