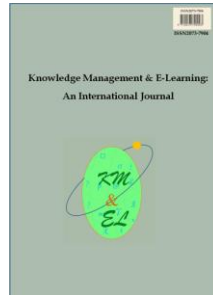


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Open organizational learning: Stakeholder knowledge for process development

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Abstract: When developing organizations their stakeholders are increasingly involved in structuring and adapting work processes. Understanding process design as open learning facility allows promoting organizational structures and change proposals in an informed and bottom-up way. In this work the constitutive elements and processes of such a participatory infrastructure are studied from an open educational resource and open access perspective on the individual and collective level. Besides providing OER the focus is on generating work process-relevant knowledge from an individual perspective, disseminating it for collective reflection, and propagating it to organizational practice. Creating, sharing, and finally, processing this knowledge in open organizational learning environments targeting business process development requires federating social media, semantic content management, business process modelling and execution systems. Stakeholders contribute through (i) articulating proposals on how to organize work, (ii) annotating content in the course of exploiting, sharing and reflecting on these proposals, and (iii) executing process models to experience a certain structure of work. Applying this approach in a healthcare setting could reveal organizational benefits due to the contextualized and traceable sharing of (generated) content with other stakeholders. In particular, the interactive execution of work processes from each stakeholder's perspective (enabled through subject orientation) ensures timely involvement in development fitting stakeholder capabilities and needs.

Keywords: Work knowledge; Articulation support; Open learning; Corporate knowledge sharing and management; Learning organization; Collective intelligence; Semantic technology; Stakeholder management; Participatory design; Business process development

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1. Introduction

Many organizations have accepted the need to re-structure their work continuously and dynamically to keep up their corporate performance and thus, to develop anti-fragile or resilient behavior (Hamel & Valikangas, 2013). Key technology enablers to achieve this objective are Business Process Management Systems (Becker, Kugeler, & Rosemann,

2013). Hence, the corresponding organizational development processes are socio-technical endeavors. In such settings, stakeholders and their behavior are essential for organizing work, as they trigger and carry out design processes (Prilla, Schermann, Herrmann, & Krcmar, 2012).

When changes are to be expected and implemented in organizations, social barriers are likely and subsequent development hindrances need to be tackled. Learning and dedicated passing on experiences, and thus a knowledge management perspective seems to be promising to overcome social barriers (Becker, Kugeler, & Rosemann, 2013). Although learning still lacks operational support in this context (Zhu, 2009), and the overall effect of knowledge flows on corporate performance still seems to be quite controversial (Ding, Liu, & Song, 2013), knowledge creation and validation in terms of sharing and processing content can be considered essential components of knowledge-based adaptation and change (work) processes in organizations (Bhatt, 2001).

In order ‘to capitalize on knowledge, an organization must be swift in balancing its knowledge management activities’ (Bhatt, 2001, p. 68). Any investment in information systems, and thus developing systems requires the ability of a project to ‘deliver meaningful benefits’ (Doherty, Ashurst, & Peppard, 2012). Hence, organizational development based on learning processes requires also concrete experiences of stakeholders in socio-technical sense: ‘It is the interaction between technology, techniques, and people that allow an organization to manage its knowledge effectively. By creating a nurturing and “learning-by-doing” kind of environment, an organization can sustain its competitive advantages’ (Doherty, Ashurst, & Peppard, 2012).

On the one hand, meaningful benefits are bound to the actual work environment of stakeholders, on the other hand, organizational development projects are highly dynamic and case-sensitive (Senge, 1990). Relationships and their dynamics beyond components (systems) rather than a linear flow of control need to be taken into consideration (Lin & Wang, 2012; Stary & Wachholder, 2016). Development processes triggered by the behaviour of involved stakeholders are bound to informal and explorative learning rather than formal structures (Wan, Compeau, & Haggerty, 2012). It is this set of characteristics that brings Open Learning and Open Educational Resources (OER) into play. As Atkins, Brown, and Hammond (2007) pointed out for the next generation of Open Learning systems stakeholders need to be actively involved designing an infrastructure. In this way, an Open Participatory Learning Infrastructure (OPLI) can be established. They are ‘fostered’ rather than ‘built’ (Atkins, Brown, & Hammond, 2007, p. 56) with ‘peer learning and labs on the wire’ (Atkins, Brown, & Hammond, 2007, p. 62).

OPLIs also require contextualized content (Atkins, Brown, & Hammond, 2007). In organizational development settings stakeholders not only consume prepared content but also generate content for the community established by the members of an organization. Both types of content needs to be shared in a contextual way before becoming manifest in organizational structures (Senge, 1990). Consequently, dissemination of contextualized content including representations of how to organize work is at the core of the presented approach (Sakarkar, Deshpande, & Thakare, 2014).

OPLI facilities for organizational development are designed (i) to inform stakeholders on content qualifying them for Business Process Management (BPM) activities as fundamental carriers of organizational development (Becker, Kugeler, & Rosemann, 2013), and (ii) to activate stakeholders to create, comment, share and probe various forms of organizing work tasks (Aschoff, Bernardi, & Schwarz, 2003; Silva & Rosemann, 2012). Correspondingly, constituent OER in OPLIs for organizational

learning (OPOLI) are educational materials (in particular on BPM), annotations, and process models. They are expected to trigger collective reflection and prototypical implementations.

Thereby, social media play a crucial role as they allow asynchronous while timely involvement in (open) learning processes (Storey, Treude, van Deursen, & Cheng, 2010; Thomas & Thomas, 2012). Moreover, they enable ‘conversational’ knowledge management (Wagner, 2004) in distributed settings where knowledge resides with multiple owners, as e.g., in expert organizations such as hospitals (Linington, Milosevic, Tanaka, & Vallecillo, 2011). Although social media have already been recognized as essential drivers of knowledge creation, sharing, and capturing, their use has also raised, fundamental questions about the very essence and value of firm knowledge’ (Von Krogh, 2012, p. 154). Hence, their role and impact to promote knowledge generation and sharing in the work space still need to be investigated (Hong et al., 2016).

