



# REFACTORING

## IMPROVING THE DESIGN OF EXISTING CODE

**MARTIN FOWLER**

With contributions by **Kent Beck, John Brant,  
William Opdyke, and Don Roberts**

Foreword by **Erich Gamma**  
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# Refactoring Improving The Design Of Existing Code

**Leslie J. Waguespack**



## **Refactoring Improving The Design Of Existing Code:**

*Refactoring* Martin Fowler, Kent Beck, John Brant, William Opdyke, Don Roberts, 2012-03-09 As the application of object technology particularly the Java programming language has become commonplace a new problem has emerged to confront the software development community Significant numbers of poorly designed programs have been created by less experienced developers resulting in applications that are inefficient and hard to maintain and extend Increasingly software system professionals are discovering just how difficult it is to work with these inherited non optimal applications For several years expert level object programmers have employed a growing collection of techniques to improve the structural integrity and performance of such existing software programs Referred to as refactoring these practices have remained in the domain of experts because no attempt has been made to transcribe the lore into a form that all developers could use until now In *Refactoring Improving the Design of Existing Code* renowned object technology mentor Martin Fowler breaks new ground demystifying these master practices and demonstrating how software practitioners can realize the significant benefits of this new process With proper training a skilled system designer can take a bad design and rework it into well designed robust code In this book Martin Fowler shows you where opportunities for refactoring typically can be found and how to go about reworking a bad design into a good one Each refactoring step is simple seemingly too simple to be worth doing Refactoring may involve moving a field from one class to another or pulling some code out of a method to turn it into its own method or even pushing some code up or down a hierarchy While these individual steps may seem elementary the cumulative effect of such small changes can radically improve the design Refactoring is a proven way to prevent software decay In addition to discussing the various techniques of refactoring the author provides a detailed catalog of more than seventy proven refactorings with helpful pointers that teach you when to apply them step by step instructions for applying each refactoring and an example illustrating how the refactoring works The illustrative examples are written in Java but the ideas are applicable to any object oriented programming language

*Refactoring* Martin Fowler, Kent Beck, 1999 Refactoring is gaining momentum amongst the object oriented programming community It can transform the internal dynamics of applications and has the capacity to transform bad code into good code This book offers an introduction to refactoring

Refactoring Martin Fowler, 2018-11-20 Martin Fowler's guide to reworking bad code into well structured code Refactoring improves the design of existing code and enhances software maintainability as well as making existing code easier to understand Original Agile Manifesto signer and software development thought leader Martin Fowler provides a catalog of refactorings that explains why you should refactor how to recognize code that needs refactoring and how to actually do it successfully no matter what language you use Refactoring principles understand the process and general principles of refactoring Code smells recognize bad smells in code that signal opportunities to refactor Application improvement quickly apply useful refactorings to make a program easier to comprehend and change Building tests writing

good tests increases a programmer's effectiveness Moving features an important part of refactoring is moving elements between contexts Data structures a collection of refactorings to organize data an important role in programs Conditional Logic use refactorings to make conditional sections easier to understand APIs modules and their functions are the building blocks of our software and APIs are the joints that we use to plug them together Inheritance it is both very useful and easy to misuse and it's often hard to see the misuse until it's in the rear view mirror refactorings can fix the misuse Examples are written in JavaScript but you shouldn't find it difficult to adapt the refactorings to whatever language you are currently using as they look mostly the same in different languages Whenever you read Refactoring it's time to read it again And if you haven't read it yet please do before writing another line of code David Heinemeier Hansson Creator of Ruby on Rails Founder CTO at Basecamp Any fool can write code that a computer can understand Good programmers write code that humans can understand M Fowler 1999 REFACTORING IMPROVING THE DESIGN OF EXISTING CODE. MARTIN. FOWLER, 1999

