Refactoring for Deeper Understanding

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The Plan for Today

- Only 1 hour
- Only 1 pattern

- Most important one for me right now

What is the problem?

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public double calcDiscount( double p1, double p2 ){
    // ...
}
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$\longrightarrow$ Bad parameter names

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public double calcDiscount( double amount,
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$\longrightarrow$ Everything is clear, right?

Maybe there are still some questions?

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- Or is the discount a percentage that is used to determine a fraction?

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- Is a percentage of 5% passed as 5.0 or as 0.05?

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- ...

How to improve this?

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Ask the type system for help!

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Object Calisthenics:

Programming exercises for better object-oriented code

Rule 3: Wrap All Primitives and Strings

Bad Types

```
public double calcDiscount( double amount,
                            double discount ){
   // ...
}
```

Better Types

```
public DiscountedAmount calcDiscount(
                            MonetaryAmount amount,
                            Percent discount ) {
    // ...
}
```

Why “DiscountedAmount” and not “AmountToBeSubtracted”?

- It’s visible whether the amount has already been discounted
- It’s robust because we cannot accidentally discount twice
- It describes stages in our process which leads to clear handovers

Let’s Check Our Questions

```
public DiscountedAmount calcDiscount(
                                    MonetaryAmount amount,
                                    Percent discount ) {
    // ...
}
```

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                          MonetaryAmount amount,
                          Percent discount ) {
   // ...
}
```

- Is the amount a monetary value? What about rounding?
- Should we really use `double` for monetary values?

$\Longrightarrow$ Encapsulated by MonetaryAmount, we know where to look / change

Let’s Check Our Questions

```
public DiscountedAmount calcDiscount(
                            MonetaryAmount amount,
                            Percent discount ) {
    // ...
}
```

- Is the discount a monetary amount that gets subtracted?
- Or is the discount a percentage that is used to divide the amount?

$\Longrightarrow$ Clear from the type name

Let’s Check Our Questions

```
public DiscountedAmount calcDiscount(
                        MonetaryAmount amount,
                        Percent discount ) {
   // ...
}
```

- Is a percentage of 5% passed as 5.0 or as 0.05?

$\Longrightarrow$ Still not obvious, but encapsulated by Percent, i.e. easy to find out

Let’s Check Our Questions

```
public DiscountedAmount calcDiscount(
                                MonetaryAmount amount,
                                Percent discount ) {
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}
```

- Is the return value just the discount or the discounted amount?

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Let’s Check Our Questions

```
public DiscountedAmount calcDiscount(
                        MonetaryAmount amount,
                        Percent discount ) {
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}
```

- Is it easy to mess up the invocation by accidentally swapping parameters?

$\Longrightarrow$ No, different types are not swappable

Refactoring - Demo

Recap: Refactoring Steps (1)

- Generate Parameter Object
  - With “old” Java: Generates class
  - With Java >= 16: Generates record
- Or write your own Parameter Object and introduce it
  - Caution with `.toString()`!
- Push the new type through step-by-step until everything is covered
- Lots of invocation sites? Add overloaded method that wraps encapsulation

“Code Magnets”

- Move code into the object that is closest to it
- Helps everybody find code faster
- Helps avoid redundant implementations because code was not found

Code Magnets in our example (1)

From `DiscountCalculator.java`

```
... percent.value() ...
```

```
... percent.value() / 100 ...
```

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Strong hint: The value is pulled out and manipulated. Let’s encapsulate it!

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From `DiscountCalculator.java`

```
... percent.value() ...

... percent.value() / 100 ...
```

Strong hint: The value is pulled out and manipulated. Let’s encapsulate it!

to `Percent.java`

```
public double asDecimal() { return percent / 100; }
public double asNominal() { return percent; }
```

(also improves our last open point)

Code Magnets in our example (2)

From `DiscountCalculator.java`

```
public static DiscountedAmount calcDiscount(
                              MonetaryAmount amount,
                              Percent discount ) { /* ... */ }
```

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From `DiscountCalculator.java`

```
public static DiscountedAmount calcDiscount(
                              MonetaryAmount amount,
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Strong hint: The method is static. Let’s find a better place for it!

