

大学计算机教育国外著名教材系列 (影印版)



OBJECT MODELS

STRATEGIES, PATTERNS, AND APPLICATIONS

SECOND EDITION

对象模型

策略、模式与应用

(第2版)



Peter Coad 著



清华大学出版社

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出版说明

进入 21 世纪, 世界各国的经济、科技以及综合国力的竞争将更加激烈。竞争的中心无疑是对人才的竞争。谁拥有大量高素质的人才, 谁就能在竞争中取得优势。高等教育, 作为培养高素质人才的事业, 必然受到高度重视。目前我国高等教育的教材更新较慢, 为了加快教材的更新频率, 教育部正在大力促进我国高校采用国外原版教材。

清华大学出版社从 1996 年开始, 与国外著名出版公司合作, 影印出版了“大学计算机教育丛书(影印版)”等一系列引进图书, 受到国内读者的欢迎和支持。跨入 21 世纪, 我们本着为我国高等教育教材建设服务的初衷, 在已有的基础上, 进一步扩大选题内容, 改变图书开本尺寸, 一如既往地请有关专家挑选适用于我国高等本科及研究生计算机教育的国外经典教材或著名教材, 组成本套“大学计算机教育国外著名教材系列(影印版)”, 以飨读者。深切期盼读者及时将使用本系列教材的效果和意见反馈给我们。更希望国内专家、教授积极向我们推荐国外计算机教育的优秀教材, 以利我们把“大学计算机教育国外著名教材系列(影印版)”做得更好, 更适合高校师生的需要。

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ACKNOWLEDGMENTS

PREFACE: STRATEGIES, PATTERNS, AND APPLICATIONS

APPLICATIONS

by Edgar A. Guest

STRATEGIES AND PATTERNS

WHY READ THIS BOOK?

Automated tool, included on the CD-ROM
Additional strategies and patterns
Creativity and innovation

To Amy Ellen Coad,
My artistic, beautiful, and perceptive one.
Love, Daddy

—Peter Coad

GETTING STARTED

IN THIS CHAPTER

IDENTIFYING SYSTEM PURPOSE AND FEATURES

Selecting (describing) the ones who live there
Selecting problem-domain objects
Applying patterns

To Beverly North,
The object of my desire. Thanks for all your extra effort.
Love, David

ESTABLISHING RESPONSIBILITIES FOR PROBLEM-DOMAIN OBJECTS

Applying patterns
Working out the problem-domain dynamics with scenarios

—David North

SELECTING HUMAN-INTERACTION OBJECTS

ESTABLISHING HUMAN-INTERACTION RESPONSIBILITIES

Working out human interaction dynamics with scenarios
Selecting system interaction objects

Establishing system interaction responsibilities
Working out system interaction dynamics
Selecting data-management objects and responsibilities
Working out data-management dynamics with scenarios

To Michael Geoffrey Mayfield,
I've been so busy. Let's play!
Love, Dad

Progress at this point
Wrap-up

—Mark Mayfield

2 WALLY'S WAREHOUSE (A WAREHOUSE APPLICATION)

IDENTIFYING SYSTEM PURPOSE AND FEATURES

IDENTIFY SYSTEM FEATURES

SELECTING PROBLEM-DOMAIN OBJECTS

APPLYING PATTERNS: SELECT AND ORGANIZE PROBLEM-DOMAIN OBJECTS

ESTABLISHING RESPONSIBILITIES FOR THE PROBLEM-DOMAIN OBJECTS

Sermons We See
by Edgar A. Guest

I'd rather see a sermon than hear one any day;
I'd rather one should walk with me than merely tell the way.

The eye's a better pupil and more willing than the ear,
Fine counsel is confusing, but example's always clear;

And the best of all the preachers are the ones who live their creeds,
For to see good out in action is what everybody needs.

I soon can learn how to do it if you'll let me see it done;
I can watch your hands in action, but your tongue too fast may run.

And the lecture you deliver may be very wise and true,
But I'd rather get my lessons by observing what you do.

For I might misunderstand you and the high advice you give,
But there's no misunderstanding how you act and how you live.

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Preface

Strategies, Patterns, and Applications

APPLICATIONS

How do people really learn? A proverb in Latin says it best: “The example educates.”

Truly, the example educates. It’s a wonder if anything else ever does. Educating by example is what true education is all about.

An elementary education innovator startled us with these words:

“Educate right at the moment someone can apply it with success.”

This book is a book of education by example.

You won’t find the obligatory 125 pages about object philosophy. You won’t find page after page of icons and adornments. Why? Because the purpose of this book is to communicate *how to build effective object models*. And the only way to do that is to give you good examples, presenting key “lessons” right at the moment you can apply them with success.

The best shortcut to building effective object models is to study real-life examples of building effective object models. That’s why this book presents applications—along with strategies and patterns, applied along the way.

