

Fundamentals of Business Process Management

Marlon Dumas • Marcello La Rosa •
Jan Mendling • Hajo A. Reijers

Fundamentals of Business Process Management

Second Edition

 Springer

Marlon Dumas
Institute of Computer Science
University of Tartu
Tartu, Estonia

Marcello La Rosa
School of Computing and Information
Systems
The University of Melbourne
Melbourne, Australia

Jan Mendling
Institute for Information Business
Vienna University of Economics
and Business
Vienna, Austria

Hajo A. Reijers
Department of Computer Sciences
Vrije Universiteit Amsterdam
Amsterdam, The Netherlands

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To Inga and Maia – Marlon
To Chiara, Lorenzo, and Valerio – Marcello
To Stefanie – Jan
To Maddy, Timon, and Mayu – Hajo

Foreword

Business processes represent one of the core assets of organisations for many reasons. They have direct impact on the attractiveness of products and services, influence customer experiences and ultimately revenue in case of corporations. Processes orchestrate corporate resources to fulfil these external demands and therefore are a key factor determining the cost-to-serve and operational efficiency. In particular, they determine tasks, jobs, and responsibilities and by this, shape the future work of every employee and machine along a business process. Processes are the arterial system within organisations and in inter-organizational supply networks. Consequently, any process failure can bring corporate life and the entire process ecosystem to a standstill. Processes determine the potential and speed of an organization to adapt to new circumstances and to comply with a fast-growing number of legislative requirements.

However, unlike other corporate assets such as products, services, workforce, brand, physical or monetary assets, the significance of business processes had not been appreciated for a long period. Despite the fact that processes are the lifeblood of an organization, they did not develop the status of a primary citizen in boardroom discussions and managerial decision-making processes until the very end of the twentieth century.

The growing demands for globalization, integration, standardization, innovation, agility, and operational efficiency, coupled with the opportunities raised by digital technologies, have finally increased the appetite for reflecting on and ultimately improving existing as well as designing entire new business processes.

In response, a comprehensive body of tools, techniques, methods, and entire methodologies to support all stages of the business process lifecycle has emerged over the past two decades. It is called Business Process Management (BPM), and it consolidates a plethora of tools and approaches coming from diverse disciplines, including Industrial Engineering, Operations Management, Quality Management, Human Capital Management, Corporate Governance, Computer Science, and Information Systems Engineering.

“Fundamentals of Business Process Management” takes on the challenge of distilling the current landscape of BPM methods and tools succinctly and

pedagogically. It brings meaningful order and consistency into approaches that often have been developed, discussed, and deployed in isolation. It derives its merits from its firm foundation in the latest applied BPM research. Relying on scientifically sound practices means capitalizing on evidence rather than depending on confidence. This clearly differentiates this much-needed publication from many of its predecessors. In particular, it gives BPM the credibility that a still growing discipline requires.

The book itself is also a compelling showcase for the importance of a new class of processes, i.e. internationally distributed, complex, and flexible business processes. In this case, it is the process of jointly writing a book involving four authors in four different countries. The team has addressed this challenge brilliantly and the outcome is an impressive compilation of the individual strengths of each author grounded in a shared understanding of the essential BPM fundamentals and a common passion for the topic.

It has been no surprise that the first edition of the book had a tremendous uptake and gained rapid adoption worldwide. The hundreds of institutions that have adopted the book in their teaching, and the tens of thousands of students and professionals who have taken the Massive Open Online Course (MOOC) developed on the basis of this book, are a testimony of both the growing demand for BPM education and the technical and pedagogical value of the book.

As the field evolves and matures, a second updated and extended edition is most welcome. The second edition significantly expands the reach of the first one with a more in-depth coverage of process architecture, process discovery, process innovation, process analytics, BPM strategic alignment, and governance, all of which are essential ingredients in a sustainable BPM program.

I have no doubts that this second edition will contribute to shaping the toolset, and even more the mindset, of the current and future generations of BPM professionals. The book will continue to be the standard reference for everyone who is keen to learn more about and to embrace the fascinating discipline of Business Process Management.

Brisbane, Australia
February 2018

Michael Rosemann

Preface

“Get the fundamentals down and the level of everything you do will rise.”

Michael Jordan (1963–)

Almost 5 years ago, we decided to join forces and deliver a textbook on Business Process Management (BPM). Since then, BPM has grown more important than ever. Businesses around the world are carrying out BPM initiatives with the aim to outperform their competitors or meet the demands of regulatory authorities. At the same time, a lively academic community is pushing the boundaries of the discipline: computer scientists, management scientists, and engineers add new elements to its repertoire, which are eagerly being picked up by practitioners. We felt that having a textbook available that organizes the broad spectrum of the topic would help us teaching at our institutions about the fascinating concepts, methods, and technologies behind BPM. What is more, we hoped that a textbook on BPM would also enable a broader audience beyond the students in our own classrooms to learn about its marvels.

