

Requirements Engineering Klaus Pohl

Requirements engineering tasks have become increasingly complex. In order to ensure a high level of knowledge and competency among requirements engineers, the International Requirements Engineering Board (IREB) developed a standardized qualification called the Certified Professional for Requirements Engineering (CPRE). The certification defines the practical skills of a requirements engineer on various training levels. This book is designed for self-study and covers the curriculum for the Certified Professional for Requirements Engineering Foundation Level exam as defined by the IREB. **The 2nd edition** has been thoroughly revised and is aligned with the curriculum Version 2.2 of the IREB. In addition, some minor corrections to the 1st edition have been included. **About IREB:** The mission of the IREB is to contribute to the standardization of further education in the fields of business analysis and requirements engineering by providing syllabi and examinations, thereby achieving a higher level of applied requirements engineering. The IRE Board is comprised of a balanced mix of independent, internationally recognized experts in the fields of economy, consulting, research, and science. The IREB is a non-profit corporation. For more information visit www.certified-re.com

"This volume contains the proceedings of the fourth European Software Engineering Conference. It contains 6 invited papers and 27 contributed papers selected from more than 135 submissions. The volume has a mixture of themes. Some, such as software engineering and computer supported collaborative work, are forward-looking and anticipate future developments; others, such as systems engineering, are more concerned with reports of practical industrial applications. Some topics, such as software reuse, reflect the fact that some of the concerns first raised in 1969 when software engineering was born remain unsolved problems. The contributed papers are organized under the following headings: requirements specification, environments, systems engineering, distributed software engineering, real-time systems, software engineering and computer supported collaborative work, software reuse, software process, and formal aspects of software engineering."--PUBLISHER'S WEBSITE.

A common problem with most texts on requirements specifications is that they emphasize structural models to the near exclusion of behavioral models—focusing on what the software is, rather than what it does. If they do cover behavioral models, the coverage is brief and usually focused on a single model. *Modeling Software Behavior: A Craftsman's Approach* provides detailed treatment of various models of software behavior that support early analysis, comprehension, and model-based testing. Based on the popular and continually evolving course on requirements specification models taught by the author at universities and corporate environments, the text covers six behavioral models—providing the background behind these models and the required mathematics. As evidence of models at work, the author introduces eleven continuing examples. Five of these examples are illustrated with the six models, allowing readers to easily compare the expressive power of the various models. The examples chosen reflect a wide variety of behavioral issues. Providing complete coverage that includes flowcharts, decision tables, finite state machines, two variations of Petri Nets, and StateCharts, this book will help students develop the understanding of the expressive capabilities and limitations of models of system behavior needed to make informed and appropriate choices among different models when confronted with new challenges.

This Open Access book presents the results of the "Collaborative Embedded Systems" (CrESt) project, aimed at adapting and complementing the methodology underlying modeling techniques developed to cope with the challenges of the dynamic structures of collaborative embedded systems (CESs) based on the SPES development methodology. In order to manage the high complexity of the individual systems and the dynamically formed interaction structures at runtime, advanced and powerful development methods are required that extend the current state of the art in the development of embedded systems and cyber-physical systems. The methodological contributions of the project support the effective and efficient development of CESs in dynamic and uncertain contexts, with special emphasis on the reliability and variability of individual systems and the creation of networks of such systems at runtime. The project was funded by the German Federal Ministry of Education and Research (BMBF), and the case studies are therefore selected from areas that are highly relevant for Germany's economy (automotive, industrial production, power generation, and robotics). It also supports the digitalization of complex and transformable industrial plants in the context of the German government's "Industry 4.0" initiative, and the project results provide a solid foundation for implementing the German government's high-tech strategy "Innovations for Germany" in the coming years.

Use case analysis is a methodology for defining the outward features of a software system from the user's point of view. *Applying Use Cases, Second Edition*, offers a clear and practical introduction to this cutting-edge software development technique. Using numerous realistic examples and a detailed case study, you are guided through the application of use case analysis in the development of software systems. This new edition has been updated and expanded to reflect the Unified Modeling Language (UML) version 1.3. It also includes more complex and precise examples, descriptions of the pros and cons of various use case documentation techniques, and discussions on how other modeling approaches relate to use cases. *Applying Use Cases, Second Edition*, walks you through the software development process, demonstrating how use cases apply to project inception, requirements and risk analysis, system architecture, scheduling, review and testing, and documentation. Key topics include: Identifying use cases and describing actors Writing the flow of events, including basic and alternative paths Reviewing use cases for completeness and correctness Diagramming use cases with activity diagrams and sequence diagrams Incorporating user interface description and data description documents Testing architectural patterns and designs with use cases Applying use cases to project planning, prototyping, and estimating Identifying and diagramming analysis classes from use cases Applying use cases to user guides, test cases, and training material An entire section of the book is devoted to identifying common mistakes and describing their solutions. Also featured is a handy collection of documentation templates and an abbreviated guide to UML notation. You will come away from this book with a solid understanding of use cases, along with the skills you need to put use case analysis to work.

