
Subject-Oriented Business Process Management

Albert Fleischmann • Werner Schmidt •
Christian Stary • Stefan Obermeier •
Egon Börger

Subject-Oriented Business Process Management



Springer

Albert Fleischmann
Pfaffenhofen
Germany

Werner Schmidt
Altmannstein-Schamhaupten
Germany

Christian Stary
Wien
Austria

Stefan Obermeier
Oberasbach
Germany

Egon Börger
Calci
Italy

ISBN 978-3-642-32391-1 ISBN 978-3-642-32392-8 (eBook)
DOI 10.1007/978-3-642-32392-8
Springer Heidelberg New York Dordrecht London

Library of Congress Control Number: 2012949920

ACM Computing Classification (1998): J.1, H.4, K.6

© 2011 by Carl Hanser Verlag, München
Title of the German original: Subjektorientiertes Prozessmanagement
ISBN 978-3-446-42707-5
All rights reserved.

© The Author(s) 2012. The book is published with open access at SpringerLink.com
Open Access This book is distributed under the terms of the Creative Commons Attribution Non-commercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.
All commercial rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for commercial use must always be obtained from Springer. Permissions for commercial use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

Numerous success stories on Business Process Management exist, however probably just as many reports of failure. In many cases, Business Process Management is an endless topic that people associate with paper, large drawings on the walls, endless discussions, etc. Based on these results, the IT departments of an organization generally receive an order to develop an IT-supported process. But workflows developed in this way typically do not have much in common with the original setting and its models, and therefore, they are rarely accepted by the involved stakeholders. Hence, so far the result of all these efforts is often unsatisfactory. Consequently, many executives still criticize Business Process Management. However, you find processes in every kind of organization—whether it is an industrial enterprise or a nonprofit animal breeding farm. Only when these processes are continuously scrutinized and optimized can redundant work in Business Process Management be avoided and the ultimate survival of the organization ensured.

Margot Berghaus writes in her book, “Luhmann easy to grasp” [“Luhmann leicht gemacht”]: “Social systems operate through communication, they are communication systems.” and organizations are social systems (Berghaus 2004). In other words:

Organization = Communication.

(A corresponding Internet search with Google delivered 269 hits on June 2, 2011). Activities in organizations performed by their members are coordinated according to organizational goals. As a precondition for this, members of an organization need to communicate with each other.

There exists a natural language sentence structure in all known languages. It is composed of three components: subject, predicate, and object. The subject is the starting point of activities, the predicate is the action on the object, and the object is affected by the action. Following this structure, everyone is well prepared to think in a process-oriented way and to model processes.

The subject-oriented approach to Business Process Management, which is presented in this book, is based on these simple, however, fundamental considerations. Actors (subjects) with their actions and their communication behavior are in the center of attention. A process is established by structuring the actions

of each actor and the necessary coordination of the required communication among the actors.

This book should be understood as an invitation to capture, reflect, and stimulate discussion around many different aspects of the design of organizations. All interested persons should be encouraged to simply try this pragmatic approach to Business Process Management. There are already many companies and institutions that have been trying it successfully, and they have been surprised that their processes have become intelligible to stakeholders.

It is an ambitious undertaking to write about an interdisciplinary topic, taking into account technical, psychological, economic, mathematical, and organizational aspects. We have tried to consider all these different aspects and their intertwining. However, we are convinced there is still much to be done and to be written about this topic.

While working on the book, we have enjoyed a team spirit allowing everyone to bring in his different background and experience, both in terms of theory and practice. Our intense collaboration allowed us to come up with a comprehensive picture of subject orientation. We experienced the struggle of streamlining structure and content as a constructive and inspiring moment of our cooperation. We hope the readers are still able to grasp it, in particular when reflecting the systemic nature of Subject-Oriented Business Process Management.

For helping us to be successful, we want to thank:

- Our families, supporting our endeavor more or less voluntarily
- All interested persons who have been waiting until we finished our work and have kept us under friendly pressure by their steady inquiries
- Metasonic AG for providing resources
- The customers of Metasonic AG for the numerous suggestions from the field
- Hanser Verlag for granting us the rights to publish the English version of our German book
- Springer-Verlag GmbH, particularly Ms. Ford and Mr. Gerstner, for their constructive cooperation
- The proofreaders
- Deutsche Bahn for providing notebook-compatible trains in which even books can be written
- Richard Wright who converted our long German sentences with English words into real English. Nevertheless, the authors still take responsibility for any awkward sentences.
- Carina Busse who brought the manuscript into the right format
- Larissa Weithaler who made all the drawings

Special thanks go to Anna Fleischmann for providing her graphic design. This includes the design of the “To Go’s”, which help the reader to grasp the individual chapters or major sections of the chapters. The “To Go’s” represent fictional dialogs among the various stakeholders in Subject-Oriented Business Process Management projects in an entertaining style. As an illustration of the roles, we have chosen essential elements of fast food: food to go bags and cups. The reader can easily take

these to a place of his choice and quickly consume their contents. From the chapter “Subject-Oriented Process Analysis” onwards, they represent the different actors operating in the open life cycle of Subject-Oriented Business Process Management. Each cup and bag has a badge with the first character of the name of the role, such as F for Facilitator.

A note on “gender”: For better readability, we typically use the masculine form in the text. The female form is always considered to be included, and vice versa. When designing the fast-food bags and cups, we also took care to maintain a balance between the sexes.

