Comparison of Wiki-based Process Modeling Systems

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ABSTRACT
As traditional process elicitation methods are expensive and time consuming, a trend toward collaborative, user-centric, on-line business process modeling can be observed. A common proposal in this area is the use of a semantic wiki-based light-weight knowledge capturing tool for collaborative process development. Although different frameworks have been proposed, nobody has compared the systems against existing requirements for collaborative maturing of processes. To address this issue we provide a comparison framework on the basis of these requirements, which we used to compare existing approaches.

Categories and Subject Descriptors
H.5.3 [Information Systems]: INFORMATION INTER-FACES AND PRESENTATION—Group and Organization Interfaces

General Terms
Design, Documentation

Keywords
Collaborative Process Development, Light-weight Knowledge Capturing, Web 2.0

1. INTRODUCTION
Processes have to be modeled in order to better understand, share, and optimize them. Today, process knowledge remains either in people’s heads, often distributed among several heads or as textual and graphical descriptions in the Intranet as HowTos, guidelines, or methodology descriptions.

Traditionally, process modelers interview domain experts to develop the process description. Unfortunately, the cost of a complete formalization of all business processes through a expert team conducting these interviews is prohibitive, and the benefits often seem elusive, especially under the stress of the daily work.

Current research focus on the use of social software to support an agile Business Process Management (BPM) (e.g. [1]). In the last years various approaches have been developed using semantic wikis to model processes in a collaborative manner. Compared to the traditional interview method, all stakeholders can be involved in process modeling, which is considered as too time-consuming with traditional methods and tools [12]. By including all stakeholders, also users which are novice in process modeling are involved.

Although different semantic wiki engines have been compared [8] and frameworks for the collaborative specification of semantically annotated processes have been proposed [9, 11], none of the existing work compared the approaches against requirements for collaborative maturing of process descriptions. We present these requirements in this paper and compare the different existing approaches with help of these requirements.

The remainder of this paper is structured as follows. We describe the requirements for collaborative maturing of process descriptions in Section 2. After we introduce different approaches for collaborative process development and compare them against the requirements in Section 3, we discuss our findings in Section 4. Eventually, Section 5 concludes the paper and gives an outlook on future research.

2. REQUIREMENTS
The following requirements were gathered in previous works [6, 4]:

R1: Natural language support for novice users.
Novices in process modeling need to be able to use natural language to supplement formal modeling constructs, so that they can create and extend the processes without the assistance of experts. If users do not know the graphical representation of a process element, natural language can be used to describe it.

R2: Intuitive graphical editing of processes.
A rich user interface can provide the user with means for interacting with processes in a highly intuitive manner. But with too many elements, the usability of the tool may suffer. This leads to a trade-off between the expressivity offered to develop the formal process models and the simple accessibility of the tool.

R3: Collaboration support.
Users must be able to discuss process models asynchronously. Changes of the process model have to be
Another SMW-based approach for collaborative process development without a graphical process editor interface is SMW process visualization extension [5]. This extension builds on the capability to query for semantic properties, provided by Semantic MediaWiki, and displays these query results as a process graph. A special query printer is added to SMW which transforms the result of a special process-property query into a process graph. The process properties are used to express process flow and corresponding process resources. Graphical editing of the process is not supported.

R4: Definition of a common language.
Different terminologies have to be unified to a common vocabulary to avoid misunderstandings which can prolong the process development. The involvement of all stakeholders at an early stage is required.

R5: Structured process documentation support.
The process models must be stored in a machine-processable documentation format, including additional properties linking to external resources. Users must be able to interlink between process descriptions and external resources to enable more sophisticated retrieval, browsing and navigation.

R6: Automated translation of text into structured process description.
Existing textual descriptions of processes such as How-Tos should automatically be translated into structured process descriptions. In addition, complementary textual descriptions for process elements containing process flow information should be detected and automatically adjusted in the graphical representation.

R7: Mechanisms for process description validation.
To avoid errors within process modeling, process descriptions have to be automatically validated by the systems. Errors have to be detected and pointed out to the modelers. In addition, suggestions for potential fixes can be helpful.

3. EXISTING SOLUTIONS
Different tools have been developed in the area of collaborative wiki-based maturing of process descriptions. In the following, we briefly introduce the solutions and compare them against our derived requirements presented in Section 2.

