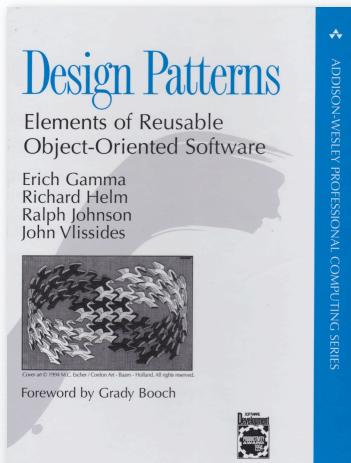


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Design pattern inspiration



- **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

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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; 1[1 General patterns theory] --> 2[2 Specific pattern theory]; 2 --> 3[3 Example using Java]; 3 --> 4[One pattern at a time]; 4 --> 5[Finish this first]
```

Content

Introduction to design patterns overview

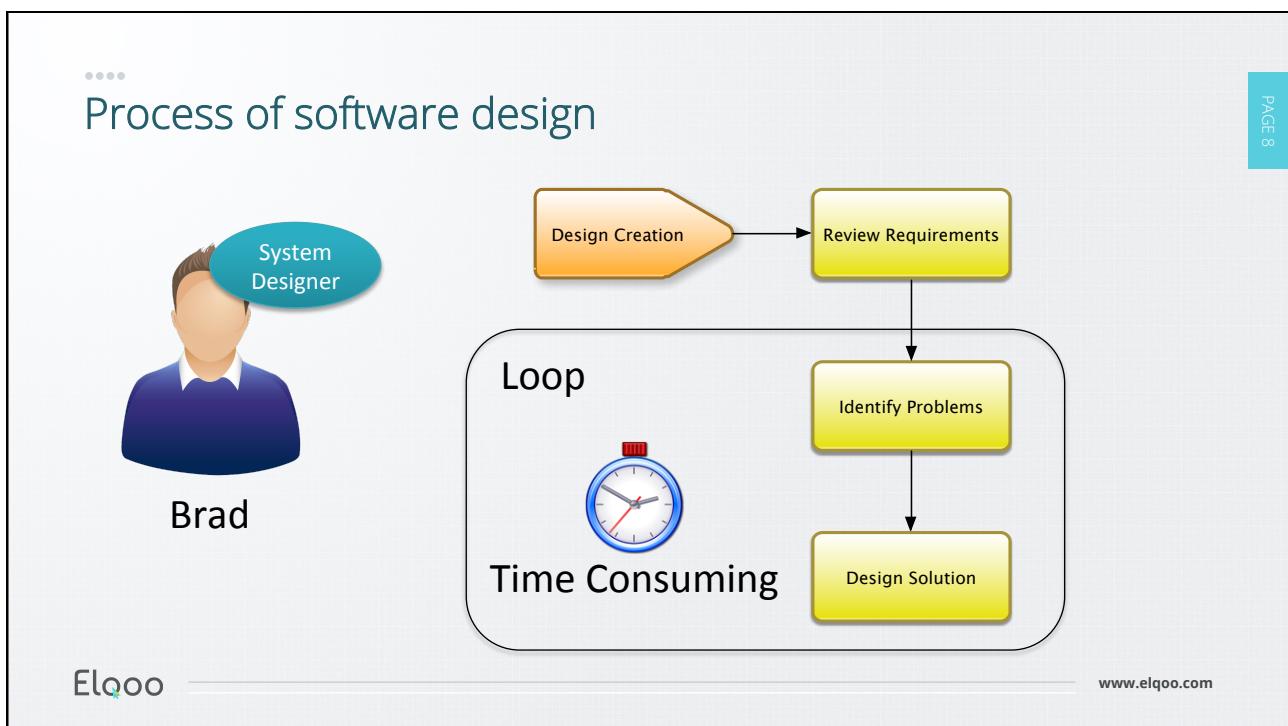
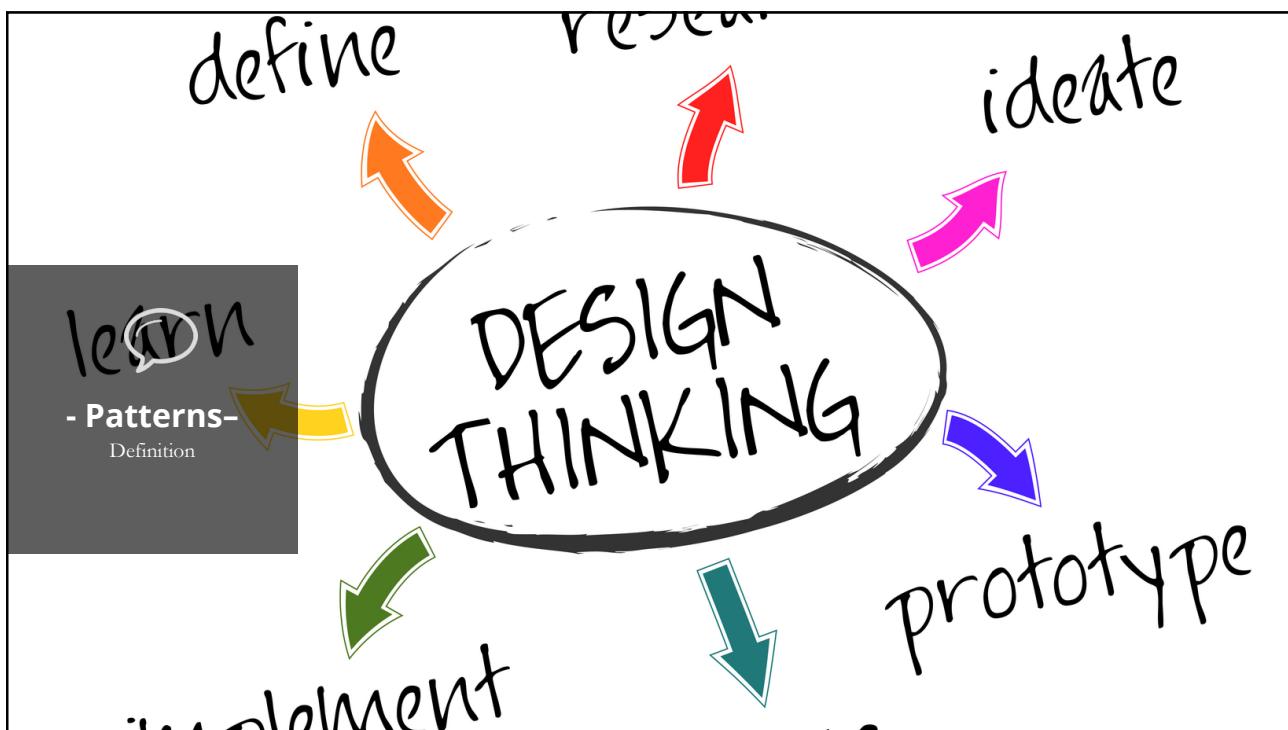
PAGE 6

1 Pattern Definition

2 Pattern Catalog

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```