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Engineering Management: Meeting the Global Challenges prepares engineers to fulfill their managerial responsibilities, acquire useful business perspectives, and take on the much-needed leadership roles to meet the challenges in the new millennium. Value addition, customer focus, and business perspectives are emphasized throughout. Also underlined are discussions of leadership attributes, steps to acquire these attributes, the areas engineering managers are expected to add value, the web-based tools which can be aggressively applied to develop and sustain competitive advantages, the opportunities offered by market expansion into global regions, and the preparations required for engineering managers to become global leaders. The book is organized into three major sections: functions of engineering management, business fundamentals for engineering managers, and engineering management in the new millennium. This second edition refocuses on the new strategy for science, technology, engineering, and math (STEM) professionals and managers to meet the global challenges through the creation of strategic differentiation and operational excellence. Major revisions include a new chapter on creativity and innovation, a new chapter on operational excellence, and combination of the chapters on financial accounting and financial management. The design strategy for this second edition strives for achieving the T-shaped competencies, with both broad-based perspectives and in-depth analytical skills. Such a background is viewed as essential for STEM professionals and managers to exert a strong leadership role in the dynamic and challenging marketplace. The material in this book will surely help engineering managers play key leadership roles in their organizations by optimally applying their combined strengths in engineering and management. Thinking: A Guide to Systems Engineering Problem-Solving focuses upon articulating ways of thinking in today's world of systems and systems engineering. It also explores how the old masters made the advances they made, hundreds of years ago. Taken together, these considerations represent new ways of problem solving and new pathways to answers for modern times. Special areas of interest include types of intelligence, attributes of superior thinkers, systems architecting, corporate standouts, barriers to thinking, and innovative companies and universities. This book provides an overview of more than a dozen ways of thinking, to include: Inductive Thinking, Deductive Thinking, Reductionist Thinking, Out-of-the-Box Thinking, Systems Thinking, Design Thinking, Disruptive Thinking, Lateral Thinking, Critical Thinking, Fast and Slow Thinking, and Breakthrough Thinking. With these thinking skills, the reader is better able to tackle and solve new and varied types of problems. Features Proposes new approaches to problem solving for the systems engineer Compares as well as contrasts various types of Systems Thinking Articulates thinking attributes of the great masters as well as selected modern systems engineers Offers chapter by chapter thinking exercises for consideration and testing Suggests a "top dozen" for today's systems engineers

Written for those who want to develop their knowledge of requirements engineering process, whether practitioners or students. Using the latest research and driven by practical experience from industry, Requirements Engineering gives useful hints to practitioners on how to write and structure requirements. It explains the importance of Systems Engineering and the creation of effective solutions to problems. It describes the underlying representations used in system modeling and introduces the UML2, and considers the relationship between requirements and modeling. Covering a generic multi-layer requirements process, the book discusses the key elements of effective requirements management. The latest version of DOORS (Version 7) - a software tool which serves as an enabler of a requirements management process - is also introduced to the reader here. Additional material and links are available at:

<http://www.requirementsengineering.info>

This book constitutes the thoroughly refereed post-proceedings of the 4th International Workshop on Product Family Engineering, PFE 2001, held in Bilbao, Spain, in October 2001. The 31 revised full papers presented together with an introduction and six session reports were carefully reviewed and selected for inclusion in the book. The papers are organized in topical sections on product issues, process issues, community issues, platform and quality solutions, diversity solutions, product validation, and process validation.

Publisher Fact Sheet A concise, hands-on approach to managing & improving the critical requirements process in software development.

In 2013, the International Conference on Advance Information Systems Engineering (CAiSE) turns 25. Initially launched in 1989, for all these years the conference has provided a broad forum for researchers working in the area of Information Systems Engineering. To reflect on the work done so far and to examine prospects for future work, the CAiSE Steering Committee decided to present a selection of seminal papers published for the conference during these years and to ask their authors, all prominent researchers in the field, to comment on their work and how it has developed over the years. The scope of the papers selected covers a broad range of topics related to modeling and designing information systems, collecting and managing requirements, and with special attention to how information systems are engineered towards their final development and deployment as software components. With this approach, the book provides not only a historical analysis on how information systems engineering evolved over the years, but also a fascinating social network analysis of the research community. Additionally, many inspiring ideas for future research and new perspectives in this area are sparked by the intriguing comments of the renowned authors.

