Transfer of Learnings between Disciplines: What S-BPM Facilitators Could Ask Progressive Educators (and might not dare to do)

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Abstract. Subject-oriented Business Process Management (S-BPM) is a novel paradigm in Business Process Management (BPM). Educating students and business stakeholders in S-BPM requires facilitating a substantial mind shift from function- towards communication-oriented (re-)construction of processes. Reformist pedagogy, as driven by Maria Montessori, allows learners grasping and applying novel concepts in self-contained settings and in an individualistic while reflected way. So why not learn from her experiences for introducing S-BPM? In this contribution her analysis of human cultural factors enabling literacy has been transcribed to S-BPM education. When informing S-BPM capacity development according to progressive education, understanding the actual situation and readiness of learners seems to play a crucial role, as it influences their engagement in learning environments. These factors need to be differentiated when conveying S-BPM concepts and activities.

Keywords: Subject-oriented Business Process Management, learning, literacy, progressive education, prepared environment, BPM capacity building.

1 Introduction

Besides structural deficiencies in curricula development relevant to Business Process Management (BPM) [16], the demand for informed education in this field is steadily increasing. The latter could be demonstrated with the advent and use of complex modeling languages, such as BPMN [12], and paradigm shifts, such as Subject-oriented BPM (S-BPM) [5]. Recent studies analyzing BPM education programs, such as by Bandara et al. [1], tend focusing on content and domain structures rather than learning issues. Besides these core elements essential for understanding BPM, the quality of education should become focus of investigations [14]. It might also influence the acceptance of dedicated learning communities, such as established by Schmidt et al. for S-BPM [15], by facilitating access to the capabilities of the novel paradigm.

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In the following we briefly introduce S-BPM from the content and didactic requirements' perspective in section 2, before discussing fundamentals of capacity building as conceptualized by Maria Montessori in section 3. In section 2 we also discuss S-BPM as BPM-for-All approach due to its structural similarity to natural language sentences and possibility for direct execution enabling immediate user experience of process models. In section 3 the suggested proposals redesigning current BPM education recognize cultural factors relevant for learning. Section 4 concludes the paper summarizing the findings and upcoming research.

2 Challenges of S-BPM Facilitators

Subject-oriented Business Process Management (S-BPM) [5,6] provides means for both, early and continuous stakeholder involvement in organizational development, and seamless (automated) execution of validated business processes. The activity bundles of the open S-BPM development cycle enable continuous organizational change under direct control of stakeholders. These aspects have not been implemented in this way and are novel in BPM. With respect to education they are likely to require shifting mind sets due to the prevalent functional perspective on organizations - for a comparison of modeling techniques see ([5], ch. 14).

2.1 Function Follows Communication

Organizational development is increasingly driven by business complexity and dynamics, as the term dynaxity [20] reveals. Business Process Management is one of the major methodological frames for operating businesses in dynamic and complex situations, with business process models at disposition [21]. While traditional approaches to modeling are mainly driven by functional decomposition of value chains, S-BPM considers behavior primarily emerging from the interaction between active system elements termed subjects, based on behaviors encapsulated within the individual subjects.

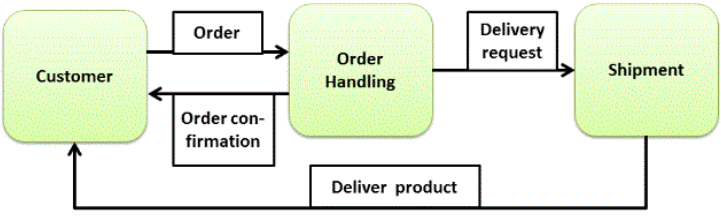

Fig. 1. A Subject Interaction Diagram for order handling

Figure 1 shows 3 subjects (Customer, Order Handling, Shipment) and their interactions (order, order conformation, delivery request, deliver product) identified for handling customer orders to finally ship a product to a customer. The representation is termed Subject Interaction Diagram, allowing to overview business operations in terms of subjects and their interactions for processing customer orders, while abstracting

from their behavior as active organizational elements. Customer, Order Handling, and Shipment are not further in detailed in Subject Interactions Diagrams.

