A Tool to Monitor Consistent Decision-Making in Business Process Execution

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Abstract. Workflow Management Systems such as Camunda allow companies to execute business processes. Here, standards such as the Decision Model and Notation (DMN) can be used to model company decision logic, governing how processes are executed. A potential problem here are inconsistencies in company decision logic, as this can lead to erroneous decision-making. However, it is essential to companies to warrant efficient and compliant process execution. In this report, we therefore present a tool which allows to monitor consistent decision-making during business process execution. Our tool detects inconsistencies in automated decisions and provides companies with an inconsistency analysis using quantitative measures.

Keywords: Decision-Making · Inconsistency Measurement · Camunda

1 Introduction

Workflow Management Systems (WMS) have received recent attention for supporting companies in the integration of process- and decision models [10]. Here, business processes and decision logic can be modeled in a shared technical environment, allowing to execute business processes (semi-)automatically, governed by the decision logic [1]. To ensure a correct process execution, a correct decision logic is thus essential. A potential problem here is the problem of inconsistency, i.e. contradictory information within the decision logic. Consider the example in Figure 1. While there are no problems locally, a global perspective yields an inconsistency in decision making for the shown process. Recent works in BPM research suggest that such inconsistencies can occur in decision models, due to the collaborative and incremental development of these artifacts [1, 2, 4].

In result, companies need to be supported in monitoring consistent decision making during process execution, i.e. in a global sense considering all decisions and their interrelations [8]. In this work, we present a tool that allows to detect and analyze inconsistencies of decisions during process execution. In case of inconsistencies, process execution is stopped to warrant that no compliance violations are commited. Furthermore, companies are presented with a careful analysis of inconsistencies so that problems can be resolved in the context of business process improvement. For this analysis, we apply quantitative measures from the scientific field of inconsistency measurement [6]. To the best of our knowledge,

F. Casati et al. (Eds.): Proceedings of the Dissertation Award and Demonstration, Industrial Track at BPM 2018, CEUR-WS.org, 2018.

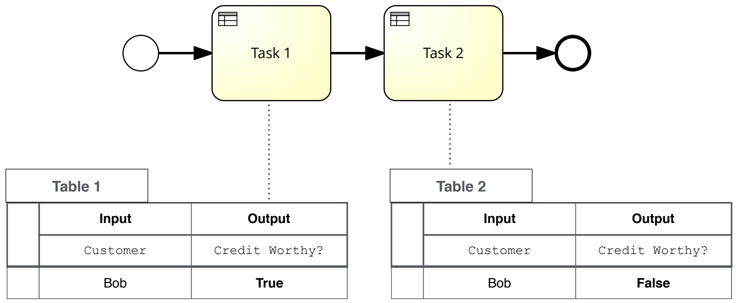

Fig. 1. Exemplary Process Model and Decision Logic

our tool is the first tool to investigate a verification of global consistency of all decisions made during process executions. Also, our tool provides quantitative insights, which can be used as a basis for an informed re-modelling strategy [8]. The following section introduces the tool and provides a usage example.

2 Tool Description

Our tool was developed as a plugin for the browser-based WMS Camunda[1]. A screencast of the tool can be found at https://youtu.be/jus4IkLMOIg.

2.1 Overview

Camunda allows to execute process models as so-called *process instances*. During execution, decisions can be automatedly computed by a rule engine. Our plugin stores every decision made during process execution in a so-called *decision history*. To clarify, this history is incrementally updated during a process execution, storing all respective DMN rules used for decision-making. On every update to this decision history, the tool analyzes the consistency of all decisions made for the current process instance.

The analysis is based on results from the field of Inconsistency Measurement [6]. A central object of study here are so-called *culpability measures*, which allow to assign a numerical value to rules, with the intuition that a higher value reflects a higher degree of inconsistency [9]. We implemented two widely acknowleged measures, namely the $\text{MIV}_{\#}$ and the MIV_c measure [7]. For applicability of these measures, we transform the decision logic into a logic-formalism, namely the Formal Contract Language (FCL) [5]. To this aim, we extended the SPINdle library[2] with a functionality to transform DMN rules into an FCL representation. Also, we extended this library with a solver to detect and analyze inconsistencies.

[1] https://camunda.com/
[2] http://spindle.data61.csiro.au/spindle/

To summarize, the implementation of inconsistency measurement in our tool allows to analyze the global consistency of all decisions made during process execution, and to assess the degree of inconsistency for individual rules in order to provide quantitative insights for companies.

2.2 Usage Example

In the following, we apply our tool for the example in Figure 1.