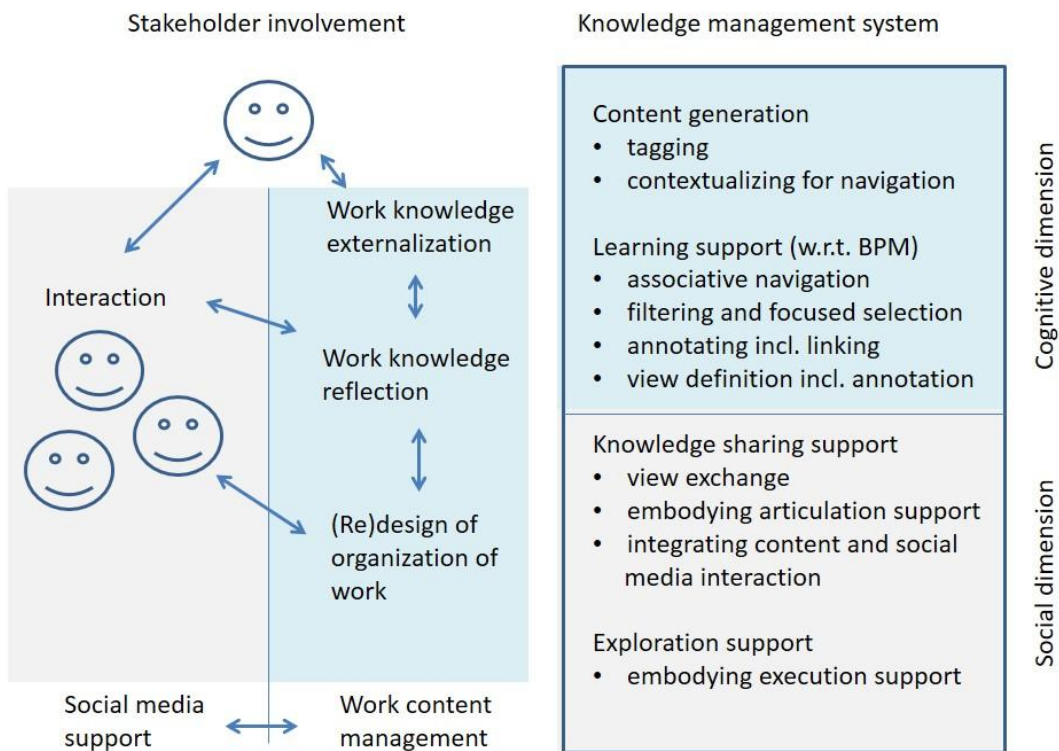


Fig. 1. Organizational development leveraging stakeholder knowledge

In this paper, a conceptual OPLI frame of reference for organizational learning is introduced. Its instantiation in a health-care field study is shown for a generative and dissemination approach of work knowledge. Following the open strategy, innovating work processes is facilitated from different angles (Gassmann & Enkel, 2015): outside-in, inside-out, and coupled, opening the organizational knowledge base to stakeholders that are directly or indirectly involved in work processes, provision and consumption of services or products. In the introduced OPLI for organizational learning (Open

Participatory Organizational Learning Infrastructure (OPOLI) stakeholders can get involved on their own behalf, e.g., articulating ideas on improving an existing organization of work, comment, or try out proposals from external sources to organize business-relevant work tasks in a different way. Fig. 1 gives an overview of the approach. The left part indicates the dual while intertwined involvement of stakeholders in social and OER management processes. The right part lists the core components and features of a corresponding knowledge management system capturing cognitively and socially grounded interaction.

In Section 2 the nature of work models and modeling is discussed in the context of stakeholder-oriented organizational development targeting business processes. The concepts to involve stakeholders in open organizational learning activities allow identifying stakeholder-centered requirements for the envisioned approach to *'learning while (re-)designing work'*. 'Open' in the context of this work does not only mean content is accessible to stakeholders without restrictions. They are also encouraged (i) to individualize content by generating personal viewpoints, (ii) to provide individual content, and (iii) to share both whenever they feel appropriate.

In Section 3 we elaborate on this kind of individual open learning support. Tagging, generating views, and disseminating content including annotations are exemplified. Dissemination, as shown in Section 4, targets towards participatory learning and exploration on the organizational level. As content elements can be directly linked to social media entries, OER and social interaction can be intertwined in a seamless way. Finally, the interactive support facility of the OPOLI for executing business process models allows stakeholders hands-on experience with validated models, thus, roundtrip engineering along organization learning processes.

In Section 5 the objectives and achievements are summarized. Future research is detailed with respect to OPOLI architecting.

2. Emergent semantics and open participatory organizational learning infrastructures (OPOLI)

The acquisition of work-relevant knowledge is likely to include leveraging tacit or implicit knowledge. Explicit knowledge is already documented information whereas tacit knowledge is not available in documented form in organizations (Nonaka & Von Krogh, 2009). Emergent development approaches allow dynamic development of semantic process representations. For instance, Cohn and Hull (2009) use (business) artifacts combining data and process as basic building blocks of modeling. Artifacts 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. Artifacts 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.

In Cohn and Hull's (2009) approach artifact instances can be generated in state-based way, as instances interact through message passing as they transition between states. The artifact-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 artifacts are identified, even at a preliminary level, they become the basis of a stakeholder vocabulary. Hence, we can conclude that evolving element and relation categories are of benefit for developing a stakeholder-oriented modeling and analysis approach (Salovaara & Tamminen, 2009), and thus should be part of open participatory organizational learning approaches.

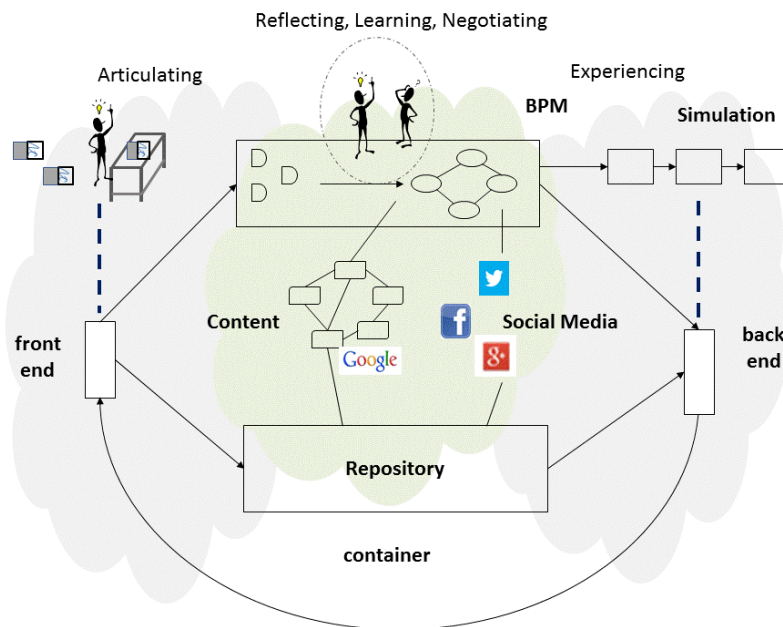


Fig. 2. The AEOLION (Articulation Engineered for Organizational Learning in Interoperable, Open Networks) frame of reference

The AEOLION frame of reference (Articulation Engineered for Organizational Learning in Interoperable Open Networks) tries to contextualize essential components of open organizational learning support allowing for emergent semantics of work knowledge (Chen, Lee, Zhang, & Zhang, 2003). Since stakeholders are the drivers of organizational development, learning support has to be understood as an intertwined cognitive, social, and emotional endeavor. Thereby, qualified stakeholder involvement in organizational learning processes is a matter of preparing fundamental content of business process development, e.g., OER, and applying and further developing domain knowledge in the sense of open material for other members of an organization. Propagation of content is crucial for participatory learning. Moving beyond traditional open learning informed stakeholders need to be able to

- *Express* themselves in terms what they know, in order to document starting points of change
- *Reflect* on articulated knowledge, either alone, with peers, or other groups

- *Represent* and *manipulate* codified knowledge, forming baselines for further steps
- *Store* to avoid loss of information and process know-how ('twice-invented-here')
- *Process* knowledge to evaluate or establish adjunct or resulting operational procedures
- *Share* knowledge by distributing content to put it to operation

Support (chains of) technologies or enablers of resulting OPOLIs (see Fig. 2) play different roles: front end tools (left side) capture various types of articulation support, such as concept mapping, whereas (organizational) learning support comprise OER and support for searching, navigating/filtering, participatory development. Back end tools (right side) enable experiencing results from developing process variants, e.g., executing business process models.