In case the readers are keen on working with the introduced method, we refer to the Web site of the nonprofit organization Institute of Innovative Process Management e.V. (see also <http://www.i2pm.net>). There, interested persons will find material and tools currently available. Every person interested in driving Business Process Management forward outside of over-trodden paths, especially by bringing in his knowledge and valuable experiences, can become a member of the Institute of Innovative Process Management.

Spring, 2012

Albert Fleischmann
Werner Schmidt
Christian Stary
Stefan Obermeier
Egon Börger

Acknowledgments: The research leading to these results has received funding from the European Commission within the Marie Curie Industry and Academia Partnerships & Pathways (IAPP) programme under grant agreement n° 286083.

Reference

Berghaus, M.; Luhmann leicht gemacht; Köln/Weimar/Wien, 2004.

Contents

1	Thinking of Business Processes Systematically	1
1.1	To Go	1
1.2	Introduction	2
	References	7
2	From Language Acquisition to Subject-Oriented Modeling	9
2.1	To Go	9
2.2	Acquiring Language and Dealing with Its Structure	10
2.3	Talking and Acting: Functional Alignment of Sentences	11
2.4	Language Proficiency: The Transmission of Meaning	12
2.5	Learning to Coordinate Speech, Thought, and Action	13
2.6	Models and Natural Language Semantics of Sentences	15
2.7	Formal Languages and Natural Language	17
2.8	Subject-Oriented Construction of Business Process Models	18
	References	23
3	The Integrated S-BPM Process Model	25
3.1	To Go	25
3.2	Concept of Processes in S-BPM	26
3.3	S-BPM Stakeholders	26
3.3.1	Governors (People Caring for, Taking Responsibility for, or Driving Processes)	27
3.3.2	Actors (Active Participants in a Process)	27
3.3.3	Experts (Specialists in a Specific Field)	28
3.3.4	Facilitators (People Accompanying Organizational Development)	28
3.4	S-BPM Activity Bundles	29
3.5	The Open Control Cycle of S-BPM Activity Bundles	30
3.6	S-BPM Framework	32
3.6.1	Business System of an Organization	33

3.6.2	IT of an Organization	33
3.6.3	Business Process Management in an Organization	34
3.6.4	Governance, Risk, Compliance Triad (GRC-Triad)	38
3.7	S-BPM for the Integrated Development of an Organization	40
	References	41
4	Subject-Oriented Process Analysis	43
4.1	To Go	43
4.2	S-BPM Stakeholders Involved in Process Analysis	44
4.2.1	Actors	45
4.2.2	Facilitators	45
4.2.3	Governors	45
4.2.4	Experts	46
4.3	Reference Points	46
4.3.1	Systems Theory	46
4.3.2	Knowledge Management	47
4.3.3	Organization	48
4.4	Choice of Approach	50
4.5	Determine the Context of a Process	52
4.5.1	Target of Analysis	52
4.5.2	Initial Information	52
4.5.3	Internal Constraints	55
4.5.4	External Constraints	56
4.6	Process Descriptions in Natural Language	56
4.6.1	Identification of Subjects	57
4.6.2	Identification of Activities	57
4.6.3	Identification of Business Objects	58
4.6.4	Example	59
4.6.5	Documentation Guidelines	59
4.6.6	Elicitation and Documentation of Implicit Knowledge	60
4.7	Evaluate and Decide	61
	References	61
5	Modeling Processes in a Subject-Oriented Way	63
5.1	To Go	63
5.2	Process Models and Process Instances	64
5.3	Modeling Procedure	65
5.4	S-BPM Modeling Stakeholders	67
5.4.1	To Go	67
5.4.2	Governors	68
5.4.3	Actors	69
5.4.4	Experts	70
5.4.5	Facilitators	70

5.5	Basic Constructs of Subject-Oriented Modeling	71
5.5.1	To Go	71
5.5.2	Subject	72
5.5.3	Subject-to-Subject Communication	73
5.5.4	Synchronization of the Technical Message Exchange	74
5.5.5	Subject Behavior	79
5.5.6	Normalization	82
5.5.7	Business Objects	85
5.6	Extension Constructs for Process Networks	93
5.6.1	To Go	93
5.6.2	Interface Subjects and Process Network	94
5.6.3	Service Processes	97
5.6.4	Multiprocesses	98
5.6.5	Complex Process Network Topologies	101
5.6.6	Business Objects in Process Networks	107
5.6.7	Reduction to Observable Behavior	109
5.7	Extension Constructs for Subject Behavior Specifications	111
5.7.1	To Go	111
5.7.2	Behavior Macros	112
5.7.3	Behavior Macro Classes	114
5.7.4	Subject Classes	115
5.7.5	Freedom of Choice	117
5.7.6	Exception Handling	120
5.7.7	Behavior Extensions	123
5.7.8	Additional Semantics	124
	References	127
6	Subject-Oriented Modeling by Construction and Restriction	129
6.1	To Go	129
6.2	Modeling by Construction	131
6.3	Modeling by Restriction	132
6.3.1	Determine Number of Subjects and Subject Identifiers	134
6.3.2	Reduce Communication Paths	135
6.3.3	Specify Message Types	135
6.3.4	Adapt Behavior of Subjects Accordingly	139
6.3.5	Specify and Refine Business Objects	140
6.4	Evaluation	141
	Reference	141
7	Subject-Oriented Validation of Processes and Process Models	143
7.1	To Go	143
7.2	Nature of Validation	144

