Live Query – Visualized Process Analysis

Dennis M. Riehle[1], Steffen Höhenberger[1], Rainer Cording[1], and Patrick Delfmann[2]

[1] University of Münster, European Research Center for Information Systems, Münster, Germany
{riehle,hoehenberger,cording}@ercis.uni-muenster.de
[2] University of Koblenz-Landau, Institute for Information Systems Research, Koblenz, Germany
delfmann@uni-koblenz.de

Abstract. Business process management (BPM) becomes continuously challenging through a steadily increasing number and even more complex processes. For enabling an effective and efficient control of business processes, (semi-)automatic approaches are necessary as a supporting means. However, these approaches are often hardly applicable in practice since they lack a broad applicability or an acceptable ease of use. This work aims to close this gap by providing an approach that supports a widely applicable, (semi-)automatic analysis of business process models and makes the analysis comprehensible using a graphical visualization.

Keywords: business process analysis, model query, visualization, ease of use

1 Motivation

The view on value creation in companies has changed during the last decades off from the function perspective to the process perspective [1], [2]. Against this background, Business Process Management (BPM) is an indispensable part of business. However, this task becomes increasingly difficult due to a steadily rising number of more and more complex processes. Thus, it is becoming harder for supervisory bodies to prevent inefficiencies, compliance violations [3] or wrong executions due to lacking overview.

Process models that conceptually represent business processes using standardized modeling languages aim to provide a remedy for this issue. Nevertheless, if the processes exhibit growing size and complexity, the models become vast and confusing, too. Hence, manual control is hardly possible, and common understanding of processes gets lost. Actually, even process models cannot reduce the complexity of real processes.

This problem can be addressed by (semi-)automatic analysis approaches [4] that support an investigation of process models at design time. In the literature, there are plenty of those. Against that, these approaches do mostly not find their way into practice. Three critical aspects mainly cause this: lacking open availability, lacking wide applicability [5], [6] and lacking ease of use [7]. While open availability is the less problematic issue to be solved in most cases, wide applicability and a sufficient ease of use are core problems of many approaches. Approaches have to be widely applicable as different modeling languages are employed in different (and sometimes even in the same) companies. Moreover, there is no common understanding of processes, e.g., in terms of granularity or terminology in many cases. Hence, the

13th International Conference on Wirtschaftsinformatik,
February 12-15, 2017, St. Gallen, Switzerland

Riehle, D.M.; Höhenberger, S.; Cording, R.; Delfmann, P. (2017): Live Query - Visualized Process Analysis, in Leimeister, J.M.; Brenner, W. (Hrsg.): Proceedings der 13. Internationalen Tagung Wirtschaftsinformatik (WI 2017), St. Gallen, S. 1295-1298

companies require analysis approaches that can be customized to their situation and characteristics. Thus, an objective of a (semi-)automatic model analysis approach should be wide applicability in connection with easy handling. This way, an effective and efficient business process management can be sufficiently supported. This work aims to close this still existing gap.

2 Yet Another Analysis Approach?

Many model analysis approaches make use of model querying. In model querying, an issue to be searched (mostly a compliance violation, an inefficiency or another kind of flaw) is modeled in a specific modeling language and searched within process models by means of a corresponding algorithm. The effectiveness of an approach is based on the assessment if a detected issue structurally and especially content-wise, corresponds to the searched one. The efficiency depicts the required resources (e.g., the needed time). Albeit, their technical efficiency or effectiveness do not predominantly determine their adoption in practice. Their ability to be adapted to a company's needs and their actual usability figure much more prominently. Understandably, companies do (mostly) not employ approaches that do not support the prevalent modeling language, the issues to be searched for in models or that are too difficult to learn for the employees.

Thus, BECKER ET AL. [8] assess different model query approaches regarding their applicability for the detection of a variety of compliance violations. It becomes apparent that only five of the 27 identified approaches can handle different modeling languages. Furthermore, many of the approaches are restricted to search only for issues that exhibit a low level of complexity (i.e., the size and the amount of crosslinking the model sub-section to be searched for can have). Some approaches retire at a medium complexity level, and only one approach can represent complex issues. In addition, only eleven approaches have been prototypically implemented, from which only one has been evaluated on real-world process models.

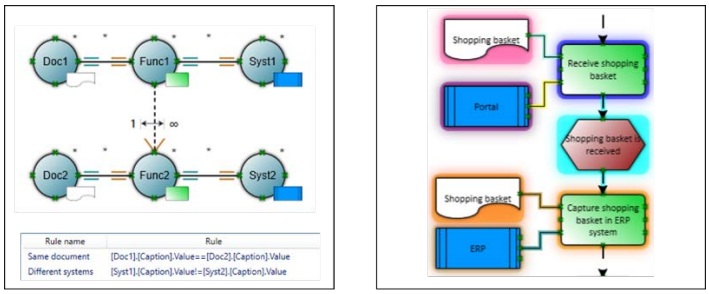
To focus on real-world problems and continuous improvement, we followed the Design Science methodology of PEFFERS ET AL. [9]. We proposed a model query approach under the objectives of wide applicability, independency of modeling languages, support of difficult and complex issues, and, at the same time, an appropriate ease of use [10]. This resulted in the *Generic Model Query Language (GMQL)*, which is based on set theory. Consisting of functions and set operators, it works independently of a modeling language and supports querying complex structural patterns (examples in [8]). An evaluation confirms the power and the utility of *GMQL* but also its amendable ease of use [11]. Though being generally applicable, the approach is inconvenient and overly complex, which prevents the application in practice.