3.1 Tool introduction
We have found six tools supporting collaborative wiki-based maturing of process descriptions. Unfortunately, demos do not exist for all tools in the Web. Available demos in the Web are indicated with a filled out circle ●. In the following we briefly describe each tool:

SMW+BPEL ●
The semantic wiki aided business process specification approach presented in [13] to model business application is based on Semantic MediaWiki (SMW) [14]. With the tool, stakeholders can collaborate to create the system requirement document containing specifications for a business system. Natural language is used to describe the requirements and is further enhanced with semantic annotations. The structured descriptions are exported via RDF and translated into BPEL, where the inherent relationships and processes are linked together to define the complete system. A BPMN modeler can be used to visualize the linked BPEL, which can be passed to a BPEL engine after verification. The approach does not allow graphical editing.

SMW+SRF ●
Another SMW-based approach for collaborative process development does not allow graphical editing.

M RM Wiki ●
A prototypical implementation for management of model relations also uses a semantic wiki-based approach [8]. A metadata ontology is presented, which provides a structure for managing model relationships. The different process models, stored in the Model Relations Management Wiki (MRM Wiki), can be described and linked by using this metadata ontology. As a result, the use of the ontology improves navigation and model retrieval. For instance, affected models can be detected, when a model is changed.

KnowWe Extension ●
The tool for modeling diagnostic guideline knowledge [11] integrates an AJAX-based editor for DiaFlux, a knowledge representation for clinical protocols, into the Semantic Wiki KnowWE. 2 The graphical DiaFlux model consisting of start, test, solution, wait composed, exit and comment nodes is encoded in XML and integrated in the corresponding wiki page. The ontological concepts which already exist in the wiki knowledge base can be reused in the DiaFlux editor. A wizard within the editor can be used to create new concepts extending the application ontology.

Wikiing Pro ●
The tool Wikiing Pro [6] combines and extends SMW and the Oryx Process Editor [3] to allow collaborative maturing of process descriptions. Only a small subset of BPMN constructs, namely tasks, sequence flows, parallel and exclusive split gateways, is used within the tool. Each process element has a corresponding wiki page. The graphical process editor interface has been extended to allow editing of the process element wiki pages directly without switching browser tabs. Process descriptions can either be modeled from scratch or automatically be sketched from existing textual descriptions as well as from predefined process properties. The process is stored within the wiki by creating a process summary page and a sub page for each process element. Links to the corresponding process element wiki pages are automatically added to the SVG graphic displayed on the process summary page, which enable the user to navigate through the process in the wiki. The properties of the process elements and the process flow of the graphical model are automatically translated into semantic annotations provided by SMW. Thus, all the process properties can be accessed within SMW and queried.

1The SMW process visualization extension is part of the Semantic Result Formats extension (SRF) http://www.mediawiki.org/wiki/Extension: Semantic_Result_Formats/process_format
2A KnowWe demo can be accessed via http://knowwedemo.informatik.uni-wuerzburg.de
3A demo can be accessed via http://bpmexample.wikiing.de (User name: ProcessTester – Password: active!)
BP-MoKi

The BP-MoKi [9] is a further development of the MoKi enterprise modeling wiki4. The tool, which also combines and extends SMW and Oryx, can be used to model and semantically annotate business processes, to create and edit ontologies, define constraints, and to export and validate process models. The user can switch between unstructured, lightly-structured and fully structured process description. A wiki page is created for each process element. Semantic annotations to the process element can be added on such a wiki page. The tool also provides validation support by checking the correctness of semantic annotation of the business process and by verifying the satisfiability of the defined constraints.

3.2 Comparison

By using the requirements for wiki-based maturing of process descriptions, we are able to compare the different approaches. Table 1 shows the result of the comparison of the different tools.5

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Table 1: Comparison of implementation of different requirements within existing approaches

While all of the tools allow the users to express their process knowledge with natural language, only half of the tools provide an intuitive graphical interface for rendering and editing processes. The collaboration support is automatically available in most of the tools. However, the semantic wiki KnowWE does not provide explicit discussion functionality and the semantic wiki aided business process specification approach only supports collaboration during the modeling of structured description, but not for the translated BPEL descriptions. By using a wiki-based approach people can collaborate to define a common vocabulary to avoid misunderstandings. Only BP-MoKi fully supports the standardization of terminologies explicitly by creating and editing ontologies within the system. All systems store the process models in a machine-processable documentation format, but the interlinking between process descriptions and external resources is not supported by all systems. The automated translation of textual process descriptions into structured ones is only partly implemented in the Wikiing Pro tool. However, the detection of process flow information in the textual description of process elements and the automatic adjustment in the graphical representation are not supported, yet. Similar to the automated translation of textual description, BP-Moki is the only tool that partly supports the automated validation of process descriptions. While constraint violation can be detected, there is currently no support for automatic interpretation, location and resolution [9].