3. Individual learning in OPOLIs

Although articulation of knowledge is the starting point of organizational development, the baseline in OPOLI is an OER for education-informed learning (see also Fig. 2). Consequently in this section, we introduce some fundamentals for articulation of work knowledge and its embodiment in OPOLIs. Although articulation and learning require different types of support at some point they need to be intertwined to enable the informed dissemination of organization-relevant content. Hereby, representations become part of an OPOLI repository. When stakeholders study these OER they develop and document their own perspective on content elements. Handling these perspectives in terms of views explicitly becomes part of individual process exploration and collective reflection supported through social media.

The presented OPOLI was tested in the field. The qualitative research study concerns re-organizing workforce planning for operating an Austrian health care clinic. Besides non-stationary patient treatment an out-patient department, stationary treatment, surgery, and academic education activities, needed to be coordinated and scheduled for daily operation. The existing planning procedure had become a central bottleneck within the daily routine of the clinic. Stakeholders had perceived a lack of transparency in communication, and overhead through redundant steps in scheduling processes. Hence a working group, and later on, a project team under the lead of the Organizational Development Department had been established. Besides the urgent need in revisiting planning procedures, nationwide promoted goals of the federal health care reform, namely the increase in the efficiency and customer orientation in health care needed to be tackled (Augl, 2012).

In a start workshop the project team, including representatives from all stakeholder groups (management, doctors, patient care, administrators) agreed on the project's objectives, namely to provide transparency in scheduling clinic doctors, in order to increase planning quality and thus, patient orientation. As a result, planning should become more effective and resources should be scheduled more efficiently. The project was design along three steps:

1. Analysis of existing scheduling procedure and underlying regulations/forms
2. Informed process (re-)design and prototypical implementation
3. Evaluation of (re-)designed approach

3.1. Knowledge articulation and content creation

Based on existing data with regard to satisfaction with planning, descriptions of scheduling operations, the articulation and elicitation of scheduling knowledge started. In contrast to traditional procedures in Business Process Management, the capability of the involved stakeholders was challenged to express scheduling knowledge according to their individual perception using the presented OPOLI. A facilitator guided the process by reflecting the meaning of the elements that were brought up.

Representatives of each involved stakeholder group were asked to create individual concept maps (Novak, 1998). They were further developed to diagrammatic story maps (McCartney & Figg, 2011) focusing on the interaction with other stakeholders. Fig. 3 exemplifies a diagrammatic story map. The circles represent stakeholders, the directed links the flow of information between the actors. The Integrative Planner plays a crucial role in scheduling each person for the period of several months, including all duties of a doctor.

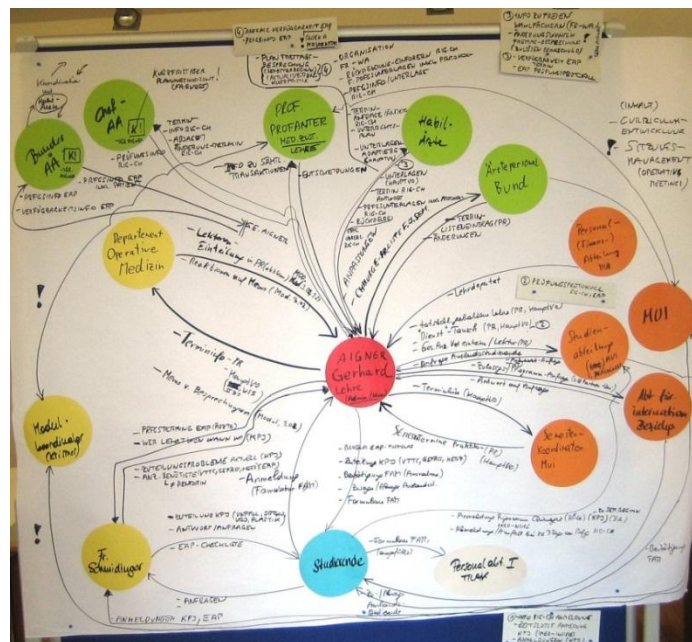


Fig. 3. Story map of Integrative Planner

The participants were asked to elaborate the communication relationships they had with other stakeholders in terms of a Value Network Analysis (www.vernaaltee.com), since the initial analysis of data had indicated the lack of accurate communication among stakeholders. This phase was a structured reflection unleashing the potential of change. In this way, the stakeholders created domain-specific content that later on became part of the OPOLI's content management, and was refined to stakeholder-specific process models (Stary, 2014).

As content elements have a certain context, they have been created in which their meaning is determined and they make sense for stakeholder at a certain point in time. In order to represent context, meta-data need to be provided. This enrichment of content becomes even more substantial for an education-informed learning approach targeting the (re-)design of work processes, as OER need to capture foundations (in our case in

Business Process Management) for informed participation in organizational learning processes.

Although technically, meta-data can easily be provided, it can be quite an effort for OER (Clements & Pawlowski, 2012). Based on positive experiences in educational learning projects (Zaharieva & Klas, 2004), a set of domain-independent tags, such as ‘explanation’, ‘example’, or ‘method’ could be used. For OPOLIs implementing the AELION frame of reference, tagging needs to be adapted. For instance, all created material in the course of articulation has been tagged with ‘stakeholder map’, and stored in a project—specific work space of the content part of the OPOLI repository.

In the case study, the story maps could easily be refined to work process models using the Subject-oriented Business Process Management (S-BPM) notation (Fleischmann, Schmidt, Stary, Obermeier, & Börger, 2012). The nodes from the maps, e.g., clinic back office, managing director, lead doctor, integrative planner, could be transformed to subjects in straightforward way. Their explicit interaction relations became messages exchanged between subjects, since the core elements of a subject-oriented process model are those of communication.

3.2. Contextualizing content

Besides tagging knowledge items, an education-informed dissemination environment requires facilities for stakeholders to individualize content. Traditionally, these are based on annotation features, as they enable exploring content through tag selection (Fürlinger, Auinger, & Stary, 2004), and adapting information spaces to individual needs (Tiropanis, Millard, & Davis, 2012). Typical examples for individualization are textual note taking, multimedia attachments, links to internal or external sources of information, and underlining/coloring of content elements. An OPOLI learning support component needs to provide the corresponding functions (see also Fig. 4 – upper right corner).

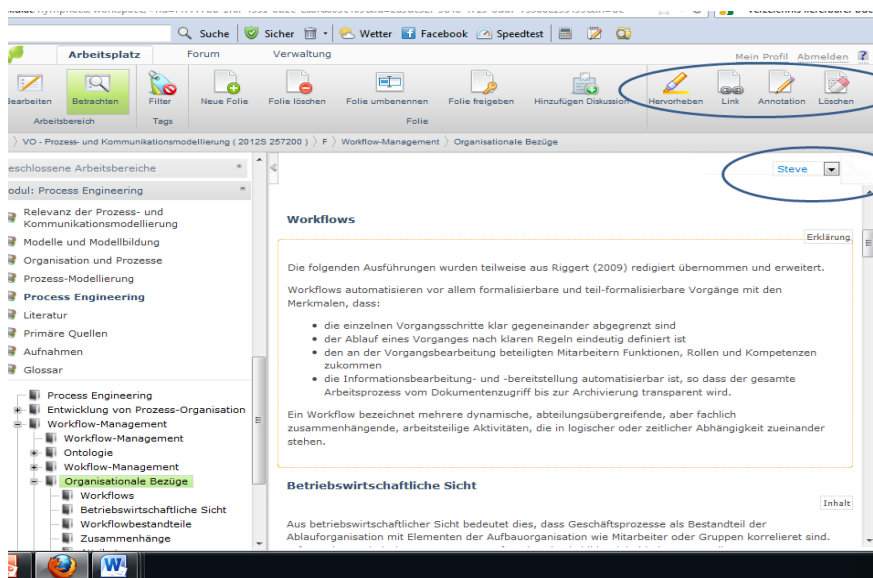


Fig. 4. OPOLI-KMS with individualization tool bar (upper right corner) and view mechanism for ‘Steve’

In the utilized Knowledge Management System (KMS) *nymphaea* (Stary & Weichhart, 2012) annotations are stored in dedicated structures, so-called views. They form the basis for dissemination and sharing (see section 4) and are initialized by individual stakeholders, such as in Fig. 4 ‘Steve’, a stakeholder. As soon as content is displayed, a view is generated like putting on top of some text an overlay transparency. The view is kept for further access and reloaded whenever the content is accessed again. In this way, the originally provided content can be preserved while being annotated by various stakeholders, enriching the content or making notes for further improvements.