graph TD; Content[Content: Introduction to design patterns overview] --- 1[1 Pattern Definition]; Content --- 2[2 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**.

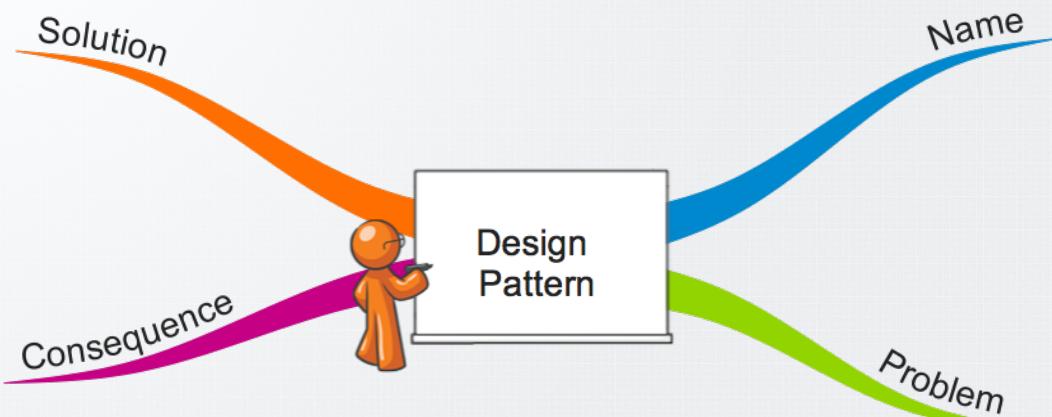
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Four elements of a Design Pattern

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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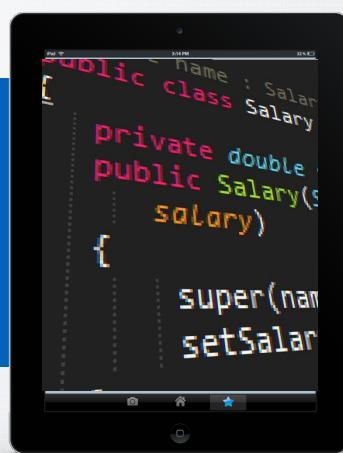
Design Pattern Examples

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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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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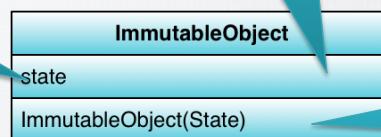
Immutable

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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