Code Magnets in our example (2)

From `DiscountCalculator.java`

```
public static DiscountedAmount calcDiscount(
                                 MonetaryAmount amount,
                                 Percent discount ) { /* ... */ }
```

Strong hint: The method is static. Let’s find a better place for it!

to `MonetaryAmount.java`

```
public DiscountedAmount applyDiscount(Percent discount) {
```

- **Reliable:** Whenever it gets created, it is correct (wrt business rules)
- **Encapsulated:** Easily modifiable in one location (no shotgun surgery)
- **Understandable:** You know where to look if something is unclear
- **Immutable:** Cannot accidentally be changed. Also, can be shared.
- **Testable:** Logic is isolated and easily testable.

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$\Longrightarrow$ Domain-Driven Design calls them **Value Objects**

Value Object in Domain-Driven Design

- Value
- Has no identity (describes “what”)
- Business wrapper around a technical datatype
- Forms a conceptual unit
- Can often be immutable
  - Then, sharing is possible (and highly desirable)
- Structure can be complex

Value Objects with multiple variables

```
public class MonetaryAmount {
    private final double amount;
    private final String currency;

  // ...
}
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Address with street, number, postal code, city, country...

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Encapsulates a business concept and reduces the “contact surface” to the surrounding code

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We need good names for types and variables

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Domain-Driven Design: **Ubiquitous Language**

- Focus on business, without technical stuff
- Uniqueness: Only one term per concept, only one concept per term
- Glossary captures all domain terms and explains them

This gives us the **deep understanding** we need to develop good software!

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This gives us the **deep understanding** we need to develop good software!

- Also lives in the team's language
- Only use domain terms in the code
- This implies: We need to cooperate with business people!

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- On Percent creation, it is not clear what to pass (5 oder 0.05)
- Add dedicated builder methods

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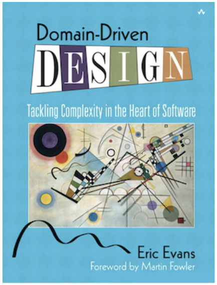
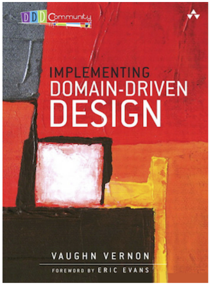
- On Percent creation, it is not clear what to pass (5 oder 0.05)
- Add dedicated builder methods

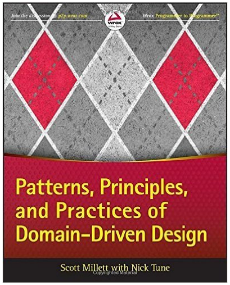
- Percentage calculation is hardcoded in the middle of somewhere
- Turn this into a Domain-Driven Design Policy

Resources: Domain-Driven Design in general

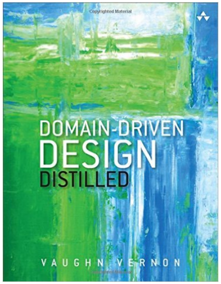
My recommendation:


Domain-Driven
DESIGN
Tackling Complexity in the Heart of Software
Eric Evans
Foreword by Martin Fowler

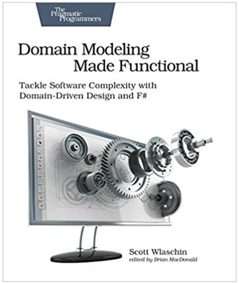



wrox
Patterns, Principles, and Practices of Domain-Driven Design
Scott Millett with Nick Tune

Resources: Domain-Driven Design in general



Vaughn Vernon
Domain-Driven
Design
kompakt
→ Aus dem Englischen übersetzt
von Carola Lilienthal und Henning Schwentner
dpunkt.verlag


The Pragmatic Programmers
Domain Modeling
Made Functional
Tackle Software Complexity with
Domain-Driven Design and F#
Scott Wlaschin
edited by Brian MacDonald

Resources: Various Links

- Object Calisthenics: `https://blog.avenuecode.com/object-calisthenics-principles-for-better-object-oriented-code`
- Java 14 Records: `https://docs.oracle.com/en/java/javase/14/language/records.html`
- Code Magnets: Talk “Power Use of Value Objects in DDD”: `https://www.infoq.com/presentations/Value-Objects-Dan-Bergh-Johnsson`

Want more?

Hexagonal Architecture - by Thomas Pierrain
In-depth session on Fri/Sat if interested

Thank You!

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