Fig. 5 gives a sample set of annotations for Steve. He has highlighted the term ‘workflow’ in the OER explanation of the content element Workflow (see tag ‘Erklärung’ on the right side of the work space), and added another explanation he found in the web through a link. The corresponding selected features have been marked in the scrollbar.

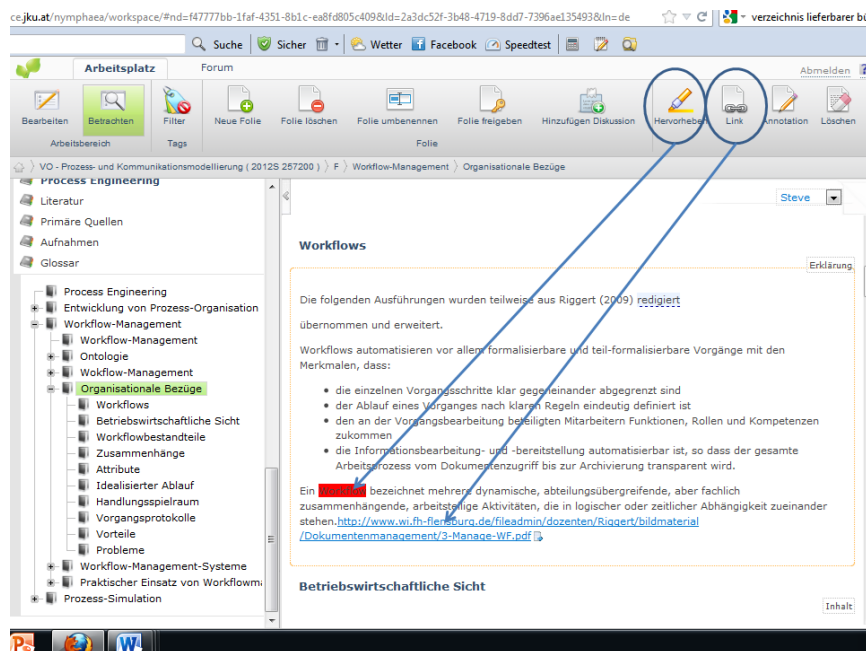


Fig. 5. Annotated content stored in view ‘Steve’

Hence, each stakeholder is provided with his/her views keeping all his/her annotations (highlighting, link, note) for further use. A stakeholder could create several views on the same OER content element. Each view can be selected from a drop down list. Initially, each stakeholder has access only to his/her created views on the selected content element. For sharing knowledge, he/she may set some or all of them public, and also individualize views others have set public (cascaded viewing - see section 4.2).

4. Leveraging collective intelligence using OPOLIs

In this Section, we detail disseminating and sharing knowledge, essential for open participatory organizational learning. First, the context needs to be set for dissemination activities in terms of open content navigation. We introduce a scheme contextualizing navigation in OPOLIs (Section 4.1). Secondly, we introduce sharing support. It is based on exchanging views among stakeholders, and on linking elements of social media

directly to content elements (and vice versa) (Section 4.2). Thirdly, participatory exploration is captured, sketching, how direct execution of validated business processes can become part of open organizational learning (Section 4.3).

4.1. Contextualizing OER navigation

Open organizational learning and change management activities require structures beyond linear tree views and hierarchical nesting of content elements (Lin & Wang, 2012). Fig. 6 visualizes the situation. On top are BPM Phases, as required for process-oriented developments, and, e.g. implemented by the Subject-oriented BPM activity bundles analysis, modeling & validation, implementation, optimization & monitoring (Fleischmann et al., 2012). Each phase refers either to existing or created content, containing BPM results, such as process analyses, business process models, and validation reports. In addition, regulations and guidelines may influence the process, e.g., compliance rules. Finally, a report subsuming all results could be written, composed of results achieved in one of the previous BPM phases.

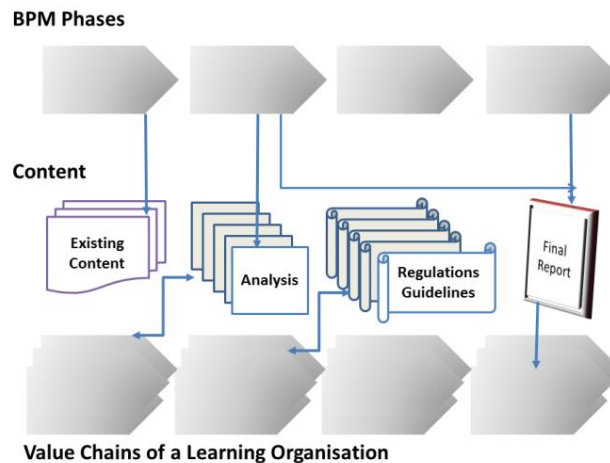


Fig. 6. Content elements in value chain contexts

In organizations there can be several relevant value chains (already implemented), stemming from change management, quality management, education and qualification, or skill development processes. On one hand, they are fueled by running development projects, on the other hand, they fuel these projects. For instance, BPM qualification for informed organizational learning participation could be based on the sequence Process Modeling – Process Engineering, setting up a module-based value chain for capacity building to participate in organizational learning processes (upper part of Fig. 6). It requires access to corresponding OER ('Existing Content' in the middle part of the figure). Each value chain has to be considered as additional context to content that can be used additionally for navigation.

Moreover, an OER content structure (in our case the BPM content as probed in <http://www.i2pm.net/interest-groups/s-bpm-edu/nymphaea>) needs to be adapted to the respective value chain, even within particular areas. Consider the following education case: While for skill development a certain sequence of learning units or modules, conform with the linear list displayed in Fig. 5 (left side of the screen) and indicated by

numbers in Fig. 7 turns out to be effective, in order to understand the field, additional relationships as shown in Fig. 7 are essential.

In open organizational learning referring to business processes, before a stakeholder is able to model business process models, he/she needs to understand the nature of models and modeling procedures. This includes mechanisms, such as abstraction. The corresponding relationship between the OER modules Process Modeling and Models and Modeling is 'requires knowledge on' in Fig. 7. The development of organizations towards process-orientation is based on model representations, such as integration elements from the organization and flow charts ('is applied to'-relation). Understanding organizations as a set of business processes is subject to modeling, setting up the universe of discourse of what to model ('concerns'-relation). Process modeling focuses ('has focus'-relation) on that universe of discourse. Once models have been constructed they can be further processed which is detailed in the module Process Engineering ('enables'-relation). In this way, a high-level learning path can be specified to support capacity development for a certain value chain.