7.3	S-BPM Stakeholders Involved in Validation	145
7.3.1	Governors	146
7.3.2	Actors	146
7.3.3	Experts	147
7.3.4	Facilitators	148
7.4	Validation of Processes	148
7.5	Validation of Process Models	150
7.5.1	Formal Validation	150
7.5.2	Content Validation	151
	References	155
8	Subject-Oriented Optimization of Processes	157
8.1	To Go	157
8.2	The Nature of Optimization	158
8.3	S-BPM Optimization Stakeholders	159
8.3.1	Governors	159
8.3.2	Facilitators	159
8.3.3	Actors	159
8.3.4	Experts	160
8.4	Specifying Optimization Targets	160
8.4.1	Process Costs	160
8.4.2	Process Time	161
8.4.3	Process Quality	162
8.4.4	Target Triangle	162
8.5	Foundations of Optimization	163
8.6	General Optimization Possibilities	164
8.6.1	Simulating Process Models	164
8.6.2	Identifying Weak Spots and Root Cause Analysis	166
8.7	Optimization Aspects	168
8.7.1	Improvement of Subject Behavior	168
8.7.2	Communication Between Subjects	169
8.7.3	Restructuring Subject Behavior	170
8.7.4	Improving Business Objects	171
	References	172
9	Organization-Specific Implementation of Subject-Oriented Processes	173
9.1	To Go	173
9.2	S-BPM Stakeholders Handling the Organization-Specific Implementation	175
9.2.1	Actors	175
9.2.2	Governors	175
9.2.3	Facilitators	175
9.2.4	Experts	176

9.3	Embedding Subjects Into an Organization	176
9.3.1	Mapping Subjects to Subject Carriers	176
9.3.2	Considering the Organization-Specific Context of a Subject Carrier	178
9.3.3	Mapping Subjects to Subject Carrier Groups	180
9.3.4	Considering Delegation Regulations	182
9.3.5	Considering the Context of Business Objects	183
9.4	Embedding Behavior	184
9.4.1	Adjustment of the Tasks in Job Descriptions	185
9.4.2	Design of the Work Environment	185
9.4.3	Coordination of Required Competencies	186
9.4.4	Change Management in S-BPM	187
	References	188
10	IT-Implementation of Subject-Oriented Business Processes	189
10.1	To Go	189
10.2	S-BPM Stakeholders in IT Implementation	190
10.2.1	Governors	190
10.2.2	Actors	190
10.2.3	Experts	191
10.2.4	Facilitators	191
10.3	Framework for Executing Subject-Oriented Processes	192
10.4	IT Implementation of Subject Carrier Access	194
10.5	IT Implementation of Subject Behavior	195
10.5.1	Action Behavior	195
10.5.2	Communication Behavior	198
10.5.3	Example	198
10.6	Relationship to Service-Oriented Architectures	200
10.6.1	Services in Subject Orientation	200
10.6.2	Service-Oriented S-BPM Architecture	202
	References	205
11	Subject-Oriented Monitoring of Processes	207
11.1	To Go	207
11.2	Nature of Monitoring	208
11.3	S-BPM Stakeholders in Monitoring	211
11.3.1	Governors	211
11.3.2	Actors	211
11.3.3	Experts	212
11.3.4	Facilitators	212
11.4	Measurement of Process Indicators (Key Performance Indicators)	212
11.4.1	Overview	212
11.4.2	Process Execution Metrics	213
11.4.3	Process Structure Key Indicators	218

11.5	Evaluation	219
11.5.1	Periodic and Ad hoc Evaluation	219
11.5.2	Continuous Business Activity Monitoring	220
11.6	Reporting	222
11.7	Process Key Indicators Related to Bundles of Activities	224
	References	225
12	A Precise Description of the S-BPM Modeling Method	227
12.1	To Go	227
12.2	Abstract State Machines	228
12.3	Interaction View of SBD-Behavior	230
12.3.1	Diagrams	230
12.3.2	SID-View of State Behavior	231
12.4	Choice of Alternative Communication Steps	232
12.4.1	Basics of the Input Pool Concept	232
12.4.2	Iteration Structure of Alternative Communication Steps	234
12.5	MultiProcess-Communication	236
12.5.1	Selection and Preparation of Messages	237
12.5.2	Sending and Receiving Messages	238
12.6	Refinement for Internal Functions	240
	Reference	240
13	Tools for S-BPM	241
13.1	To Go	241
13.2	Process Analysis	242
13.3	Process Modeling	246
13.3.1	Process Overview	246
13.3.2	Communication View	246
13.3.3	Subject Behavior	249
13.4	Process Validation	255
13.5	Process Optimization	258
13.6	Modeling Business Objects and Integrating in Behavior Descriptions	259
13.7	Organization-Specific Implementation	263
13.8	IT-Specific Implementation	263
13.9	Process Execution	265
13.10	Process Monitoring	267
14	S-BPM Method by Comparison	269
14.1	To Go	269
14.2	Subject, Predicate, and Object in Modeling	270
14.3	Comparative Analysis	272
14.3.1	Modeling While Focusing on Predicates	272
14.3.2	Modeling While Focusing on Objects	279

14.3.3	Modeling While Focusing on Predicate and Object	281
14.3.4	Modeling While Focusing on Subjects	284
14.3.5	Methods Considering Subject, Predicate, and Object . . .	287
14.3.6	Synopsis	290
	References	291
15	Conclusion	293
15.1	Continuous Round-Trip Engineering in Real Time	293
15.2	Stakeholders as Key Enablers	295
	References	296
	Glossary	297
	A Subject-Oriented Interpreter Model for S-BPM	315
	Meanings of the Term “Subject”	365
	Modeling Tool Kit	369
	Index	371

Thinking of Business Processes Systematically

1.1 To Go

Why should I read this book and work in a subject-oriented way? What is special about it? Is it not just another book, new wine in old bottles, enriched with more or less helpful examples and pretty pictures? What is special about subjects?



