Enhanced Stakeholder Socialization using Common Language in Agile BPM

Living business processes models instead of rigid documentations

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Abstract- **Business Process Management (BPM) and its supporting systems (BPMS) focus on business processes without sufficiently taking all stakeholders into account. Instead, the focus is put on the modeling and execution of business processes. Rigid business process documentations, long update cycles and insufficient understanding of business process models are the results. In this paper, we present how to use common language to simplify and further develop existing methods aiming at "living" business processes instead of rigid documentations. We enhance the innovative agile method BPM(N)$^{Easy1.2}$, which includes a supporting mobile application called BPM Touch. This combination allows the powerful usage of common language with BPM and enables stakeholders to better "socialize" with one another in the context of business processes and their management. The application of the method is illustrated with the help of a public administration sample. The paper concludes with a summary and outlook on further research.**

Keywords-computational society architecture; business process; common languagey; agile bpm.

I. INTRODUCTION

Business Process Management is becoming more and more an important discipline in organizations. High dependencies and fast moving changes of the business processes and general business conditions are reasons behind this trend [1]. Because of this importance, many BPM approaches and tools have been developed by different researchers and software companies. These BPM approaches can be categorized in traditional and agile approaches. Both categories deliver frameworks which describe how to handle current BPM challenges, e.g., [2][3][4][5]. In general, the approaches cover all phases of a business process lifecycle, starting with modeling business processes, analyzing and automating through monitoring and optimizing them. Besides the BPM approaches, a lot of BPM systems are available. Only on the German market, Fraunhofer [6] investigated over fifty different BPMSs which support BPM experts, e.g., in modeling or automating business processes. Nowadays, these approaches and tools are increasingly used to set up a successful technical BPM environment in companies. Aside from positive effects, such as measuring Key Performance Indicator (KPI), monitoring of the executed business processes [7], and efficient automated workflows [8], this setup also brings along several challenges. Failing BPM trainings [9] or outdated business process documentations [10] are well-known examples. Furthermore, the interpretation of business process models is affected by the specific knowledge of each person [11]. These problems arise because of complex implementations and long update cycles or approaches, which are for technical BPM experts only. In the end, the involvement of all stakeholders breaks down. This leads to rigid models instead of "living" business processes within a successful socialized BPM philosophy. From the authors' point of view, a promising option and solution out of this scenario is the application of agile methods and corresponding tools. Agility is defined as a successful balance between flexibility and robustness [12]. Given samples, e.g., out of the software engineering branch show how successful the usage of agile methods can be. Based on the Agile Manifest [13], which describes rules for interacting in an agile manner, methods such as Scrum [14] or Extreme Programming [15] are applied in a lot of software projects to implement new products successfully. The results of this application are, e.g., decreased costs and higher user acceptance. Also in the branch of BPM agile methods are applied more and more. BPM(N)$^{Easy1.2}$ [4] is one example. BPM(N)$^{Easy1.2}$ describes a combination between BPM and the business process modeling language BPMN 2.0 with the ambition of providing a method which makes the traditional phases of BPM [2] – modeling, analyzing, execution, optimization – more agile and easier.

However, there are still challenges which are not solved in a satisfying way. For instance, synchronization and interaction between all stakeholders are fraught with misunderstandings [16]. Interaction describes the collaboration between the stakeholders in general, synchronization the explicit knowledge update of each other c.f. Mevius et al.[17]. Therefore, business processes are often inconsistent or give a biased view on the reality. Another problem is that the high amount of information and needs regarding a business process cannot be captured without expending a lot of time and effort [18]. But, as Mayr [19] mentioned, the aim should be to "more act, less plan" business processes. In addition, Hauser [20] speaks about "five social feelings", which have to be included for successful business process management, e.g., the feeling of

anger can be a positive or negative driver of action within a business process activity.

To enable agile BPM to counter these challenges, this paper introduces the application of common language as fundament of methods. Furthermore, this paper describes how existing approaches can be improved with the help of common language and enabled for Social Computing. Therefore, common language defines both, the language which is used for a "normal" conversation and the language which is used for an expert talk [21], e.g., discussion about a parking slot approval by the public administration. Furthermore, from the authors' perspective, Social Computing describes the stakeholder (human) interactions, which are supported by different Information Technology (IT) systems. Referencing to [22], stakeholders use IT to generate new content together, e.g., new business processes.

