

Foreword

The quality of business software is determined not only by the functionality and the quality properties of the software, but also by its fitting into the business context. Business processes constitute the major part of this context. Missing alignment between software and context induces disruption, inefficiency and frustration. The design (and thus also the quality) of business processes and of business software are nowadays typically separated in the discipline of business process management and in the discipline of software engineering. Business informatics and information system science study the concurrence of both, but typically focusing on functional aspects and not addressing detailed technical software properties. A precise specification of quality as well as its measurement and prediction is neglected both in practice and in research.

The contribution of this book is to give examples from research and practice for an integrated design of the quality of business processes and software. The first research contribution is a foundation for the integrated specification of quality for business process and software in terms of a business process quality reference model (BPQRM) which is compatible with well known software product quality standards such as ISO/IEC 25000. To apply the BPQRM in practice an extension of typical business process modeling notations such as BPMN is proposed and implemented. The second research contribution is an integrated model of business process and software performance and a corresponding tool for integrated simulation and performance analysis and prediction. The book shows the limitations of a separated but connected simulation of business processes and information systems (BIIS) which could be viewed as a natural solution to the alignment problem. Based on this the intricacies of a true integration are motivated and developed. Important parts of this integration (IntBIIS) are a scheduling policy for human actors as well as the treat-

ment of variable load which does not impact the stability of the simulation.

To support further work on quality specification and alignment this book contains several case studies which show the potential of the integrated approach. The usefulness of the BPQRM for elicitation of quality issues is shown through a study in the medical domain. The usefulness of BIIS and IntBIIS is discussed for the order picking process at a manufacturing and distribution company. This is first published application of performance modeling and prediction in practice and provides several interesting insights on the difficulties and opportunities of such application in industry.

Integration (of the design of business process and software quality as well as of research and practice) is the underlying theme of this book. This is exactly what we need to advance the quality of information technology and its application.

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Preface

One of the major reasons why information systems encounter problems or fail in the context of an organization is the missing alignment with business processes. This means that information systems are designed without taking the impact of business processes into account, and vice versa. Business processes and information systems mutually affect each other in non-trivial ways. Missing alignment at design-time often results in quality problems at run-time, such as interrupted business processes due to overloaded information systems, or large information system response times due to unexpectedly high workloads induced by business processes.

Aligning business process quality and information system quality at design-time requires the solving of the following problems (**P**). Business process quality and information system quality have to be characterized. **P1**: In contrast to information system quality, which is specified, e.g. in the ISO/IEC 9126 standard, there is no common and comprehensive understanding of business process quality. **P2**: Beyond that, current business process modeling notations do not aim at representing quality aspects. The impact of a business process on the quality of an information system, and vice versa, is unknown at design-time. **P3**: The mutual impact between business processes and information systems must be predicted at design-time.

In this book, the *Business Process Quality Reference-Model* (BPQRM), a quality model for business processes, is introduced. The model allows for a comprehensive characterization of business process quality (P1). The BPQRM is applied successfully in a case study to identify potentials for process quality improvement in practice. Based on the BPQRM, an existing process modeling notation is extended by model elements to represent quality aspects (P2). Simulation is a powerful means to predict the impact of a business process on the quality of an information system, and vice versa, at design-time. This book proposes two simulation approaches

to predict the mutual impact between business processes and information systems in terms of performance (P3). The approach *Business IT Impact Simulation* (BIIS) defines interfaces between the business process simulation and the information system simulation. Performance-relevant information is exchanged via the interfaces between both simulations. When using business process simulation and information system simulation in isolation, workload burstiness is not adequately reflected. This is especially true for occasional, volatile peak loads. Workload burstiness can significantly affect the performance of business processes and information systems. The approach *Integrated Business IT Impact Simulation* (IntBIIS) for the integration of business processes and information systems in a single simulation allows reflecting workload burstiness correctly. The simulation approaches support the comparison of design alternatives and the verification of a certain design against requirements. A case study confirms the feasibility in practice and the acceptance from practitioners' point of view.

This book is equivalent to the dissertation titled "Aligning Business Process Quality and Information System Quality" submitted by me to the Combined Faculty for the Natural Sciences and Mathematics of the Ruprecht-Karls-University of Heidelberg. The degree Doctor of Science (Dr. rer. nat.) has been awarded to me subsequent to the submission and demonstration of my scientific ability by oral defense.

Numerous people supported me in the course of my research for and during writing this book over the last years. Without the support of these people, it would not have been possible to develop the proposed contributions and to apply them in practice.

Taking the risk of forgetting someone, I explicitly want to name the involved people. First, I thank my supervisors, Barbara Paech and Ralf Reussner, for their helpful comments, fruitful discussions, and support during my research. I thank Jörg Henß, Philipp Merkle, Wilfrid Utz, and Franz Brosch for valuable discussions on the properties of business processes and information systems, their mutual impact, the prediction of such impact, and much more. The extension of EventSim for the integrated simulation of business processes and information systems was strongly supported by Philipp Merkle and Jörg Henß.

I had the chance to apply the major contributions of this book in practice. This would not have been possible without the support of practitioners. I thank all the responsible people at the Center of Information Technology and Medical Engineering of University Hospital Heidelberg for their support in the discharge letter study. Special thanks go to Ulrike Kutscha, Antje Brandner, and Björn Bergh for their commitment while creating the questionnaire, and to all participants in the questionnaire survey. Moreover, I thank all the responsible people and all the employees at Thor GmbH for their support in the order picking study. Special thanks go to all the participants in the questionnaire survey.

I thank the Combined Faculty for the Natural Sciences and Mathematics of the Ruprecht-Karls-University of Heidelberg and all its members for providing a pleasant work environment and for supporting my research. Furthermore, I got great support from students, for which I am very grateful. I supervised three master students, as well as bachelor students, internship students, and student assistants. Each of them contributed her/his piece to the puzzle of my research.

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Mannheim

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