S-BPM AS A NEW IMPETUS IN BUSINESS PROCESS MANAGEMENT: A SURVEY

Albert FLEISCHMANN
Owner, Interaktiv Unternehmensberatung
Address: 16, Burgfriedenstraße, Pfaffenhofen, 85276, Germany
E-mail: albert.fleischmann@interaktiv.expert

Werner SCHMIDT
Professor for Business Informatics, Technische Hochschule Ingolstadt, Business School
Address: 10, Esplanade, Ingolstadt, 85049, Germany
E-mail: werner.schmidt@thi.de

Subject-oriented Business Process Management (S-BPM) is a relatively new approach for the overall handling of work procedures in organizations, from analysis to IT-based execution. It focuses on the acting entities in processes (people, software, robots etc.) and their interactions to achieve the process goal. The explicit stakeholder and communication orientation makes it a promising candidate to overcome the major drawbacks of traditional BPM, as there are deviations of lived processes from their specification (model-reality divide), giving away opportunities for improvement proposed by employees (lost innovation) and slow adaption of organization and IT to changing requirements.

With its easy-to-understand and easy-to-use notation based on the Subject-Predicate-Object scheme of natural language, S-BPM facilitates semantic and organizational integration of people in the design of their work procedures. On the other hand, clear formal semantic behind the graphical notation allows automatic code generation for workflow execution at runtime. Hence, stakeholders can instantly test the models they created, and iteratively improve and complete them until they are considered ready for going live and being executed by a workflow engine. This leads to seamless roundtrip engineering based on a common understanding of both business and IT people, so it can significantly increase organizational agility.

The article first briefly explains the properties of the S-BPM approach, and then details their impact on the BPM lifecycle activities, with regard to improving stakeholder participation and BPM lifecycle responsiveness.

Key words: agility, process modeling, process execution, BPM life cycle, S-BPM, subject-oriented.

Citation: Fleischmann A., Schmidt W. (2015) S-BPM as a new impetus in Business Process Management: A survey. *Business Informatics*, no. 2 (32), pp. 7–19.

1. Introduction

1.1. Purpose and Methodology

Although Subject-oriented Business Process Management (S-BPM) is a relatively new approach, its recognition and application significantly grew both in science and in practice during the last decade. It resulted in numerous scientific articles, books and reports on its practical use.

The purpose of this contribution is to provide a summative overview of the concept and show how it can help overcome the typical shortcomings of traditional BPM approaches. We performed a comprehensive literature review, structured the results and added some new ideas/development lines. The article is structured as follows: we first discuss the shortcomings of the traditional BPM and the concepts to overcome them. Section 2 briefly

introduces the S-BPM approach, before we explain in Section 3 how S-BPM can influence single BPM life cycle activities and the overall BPM meta process, with respect to the improvement concepts mentioned in section 1.2. The conclusion in section 4 summarizes the S-BPM contributions to a more contemporary BPM, and touches some aspects of its further development.

1.2. Shortcomings of the Traditional BPM

Scientific Management by Taylor, aiming at efficient operation in a well-structured, stable, predictable economic environment, still forms the basis of traditional BPM. However, today's enterprises often compete in global and dynamic markets, which requires high flexibility with regard to their product and service offerings, as well as their processes. As a consequence they need to shift to a more agile, self-organized form of organization [cf. 1, 10], by 'fundamentally and holistically rethinking how the work is done, who does it, and how insights derived from social interactions are analyzed and acted on within the process' [14]. This also refers to radical changes in the BPM life cycle [2, 26].

Due to its roots, the traditional BPM shows some significant shortcomings with regard to the required shift [3, 10, 21] (see Table 1, left column). In order to overcome them, a number of remedy concepts have been identified (*see Tab. 1*, right column) [2, 10]. As we will show later, S-BPM contributes a good part to the implementation of those concepts.

2. Introduction to S-BPM [12]

2.1. Properties

S-BPM is not just another modeling language, but a comprehensive methodology spanning the whole BPM life cycle. It suggests a shift of the paradigm, from the traditional control flow-based view to a stakeholder- and communication-oriented view of business processes. The subjects represent active entities in a process, and they behave in a certain way to accomplish the goal. Their behavior includes exchanging messages and performing activities with business objects. Hence, a subject-oriented specification of a process follows the standard sentence semantics of a natural language consisting of subject, predicate and object.

This is reflected in the graphical notation with only a few symbols. Constructing a Subject Interaction Diagram (SID) depicting the communication structure of a process only requires subjects and messages as symbols (*see Fig. 1*). Symbols for a function state, a send state and a receive state is all that is necessary to describe the sequential subject activities in the Subject Behavior Diagram (SBD, see Fig. 2). Behaviors are synchronized by messages (see the arrows *in Fig. 2*).

The graphical notation is based on a clear formal semantic, allowing for automated code generation (executable models).

This means there is only one model serving both as a communication means for business and IT people,

Table 1.

Shortcomings of the traditional BPM and remedy concepts

Shortcomings [3, 10, 21]	→	Remedy Concepts [2, 10]
Model-reality divide Process implementation often does not sufficiently incorporate (well-defined) models causing their insufficient adoption by stakeholders. As a consequence, processes often are not executed the way they are modeled. **Lost innovation** Existing knowledge for improvement often is not being utilized, or it is not even recognized.	→	**Semantic Integration** Overcoming semantic barriers caused by different languages of the participants. For communication and mutual understanding, the community needs to be provided with a universal language covering all relevant aspects of business processes enabled by simple syntax. A minimum number of elements should allow high expressiveness with clearly defined semantics, which can be quickly mastered even by inexperienced users [24]
caused by		**Organizational Integration** Overcoming organizational barriers to avoid stakeholder exclusion, which can be caused by a lack of education, method and tool literacy, or simply not being part of the eligible groups in the organization. This also addresses the necessity to successfully organize participation of people with different objectives, abilities, competencies, positions, as well as to motivate them to contribute. [24].
Information pass-on threshold People do not pass on improvement proposals because the process might be too complicated and non-transparent. **Lack of information fusion** Organizational, methodological or tooling issues hinder stakeholder participation. The reasons for exclusion can include too formal modeling languages, too complicated software etc. Thus, users cannot actively participate in the creation of their work procedures, so they need to adopt those defined for them in a top-down manner by 'white collar' experts.	→	**BPM Life Cycle Responsiveness** Responsiveness of the BPM meta process needed to overcome procedural barriers. This means to design the BPM life cycle for flexible use, in order to quickly adapt to the environment changes, increasing organizational agility.