The paper is structured as follows: Section 2 describes the evolution towards Social Computing and introduces a Social Computing architecture. Section 3 applies this architecture and analyses related work regarding the usage of common language in BPM and other related disciplines. In Section 4, the application of common language in agile business process management is described by means of the project "Smart City Constance". Section 5 introduces the existing BPM(N)$^{Easy1.2}$ method and demonstrates where and how common language can be applied within an agile method. Furthermore, a tool support is illustrated. Section 6 presents a conclusion and outlook.

II.   SOCIAL COMPUTING

Social Computing empowers individual stakeholders independent of their IT skill level [22]. For instance, stakeholders are enabled to share their creativity or expertise with the help of (Web) applications. Fig. 1 displays the different layers of a Computational Society Architecture.
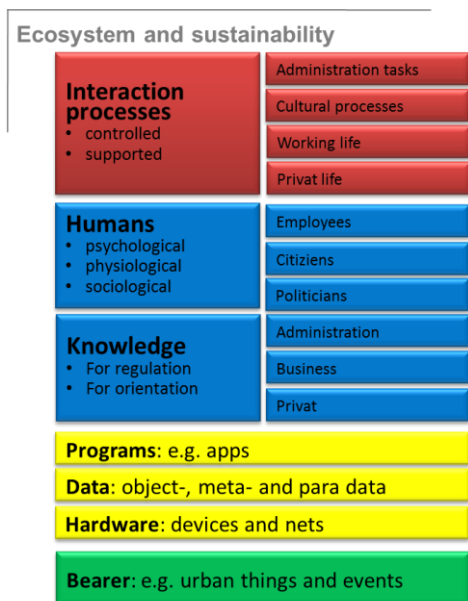

Figure 1. Computational Society Architecture

Furthermore, social interaction and content sharing are becoming more and more important. Pure technique-focused requirements lose in value. First approaches for this shift can already be found in [23]. Ortner [23] describes a matrix, which can be used to capture all requirements for an application system, e.g., business process applications. These requirements can be technical as well as economic or human-oriented.

Based on initial events, IT (c.f. yellow layers in Fig. 1) provides supporting technologies. With the help of these technologies all stakeholders (humans) can interact and synchronize themselves regarding knowledge and the interaction context. Application systems, which are based on this architecture (Fig. 1) depicts how humans, technique and organization work together [24].

The following sections focus on the ecosystem of agile business process management.

III.   RELATED WORK

The direct linking of the (human) language with digital applications is a fundamental objective of language-based computer science [21]. If an application system, e.g., a complex workflow application or a customer relationship system, is introduced or developed individually, the requirements of the future end users must be collected and described as completely as possible from a technical point of view [25]. The aim should be the attainment of a mutual understanding of all stakeholders: end users, BPM, IT experts and management.

This section links to existing work selected from BPM (-related) disciplines, in the context of enhancing communication between as well as understanding and involving all stakeholders.

Moody [26] defined principles for designing cognitively effective visual notations, aiming for an optimized human communication and problem solving. For instance, the principle of "Perceptual Discriminability" describes that different symbols should be strictly distinguishable from each other. In [27], Evans introduces the approach of "Domain Driven Design" in which the goal of integrating the user directly in the conception and design phase is claimed. In addition to formulating software requirements, the end users are also involved in the design and modeling phase of the software. On one hand, this increases the understanding of the IT experts for the domain and its issues, on the other hand, end users are introduced in the process early on and are quickly able to detect design errors or misunderstandings. User stories, which are formulated by the end users, serve the purpose of describing the future software system. In general, a user story describes a requirement from the user's perspective. To develop uniform user stories to different patterns, formulations such as "As a <user role>, I <want/need/can/etc.> <goal> <reason> " can be used. In this context, communication counts more [28] than the actual software requirement.

Another approach is called Very Lightweight Modelling Language (VLML) [29]. This approach follows the idea of combining the expressive power and ease of natural language, rapid and easy sketching and functions to structure, analyze and validate models. Even these approaches [26][27][29] extend the possibilities, they do not provide an entire support of common language.

