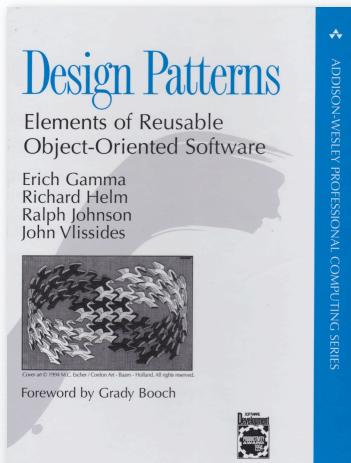


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## Design pattern inspiration



- **Design patterns: Elements of Reusable Object-Oriented Software**
- Pattern **definition** and catalog
- Enrich Gamma, Richard Helm, Ralph Johnson, John Vlissides

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## How is the course organized?

1

General patterns theory

2

Specific pattern theory

3

Example using Java

Iteration per pattern

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## How should you use this course?

PAGE 5

1 General patterns theory

2 Specific pattern theory

3 Example using Java

Finish this first

One pattern at a time

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```
graph TD; A[General patterns theory] --> B[Specific pattern theory]; C[Example using Java] --> D[One pattern at a time]
```

## Content

Introduction to design patterns overview

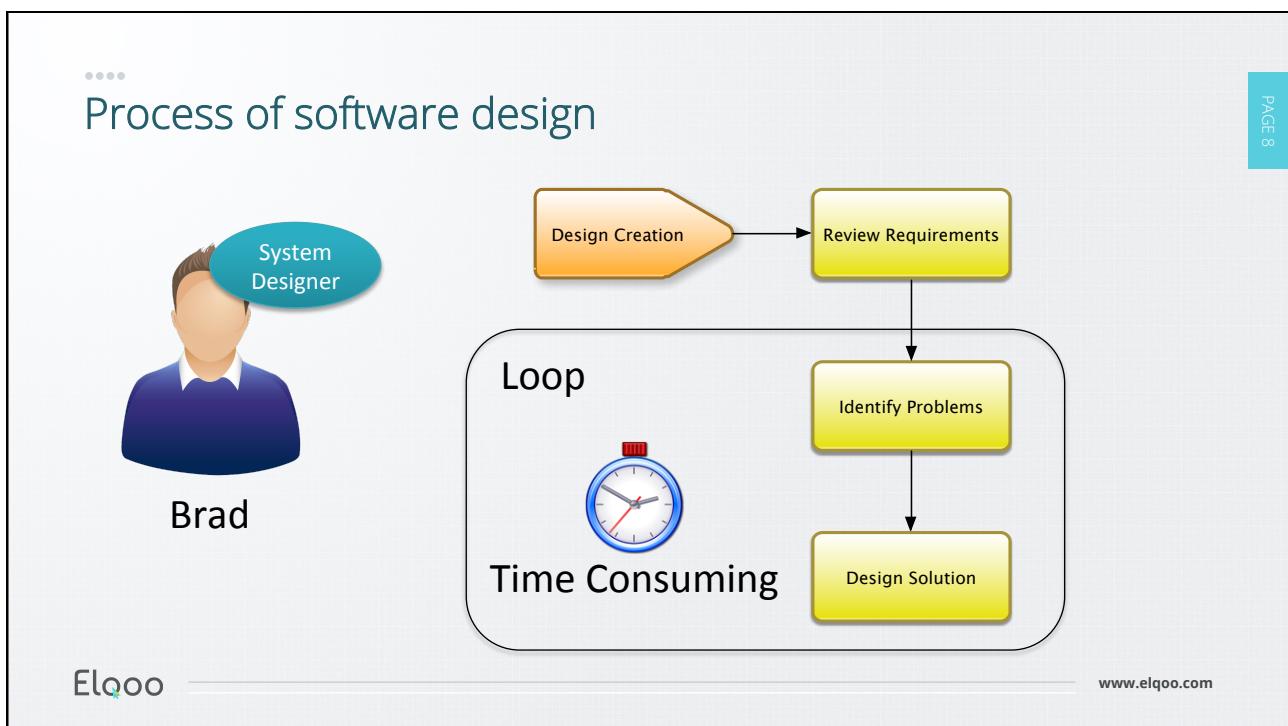
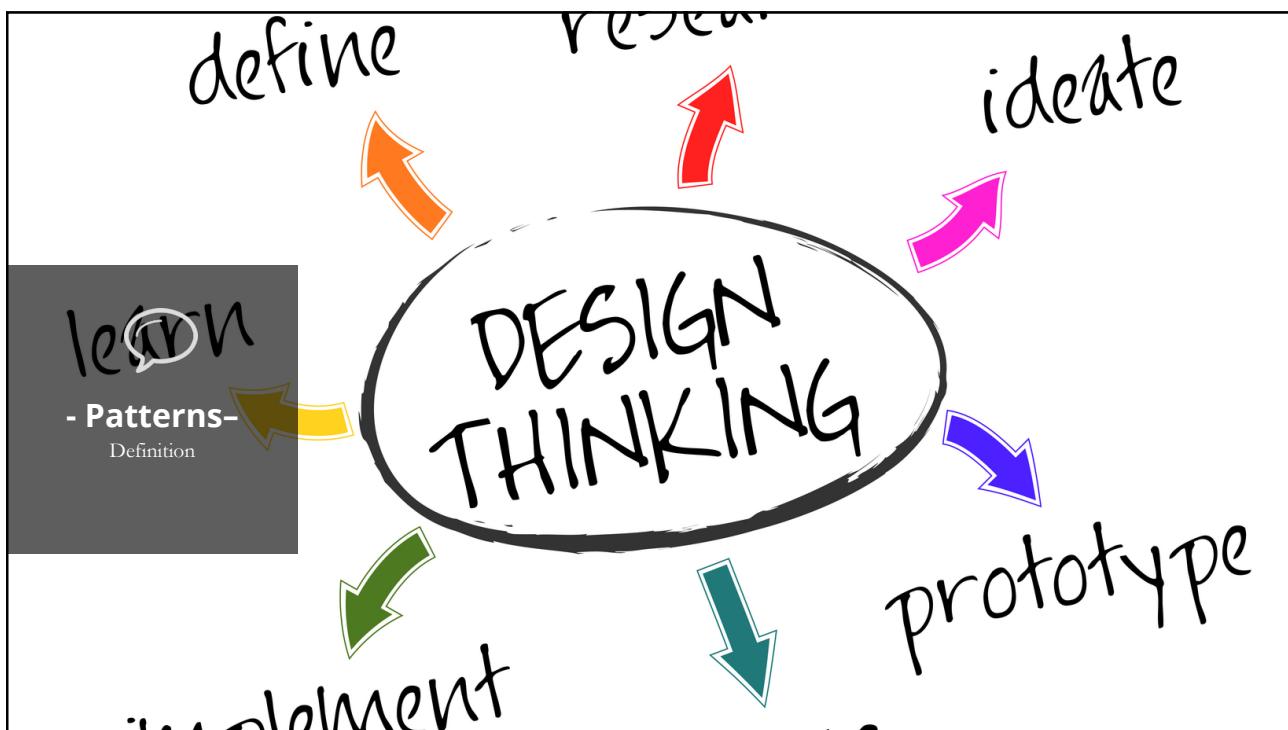
PAGE 6

1 Pattern Definition

2 Pattern Catalog

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```
graph TD; A[Content] --> B[Pattern Definition]; A --> C[Pattern Catalog]
```