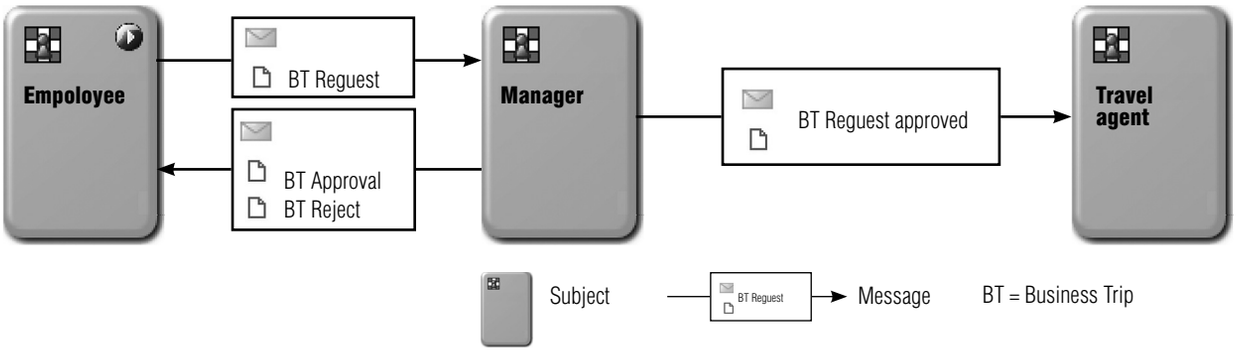


Fig. 1. Subject interaction diagram for a business trip request process

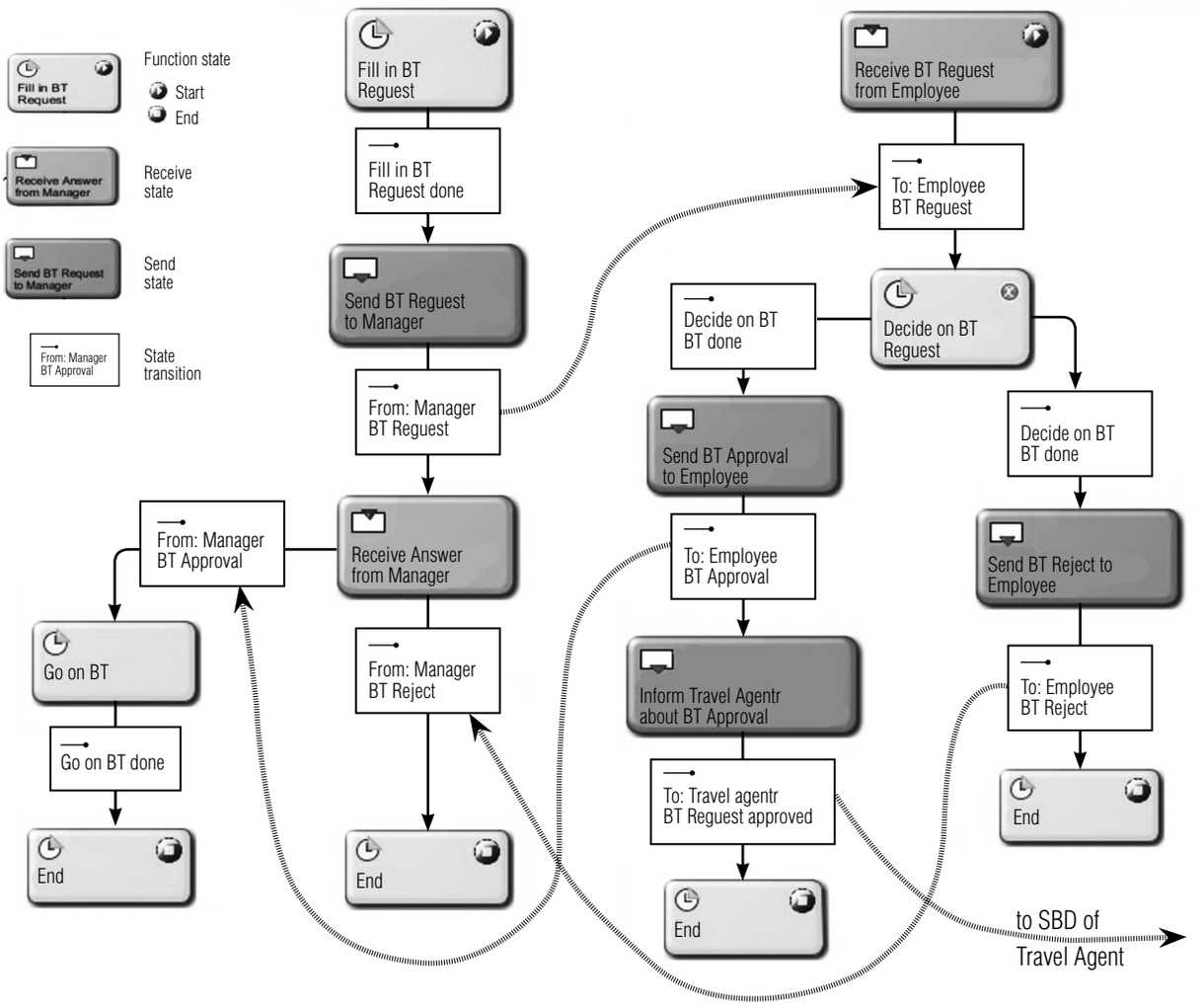


Fig. 2. Subject behavior diagrams for Employee and Manager

and as a business specification to generate the workflow application form. As a consequence, there is no inconsistency between the modeled behavior and implemented workflow system, the way it often can be seen in traditional BPM approaches, where transforming the business model into a technical implementation creates a gap from the very beginning, and over time increases it in case of changes. To the contrary, S-BPM facilitates seamless roundtrip engineering, immediately feeding back user experience to the model from validation (see Section 3.2), as well as from execution (see Section 3.4).

2.2. Constituents [10]

The major ingredients of the S-BPM concept come from sociology and information science. The starting point for Fleischmann's developing S-BPM was Luhmann's statement that the smallest unit of organizations as social systems is communication, which is mostly implemented among humans through natural language with a subject, predicate and object. Looking for a way to model such communication, he was inspired by Calculus of Communicating Systems and Communicating Sequential Processes, process algebras by Milner and Hoare for specifying the communication (of processes) in concurrent systems (e.g., in operating systems). Adding aspects of object orientation, an input pool concept for message exchange and the aforementioned graphical notation, Fleischmann developed the Parallel Activities Specification Scheme (PASS), the core of S-BPM. The correctness of its formal semantic was proven by Börger, using the Abstract State Machine concept.

2.3. S-BPM in practice and science

Subject-oriented Business Process Management has been successfully applied in several countries and various industries like financial, telecommunication and health service providing, car manufacturing, publishing houses, as well as several application domains like IT service management, incident management or customer knowledge management [4, 5, 16, 19, 27]. It has been used by such companies as NEC, Hitachi, Swisscom and Fiducia.

The S-BPM approach is scientifically grounded by a lot of research work. Its establishment and further development is also accompanied by manifold scientific activities, not only bringing up additional features, but also providing proofs of the concepts and looking for beneficial use in operational practice. Examples for results of such activities in form of events, projects, publications, or institutions are:

✦ International S-BPM ONE conference series since 2009, annually bringing together a growing community of researchers and practitioners to share ideas, results, experience around the methodology and tooling (see www.s-bpm-one.org)

✦ Institute of Innovative Process Management (I2PM). This institution was established to promote innovative scientific discoveries and solutions in the field of process management, as well as to test them through academic work over the long term. The objective is to transfer the expertise from theory to practice (see www.i2pm.net). I2PM is the umbrella institution for the S-BPM ONE conference series, as well as for the Open S-BPM initiative, which aims at spreading the idea and concept of the S-BPM approach, and to stimulating research on it.

✦ Numerous publications of books and articles in conference proceedings and journals

✦ Research bodies at universities, for example, in Germany (e.g., in Darmstadt, Ingolstadt, Hof) and Austria (Linz, Graz).