Within quality management, a continuous improvement and involvement of stakeholders is required. For this purpose, different approaches, such as total cycle time, Kaizen and Lean Sigma have been developed [30]. For instance, Lean Sigma leads an improvement of the product and process quality, on one hand, and, on the other hand, it increases the performance of business processes. In order to involve stakeholders, audits, which are conducted internally or externally, are used to interview the user directly. As a result of these interviews, the quality management can interact to improve the quality of, e.g., an automated production process. Nevertheless, usually, the audits are too rarely held so that the involvement of the stakeholders are too less.

Schnabel et al. [5] describe how stakeholders can define business process requirements effectively. Hereby, the approach suggests a modeling language (Language for Lightweight Process Modelling (LLPM)), which keeps away (technical) information from the participants, without losing the opportunity of business process automation. Concepts of representation and visual composition are used by Antunes et al. [31]. The approach focuses on the perspective of end users while the modeling of business processes. For instance, business process activities can be enriched by adding annotations in form of text or pictures to a business process element. This leads to an enhanced understanding of the models. Another method [33] suggests the connections of additional information as natural language artifacts to business processes elements. Within this artifact, the identifier label of a business process activity is mentioned and connected. By providing this "common understandable" information, a higher integration of employees, especially of the operative business (non-IT-specialists) can be reached. Furthermore, Bruno et al. [34] introduce a method, which focuses on Social Media integration in BPM. Hereby, they use different aspects, such as real-time collaboration to support the activities of BPM. Rigid structures, which are identified in, e.g., models of business process or role models, can be relaxed. However, especially in agile environments even higher flexibility is required, e.g., not only the feedbacks of all stakeholders have to be collected frequently. Moreover, automated business processes need to be developed and adapted very flexible.

Last, but not least, there are informal options for communicating with stakeholders defined and implemented by industry players [26]. Among these, for instance, existing notation standards as the modeling language Business Process Modeling and Notation (BPMN 2.0) [35] are

modified for a specific goal. One approach comes with a BPM suite called Axon.ivy [36]. Within the tool, the BPMN 2.0 standard elements can be enriched in different ways, e.g., by adding user interface drafts directly on an activity. Furthermore, Barker [37] has defined a natural-language-based normative language which is used by Oracle modeling tools.

All sketched approaches allow a far-reaching usage of BPM. However, there is still a critical gap between stakeholders e.g. end users and IT experts. Moreover, the stakeholder involvement in BPM projects and their success is still not satisfying, c.f. study to BPM projects [18]. During the next sections it will be illustrated how the interaction and synchronization of all stakeholders, especially involving end users, can be enhanced within existing methods by using common language.

IV. SCENARIO

A business process model has been chosen to demonstrate the active usage of common language with agile BPM. The business process is taken from a real business process model repository of the innovative project "Smart City Constance". The project deals with Social Computing in the context of public administration. The business process model describes the sequence of activities which have to be executed to approve a request for reserved car parking. Furthermore, the involved stakeholders each bring along different knowledge and motivation, e.g., a citizen wants to have a parking space as soon as possible, but the public authority has to follow the predefined business process. The scenario describes two iterations of capturing, modeling the business process and involving all required stakeholders. The business process model is modeled with BPMN$^{Easy1.2}$ and executed on the mobile application BPM Touch [38]. BPMN$^{Easy1.2}$ is a business process modeling language which uses BPMN 2.0, but only with a specific element set. In addition, it is possible to add some media files, e.g., video sequence to the modeled concepts. Table I illustrates an extract of the first iteration of capturing information, which is required for an initial version of a business process model.