As in actual business operation, subjects as active elements operate in parallel and can exchange messages asynchronously or synchronously – processes are autonomous, concurrent behaviors of distributed entities. A subject is an abstraction of behavior referring to a role an active entity is able to play through performing actions. The entity can be a human, a piece of software, a machine (e.g., a robot), a device (e.g., a sensor), or a combination of these, depending on the purpose of modeling. Most important for parallel operation, subjects can execute local actions that do not involve interactions with other subjects, e.g., calculating costs (subject Order Handling). Besides performing actions, each subject exchanges messages with other subjects using the operations send and receive message.

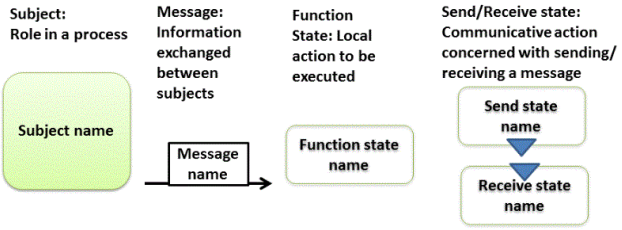

Fig. 2. Set of diagrammatic elements capturing subject behavior in S-BPM

The interaction capability of subjects completes the set of core diagrammatic elements in S-BPM (see Figure 2), as used in two types of diagrams representing a business process completely: Subject Interaction Diagrams (SIDs) like the one in Figure 1 and Subject Behavior Diagrams, as given for Customer and Order Handling in Figure 3. SIDs provide the global view of a process, including the subjects involved and the messages they exchange. The SID of an ordering process is shown in Figure 1. Subject Behavior Diagrams (SBDs) provide the internals of individual subjects. They include sequences of states representing local actions and communicative actions including sending messages and receiving messages. State transitions are represented as arrows, with labels indicating the outcome of the preceding state. In Figure 3 the local view is provided partially for Customer and Order Handling (SBDs), comprising the interactions required for overall task accomplishment.

From a procedural perspective, in S-BPM business operations are constructed along defining relevant

- Subjects involved in a business process, e.g., Customer, Shipment in Figure 1,
- Interactions occurring between the identified subjects, e.g., order in Figure 1,
- Messages the specified subjects send or receive in the course of each interaction, e.g., To: Order Handling order in Figure 3 for the subject Customer,
- Internal behavior of the individual subjects, as shown for Customer and Order Handling in Figure 3, and the
- Business objects (data) exchanged, e.g., order confirmation in Figure 1, that need to be detailed in terms of their structure for processing and implementation purposes.

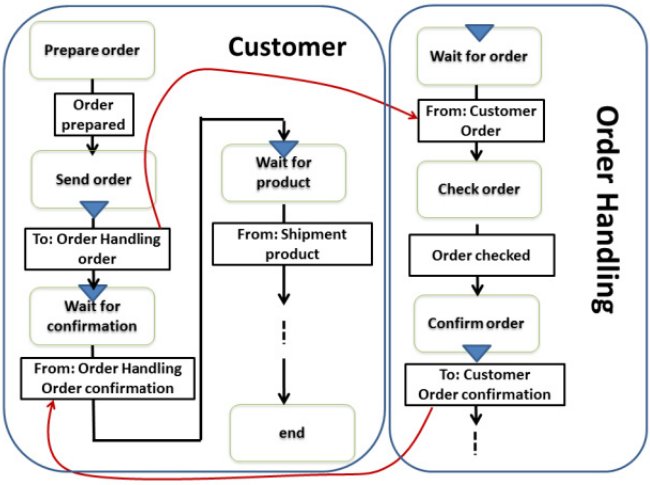

Fig. 3. Intertwined Subject Behavior Diagrams 'Customer' and 'Order Handling'

The description of a subject determines the order in which it sends and receives messages and performs internal functions. Its behavior thus defines the order in which a subject processes data, finally, a business is operated, driven by communication and followed by subject-internal functional task accomplishment.

2.2 S-BPM = BPM-for-All?

The S-BPM notation can be utilized to actively involve business stakeholders in organizational developments, as already demanded for effectively handling increased complexity and dynamics in business when using BPM models [7]. However, their active participation and degree of involvement heavily depend on their capability to provide relevant inputs for modeling or model by themselves processes. As shown above, the design of the S-BPM notation aims reducing complexity. In fact, the diagrammatic elements correspond to elements used by humans in natural language (see also [5,6]). The structure of sentences in natural language corresponds to S-BPM's notational convention. We can specify handling of orders along the fundamental sequence s*ubject – predicate - object*, both, on the abstract process layer addressed by SIDs, and the behavior layer represented through SBDs:

- Global view (SID): A Customer (*subject*) sends (*predicate*) an order (*object*) to Order Handling. Order Handling (*subject*) sends (*predicate*) an order confirmation (*object*) to the Customer (i.e. another S-BPM subject).
- Local view (Customer SBD): A Customer (*subject*) prepares (*predicate*) an order (*object*). The Customer (*subject*) sends (*predicate*) an order (*object*). The Customer (*subject*) waits (*predicate*) for the order confirmation (*object*), and so forth.