Requirements Engineering Fundamentals, Principles, and Techniques Springer

Hauptbeschreibung Hinweis: Dieses E-Book ist nicht mit interaktiven Elementen (aktives Inhaltsverzeichnis, Querverweise) ausgestattet! Wir bieten Ihnen das PDF daher zu einem günstigeren Preis an. Der 'Certified Professional for Requirements Engineering' hat sich als international standardisiertes Aus- und Weiterbildungsprogramm etabliert. Dieses Lehrbuch ist das erste für die Zertifizierung zum Foundation Level, geschrieben von Mitgliedern des International Requirements Engineering Board (IREB), die den Lehrplan mit entwickelt haben. Es umfasst Grundlagenwissen in den Gebieten.

Solid requirements engineering has increasingly been recognized as the key to improved, on-time, and on-budget delivery of software and systems projects. This textbook provides a comprehensive treatment of the theoretical and practical aspects of discovering, analyzing, modeling, validating, testing, and writing requirements for systems of all kinds, with an intentional focus on software-intensive systems. It brings into play a variety of formal methods, social models, and modern requirements for writing techniques to be useful to the practicing engineer. This book was written to support both undergraduate and graduate requirements engineering courses. Each chapter includes simple, intermediate, and advanced exercises. Advanced exercises are suitable as a research assignment or independent study and are denoted by an asterisk. Various exemplar systems illustrate points throughout the book, and four systems in particular—a baggage handling system, a point of sale system, a smart home system, and a wet well pumping system—are used repeatedly. These systems involve application domains with which most readers are likely to be familiar, and they cover a wide range of applications from embedded to organic in both industrial and consumer implementations. Vignettes at the end of each chapter provide mini-case studies showing how the learning in the chapter can be employed in real

systems. Requirements engineering is a dynamic field and this text keeps pace with these changes. Since the first edition of this text, there have been many changes and improvements. Feedback from instructors, students, and corporate users of the text was used to correct, expand, and improve the material. This third edition includes many new topics, expanded discussions, additional exercises, and more examples. A focus on safety critical systems, where appropriate in examples and exercises, has also been introduced. Discussions have also been added to address the important domain of the Internet of Things. Another significant change involved the transition from the retired IEEE Standard 830, which was referenced throughout previous editions of the text, to its successor, the ISO/IEC/IEEE 29148 standard.

Software product line engineering has proven to be the methodology for developing a diversity of software products and software intensive systems at lower costs, in shorter time, and with higher quality. In this book, Pohl and his co-authors present a framework for software product line engineering which they have developed based on their academic as well as industrial experience gained in projects over the last eight years. They do not only detail the technical aspect of the development, but also an integrated view of the business, organisation and process aspects are given. In addition, they explicitly point out the key differences of software product line engineering compared to traditional single software system development, as the need for two distinct development processes for domain and application engineering respectively, or the need to define and manage variability.

This book constitutes the proceedings of the 27th International Working Conference on Requirements Engineering - Foundation for Software Quality, REFSQ 2021, which was due to be held in Essen, Germany, in April 2021. Due to the COVID-19 pandemic the conference was held virtually in April 2021. The special focus of this year's REFSQ 2021 conference are contributions emphasizing the importance of human values, such as privacy and fairness, when designing software-intensive systems as well as the challenges that intelligent and autonomous systems pose due to the tight interplay with humans.

React helps you create and work on an app in just a few minutes. But learning how to put all the pieces together is hard. How do you validate a form? Or implement a complex multistep user action without writing messy code? How do you test your code? Make it reusable? Wire it to a backend? Keep it easy to understand? The React Cookbook delivers answers fast. Many books teach you how to get started, understand the framework, or use a component library with React, but very few provide examples to help you solve particular problems. This easy-to-use cookbook includes the example code developers need to unravel the most common problems when using React, categorized by topic area and problem. You'll learn how to: Build a single-page application in React using a rich UI Create progressive web applications that users can install and work with offline Integrate with backend services such as REST and GraphQL Automatically test for accessibility problems in your application Secure applications with fingerprints and security tokens using WebAuthn Deal with bugs and avoid common functional and performance problems

