

# ProMoEE - A lightweight web editor supporting study research on process models

Michael Winter<sup>\*[0000-0003-2561-7923]</sup>, Rüdiger Pryss<sup>\*[0000-0003-1522-785X]</sup>, and  
Manfred Reichert<sup>\*[0000-0003-2536-4153]</sup>

\* Institute of Databases and Information Systems, Ulm University, Ulm, Germany  
([michael.winter,ruediger.pryss,manfred.reichert@uni-ulm.de](mailto:michael.winter,ruediger.pryss,manfred.reichert@uni-ulm.de))

**Abstract.** Process models are not only used for the sole documentation of the numerous processes in an organization. Among others, they are essential artifacts in the context of service-oriented computing. Hence, high quality process models are the enabler for streamlining, prediction, and automation in many fields (e.g., industrial production). Therefore, a proper and effective comprehension of process models and knowledge about factors influencing the creation of such models constitutes a key criterion for this endeavor. The collection and analysis of data in scientific studies help to understand the objective and subjective factors influencing process model creation and comprehension. This work presents an editor for the definition, execution, and analysis of studies in the context of process model creation and comprehension. The editor features a clean design and allows for a fast implementation for conducting and reporting study research, while ensuring the collection of high-quality data.

**Keywords:** Study Research, Experimental Web Editor, Process Models

## 1 Introduction

Graphical workflows (i.e., process models) are key artifacts for the descriptive representation of business tasks, logistical steps, or sophisticated algorithms. For instance, as a centerpiece of the Business Process Management (BPM) domain [7], it must be ensured that business process models are created and comprehended in such a way that practitioners can apply them correctly for their purposes. Moreover, in the context of service-orientation, process models integrate a multitude of essential functions, such as the definition of service mechanisms, allocation of responsibilities, and the formulation of effective routines [2]. Research on process models has unraveled numerous factors that influence the creation of process models as well as factors fostering model comprehension [3]. However, there are still many not known or not adequately known factors (e.g., especially from a cognitive point of view) influencing the process model creation as well as the comprehension. Consequently, it poses a challenge to bring those factors into the light. One promising approach for coping with this challenge is to conduct studies in order to develop a deeper understanding of the essential factors in this context [9]. Following this, the work at hand presents the Process Modeling

Experimental Editor (ProMoEE)<sup>1</sup>. ProMoEE is a lightweight web editor enabling academics as well as professionals to get a swift, intuitive, and clean way to conduct studies aiming at process model creation and comprehension. In the long term, ProMoEE shall improve our general understanding of working with process models in different domains (e.g., service-orientation).

The structure of this paper is as follows: Section 2 introduces ProMoEE. In Section 3, related work is discussed and, finally, Section 4 summarizes the paper.

## 2 Process Modeling Experimental Editor

The emphasis of the Process Modeling Experimental Editor (ProMoEE) is to foster study research on the creation as well as comprehension of process models. Thereby, the editor supports the following three mandatory stages in study research, i.e., *Definition* ①, *Execution* ②, and *Analysis* ③.

Regarding *Definition* ①, Fig. 1 presents the graphical user interface for the definition of a study in ProMoEE. Thereby, the editor relies on the concept of questionnaires. More specifically, a study and its progression are defined in a structure known from questionnaires (see Fig 1(A)). Thereby, each questionnaire contains an unique key to identify the correct study. A questionnaire has at least one page (see Fig 1(B)) and a page can be defined with the following types: *Question*, *Comprehension*, and *Creation*. In the *Question* section (see Fig 1(C)), questions (e.g., demographics) can be created with different response options (e.g., text field, single-/multi-choice). In the *Comprehension* section (see Fig 1(D)), a predefined process model expressed in terms of the Business Process Model and Notation (BPMN) 2.0 is provided in order to evaluate the aspects

<sup>1</sup> Demonstration video of ProMoEE: <https://tinyurl.com/y2hvm99>

Fig. 1. Definition of a Study in ProMoEE

of process model comprehension [5]. Therefore, specific questions emphasizing model comprehension can be created to the user’s need. Finally, in the *Creation* section, an environment is provided that allows for the creation of process models in BPMN 2.0. In addition, a predefined process model can be specified in the environment as well, which can be then adapted.

Regarding *Execution* ②, to participate in a study, the unique key defined in *Definition* ① must be entered in the start screen. Here, as a major advantage, ProMoEE can be accessed via web browser from anywhere with any computer device (e.g., laptop, tablet). After entering the unique key, study participants complete the study based on the defined questionnaire structure in *Definition* ①. Thereby, questions types like *mandatory* or *restricted* (e.g., integers only) ensure that there are no missing or inconsistent values. Moreover, participants are able to scroll (e.g., back) between the pages and, in case the study is canceled very early, no data will be stored. At the end, participants are able to leave feedback.