'Subject' is not only used to denote the constituent of natural language sentences, but also as a term encapsulating behavior specifications including activities (predicates).

Predicates either represent dedicated problem solving functions, or denote sending/receiving messages. The latter are constituent for S-BPM, function following communication: A subject, e.g., Customer, needs to communicate to get a process done, specified in SIDs (see Figure 1). Hence, before functions can be detailed, the communication pattern needs to be set up and clarified. The focus on interacting roles and systems leads to a complete control and data flow specification of a process. Consequently, each model can be validated and executed reflecting interactive behavior (lower part of the screen in Figure 4).

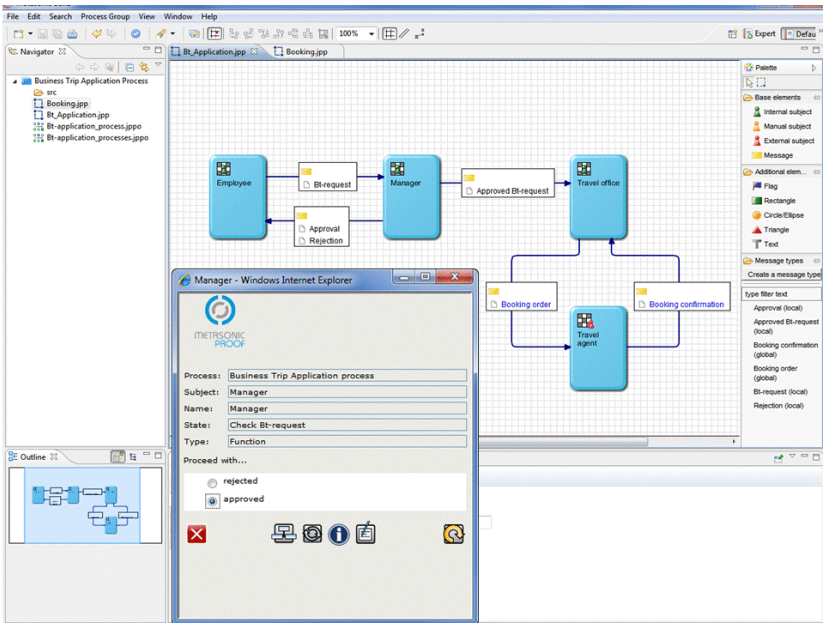

Fig. 4. Creating immediate User Experience

3 Facilitating S-BPM Education

In this section we follow frequently discussed issues in progressive education (http://mariamontessori.com/mm/?page_id=551) abbreviated MM-FDI in the following. The relevance to S-BPM education is evident in the respective heading of each subsection. After providing Montessori-specific inputs to each item we apply Montessori's method of analysis [9] for contextualizing S-BPM issues. Inputs have also been taken from language learning [17] and creating meaningful representations [18].

What Should be the Difference in S-BPM Education and Current BPM Education? To this respect we could learn from the difference between Montessori and traditional education – MM-FDI: 'For children six and under, Montessori emphasizes learning through all five senses, not just through listening, watching, or reading. Children in Montessori classes learn at their own, individual pace and according to their own

choice of activities from hundreds of possibilities. They are not required to sit and listen to a teacher talk to them as a group, but are engaged in individual or group activities of their own, with materials that have been introduced to them 1:1 by the teacher who knows what each child is ready to do. Learning is an exciting process of discovery, leading to concentration, motivation, self-discipline, and a love of learning.

Above age 6 children learn to do independent research, arrange field trips to gather information, interview specialists, create group presentation, dramas, art exhibits, musical productions, science projects, and so forth. There is no limit to what they can create in this kind of intelligently guided freedom. There are no text books or adult-directed group lessons and daily schedule. There is great respect for the choices of the children, but they easily keep up with or surpass what they would be doing in a more traditional setting. There is no wasted time and children enjoy their work and study. The children ask each other for lessons and much of the learning comes from sharing and inspiring each other instead of competing with each other.'