When the first edition of the book hit the shelves in early 2013, it became clear to us that our textbook met an unsaturated demand. The book quickly became the basis for BPM courses at around 200 universities across the continents. Lecturers around the world reached out to us to discuss the material and a community of BPM educators evolved from these interactions. We traveled to various institutions ourselves to deliver guest lectures on the basis of the book and, from time to time, also stepped into the corporate world to preach the BPM gospel. The demand was such that we were compelled to produce a Massive Open Online Course (MOOC) based on the textbook, which brought together over 7,500 participants in its first delivery and over 25,000 in total after several deliveries. In a sense, our mission seemed to be accomplished. But then again, we knew it was not.

After all, BPM is a cross-disciplinary field that is continuously evolving. The boundaries of what we previously saw as the fundamentals of the discipline have moved in the five years since the first edition of our book appeared. On the positive side, we could see the emergence of new methods, the evolvement of important standards, and a maturation of BPM technology. However, we also saw how difficult some organizations found it to successfully apply BPM, as accentuated by a number

of failed BPM projects. In other words, it was time to carry out a major update to our book to reflect on such developments and insights. The result of our efforts in this direction is this second edition.

Compared to the first edition of the book, the new edition incorporates a range of extensions and improvements. The highlights are as follows:

- The roots of BPM are more thoroughly discussed, in particular the relationship with the concept of Adam Smith's division of labor;
- Major rework took place to better illustrate the design of a process architecture and the way performance measures can be integrated in such an architecture;
- We extended our treatment of process modeling with the modeling standards CMMN and DMN;
- We enhanced the coverage of process discovery and modeling methods;
- To the wide range of process analysis techniques already present in the first edition, we added waste analysis, stakeholder analysis, capacity analysis, and the critical path method;
- The treatment of redesign methods has been vastly expanded with a range of methods, both old and new, that were not covered in the previous edition;
- A new chapter has been added to provide an overview of both domain-specific (ERP, CRM) and domain-agnostic process-aware information systems;
- The overview of process monitoring techniques has been substantially revised and enhanced to incorporate recent developments in the field of process mining;
- A new chapter has been added to introduce BPM as an enterprise capability. This chapter expands the scope of the book to encompass topics such as the strategic alignment and governance of BPM initiatives.

Some things have not changed. Every chapter of the textbook still contains a number of elaborated examples and exercises. Some of these exercises are spread throughout the chapter and are intended to help the reader to incrementally put into action, via concrete scenarios, concepts and techniques exposed in the chapter. These "in-chapter" exercises are paired with sample solutions at the end of the chapter. In addition, every chapter closes with a number of further exercises for which no solution is provided. Instructors may wish to use these latter exercises for assignments. We are happy to announce that through the various extensions, over 40 additional examples and exercises have become part of this second edition.

The reader will also note that most chapters contain "highlighted boxes" that provide complementary insights into a specific topic, some of them brand new in comparison to the first edition. These boxes are tangential to the flow of the book and may be skipped by readers who wish to concentrate on the essential concepts. Similarly, every chapter closes with a "Further Readings" section that provides external pointers for readers wishing to deepen their understanding of a specific topic. These sections have been updated to include the most recent developments in the various areas.

What is also still around is our website, which has the primary aim to collect course materials: <http://fundamentals-of-bpm.org>. This website includes slides, lecture recordings, sample exams, links to related resources, and additional

exercises. The interested reader can also find in the website a list of institutions where the book is used in class. There is an active community of instructors who have adopted the book and who regularly share their insights via a message forum. New instructors who adopt this book in their classes can request to be added to this community. By joining the community, instructors get access to a wealth of instructors-only material.

This book draws from the work of many of our colleagues in the BPM field. We would like to thank Han van der Aa, Wil van der Aalst, Adriano Augusto, Thomas Baier, Saimir Bala, Wasana Bandara, Alistair Barros, Anne Baumgraß, Boualem Benatallah, Jan vom Brocke, Cristina Cabanillas, Fabio Casati, Raffaele Conforti, Claudio Di Ciccio, Gero Decker, Remco Dijkman, Boudewijn van Dongen, Dirk Fahland, Avigdor Gal, Paul Harmon, Arthur ter Hofstede, Henrik Leopold, Fabrizio Maria Maggi, Monika Malinova, Fredrik Milani, Michael zur Muehlen, Markus Nüttgens, Fabian Pittke, Johannes Prescher, Artem Polyvyanyy, Manfred Reichert, Jan Recker, Stefanie Rinderle-Ma, Michael Rosemann, Stefan Schönig, Matthias Schrepfer, Priya Seetharaman, Sergey Smirnov, Andreas Solti, Lucinéia Heloisa Thom, Peter Trkman, Irene Vanderfeesten, Barbara Weber, Ingo Weber, Matthias Weidlich, Mathias Weske, and J. Leon Zhao, who all provided constructive feedback on drafts of earlier versions of this book or inspired us in other ways while we were writing it. Last but not least, we are grateful to the numerous instructors and students who reported errata in the first edition of the book and who made useful suggestions. Our thanks, in particular, go to Ahmad Alturki, Anis Charfi, Dave Chatterjee, Manfred Jeusfeld, Worarat Krathu, Ann Majchrzak, Shane Tomblin, Phoebe Tsai, Inge van de Weerd, and Chris Zimmer.

