Semantic Work Process Analysis – A Reflexive Stakeholder Articulation Approach

Christian Stary

University of Linz

Institut für Wirtschaftsinformatik

Communications Engineering

Science Park 3, Altenberger Straße 69

A 4040 Linz, Austria

Christian.Stary@JKU.AT

ABSTRACT

Developers still frequently fail to meet stakeholder needs due to the lack of human-centred work representations. The resulting lack of understanding among technology providers, responsible authorities, management, and staff requires revisiting work process representations. Semantic work analysis based on Concept Mapping and Value Networks Analysis helps eliciting, elaborating, reflecting, and developing essential elements of a currently perceived towards an envisioned work structure. Rather than referring to other stakeholders it pinpoints individual potential in terms of generated services or products. They are assessed as additional tangible or intangible input to other process participants.

Author Keywords

Semantic process modelling; work knowledge; articulation; notation; representation; value networks; concept mapping.

ACM Classification Keywords

K.6.1. [Project and People Management]

General Terms

Human Factors; Design

INTRODUCTION

Today's organizations increasingly require capabilities to integrate, build and reconfigure internal and external competencies dynamically [16], ensuring high performance based on organizational agility [31, 61]. Technology seems to be pertinent for managing change in work environments, as traditional applications in Business Process Management (BPM) [15, 28], and other IT-affine approaches [30, 37, 44, 48] continuously reveal. However, neither the adoption of IT systems, nor the design of work environments is a straightforward task [20, 29].

In-depth studies to that respect refer to the social context of IT adoption and use, and thus to stakeholders, such as stated by Korpelainen et al. [33] recently: 'The results show that most of the problems were identified in the social context and only one fifth of the problems were related to the employees' experiences of a lack

of skills and competencies in using the IT-systems.' Some of the identified issues have already been addressed in the context of Business Process Re-Engineering by Hammer [23, 24] revisiting the original concept of Hammer et al. [25]. Still, as Ding et al. [14] found out, the overall effect of knowledge flows on business performance remains quite controversial, thus requiring rethinking current forms of propagating work (process) knowledge to IT system development [20].

Methodologically, most studies on intertwining organizational and technical system design focus on the adoption of IT systems [1] rather than on organizational design involving human-centred work models and semantic process analysis [45]. Nevertheless, with the advent of business process modelling notations, in particular integrative ones, such as BPMN (www.bpmn.org), the role of languages and notations for understanding and modelling work processes have become prominent. Moreover, once work activities move to the centre of concern roles and actors play a crucial role, either in analysis, modelling, or implementation [28].

A stakeholder-centred approach to process management requires capturing human experience and ideas for organizing work through semantic modelling for a variety of users. In particular, work processes and thus process models being continuously changed, stakeholders should spend minimal effort on notational issues [19, 29, 64]. Effective and efficient support to change management based on work process models requires coordinated activities, executable in a straightforward way by the involved stakeholders [53].

In BPM, analysing work processes means decomposing them into several parts according to their context and rationale [cf. 50]. For modelling, a self-contained set of elements is used to abstract from the observed reality. Work or business process models traditionally capture humans or machines as actors, performance in terms of activities (tasks, functions), objects manipulated along processes, and tools supporting the accomplishment of tasks (e.g., IT systems), in order to achieve valued results. Following the BPM life cycle, once a model has been validated, it can be embedded in its organizational and IT context. Monitoring enables control and further development, including simulation [19]. Hence, models play a crucial role, not only for the initial design of work processes, e.g., implementing a business strategy, but rather when transforming organizations [43, 44]. Models as representational anchor serve as baseline of all the above mentioned activity bundles, in particular taking into account their execution for operation support [cf. 3].

Once stakeholders should drive the process of modelling and change, the semantic distance to the notation they use needs to be minimal, as recent developments of semi-structured languages for

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from Permissions@acm.org.

ECCE '13, August 26 - 28 2013, Toulouse, France

Copyright 2013 ACM 978-1-4503-2251-5/13/08...\$15.00.

<http://dx.doi.org/10.1145/2501907.2501936>

work descriptions reveal [cf. 45]. Hence, in this paper such an approach is taken not only for describing the organization of work through semantic process models, but also for analysis, i.e., developing change proposals, based on perceived interaction patterns between stakeholders. The modelling and change process itself remains traceable all the time, ranging from eliciting work knowledge to negotiating change proposals with other stakeholders.