TABLE I. EASY CAPTURE SHEET IN ITERATION 1

1. Iteration	Enriched with common language media files…			
BPMNEasy1.2 modeling element	Doc	Image	Video	Audio
Entering request		X*1	X*2	
Enriching request info	X*3			
Informing requester			X*4	

The "Easy Capture Sheet" lists all BPMN$^{Easy1.2}$ elements (table I, column 1). For instance, the first activity "Entering request" describes how a stakeholder has to enter the required data for a car parking slot request. Instead of using textual business rules or complex model constructs, the BPMN$^{Easy1.2}$ element is enriched with common language media files. The attached image (table I, X*1) and the connected video sequence (table I, X*2) are used to explain the activity in detail. In addition to the description of the specific activities, the executing roles are added directly as a property to each activity. Furthermore, the color of the activities presents directly which kind of activity the stakeholders have to execute: manual (green form), semi-automated (blue form) and automated (red form). After finishing the "Easy Capture Sheet", the modeled business process can already be executed (e.g. in a test run) by the responsible stakeholders. As stated in the agile methodology, following each iteration, a useable "product" must be available (although it is not completely finished). Before and after the execution, feedback was collected from the stakeholders. One feedback was that after entering the data, there are eight alternatives possible depending on the branch, location and type of the parking space request. The feedback is documented in the "Easy Capture Sheet" again. Table 2 shows an extract of the result of the second iteration.

TABLE II. EASY CAPTURE SHEET IN ITERATION 2

2. Iteration	Enriched with common language media files...				Feed-back
BPMNEasy 1.2 modeling element	Doc	Image	Video	Audio	
Entering request		X*1	X*2		
◇X◇				X*3	More alter-natives possible
Enriching request info				X*4	
Informing requester			X*5		
...					

Distinguishing from the first iteration, a new element in form of an exclusive gateway (XOR) has been added (table II, row 3). A XOR defines that within a business process instance only one path can be taken [35]. Instead of

modeling all possible alternative business processes paths graphically, the alternatives have been captured in common language. After this modification, the business process was executed again.

The required information and data have been captured according to an agile method, e.g., to prove the correctness, stakeholders interacted and communicated with each other closely. In the following section, the usage of common language with an agile environment will be described in detail.

V. ENHANCED STAKEHOLDER SOCIALIZATION USING COMMON LANGUAGE IN AGILE BPM

According to Schienmann [37], three language types can be distinguished as follows:

(1) The language of stakeholders (common language) as a problem-oriented language to communicate the requirements to an application system/business process, which has to be developed.

(2) The language of BPM experts, e.g., diagrams languages such as BPMN 2.0, which are solution-oriented to model the requirements of the stakeholders with respect to the IT experts.

(3) The language of IT experts, e.g., programming languages such as Java in order to realize, e.g., an automated business process.

This paper focuses in particular on human orientation and the usage of common language. For instance, according to [38] the quality of the (graphical) representation of business process models depends on the modeling experience of the stakeholders. Differences lead to errors and misunderstandings if there is no enhanced way of communication and involvement. Corresponding to Ortners medial-real world model [39], this problem can be solved by improving the connection between the medial and real world. Within the medial world, requirements are defined which will be executed in the real world and monitored by the medial world again. The underlying architecture of Computational Society Architecture, in which stakeholders and IT systems are combined, has been depicted in Fig. 1.

The following sections describe how common language can be used to improve the collaboration and involvement of all stakeholders in agile environments.

A. Agile BPM

Various methods introduce agile BPM, e.g., [4][5]. In the this section, the agile method BPM(N)$^{Easy1.2}$ is used to present how and when during the methodology common language can be very helpfully applied. BPM(N)$^{Easy1.2}$ consists of a modeling language (BPMN$^{Easy1.2}$), an approach (which explains, e.g., the interaction between different stakeholders) and of a tool called BPM Touch. BPM(N)$^{Easy1.2}$ follows the method term definition of Ortner [41].

This combination allows the usage in all steps of Business Process Management – from business process capturing and modeling through analyzing, automation/execution and monitoring without losing its focus on integrating all stakeholders. Furthermore, it is possible to cover all layers of the Computational Society Architecture (Fig. 1).

- Language BPMN$^{Easy1.2}$

The elements set (graphic elements which can be used for modeling) of BPMN$^{Easy1.2}$ specifies the BPMN 2.0 element set to a compact number of intuitive elements. BPMN$^{Easy1.2}$ admits only elements which are generally known in common language – simple events (start, end, intermediate), simple gateways (AND, OR) and tasks/activities. For instance, there is an AND symbol which corresponds to the common understanding of "and". In addition to each graphical element, media files can be added. For example, it is possible to add a video sequence to an activity to describe it in more detail. The compression at the level of modeling does not affect the XML Schema Definition (XSD) of BPMN 2.0. Every BPMN$^{Easy1.2}$ model is stored in the form of BPMN 2.0. The BPMN 2.0 Data Object is used to keep a record of possible media files [4].