Refactoring Martin Fowler, 2009 **Extreme Programming and Agile Methods - XP/Agile Universe 2002** Don Wells, Lauris Williams, 2003-08-02 The second XP Universe and first Agile Universe brought together many people interested in building software in a new way Held in Chicago August 4-7 2002 it attracted software experts educators and developers Unlike most conferences the venue was very dynamic Many activities were not even well defined in advance All discussions were encouraged to be spontaneous Even so there were some written words available and you are holding all of them now We have collected as much material as possible together into this small volume It is just the tip of the iceberg of course A reminder to us of what we learned the people we met and the ideas we expressed The conference papers including research and experience papers are reproduced in these proceedings Forty one 41 papers were submitted Each submitted paper received three reviews by program committee members The program committee consisted of 40 members Papers submitted by program committee members were refereed separately This ensured that reviewers could provide an honest feedback not seen by the paper submitters In many cases the program committee shepherded authors to significantly improve their initial submission prior to completing the version contained in these proceedings In the end the program committee chose 25 papers for publication 60% acceptance *Innovations in Computer Science and Engineering* H. S. Saini, Rishi Sayal, A. Govardhan, Rajkumar Buyya, 2018-05-25 The book is a collection of high quality peer reviewed research papers presented at the Fifth International Conference on Innovations in Computer Science and Engineering ICICSE 2017 held at Guru Nanak Institutions Hyderabad India during 18-19 August 2017 The book discusses a wide variety of industrial engineering and scientific applications of the engineering techniques Researchers from academic and industry present their original work and exchange ideas information techniques and applications in the field of Communication Computing and Data Science and Analytics The Guru's Guide to SQL Server Stored Procedures, XML, and HTML Ken Henderson, 2002 CD ROM contains Source code from text **Object-oriented Reengineering Patterns** Serge Demeyer, Stéphane Ducasse, Oscar

Nierstrasz,2008 Object Oriented Reengineering Patterns collects and distills successful techniques in planning a reengineering project reverse engineering problem detection migration strategies and software redesign This book is made available under the Creative Commons Attribution ShareAlike 3.0 license You can either download the PDF for free or you can buy a softcover copy from lulu.com Additional material is available from the book's web page at <http://scg.unibe.ch/oorp>

*Agile Software Development in the Large* Jutta Eckstein,2013 Who Says Large Teams Can't Handle Agile Software Development Agile or lightweight processes have revolutionized the software development industry They're faster and more efficient than traditional software development processes They enable developers to embrace requirement changes during the project deliver working software in frequent iterations focus on the human factor in software development Unfortunately most agile processes are designed for small or mid-sized software development projects bad news for large teams that have to deal with rapid changes to requirements That means all large teams With *Agile Software Development in the Large* Jutta Eckstein a leading speaker and consultant in the agile community shows how to scale agile processes to teams of up to 200 The same techniques are also relevant to teams of as few as 10 developers especially within large organizations Topics include the agile value system as used in large teams the impact of a switch to agile processes the agile coordination of several sub-teams the way project size and team size influence the underlying architecture Stop getting frustrated with inflexible processes that cripple your large projects Use this book to harness the efficiency and adaptability of agile software development Stop getting frustrated with inflexible processes that cripple your large projects Use this book to harness the efficiency and adaptability of agile software development

**Becoming a Better Programmer** Pete Goodliffe,2014-10-03 If you're passionate about programming and want to get better at it you've come to the right source Code Craft author Pete Goodliffe presents a collection of useful techniques and approaches to the art and craft of programming that will help boost your career and your well-being Goodliffe presents sound advice that he's learned in 15 years of professional programming The book's standalone chapters span the range of a software developer's life dealing with code learning the trade and improving performance with no language or industry bias Whether you're a seasoned developer a neophyte professional or a hobbyist you'll find valuable tips in five independent categories Code level techniques for crafting lines of code testing debugging and coping with complexity Practices approaches and attitudes keep it simple collaborate well reuse and create malleable code Tactics for learning effectively behaving ethically finding challenges and avoiding stagnation Practical ways to complete things use the right tools know what done looks like and seek help from colleagues Habits for working well with others and pursuing development as a social activity