Utilizing this approach supports concerned stakeholders in developing their specific modelling language and keeping their model as point of reference for process optimization. Moreover, the approach focuses on individually recognized change capacities rather than stating problems. The latter refer to creating results of higher value that could directly be utilized by other stakeholders. They are shared before establishing a novel work practice.

The next section starts with detailing the nature of process analysis and the involvement of stakeholders in this phase of BPM. The next section reviews the state of the art with respect to emergent semantics when analysing work models. The subsequent section introduces the empirical approach and exemplifies transforming a medical expert organization unit in a hospital. The final section concludes the paper with discussing the impact of the achievements and future research activities.

WORK PROCESS MODELING AND ANALYSIS

Work processes are identified by their contribution to the value chain of an organization [60]. They involve stakeholders in responsible and operative positions. In the following we elaborate on the content and the procedure of work process modelling and analysis.

Representing Work

In strategic process management, as well as in controlling and monitoring running business processes, modelling principles and conventions (cf. GoM [6]) traditionally set the stage for representing work knowledge. As notational specification often comprises 100 and more pages, they may neither be understood nor accepted by stakeholders [cf. 64]. Such an approach easily conflicts with the above mentioned requirement concerning modelling notations. They should serve as a straightforward means for communication and sharing work knowledge rather than require technical mastery.

The organizational aspect of work should be considered primarily from work profiles of stakeholders in the operational business, and the roles that need to be supported by information technology. Analysis is an overarching process which needs to involve a large part of the organization, as it denotes a purposeful representation of relevant process information in preparation for transforming an organization [cf. 60].

Analysis may start with particular elements, e.g., with actor abstractions in S-BPM [18], or functions in ARIS [50]. Of particular importance are mutual relationships as constitutive element, as effective relationships form a major part of analysis. The acquisition of work-relevant knowledge might include leveraging tacit or implicit knowledge [38]. Explicit knowledge is already documented information whereas tacit knowledge is not available in documented form so far. It resides with people, and can be elicited to drive change processes and explain the rationale of behaviours or processes [2, 59].

In the course of analysis performance-relevant processes are put into mutual context. Traditionally, when the dynamic view of an

organization is the focus, tasks rather than roles are put to the centre of interest [60]. The essential question is how functional units need to collaborate to accomplish work task objectives. The focus is on the 'end-to-end collection of activities that collectively create value for a customer or end user' [34, p.81ff] rather than on stakeholders and their collaboration.

Top-Down or Bottom-Up?

In traditional process analysis basically two approaches can be followed, top-down and bottom-up: The top-down approach puts the corporate strategy and vision of an organization to the centre. Processes at the top level, such as customer service routines, are progressively detailed and structured. Process analysis is correspondingly understood as a stepwise refinement of the processes of a coarse representation to a more detailed description level [cf. 21].

As different stakeholders will approach even top-down modelling in a different way, the bottom-up approach allows stakeholders constructing processes starting in their role and with those actions they actually perform. When role-specific actions are mutually linked in case of collaboration, process models emerge and can be abstracted on various levels [18].

Such models can also be analyzed top-down, both from a role-, and a task-specific perspective, with no need of decoupling originally created stakeholder representations - participative organizational learning is triggered, once individual perspectives can be communicated effectively. Interactive management of change can be based on stakeholder behaviour specifications [53].

EMERGENT SEMANTICS AND PROCESS ANALYSIS

After detailing modelling and identifying functions or stakeholders as points of reference, we discuss how to overcome limitations of prescriptive representation schemes for the sake of immediate stakeholder articulation.

Towards Open Semantic Articulation Spaces

Most of the modelling approaches for knowledge work provide a notation, which might be more or less oriented towards execution, such as CommonKADS [51] focusing on representation and analysis, and FRODO [3] interleaving modelling and execution of knowledge-intense processes. Emergent Semantics approaches allow dynamic development of semantic process representations. For instance, Cohn et al. [10] use (business) artefacts combining data and process as basic building blocks of modelling. Artefacts are key business entities (business-relevant objects) evolving when passing through a business's operation. They can be created, modified, and stored.

As a result business operations can be decomposed along various levels of abstraction. Artefacts are typed using both an information model for data about the business objects during their lifetime, and a lifecycle model, describing the possible ways and timings that tasks can be invoked on these objects.