- Approach

Two connected cycles build the path of interaction and synchronization between all stakeholders. One cycle is used to capture or enhance business process models such as BPMN$^{Easy1.2}$. At the beginning of an iteration, BPMN$^{Easy1.2}$ models are created. All stakeholders define the sequence of the captured activities, gateways and events. The BPMN$^{Easy1.2}$ models are especially used to design the flow in general. If necessary, e.g., to describe an activity more in detail or to store a complex business rule, media files are used to add the additional information. All information is recorded in common language which makes it understandable for everybody. The modeled and formulated requirements can be the basis for modeling and implementation of enriched BPMN 2.0 business processes. This enrichment can lead to an automated workflow application. Therefore, the responsible stakeholders select a BPMN$^{Easy1.2}$ model and a number of elements to work on. Parallel to the more technical work, stakeholders can directly start to create documentations or trainings. Within the flow path (within the iteration) quality gates are included. These quality gates are used to ensure that all stakeholders approve that the result, e.g., an automated business process, corresponds with the BPMN$^{Easy1.2}$ models and captured media files (synchronization and acceptance). In addition, the second cycle describes the steps of analyzing/execution and optimizing. Predefined key performance indicators can be used for evaluating the stakeholders' feedback, which have been collected within the business process execution. Immediately after the acceptance, new elements are captured or selected.

- BPM Touch tool

The mobile application BPM Touch follows innovative usability concepts. The focus is on user friendly features and the usage of mobile potentials. The modeling and user interface supports a revolutionary option for modeling business processes on mobile devices. For instance, after a business process has been selected by a simple touch on the sidebar, the business process model appears and can be directly edited. The flexible navigation is completed by a menu bar on the top, which provides basic functions to, for instance, create or save a new business process and by a dynamic pie menu to model a process flow very rapidly. Furthermore, media files can be assigned to every element of BPMN$^{Easy1.2}$. Audio files, which record, e.g., an oral description of an activity, video sequences, images and files, can be attached. Therefore, BPM Touch automatically loads the appropriate device, e.g., digital camera for video sequences. In addition, a "share"-button allows the direct distribution of BPMN$^{Easy1.2}$ models to all stakeholders. For instance, the models can be exported to Microsoft PowerPoint for summarizing the complete documentation into a PowerPoint presentation. Summarizing the BPM(N)$^{Easy1.2}$ method is based on the following foundations (c.f. [16]) :

- Common language, modeling languages, and programming languages

The common language is used throughout the entire business process management to communicate with all involved stakeholders. For instance, it can be necessary to transfer a business process model into a programming language, for example, to implement an automated workflow application. This is done by using agile concepts and focusing on interaction and synchronization in common language.

- Medial and Real World

Due to the iterative and incremental approach, in the context of BPM(N)$^{Easy1.2}$ the medial/digital control level is closely linked to the level of doing (real world). Hereby, e.g., misinterpretations of stakeholders can be identified and corrected quickly.

- Terms and anchor

Dealing with term defects, such as synonyms, homonyms or false identifiers is intuitively supported by the usage of common language modeling. For instance, a transfer to other modeling languages is considerably simplified due to the iterative increased understanding of all involved stakeholders. Three anchors are taken as the primary goals of common language modeling: interaction, synchronization and quality. For example, the anchor of synchronization builds the organizational basis for a structured and proper coordination of all stakeholders involved.

However, the higher interaction and synchronization within agile methods can only lead to an enhanced stakeholder involvement if the project content is to be understandable for everybody. Otherwise, it may lead to quality issues of business processes [42]. Indeed, for some reasons, there is not enough time or effort spent for the required stakeholders coordination and communication. Counteracting this gap, e.g., to guarantee the quality of business processes, the following section explains different options to enhance the involvement of stakeholders during the application of an agile method to reach an enhanced implementation of the Computational Society Architecture.

