Overview of the Book

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Abstract: For the different readers interested in this book, we provide a short introductory overview of the book. This overview helps to select appropriate chapters and to assure an efficient start.

The Introduction (Part 1) highlights the topic and outlines the importance of configuration technologies. It provides a short overview of historical developments (Chapter 2), explains related topics such as recommender systems, software configuration, and product data management (Chapter 3), and provides insights into commercial benefits for organizations that integrate configurators in their business processes (Chapter 4).

The Basics (Part 2) introduces the concepts needed for understanding how configuration technologies work. This part helps the reader to develop an answer, for example, to the following questions: What is configuration? What is a configuration model? What is a configuration task (problem)? How can a configuration task be represented on a formal level? Which reasoning approaches exist for solving a configuration task? What are key criteria to be taken into account by configurator user interfaces? How can configuration be applied to support mass customization?

The following chapters are included in Part 2. In Chapter 6, Lothar Hotz et al. provide an in-depth introduction to the topic of configuration knowledge representations and related reasoning approaches. This chapter includes a presentation of a UML (Unified Modeling Language) based configuration model, which is used as a working example throughout the book. Consistency management for configuration knowledge is an important issue in industrial environments. Configuration knowledge bases have to determine correct solutions that take into account technical restrictions and constraints related to marketing and sales. In Chapter 7, Alexander Felfernig et al. introduce different consistency management techniques and explain these in the context of an example configuration knowledge base. In Chapter 8, Gerhard Leitner et al. discuss major issues related to the design of configurator user interfaces. Furthermore, Paul Blazek and Frank T. Piller shed light on relationships between the mass customization paradigm and underlying technologies (Chapter 9). Finally, Lothar Hotz and Katharina Wolter introduce a configuration model from the domain of smarthomes (Chapter 10).

Advanced Topics (Part 3) provides an overview of ongoing research dedicated to advancing the state of the art in configuration systems. This part of the book helps to answer, for example, the following questions: How can configurator user interfaces be personalized? How can configurations be
personalized? Answering both of these questions is very relevant in order to tackle the problem of mass confusion that occurs when too many options are presented to the user. How can we automatically test and debug configuration knowledge bases? How can we improve the quality of configuration knowledge bases, for example, by detecting redundant (and therefore often not necessarily needed) constraints? What are major issues related to different psychological theories of human decision-making? How do these theories have an impact on the way users are interacting with a configurator? This part concludes with a discussion of important issues for future research.

The following chapters are included in Part 3. Gerhard Friedrich et al. (Chapter 11) build upon the concepts in Chapter 7 and introduce an approach to the automated testing and debugging of configuration knowledge bases. Alexander Felfernig et al. extend the idea of testing and debugging knowledge bases with approaches to automatically identify redundancies in knowledge bases (Chapter 12). Redundant constraints are constraints that can be deleted from the knowledge base without changing the semantics of the knowledge base. In Chapter 13, Juha Tiihonen et al. introduce concepts related to the idea of personalizing configuration processes—in this context different algorithmic approaches are sketched with the goal to proactively support the user within the scope of a configuration process. Decision psychological aspects of consumer decision-making in the context of configuration systems are discussed by Monika Mandl et al. in Chapter 14. The authors focus on different decision-psychological phenomena and their potential impact on the decision making of a user when interacting with a configurator.

The Applications of Configuration Technologies (Part 4) entails six business cases that show the application of configuration technologies in different product domains. Four contributions report experiences of deploying configuration technologies in industrial environments, and the remaining two contributions introduce future application domains and related business benefits.

The following chapters are included in Part 4. Four chapters report experiences with configuration technologies in real-world scenarios. In Chapter 16, Andreas Falkner and Herwig Schreiner introduce the SIEMENS configuration environment on the basis of a configurator application deployed in the domain of railway interlocking systems. Klas Orsvarn and Morten Bennick report experiences with the Tacton configuration environment in the domain of cement plant equipment (see Chapter 17). Thereafter in Chapter 18, Björn Höfling presents a deployed configurator application in the domain of compressed air systems. Finally, Rick Rabiser et al. motivate the relevance of configuration technologies in the context of configuring documents—feature model technologies are applied in this context (see Chapter 20). The remaining two chapters discuss application areas with related potential impacts—no deployment in an industrial environment took place in these two cases. First, Iulia Nica et al. motivate the application of (re)configuration technologies in the domain of mobile phone network infrastructures (see Chapter 19). Second, Juha Tiihonen et al. discuss the peculiarities of configuration technologies in the context of service and process configuration (see Chapter 21).

Configuration Environments (Part 5) entails a discussion of configuration environments on a more technical level. This part includes four commercial and two academic configuration environments. The chapters of this part provide an impression of how the PC configuration model introduced in Chapter 6 can be implemented in the form of a configuration knowledge base when using the corresponding configuration environment. First, Alois Haselböck and Gottfried Schenner introduce the S’UPREME configuration environment from SIEMENS (Chapter 22). Thereafter, Thorsten Krebs provides an overview of the encoway configuration environment (Chapter 23). Lothar Hotz introduces the KONWERK open source configuration environment (Chapter 24). Felfernig et al. introduce the
Table 5.1 Recommendation of book parts for different reader segments.

<table>
<thead>
<tr>
<th>Reader Segment</th>
<th>Recommended Parts</th>
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<tbody>
<tr>
<td>Industry with no configuration-related knowledge</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>Industry with configuration-related knowledge</td>
<td>2, 3</td>
</tr>
<tr>
<td>Industry and researchers interested in learning material</td>
<td>2, 3, 4, 5</td>
</tr>
<tr>
<td>Researchers interested in configuration systems</td>
<td>2, 3</td>
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A (Wikipedia-based) *WeeVis* environment, which is useful as a simple learning environment for configuration model development (Chapter 25). Furthermore, Juha Tiihonen and Andreas Anderson introduce the *VariSales* environment (Chapter 26). Finally, in Chapter 27 Albert Haag presents a retrospective of the developments related to the *SAP* configuration environment.

An Appendix (Part 6) concludes this book. It includes an overview of existing commercial configuration environments, an overview of open-source constraint solvers that are especially useful when dealing with less complex configuration scenarios, an overview of configuration-related lexicons and databases (summarizing existing applications of configuration technologies), an overview of existing benchmarks that can be used to compare new (algorithmic) developments with the existing state of the art, and an overview of existing journal special issues and events (conferences and workshops) related to the field of configuration.

In order to support the reader in the selection of specific chapters, we provide the following recommendations (see Table 5.1).

1. **People from industry with no configuration-related knowledge** should take a look at the chapters in Part 2 to gain a basic understanding of the concepts behind configuration systems and then switch to Part 4, which includes a discussion of related business cases. Part 5 is a good complement in terms of a visualization of functionalities of existing configuration environments.
2. **People from industry with a configuration-related background** are encouraged to take a look at Part 2 and then to move on to Part 3, which includes a discussion of new and future technological developments.
3. **Readers interested in the establishment of learning units** related to the topic of configuration are referred to Parts 2 through 5 as well as the slides provided with the contents of this book.
4. **Researchers new in the field of configuration** are referred to the Parts 2 and especially Part 3, which provides an overview of issues for future research that may be of interest for PhD students in the early phase of their work.