You find a lot of literature on business processes, considering processes as sequences of activities. If you take a closer look, it is never at all mentioned who performs these activities. However, the activities of the processes are performed by the involved stakeholders, which we call subjects. Subjects exist in all business processes. They have not been invented by this book. They are rather taken for granted—to such an extent that they might need to be revisited—in particular when they are considered implicit or secondary process information. Once we move the subject to the center of a process, the entire perspective on the process changes. And many open issues that could not be previously clarified can be resolved immediately. Amazingly, subject-oriented process models can be directly transformed into technology-supported workflows. See for yourself!

1.2 Introduction

Today, the success of organizations is not only based on their products and services but rather on their capability to (re)design their business processes in a flexible and dynamic way (Scheer et al. 2007). In this respect we need to take different influencing factors into account:

- *Globalization*. Through the worldwide opening of goods, labor, and information markets, the dynamics of business activities has steadily increased. Markets are not only reinvented, which generates additional growth, but they also lead to a continuous redesign of jobs, dynamically changing portfolios and reorganized business operations. Any small change can have a far-reaching impact in a networked organization. The division of labor exceeds corporate and national boundaries.
- *Stakeholder Orientation*. In addition to procurement and sales, other actors and interests on the market affect the company directly or indirectly. For listed companies, the shareholders have a strong influence. The management is committed to them and tries to satisfy their striving for increasing profit. In addition, organizations need to comply with more and more regional, national, European, and other international laws and regulations, such as requirements for implementing risk management systems. In this context, mandatory equity agreements, e.g., Basel II, govern the granting of loans to organizations with a rating system.
- *Progressive Penetration* of the business community with information and communication technologies: in particular, internet technologies are driving forces for organizational and technical changes in almost all economic and business-relevant sectors of society. The transmission and communication platforms enable partial (if not complete) support, processing, and maintenance of exchange processes by means of electronic communication networks. Exchanging goods and services comprises the transfer of tangible and intangible elements, accompanied with configurable structure description languages such as Extensible Markup Language (XML). The latter allow the exchange of technical information across system boundaries, adapted to the respective interaction partner.

Each of these factors is directly or indirectly related to the organization and implementation of business processes or work processes. At the same time, these factors are interdependent and cannot be considered in isolation from each other. The mastery of complex business processes is one of the major challenges of every business. However, it requires concepts to deal with these challenges in a structured way (Heracleous 2003).

Accordingly, the continuous design of business processes and thereby, business process management (BPM) is of crucial importance for the success of organizations. It comprises the implementation of strategies and business models in organizational processes. As such, it goes beyond traditional management activities, resulting in cyclic planning, organization, management, and control of organizations. This has for example been vividly described by Liappas:

“Companies often have inhomogeneous business operations. Different types of business require different types of organization. The organization needs to be geared to the market and customer requirements” (Liappas in Scheer et al. 2007, p. 44). The management of an organization is interested in two views: financial figures are generally used for looking to the past; BPM provides a means for looking to the future (Gilbert 2010).

Apparently, BPM has primarily to do with the business of a company. It is no coincidence that the word “Business” precedes Process Management. Processes are considered as leverage to operate a business according to its strategy or to align an organization according to its (public) mandate (cf. Liappas in Scheer et al. 2007, p. 44).

Subject-oriented process orientation means moving from profit orientation per se to sustainable income. The latter can be only achieved through high stakeholder satisfaction.

Two examples from consulting practices (Scheer et al. 2007):

- A market-leading chemical company has identified cost leadership as the most important success factor in its business. Product and process costs are the two key leverages for this purpose. The production network, which has been responsible for product manufacturing, guaranteed low product cost. The company decided to focus its efforts on developing an effective, efficient process landscape. It should, on the one hand both simplify and automate the customer interaction with the company and, on the other hand, ensure that the organization acts in compliance with the business model it has adopted.
- A European authority has decided to use business processes as a means of implementing its strategy and optimizing its resources. As a basis for subsequent activities, a business process model was created that reflected the statutory mandate to that authority. Based on this model, several design projects have been set up successfully, such as zero-based budgeting, optimization in various areas of the organization, and the introduction of a new ERP (enterprise resource planning) system.

Public service organizations often ask whether they can use the same methods as companies with market orientation. The only difference between the two of them is the purpose of the organization: one wants to earn money, and the other has to administer the law. However, the approach to the fulfillment of each objective can be the same in both cases.

These cases show tangible connections between business processes and their impact on organizations. Nevertheless, handling business processes at a high level of abstraction is the greatest risk for BPM today: the trivialization of dealing with processes. It is challenging to deal simultaneously with the company’s business model, the processes, the planning and control systems, rules of conduct, information technology, and personnel matters.

Lack of knowledge about business processes can lead to wrong decisions with negative consequences for the organization.

Managers have to deal with the planning, monitoring, and controlling of business processes. Such a traditional focus on business-relevant processes is often chosen in practice; however, this results in unsatisfying outcome and low acceptance of BPM. Even when organizations publish their process descriptions on the intranet, these pages are rarely visited. Why? Since the process documentation is already memorized, or nobody is actually interested in it? “Processes cannot be decoupled from the business!” (Liappas in [Scheer et al. 2007](#)). They rather control what happens in the organization.