Efficient communication, collaboration, data exchange and sharing are crucial for the success of today's many multi-disciplinary and interdisciplinary work environments. The implementation of computer-integrated environments (CIE) is increasing and the requirements engineering necessary for the development of these systems is critical. Requirements Engineering for Computer Integrated Environments in Construction provides an important source of information and advice for organizations needing to bridge the gap between users and developers in the implementation of computer-integrated solutions as well as for consultants providing services to their clients in CIE development. The framework explained in the book is comprehensive and accessible. It provides a set of tools and techniques enabling readers to design, manage and deliver effective CIE-type systems in any complex organization – from construction and manufacturing to the information technology and service sectors. Construction companies for example, can use the framework provided to implement building information modelling to manage the diagnosis, planning, implementation and monitoring stages in BIM adoption. Based on real experiences and lessons learned from many years of system development, this book offers an excellent resource for researchers and postgraduate students interested in CIE development for all multi-disciplinary and interdisciplinary work environments.

Written for those who want to develop their knowledge of requirements engineering process, whether practitioners or students. Using the latest research and driven by practical experience from industry, this book gives useful hints to practitioners on how to write and structure requirements. - Explains the importance of Systems Engineering and the creation of effective solutions to problems - Describes the underlying representations used in system modeling - data flow diagrams; statecharts; object-oriented approaches - Covers a generic multi-layer requirements process - Discusses the key elements of effective requirements management - Includes a chapter written by one of the developers of rich traceability - Introduces an overview of DOORS - a software tool which serves as an enabler of a requirements management process Additional material and links are available at: <http://www.requirementsengineering.info> "In recent years we have been finding ourselves with a shortage of engineers with good competence in requirements engineering. Perhaps this is in part because requirements management tool vendors have persuaded management that a glitzy tool will solve their requirements engineering problems. Of course, the tools only make it possible for engineers who understand requirements engineering to do a better job. This book goes a long way towards building a foundational set of skills in requirements engineering, so that today's powerful tools can be used sensibly. Of particular value is a recognition of the place software requirements have within the system context, and of ways for dealing with that sensitive connection. This is an important book. I think its particular value in industry will be to bring the requirements engineers and their internal customers to a practical common understanding of what can and should be achieved." (Byron Purves, Technical Fellow, The Boeing Company)

This book provides a comprehensive introduction into the SPES XT modeling framework. Moreover, it shows the applicability of the framework for the development of embedded systems in different industry domains and reports on the lessons learned. It also describes how the SPES XT modeling framework can be tailored to meet domain and project-specific needs. The book is structured into four parts: Part I "Starting Situation" discusses the status quo of the development of embedded systems with specific focus on model-based engineering and summarizes key challenges emerging from industrial practice. Part II "Modeling Theory" introduces the SPES XT modeling framework and explains the core underlying principles. Part III "Application of the SPES XT Framework" describes the application of the SPES XT modeling framework and how it addresses major industrial challenges. Part IV "Evaluation and Technology Transfer" assesses the impact of the SPES XT modeling framework and includes various exemplary applications from automation, automotive, and avionics. Overall, the SPES XT modeling framework offers a seamless model-based engineering approach. It addresses core challenges faced during the engineering of embedded systems. Among others, it offers aligned and integrated techniques for the early validation of engineering artefacts (including requirements and functional and technical designs), the management of product variants and their variability, modular safety assurance and deployment of embedded software.

Requirements engineering is the process of eliciting individual stakeholder requirements and needs and developing them into detailed, agreed requirements documented and specified in such a way that they can serve as the basis for all other system development activities. In this textbook, Klaus Pohl provides a comprehensive and well-structured introduction to the fundamentals, principles, and techniques of requirements engineering. He presents approved techniques for eliciting, negotiating and documenting as well as validating, and managing requirements for software-intensive systems. The various aspects of the process and the techniques are illustrated using numerous examples based on his extensive teaching experience and his work in industrial collaborations. His presentation aims at professionals, students, and lecturers in systems and software engineering or business applications development. Professionals such as project managers, software architects, systems analysts, and software engineers will benefit in their daily work from the didactically well-presented combination of validated procedures and industrial experience. Students and lecturers will appreciate the comprehensive description of sound fundamentals, principles, and techniques, which is completed by a huge commented list of references for further reading. Lecturers will find additional teaching material on the book's website, www.requirements-book.com.