✦ Research projects run by those research groups in cooperation with partners from industry. Examples here are such EU-funded projects as Interactive Acquisition, Negotiation and Enactment of Subject-Oriented Business Process Knowledge (IANES; http://ianes.eu/) or Subject-Orientation for People-Centred Production (SoPCPro; http://cordis.europa.eu/project/rcn/109221_en.html).

2.4. Software tool support

Currently two commercial business process management suites based on the S-BPM methodology are available, offering comprehensive support of the BPM life cycle activities. The Java-based Metasonic Suite comprises of components for modeling («Build»), validating («Proof»), organizational embedding («User Manager»), execution and monitoring («Flow») and some administration tools («Model Manager», «Instance Manager» etc.) (www.metasonic.de). InFlow is the name of a .net-based solution using Microsoft components, which also provides functionality to bring processes from modeling to execution and monitoring (www.strict-solutions.at).

Under the Open S-BPM initiative (www.i2pm.net), several universities work on non-commercial S-BPM-based software tools [8], e.g., a workflow engine based on Core-ASM [18].

3. S-BPM impact on life cycle activities and on overall life cycle

In the following sections we outline the opportunities the S-BPM concept offers in the BPM life cycle activities and refer to respective contributions to support the remedy concepts in *Tab. 1.*

3.1. Analysis and modeling

Modeling language and interface types

The easy-to-understand and easy-to-use language empowers the domain experts to model their work procedures themselves. It also is extremely good at supporting tangible modeling interfaces, complementing intangible GUI-based ones (*see Fig. 3*) [6, 7, 10].

People can model a process on a tabletop interface called Comprehand with a digitally augmented modeling surface (*see Fig. 3* upper left) [7]. They place graspable color-coded building blocks on the table. A video camera films all their movements and positions from below, while software interprets the results in real-time and displays them via a video projector on the table surface, as well as on an auxiliary screen. Modelers can connect elements by just touching each other, label them with a PC keyboard or use tangible tools like a rubber to erase connections between the building blocks. The modeling results adopted by all stakeholders can be imported in a GUI-based interface like Metasonic Build, in order to be elaborated and further processed. Comprehand supports many scenarios for joint, collaborative and spatially distributed modeling [20]. A commercial version called Metasonic Touch is available.

Buildbook and Rural Comprehand are technically less sophisticated tangible modeling S-BPM based interfaces. In Buildbook, letter cases represent subjects, while color-coded plugs are used to depict the three behavior states of the S-BPM notation (do, send, receive) and the state transitions (*see Fig. 3* upper middle) [13]. When applying Rural Comprehand, the modelers lay out (magnetic) cards on pinboards and draw lines to connect them in order to construct S-BPM diagrams (see *Fig. 3*, upper right). In both cases, the models generated can be photographed, analyzed with image recognition and imported in a GUI-based interface for further processing.

Combining S-BPM properties with alternative interactive interface types for modeling can reduce method and tool overhead, lower the barriers for stakeholder involvement, increase their motivation and foster elicitation of implicit process knowledge. The high level of stakeholder inclusion and participation promises higher model quality, higher level of acceptance, less model-reality divide and better leveraging of the process know-how in the organization.

This means that S-BPM significantly contributes to improving the semantic and organizational integration of all stakeholders, facilitating organizational learning driven by them.

Intertwining S-BPM and Value Network Analysis (VNA) [28]

Value Network Analysis (VNA) is derived from Social Network Analysis (SNA). It identifies interactions between value creating and exchanging roles in networks, so it is highly appropriate for analyzing and designing subject-oriented processes. In particular, it helps to identify subjects and their communication to be included in S-BPM models. As VNA analyzes tangible and intangible deliverables, it not only excavates information about formal workflows, but also reveals process behavior that has not been documented or even recognized. Recognizing patterns of informal communication can help identify the «go to» persons with the right know-how, power etc. for actor-driven organizational development, according to the open S-BPM lifecycle (see Section 3.5). VNA

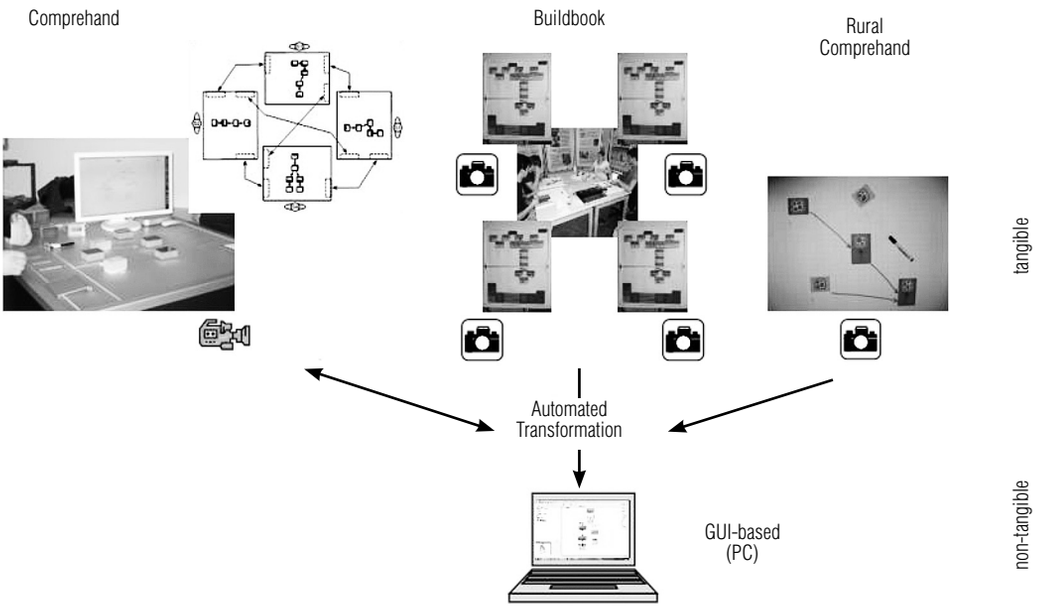


Fig. 3. S-BPM-based modeling interfaces (tangible and non-tangible)

can also help to assign the right-skilled people to subjects. Hence, intertwining S-BPM and VNA supports organizational integration and embedding (see Section 3.3).

Modeling by Construction and Restriction [11]

S-BPM offers an interesting opportunity with regard to the course of modeling. Traditionally, the design process starts with an «empty sheet» and modelers build up the process from scratch by adding elements as necessary (modeling by construction). Beside this, S-BPM allows modeling by restriction. This means the designer presets a «complete» process. It includes all the subjects that are part of the process, their behavior abstractions and an interaction structure, in which each subject can send any message to any other subject at any time, and can receive any message from any other subject, also at any time. From this starting point, the modelers restrict options step by step, by questioning whether a message is necessary to achieve the business goal related to the process, and remove it if not. Needed messages are labeled according to their semantic and, in any case, send and receive states are removed or adapted in the affected behavior specifications. S-BPM-based modeling by restriction can help to increase the model quality and decrease modeling time.