B. Socialization of stakeholders

Fig. 2 illustrates the BPM(N)$^{Easy1.2}$ approach and marks the parts in which stakeholder involvement is specifically enhanced:
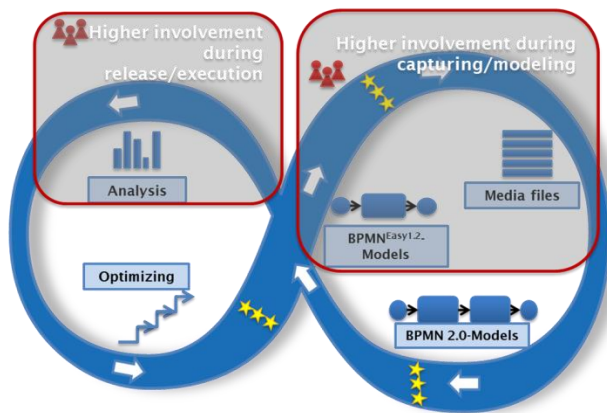

Figure 2. Illustration of the BPM(N)Easy1.2 approach

On one hand, stakeholders can be directly involved during the capturing and modeling of the business processes. On the other hand, BPM(N)$^{Easy1.2}$ focuses on the increased involvement while executing or analyzing the documented business processes. The areas of optimizing and enriching the business processes models, e.g., towards BPMN 2.0, are omitted because of required expert knowledge which cannot be expected from all stakeholders. For instance, to automate business processes a higher technical skill is needed.

The approach described in Fig. 2 has been applied to the scenario presented in Section IV. Several aspects of an enhanced stakeholder involvement were identified:

- Enhanced documentation and publication

Within BPM(N)$^{Easy1.2}$, common language is used to simplify the documentation and publication of business process models. In fact, there are stakeholders who are not able to understand a graphic modeling language completely. To counteract this, the business process models can be exported or published in views which are comprehensible intuitively. For instance, all required information can be displayed as shown in table 1 and table 2. In addition, the BPM Touch application provides a clear overview of the

business process model elements. The following screenshot presents the user interface, which displays all information on the business process model element.
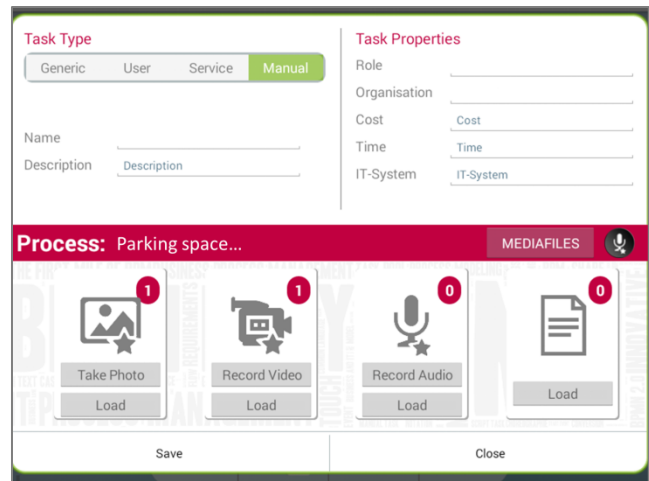

Figure 3. Screenshot of BPM Touch media file overview

As shown in Fig. 3, all collected common language media files are displayed at the bottom of the screen and can be opened by one touch easily.

- Enhanced capturing of information

Concerning capturing of information, BPM(N)$^{Easy1.2}$ offers innovative ways. For instance, instead of modeling all paths of an OR gateway, BPMN$^{Easy1.2}$ uses audio or video sequences, in which common language is used to explain the required behavior of the executing stakeholder. Fig.4 illustrates the difference between a traditional notation and BPM(N)$^{Easy1.2}$.
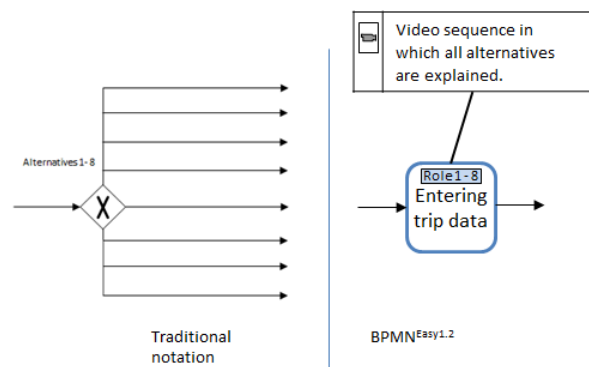