As an artefact could be a knowledge claim, its information model could include attributes, such as claimID, originator, elaboration time, duration of validity, and operating information. Consequently, the lifecycle model could include multiple ways for handling the knowledge claim. Artefacts define a useful way to understand and track operations, such as the stations that a claim has passed through, typically being of relevance for involved stakeholders. The information model's attributes contain descriptive elements along the life cycle time of the artefact.

In Cohn et al.'s approach artefact instances can be generated in state-based way, as instances interact through message passing as they transition between states. The artefact-based business operation model is thus being termed actionable. Specifications can be used to automatically generate an executable system based on various, accumulated kinds of data corresponding to the stages in a business entity's lifecycle. Clustering data based on a dynamic entity that moves through a business's operations is in contrast to decomposing business entities, as it avoids isolated data manipulations.

Moreover, it facilitates the use of representations, as the authors state 'it enables strong communication between a business's stakeholders in ways that traditional approaches do not. Experience has shown that once the key artefacts are identified, even at a preliminary level, they become the basis of a stakeholder vocabulary. Artefacts enable communication along three dimensions' [10]:

- *Lifecycle dimension*, as 'stakeholders who focus on one part of a lifecycle are better equipped to communicate with stakeholders focused on another part. All are talking about the same overall artefact and can confidently discuss attributes that are shared or produced in one part of the lifecycle and consumed in another' (*ibid.*).
- *Variations dimension*, as 'stakeholders from multiple geographies could understand similarities and differences between their respective operations by comparing them to the commonly held artefact model' (*ibid.*).
- *Management dimension*: 'Communication between stakeholders at different management levels is enhanced because the artefact approach naturally lends itself to a hierarchical perspective' (*ibid.*).

Hence, we can conclude that evolving elements are of benefit for developing a stakeholder-oriented modelling and analysis approach.

Learnings from Semantic BPM

SBPM (Semantic Business Process Management) also relies on ontological concepts in order to capture process-relevant items, however targeting automated processing and reasoning [9, 13, 26]. While striving for consistency by relying on a common terminology, 'the main challenge here lays in the availability and existence of the common domain description that would be accepted by the process participants. Not only obtaining process participants' acceptance to use the proposed ontology constitutes a problem, but also development of domain ontologies that would be a specialization of already delivered solutions is a challenging and time consuming task.' [17]

In a first phase in SBPM a business analyst models a business process. As a result of this phase semantically annotated business process models exist. They should not only capture explicitly the functionality of tasks and decisions in the process flow, but also actors, roles, resources that are involved in the process. This process content is revisited in terms of not only accurate modelling, but also in terms of additional functionalities taking advantage of the ontological process descriptions for matching

business criteria or checking compliance. Although such a procedure allows embodying existing knowledge automatically, it requires collective reflection for semantic process analysis.

REFLEXIVE STAKEHOLDER ARTICULATION

So far, both inputs to reflexive stakeholder articulation for semantic process analysis have been discussed separately, namely engaging stakeholders to participate with their body of work knowledge in process modelling and analysis, and opening representation spaces for stakeholder-specific notations. In this section we integrate those findings both, from a methodological, and empirical perspective. The introduced design allows combining top-down and bottom-up analysis, taking into account the above listed findings on stakeholder participation, intelligibility of models and the modelling process itself. We first give some procedural and field-study domain background before exemplifying the semi-structured approach to semantic work process analysis.

Design

The approach can be classified as a qualitative study [36] with elements from phenomenological and case study designs. It allows on one hand focusing on individuals' experiences concerning a phenomenon, e.g., how knowledge workers experience a work situation such as a treatment planning procedure, and on the other hand, sharing their interpretations of these experiences. A facilitator helps analysing the data brought up thematically [7] within the given work context, reflecting with the group of participants what has been brought up, and thus, clarifying the meaning of the data for the group [46]. The latter frames the phenomenon (case) being studied [62].

Hence, the approach's intention is to ensure traceability of the process through timely and accurate codification of work knowledge: 'Relying on experience accumulation, however, according to Zollo and Winter [63] is not the most effective way to build up a dynamic capability. Rather they suggest that knowledge articulation is a more effective mechanism for doing this. Knowledge articulation is defined as the 'deliberate process through which individuals and groups Figure out what works and what doesn't in the execution of an organizational task' [56, p.341].