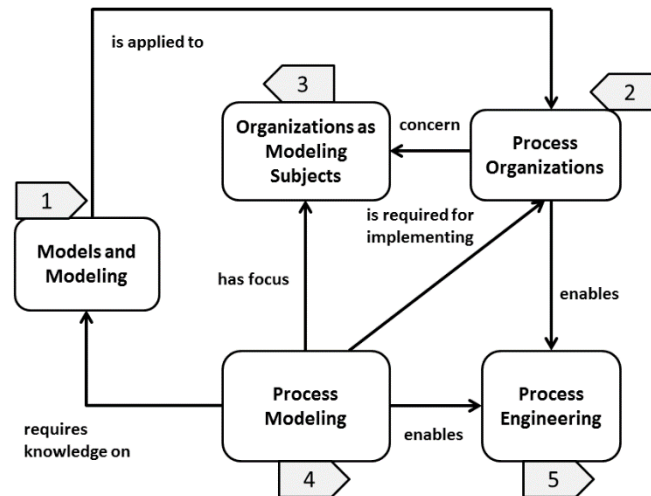


Fig. 7. Sample dual context of use: BPM education & open organizational learning qualification

For implementing multiple contexts, we follow the approach of dual navigation introduced by Neubauer, Stary, and Oppl (2011). Originally developed to enrich hierarchic navigation design, it allows specifying arbitrary relations between content elements in addition to the hierarchical ones represented by the tree (view) design of content. Consequently, it can be used to specify specific contexts while referring to (tagged) content. The approach is oriented towards explicit relationships beyond hierarchies, as required for situation-sensitive dissemination. It is grounded on concept maps, facilitating orientation and context awareness (Novak, 1998). Fig. 8 exemplifies the scheme instantiated for the domain Enterprise Architecting which is of interest in BPM when it comes to IT support.

Relations, such as 'determines' or 'is-part-of', facilitate understanding, provide overviews to available content with respect to a certain topic, and can guide both, organizational learning and qualification paths. The map is displayed on the KMS screen

in the workspace in addition to the tree view. When clicking on a node, the respective tag, e.g., ‘motivation’ for ‘Enterprise Architecting’ is displayed and the stakeholder can open the respective OER content element, in this case a text on motivating the use of enterprise architectures for BPM.

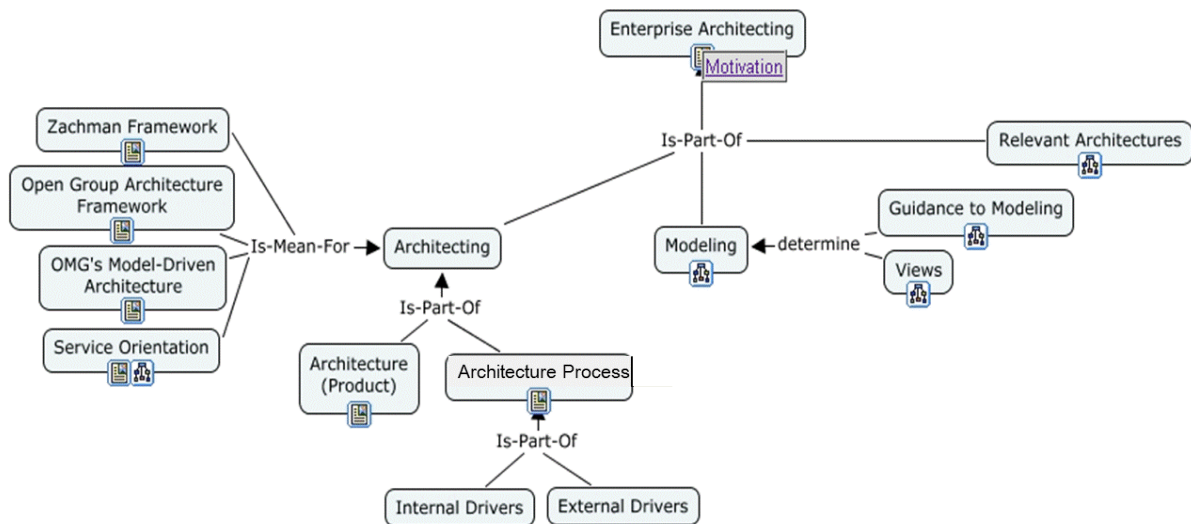


Fig. 8. Sample context schema as displayed to users. Adapted from Neubauer, Stary, and Oppl (2011)

In this way, at different levels of granularity OER access patterns can be provided. Typical high level patterns are BPM phases as part of change projects. Low-level patterns refer to action-relevant details, either when qualifying stakeholders, e.g., how to set up a function-oriented business process model, or when performing BPM tasks, e.g., reflecting workflow implementations of business processes.

4.2. Participatory organizational learning

In this Section, first, the active exchange of views is described, as it constitutes a novel form of participatory learning in OPLIs. Then, the integration of social media in process-oriented organizational learning processes is exemplified. Finally, it is sketched, how role-specific hands-on experience of validated business process models can be embedded in OPOLIs, exemplifying it for subject-oriented business process models.

4.2.1. Exchanging views

As all annotations of content can be stored in individual views, not only OER content can be shared among users, but also the entire set of annotations. Initially being private, stakeholders can set their views public, and share them with others by importing them into their work space. In the KMS, the navigation for view management is located on top of the content area (see Fig. 4). Stakeholders can manage views, including their deletion and the transfer to other members of the community at hand (Röder, 2003). As views refer to OER content elements, they may even be cascaded, pushing them back and forth among users. In this way, a shared memory of a group of stakeholders studying and

reflecting certain topics, e.g., business process models for marketing, can evolve. Fig. 9 shows this principle of exchanging views, leading to cascading according to individual users and their behaviour of exchange.

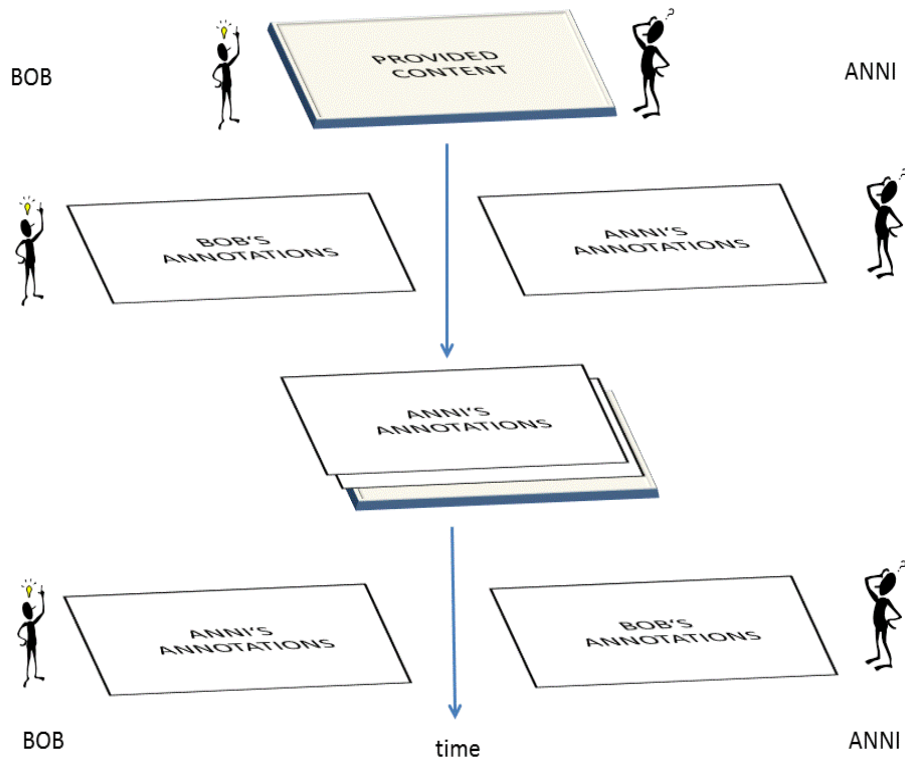


Fig. 9. The OPOLI-KMS mechanism of sharing and accessing views

Such a scenario is useful in OPOLIs, as soon as generated process models need to be validated to become part of acknowledged work structures, e.g., applying a novel work procedure in some compliance context. In views, stakeholders, e.g., all employees of an organization, comment on the model and suggest changes, set links to other reference models, or provide alternative models for the organization at hand.