Another problem is the generally known fact that process issues are pursued by various stakeholders. Processes of an organization are actively incorporated and modeled by business departments, as well as by IT departments. However, IT departments take a different, more technical perspective on the processes. When stakeholders involved in the processes are interviewed, they do not speak the same language as process modelers or organization developers. A major government agency has reported that the process of attaining a thorough understanding causes most of the effort in process management. This is already mirrored in the terms business process and workflow. The business processes of individual departments are mainly implemented using information technologies. A business process is technically refined and becomes a workflow. The latter is often described using different methods than those used for describing business processes, leading to incoherent and inconsistent specifications. Hence, such a transformation can lead to a significant loss of information, due to the mapping and translations. In addition, process descriptions are usually not detailed sufficiently by concerned members of the organization to be transferred without further effort into a workflow system. This causes additional effort for a successful implementation, including making assumptions about the actual work procedures.

The design of business processes should be in line with the business intelligence of an organization ([Kemper et al. 2004](#)). It bundles relevant information about organizations. By modeling business processes, organizations can build up business intelligence, i.e., they can collect their knowledge to achieve organizational goals and transparent models for the targeted processing. Information and communication technologies play a major role in the presentation, imaging, and processing of information.

Moreover, the organization has to be recognized as a system consisting of people and their communication relationships. The individual stakeholders are responsible for implementing the business processes. Their qualifications and motivation are crucial for the success of the business. System thinking helps to recognize the mutual relationships of all relevant elements and their relationships within an organization (which is then considered a system).

The more organizational changes are triggered through models, the more important the explicit consideration of contextual information becomes, so-called system thinking.

The generation of added value, therefore, requires an integrated BPM approach that takes into account many different aspects in a balanced way. To this end, a number of different capabilities are required, in particular product orientation, customer (or market) orientation, system thinking, and abstract thinking in terms of models:

- *Product orientation.* A market-driven orientation toward partners and products (Lehner et al. 2007) includes services and software and represents one of the key factors of process design. The use of corporate resources (information, materials, skills, etc.) should be aligned with the life cycle of products.
- *Customer orientation.* In addition to product orientation, customer orientation is the major trigger for the design and change management of an organization. The life cycle of a product has to be aligned with customer expectations (cf. debate about climate change) and is subject to changes according to customer behavior. Nevertheless, development, production, and distribution of products or services have to comply with the principles of economic efficiency.
- *System thinking* requires explicit recognition of context of all processes of an organization and linking of information across system boundaries, especially for decision-making purposes.
- *Abstract thinking in terms of models*, as a principle to approach capabilities and problems, allows focusing on relevant events and structures of the world as observed by humans. It strives for the “essence” without losing target-specific context.

The primary area of design for change management in integrated BPM is represented by organizations being seen as increasingly self-regulated socio-technical systems (Exner et al. 2010). IT systems, especially systems supporting the operational flow, such as workflow management systems, are embedded in the context of a work organization and need to be adapted according to economic benefits and human work requirements. Models, methods, and tools need to be applied accordingly.

Systemic BPM is context sensitive in two respects: on the one hand, organizational, technical, and human–social factors are considered, including their mutual relationships; on the other, these factors, along with their mutual dependencies, form the context for all BPM activities (ranging from the acquisition of work knowledge to evaluation and execution).

A comprehensive method for the concrete implementation of an integrated BPM-oriented approach is subject-oriented business process management (S-BPM). It brings the subject of a process to the center of attention. In doing so, it considers business processes and their organizational environment from a new perspective, meeting organizational requirements in a much better way.

At the S-BPM-ONE Conference in 2009, Hagen Buchwald differentiated between three different phases of perspectives in computer science, starting with flowcharts (predicate orientation) in 1970 (Buchwald 2010, p. 20f). This changed around 1990 by the paradigm shift to object orientation. And, again 20 years later, in 2010, a further change occurred, the shift to subject orientation.

Integration is more than the sum of its parts. The subject-oriented management process is not only results-oriented but rather substantially reshapes modeling as a comprehensive construction process; in the long run, managers trust their staff to reflect business processes interactively and to (re)construct them dynamically.

S-BPM provides a coherent procedural framework of reference to manage business processes of an organization: its focus is on the cooperation of those involved in the strategic, tactical, and operational issues, sharing their knowledge in a networked structure of the organization. Thus, S-BPM is an integrated approach to organizational design and development of an organization. Regardless of the complexity of a case at hand, it can be handled on a technological basis, as all validated behavior models can be directly executed. Moreover, the concept and precise prescription of technological behavior allow the seamless integration of S-BPM models into existing, and heterogeneous IT landscapes.

The only requirement for acquiring S-BPM competence is a good command of natural language. Hence, based on the findings of developmental psychology and linguistics, we first explain in Chap. 2 that for complete S-BPM specifications sentence natural language semantics has to be used. In this way, business process owners are able to ensure that business requirements of internal and external stakeholders are entirely met. All involved people, regardless of their functional roles, are able to learn how to model in a subject-oriented way, because this approach is closely tied to operational actions and provides a direct reference to existing information exchange processes between stakeholders. Hence, in this chapter, we also explain how information systems can be developed using S-BPM, in order to meet different requirements on the implementation level in a straightforward way.