Accordingly, learners starting with (S-)BPM should be supported with case studies demonstrating the idea and scope, e.g., service production in organizations. After watching and listening they should articulate their observations using their favorite way of expression. Following the flow of learning advised by Cornell [4] and utilized by Montessori 'Induce Excitement – Perceive in a Focused Way – Immediate Experience – Share Experience', the individual pace is followed by interaction. Essential for individual and group activities is material that needs to be introduced to them 1:1 by the facilitator. Hereby, the readiness of learners in terms of being in a sensitive period needs to be taken into account for the learning processes. The sensitivity for BPM should be fostered by the considered universe of discourse being close to the actual work environment of the learners, and the prepared material (environment). As learners feel motivated, they are able to listen in a focused way and discover novel information. It facilitates (re-)call and application of knowledge.

After getting confident with (S-)BPM, 'independent research', such as field trips or interviews to collect information, group presentations and collaborative experience design help to deepen knowledge. Hereby, facilitators need to respect the choices of the learners, as this freedom pays back in terms of knowing. S-BPM, in contrast to function-oriented BPM, has the focus on actors as active systems, their role-specific behavior and communication. Consequently, S-BPM allows getting into the flow of learning through role playing, sharing perceived behavior, and triggering reflection based on feedback of the peer group (rather than the facilitator).

For BPM Bandara et al. [1] have identified not only a lack of educational materials and facilitators. They have recognized mostly high-level overviews of BPM topics rather than in-depth learning resources. Such a finding induces further work to generate awareness for different types of BPM. It could become part of open initiatives, such as the Foundry for learning and teaching [11]. While still evolving as a collaborative virtual space for students to learn the concepts of BPM in combination with Service-Oriented Architectures (SOA), practicing skills using real-world examples is a core concept. Learners interact with their peers across classes, institutions or even disciplines, hereby generating BPM material.

Further inputs could stem from experiences with motivation labs (cf. Caporale et al. [3]) to excite potential learners, or from gamification with respect to simulation (cf. Vuksic et al. [20]) conveying possible impact when executing BPM models. S-BPM could then either be perceived through multimodal access facilities, or Social Media sharing inputs and reflections. The latter could also trigger communication skill development, as recently demanded by Bergener et al. [2].

Do We Need All Stakeholders Involved In A Process? Montessori had multi-age classrooms which have been argued for – MM-FDI: 'Multi-age classrooms afford us the luxury of adapting the curriculum to the individual child. Each child can work at his or her own pace, while remaining in community with his or her peers. In addition, the multi-age format allows all older children to be the leaders of the classroom community – even those children who may be shy or quiet.' This finding helps educating in S-BPM in progressive environments, both, from an organizational and individual perspective:

- S-BPM is oriented towards business stakeholders and active systems relevant for an organization. Hence, a process description is not complete unless all subjects have been identified.
- Even for each stakeholder role there should be more than one person involved. It allows capturing the variety of behavior specifications within the scope addressed by each subject.
- Experienced business stakeholders might model behavior in a differentiated way, e.g., distinguishing routine versus non-routine behavior, strict rules versus non-regulated behavior, in contrast to non-experienced business stakeholders.
- From the perspective of organizing learning processes the facilitator could profit from different levels of competences and experiences, as they might trigger corresponding learning designs, expressed through material and navigation paths of the learning environment.

The latter issue indicates the generation of meta-data that could be used for navigating resources, as shown by Neubauer et al. [10] who related content tags for structuring navigation to (S-)BPM content elements. Latest developments in web navigations go even a step further, as WebML's enriched navigation model explicitly addresses the flow of interaction in IFML (Interaction Flow ML - www.ifml.org). Such structures support the development of agile communication skills [2].

Is S-BPM Good For Stakeholders Without Any Modeling Or Process Experience? Montessori has been questioned with respect to children's learning (dis)abilities - MM-FDI: 'What about gifted children? Montessori is designed to help all children reach their fullest potential at their own unique pace. A classroom whose children have varying abilities is a community in which everyone learns from one another and everyone contributes. Moreover, multi-age grouping allows each child to find his or her own pace without feeling "ahead" or "behind" in relation to peers.'