3.2. Validation and optimization

Before implementation, the process models need to be checked for effectiveness and logical correctness. As S-BPM models are executable, this cannot only be done in traditional walkthroughs using print-outs, large wall papers or projections, but also in IT-based role plays. A model only needs to be deployed onto a webserver, and then it can be tested by representatives of the subjects involved in a distributed web application at different locations. This is the way that they can verify whether the models' do, send and receive actions and their sequence really conforms to how work should be organized from their subject's perspective. Additionally, the availability of the right data at the right time can be checked, e.g., if a subject needs to make a decision in a particular state based on the data received by another subject. In case of any necessity to modify a behavior, the participants of the validation session can change the model on the fly and instantly test the new version again. Such iterations take place until all stakeholders have approved the model. This way of validation again adds to a high level of acceptance and quality of work procedure models. It also significantly reduces the time for building and mutually adopting the model, as compared to traditional approaches.

Hence, subject-oriented validation and optimization fosters integrating stakeholders semantically and organizationally. In pair with the seamless roundtrip engineering, this increases the BPM lifecycle responsiveness, and it can accelerate organizational learning.

3.3. Embedding into Organization and IT

The subjects in the S-BPM model are abstract behavior representations, which are executed by agents at runtime (subject carriers). Concrete agents can be acting elements like humans, robots, software and combinations of those subjects suitable to embody. They need to be assigned to the subjects in order to process instances in daily operation (Embodying).

Organizational embedding means integrating the process model into the existing structure by assigning organizational units and/or single people. The assignment must consider qualification and decision authority required for implementing a behavior, and aim for an optimal match with the know-how, skills and role or position of persons to be assigned. The embedding defines who really gets involved in process instances as initiator (which kind of instance can I start?) and contributor (which instances do I have to work on? → personal work list).

Embedding a model into the IT landscape refers to transforming it into an IT-based workflow controlled by a process engine, as well as to integrating other IT applications where needed. In the available S-BPM-based software environments, a workflow can be created without programming, due to the aforementioned precise formal semantic of the notation.

IT systems or services can be integrated by assigning them to subjects or calling them in respective behavior states. In both cases, interfaces need to be implemented, e.g., for messages exchange with such a subject carrier, or for manipulating business objects managed by another system. For instance, an SAP system could be integrated by addressing its Business Application Programming Interface (BAPI). This would require some lines of code provided in a so-called refinement in the respective behavior state, executed by the process engine at runtime.

With this way of embedding models into organization and IT S-BPM consequently decouples models from implementation. It results in a high level of flexibility in assigning elements of the organizational structure (people, organizational units) and IT to subjects: one process model can be implemented using different organizational structures or agent environments (human and/or IT), e.g., in different subsidiaries. In turn, those environments can serve to implement various process

models. This makes S-BPM a promising candidate for modeling and implementing Multi Agent Systems (MAS) [9, 17].

The described implementation flexibility that S-BPM enables with regard to organization and IT, as well as its roundtrip properties, positively influences BPM lifecycle responsiveness from the process implementation point of view.

3.4. Execution and monitoring

Subject execution control by process engine

During execution, the subject carriers assigned in the step of organizational and IT embedding (see Section 3.3) implement the behavior modeled for their subject. If the execution is controlled by a workflow engine, they are involved by this system according to the model when an instance is being processed. The process engine also provides the users with a list of processes they can start instance of, because they are assigned to the starting subject according to the organizational embedding (e.g., in a vacation request, usually possible for each employee).

The level of detail in the behavior specification defines the degree of freedom the process engine grants the actor for accomplishing their tasks. This usually depends on leadership style and governance in the organization. For example, in a Management by Objectives environment (MBO), only the aim (what?) is specified, while the stakeholders can choose their own ways to get there (how?). In S-BPM this is possible by just defining the interaction points and deliverables, and leave the remaining parts of the behavior open to be specified in more detail by the actors themselves (if necessary). This means they can modify (optimize) their behavior, as long as the interfaces to other subject are not affected.

Thus S-BPM can grant the stakeholders as much individual freedom for designing and performing their work as possible, while assuring coherence at the organizational level. High acceptance and responsiveness of the BPM lifecycle can be expected as an outcome.

S-BPM Support for traditional and Business Activity Monitoring [22, 23]

The subject-oriented BPM approach supports both traditional monitoring and the complementing Business Activity Monitoring (BAM) concept. The traditional business process monitoring creates an ex-post view on Process Performance Indicators (PPIs), such as cycle time. It collects instance data from transactional systems and event logs at runtime, stores it on an aggregated level in a data warehouse, analyzes it on request or periodically, as well as reports and presents results (e.g., as-is vs. to-be values of PPIs) to particular target groups (e.g., process owner). S-BPM based process engines, such as Metasonic Flow, store all sorts of execution data, like number of instances per time. or time stamps for start and end of activities in their audit log (event log). This data can be used for creating reports including

✧ Runtime of currently executed and completed instances and duration status displayed as traffic light colors, depending on the time deviation of a maximum value specified in the process model (*see Fig. 4a*).

✧ Runtime of a currently executed instance (absolute value compared with the average), chronological sequence and runtime of single steps performed by the subjects involved (*see Fig. 4b*).

✧ Sequence of process steps of a currently executed instance and time stamps for their completion (*see Fig. 4c*).

✧ Number of instances created per period (e.g. week) of a particular process, average, minimum and maximum processing time per subject and per process step (activity) (*see Fig. 4d*).

BAM aims for measuring and analyzing metrics for occurring instances in real- time or near real-time. Based on the Complex Event Processing (CEP) concepts, BAM provides timely insight into the running processes, short-term signaling of deviations, and it can trigger exception handling like modifying the course of the current instance or starting another process.

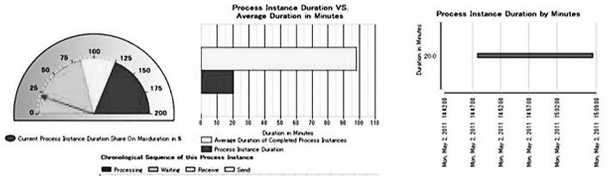
[23] describe an integrated BAM/CEP architecture and an approach to add BAM parameters like activity duration or metric aggregation rules to S-BPM behavior diagrams at build time.

Such BAM architecture can increase responsiveness and assist to early recognizing problems in single instances, as well as taking actions to avoid negative consequences, like customers being dissatisfied and the probability of their cancelling orders.

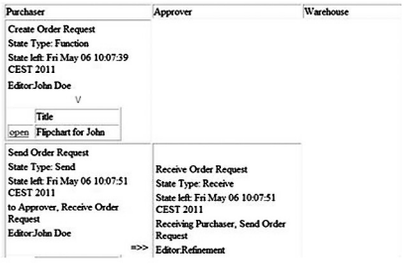
S-BPM and Activity-based Costing [29]

S-BPM creates new opportunities for process controlling, due to providing both the functional and process-oriented view within one system. It explicitly considers the subjects and people assigned to them during organizational embedding. The multiplication of the time spent by the subjects on their activities with the wages of concrete subject carriers results in realistic process cost estimations with regard to personnel. Subject carriers link to the organizational structure units they belong to. As cost centers are assigned to those organizational units, process costs

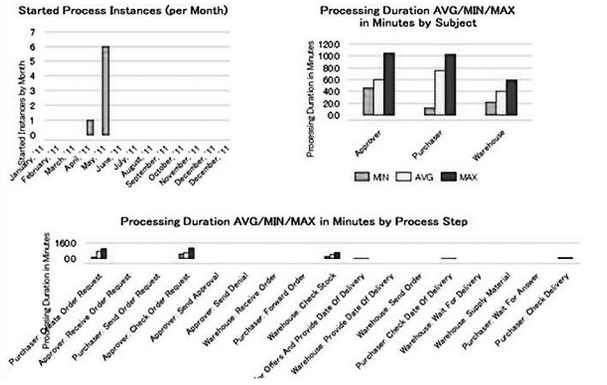
a) Instance Report 1



b) Instance Report 2



c) Instance Report 3



d) Process Report

Fig. 4. Instance and process reports created by S-BPM-based workflow engine

can be easily determined at the cost center level, providing valuable information for optimizing processes.