In *Analysis* ③, the originator of a study is able to analyze the obtained data with a set of empirical and statistical methods. Therefore, all types of different data (e.g., timestamps) are stored in a database during the execution of a study. In a specific analysis view, ProMoEE allows for a fine-grained analysis; the obtained answers can be aggregated as well as visualized with different techniques (e.g., pie chart). Moreover, on the created or comprehended process models, numerous quantitative metrics as well as customized process model inspectors (e.g., syntactical compliance, semantic completeness) can be applied. In addition, ProMoEE offers an export of data in an Excel file. Therefore, the editor generates an adapted file (e.g., colored separation) for further usage in other applications (e.g., SPSS). Finally, ProMoEE includes an identity and access management, in which three different account types can be utilized (i.e., *Admin* ④, *User* ⑤, and *Participant* ⑥).

Altogether, ProMoEE supports research in the definition, execution, and analysis of studies in the context of process model creation as well as comprehension. The editor provides a standardized and intuitive procedure for study research to support academics or professionals in this context. For example, ProMoEE mitigates threats towards data validity and pursues the collection of high-quality data. Further, ProMoEE can be accessed with any computer device (e.g., smartphone), only by the use of a web browser. Due to the use of latest technologies (i.e., backend is implemented with PHP, frontend is implemented using current web technologies), ProMoEE can be enriched with additional features. Finally, the lightweight characteristics of ProMoEE allow for a fast and clean implementation as well as execution of studies. Generally, ProMoEE might be applied in various studies to gain a better understanding of working with process models.

### 3 Related Work

Various tools exist for the implementation of studies that can be employed for research on the creation and comprehension of process models. The *Cheetah Experimental Platform* provides an experimental workflow for research investi-

gating of the process of process modeling [6]. The authors in [8] demonstrate a powerful configurator for designing studies, which, in turn, may also be used for similar settings as ProMoEE. [1] presents a highly configurable smart mobile device assessment tool that can be used for different visual tasks in the context of process model comprehension. The application in [4] offers similar features for collecting and sharing data from surveys. Summarizing, ProMoEE was developed for empirical research in the domain of BPM to study especially cognitive aspects (e.g., decision-making) and, hence, none of the discussed approaches combines such functionality with lightweight characteristics like ProMoEE does.

## 4 Summary and Outlook

This paper presented the Process Modeling Experimental Editor (ProMoEE) empowering researchers to define, execute, and analyze studies in the context of process model creation as well as comprehension in an intuitive, clean, and fast manner. Thus, the insights obtained with ProMoEE may be used, inter alia, to improve the business processes of an organization. Currently, ProMoEE is used in different studies in order to evaluate user acceptance, usability, and performance, especially in large-scale studies. Furthermore, ProMoEE is used in various studies in the context of a conceptual framework to foster process model comprehension from a cognitive viewpoint [10]. In future, ProMoEE will be enriched with additional features (e.g., multi-process notation support), metrics, and statistical methods (e.g., significance tests) to increase its applicability.

## References

1. Andrews, K., et al.: A smart mobile assessment tool for collecting data in large-scale educational studies. In: 15th Int'l Conf on MobiSPC'18. pp. 67–74 (2018)
2. Deng, S., et al.: Computation offloading for service workflow in mobile cloud computing. *IEEE Trans on Parallel and Distributed Systems* **26**(12), 3317–3329 (2014)
3. Figl, K.: Comprehension of procedural visual business process models - A literature review. *Business & Information Systems Engineering* **59**(1), 41–67 (2017)
4. Google: Google Forms (2019), <https://www.google.com/forms/about>, last visited on 2019/09/27
5. OMG: Object Management Group Specification. Business Process Model & Notation 2.0 (2019), <https://www.bpmn.org>, last accessed on 2019/09/20
6. Pinggera, J., et al.: Investigating the process of process modeling with cheetah experimental platform. In: 1st Int'l Workshop on ER-POIS'10. pp. 13–18 (2010)
7. Rosemann, M., vom Brocke, J.: *The six core elements of business process management*. Springer, 2 edn. (2015)
8. Schobel, J., et al.: A configurator component for end-user defined mobile data collection processes. In: 14th Int'l Conf on ICSOC'16. pp. 216–219 (2016)
9. Tallon, M., et al.: Comprehension of business process models: Insight into cognitive strategies via eye tracking. *Expert Systems with Applications* **136**, 145 – 158 (2019)
10. Zimoch, M., et al.: Cognitive insights into business process model comprehension: preliminary results for experienced and inexperienced individuals. In: 28th Int'l Conf on BPMDS'17. pp. 137–152 (2019)