Tartu, Estonia
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Marlon Dumas
 Marcello La Rosa
 Jan Mendling
 Hajo A. Reijers

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List of Acronyms

6 M	Machine, Method, Material, Man, Measurement, Milieu
4 P	Policies, Procedures, People, Plant/Equipment
7PMG	Seven Process Modeling Guidelines
ABC	Activity-Based Costing
ACM	Adaptive Case Management
API	Application Programming Interface
APQC	American Productivity and Quality Center
ATAMO	And Then, A Miracle Occurs
B2B	Business-to-Business
BAM	Business Activity Monitoring
BOM	Bill-of-Material
BPA	Business Process Analysis
BPE	Business Process Excellence
BPEL	Web Service Business Process Execution Language
BPM	Business Process Management
BPMN	Business Process Model & Notation
BPMS	Business Process Management System
BPR	Business Process Reengineering
BTO	Build-To-Order
BVA	Business Value-Adding
CEO	Chief Executive Officer
CEP	Complex Event Processing
CFO	Chief Financial Officer
CIO	Chief Information Officer
CMMI	Capability Maturity Model Integrated
CMMN	Case Management Model and Notation
CNC	Coefficient of Network Connectivity
COO	Chief Operations Officer
CPIO	Chief Process and Innovation Officer
CPM	Critical Path Method
CPN	Colored Petri Net

CPO	Chief Process Officer
CRM	Customer Relationship Management
CSV	Comma Separated Values
CT	Cycle Time
CTC	Cost-To-Company
CTE	Cycle Time Efficiency
DBMS	Database Management System
DCOR	Design Chain Operations Reference (product design)
DES	Discrete-Event Simulation
DMN	Decision Model and Notation
DMR	Department of Main Roads
DMS	Document Management System
DRG	Decision Requirements Graph
DUR	Drug Utilization Review
DVS	Deputy Vice Chancellor
EDI	Electronic Data Interchange
EF	Early Finish
EHS	Environmental Health and Safety
EPA	Environment Protection Agency
EPC	Event-driven Process Chain
ERP	Enterprise Resource Planning
ES	Early Start
eTOM	Enhanced Telecom Operations Map
FIFO	First-In-First-Out
HR	Human Resources
IDEF3	Integrated Definition for Process Description Capture Method
ISP	Internet Service Provider
IT	Information Technology
ITIL	Information Technology Infrastructure Library
JSON	JavaScript Object Notation
KM	Knowledge Management
KPI	Key Performance Indicator
LF	Late Finish
LS	Late Start
NESTT	Navigate, Expand, Strengthen, and Tune/Take-off
NRW	Department of Natural Resources and Water
NVA	Non-Value-Adding
OASIS	Organization for the Advancement of Structured Information Standards
OMG	Object Management Group
OS	Operating System
PAIS	Process-Aware Information System
PCG	Productivity Consulting Group
PCF	Process Classification Framework
PD	Product Development

PDCA	Plan-Do-Check-Act
PDF	Portable Document Format
PICK	Possible, Implement, Challenge, Kill
PLM	Product Lifecycle Management
PMBOK	Project Management Body of Knowledge
PO	Purchase Order
POS	Point-of-Sale
PPI	Process Performance Indicator
PPM	Process Performance Measurement
PRINCE2	Projects in Controlled Environments
RBAC	Role-based Access Control
REST	Representational State Transfer
RFID	Radio-Frequency Identification
RFQ	Request for Quote
ROI	Return-On-Investment
RPA	Robotic Process Automation
RPH	Reference Process House
SCAMPI	Standard CMMI Appraisal Method for Process Improvement
SCM	Supply Chain Management
SCOR	Supply Chain Operations Reference Model
S-FEEL	Simple Friendly Enough Expression Language
SIPEX	Siemens Processes for Excellence
Smart eDA	Smart Electronic Development Assessment System
SOA	Service-Oriented Architecture
SPICE	Software Process Improvement and Capability Determination
STP	Straight-Through-Processing
TCT	Theoretical Cycle Time
TOC	Theory of Constraints
TPS	Toyota Production System
TQM	Total Quality Management
UIMS	User Interface Management System
UEL	Universal Expression Language
UML	Unified Modeling Language
UML AD	UML Activity Diagram
URI	Uniform Resource Identifier
VA	Value-Adding
VCH	Value Creation Hierarchy
VCS	Value Creation System
VOS	Voice of the Customer
VRM	Value Reference Model
WIP	Work-In-Process
WfMC	Workflow Management Coalition
WfMS	Workflow Management System
WS-BPEL	Web Service Business Process Execution Language
WSDL	Web Service Definition Language

XES	Extensible Event Stream
XML	Extensible Markup Language
XPATH	XML Path Language
XSD	XML Schema Definition
YAWL	Yet Another Workflow Language