ABSTRACT

There are a lot of software tools in the market for process modeling (PM). However, a general issue with these tools is the lack of modeling methodologies that cater for non IT-savvy business users (BUs). To allow BUs to perform modeling tasks efficiently and error-free, it is necessary to offer them an appropriate, more user-friendly PM approach. This paper presents research on End User Development (EUD) for PM, which aims at improving the ability of BUs to effectively modify process models according to their individual needs. These research efforts address how an EUD technique, based on a step-by-step instruction design pattern which has been judged suitable for the considered users, can simplify PM. The approach specifically considers how the knowledge of IT experts can be integrated in the development of a tool for supporting PM. As these experts know how PM activities are performed and what information is required to support BUs in performing those activities. Advances in these research topics are presented through an overview of the developed wizard prototype and evaluation results.

Categories and Subject Descriptors
D.2.2 [Design Tools and Techniques]: User interfaces. H.5.2 [User Interfaces]: Interaction styles.

General Terms
Documentation, Design, Human Factors, Languages.

Keywords

1. INTRODUCTION

Process models are predominantly created by process architects and software engineers who have expertise in PM. The enablement of a broader user-base incl. non-savvy BUs has been identified as a key requirement of the business process management of the future [6]. Hence PM methodologies are required to cater for such an extended user-base. In many cases, BUs don't have sufficient expertise in the modeling of business processes due to several reasons:

1. Workshop results in the SOA4All project and studies in research literature [1, 3] discovered that current PM tools do not guide users in any sensible way. Supported by an analysis of Gartner [6] that shows that PM tools are too complex and error-prone for average users. These PM tools are as such a significant barrier for non IT-savvy BUs both in usability and complexity. They prevent BUs to participate in the procedure of PM.

2. Creating business process models demand a certain level of domain expertise in both business and IT [4].

We have identified the following research questions which are elaborated within this paper:

1. How can we support BUs in PM and guide them in a sensible way?
2. How can we involve IT experts in supporting BUs in PM activities?

We are approaching this challenge from an EUD perspective. EUD defines “a set of methods, techniques, and tools that allow users of software systems, who are acting as non-professional software developers, at some point to create or modify a software artifact” [5]. In this context a new type of user-friendly web based applications are currently about to emerge, known as lightweight PM tools. Novel lightweight design principles seek to lower the entry barrier for PM. Lightweight PM tools allow the creation of formalized process models on a high abstraction level.

We present a wizard concept for supporting BUs acting as End-User Developers in lightweight PM, especially during first contact and learning phases. The wizard concept allows guided PM using dynamically generated wizards.

1.1 Related work on EUD & BPM

Examples for BPM tools on the market are SAP NetWeaver BPM1 and Oracle BPEL Process Manager2 that both require technical knowledge about business process modeling and execution and are thus not suitable for non-expert BUs. The Eclipse BPEL project3 is another BPM tool mainly targeting developers and technical experts. Its compact user interface tries to make the process generation simple. However, the PM is far from being usable by non-technical people. Furthermore, all three tools do not make use of any guided modeling. A detailed

1 http://www.sap.com/platform/netweaver/components/sapnetweaverbpm/
2 http://www.oracle.com/technology/bpel/
3 http://www.eclipse.org/bpel/
overview about the current state of the art in process composition is addressed by Delchev, Vogel et al. [2]. The documentation and provision of examples is outstanding in the Oracle BPEL Process Manager. It helps users get started quickly with a complex product. To create a similar set of examples showing BUs how to create simple business process within a few steps would be desirable.

The wizard-based process modeling methodology will focus on supporting non-expert BUs and will be web-based.

2. WIZARD CONCEPT
The developed wizard-concept consists of two steps where the first step enables IT experts to describe the PM activity, annotate this description, and publish it as a wizard-model representation to a central repository (wizard production). In a second step, BUs are able to browse through the repository and load the descriptions as needed. Relying on this description a wizard can be automatically generated. This generated wizard guides the BU in an intuitive way through the PM activity and performs the necessary changes on the process model (wizard consumption).

2.1 Wizard production
For the description of lightweight PM activities a formalism is applied in the first step that has the advantage of using an XML-based language. Thus it is intuitive for IT experts who are experienced in lightweight PM. Moreover, the formalism is suitable to document knowledge on how to perform certain PM tasks. Additionally, a tool has been developed that allows IT experts to easily create, annotate and publish wizard-models. It stores the models in a central repository.

2.2 Wizard consumption
Wizard-models can be loaded by BUs and serve as input for the lightweight PM-Editor (SOA4All-Composer) [2] to automatically generate a wizard. The wizard is a fully functional tool to guide BUs through the lightweight PM activities and to give them support, based on the knowledge of IT experts (Figure 1).