Knowledge articulation thus occurs when teams make a cognitive effort to enhance their understanding of the causal links between actions and outcomes through collective reflection. Moreover, the final, and highest level, mechanism to develop a dynamic capability is knowledge codification - 'Knowledge codification is a step beyond knowledge articulation' [56, p.342], allowing the knowledge to be accessed and used by others sometime in the future and not dependent on personal networking [56]. Consequently, the approach includes role-specific documentation, at least for explicit articulation work [55].

To test the ideas a field study has been performed in a health care institution, involving various medical experts stemming from different disciplines, according to the patient treatment requirements. Essentially, the analysis did not start with predefined notational elements to represent work elements, having in mind executable process representations [4]. It rather targeted at the capability of the involved stakeholders to express knowledge according to their individual perception of their functional role relevant for patient treatment planning. A facilitator guided the process by focusing on the analysis of provided data reflecting the meaning of the data brought up (cf.

content analysis approach by Sonpar et al. [52]), in order to justify the results of the common sessions on the current organization of work tasks [49].

Such an approach can be considered more beneficial than developer interventions (using certain notations and prescribing rigid process steps) [8], as it allows more coherent development processes for individuals and organizations [cf. 11]. Bardram et al. [5] have shown in the context of hospital planning support that articulation of stakeholders allows resolving inconsistencies in work procedure, as they are committed to ‘get the job done’, even when negotiations between the involved parties are required. Articulation in this way includes how tasks are identified, assigned and coordinated [22]. It has been applied in several domains, such as engineering [54], revealing high engagement of stakeholders.

Starting out with Concept Mapping

After agreeing on the goal of process analysis, namely to align their treatment planning procedure

- minimizing the involvement of patients while minimizing the waiting period for treatment,

The stakeholders were asked to construct a concept map showing their underlying work processes. Concept maps facilitate developing representations of a domain, situation or procedure [39]. They have been used to guide analytic developments [57] and to capture content in its systemic context [58]. The participants start by 2D-drawing or placing 3D-nodes (concepts, meaningful items) and adjunct relationships on a virtual or physical surface. In the field study a tabletop approach has been used [40, 41]. Its essential benefits are the support of

- human perceptual and interactional capabilities, and
- interpersonal communication and collaboration [27].

Each step can be negotiated to reach group consensus, according to the mapping procedure proposed by Kolb et al. [32], after selecting and preparing the participants (doctors, nurses, administration staff):

- generation of statements (concepts) that deal with the topic matter
- structuration of generated statements while positioning items on a concept map
- interpretation of maps

As the participants of the radio-oncological hospital unit have only agreed on the major topic of analysis, namely increasing the quality of patient care in the course of treatment planning it has not been clear which process information they would come up with. They came up with an overview of roles involved in patient treatment planning. The latter represent the nodes of the concept map, also termed concepts, and are visualized as red rectangles in Figure 1. The roles refer to doctor functions, e.g., case manager, and experts, e.g., LINAC system specialist.

In this way the process participants define their individual modelling notation. They continued with representing a functional unit, placing a blue half circle on the table representing the Stereotaxie group. It comprises several roles involving several functional units, namely out-patient department and LINAC specialists. Overall the participants started with concrete and

aggregate structure elements required for patient treatment planning.

Figure 1. Start map

The relationships the participants set were either ‘part-of’ ones, e.g., out-patient department is part of the Stereotaxie group, or addressing the exchange of patient data (‘mutual communication’), the latter being central to coherent and consistent planning. In this way, process knowledge evolves.

The facilitator asked whether the concept map represented all relevant elements of the organization before proceeding. Then, the participants enriched the map with auxiliary and enabling actors/work groups, such as the secretary and device management group (yellow hexagons) in Figure 2.

Figure 2. Completing the relevant part of the organization

The pattern in Figure 2 reveals the entire scope of patient treatment planning. Again, structural elements and relationships of both types, structure-, and behaviour-relevant ones, have been set. After scoping the group decided to pick out major actors, such as the out-patient department and detail the relevant process parts for patient treatment planning. Figure 3 shows the major steps in the middle row (red rectangles) enriched with stakeholder-

Focusing on major actors – the refinement starts:

Figure 3 reveals several categories of elements the group used to detail the patient treatment planning procedure thus constituting what could be termed a User Semantic Work Process Notation:

- Both, elements and relationships are required for task accomplishment: Structural elements, such as functions, are the prerequisite to set temporal relationships, and further associations, such as responsibilities related to roles. The participants specified several flows, namely the function flow, and the ‘responsibility’ flow. This distinction allows separating information from function flows, as traditionally done in function-oriented modelling approaches, such as ARIS [50].