Looking to organizations, their main asset is the set of stakeholders contributing to its wealth [12]. Since S-BPM considers stakeholders and their interaction to be the

key for modeling and organizational development, each stakeholder needs to be aware of individual and organizational behavior. In particular,

- The barrier to modeling is low, as it only requires natural language capabilities for stakeholders to contribute to modeling,
- Sticking to the structure of simple sentences (subject-predicate-object) an entire business process can be described from a stakeholder perspective, thus enabling complete task descriptions.
- Memory load in the course of modeling has been minimized – once a subject can be named, each level of competence can be expressed in terms of doing, sending and receiving messages.
- Models can easily be shared, as the behavior abstraction is intelligible in the given universe of discourse.
- Various competence levels can be mapped to subject behavior description and supported dynamically.

Competence using adequate means of expression could become crucial in education, referring to Montessori's observation of the different skill levels for diagrammatic and text expression [9]. For getting acquainted to learning environments, such as the Foundry [11], these systems need to be enriched with articulation tools facilitating interaction and meaningful (re)presentation [18].

Are S-BPM Stakeholders Successful Later In Organizations? MM-FDI: 'Are Montessori children successful later in life? Research studies show that Montessori children are well prepared for later life academically, socially, and emotionally. In addition to scoring well on standardized tests, Montessori children are ranked above average on such criteria as following directions, turning in work on time, listening attentively, using basic skills, showing responsibility, asking provocative questions, showing enthusiasm for learning, and adapting to new situations.'

Although no long-term studies are available so far, the (BPM) education towards behavior encapsulation combined with communication skills to articulate and share qualify operational stakeholder for participating in S-BPM model reflection and adaptation. In case educational environments contain context-sensitive content, such as proposed by Mircea [8] intertwining (S-)BPM with SOA (Service-Oriented Architecture), the implementation of organizational developments could be facilitated.

Is S-BPM a Dogma? This question comes close to the MM-FDI: 'Are Montessori schools religious? No. Montessori educates children without reference to religious denomination. As a result, our classrooms are extremely diverse, with representation from all peoples, cultures and religions.' Analogously, organizations comprise a variety of stakeholders that need to be understood in their diversity, from their background and attitude towards (S-) BPM. Hence, S-BPM, both in operation and education, is considered a paradigm, enforcing to look from a certain perspective on operating a business. In order to facilitate understanding support on a meta(-data) level, such as enabled by IFML (www.ifml.org) or ontology-based content navigation [10] can be provided.

Is S-BPM Education A Franchise? Who Can Educate S-BPM? MM-FDI: 'Is Montessori a franchise? Who can open a Montessori school? The term Montessori is not trademarked and anyone, regardless of training, experience or affiliation can open a "Montessori" school. It is essential that parents researching Montessori act as good consumers to ensure the authenticity of their chosen program.' Since a reliable baseline needs to be provided for organizations and educators, reference material to S-BPM and its education has been provided by Fleischmann et al. [5]. It is available as open text in a learning platform at www.i2pm.net. Although S-BPM has been integrated into BPM study programs at several university (KIT Karlsruhe, FH Fulda, JKU Linz, FH Joanneum Graz etc.), so far no comparative studies with respect to curriculum embodiment similar to Bandara et al. [1] or teacher qualification are available.

Who accredits S-BPM entrepreneurs? MM-FDI: 'Who accredits Montessori schools? Dr. Montessori founded the Association Montessori Internationale in 1929 to preserve her legacy. AMI ensures that Montessori schools and teachers are both well-grounded in the basic principles of the method and ready to carry those principles forward in the modern educational world. AMI offers teacher training and conferences, approves the production of Montessori materials and books, and, through their AMI-USA branch office, accredits schools.'

So far, S-BPM educational and development activities have been bundled in the Institute for Innovative Process Management (www.i2pm.net) under the umbrella of the S-BPM Open Initiative. This learning community not only facilitates exchanging S-BPM knowledge but also is intended to attract entrepreneurs, aligning with standardization bodies, such as OMG moving towards IFML (www.ifml.org).

Isn't S-BPM Just A Modeling Instrument? MM-FDI: 'Isn't Montessori just a preschool? Montessori schools may be best known for their programs with young children, but the underlying educational method describes programs for students up through high school.'

More than in other BPM approaches modeling is the core activity in S-BPM, thus models forming the baseline for articulation, refinement, and sharing business process knowledge. Since validated models can be executed automatically, allowing direct user experience, stakeholders need to be guided by means such as the motivation lab [3], tabletop modelling (www.metasonic.de/touch), or socially networked content (cf. Paik et al. [11]). Domain-specific teasers can be ontological navigation structures [10], agile communication skill trainings [2], and organizational simulation games [20].