**Refactoring in Java** Stefano Violetta,2023-12-29 Master code refactoring techniques improve code quality design and maintainability and boost your development productivity with this comprehensive handbook Key Features Get a thorough understanding of code refinement for enhanced codebase efficiency Work with real world examples and case studies for hands-on learning and application Focus on essential tools emphasizing

development productivity and robust coding habits Purchase of the print or Kindle book includes a free PDF eBook Book Description Refactoring in Java serves as an indispensable guide to enhancing your codebase's quality and maintainability The book begins by helping you get to grips with refactoring fundamentals including cultivating good coding habits and identifying red flags You'll explore testing methodologies essential refactoring techniques and metaprogramming as well as designing a good architecture The chapters clearly explain how to refactor and improve your code using real world examples and proven techniques Part two equips you with the ability to recognize code smells prioritize tasks and employ automated refactoring tools testing frameworks and code analysis tools You'll discover best practices to ensure efficient code improvement so that you can navigate complexities with ease In part three the book focuses on continuous learning daily practices enhancing coding proficiency and a holistic view of the architecture You'll get practical tips to mitigate risks during refactoring along with guidance on measuring impact to ensure that you become an efficient software craftsman By the end of this book you'll be able to avoid unproductive programming or architecting detect red flags and propose changes to improve the maintainability of your codebase What you will learn Recognize and address common issues in your code Find out how to determine which improvements are most important Implement techniques such as using polymorphism instead of conditions Efficiently leverage tools for streamlining refactoring processes Enhance code reliability through effective testing practices Develop the skills needed for clean and readable code presentation Get to grips with the tools you need for thorough code examination Apply best practices for a more efficient coding workflow Who this book is for This book is for Java developers software architects and technical leads looking for a comprehensive guide to advancing their skills in software design and refactoring The book is ideal for experienced Java enthusiasts quality assurance engineers and codebase maintainers as it provides practical insights real world examples and essential patterns Development managers who want to foster clean coding practices by using best practices for efficient workflows will also find this book useful [Encyclopedia of Software Engineering Three-Volume Set \(Print\)](#) Phillip A. Laplante, 2010-11-22 Software engineering requires specialized knowledge of a broad spectrum of topics including the construction of software and the platforms applications and environments in which the software operates as well as an understanding of the people who build and use the software Offering an authoritative perspective the two volumes of the Encyclopedia of Software Engineering cover the entire multidisciplinary scope of this important field More than 200 expert contributors and reviewers from industry and academia across 21 countries provide easy to read entries that cover software requirements design construction testing maintenance configuration management quality control and software engineering management tools and methods Editor Phillip A Laplante uses the most universally recognized definition of the areas of relevance to software engineering the Software Engineering Body of Knowledge SWEBOK as a template for organizing the material Also available in an electronic format this encyclopedia supplies software engineering students IT professionals researchers managers and scholars with unrivaled

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## **The Art of Agile**

**Development** James Shore, Shane Warden, 2021-10-12 Most companies developing software employ something they call Agile But there's widespread misunderstanding of what Agile is and how to use it If you want to improve your software development team's agility this comprehensive guidebook's clear concrete and detailed guidance explains what to do and why and when to make trade offs In this thorough update of the classic Agile how to guide James Shore provides no nonsense advice on Agile adoption planning development delivery and management taken from over two decades of Agile experience He brings the latest ideas from Extreme Programming Scrum Lean DevOps and more into a cohesive whole Learn how to successfully bring Agile development to your team and organization or discover why Agile might not be for you This book explains how to Improve agility create the conditions necessary for Agile to succeed and scale in your organization Focus on value work as a team understand priorities provide visibility and improve continuously Deliver software reliably share ownership decrease development costs evolve designs and deploy continuously Optimize value take ownership of product plans budgets and experiments and produce market leading software

Clean Code with C# Jason Alls, 2023-12-22 Enhance your programming skills through code reviews TDD and BDD implementation and API design to overcome code inefficiency redundancy and other issues arising from bad code Key Features Write code that seamlessly integrates with other systems while maintaining well defined software boundaries Understand how coding principles and standards elevate software quality Learn how to avoid common errors while implementing concurrency or threading Purchase of the print or Kindle book includes a free PDF eBook Book Description Traditionally associated with Windows desktop applications and game development C has expanded into web cloud and mobile development However despite its extensive coding features professionals often encounter issues with efficiency scalability and maintainability due to poor code Clean Code in C guides you in identifying and resolving these problems using coding best practices This book starts by comparing good and bad code to emphasize the importance of coding standards principles and methodologies It then covers code reviews unit testing and test driven development and addresses cross cutting concerns As you advance through the chapters you'll discover programming best practices for objects data structures exception handling and other aspects of writing C computer programs You'll also explore API design and code quality enhancement tools while studying examples of poor coding practices to understand what to avoid By the end of this clean code book you'll have developed the skills needed to apply industry approved coding practices to write clean readable extendable and maintainable C code What you will learn Master the art of writing evolvable and adaptable code Implement the fail pass refactor methodology using a sample C console application Develop custom C exceptions that provide meaningful information Identify low quality C code in need of refactoring Improve code performance using profiling and refactoring tools Create efficient and bug free code using

functional programming techniques Write cross platform code using MAUI Develop cloud deployable microservices for versatile applications Who this book is for This coding book is for proficient C developers team leads senior software engineers and software architects who want to improve the efficiency of their legacy systems A strong understanding of C programming is assumed