Who supports whom along the task chain?

Identifying and linking key enablers

In summary, semantic process analysis with evolving model elements has been performed along several steps:

- In each of the steps both, structure, and behaviour relationships were of crucial importance. They have been considered relevant between all categories of structure elements, such as key enablers and functional tasks.

So far, the perceived exchange of information between stakeholders has been indicated in a general way – the yellow hexagons have been mutually related indicating required communication and flow of responsibility among the actors in their respective roles. For effective change management they need to be detailed. The facilitator suggested Impact and Value Exchange Analysis as part of the Value Network Analysis [2] to deal with the details from both perspectives, incoming and outgoing information for each involved role in the process.

The participants agreed and started with the Impact Analysis (incoming perspective) – see table 1 exemplified for the case manager being responsible for guiding a patient along the treatment planning process. The analysis of incoming information (deliverables) focuses on the situation as it has been perceived by the participants and aims towards identifying the individually perceived value for each received input from another stakeholder. The participants switched from the tabletop system to paper for detailing their findings. Figure 5 shows the deliverables in both directions involving the case manager: Existing tangible (role-conform) deliverables are black lines, intangible ones (deliverables that are provided voluntarily ensuring smooth planning and high-quality patient care) are dotted black lines

Table 2: Value Creation Analysis for Case Manager

Case Manager		Which intention is conveyed when providing this output?	Which activities could increase the value of this output?			
Output (sender)	Output receiver	Value added of activity	Improvement	Effort	Risk	Benefit
Response	Org.-RT	Confidence	Background info	Low	Low	High, highly informed treatment planning
Treatment plan	Org.-RT	Required to proceed	Context annotations	Low, simply addition	Low	High, more context available
Questions	Out-patient department	Clarification of case	Transparent availability	Low	Low	High
Acknowledgement	Planning staff	Enabling next step in treatment procedure	Planning staff sends proposal to CM and vice versa	Low, only additional receiver of information	Low, could be provided anyway	High, safe procedure
Patient information	CT-RT's	Informed patient handling	Just-in-time delivery	High, when peak	Low	High, higher efficiency

These findings served as input to the Value Creation Analysis. Here, each participant started to add relationships for process improvement – see red exchange relationships in Figure 5 representing envisioned ones. In most of the cases additional information about the case has been proposed to be exchanged between actors. The additional relations also need to be detailed, namely in terms of outgoing deliverables. Value Network Analysis enforces reflecting the potential of individually produced deliverables rather than waiting for others to provide additional inputs to the own workspace.

Table 2 shows the analysis table for the case manager. Here the individual outputs are detailed as they are perceived ('what intention is conveyed when providing this output?') and how they could be enforced in the future ('which activities could increase the value of this output?'). The latter are rated according to the effort to be spent, the risk when enforcing it, and the benefit of implementing it on the organizational level. It is this table where individual stakeholders provide indicators what could be changed on the basis of their role-specific work force in a certain interaction context. Each proposal for change only relies on individual capabilities and commitment, thus making this approach highly reflexive.

The envisioned future organization of work is complete once for each role/actor the incoming and outgoing relationships have been analyzed and undergone a shared review process. In this way, each participant could articulate his/her experience and share change proposals influencing his/her own behaviour.

CONCLUSIONS

The evolution of semantic systems and the growing capabilities of technology infrastructures enable the development of context-aware work environments. The field of Business Process Management, in particular with respect to modelling work procedures, plays a crucial role for mapping stakeholder needs to

system features in volatile and knowledge-intense settings.

Although organizational design can be discussed on an implementation-independent level when modelling business processes, developers still need to rely on the semantic expressiveness of modelling notations when trying to meet stakeholder needs at their work place. Becoming aware of the limitations of existing approaches to process analysis we followed an evolutionary and participatory approach to modelling and sharing models for transforming work.