Modeling while Executing [10]

In Section 3.1 we presented modeling options applied before runtime. The S-BPM-based ModelAsYouGo approach [15] also facilitates dynamic modeling, where actors record their communication and functional behavior while executing a process instance. They can modify a model for a single instance by adding subjects or tasks not known at build time. If procedure patterns arise, they can be used as input for formal models, following the Design-by-Doing principle [14, 25] and closing the roundtrip engineering cycle.

This is another facet of the S-BPM contribution to a more responsive BPM lifecycle.

3.5. Open S-BPM Life Cycle [10]

In the previous sections, we discussed the potential that S-BPM can unfold in single life cycle activities for improving organizational and social integration of stakeholders, as well as BPM life cycle responsiveness. The latter refers to the meta process of S-BPM, in which people can initiate, drive and perform the activity bundles in several: actors execute process instances and interact in order to create the process result (product, service). Experts and facilitators support them in S-BPM life cycle activities on demand. Experts can bring in special domain know how, for example, in IT, while facilitators guide the change process and ensure its adoption within the organization. Governors take care of the design and implementation of the BPM meta process, which sets the frame for organizational development. Cooperation of these roles along life cycle activities helps to align stakeholder behavior and IT capabilitie,s in order to achieve the business goals. Unlike traditional approaches, S-BPM not only facilitates linear but also nonlinear sequences of the activity bundles (*see Fig. 5*). The reason for that lies in its capability for seamless roundtrip engineering with executable models, contributing to stakeholder-driven dynamics and agile organizational development. Hence, we call the S-BPM life cycle 'open'.

4. Conclusion

To conclude, we summarize the results of chapter 3 and then present some selective concepts for further developing of S-BPM.

4.1. S-BPM contributions to meet current BPM challenges

In section 1.2, we explained the shortcomings of the traditional BPM, as well as the concepts to tackle them in order to move to a more contemporary BPM (*see Tab. 1*). In *Fig. 6*, we seize these remedy concepts and assign them to the major features S-BPM has to offer for implementing them [10]. The figure also depicts the most important benefits, which can arise from applying subject orientation.

4.2. Lines of further development

In the previous sections, we described S-BPM as a people-centric BPM concept, which fosters a high degree of organizational and semantic integration of

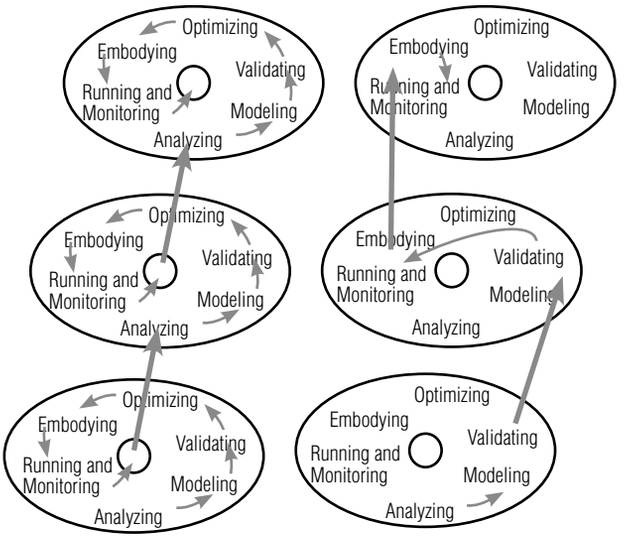


Fig. 5. Linear and non-linear S-BPM-based organizational development

stakeholders and life cycle responsiveness, all adding to increased agility of the organization. One of the reasons is that the simple S-BPM notation facilitates modeling interface types, such as those presented in Section 3.1 and discussed in more detail in [7], very well supporting the elicitation of process knowledge. However, these interfaces differ in learning effort for usage, possibility to further process the results and accessibility. For example, modeling software like Metasonic Build requires user training and buying licenses. In case users only model from time to time, this might be a disadvantage. Tangible interfaces in form of modeling tables or letter cases, like Metasonic Touch and Buildbook, are easy to use, and their results can easily be brought to execution. Their availability might be limited though, e.g. because of cost. Brown paper modeling is easy and the equipment needed is available in each office. The disadvantage here is that manual transformation is required to prepare the model for execution or later modification.

Considering these limitations, we were looking for a modeling interface that would be available in nearly any work place and allow using the models created with it for direct execution by an IT system. This led to the idea of using MS Excel for describing S-BPM models. It is available on nearly each office desk, besides, spreadsheet files have a well-defined structure, which can further be processed by workflow tools. Subject interaction and behavior can easily be described in S-BPM notation following simple rules. *Fig. 7* depicts the subject communication of the business trip example (compare with *Fig. 1*). The subjects are arranged in columns, and messages, in lines as combined cells, indicating direction beside their name and marking the receiver by higher/lower case.

In the subject behavior diagram, the columns contain behavior states of the three types (S=Send, R=Receive, I=Internal Function), while the combined cells in the rows serve to express the state transitions. The employee's