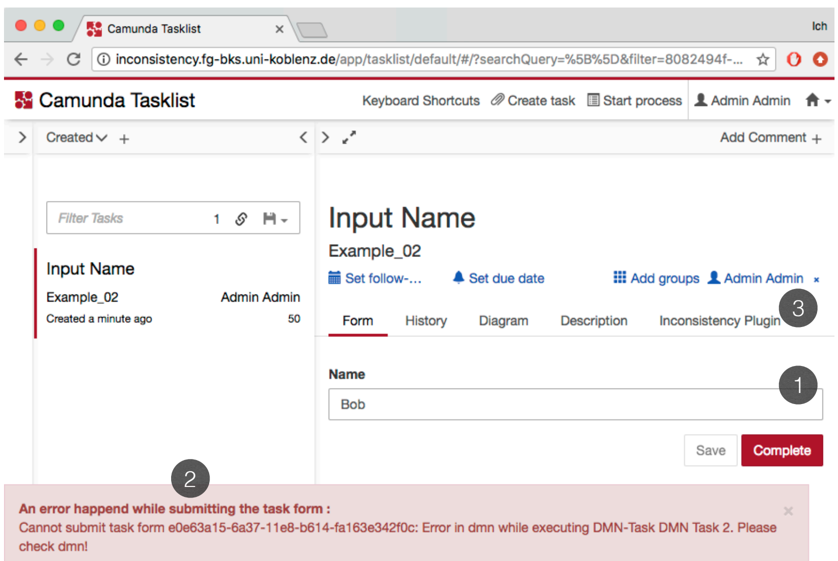

Fig. 2. Camunda Tasklist with Inconsistency Plugin

Figure 2 shows the *Camunda Tasklist*. We assume an employee verifies the creditworthiness of customer Bob (1). In *Task 1* of the process, a decision is made via the rule in *Table 1*. After this decision, the decision history contains this single rule and is thus still consistent. Next, *Task 2* is performed and a corresponding decision via the rule in *Table 2* is computed. This updates the decision history. The tool again checks the consistency of decisions for the current process instance. As can be seen, an inconsistency was detected (2). Process execution is automatically stopped to mitigate potential compliance violations. The user can then switch to the *inconsistency plugin tab* (3).

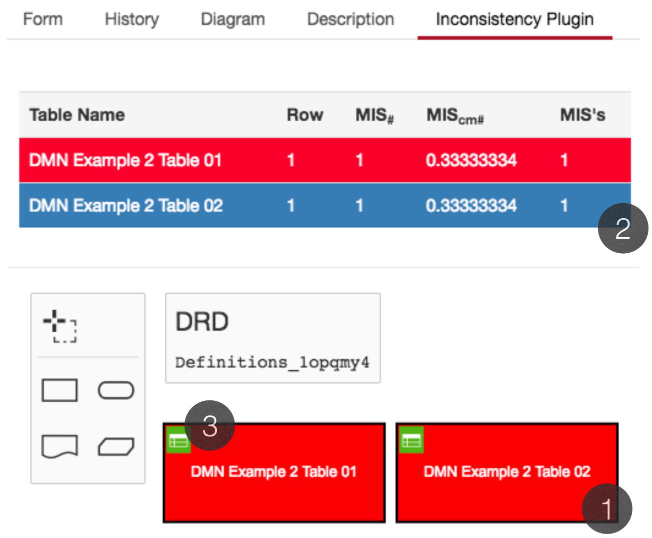

Fig. 3. Inconsistency Plugin main Overview

Figure 3 shows the overview provided by the plugin. All DMN tables that contain rules which cause the inconsistency for the process instance are highlighted in red (1). Also, (2) shows a quantitative analysis of inconsistencies. In this example, we assume the user decides to alter a rule in *Table 1* (3).

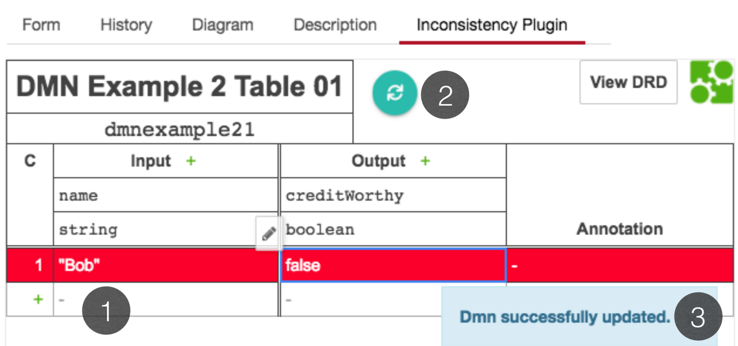

Fig. 4. Resolving Inconsistencies via our Plugin

Figure 4 shows the detail view of *Table 1* in the plugin tab. All inconsistent rows are highlighted to allow the modeler to find the problematic rules (1). We integrated dmn-js[3], a JavaScript library for editing DMN tables. The user can

[3] https://bpmn.io/toolkit/dmn-js/

consequently directly edit DMN tables in Camunda. A refresh button allows to upload the changes (2), which automatically deploys the DMN table (3).

Camunda also offers a dashboard for management, entitled the *Camunda Cockpit*. Here, the problems detected by our plugin are seamlessly integrated into the Cockpit by triggering so-called *incidents*. This allows to provide business intelligence for management in the usual Cockpit environment, allowing to quickly be alerted of and view inconsistencies in decision-making which occured during process execution.

3 Conclusion and Outlook

The tool presented in this report allows to monitor consistent decision-making during process execution. *Detecting* inconsistencies supports compliant process execution. Also, inconsistency *analysis* based on inconsistency measurement provides quantitative insights, which can be used as a basis for an informed resolution and re-modelling strategy [8]. Our tool consequently fosters sustainable business rules management.

Our tool is seamlessly integrated into Camunda. In future work, we aim to present case-studies of applying our tool in industrial settings.

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