Methodologically, the approach to semantic work analysis is based on Concept Mapping and Value Networks, as they structure the representation and elaboration of the current and envisioned work structure and task-related behaviour without prescribing a notation. The major benefit of the proposed analysis approach is its ability to take into account various perspectives on task accomplishment. It allows actors involved in (knowledge-intense) work procedures to structure knowledge for sharing and subsequent negotiations on organizing work in an alternative way.

The obtained results provide inputs for future methodological developments in participatory change management based on meaningful models. With respect to articulation, structured creativity techniques, such as the '6 Thinking Hats' [12] will be explored. Hereby, each stakeholder has to take six different perspectives on a selected issue. Such techniques enlarge limited views, and in this way, are likely to lead to a variety of stakeholder-oriented change indications.

ACKNOWLEDGMENTS

The author gratefully appreciates the hospital staff's willingness and the organization development team's kindness of the health care provider to participate in the case study and to support the research.

REFERENCES

- Adams, B., Berner, E.S., Wyatt, J.R. Best practice. Applying strategies to overcome user resistance in a group of clinical managers to a business software application: a case study, in: *Journal of Organizational and End User Computing*, 16 (4), 2004, 55–64
- Allee, V. (2002) *The Future of Knowledge - Increasing Prosperity Through Value Networks*, Butterworth Heinemann, New York
- Aschoff F.-R., Bernardi, A. Schwarz, S. Weakly-structured workflows for knowledge-intensive tasks: an experimental evaluation, in: *Proceedings International Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises (WETICE'03)*, IEEE, 2003, 340 – 345
- Augl, M. Building a conceptual roadmap for systemic change—a novel approach to change management in expert organizations in health care, in: *Proceedings S-BPM ONE—Scientific Research, LNBIP Vol. 104*, Springer, Berlin, 2012, 43-61
- Bardram, J. E., Hansen, T. R. Why the plan doesn't hold: a study of situated planning, articulation and coordination work in a surgical ward, in: *Proceedings Conference on Computer-Supported Cooperative Work (CSCW'10)*, ACM, 2010, 331-340
- Becker, J., Kugeler, M., Rosemann, M. (eds.) (2008) *Prozessmanagement, 6. Auflage*, Springer, Berlin
- Braun, V., Clarke, V. Using thematic analysis in psychology, in: *Qualitative Research in Psychology*, 3, 2006, 77–101
- Chevalier, A., Bonnardel, N. Articulation of web site design constraints: Effects of the task and designer's expertise, in: *Computers and Human Behavior*, 23, 2007, 2455-2472
- Ciuciu, I., Zhao, G., Mülle, J., von Stackelberg, S., Vasquez, C., Haberecht, T., Böhm, K. Semantic support for security-annotated business process models, in: *Enterprise, Business-Process and Information Systems Modeling*, Springer, Berlin, 2011, 284-298
- Cohn, D., Hull, R. Business artifacts: A data-centric approach to modeling business operations and processes, in: *Bulletin of the IEEE Computer Society Technical Committee on Data Engineering*, 32(3), 2009, 3-9
- Collins, A.; Brown, J.-S., Holum, A. Cognitive Apprenticeship: Making Thinking Visible, in: *American Educator*, American Federation of Teachers, 6(11), 1991, 38-46