![Figure 1: GUI of the wizard in the SOA4All-Composer](image)

Whenever possible, the tool performs the necessary changes on the process model to serve the convenience of the BUs. As a result, even BUs that are not necessarily IT professionals, are able to create and modify lightweight process models according to their needs.

3. EVALUATION
3.1 Evaluation of the wizard concept
We carried out a preliminary task-based evaluation to test the usability of the wizard-based modeling method and measured BUs' performance while carrying out typical tasks. We analyzed the number and type of errors users made and recorded the time spent to perform these tasks. At the end of the experiment, the users' option was elicited using questionnaires. To gain further understanding of the identified problems the results were analyzed using as usability post analysis process [7]. The following two hypotheses should have been proven:

H1. Faster lightweight PM (less time)
H2. More accurate lightweight PM (less errors)

12 volunteers from our research lab participated in the study. Three were female, nine were male and ten had experience with visual tools like MS Visio. Nine had experience in UML tools and 10 had programming experience.

Each participant conducted two study sessions. One session using the traditional drag-and-drop modeling method and another using the wizard-based method. The independent variable in this test was the PM method. The dependent variables were the time spent and the number of errors produced to perform each task, as well as the usability rating of the test persons.

All study sessions were conducted using a desktop computer running the latest version of MS Internet Explorer. Each session started with giving the participants an introduction on how to use the modeling tools and an explanation about the tasks they would have to perform. This briefing took approx. 5 minutes. After the briefing, the subjects were asked to model three process models on their own, each model with and without the support of a wizard. The three process models were: (1) A simple linear PM; (2) A PM with one loop and two conditional flows; (3) A PM with two parallel activities and two conditional flows.

We specified the parameters of the activities that should be used for the task consisting of an activity name and a URI. The experimenter was available for help, but only when the subject explicitly requested it. After the session, the subjects were asked to fill out a questionnaire.

3.2 Results
The results of the user study showed that hypothesis (H1) and (H2) could be validated in the test setting. We observed that the more complex the task was, the higher the decrease of time needed for achieving the task has been. Further, we observed a decreased error-rate during modeling.

<p>| Table 1. Evaluation time results (time in minutes) |</p>
<table>
<thead>
<tr>
<th>PM method</th>
<th>Task 1</th>
<th>Task 2</th>
<th>Task 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drag-and-drop</td>
<td>1.4</td>
<td>4.0</td>
<td>3.5</td>
</tr>
<tr>
<td>Wizard-based</td>
<td>1.1</td>
<td>2.6</td>
<td>1.3</td>
</tr>
</tbody>
</table>

<p>| Table 2. Evaluation errors results (number of errors) |</p>
<table>
<thead>
<tr>
<th>PM method</th>
<th>Task 1</th>
<th>Task 2</th>
<th>Task 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drag-and-drop</td>
<td>0.25</td>
<td>1.1</td>
<td>0.9</td>
</tr>
<tr>
<td>Wizard-based</td>
<td>0.2</td>
<td>0.5</td>
<td>0.1</td>
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The usage and support through the wizard was assessed as mainly above-average. On a scale of 1-5 all features and benefits were between 4.2 (usefulness of the instructions) and 4.6 (no unnecessary input needed).

3.3 User study discussion
Some of the difficulties that arose during the user study were associated to textual and user interface details that can be improved in upcoming versions of the wizard. For example, the wizard start button is not visible enough (2x) and textual descriptions were perceived as too long (4x) and not precise enough (2x). Another problem arose because the wizard interface within the SOA4All-Composer primary interface does not support all drag-and-drop interactions. The user is informed about the actions he can carry out, though more work is needed to integrate the wizard-based interface with the main drag-and-drop interface. Despite these problems, the users report that by the end of their session, they were comfortable with the wizard.

4. DISCUSSION AND FUTURE WORK
More work is needed to study and improve the set of wizard-models appropriate for BUs that are new to the lightweight PM and the two different modeling methodologies on hand. In future, we plan to conduct further comprehensive user studies involving only users that are new to PM to better understand what problems these particular users are facing.

Another area of future work is to integrate the wizard-based PM more tightly with the SOA4All-Composer to also allow the creation of wizard-models using a kind of macro recorder. This macro recorder should allow users to record drag-and-drop activities for publishing and later wizard-based playback. However, a key challenge will be maintaining the transport of IT expert knowledge through the modeling process which is so powerful in the current design.

5. CONCLUSION
The wizard-based PM methodology for BUs acting as End User Developers is distinguished from other PM methods by: 1) its focus on business users; 2) the step-by-step instruction and guided interaction style; 3) the involvement of IT experts in the transport of PM activity knowledge. These features lower the barrier for PM. By making lightweight PM simpler, more business-users can adopt process models as required to meet their needs.

6. ACKNOWLEDGMENTS
We thank our user study participants and the SOA4All team for their help and for their valuable comments.

7. REFERENCES