Figure 1. Overall development process

Therefore, starting a new process iteration in our Design Science methodology, we introduced the *Diagramed Model Query Language (DMQL)* to keep the wide applicability of *GMQL* by simultaneously improving the ease of use [12]. With the prototype accompanying this paper, we provide an implementation of our *DMQL* approach. This leads to the overall development process as depicted in Figure 1.

Both approaches, *GMQL* and *DMQL* have been implemented as a plug-in for the meta-modeling tool called [εm]. Similar to *GMQL*, *DMQL* is an intelligent brute-force algorithm, which uses concepts from graph theory (like subgraph isomorphism) to find a query in process models automatically. In contrast, *DMQL* queries are modeled by using edges and vertices that reflect structural relations. Queries depict possibly occurring parts of process models that correspond to the initial real-world issue.

Regarding the main objective, the improvement of the ease of use, *DMQL* enables the visual creation of the queries. Hence, formulating a query in *DMQL* strongly resembles graphical process modeling "as usual." Furthermore, the plug-in supports querying models by using the *DMQL* algorithm with a real-time marking within the process models during the search process. An exemplary model query and a corresponding result are shown in Figure 2. Contextual requirements are included by using captions or attributes of the nodes. A detailed application of the plug-in is shown in the accompanying video. Finally, with the graphical specification of queries, the plug-in implementation is a promising approach to easy-to-use model querying.



Exemplary Query Returned Result

Figure 2. Exemplary DQML Model Query & Returned Result

3 Conclusion

Summarizing, *DMQL* is an approach to provide a widely applicable and easy to use support for the analysis of (business process) models. It was developed following the design process stated above by passing through several evaluations. A comparison we made between *GMQL* and *DMQL* showed that both are usable independently from a modeling language [13]. In addition, a preliminary evaluation, where a group of modelers was asked to create the same query with both approaches, showed that the average creation time is 20 minutes for *GMQL* and 16 minutes for *DMQL* and modelers have reported to find *DMQL* more convenient, which let us presume a possible ease of use improvement. However, this was only an internal comparison and reliable numbers

are still pending. While an in-depth evaluation is still part of future work, *DMQL* addresses the identified research gap with wide applicability and easy handling.

Additionally, the efficiency and effectiveness have been successfully evaluated by [13]. As already done during the past development process, evaluation insights and thereof upcoming ideas are taken continuously into account for further algorithm improvement are an improvement the approach. The latest published version of the approach and the video are accessible via www.conceptual-modeling.org.

References

1. PwC: Zukunftsthema Geschäftsprozessmanagement. (2011).
2. Weske, M.: Business Process Management. Springer, Berlin, Germany (2012).
3. Elgammal, A., Turetken, O., van den Heuvel, W.-J., Papazoglou, M.: Formalizing and Appling Compliance Patterns for Business Process Compliance. Softw. Syst. Model. 1–28 (2014).
4. Sadiq, S., Governatori, G., Namiri, K.: Modeling Control Objectives for Business Process Compliance. In: Proc. of the BPM 2007. pp. 149–164. Brisbane, Australia (2007).
5. Lee, A.S., Baskerville, R.L.: Generalizing Generalizability in Information Systems Research. Inf. Syst. Res. 14, 221–432 (2003).
6. Rosemann, M., Vessey, I.: Toward Improving the Relevance of Inf. Syst. Res. to Practice: The Role of Applicability Checks. MISQ. 31, 1–22 (2008).
7. Höhenberger, S., Riehle, D.M., Delfmann, P.: From Legislation to Potential Compliance Violations in Business Processes - Simplicity Matters. In: Proc. of the ECIS 2016. Istanbul, Türkei (2016).
8. Becker, J., Delfmann, P., Eggert, M., Schwittay, S.: Generalizability and Applicability of Model-Based Business Process Compliance-Checking Approaches - A State-of-the-Art Analysis and Research Roadmap. BuR - Bus. Res. 5, 221–247 (2012).
9. Peffers, K., Tuunanen, T., Rothenberger, M.A., Chatterjee, S.: A Design Science Research Methodology for Inf. Syst. Res. J. Manag. Inf. Syst. 24, 45–77 (2007).
10. Delfmann, P., Steinhorst, M., Dietrich, H.-A., Becker, J.: The Generic Model Query Language GMQL – Conceptual Specification, Implementation, and Runtime Evaluation. Inf. Syst. 47, 129–177 (2015).
11. Becker, J., Delfmann, P., Dietrich, H.-A., Steinhorst, M., Eggert, M.: Business Process Compliance Checking – Applying and Evaluating a Generic Pattern Matching Approach for Conceptual Models in the Financial Sector. Inf. Syst. Front. 1–47 (2014).
12. Delfmann, P., Breuker, D., Matzner, M., Becker, J.: Supporting Information Systems Analysis Through Conceptual Model Query – The Diagramed Model Query Language (DMQL). Commun. Assoc. Inf. Syst. 37, (2015).
13. Delfmann, P., Höhenberger, S.: Supporting Business Process Improvement through Business Process Weakness Pattern Collections. In: Proc. of the Wirtschaftsinformatik 2015. pp. 378–392. Osnabrück, Germany (2015).