- De Bono, E., Markland, J. (1999) *Six thinking hats*, Back Bay Books 192, New York
- de Castro, R. P. L., Armayor, D. P., Gómez, J. M., Mosquera, I. S., Batista, J. A. D. Semantic supported modeling and orchestration of logistic integrated processes, with focus on supply chain: framework design, in: *ICT Innovations 2009*, Springer, Berlin, 2010, 285-294
- Ding, X.-H., Liu, H. and Song, Y. Are internal knowledge transfer strategies double-edged swords?, *Journal of Knowledge Management* 17(1), 2013, 69-86
- El Kharbili, M., Keil, T. Bringing agility to business process management: Rules deployment in an SOA, in: *Emerging Web Services Technology Volume III*, Birkhäuser, Basel, 2010, 157-170
- Eisenhardt, K. M., Martin, J. A. Dynamic capabilities: what are they?, in: *Strategic Management Journal*, 21(10-11), 2000, 1105-1121
- Filipowska, A., Kaczmarek, M., Koschmider, A., Stein, S., Wecl, K., Abramowicz, W. Social software and semantics for Business Process Management-Alternative or synergy?, in: *Journal of Systems Integration*, 2(3), 2011, 54-69
- Fleischmann, A., Schmidt, W., Sary, Ch., Obermeier, St., Börger, E. (2012) *Subject-oriented Business Process Management*, Springer, Berlin
- Fleischmann, A., Sary, Ch. Whom to talk to? A stakeholder-perspective on business process development, in: *Universal Access in the Information Society*, 11(2), 2012, 125-150
- Fowler, J.J., Horan, P. Are information systems' success and failure factors related? An exploratory study, in: *Journal of Organizational and End User Computing*, 19 (2), 2007, 1–22
- Gaitanides, M. (1983) *Prozessorganisation. Entwicklung, Ansätze und Programme prozessorientierter Organisationsgestaltung*, Hanser, München
- Gerson, E. M., Star, S. L. Analyzing due process in the workplace, in: *ACM Trans. Inf. Systems*, 4(3), 1986, 257-270
- Hammer, M. (1996) *Beyond Reengineering: How the Process-Centered Organization Is Changing Our Lives*, Harper Business, New York
- Hammer, M. How process enterprises really work, in: *Harvard Business Review*, 77(6), 1999, 108-18
- Hammer, M., Champy, J. (1993) *Reengineering the Corporation: A Manifesto for Business Revolution*, Harper Business, New York
- Hoang, H. H., Tran, P. C. T., Le, T. M. State of the art of semantic business process management: an investigation on approaches for business-to-business integration, in: *Intelligent Information and Database Systems*, Springer, Berlin, 2010, 154-165
- Hurtienne, J., Israel, J.H., Weber, K. Cooking up real world business applications combining physicality, digitality, and image schemas, in: *Proceedings International Conference on Tangible and Embedded Interaction (TEI'08)*, ACM, 2008, 239-246
- Jeston, J., Nelis, J. (2008) *Business Process Management. Practical Guidelines to Successful Implementations*, 2nd edition, Elsevier, Oxford, UK
- Klaus, T., Wingreen, S., Blanton, J.B. Examining user resistance and management strategies in enterprise system implementations, in: *Proceedings SIGMIS Conference on Computer Personnel Research (CPR'07)*, ACM, 2007, 55–62
- Kim, G., Suh, Y. Building semantic business process space for agile and efficient Business Processes Management: Ontology-based approach, in: *Business Enterprise, Process, and Technology Management: Models and Applications*, eds.: Venky Shankararaman, J. Leon Zhao, Jae Kyu Lee, 51-74, IGI Global, Hershey, PA, 2012.