The core of this book is its six application chapters. Each example is a real-life example of building an object model. Each application has enough detail in it, so that you might read it and say, “Yes, I get it. I can build real systems this way.” Moreover, each application is one that, by analogy, is applicable to most businesses and industries. For example, “point of sale” and “warehouse” are applications that nearly every business needs.

Chapters 1 to 6 present the applications, delivering new strategies and patterns at the moment you can apply them with success. Chapter 1, “Connie’s Convenience Store,” presents a point-of-sale application (nearly every business has one, in one form or another). Chapter 2, “Wally’s Warehouse,” presents a warehousing application (again, nearly every business has one). Chapter 3, “Ollie’s Order Center,” presents an order processing application (nearly every business has one). Chapter 4, “Dani’s Diverters,” presents a soft real-time application: a sensor-and-diverter system (nearly every manufacturing or shipping business has one). Chapter 5, “Andi’s Autopilot,” presents a hard real-time application: an autopilot system (many hard real-time systems have similar needs). Chapter 6, “All Five Applications, At High Speed,” presents instructions for building initial object models entirely with patterns, resulting in object models that are ready for subsequent refinement with strategies.

STRATEGIES AND PATTERNS

As you read through the applications, you'll also discover specific strategies and patterns, practical and repeatable "how to" advice that will help you develop an intuitive feel for building object models. Strategies and patterns are nuggets of wisdom about building object models. In this book, you'll learn 148 strategies and 31 patterns, which appear in sequence in Chapter 7.

A *strategy* is a plan of action intended to accomplish a specific objective.

A *pattern* is a template, one worthy of emulation. "Pattern" can apply to the plans for a product rather than to the creations made from its specifications. The word often suggests blueprints or templates to be followed in constructing the product. More generally, the word indicates the design or configuration that something takes in actuality. But the word can also refer to the perfect representative of a type, or to any example thought worthy of emulation" (*Use the Right Word*). Observe that:

- A pattern is a plan, rather than a specific implementation.
- A pattern is a *template*, to be followed during construction.
- A pattern is something observed from something in actuality.
- A pattern is *an example worthy of emulation*.¹

An *object-model pattern* is a template of objects with stereotypical responsibilities and interactions; the template may be applied again and again, by analogy.

Object patterns are repetitive forms, just like those in music. They occur again and again and again. You'll learn how to use them to your advantage, in building effective object models.

Strategies and patterns express examples of good practice, ones that can be used to help object modelers develop more effective results. Both help developers gain an intuitive understanding, a "gut feel," for good object models.

Strategies and patterns make it possible to communicate object-modeling expertise effectively. Without such patterns, that much-needed expertise is only acquired by trial-and-error. Where did these strategies and patterns come from? From continual introspection, while building hundreds of object models over a five-year period.

Through time, strategies and patterns join the language of analysts and designers, even when discussing the architectural aspects of an object model. For example, as soon

¹Some researchers have suggested that a pattern is "a solution to a problem in a context," citing Chris Alexander's work in architecture (see the bibliography). Here are some thoughts on this.

- (1) A pattern is a template, not a specific solution.
- (2) Alexander's "pattern" theory remains unaccepted by his peers.
- (3) No dictionary supports his definition of the word "pattern." (Although it is true that one may assign any meaning to any word, when a word's meaning has been established over several millennia of human experience, it is probably unwise to do so.)
- (4) Although "a solution to a problem in a context" is a compelling writing style—after all, nearly every sales letter follows it—that does not make an instance of that writing style a "pattern."

as someone on the team describes a pair of objects as “participant-transaction,” others on the team immediately know what kinds of objects and stereotypical responsibilities are involved.

Strategies and patterns move object-model building to something more than just “one object a time.”

Chapter 7 is a strategy and pattern handbook. The appendices address supporting issues: notation, patterns in other fields, data management, the executive decision to adopt object technology, and a histogram of initial object modeling. A glossary defines key terms.

WHY READ THIS BOOK?

What makes this book unique? In other words, why read this book?

It teaches *a software method by example—entirely by example.*

- This is the world’s first software method book to do so. It’s about time!

It presents *applications that occur in nearly every industry.*

- You’ll find it easy to relate to the applications.

- You’ll find it easier to transfer what you learn to your own software development projects.

It uses real-world applications, with *a depth that readers can say, “Yes, it can be done.”*

- The book selectively explores specific aspects of each application, to expose you to specific strategies and patterns.

- No trivial examples!

- No rambling case studies, either (the applications expose strategies and patterns, not mind-numbing minutia).

It delivers *148 strategies and 31 patterns*—practical, ready-to-use insights for building effective object models.

- This is the world’s first (and only) methods book to do so.

- It’s a no-BS guide that really helps.

- It delivers tangible chunks of “how to” advice, designed to help you more quickly develop an intuitive sense in building effective object models.