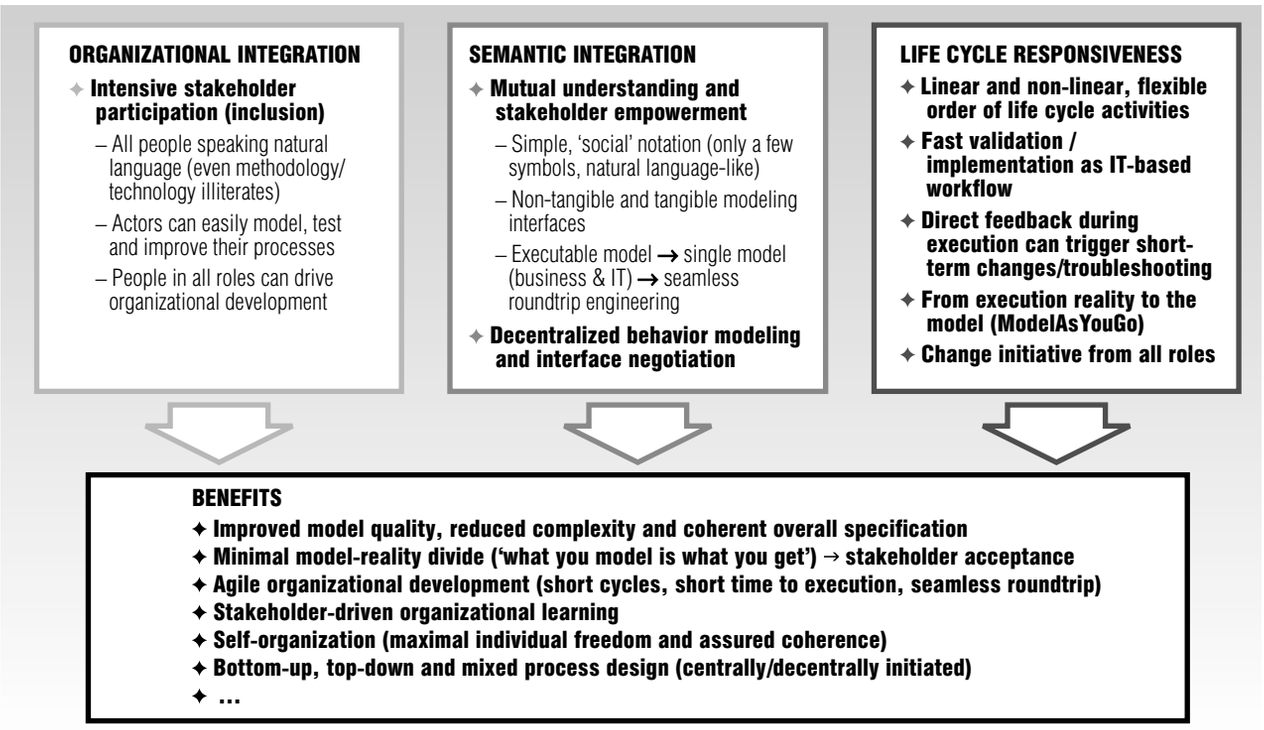


Fig. 6. S-BPM contributions to meet current BPM challenges

0	Employee		Manager		Travel agent
1	BT Resguest		>		
2	<		BT Approval		
3	<		BT Reject		
4				BT Resguest approved	>

Fig. 7. Subject interaction diagram defined with MS Excel

behavior is visible in *Fig. 8* (compare with *Fig. 2* left part).

The MS Excel tables describing a business process can be exported to files in the 'Comma-Separated Values (CSV)' format. For the employee behavior, this results can be seen in *Fig. 9*. The line numbers were included to directly refer to the rows in the table, we replaced the commas with semicolons as separators.

The CSV file contains all the information required for generating code for the subject-specific behavior. In order to allow comprehensive process specifications, the approach based on standard office tools needs to be extended. Further research should include concepts for input pool implementation and for incorporating the existing applications and data in form of business objects. The overall structure of the code for implementing a subject is given in *Fig. 10*.

Code generation out of the CSV format should consider emerging programming languages appropriate for cloud computing. The Akka framework in combination with Scala (http://akka.io/) is a promising candidate because it covers a lot of S-BPM aspects e.g., actors and asynchronous message exchange. First experiments with that environment led to promising results and will be continued. ■

```
;I;S;R;I;I;I
0;Fill in BT Request;Send BT Request
to manager;Receive Answer
from manager;Go on BT;End;End
1;Fill in BT Request done;>;;;;
2;;To manager: BT Request;>;;;
3;;;From Manager: Rejected;;;>
4;;;From Manager: Accepted;>;;
5;;;;Go on BT done;>;
;;;;;;
```

Fig. 9. CSV code of the subject behavior of 'Employee'

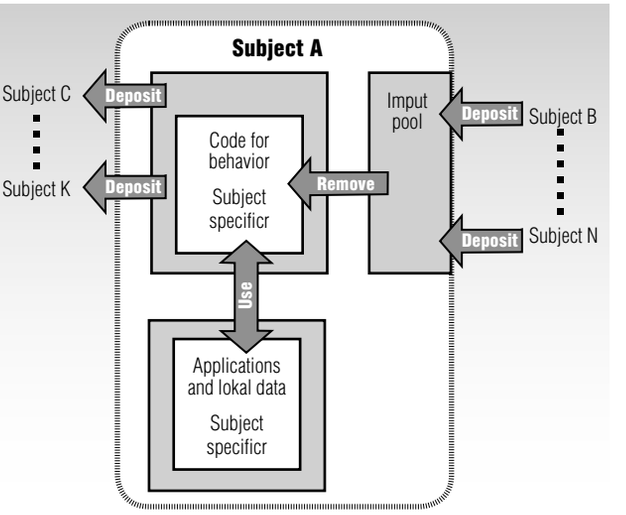


Fig. 10. Code structure for subjects

	I	S	R	I	I	I
0	Fill in BT Resguest	Send BT to Resguest manager	Receive Answer from manager	Go on BT	End	End
1	Fill in BT Resguest done	>				
2		To manager: BT Resguest	>			
3			To Manager: Rejected			>
4			To Manager: Accepted	>		
5				Go on BT done	>	

Fig. 8. Subject behavior diagram of the subject 'Employee' specified in MS Excel

References

1. Back A., von Krogh G., Seufert A., Enkel E. (eds) (2005) *Putting knowledge networks into action*, Berlin: Springer.
2. Bruno G., Dengler F., Jennings B. (2011) Key challenges for enabling agile BPM with social software. *Journal of Software Maintenance and Evolution: Research and Practice*, no. 23, pp. 297–326.
3. Erol S., Granitzer M., Happ S., Jantunen S., Jennings B., Johannesson P., et al (2010) Combining BPM and social software: Contradiction or chance? *Journal of Software Maintenance and Evolution: Research and Practice*, no. 22, pp. 449–476.
4. Fleischmann A., Schmidt W., Stary C. (2015) *S-BPM in the wild: Value creating practice in the field*, Berlin Heidelberg: Springer (in press).
5. Fleischmann A., Schmidt W., Stary C. (2014) Subject-oriented Business Process Management. *Handbook on Business Process Management*, 2nd edition (eds. J. vom Brocke, M.Rosemann), Berlin Heidelberg, Springer.
6. Fleischmann A., Schmidt W. (2014) Cognitive support for S-BPM user interfaces intertwining modeling and

