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## Preface

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### What is the Point of This Book?

Software architecture evaluation is a powerful means to mitigate risks when making decisions about software systems, when constructing them, when changing them, when considering (potential) improvements, or when reasoning about ways to migrate. Architecture evaluation is beneficial in such cases either by predicting properties of software systems before they are built or by answering questions about existing systems. Architecture evaluation is both effective and efficient: effective, as it is based on abstractions of the system under evaluation, and efficient, as it can always focus only on those facts that are relevant for answering the evaluation questions at hand.

Acknowledging the need for architecture evaluation does not necessarily mean that it has been adopted by practitioners. Although research has disseminated numerous publications about architecture evaluation, a pragmatic and practical guide on how to apply it in one's own context and benefit from it is still missing. With this book we want to share our lessons learned from evaluating software architectures. We do not aim at reinventing the wheel; rather, we present a consolidation of useful ideas from research and practice, adapting them in such a way as to make them applicable efficiently and effectively—in short, we take a pragmatic approach to evaluating software architectures. Where necessary, we will fill in gaps in existing approaches, in particular in the areas of scalability and applicability. Additionally, we aim at interrelating all aspects and techniques of architecture evaluation and creating an understandable and memorable overall picture. We will refer to examples of real architecture evaluation cases from our industrial practice (anonymized due to confidentiality reasons) and provide data on projects.

## Why Read This Book?

“The most serious mistakes are not being made as a result of wrong answers. The truly dangerous thing is asking the wrong question.”

Peter Ferdinand Drucker

We think that thorough and continuous architecting is the key to overall success in software engineering, and architecture evaluation is a crucial part of architecting. Asking the right questions and knowing about the right techniques to answer is crucial for applying architecture evaluations as a valuable and pragmatic means of technical risk management in software engineering.

To date (i.e., as of February 2016), we have conducted more than 75 architecture evaluation projects with industrial customers in the past decade. In each of these projects, at least one of the authors has been directly or indirectly involved as part of our jobs as architects and consultants at the Fraunhofer Institute for Experimental Software Engineering IESE. Fraunhofer IESE is an applied research institute for software engineering located in Kaiserslautern, Germany. These projects covered a large number of different types of systems, industries, organizational constellations, technologies, modeling and programming languages, context factors, and, of course, a whole spectrum of different evaluation results. Most importantly, we collected a lot of evaluation questions that were asked and operationalized them into actions.

“You can’t control what you can’t measure.”

Tom DeMarco

“Everything that can be counted does not necessarily count; everything that counts cannot necessarily be counted.”

Albert Einstein

While scientific literature on architecture evaluation approaches is available, the number of publications on practical experiences is rather limited. The contribution of this book consists of the presentation and packaging of our experiences together with context factors, empirical data, example cases, and lessons learned on mitigating the risk of change through architecture evaluation. Our approach for architecture evaluation (called RATE Rapid ArchiTecture Evaluation) has evolved and been proven successful in many projects over the past decade. We will provide an

in-depth description on the ingredients of our approach, but will also tackle the field of architecture evaluation as a whole, as many of our insights and findings are independent of the approach.

After reading this book, the target audiences will be able to take their own steps in evaluating software architecture. By giving comprehensive answers to more than 100 typical questions (including questions we had, questions we heard, and questions our industrial partners had) and discussing more than 60 frequent mistakes and lessons learned, readers will take their first steps on ground paved by more than a decade of the authors' experiences.

Even more importantly, readers will learn how to interpret the results of an architecture evaluation. They will become aware of risks such as false conclusions, fiddling with data, and wrong lines of arguments in evaluations. Last but not least, readers will become confident in assessing quantitative measurement results and will learn when it is better to rely on qualitative expertise. In short, it is important to be aware what counts in architecture evaluation.

The target audience for the experience shared with this book includes both practitioners and researchers. On the one hand, we aim at encouraging practitioners to conduct architecture evaluations by showing the impact and lowering the hurdles to making first attempts on their own by providing clear guidelines, data, and examples. On the other hand, we aim at giving researchers insights into industrial architecture evaluations, which can serve as basis for guiding research in this area and may inspire future research directions.

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## How Should I Read This Book?

Our book is structured into three parts explaining the background of architecture evaluation, describing concrete evaluation techniques, and offering hints on how to successfully start and institutionalize architecture evaluation in practice.

Part I What is the Point of Architecture Evaluation?

Part II How to Evaluate Architectures Effectively and Efficiently?

Part III How to Apply Architecture Evaluation in Practice?

- For an **executive summary** on one page, please jump directly to question Q.117 on page 148.
- For **architects, developers**, or as learning material for **aspiring evaluators**, all three parts are highly relevant.
- For **managers**, mainly Part I and Part III are relevant.
- For a **quick start into an evaluation**, we recommend starting with question Q.117, reading Chaps. 3, 4, and 11, then proceeding directly to the respective checks you want to conduct in Chaps. 5–9.

In order to serve practitioners' needs in the best possible way, the entire book is structured along questions. These questions are organized in a hierarchical and uniform way to cover the big picture of architecture evaluation. For every topic, we also present frequently made mistakes we often encountered in practice and give hints on how to avoid them. Lists containing all questions, all frequently made mistakes, and the lessons learned serve to offer quick guidance for the reader.

In the following, we depict the recurring patterns that guide readers through the book. To a large extent, the chapters follow a uniform structure and are organized internally along questions. The questions are numbered consecutively. Frequent mistakes and lessons learned are visually highlighted, as shown in the following examples.

1.1 What is the point?

→ *This section summarizes the key points of the chapter's topic.*

1.2 How to do it effectively and efficiently?

→ *Here we present detailed descriptions and guidance.*

1.3 What mistakes are made frequently in practice?

→ *This section names typical pitfalls and points out how to avoid them.*

**Q.001. Question**

**Frequently made mistake**

→ Question Q.00X (*please read this question for more background information*)

**Lesson learned**



<http://www.springer.com/978-3-319-34176-7>

Pragmatic Evaluation of Software Architectures

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2016, XXIII, 154 p. 40 illus., Softcover

ISBN: 978-3-319-34176-7