Multilevel Business Processes

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Modeling and Data Analysis

With a foreword by Prof. Dr. Michael Schrefl

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Foreword

The multilevel modeling approach has gained prominence during the last couple of years, highlighted by high-quality contributions in various fields, such as database modeling and software engineering, as well as the emergence of the MULTI workshop series co-located with the MoDELS conference. Multilevel models more naturally reflect the reality of many information systems. In this respect process-aware information systems are no exception. Multilevel models capture interdependencies between business processes at different organizational levels and allow for a convenient representation of business process variability which, in turn, facilitates the analysis of business processes across different organizational units.

In his dissertation, which is now published in this book, Christoph G. Schuetz proposes a multilevel modeling approach for the artifact-centric representation of business processes. The proposed approach towards multilevel business process modeling extends an existing object-oriented data model, the multilevel object, for the representation of data at multiple levels of abstraction. This extension, the *multilevel business artifact*, describes, in a single object, a process instance as well as data-centric process models at multiple, iterative instantiation levels. Multilevel business artifacts are arranged in concretization hierarchies, which allows for the specialization of business process models in different sub-hierarchies of an organization. The resulting business process model is hetero-homogeneous: A globally homogeneous model interspersed with heterogeneities in individual sub-hierarchies.

This book, on the one hand, examines the conceptual modeling aspects of multilevel business processes without neglecting, on the other hand, the implementation aspects. An XML-based logical representation allows for the automation of multilevel business processes. Furthermore, this book investigates the advantages of hetero-homogeneous models for quantitative business process analysis.

Linz, June 2015 *Michael Schrefl*

Preface

Tennis, like any activity, can be mastered
if one knows the principles behind it.
— Alexander McCall Smith, "Portuguese Irregular Verbs"

This book with the title "Multilevel Business Processes: Modeling and Data Analysis" is a revised version of my business informatics dissertation of the same name [117], submitted to the Johannes Kepler University (JKU) Linz, Austria, for the doctorate program in social and economic sciences in January 2015. As such, the book is the result of my research activities with Michael Schrefl and Bernd Neumayr at the Department of Business Informatics – Data & Knowledge Engineering (DKE) of JKU Linz started in March 2010. Michael Schrefl and Werner Retschitzegger served as reviewers of the dissertation and members of the defense committee. Josef Küng complemented the defense committee as third member. Preliminary results were published at various international conferences and workshops [115, 111, 114] as well as in a technical report [110]. This book features revised and extended versions of these preliminary results.

The fundamentals for the modeling part of this book were developed together with Lois M. L. Delcambre during my research stay at Portland State University (PSU) in Portland, Oregon, USA, from 1st March to 31st August 2012; this research stay was supported by a Marshall Plan Scholarship awarded by the Austrian Marshall Plan Foundation. The fundamentals of the XML-based logical representation and the data analysis part of this book were developed during my research stay with Marc H. Scholl's database group at the University of Konstanz, Germany, from 1st March to 31st August 2014; this research stay was supported by a Marietta Blau Grant awarded by the Austrian Federal Ministry of Science and Research. My research was further supported by a study grant awarded by the Faculty of Social Sciences, Economics and Business at JKU Linz, partly financing conference visits. My doctoral studies were also sponsored by Pro Scientia, which contributed towards literature expenses.

In addition to my main contributors, thesis supervisors, committee members, and host professors, special acknowledgments are due for my colleagues Michael Huemer, Michael Karlinger, Dieter Steiner, Stefan Berger, and Felix Burgstaller at DKE for their support. Margit Brandl provided invaluable administrative support and patiently listened to my explanations of various research topics. Many thanks go to Scott Britell, Jeremy Steinhauer, and David Maier at PSU who were open for discussion during the weekly 'slim meetings' at PSU and beyond. Leonard Wörteler from the BaseX team provided highly useful advice on XQuery and the BaseX database management system. Andreas Weiler from the University of Konstanz, with whom I shared an office during my research stay, helped create an enjoyable workplace. Last, but not least, Michael Grossniklaus at PSU and later at the University of Konstanz gave invaluable advice on various matters.

My time as a doctoral student and research assistant at DKE was a rich and interesting experience. Although hard at times, I had a wonderful time conducting the research that underlies this book, meeting many great people on the way. I publish this book in the hope that it will be useful and that readers will find the topic as interesting as I did while conducting the research for this book. The interested reader is also referred to my personal website[1], which contains links to source code and other material.

Linz, June 2015 *Christoph G. Schuetz*

[1] http://christoph.schuetz.ws/

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