If Stakeholders Are Free To Choose Their Own Style Of Work, How Can Be Ensured That An Organization As A Whole Works? MM-FDI: 'If children are free to choose their own work, how do you ensure that they receive a well-rounded education? Montessori children are free to choose within limits, and have only as much freedom as they can handle with appropriate responsibility. The classroom teacher and assistant ensure that children do not interfere with each other, and that each child is progressing at her appropriate pace in all subjects.'

It is the nature and origin of S-BPM that each participating stakeholder is likely to represent at least one subject in the course of modeling. Scoping a business process is

achieved by role-specific stakeholder or active systems behaviors, respectively. Once business stakeholders use standard sentence semantics processes can be elicited and represented. For the latter besides tasks the interaction perspective using send and receive for data exchange need to be recognized. Running a business process operation beyond validation and automated execution of models might require organizational simulation games [20], targeting to avoid side effects when organizational structures become operational. Additionally, they could trigger readiness for change.

S-BPM Education And Applications Do Not Look Like Regular BPM Education And Applications. Where Are The Functions? Who Is In Control? MM-FDI: 'Montessori classrooms don't look like regular classrooms. Where are the rows of desks? Where does the teacher stand? The different arrangement of a Montessori classroom mirrors the Montessori methods differences from traditional education. Rather than putting the teacher at the focal point of the class, with children dependent on her for information and activity, the classroom shows a literally child-centered approach. Children work at tables or on floor mats where they can spread out their materials, and the teacher circulates about the room, giving lessons or resolving issues as they arise.' In S-BPM, there is no need for central control, rather sensitivity to model individual behavior in terms of communication and function. Each stakeholder is in charge of his/her individual task including the flow of interaction (cf. IFWL). In order to complete a learning cycle, specifications need to be put into an S-BPM execution engine, regardless which way the S-BPM models have been constructed.

Is S-BPM as Academically Rigorous as Traditional BPM? MM-FDI: 'Are Montessori schools as academically rigorous as traditional schools? Yes; Montessori classrooms encourage deep learning of the concepts behind academic skills rather than rote practice of abstract techniques. The success of our students appears in the experiences of our alumni, who compete successfully with traditionally educated students in a variety of high schools and universities.'

S-BPM has been integrated into curricula and become a topic of peer-reviewed research activities – see www.S-BPM-ONE.org. In this way, not only study but also development and research programs contribute to rigorous academic education. Momentum will be gained when these programs are aligned with the latest OMG developments towards standardizing IFML (www.ifml.org).

Since S-BPM Models Emphasize Non-Centralized Control, How Are Stakeholders Adequately Prepared For Real-Work Work Later on? MM-FDI: 'Since Montessori classrooms emphasize non-competitiveness, how are students adequately prepared for real-life competition later on? Montessori classrooms emphasize competition with oneself: self-monitoring, self-correction, and a variety of other executive skills aimed at continuous improvement. Students typically become comfortable with their strengths and learn how to address their weaknesses. In older classes, students commonly participate in competitive activities with clear "winners" (auditions for limited opera roles, the annual spelling bee, etc.) in which students give their best performances while simultaneously encouraging peers to do the same. It is a healthy competition in which all contenders are content that they did their best in an environment with clear and consistent rules.'

It is the set of interfaces (send, receive) that enables connecting business operation to stakeholder behavior (SBDs). Moreover, using SOA on the level of functional activities in S-SBDs ensures compatibility with organizational implementation architectures (cf. [8]). With respect to self-organized change management S-BPM models can be constructed or updated at run time, thus allowing stakeholders to learn and share on the fly. Each stakeholder is responsible for encoding his/her competence in terms of individual behaviour that could become effective on the organizational layer. This process can be started anytime, structuring organizational change according to the progressive learning cycle of Cornell [4].

4 Conclusions

When introducing a novel paradigm in Business Process Management, in particular Subject-oriented Business Process Management, educators should be aware of the required mind shift for learners. Instead of focusing on function flows the interaction among business stakeholders is at the center in S-BPM. Inputs from progressive educators should help facilitating the acquisition of novel concepts while establishing stakeholder-driven organizational development. Once business stakeholders have learnt to articulate ideas and proposals effecting business processes, they influence the operational agility of their organization directly. By that time, S-BPM has advanced from a guided to a mentally anchored concept.

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