The analysis of the different tools by means of the requirements shows that all approaches offer natural language, collaboration and structured process documentation support. Additionally, a common vocabulary can be defined with all the solutions. This can be traced back to the fact that all solutions are based on semantic wikis, which already provide at least parts of the required functionality [2, 8]. The remaining three requirements have to be implemented additionally. In addition, the automated translation of text and the validation are current research areas in BPM and thus current tools only provide the functionality to a small extent.

4. DISCUSSION

All existing wiki-based solutions for collaborative process maturing are implemented as extensions of already existing semantic wikis, which have been proven as stable and reliable tools. An additional reason for that could be that most users are already familiar with these wikis, which lowers the contribution barrier. As a consequence, the extension for process support should be implemented in such a way, that all existing features of the basic semantic wiki can be also used for processes. The tools use either their own knowledge base or the semantic wiki to store the process knowledge. The use of an own external knowledge base can offer additional functionality, like constraint validations. But it also requires additional implementation effort to take advantages of the provided semantic wiki functions such as the ASK query language in SMW. For instance, BP-MoKi stores the semantics of the process in a separated store, which cannot be accessed with the query language provided by SMW. For better and intuitive usability of the tools, existing functionality should not be limited, because the user expects such functionality.

Validations of the SMW+SRF approach presented in [5] to industry use cases within theACTIVE project have shown, that the provided textual process-editing functionality is not sufficient. The trialists wanted to have a graphical process-edit functionality similar to Microsoft Visio [7]. As the SMW+SRF, SMW+SRF and MRM Wiki solutions, introduced in Section 3, do not provide a specialized or graphical user interface in the wiki platform, they do worse than the three others providing graphical editing functionality. Furthermore, the graphical interface should allow the user to read and edit the wiki pages within the graphical edit mode.

Especially in process description maturing, it is important that existing textual process descriptions, previously stored within the wiki, can be reused. As a result, textual descriptions have to be automatically transformed into graphical process descriptions. In a collaborative environment, the transformation can be seen as a suggestion for the user. Although the translation is not fully correct, the user has an indication for a rough graphical representation. The users have to refine and correct them. In this case a clear defined methodology can help to ensure that errors in the formal graphical descriptions translated from natural language will be corrected. As textual descriptions can be used to express part of the process flow, for instance a condition, it would

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4 A MoKi demo can be accessed via https://moki.fbk.eu/moki/tryout2.0/index.php/Main_Page
5 A filled out circle ● indicates that a tool fully satisfies the requirement. If it only supports a part, a half-filled circle is used ●. An empty circle ○ indicates that the tool does not meet the requirement.
be beneficial to detect these text components and adjust the model accordingly. Thus, the process description is more formalized, which improves search, navigation and further reuse of the model. By having such a translation functionality, mismatches between textual and graphical descriptions within a process can be detected by the system. As a result the user can be pointed to such mismatches to solve them.

Another important aspect in a collaborative process development environment is the trade-off between usability, especially for users being novice in process modeling, and expressivity of the used process formalism. The quality of the process descriptions in terms of semantic correctness and required formalisms highly depends on the use case. While a process, which should be automatically executed, must be fully formalized and semantically correct, a process, executed by a human, does not necessarily have to meet such a high standardization and formalism. Novice modelers contributing with their domain knowledge can be involved in both scenarios. As long as only human executed processes are modeled, the expressivity of the process language can be reduced to enhance usability due to two reasons. First, novice users are provided with intuitive means to model processes. Second, novices in process modeling have to read and understand the process descriptions. A process model is hard to understand, if too many elements are used, which are not known to the readers. For automatically executed processes, experts are required in a second step to refine the process descriptions by adding further elements and attributes required for the execution.

5. CONCLUSION
In this paper, we used existing requirements to compare existing solutions for collaborative process development. All investigated tools combine a wiki-based light-weight knowledge capturing approach with a process visualization functionality to allow collaborative process development. All solutions are based on semantic wiki engines, which are extended to deal with processes. The older solutions use semantic annotations and translate them into graphical representations to visualize the process flow. The newer approaches address the problem of process modeling by including a graphical interface for process editing.

The comparison of the different solutions against the requirements shows, that none of the existing solutions satisfies all requirements. Although the automatic translation of existing textual descriptions into graphical representations is an important feature, it is only implemented in parts within the Wiking Pro tool. This functionality supports the idea of collaborative process maturing that existing explicit process knowledge can automatically be reused within the graphical representations. As a consequence, the different used options to modeling processes, namely natural language, semantic annotations and graphical process descriptions, are further integrated with each other. Process descriptions can be matured seamless.

All in all, we have shown that current approaches are not fully implementing all requirements for collaborative process maturing. This indicates that current wiki-based solutions for collaborative process development can be further improved.

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6. REFERENCES