Enter Design Patterns

PAGE 9



Each pattern **describes a problem** which occurs over and over again, and then **describes the core of the solution to that problem**.

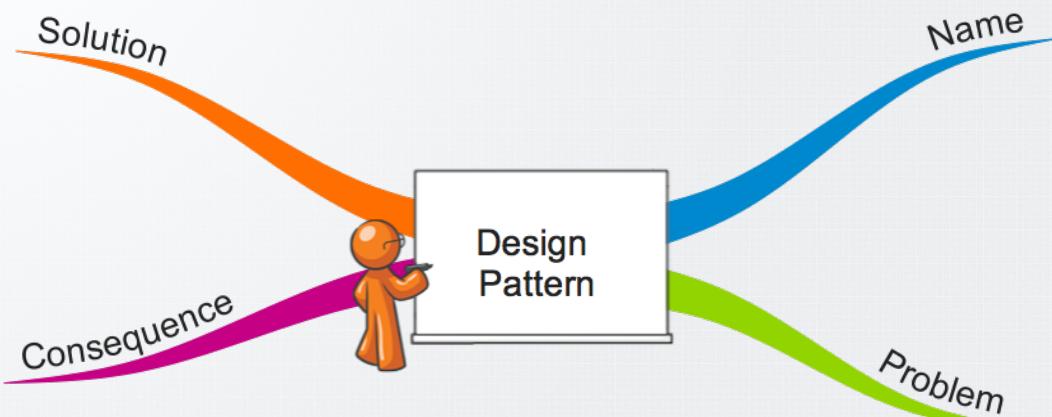
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Four elements of a Design Pattern