In the Chap. 3.5 we detail the procedures behind S-BPM when developing organizations on the basis of subject-oriented business process models. The process model is coherent and justifies its practicality. Its development has been based on widespread experiences with the use of S-BPM. Chapters 4–11 detail the various bundles of activities of the S-BPM method. Starting out with analysis, we demonstrate how subject orientation can develop and be experienced by gradually focusing on communication for service provision. The subject-oriented perspective is also of benefit for real-time execution of specifications as well as for solving complex problems due to the simple, networked modeling structure of S-BPM. In Chap. 12, we provide a formal specification of the modeling method. In Chap. 13,

we illustrate how each of the previously described activity bundles can be supported through the use of appropriate software tools.

In the final part of the book, we show in Chap. 15 a typical round-trip from current S-BPM practice. We also mutually contrast existing formal methods for modeling business processes in the Chap. 14. The approaches are described on the basis of their fundamental concepts. We also explain what relationship natural languages have with formal languages of computer science in general, and how the subject-oriented modeling method could be developed out of the structure of natural language. These considerations complete our round-trip that started with discussing natural language capabilities required for subject-oriented modeling in the course of human-centered design of socio-technical systems.

Each chapter begins with a summary of key findings with respect to the addressed topic, called “To Go”: in a fictional dialog of actors relevant for S-BPM the content of each chapter is addressed in an engaging and entertaining form.

The glossary and index at the end of the book should facilitate profound discussions and serve as a quick reference to S-BPM concepts and operational methods.

References

- Buchwald H (2010) The Power of ‘As-Is’ Processes, Springer CCIS 85, pp. 13–23, 2010.
- Exner, A., Exner, H., Hochreiter, G., Unternehmens(Selbst)Steuerung - Ein praktikables Managementmodell, in: Organisationsentwicklung - Zeitschrift für Unternehmensentwicklung und Change Management, No. 2, S. 56–65, 2010.
- Gilbert, P., The next decade of BPM, in: Hull, R., Mendling, J., Tai, S. (Eds.), Business Process Management, Springer LNCS 6336, Berlin 2010.
- Heracleous L., Strategy and Organization - Realizing Strategic Management, Cambridge/UK 2003.
- Kemper, H.-G., Mehanna, W., Unger, C., Business Intelligence - Grundlagen und praktische Anwendungen, Wiesbaden 2004.
- Lehner, F., Wildner, S., Scholz M., Wirtschaftsinformatik - Eine Einführung, München 2007.
- Scheer, A.-W., Kruppke, H., Jost, W., Kindermann, H. (Hrsg.), Agilität durch ARIS-Geschäftsprozessmanagement, Jahrbuch Business Process Excellence 2006/2007, Berlin 2007.

Open Access. This chapter is distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.

From Language Acquisition to Subject-Oriented Modeling

2

2.1 To Go

Everybody is able to talk in natural language, well, more or less: Why would we like to describe processes in natural language? Since we already know how to do it, without the need to learn some strange language, such as that of IT people, which nobody can really relate to. Is S-BPM now the next hype? Another lingo? How does subject orientation help? And how is it related to natural language?



A business process is a highly complex bundle of communication in an organization. Humans have learned to communicate using language. Given that fact, it makes sense to describe processes entirely through natural language. Complete sentences are composed of subject, predicate, and object. At least, to my knowledge, all languages have this structure, and I have asked people of highly different origins. There might be differences in arranging the terms within a sentence, but with respect to their category they remain the same across different languages. Looking into existing BPM approaches, most of them are incomplete—they may lack the subject, the predicate, the object or some combination of these. In particular, subjects, if they are included at all, may be expressed indirectly or implicitly, e.g., using passive voice. Traditionally, processes are described by lists of predicates—we call them functions. Take, e.g., object-oriented methods: Besides predicates there are objects on which developers carry out operations. We tend to avoid expressing explicitly WHO is doing what. However, once we recognize that nothing happens without being triggered by someone, we have to move the subjects to the focus.

In this chapter, we first reflect the origin and development of human thinking, acting, and natural language. Then, we introduce subject-oriented business process modeling by describing its main features and constructs intended to support organizational development steps. The focus of S-BPM modeling is on subjects as these are the active actors or systems in organizational development processes. Such a focus allows expressing knowledge in terms of natural language sentence semantics, as we do in natural language: a sentence consists of a subject, a predicate, and an object. Subject-oriented business process models can be directly derived from such natural language representations. Language is a complex communication system, using arbitrarily chosen symbols that can be combined in countless ways to achieve a single goal: conveying information.

In the following, we offer an overview of basic elements of natural language and show the transition of natural language representations to subject-oriented models. We start with significant findings on language acquisition and then discuss the developmental relationships between speech and action. We focus on language features and language development as detailed by Zwisler (1999).

For this reason, we deal first with the natural language semantics of sentences, which subsequently enable us to step directly into subject-oriented modeling of business processes without further effort. We then discuss the relationship of formal languages to natural language in order to clarify some differences. This discussion should help avoiding problems, primarily with respect to modeling, and subsequently with respect to implementing S-BPM models.

2.2 Acquiring Language and Dealing with Its Structure

Not only does the acquisition of language appear to be intrinsically motivated, but also its use, and thus, how to deal with distinct language structures. People intend to convey information and deliver meaningful messages when using language. Children are in particular interested in using voice communication: they find out very early how to influence their environment by acting. While improving their actions, they try to imitate the language of their parents. They learn that opening and closing the mouth twice when saying “ma” results in “mama” which not only delights their environment but also allows them to influence the behavior of their parents. Children experiment and play with language, and they quickly recognize that it is indeed useful to speak the same language as their parents. This insight has been conceptually explained as follows: “The foundation of language is based on a common understanding on the combination of sounds into meaningful units, and the combination of words into sentences. Phonemes are the sounds that make up the language. Morphemes are the smallest meaningful units” (Zwisler 1999).