Figure 4. Illustration of modeling a OR gateway

As presented in Fig. 4, BPM(N)$^{Easy1.2}$ models are highly compressed. Compared to traditional notations, in which already few alternatives can be confusing, the flow is still clear. In addition, the active recording of stakeholders leads to a higher involvement within the modeling phase.

- Enhanced quality

Gebhart et al. describe how quality of business processes can be improved and assured [42]. According to

this, the scenario described two iterations. Already in the second iteration, the collected feedback was taken to optimize the business process model. The usage of common language requires no training and motivates stakeholders to integrate their feedback. Predefined quality attributes are taken to check the expected quality. Furthermore, the quality attributes can be formulated in common language.

- Enhanced interaction using BPM(N)$^{Easy1.2}$ role concept

The usage of concrete BPM roles improves the interaction and synchronization within a BPM project. The screenshot in Fig. 5 presents a view of modeling a business process model on BPM Touch.
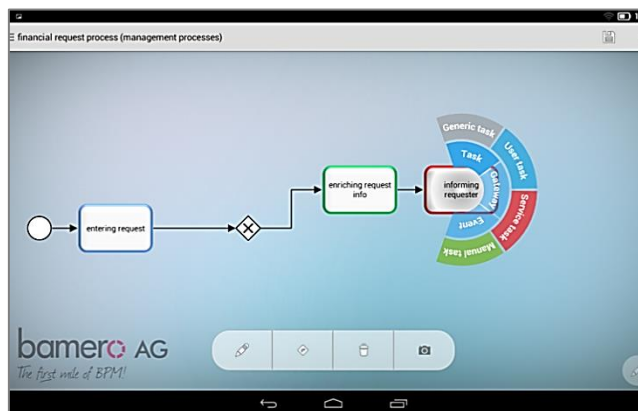

Fig. 5. Screenshot of BPM Touch modeling perspective

BPM(N)$^{Easy1.2}$ adapts (c.f. Scrum [14]) and introduces three roles: BPM expert, IT expert and (key) user. In Fig. 5, the BPM expert uses the BPMN$^{Easy1.2}$ model to capture all information and synchronize all roles in predefined time slots. Furthermore, the BPM expert instructs the other stakeholders. Hereby, IT experts are in charge of required software implementations and (key) users coach each other or execute the business processes. For communication, all roles use common language so that everybody is able to be involved instead of excluded. Potential misunderstandings, e.g., different interpretations of a specific term will be caught and solved in the next iteration. The BPM expert accompanies and promotes the discussion between all stakeholders. With the help iterative adjustments, e.g., the business process models or the user interfaces of an application, the optimization will be done.

VI. CONCLUSION AND OUTLOOK

In this paper, common language has been applied in an agile BPM environment to promote the involvement of all stakeholders by increasing the general access and understanding of modeled business processes. For this purpose, we exemplarily chose the agile BPM method BPM(N)$^{Easy1.2}$ and applied it to a concrete scenario. BPM(N)$^{Easy1.2}$ focuses on describing a method which delivers an approach, a language and a tool for business process management in an agile environment. The existing methods are enhanced by using common language for interaction, synchronization and quality assurance based on the perspective of the Computational Society Architecture.

The scenario showed how to use techniques such as the "Easy Capture Sheet" and how to apply the innovative BPM Touch mobile application. BPM Touch can be used for capturing all required information for business process models. Furthermore, it has been shown that BPM Touch is also useful to increase stakeholder involvement, e.g., in the execution and publication phases of business processes. All these aspects lead to "living" business processes instead of creating rigid documentations. However, the investigation of more aspects using common language business process management has to be a subject of further research. Moreover, more projects such as the modeling project of "Smart City Constance" have to be initialized to validate the method and concept of common language and social stakeholder involvement.

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