

Fundamentals of Business Process Management

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

Foreword

Business processes represent a core asset of corporations. They have direct impact on the attractiveness of products and services as perceived by the market. They determine tasks, jobs and responsibilities and by this, shape the work of every employee. Processes integrate systems, data, and resources within and across organizations and any failure can bring corporate life to a standstill. Processes determine the potential of an organization to adapt to new circumstances and to comply with a fast growing number of legislative requirements. Processes influence the revenue potential as much as they shape the cost profile of an organization.

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.

Only the growing demands for globalization, integration, standardization, innovation, agility and operational efficiency, and the related challenge of finding further variables in the corporate ecosystem that can be optimized, have finally increased the appetite for reflecting on and ultimately improving business processes.

In response, over the last two decades a comprehensive set of tools, techniques, methods and entire methodologies has been developed providing support for all stages of the business process lifecycle. Relevant contributions have been made by diverse disciplines such as Industrial Engineering, Operations Management, Quality Management, Human Capital Management, corporate governance, conceptual modeling, workflow management and system engineering.

Business Process Management (BPM) is the discipline that now faces the difficult, but rewarding task of consolidating and integrating the plethora of these approaches.

This book is the first and most up-to-date contribution that faces and masters this challenge. It succinctly captures the current status of BPM and brings meaningful order and consistency into approaches that often have been developed, discussed and deployed in isolation.

“Fundamentals of Business Process Management” 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 young and growing discipline requires.

The book itself is also a compelling showcase for the importance of a new class of processes, i.e. long living, 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.

I have no doubts that this book will shape the toolset, and hopefully even more the mindset, of the current and future generations of BPM professionals. This publication has the potential to become a significant catalyst for future BPM success by establishing a common sense for the fundamentals of BPM upon which it can be further developed and tailored to individual circumstances. The book provides the needed consistency and rigor within and across the diverse and fast growing community of professionals and researchers committed to and passionate about the merits of the process-based organization.

Finally, and maybe most of all, the book is an outstanding reference for all students who are keen to learn more about and want to embrace the fascination of BPM. This long missing BPM textbook addresses a severe shortcoming within the BPM community, i.e. the lack of resources to facilitate the introduction of BPM subjects into tertiary and corporate education. Making BPM more accessible to future decision makers ensures that processes will play the role they deserve.

Brisbane, Australia

Michael Rosemann

Preface

First, master the fundamentals.
Larry Bird (1957–)

Business Process Management (BPM) is a special field for more than one reason. First of all, BPM is a crossroad of multiple, quite different viewpoints. Business managers are attracted to BPM because of its demonstrated ability to deliver improvements in organizational performance, regulatory compliance and service quality. Industrial engineers see BPM as an opportunity to apply well-trodden manufacturing optimization techniques in the context of organizations that deliver services rather than physical products. Finally, Information Technology (IT) specialists appreciate the fact that BPM provides them with a shared language to communicate with business stakeholders. Furthermore, business process automation technology allows IT specialists to implement and monitor IT systems in a way that is aligned with the vision that business stakeholders have of the organization. In other words, BPM is a boundary-spanning field that serves as a melting pot for otherwise separate communities. For those who have experienced how business managers, industrial engineers and IT professionals often seem to live in different worlds, this shared field of interest is a remarkable opportunity to achieve a joint understanding of the inner workings of a business.

A second special characteristic of BPM is that it is both actively practiced and actively researched. In other words, it is a field where there are both proven and established practices as well as open challenges. Businesses around the world are carrying out BPM initiatives with the aim to, for example, outperform their competitors or meet the demands of regulatory authorities. Academics in fields like computer science, management science, sociology, and engineering are working on the development of methods and techniques to support such initiatives. It is appropriate to see BPM as a “theory in practice” field. On the one hand, practical demands inspire the development of new methods and technologies. On the other hand, the application of these methods and technologies in practice feeds back to the drawing boards in universities and research centers.

After teaching BPM to thousands of students and professionals over the past decade, we strongly feel the lack of a textbook to give a structure to our courses and to allow our audience to study for themselves beyond classwork and homework

assignments. This situation is not due to a lack of excellent books on BPM—in fact there is a good number of them—but rather due to the cross-disciplinary and continuously evolving nature of BPM.

There are excellent treatments of BPM from a business management perspective, most notably Harmon's *Business Process Change* and Sharp and McDermott's *Workflow Modeling*. Both of these books provide useful conceptual frameworks and practical advice and should definitely lie in the bookshelves (or better in the hands) of BPM practitioners. However, one needs an introductory background and preferably years of experience in order to truly appreciate the advice given in these books. Also, these books give little attention to technology aspects such as business process management systems and process intelligence tools.

On the other side of the spectrum, other books adopt a computer science perspective to BPM, such as Van der Aalst and Van Hee's *Workflow Management* and Weske's *Business Process Management*, both focused on process modeling, analysis and automation for computer scientists. At a more specialized level, one can find a range of books focusing on process modeling using specific languages—for example Silver's *BPMN Method and Style*.