In organizational development round trips, the mutual transfer of views is essential, as input, reflection, and actual change of business processes have to be understood as a spiral process: each contribution builds on previous ones. More particular, all concerned stakeholders can participate in an egalitarian way. Each participant has the choice: Either continue working on an existing (public) view, or create another view to open up for alternatives, eventually starting another track of development. Once a change round trip has been completed, it can be traced according to the created views.

4.2.2. Participatory learning

Views can also contain comments and entries in social media (chat, blog, wiki, forum, facebook, twitter etc.) The OPOLI-KMS allows stakeholders not only adding links to internal or external sources of information to OER content, but also to jump directly to

entries in social media, in particular, to those of discussion forums on development topics, for the sake of structured development. In this way, social media entries are provided with the required context for learning (Sakarkar, Deshpande, & Thakare, 2014).

Referencing entries in the discussion forum or other social media is performed similarly to linking content elements in a view. In case a stakeholder sets a link to an entry in the discussion forum the addressed medium is opened. Then, he/she edits entries which are directly linked to content in both directions, as indicated in Fig. 10 through the respective link to a content element of an entry of the discussion forum. After proper content selection, the link is instantiated and stored.

Fig. 10 shows the participatory learning starting point in terms of focused, context-sensitive interaction, when in the OPOLI-KMS forum a stakeholder raises a question (in this case about categories of models), as displayed in the upper part of the interactive work space. Another stakeholder provides an answer. Rather than writing an own answer, according to the provided content, he/she may set a direct link (see highlighted box in the interactive workspace). Clicking on this link allows readers of the forum entry to go directly to the relevant piece of information in the content part of the OPOLI-KMS.

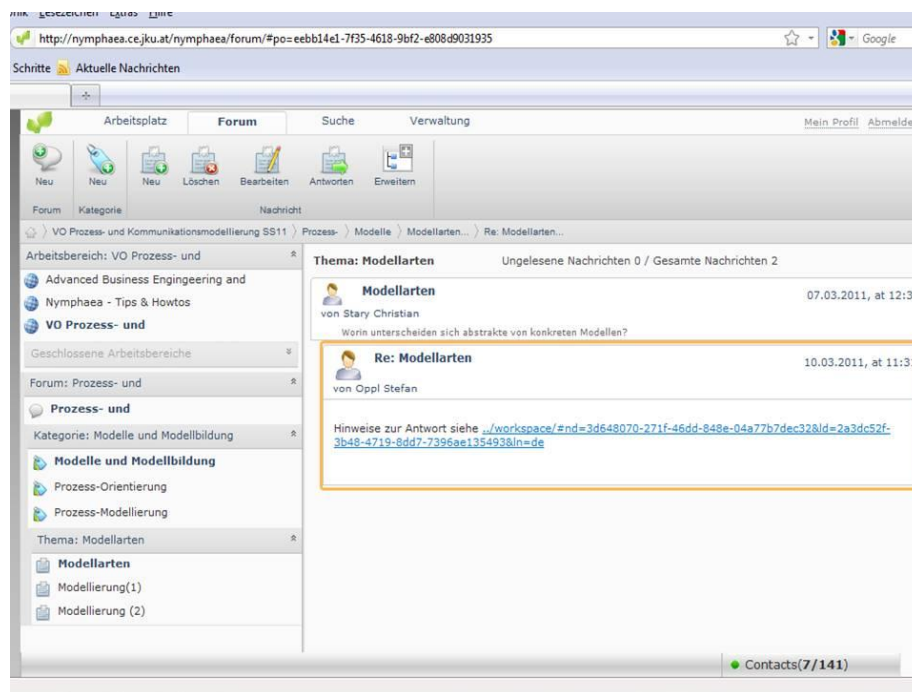


Fig. 10. Contextualized content: Question answering through directly linked social media entries

In the workspace, the discussion board becomes available as part of an OER content block (see marked spot in Fig. 11). Hence, in the course of BPM-based open organizational learning and change management communication entries and content can be both disseminated in their mutual context. This kind of participatory learning approach has been rarely tested in healthcare so far (Kothari, Hovanec, Hastie, & Sibbald, 2011). Adoption of novel forms of digital interaction in traditional face-to-face settings as in

healthcare is likely to be slow (Thomas & Thomas, 2012) - resistance to the adoption of new technologies has to be expected from various stakeholders. In the healthcare case annotations were designed as trigger of social interaction, as views serve as containers of socially and cognitively grounded development contributions.

Once OER content has been generated by stakeholders on the fly, it can either become part of a work space of the OPOLI-KMS or be stored in a stakeholder-specific view. For instance, in case a stakeholder wants to adapt a reference model of applying for absence, he/she could use his/her model and link it to the reference model in the material. Such integration allows for social embodiment of models, as other may refer to the reference model while still having access to the initial proposal of the stakeholder. Fig. 9 shows this mechanism of making views public and exchange them. The discussion that follows can be made accessible through the forum displayed when clicked on it, as it can be accessed as integral part of OER content – see Fig. 11.

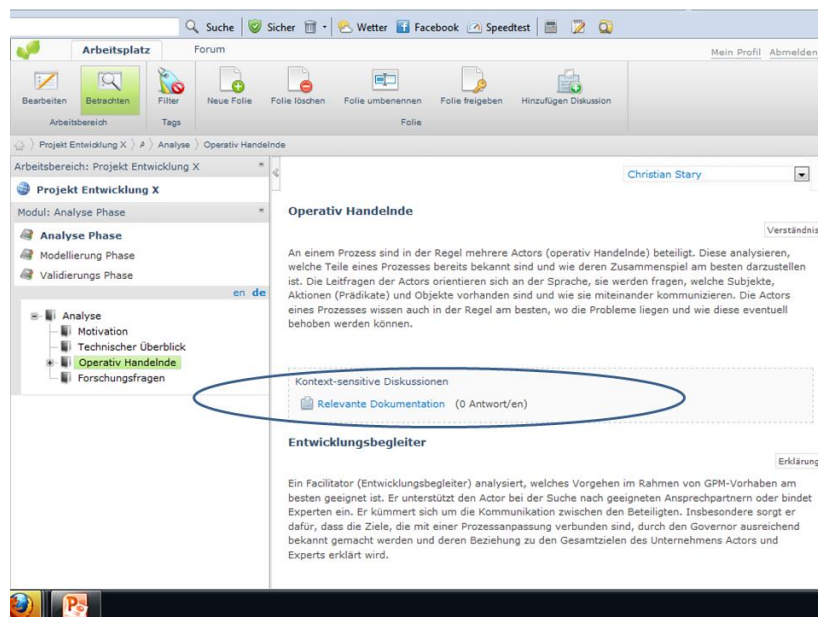


Fig. 11. Social interaction as inherent part of the OPOLI-KMS workspace

With the latter intertwining, all major principles of conversational knowledge creation, as proposed by Wagner (2004, p. 270), could be implemented, and applied to tagged elements of OER content linked to social media entries:

- **Open:** If a content element is found to be incomplete or poorly organized, any stakeholder can edit it as he/she sees fit.
- **Incremental:** Content elements can be linked to other content elements or social media entries, including those that have not been filled with content yet (given a structural reference, such as a node of the navigation map)
- **Organic:** The structure and content of an OPOLI-KMS instance is open to editing and evolution, including the embodiment of social media.