execution, Proceedings of the *32nd European Conference on Cognitive Ergonomics (Vienna, Austria, September 01-03, 2014)*, New York: ACM.
7. Fleischmann A., Schmidt W., Stary C. (2014) Tangible or not tangible: A comparative study of interaction types for process modeling support. *Human-Computer Interaction, Part II (ed. M.Kurosu)*, HCII 2014, LNCS 8511, pp. 544–555.
8. Fleischmann A., Schmidt W., Stary C. (2013) Open S-BPM = Open innovation. Proceedings of the *5th International Conference S-BPM ONE 2013, Communications in Computer and Information Sciences (CCIS), Deggendorf, Germany, March 11-12, 2013 (eds. H.Fischer, J.Schneeberger)*, Berlin Heidelberg: Springer, pp. 295–320.
9. Fleischmann A., Kannengießer U., Schmidt W., Stary C. (2013) Subject-oriented modeling and execution of multi-agent business processes. Proceedings of the *2013 IEEE/WIC/ACM International Conferences on Web Intelligence (WI) and Intelligent Agent Technology (IAT) (Atlanta, US, November 17-20, 2013)*. IEEE Computer Society, pp. 138–145.
10. Fleischmann A., Schmidt W., Stary C. (2013) Subject-oriented BPM = Socially Executable BPM. Proceedings of the *15th IEEE Conference on Business Informatics (CBI 2013), Workshop on Social Business Process Management (SBM 2013) (Vienna, Austria, July 15-18, 2013)*. IEEE Computer Society, pp. 399–406.
11. Fleischmann A., Schmidt W., Stary C. (2012) A primer to subject-oriented business process modeling. Proceedings of *S-BPM ONE – Scientific Research: 4th International Conference S-BPM ONE 2012 (Vienna, Austria, April 4-5, 2012), Lecture Notes in Business Information Processing (LNBIP)*, no. 104, Berlin-Heidelberg: Springer, pp. 218–239.
12. Fleischmann A., Schmidt W., Stary C., Obermeier S., Börger E. (2012) *Subject-oriented Business Process Management*. Berlin-Heidelberg, Springer.
13. Fleischmann C. (2013) *Subject-oriented process survey: An approach and modeling tool for executing subject-oriented process surveys*, Diploma thesis, Vienna: Vienna University of Technology.
14. Gall N. (2012) Social BPM. *Hype cycle for Business Process Management* (ed. J.Dixon), Gartner Inc., pp. 27–29.
15. Gottanka R., Meyer N. (2012) ModelAsYouGo: (Re-) design of S-BPM process models during execution time. *S-BPM ONE 2012, LNBIP*, vol. 104 (ed. C.Stary), Berlin: Springer, pp. 91–105.
16. Konjack G. (2010) Case study: AST order control processing. S-BPM ONE – Setting the stage for Subj*ect Oriented Process Management, CICS*, vol. 85 (eds. H.Buchwald et al), Heidelberg: Springer Verlag, pp. 115–120.
17. Lawall A., Schaller T., Reichelt D. (2013) Integration of dynamic role resolution within the S-BPM approach. *S-BPM ONE - 2013, CCIS*, vol. 360 (eds. H.Fischer, J.Schneeberger), Heidelberg: Springer Verlag, pp. 21–33.
18. Lerchner H., Stary C. (2014) An open S-BPM runtime environment based on abstract state machines. Proceedings of the *16th IEEE Conference on Business Informatics (CBI 2014, Geneva, Switzerland, July 14-17, 2014)*. IEEE Computer Society, pp. 54–61.
19. Nakamura S. et al (2011) CGAA/EES at NEC Corporation, powered by S-BPM: The subject-oriented BPM development technique using top-down approach. *S-BPM ONE – Learning by Doing - Doing by Learning, CCIS*, vol. 213 (ed. W.Schmidt), Heidelberg: Springer Verlag, pp. 91–105.
20. Oppl S. (2011) Subject-oriented elicitation of distributed business process knowledge. *S-BPM ONE 2011, CCIS*, vol. 213 (ed. W.Schmidt), Berlin: Springer, pp. 16–33.
21. Schmidt R., Nurcan S. (2009) BPM and social software. *BPM 2008 International Workshops, LNBIP*, vol. 17 (eds. D.Ardagna, M.Mecella, et al), Berlin: Springer, pp. 649–658.
22. Schmidt W. (2013) Business activity monitoring. *Business Intelligence and Performance Management: Theory, systems and industrial applications* (eds. P.Rausch, A.Sheta, A.Ayesh), Springer UK, pp. 229–242.
23. Schmidt W., Fleischmann A. (2013) Business process monitoring with S-BPM. Proceedings of the *5th International Conference S-BPM ONE 2013, Communications in Computer and Information Sciences (CCIS)*, vol. 360 (eds. H.Fischer, J.Schneeberger), Berlin Heidelberg: Springer, pp. 274-291.
24. Schönthaler F., Vossen G., Oberweis A., Karle T. (2012) *Business processes for communities*, Berlin: Springer.
25. Sinur J. (2010) *Design by doing: An extension to BPM behavior*. Available at: http://blogs.gartner.com/jim_sinur/2010/05/02/design-by-doing-an-extension-to-bpm-behavior/ (accessed 15 January 2015).
26. Swenson K. (2010) The quantum organization: How social technology will displace the Newtonian view. *Social BPM* (ed. L.Fischer), Lighthouse Point: Future Strategies Inc., pp. 19–34.
27. Walke T. et al (2013) Case Study @ Swisscom (Schweiz) AG: iPhone 5 Self-Service Order App and Process-Workflows. *S-BPM ONE – 2013, CCIS*, vol. 360 (eds. H.Fischer, J.Schneeberger), Heidelberg: Springer Verlag, pp. 264–273.
28. Weber J. Schmidt W., Weber P. (2012) Using social network analysis and derivatives to develop the S-BPM approach and community of practice. Proceedings of *S-BPM ONE – Scientific Research: 4th International Conference S-BPM ONE 2012 (Vienna, Austria, April 4-5, 2012)*, Lecture Notes in Business Information Processing (LNBIP), no. 104 (ed. C.Stary). Berlin Heidelberg: Springer, pp. 205–217.
29. Zehbold C., Schmidt W., Fleischmann A. (2013) Activity-based costing for S-BPM. Proceedings of the *5th International Conference S-BPM ONE 2013, Communications in Computer and Information Sciences (CCIS)*, no. 360 (eds. H.Fischer, J.Schneeberger), Berlin Heidelberg: Springer, pp. 166-177.

S-BPM КАК НОВЫЙ ИМПУЛЬС В УПРАВЛЕНИИ БИЗНЕС-ПРОЦЕССАМИ: ОБЗОР

А. ФЛЯЙШМАН
Owner, Interaktiv Unternehmensberatung
Адрес: Burgfriedenstraße,
Адрес: Pfaffenhofen, 85276, Germany
E-mail: albert.fleischmann@interaktiv.expert

В. ШМИДТ
Professor for Business Informatics, Technische Hochschule Ingolstadt, Business School
Адрес: 10, Esplanade, Ingolstadt, 85049, Germany
E-mail: werner.schmidt@thi.de

Субъектно-ориентированное управление бизнес-процессами (S-BPM) представляет собой достаточно новый подход к работе с различными бизнес-процессами в организациях, от анализа до их реализации, с использованием информационных технологий. Данный подход сфокусирован на действующих субъектах в процессах (человек, программное обеспечение, роботы и др.) и их действиях для достижения цели, поставленной перед процессом. Ориентация на различных стейкхолдеров и коммуникации делает данный подход более предпочтительным по сравнению с традиционными средствми управления бизнес-процессами. Это объясняется отсутствием различий между реальными процессами и их представлениями (разделения между моделью и реальностью), возможностями улучшений на основе предложений сотрудников компаний (отсутствием «потерянных инноваций»), а также относительно быстрой адаптацией организации и ее ИТ-инфраструктуры к изменяющимся требованиям.

С учетом простоты понимания и использования описательного подхода на основе схемы естественного языка «субъект-предикат-объект», S-BPM использует семантическую и организационную интеграцию людей при описании и проектировании бизнес-процессов. С другой стороны, понятная формализованная семантическая модель на фоне графического представления позволяет организовать автоматическое создание программного кода для выполнения потока рабочих процессов «на лету». Таким образом, стейкхолдеры могут сразу тестировать создаваемые модели, а затем итерационно их улучшать, дорабатывая до полной, по их мнению, готовности к выполнению и запуску на компьютере. Это ведет к реализации двустороннего подхода к проектированию, понятного для обеих сторон – бизнеса и специалистов в области информационных технологий, что значительно улучшает организационную составляющую и адаптивность подхода.