Against this background, we decided it was time to put together our combined teaching experience in BPM in order to deliver a textbook that:

- Embraces BPM as a cross-disciplinary field, striking a balance between business management and IT aspects.
- Covers the entire BPM lifecycle, all the way from identifying processes to analyzing, redesigning, implementing and monitoring these processes.
- Follows a step-by-step approach punctuated by numerous examples, in order to make the content accessible to students who have little or no BPM background.
- Contains numerous classroom-tested exercises, both inside each chapter and at the end of the chapters, so that students can test their skills incrementally and instructors have material for classwork, homework and projects.
- Relies on a mature and standardized process modeling language, namely BPMN.

In the spirit of a textbook, every chapter 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 concepts and techniques exposed in the chapter in concrete scenarios. 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 solutions are provided. Instructors may wish to use these latter exercises for assignments.

Most chapters also contain “highlighted boxes” that provide complementary insights into a specific topic. 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.

To better serve our readership, we have set up a website 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 book is designed to support courses of a wide variety. An in-depth course on BPM could cover all chapters in a balanced way. In order to fit the content into one semester though, it may be necessary to sacrifice one or two chapters. If this was required, our suggestion would be to skip Chap. 4 or 10. An introductory BPM course could skip Chaps. 2, 4, 7 and 10 while still providing a consistent picture of the field. A course on process automation for IT students could skip Chaps. 2, 5 and 6. A course on process modeling would focus on Chaps. 2 to 5, and possibly Chap. 9 if the intention is to produce executable process models. Chapters 3 and 4 can be integrated into a broader semester-long course on systems modeling. Finally, a process improvement course for business students might focus on Chap. 3 and Chaps. 5 to 8. Naturally, Chap. 1 could find its place in any of the above courses.

Each chapter can be delivered as a combination of lectures and classwork sessions. Shorter chapters (1, 2, 3, 5, 6 and 10) can be delivered in one lecture and one classwork session. Chapters 4, 8 and 9 may require two lectures and two classwork sessions each. Chapter 7 can be delivered across two lectures and two classwork sessions, or it can be delivered in one lecture and one classwork session by skipping the content on queues and flow analysis.

This textbook is the result of many years of educational practice both at the undergraduate and postgraduate levels in more than half a dozen institutions, including Eindhoven University of Technology (The Netherlands), Queensland University of Technology (Australia), Humboldt University of Berlin (Germany), University of Tartu (Estonia), Vienna University of Economics and Business (Austria) and National University of Colombia. The material in this textbook has also served as a basis for professional training courses delivered to organizations in Australia, The Netherlands and elsewhere. We are grateful to the thousands of students who over the past years have given us constructive feedback and encouragement.

We also owe a lot to our many colleagues who encouraged us and provided us with feedback throughout the entire idea-to-textbook process. We would like to thank Wil van der Aalst, Raffaele Conforti, Monika Malinova, Johannes Prescher, Artem Polyvyanyy, Manfred Reichert, Jan Recker, Michael Rosemann, Matthias Schrepfer, Arthur ter Hofstede, Irene Vanderfeesten, J. Leon Zhao and Michael zur Muehlen, who all provided constructive feedback on drafts of the book. Fabio Casati and Boualem Benatallah provided us with initial encouragement to start the writing process. Special mentions are due to Matthias Weidlich who provided us with detailed and comprehensive suggestions, and Remco Dijkman who shared with us teaching material that served as input to Chaps. 2 and 9.

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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
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
BP EL	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
CFO	Chief Financial Officer
CIO	Chief Information Officer
CMMI	Capability Maturity Model Integrated
COO	Chief Operations Officer
CPO	Chief Process Officer
CRM	Customer Relationship Management
CPN	Colored Petri Net
CT	Cycle Time
DBMS	Database Management System
DCOR	Design Chain Operations Reference (product design)
DES	Discrete-Event Simulation
DMR	Department of Main Roads
DMS	Document Management System

DUR	Drug Utilization Review
EPA	Environment Protection Agency
EPC	Event-driven Process Chain
ERP	Enterprise Resource Planning
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
KM	Knowledge Management
KPI	Key Performance Indicator
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
PCF	Process Classification Framework
PD	Product Development
PDCA	Plan-Do-Check-Act
PO	Purchase Order
POS	Point-of-Sale
PPM	Process Performance Measurement
RBAC	Role-based Access Control
RFID	Radio-Frequency Identification
RFQ	Request for Quote
ROI	Return-On-Investment
SCAMPI	Standard CMMI Appraisal Method for Process Improvement
SCOR	Supply Chain Operations Reference Model
Smart eDA	Smart Electronic Development Assessment System
SOA	Service-Oriented Architecture
STP	Straight-Through-Processing
TCT	Theoretical Cycle Time
TOC	Theory of Constraints
TQM	Total Quality Management
UIMS	User Interface Management System
UEL	Universal Expression Language
UML	Unified Modeling Language
UML AD	UML Activity Diagram
VA	Value-Adding
VCH	Value Creation Hierarchy
VCS	Value Creation System
VRM	Value Reference Model

WIP	Work-In-Progress
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
XSD	XML Schema Definition
YAWL	Yet Another Workflow Language

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