**xUnit Test Patterns** Gerard Meszaros,2007-05-21 Automated testing is a cornerstone of agile development An effective testing strategy will deliver new functionality more aggressively accelerate user feedback and improve quality However for many developers creating effective automated tests is a unique and unfamiliar challenge xUnit Test Patterns is the definitive guide to writing automated tests using xUnit the most popular unit testing framework in use today Agile coach and test automation expert Gerard Meszaros describes 68 proven patterns for making tests easier to write understand and maintain He then shows you how to make them more robust and repeatable and far more cost effective Loaded with information this book feels like three books in one The first part is a detailed tutorial on test automation that covers everything from test strategy to in depth test coding The second part a catalog of 18 frequently encountered test smells provides trouble shooting guidelines to help you determine the root cause of problems and the most applicable patterns The third part contains detailed descriptions of each pattern including refactoring instructions illustrated by extensive code samples in multiple programming languages

Designing Thriving Systems Leslie J. Waguespack,2019-04-10 This monograph illuminates a design mindset for systems artefacts that not only survive but thrive Of itself an artefact is devoid of design quality until encountered in a specific social context by human attendants Design quality is the affect of an intertwining of a an artefact s structural and behavior properties b an attendant humanly conception of quality an appreciative system and c the enfolding social context of their encounter To pursue quality in design is to interweave these three strands bound as a durable cord that evokes a visceral satisfaction or the delight of a ringing musical chord The human consciousness of design quality is fundamentally metaphoric and dynamic a perception of reality mediated by a personal value disposition In the continuum of experience living moment after moment both the attendant s metaphorical appreciation and their sense of quality evolve And thus design quality issues from perpetual concentric cycles of design construct experience learn assess calibrate over the life span of relationship with an artefact Design as a verb s purpose is to service the life in that relationship sustain its survival and hopefully raise that life to a state of thriving Design quality manifests throughout the cycles of design as a verb rather than as a product of it Such is the mindset in which the designer must indwell and that design education must nurture While all artefacts are systems the domain of artefact design of which I am most experienced is computing systems Therefore I will rest upon that domain to explore a theory and practice of design as a verb designing thriving systems

*Extreme Programming Mastery: An In-Depth Exploration and Practical Guide* Adam Jones,2025-01-02 Extreme Programming Mastery An In Depth Exploration and Practical Guide unlocks the full potential of Extreme Programming XP an agile software development methodology celebrated for its focus on customer



satisfaction dynamic teamwork and the production of high quality software This comprehensive guide delves deeply into XP s foundational practices values and principles providing both novice and seasoned developers with an extensive understanding of both its basic and sophisticated techniques Covering essential topics such as Test Driven Development Refactoring Pair Programming Continuous Integration and Deployment this book equips readers with the skills and insights needed to implement XP efficiently in their projects It also tackles the challenges of adopting coding standards using system metaphors practicing collective code ownership and scaling XP for larger projects ensuring a thorough exploration of the methodology Whether you re looking to enhance your existing XP practices or fully embrace the methodology for the first time Extreme Programming Mastery An In Depth Exploration and Practical Guide is an invaluable resource Discover how to nurture a collaborative team atmosphere seamlessly adapt to evolving requirements and deliver software that exceeds customer expectations Embark on your journey to mastering Extreme Programming and transform your software development processes to achieve unparalleled project quality