Name, Problem, Solution and Consequence

PAGE 10



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## Design Pattern Benefits

PAGE 11

- **Improved design**
- **Team communication**
  - Everyone talks about the same concepts

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## Design Pattern Name

PAGE 12

- **Name** to describe the design problem
- **Increase abstraction** in design.
- Create a **common vocabulary**
  - Share a language with colleagues

Choose your name wisely → One of the hardest parts

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## Design Pattern Problem

PAGE 13

- When can the pattern be applied?
- What is the **context**?
- Might include
  - **Problem** with current design structures
  - Indicate **inflexibilities**

....

## Design Pattern Solution

PAGE 14

- **Define elements that compose the design**
  - Their **relationships**
  - **Responsibilities**
  - **Collaborations**
- General abstract definition (template)
  - Fully **re-usable**
  - **Language agnostic**

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## Design Pattern: Consequences

PAGE 15

- **Trade-offs**
- Necessary to **evaluate alternatives**
  - Is this pattern the right choice ?
- **Costs and benefits**
- Can include language and implementation issues
  - Some things can be done better in Java or .Net

**Choose the correct pattern by understanding the consequences**

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## What is and isn't a pattern ?

PAGE 16

- Certain level of **abstraction** is required
- **Not about**
  - Hash maps, Lists, Arrays
- Not a design of an entire application
  - It is a design for a specific problem

**Patterns are no primitive building blocks**

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## Chainsaw Principle

Pattern misuse

PAGE 17

### Pattern usage

Don't fit  
everything into  
one pattern



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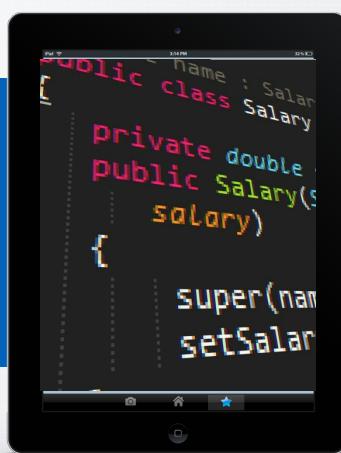
## Design Pattern Examples

PAGE 18

### Examples in Java

Each pattern will be explained using  
the Java language as a basis.

The design patterns explained here  
expect a certain functionality of the  
core language.



Object Oriented

Supports Generics

Widely adopted

Ideally for teaching

Perfect fit

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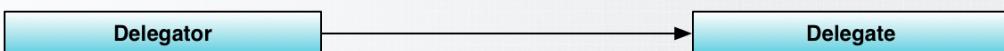
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## Delegation

Delegate functionality to another object

PAGE 20



- **Delegate functionality** to another object
- **Benefits**
  - Promote **re-use**
  - Limit number of class definition
  - Reduce **inheritance**

## Interface

Interface definition

PAGE 21



- **Bundle service definition in one interface**
- Loose coupling between client and Service impl.
- Built in the language

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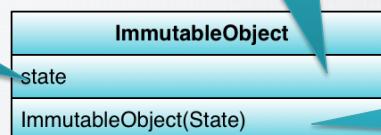
## Immutable

Immutable definition

PAGE 22

State is private  
→ Non accessible

Object with state



State is passed  
through on  
construction

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## Design Pattern Catalog

Concept of a catalog

PAGE 24

- **Large catalog of design patterns**
- How to easily find a pattern?

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## Design Pattern: Main Categories

Purpose of a design pattern

PAGE 25

1

Creational

2

Structural

3

Behavioral

1 Object Creation

2 Composition of class or objects

3 Object interaction

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## Design Pattern Categories: Scope

Classes or Objects

PAGE 26

1

Class

2

Object

1 Static relations between classes (inheritance, etc.)

2 Dynamic object relations

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