- **Mundane:** A certain number of conventions (e.g., didactic tags) and tool features (e.g., concerning social media) provides access to useful content item markups
- **Universal:** The mechanism of editing and organizing are the same as creating so that any stakeholder generating content is both, an organizer and an editor.
- **Overt:** The formatted output suggests the input required to reproduce a content item.
- **Unified:** Labels are drawn from a flat space so that no additional context is required to interpret them.
- **Precise:** Content items are titled with sufficient precision to avoid most label or name clashes
- **Tolerant:** Interpretable behavior is preferred to error messages, as the intertwining social media reveal.
- **Observable:** Activities within a content elements or structural item, such as module or discussion forum, can be watched and reviewed by other stakeholders, both on the cognitive (content editing, view management) and social level (social medium entry).
- **Convergent:** Duplication can be discouraged or removed by identifying and linking similar or related content.

Moreover, due to the arbitrary embodiment of social interaction media, such as the discussion forum in the OPOLI-KMS, and the views keeping annotating separated from OER content items, changes on content items can be discussed before becoming effective as baseline information or OER content. Social media interaction and view management allow an open implementation of editing/versioning policies, taking into account a certain situation of use, or the position of certain stakeholders, such as domain expert or quality manager.

4.2.3. Participatory exploration

After modelling and agreeing on business process models for implementation an organizational learning round trip can be started or is continued with executing process models. In order to provide the flavour of implementation before the organization of work is actually changed according to the process models, stakeholders could be provided with respective hands-on experience (Tuulenmäki & Välikangas, 2011), given proper OPOLI tool support. Any application can be activated in the OPOLI-KMS through a link represented in the content area, in a view, or a social media entry. Once the link is activated, stakeholders can load process models into the activated tools for editing, validating, and executing process representations.

Since in case of Subject-oriented BPM (Fleischmann et al., 2012), validated process models can be executed without further transformations, hands-on experiences can be disseminated together with the models. In the OPOLI-KMS workspace, executable models are interactive elements that can be run once the stakeholder clicks on them.

Fig. 12 shows such an activation, namely the Metasonic Suite (www.metasonic.de). On the left side the subject-oriented behavior model is shown,

indicating the position of execution by framing a state. Its prototypical execution using a form management system is displayed on the right side of the figure using Metasonic Proof. Monitoring the execution of behaviour diagrams triggers feedback loops and facilitate continuous organizational development design in terms of seamless roundtrip engineering – each run can be reflected and positions of further changes immediately located in the model due to bootstrapping (see also Fleischmann & Stary, 2012).

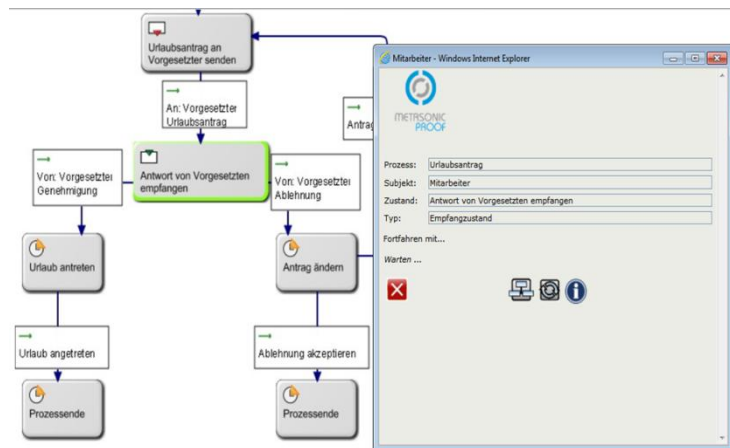


Fig. 12. Sample interactive experience of a work process

However, it requires a stakeholder-oriented process perspective. It allows individual learning processes being coupled with collective ones, as individual changes or change proposals can be shown on both layers, the stakeholder – each stakeholder’s role behavior can be captured in a separate Subject Behavior Diagram – and the organization – represented through a Subject Interaction Diagram – without disturbing the entire operational business.

The field study had opened the opportunity to implement a new communication pattern for daily scheduling of physicians. Its specification in terms of S-BPM models based on the articulated work knowledge enriched the planning horizon significantly and has been implemented, after detailing all subjects in terms of behaviour diagram. For execution, the messages needed to contain all relevant data, as exemplified for checking the availability of doctors in Fig. 13. Results were displayed along the workflow (Fig. 14).

After implementation, the stakeholders have been asked whether the quality of planning could be increased through implementing the designed processes using a subject-oriented business processing platform. Of particular interest was whether the increase in transparency of communication could positively influence the perceived quality in planning. Each stakeholder, including doctors and patient care staff, was asked to answer the following questions:

- Do I communicate with all parties involved in planning?
- Are the generated schedules of use for me?
- Which value added do I experience when using the schedules?

In addition, suggestions for improvement were collected with respect to data input (forms, search fields), the presentation of results and status information of processes, and the structure of communication.

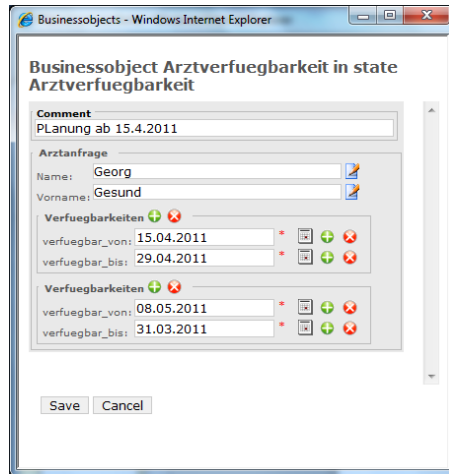


Fig. 13. Prototypical business object checking the availability of doctors in daily routine planning