- It offers practical insights into how to build better object models, no matter what notation you use.

It presents *four activities and four object model components*—not steps and phased models.

- You’re free to follow the development path that best suits your customer, your company, your project—and your time-to-market needs.

- You apply four activities—purposes and features, objects, responsibilities, and scenarios—following whatever path best fits your project needs.

- You work with objects in four model components—problem domain, human interaction, data management, and system interaction—as you see fit, on your project.

- You get the “separation of concerns” benefit of “analysis and design” approaches—without forcing people to work with those considerations in separate phases or steps.

It presents the Coad notation, *fully integrating class diagrams, object interaction diagrams, and object timing diagram*—one model, from concept to code.

- Such a unified notation is an essential ingredient, an absolute must:
 - for delivering frequent, tangible, working results—and corresponding risk reduction.
 - for acquiring and using tools that support continuously up-to-date object models and object-oriented programming.
- Chapter 1 describes the notation, right when you need it. In addition, Appendix A summarizes it.

All six application chapters present *object model results in all three leading notations: Coad, OMT, and Unified*. Here’s why:

- To communicate better with those readers already familiar with any of these notations.
- To facilitate multinotation literacy, for all readers.
- To demonstrate that the heart and soul of effective object models is its strategies and patterns (not the shape of an icon or the number of adornments).

AUTOMATED TOOL, INCLUDED ON DISKETTE

This book comes with automated tool support, called Playground™.

Playground is a low-cost, easy-to-use tool for building objects models. It’s shareware. And you can use it free, while working through the examples in this book.

Playground is especially suited for teams of domain experts and object modelers, working together during the early stages of a new project. It’s a great way to get started with building effective object models.

- Features: Drag-and-drop classes, attributes, services, connections; multiple views, always in-sync; view management, with view categories, selective hiding/showing, and view update options; full control over connections, including routing points, right-angled or diagonal connections, and more; and extensive customization with preferences.
- Requirements. Windows with Win32s, 486-33 or better, 8 MB RAM, 4 MB disk space. Maximum recommended model size: 50 classes.
- Tech support for Playground is provided by e-mail (playground@oi.com) or regular mail only.
- Try it out for free. Use Playground for free, while working out examples in this book or using it in a classroom. The “Classroom and Personal Study ONLY” version is included with this book on diskette (the newest version is at <ftp://ftp.oi.com/pub/oi/playground>).
- Registered version benefits package. Diskette of most recent release, priority tech support, automatic notification of upgrades—and freedom

from the “Classroom and Personal Study ONLY” watermark (a tiny label that appears at the bottom of windows and printed outputs).

- Registered version pricing. For individual use: \$40. For individual use within a company or organization: \$95. The registration fee applies only to the version you receive at that time. Site licenses are available.
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- How to register. Send your name, address, e-mail address, and payment to Object Intl., Inc. Payment by check (US funds) or Visa/MC/Amex (for credit card orders, be sure to include both your card number and its expiration date).

For object models and C++, we use Object International’s Together™/C++, the tool for continuously up-to-date object modeling and C++ programming.

Contact Object International, Inc., 1720 Leigh Drive, Raleigh NC 27603 USA (om-book@oi.com or visit <http://www.oi.com>).

ADDITIONAL STRATEGIES AND PATTERNS

What about updates, including additional strategies and patterns?

As a reader of this book, you qualify for a free one-year subscription to The Coad Letter®, a continuing series of special reports on object technology.

Enjoy reading about new advances in object technology. Recent issues include “Amplified Learning” (16 pages on accelerating mastery of “object think”) and an advance copy of the hypertext version of the “Strategies and Patterns Handbook.”

Delivered by e-mail. To subscribe: just send a message to us at majordomo@oi.com. The body of the message should read: subscribe coad-letter.

(If you don’t have e-mail and would like to receive an issue whenever we print one, please feel free to send in your contact information.)

OBJECT MODEL WORKSHOPS

What about object workshops, for the latest advances in strategies and patterns?

Announcing: lively and engaging workshops that deliver practical insights into building better object models.

In each hands-on session, you’ll learn and apply specific strategies and patterns for building objects models (applicable with whatever notation you prefer: Coad, Booch, or Rumbaugh).

Peter Coad and Mark Mayfield will personally work with your team. Your team will “learn-by-doing,” building actual project results, mastering more and more strategies and patterns, including new breakthroughs, not yet in print.

Delivered at your site or ours. Money-back guarantee. Our goal is customer delight. “I’ve been working with OOA/OOD and C++ for 3 years, yet I learned more in this workshop than in all that time!” (sr. developer in a “big 3” C++ software company).

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CREATIVITY AND INNOVATION

Creativity and innovation are essential. The global marketplace demands them from all of us.

Methods, at their best, help people move to greater heights of creativity and innovation. We hope that this method—the Coad method—might serve you in this way.

Peter Coad

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