Language therefore is governed by certain rules and hence structures the communication and interaction between people. While the syntactic dimension determines the relationship between linguistic symbols, the semantic dimension determines the relationship of symbols to nonlinguistic realities. Finally, the pragmatic dimension determines the relationship of symbols to speakers and listeners.

Language itself can therefore be regarded as a formal system. Within this system, distinct syntactic and semantic elements can be put into mutual context by way of rules. The most important basic semantic unit is a sentence. Language description and explanation are thus reduced to the description and explanation of sentences; the use of language is excluded. However, according to Chomsky, when using language, speakers and listeners generate some cognitive effort (while perception is learned prior to the production of language) (Chomsky 1986):

- They can judge sentences on their grammatical correctness.
- They recognize semantically equivalent sentences.
- They check ambiguities and can resolve them through paraphrasing content.
- They are able to repeatedly form new sentences and understand their meaning—they show linguistic creativity.

From the first three observations, Chomsky concluded that the perceivable forms of sentences are based on construction plans constituting actual meaning. He distinguishes between a surface structure and a deep structure of sentences. The deep structure determines which grammatical categories a sentence contains, which grammatical relations exist between the categories, and which lexical units can be used for the grammatical categories. The deep structure is allocated according to a semantic interpretation, which determines its semantic structure. By means of transformation rules, the deep structure is transferred into surface structure. Finally, sentences are pronounced correctly using the phonological component (Chomsky 1986).

Adolescents develop an individual language specific to their peer group or social environment. This language is generally characterized by simple sentences, revealing the sufficiency of natural language sentence semantics for effective communication.

Later, we show that the mapping of natural language sentences to an S-BPM model is comprehensive. Consequently, subject-oriented models enable effective communication, conveying complete information.

Language as a formal system contains the grammar as a fundamental means for the formation of expressions, sentences, and stories.

2.3 Talking and Acting: Functional Alignment of Sentences

People do not produce sentences per se; they use them intentionally and purposefully. Linguistic competence, in terms of being able to understand meaning, includes the ability to know what to say in a certain social context, the skill to formulate content according to expectations of listeners, and the ability to recognize when it is perhaps better to conceal something. People learn the socio-normative rules of communication, i.e., communicative competence, through communication, not because they master a set of grammatical rules. People acquire the structure of

sentences through the use of language, which in turn empowers them to explore its further usage. Hence, function and structure are mutually intertwined.

Language in its functional orientation enables speech. Talking represents a kind of action, with the speech act being constituent of the mutual relationship of the communication partners. The speech act can succeed or fail, just as any other activity. Bühler, with emphasis on the action character of language, interpreted language as a tool “to tell somebody something about things” (Bühler 1937). Thus, three constituent components of language can be distinguished:

- The subjective component: “oneself” (expression)
- The intersubjective component: “the other” (appeal)
- The objective component “of things” (presentation)

This distinction emphasizes the importance of separating presentation from content. It is reflected by the respective categories of symbols:

- Symbols by virtue of their relationship to objects and situations (objective component).
- Symptoms by virtue of their dependence on the speaker’s intention, therefore, from the sender (subjective component).
- Signals by virtue of their appeal to the listener whose behavior they control (intersubjective component).

Therefore, a speech act always concurrently serves as a means for presentation, expression, and appeal. Usually, in a speech act, one of these functions moves to the foreground. Similarly, model building in BPM is aligned to a specific function.

2.4 Language Proficiency: The Transmission of Meaning

Being capable to use a certain (modeling) language means for a person to be able to master the grammatical rule set on the one hand. On the other hand, it means being able to make other people understand, to talk about items and issues, and—where appropriate—to reach an agreement. The first functional aspect is also known as “linguistic competence,” while the second one is termed “communicative competence” due to its orientation toward action. In the context of modeling a business process, the functional aspect refers to the appropriateness of representation, from scratch to a complete and therefore coherent representation. The action aspect refers to adequately representing a situation by using a modeling language.

Language proficiency goes beyond the knowledge and application of the grammar of a language to convey meaning. People can only interpret information correctly when knowing its overall context. The conveyed meaning of a sequence of words can only be determined when knowing who the receiver is and what the concrete situation the sender and the receiver are part of involves. These dependencies of intended meaning determine, among other things, the cultural evolution:

- Semanticity: the utterance of a word is not necessarily linked to the presence of the signified object.
- Productivity: utterances that have never been expressed are possible.

- **Substitutability:** communication can occur independently of space and time.

When applying this knowledge to S-BPM and the development of organizations, organizational development using models of business processes is driven by the following characteristics: semanticity means that models based on the structure of language (as representations of the observable or anticipated reality) express organizational development opportunities. Productivity refers to situations achievable in the future. Substitutability implies the possibility of holding on to ideas that may become productive (in terms of the preceding sentence).

Consequently, the capability of speaking and articulating in natural language enables stakeholders, according to their relation to cultural evolution to actively participate in organizational development.

Language allows the mapping of context with its own resources. Humans use their knowledge about language to describe processes and their embodiment in organizations.

2.5 Learning to Coordinate Speech, Thought, and Action

According to the findings of developmental psychology, the ability of individuals to learn a language is biologically determined. The environment only helps to trigger the biological potential. The receptor and articulation mechanisms of language according to their anatomical and physiological basis are already operational at the moment of birth. However, the brain regions required for the actual functioning of these mechanisms yet need to go through a further maturation process after birth. According to Chomsky, a speaker can only learn a language, when he has extracted the respective rules to construct linguistic utterances out of the abundance of utterances surrounding him as a child. These rules specify how the surface structure of a language is connected to the underlying deep structure. Mastering of all these rules has been referred to by Chomsky as linguistic competence. It is however an ideal claim, which will not be encountered in actual life. The actual speech capability is then speech performance.