31. Kirchmer, M. What has Jazz to do with MPE?, in: *High Performance Through Process Excellence*, ch.11, Springer, Berlin, 2011, 159-169
32. Kolb, D.G., Shepherd, D.M. Concept mapping organizational cultures, in: *Journal Management Inquiry*, 6 (4), 1997, 282–295
33. Korpelainen, E., Kira, M. Systems approach for analysing problems in IT system adoption at work, in: *Behaviour & Information Technology*, 32(3), 2013, 247-262
34. Martin, J. (1996) *Cybercorp - The New Business Revolution*, American Management Association, New York
35. Mendling, J., Reijers, H. A., Recker, J. Activity labeling in process modeling: Empirical insights and recommendations, in: *Information Systems*, 35(4), 2010, 467-482
36. Merriam, S.B. (2009) *Qualitative Research: A Guide to Design and Implementation*, 3rd, Jossey-Bass, San Francisco
37. Ngai, E. W., Chau, D. C., Chan, T. L. A. Information technology, operational, and management competencies for supply chain agility: Findings from case studies, in: *The Journal of Strategic Information Systems*, 20(3), 2011 232-249
38. Nonaka, I., Von Krogh, G. Perspective—Tacit knowledge and knowledge conversion: Controversy and advancement in organizational knowledge creation theory, in: *Organization Science*, 20(3), 2009, 635-652
39. Novak, J.D., Gowin, D.B. (1984) *Learning How to Learn*, Cambridge University Press, NY
40. Oppl, S., Stary, Ch. (2009) Tabletop concept mapping, in: *Proceedings 3rd International Conference on Tangible and Embedded Interaction (TEI'09)*, ACM, 275-282
41. Oppl, S., & Stary, C. (2011) Effects of a Tabletop Interface on the Co-construction of Concept Maps, in: *Proceedings INTERACT 2011*, Springer, Berlin, 443-460
42. Österle H. (1995) *Prozessanalytik*, Oldenburg, München
43. Österle, H., Winter, R. (1995) (eds.), *Business Engineering*, 2nd edition, Springer, Berlin
44. Overby, E., Bharadwaj, A., Sambamurthy, V. Enterprise agility and the enabling role of Information Technology. *European Journal of Information Systems*, 15(2), 2006, 120-131
45. Prilla, M., Schermann, M., Herrmann, I. T., Krcmar, H. Process modeling with SeeMe: a modeling method for service processes, in: *Implementing International Services. A Tailorable Method for Market Assessment, Modularization, and Process Transfer*, eds. Böhm, T., Burr, W., Herrmann, Th., Krcmar, H., Gabler, 2012, Wiesbaden, 67-81
46. Rentsch, J. R., Mello, A. L., Delise, L. A. Collaboration and meaning analysis process in intense problem solving teams, in: *Theoretical Issues in Ergonomics Science*, 11(4), 2010, 287-303
47. Salovaara, A., Tamminen, S. Acceptance or appropriation? A design-oriented critique of technology acceptance models, in: P. Saariluoma, H. Isomaki, eds. *Future Interaction Design II*, Springer, London, 2009, 157–173
48. Sambamurthy, V., Anandhi, B., Varun, G. Shaping agility through digital options: Reconceptualizing the role of Information Technology in contemporary firms, in: *MIS Quarterly* 27(2), 2003, 237-263
49. Sandberg, J. (2005) How do we justify knowledge produced within interpretive approaches?, in: *Organizational Research Methods*, 8 (1), 2005, 41–68
50. Scheer, A.W. (1999) *ARIS-Business Process Modeling*, 2nd ed., Springer, Berlin
51. Schreiber G., Akkermans R., Anjewierden A., Hoog R., Shadbolt N., DeVelde W. V., Wielinga B. (2002) *Knowledge Engineering and Management: The CommonKADS Methodology*, MIT Press, Cambridge
52. Sonpar, K., Golden-Biddle, K. Using content analysis to elaborate adolescent theories of organization, in: *Organizational Research Methods*, 11 (4), 2008, 795–814
53. Stary, Ch., Fleischmann, A. Evidence-based interactive management of change, in: *Knowledge Management & E-Learning* 3(2), 2011, 170-200
54. Storey, M. A., Treude, C., van Deursen, A., Cheng, L. T. The impact of social media on software engineering practices and tools, in: *Proceedings of the FSE/SDP Workshop on the Future of Software Engineering Research*, ACM, 2010, 359-364
55. Strauss, A. Work and the Division of Labor, in: *The Sociological Quarterly*, 26(1), 1985, 1-19
56. Swan, J., Scarbrough, H., & Newell, S. Why don't (or do) organizations learn from projects?, in: *Management Learning*, 41(3), 2010, 325-344
57. Toral, S.L., Martínez-Torres, M. R. Barrero, F. , Gallardo, S., Durán, M. J. An electronic engineering curriculum design based on concept-mapping techniques, in: *International Journal of Technology and Design Education*, 17 (3), 2007, 341–356.
58. Trochim, W.M.K. An introduction to concept mapping for planning and evaluation, in: *Evaluation Program Planning*, 12 (1), 1989, 1–16
59. Weber, J.E., Schmidt, W., Weber, P.S. Using Social Network Analysis and derivatives to develop the S-BPM approach and Community of Practice, in: *Proceedings S-BPM ONE 2012, LNBIP 104*, Springer, Berlin, 2012, 205-217
60. Weske, M. (2012) *Business Process Management. Concepts, Languages, Architectures*, 2nd edition, Springer, Berlin
61. Worley, C. G., Lawler, E. E. Agility and organization design: a diagnostic framework, in: *Organizational Dynamics*, 39(2), 2010, 194-204
62. Yin, R.K., (2003) *Case study research: design and methods*, 3rd ed., Sage, Thousand Oaks, CA
63. Zollo, M., Winter, S.G. Deliberate learning and the evolution of dynamic capabilities. *Organization Science*, 13, 2002, 339-351
64. Zur Muehlen, M., Recker, J. How much language is enough? Theoretical and practical use of the business process modeling notation, in: *Advanced Information Systems Engineering*, Springer, Berlin, 2008, 465-