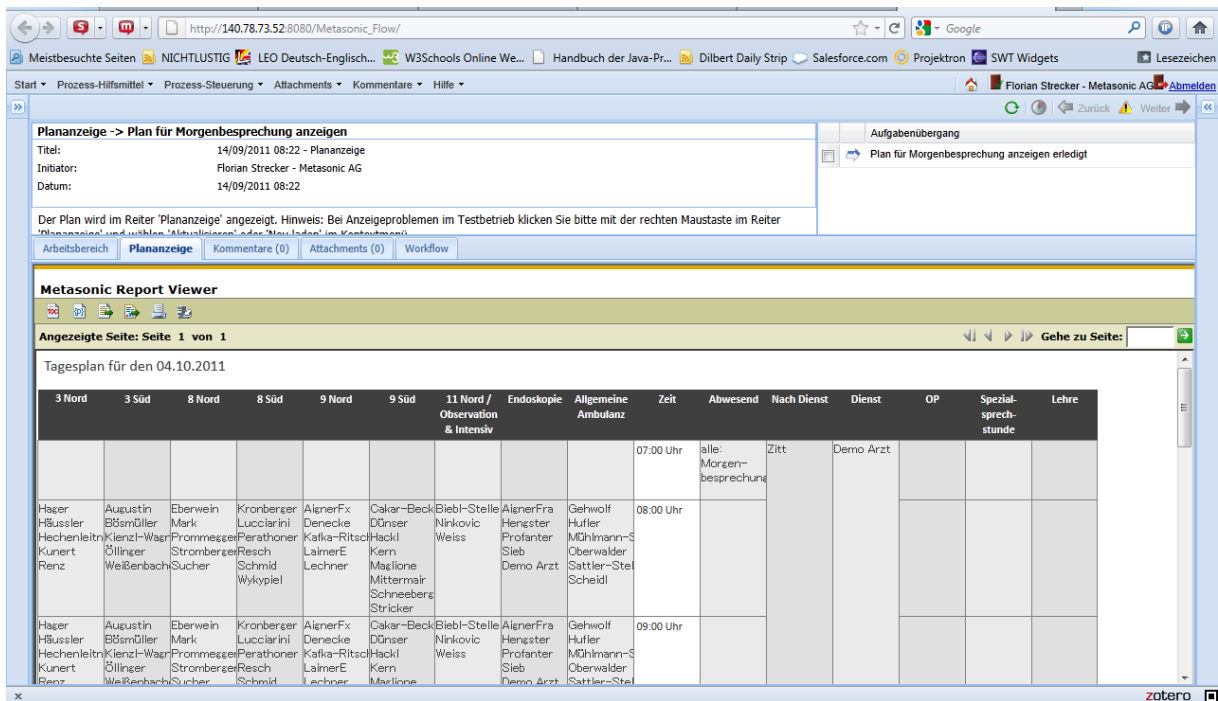


Fig. 14. Sample schedule created along the planning process

The evaluation was overlaid by usability problems of the workflow processing system. Hence, most stakeholders experienced troubles accessing the technical system and handling the provided features for interaction to accomplish their task. However, both, the increase in scope with respect to planning, taking into account academic teaching periods, and the visibility and traceability of the work were rated positively by

the participants. The evaluation triggered further processes of redesign, both in terms of understanding roles of actors - subjects needed to be refined - , and social adaptation to new behavior patterns or conventions.

For a deeper understanding of the capabilities and thus, further development steps, the relation to BPM OER allows the results from the field study to become part of the content, e.g., tagged 'example' when taking parts of it or 'case study' when providing the entire field study as OER content. It allows an organization to learn from each case, both in terms of concrete organizational designs, and in terms of the organizational development step, in particular when to take a certain step and how to involve stakeholders. The latter shapes the meta-cognitive capabilities of an organization, and has to be as transparent as changing the concrete organization of work.

From the side of the OPOLI-KMS, feedback to shared specifications or running versions of validated business processes at the concrete or meta-cognitive layer, can either be provided via annotations in views (on top of the models), or entering comments in social media. In both cases, feedback can be shared, according to the nature of social media, or setting views public. It can be processed for implementation or further refinement/development.

5. Conclusions

Taking an open learning perspective, and orienting organizational development towards participatory knowledge management empowers stakeholders to design their business processes actively. Organizing work to adapt to user, market, and partner facilitates the business operation in a resilient way. However, stakeholders need to be supported if not qualified to actively participate in developing work knowledge and implement changes after reflecting the impact on the level of operation. The introduced approach to Open Participatory Learning Infrastructures utilizes semantic technologies, social media, and contextual design to trigger and implement open learning processes.

The support for articulating, modeling/representing and sharing (social and technical processing) of work knowledge plays a crucial role for stakeholder engagement. Once stakeholders get actively involved, learning support becomes essential. As the education-informed access to OER also the case study in healthcare reveal generating and sharing work knowledge referring to operational business processes need to feature:

- (i) Meta-data encoded fundamental and applied knowledge on business process models and change management, in order to support interactive selection and arrangement of relevant information for qualification and organizational change.
- (ii) Non-linear navigation and views representing different perspectives (of different stakeholders) need to be generated on top of content items. Views including annotations and comments (from social media interaction) on generated content are exchanged explicitly when a certain idea or organization of work (e.g., business process model) is collectively reflected. Creating and exchanging views supports transparent switching from individual feedback to structural feedback in organizational team learning (Hillier & Dunn-Jensen, 2012).
- (iii) Social media contributions in the context of work and process design, and interactive experience based on executed process models requires linking content item with social media entries and applications directly. This intertwining of tools lays ground to situated and integrative learning (Welsh & Dehler, 2012).

Open organizational learning leverages stakeholder knowledge while connecting to open educational resources, intelligent content management, sharing and prototyping facilities. The connection with educational resources is required, as not all participating stakeholders can be assumed to contribute in a skilful way to organizational development albeit being experienced in their work.

Table 1 summarizes the features and constitutive elements of open organizational learning processes according to the proposed concept and field study experiences. It reveals the relation between affected activity layers, type of learning processes, enabling features, methods, and tools.

Table 1
Open learning / design dimensions, activities, and tools

Levels, Loops, and Enablers	Individual layer	Collective Layer	Learning Processes	Enablers: Cognitive / Social/ Emotional (m = method, t = tool) m also includes tool-specific feature set
Learning Chain Elements	Features	Features	Constituents (what it is about)	
Articulation	Express (model)	Immediate sharing (express and negotiate)	Knowing about operation (processes), content, assumptions, change proposals, reflection of change processes	Concept mapping (m), story mapping (m), BPM modeling (m), structure elaboration table (t) / Social media (m+t) / Social media (m+t)
Representation	Navigate, search, store, trace, versioning	Navigate, search, store, trace, versioning	Business process models, Knowledge (change)	Filter (m), topic map (m), annotations (m), content management system, social media support (t), workflow modeling tools (t) / annotations (m) / annotations (m)
Share	Search, retrieve, develop individual perspective, edit content,	Search, retrieve, develop group perspective, edit content, manage perspectives	Getting knowledgeable through perspective on constituents	Tagging (m), tracing (history) (m), editor (t), create/edit view (t) structure elaboration table (t) / Like, follow, exchange annotations (m), set view public (t), social media (t), structure elaboration table (t) / like, endorse, follow (m), social media (t)
Processing	Explore	Explore impact on organizational level	Evaluated proposals for changing organization of work, validated business processes	Validation and processing of business processes (m), Workflow Management System (t), Simulation model (m) Simulation engine (t)

Further research will focus on additional empirical studies in complex settings, such as developing process knowledge across expert organizations, involving stakeholders from different organizations. Instruments need to be developed to measure and evaluate the impact of open network learning. In addition, various learning

frameworks, stemming from different paradigms, e.g., Complex Adaptive Systems' theory, and requiring certain learning behaviour, e.g. single and double loop, need to be tested with respect to effective development support of organizations.

From the technology perspective, open annotation frameworks (Haslhofer, Sanderson, Simon, & van de Sompel, 2014) will be explored, in order to investigate possible enrichments of OPOLIs with this type of open systems (annotation capabilities have been handled as integrated features so far). Finally, from the business perspective, the design of enterprise-specific architectures needs to be investigated, as work knowledge forms the relevant basis for further adaptations, in particular, tactics and strategy of organizations. Further studies need to explore work knowledge items in relation to business goals and business models.

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