В статье представлены основные свойства и характеристики подхода S-BPM и рассматриваются особенности его влияния на жизненный цикл управления бизнес-процессами, с учетом повышения степени участия различных стейкхолдеров в моделировании и оптимизации бизнес-процессов.

Ключевые слова: быстрота, моделирование процессов, выполнение процессов, жизненный цикл бизнес-процессов, субъектно-ориентированное управление бизнес-процессами, субъектно-ориентированность.

Цитирование: Fleischmann A., Schmidt W. S-BPM as a new impetus in Business Process Management: A survey // Business Informatics. 2015. No. 2 (32). P. 7–19.

Литература

1. Back A., von Krogh G., Seufert A., Enkel E. (eds) Putting knowledge networks into action, Berlin: Springer, 2005.
2. Bruno G., Dengler F., Jennings B. Key challenges for enabling agile BPM with social software // Journal of Software Maintenance and Evolution: Research and Practice. 2011. No. 23. P. 297–326.
3. Erol S., Granitzer M., Happ S., Jantunen S., Jennings B., Johannesson P., et al. Combining BPM and social software: Contradiction or chance? // Journal of Software Maintenance and Evolution: Research and Practice. 2010. No. 22. P. 449–476.

4. Fleischmann A., Schmidt W., Stary C. S-BPM in the wild: Value creating practice in the field. Berlin Heidelberg: Springer, 2015 (in press).
5. Fleischmann A., Schmidt W., Stary C. Subject-oriented Business Process Management // Handbook on Business Process Management, 2nd edition / Eds. J. vom Brocke, M.Rosemann. Berlin Heidelberg, Springer, 2014.
6. Fleischmann A., Schmidt W. Cognitive support for S-BPM user interfaces intertwining modeling and execution // Proceedings of the 32nd European Conference on Cognitive Ergonomics (Vienna, Austria, September 01-03, 2014). New York: ACM, 2014.
7. Fleischmann A., Schmidt W., Stary C. Tangible or not tangible: A comparative study of interaction types for process modeling support // Human-Computer Interaction, Part II / Ed. M.Kurosu. HCII 2014, LNCS 8511. 2014. P. 544–555.
8. Fleischmann A., Schmidt W., Stary C. Open S-BPM = Open innovation // Proceedings of the 5th International Conference S-BPM ONE 2013, Communications in Computer and Information Sciences (CCIS), Deggendorf, Germany, March 11-12, 2013 / Eds. H.Fischer, J.Schneeberger. Berlin Heidelberg: Springer, 2013. P. 295–320.
9. Fleischmann A., Kannengießer U., Schmidt W., Stary C. Subject-oriented modeling and execution of multi-agent business processes // Proceedings of the 2013 IEEE/WIC/ACM International Conferences on Web Intelligence (WI) and Intelligent Agent Technology (IAT) (Atlanta, US, November 17-20, 2013). IEEE Computer Society, 2013. P. 138–145.
10. Fleischmann A., Schmidt W., Stary C. Subject-oriented BPM = Socially Executable BPM // Proceedings of the 15th IEEE Conference on Business Informatics (CBI 2013), Workshop on Social Business Process Management (SBM 2013) (Vienna, Austria, July 15-18, 2013). IEEE Computer Society, 2013. P. 399–406.
11. Fleischmann A., Schmidt W., Stary C. A primer to subject-oriented business process modeling // Proceedings of S-BPM ONE – Scientific Research: 4th International Conference S-BPM ONE 2012 (Vienna, Austria, April 4-5, 2012), Lecture Notes in Business Information Processing (LNBIP). 2012. No. 104. P. 218–239.
12. Fleischmann A., Schmidt W., Stary C., Obermeier S., Börger E. Subject-oriented Business Process Management. Berlin-Heidelberg, Springer, 2012.
13. Fleischmann C. Subject-oriented process survey: An approach and modeling tool for executing subject-oriented process surveys / Diploma thesis. Vienna: Vienna University of Technology, 2013.
14. Gall N. Social BPM // Hype cycle for Business Process Management / Ed. J.Dixon. Gartner Inc., 2012. P. 27–29.
15. Gottanka R., Meyer N. ModelAsYouGo: (Re-) design of S-BPM process models during execution time // S-BPM ONE 2012, LNBIP. 2012. Vol. 104. P. 91–105.
16. Konjack G. Case study: AST order control processing // S-BPM ONE – Setting the stage for Subject Oriented Process Management, CICS. 2010. Vol. 85. P. 115–120.
17. Lawall A., Schaller T., Reichelt D. Integration of dynamic role resolution within the S-BPM approach // S-BPM ONE - 2013, CCIS. 2013. Vol. 360. P. 21–33.
18. Lerchner H., Stary C. An open S-BPM runtime environment based on abstract state machines // Proceedings of the 16th IEEE Conference on Business Informatics (CBI 2014, Geneva, Switzerland, July 14-17, 2014). IEEE Computer Society, 2014. P. 54–61.
19. Nakamura S. et al. CGAA/EES at NEC Corporation, powered by S-BPM: The subject-oriented BPM development technique using top-down approach // S-BPM ONE – Learning by Doing - Doing by Learning, CCIS. 2011. Vol. 213. P. 91–105.
20. Oppl S. Subject-oriented elicitation of distributed business process knowledge // S-BPM ONE 2011, CCIS. 2011. Vol. 213. P. 16–33.
21. Schmidt R., Nurcan S. BPM and social software // BPM 2008 International Workshops, LNBIP. 2009. Vol. 17. P. 649–658.
22. Schmidt W. Business activity monitoring. Business Intelligence and Performance Management: Theory, systems and industrial applications / Eds. P.Rausch, A.Sheta, A.Ayesh. Springer UK, 2013. P. 229–242.
23. Schmidt W., Fleischmann A. Business process monitoring with S-BPM // Proceedings of the 5th International Conference S-BPM ONE 2013, Communications in Computer and Information Sciences (CCIS). 2013. Vol. 360. P. 274-291.
24. Schönthaler F., Vossen G., Oberweis A., Karle T. Business processes for communities. Berlin: Springer, 2012.
25. Sinur J. Design by doing: An extension to BPM behavior [Электронный ресурс]: http://blogs.gartner.com/jim_sinur/2010/05/02/design-by-doing-an-extension-to-bpm-behavior/ (дата обращения 15.01.2015).
26. Swenson K. The quantum organization: How social technology will displace the Newtonian view // Social BPM / Ed. L.Fischer. Lighthouse Point: Future Strategies Inc., 2010. P. 19–34.
27. Walke T. et al. Case Study @ Swisscom (Schweiz) AG: iPhone 5 Self-Service Order App and Process-Workflows // S-BPM ONE – 2013, CCIS. 2013. Vol. 360. P. 264–273.
28. Weber J. Schmidt W., Weber P. Using social network analysis and derivatives to develop the S-BPM approach and community of practice // Proceedings of S-BPM ONE – Scientific Research: 4th International Conference S-BPM ONE 2012 (Vienna, Austria, April 4-5, 2012). Lecture Notes in Business Information Processing (LNBIP). 2012. No. 104. P. 205–217.
29. Zehbold C., Schmidt W., Fleischmann A. Activity-based costing for S-BPM // Proceedings of the 5th International Conference S-BPM ONE 2013, Communications in Computer and Information Sciences (CCIS). 2013. No. 360. P. 166-177.