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THE SOFTWARE TOOL FOR ERROR PROBABILITY EVALUATION IN BUSINESS PROCESS MODELS

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Abstract. *This paper considers the process of quality assessment of business process models created using the BPMN (Business Process Model and Notation) standard. The quality of business process models impacts organization activities and the software these models describe. Therefore, this study aims the evaluation of an error probability in business process models to improve their quality. The respective software tool for the quality assessment of business process models created using BPMN graphical notation was designed and developed.*

Problem statement. Business process modeling can be used to document the current business process and model the new one. Its purpose is to get a detailed view of the process, people, inputs, controls, and outputs, and then potentially simplify it all, make it more efficient, and/or improve the results of the process. Business process modeling takes time and discipline, but over time the payoff can be significant. Business process modeling has become a common approach in the business world to standardize procedures, improve efficiency, meet audit requirements, and gain a competitive advantage [1].

Business process modeling can range from simple hand-drawn diagrams to more complex ones with expandable sections to offer adequate implementation information. BPMN (Business Process Modeling Notation), at its most sophisticated, is carried out by qualified analysts. The Object Management Group (OMG) offers five BPMN 2.0 certifications known as OCEB 2, which stands for OMG-Certified Expert in BPM 2.0. One track is focused on business, while the other is focused on technology. BPMN 2.0, according to OMG, will unify business process modeling in the same manner that Unified Modeling Language (UML) standardized software modeling [2].

According to [3], the quality of conceptual business process models is critical for the design of associated information systems. A precise measurement of model properties, in particular, can be useful from a commercial standpoint, allowing for cost savings due to early error discovery. This is also true in terms of software engineering. Models help with stakeholder communication and software system design in the latter instance. From a correlational standpoint, research has looked into numerous proposals for metrics for business process models. This is useful for understanding, for example, the general driving forces of error probability, such as size and complexity. However, design decisions must usually be based on thresholds that may reliably indicate that a specific counter-action must be done.

Hence, the following recommendations and corresponding size metrics with respective thresholds could be used to evaluate the quality of BPMN business process models [3]:

- 1) avoid inclusive gateways (OR-splits);
- 2) use one start and one end event;
- 3) use as few elements in the model as possible.

Despite the variety of suggested metrics and corresponding thresholds, we propose to use the size metrics (nodes, OR-splits, start-events, and end-events) because they will allow checking a BPMN model without extra calculations in a fast and easy manner.

Solved tasks. Therefore, to evaluate the probability of errors in business process models necessary to improve their quality, the following tasks were solved:

– existing software solutions for business process modeling were analyzed: ProcessMaker, Questetra BPM Suite, BizAgi Process Modeler, and Adonis BPM-centric software tools were defined as the most suitable for BPMN business process modeling;

- the business process management lifecycle was studied and an improved business process modeling activity was proposed: it depends on the developed software tool for quality assessment of business process models to detect modeling errors using size metrics and respective thresholds;
- the general system architecture design was proposed, as well as the database and the software application were designed and developed: it is a Java-based 3-tier client-server web application that uses the Oracle database;
- the quality analysis of a software tool was done, and the usage of a software tool was demonstrated: reliability, efficiency, and maintainability properties were defined as subjects for further software improvement; BPMN business process models were evaluated toward the size metrics and compared to the thresholds to calculate the probability of errors.

Research results. The following functional requirements given in the text form below define the functions of a software tool for quality assessment of business process models:

- 1) when a local user prepares BPMN models for quality assessment, the software extracts business process data, calculates model metrics, and saves them to a database;
- 2) when a local user analyzes prepared BPMN models, the software compares metrics to thresholds, calculates error probabilities, and saves them to a database;
- 3) when a local user prepares a report to push it to a remote repository, the software reads results from a database and generates a report;
- 4) when a remote user sees a report and BPMN models on a repository hosting website, they can clone a repository, contribute, and make a pull request.

Let us demonstrate the use cases of a software tool for quality assessment of business process models through a UML diagram (Fig. 1) designed using textual functional requirements formulated earlier.