**The Guru's Guide to Transact-SQL** Ken Henderson, 2000-02-23 Since its introduction over a decade ago the Microsoft SQL Server query language Transact SQL has become increasingly popular and more powerful The current version sports such advanced features as OLE Automation support cross platform querying facilities and full text search management This book is the consummate guide to Microsoft Transact SQL From data type nuances to complex statistical computations to the bevy of undocumented features in the language The Guru s Guide to Transact SQL imparts the knowledge you need to become a virtuoso of the language as quickly as possible In this book you will find the information explanations and advice you need to master Transact SQL and develop the best possible Transact SQL code Some 600 code examples not only illustrate important concepts and best practices but also provide working Transact SQL code that can be incorporated into your own real world DBMS applications Your journey begins with an introduction explaining language fundamentals such as database and table creation inserting and updating data queries joins data presentation and managing transactions Moving on to more advanced topics the journey continues with in depth coverage of Transact SQL performance tuning using tools such as Query Analyzer and Performance Monitor Nuances of the various T SQL data types Complex statistical calculations such as medians modes and sliding aggregates Run sequence and series identification and interrogation Advanced Data Definition Language DDL and Data Management Language DML techniques Stored procedure and trigger best practices and coding methods Transaction management Optimal cursor use and caveats to look out for Full text search Hierarchies and arrays Administrative Transact SQL OLE Automation More than 100 undocumented commands and language features including numerous unpublished DBCC command verbs trace flags stored procedures and functions Comprehensive written in understandable terms and full of practical information and examples The Guru s Guide to Transact SQL is an indispensable reference for anyone working with this database development language The accompanying CD ROM includes the complete set of code examples found in the book as well as a

SQL programming environment that will speed the development of your own top notch Transact SQL code      **Mastering Enterprise JavaBeans** Ed Roman,Rima Patel Sriganesh,Gerald Brose,2004-12-22 Includes more than 30 percent revised material and five new chapters covering the new 2.1 features such as EJB Timer Service and JMS as well as the latest open source Java solutions The book was developed as part of TheServerSide.com online EJB community ensuring a built in audience Demonstrates how to build an EJB system program with EJB adopt best practices and harness advanced EJB concepts and techniques including transactions persistence clustering integration and performance optimization Offers practical guidance on when not to use EJB and how to use simpler less costly open source technologies in place of or in conjunction with EJB

The book delves into Refactoring Improving The Design Of Existing Code. Refactoring Improving The Design Of Existing Code is an essential topic that must be grasped by everyone, ranging from students and scholars to the general public. This book will furnish comprehensive and in-depth insights into Refactoring Improving The Design Of Existing Code, encompassing both the fundamentals and more intricate discussions.

1. The book is structured into several chapters, namely:
    - Chapter 1: Introduction to Refactoring Improving The Design Of Existing Code
    - Chapter 2: Essential Elements of Refactoring Improving The Design Of Existing Code
    - Chapter 3: Refactoring Improving The Design Of Existing Code in Everyday Life
    - Chapter 4: Refactoring Improving The Design Of Existing Code in Specific Contexts
    - Chapter 5: Conclusion
  2. In chapter 1, the author will provide an overview of Refactoring Improving The Design Of Existing Code. This chapter will explore what Refactoring Improving The Design Of Existing Code is, why Refactoring Improving The Design Of Existing Code is vital, and how to effectively learn about Refactoring Improving The Design Of Existing Code.
  3. In chapter 2, this book will delve into the foundational concepts of Refactoring Improving The Design Of Existing Code. The second chapter will elucidate the essential principles that need to be understood to grasp Refactoring Improving The Design Of Existing Code in its entirety.
  4. In chapter 3, this book will examine the practical applications of Refactoring Improving The Design Of Existing Code in daily life. This chapter will showcase real-world examples of how Refactoring Improving The Design Of Existing Code can be effectively utilized in everyday scenarios.
  5. In chapter 4, the author will scrutinize the relevance of Refactoring Improving The Design Of Existing Code in specific contexts. The fourth chapter will explore how Refactoring Improving The Design Of Existing Code is applied in specialized fields, such as education, business, and technology.
  6. In chapter 5, this book will draw a conclusion about Refactoring Improving The Design Of Existing Code. The final chapter will summarize the key points that have been discussed throughout the book.
- The book is crafted in an easy-to-understand language and is complemented by engaging illustrations. This book is highly recommended for anyone seeking to gain a comprehensive understanding of Refactoring Improving The Design Of Existing Code.

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### Refactoring Improving The Design Of Existing Code Introduction

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