This book constitutes the refereed proceedings of the 29th International Conference on Advanced Information Systems Engineering, CAiSE 2017, held in Essen, Germany, in June 2017. The 37 papers presented together with 3 keynote papers in this volume were carefully reviewed and selected from 175 submissions. The papers are organized in topical sections on information systems architecture; business process alignment; user knowledge discovery; business process performance; big data exploration; process variability management; information systems transformation and evolution; business process modeling readability; business process adaptation; data mining; process discovery; business process modeling notation.

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This book covers research into the most important practices in product line organization. Contributors offer experience-based knowledge on the domain and application engineering, the modeling and management of variability, and the design and use of tools to support the management of product line-related knowledge.

Requirements Engineering (RE) ist eine Schlüsseldisziplin der Systementwicklung und entscheidet maßgeblich über den Erfolg oder Misserfolg eines Projekts. Fachleute, die in diesem Bereich tätig sind, sollten über ein gesichertes RE-Grundlagenwissen verfügen - so wie es im Lehrplan des "Certified Professional for Requirements Engineering" (CPRE) festgelegt ist. Entwickelt und eingeführt wurde das CPRE-Zertifikat vom "International Requirements Engineering Board" (IREB e.V.). Der IREB e.V. setzt sich für die Verbesserung der Requirements-Engineering-Praxis sowie für eine qualitätsgesichert.

This book constitutes the thoroughly refereed post-proceedings of the 5th International Workshop on Product-Family Engineering, PFE 2003, held in Siena, Italy in November 2003. The 36 revised full papers presented together with an introductory overview and 3 keynote presentations were carefully selected during two rounds of reviewing and improvement. The papers are organized in topical sections on variation mechanisms, requirements analysis and management, product derivation, transition to family development, industrial experience, evolution, and decision and derivation.

Embedded systems have long become essential in application areas in which human control is impossible or infeasible. The development of modern embedded systems is becoming increasingly difficult and challenging because of their overall system complexity, their tighter and cross-functional integration, the increasing requirements concerning safety and real-time behavior, and the need to reduce development and operation costs. This book provides a comprehensive overview of the Software Platform Embedded Systems (SPES) modeling framework and demonstrates its applicability in embedded system development in various industry domains such as automation, automotive, avionics, energy, and healthcare. In SPES 2020, twenty-one partners from academia and industry have joined forces in order to develop and evaluate in different industrial domains a modeling framework that reflects the current state of the art in embedded systems engineering. The content of this book is structured in four parts. Part I "Starting Point" discusses the status quo of embedded systems development and model-based engineering, and summarizes the key requirements faced when developing embedded systems in different application domains. Part II "The SPES Modeling Framework" describes the SPES modeling framework. Part III "Application and Evaluation of the SPES Modeling Framework" reports on the validation steps taken to ensure that the framework met the requirements discussed in Part I. Finally, Part IV "Impact of the SPES Modeling Framework" summarizes the results achieved and provides an outlook on future work. The book is mainly aimed at professionals and practitioners who deal with the development of embedded systems on a daily basis. Researchers in academia and industry may use it as a compendium for the requirements and state-of-the-art solution concepts for embedded systems development.

This open access book includes contributions by leading researchers and industry thought leaders on various topics related to the essence of software engineering and their application in industrial projects. It offers a broad overview of research findings dealing with current practical software engineering issues and also pointers to potential future developments. Celebrating the 20th anniversary of adesso AG, adesso gathered some of the pioneers of software engineering including Manfred Broy, Ivar Jacobson and Carlo Ghezzi at a special symposium, where they presented their thoughts about latest software engineering research and which are part of this book. This way it offers readers a concise overview of the essence of software engineering, providing valuable insights into the latest methodological research findings and adesso's experience applying these results in real-world projects.

S-Cube's Foundations for the Internet of Services Today's Internet is standing at a crossroads. The Internet has evolved from a source of information to a critical infrastructure which

underpins our lives and economies. The demand for more multimedia content, more interconnected devices, more users, a richer user experience, services available any time and anywhere increases the pressure on existing networks and service platforms. The Internet needs a fundamental rearrangement to be ready to meet future needs. One of the areas of research for the Future Internet is the Internet of Services, a vision of the Internet where everything (e. g. , information, software, platforms and infrastructures) is available as a service. Services available on the Internet of Services can be used by anyone (if they are used according to the policies defined by the provider) and they can be extended with new services by anyone. Advantages of the Internet of Services include the possibility to build upon other people's efforts and the little investment needed upfront to develop an application. The risk involved in pursuing new business ideas is diminished, and might lead to more innovative ideas being tried out in practice. It will lead to the appearance of new companies that are able to operate in niche areas, providing services to other companies that will be able to focus on their core business.

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