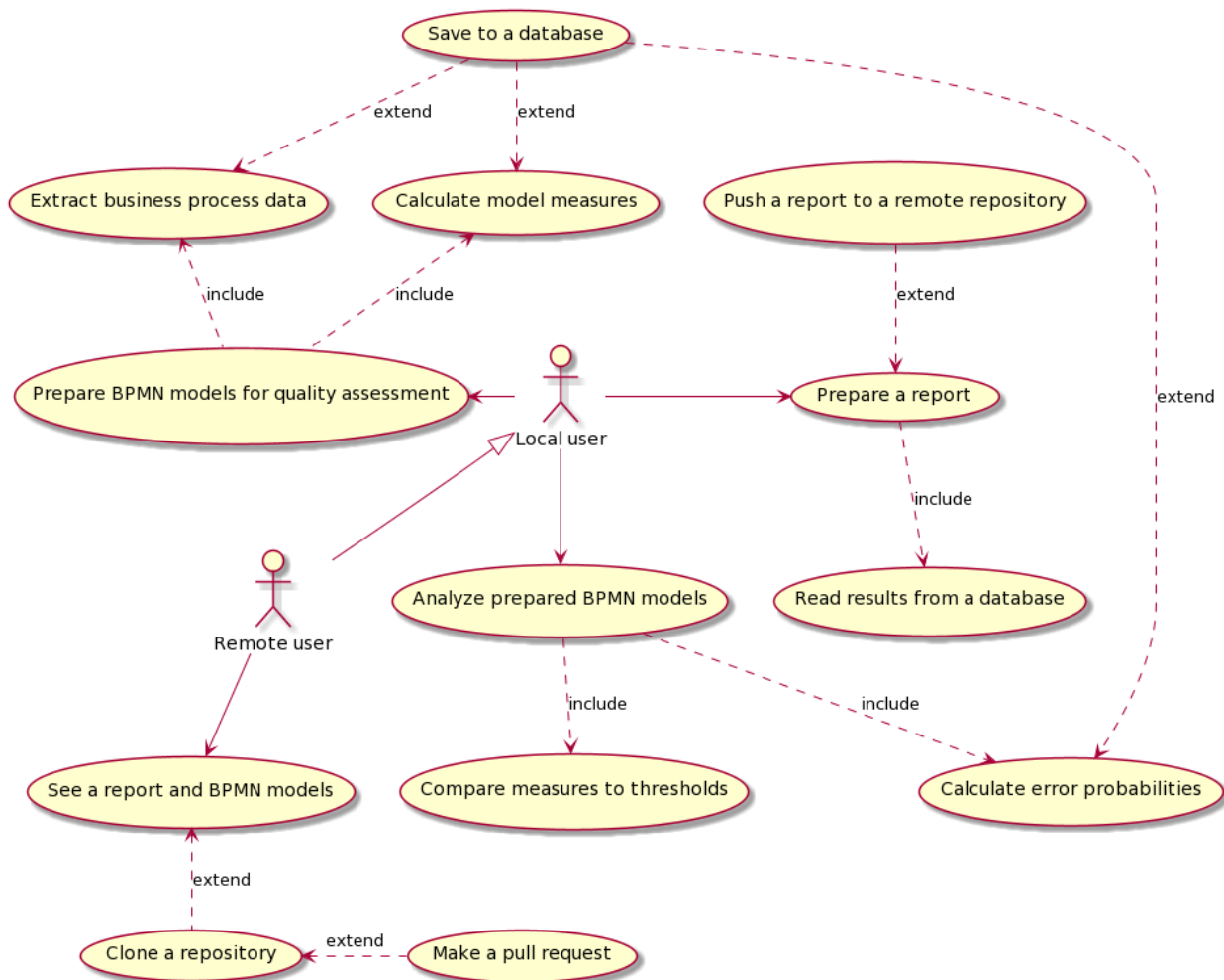


Figure 1 – Use cases of a software tool for quality assessment of business process models

Besides the functional requirements defined above, there should be taken into account the following non-functional requirements:

- 1) the software should support the BPMN 2.0 file format;
- 2) the software should use the relational database to manage local data;
- 3) the software should generate reports, e.g. as the GitHub readme files using the Markdown formatting.

The following screenshot (Fig. 2) demonstrates the usage of the developed software tool for the quality assessment of business process models.

Figure 2 – The usage of the developed software tool

Conclusion. In this paper, we assumed that business process models that violate business process modeling rules are unintelligible and unsuitable for further work, which can lead to a variety of errors during the stages of business process analysis, improvement, and implementation of proposed modifications, i.e. during the development, testing, and maintenance of various software components, information system components, etc. Hence, this study investigated the size metrics of BPMN business process models.

Considered BPM-centric software tools were defined as the most suitable for BPMN business process modeling. The improved business process modeling activity depends on the developed software tool for quality assessment of business process models to detect modeling errors using quality metrics and respective thresholds. The Java-based 3-tier client-server web application was designed and developed, and then used for the evaluation of business process models created using BPMN graphical notation. The evaluation is performed as the comparison of the quality metrics toward the respective thresholds to calculate the probability of arising errors.

References

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