According to Chomsky, there are universal principles that determine the types of grammatical regularities in the different languages; these should be innate to a child for language acquisition. What is to be determined by biology is a set of rules consisting of universal principles of structuring, which guide and channel the acquisition of grammar in the process of socialization. This control apparatus is called “LAD” (language acquisition device). It allows the child to induce general rules on how to form hypotheses from individual experiences with the language of its environment. In this way, it acquires a command of the grammar for that particular language. The constructive activity of the child in language learning comes to the foreground. Language is thus acquired in a long-lasting process. Since the child is fully engaged in the dynamic flow of the listener and speaker, it is able to understand what is meant by the (adult) speaker. Once the child knows what the

speaker means, it can recognize and explore the meaning of what this person says. The child therefore does not learn what a word means, but rather how an existing meaning, or a term or concept, can be described verbally. The anchoring of language learning is provided through recognizing the intention of the speaker.

Up to a certain point, the development of thought and language proceed separately. But then, approximately at the age of two, they meet: thinking becomes language, and language becomes intellectual. “There is indeed no way to make achievements of thought visible without language” (Zwislser 1999).

The development of language itself involves several steps, which are of importance for the recognition of semantics. The following are particularly important:

- The one-word stage (age 1–2 years): The child uses single words to express whole phrases or sentences. The meaning of the words is understood by the adults because of the context. The child understands much of what it hears, as can be observed from the fact that it carries out correlated actions.
- The spurt in the development of words (at the age of two): The vocabulary is growing from about 300 words at 24 months to 1,000 words at 36 months. Two- and three-word sentences are formed by the child’s own rules, which are not copied from the grown-ups’ language.
- The sentence period (at the age of three): At this time the child uses sentences that contain grammatical features of the grown-ups’ language. The child can use functionally complete, but grammatically incomplete sentences.
- To 5 years of age: The child uses sentences of each type: incomprehensible sentences; functionally complete but grammatically incomplete sentences; simple sentences; connected sentences; complex sentences; and mixed forms of the latter two.

Sentences, in which the actual subject is not explicitly named, are hard to understand for children (“At night, a black cat is hard to see”—Who sees the cat here? The subject “any person” has to be added with cognitive effort). Chomsky used a doll in his investigations which he blindfolded. Then he posed the question: “Is the doll easy to see or hard to see?” Only children at the age of 7 years gave correct answers at a high enough rate to indicate that this was not coincidental. The latter is particularly significant because linking displayed content to the respective actors seems to be of high importance for understanding.

Equally important is the sentence structure. In a sentence, words are put into mutual relation. The two most important keys to understanding sentences are the sequences of words and their inflection. The child begins with the word that has the most importance and includes the focus on what it wants to say (-> semantics). One of the most difficult grammatical forms seems to be the passive sentence. Often children are not able to use it correctly until the age of seven. For its understanding, they need to reverse their thoughts.

Semantic development occurs initially through vocalizations. In this way, the child can achieve targets. The child only knows that a particular verbal behavior can lead to desirable consequences; the actual meaning of a particular word is still not known to him. Semantics is achieved by inductive extrapolation: the child takes those speech utterances from the environment which it hears frequently and

considers relevant for his needs and demands. These statements are memorized as best as possible and recalled in this form. Due to the variable use of these forms, the child then gradually recognizes that their individual positions can be taken by different words. The words in identical positions are turned into categories, and from their sequences syntactic rules for word positioning are derived.

A child does not operate only on the level of words, but also, and just at the beginning of language, with larger units. It is not only a cognitively motivated analyzer, but also, and primarily, a socially and emotionally motivated impersonator. The language rule sets do not only stem from internal but also external sources. The child does not learn the syntax in a direct way, but rather through conveyance of nonlinguistic conceptual information and linguistic semantic information; language acquisition is a highly active procedure.

These findings on language acquisition clarify which achievements are cognitively necessary for a successful language proficiency, even if they are intrinsically motivated. Active language acquisition lays the ground for the capability of people to interact, and ultimately for their coexistence in all systems of the society. These findings can be used to generate models of business processes and to contribute to organizational development. Considering the process of acquiring language skills, however, we have to recognize the inverse nature of S-BPM modeling through language constructs. The conscious use of syntax already allows the generation of meaningful content of models as shown in the sequel.

2.6 Models and Natural Language Semantics of Sentences

Models are representations of the perceived reality of humans. They can be formulated by means of natural language, even when they are processed by IT systems. The advantage of natural language descriptions is that they can be immediately understood by all people. And they are in line with natural language sentence semantics, as they contain subject, predicate, and object. What we call here natural language sentence semantics is considered the second level of sentence semantics in linguistics, with the semantic roles agent, predication, and theme (“Max plays the ball”). Level one corresponds to statements like “The ball is round.” The third and last level is equivalent to the semantic structures within parts of sentences (“Peter’s enjoyment of football brought luck”). For details, see Schmidt et al. (2005).

Natural language sentence semantics is familiar to all of us, as we invariably use it to communicate. However, natural languages have the disadvantage that they are frequently used in an incomplete and not sufficiently precise way. The results are different interpretations and misunderstandings.

The following illustrative example can be found in several Internet forums (Fig. 2.1):