Enterprise Operational Analysis Using DEMO and the Enterprise Operating System

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EEWC_2015@Prague.cz

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- Introduction
- GRC principles
- State-of-the-Art Process Mining
- Problem Definition
- The Enterprise Operational Analysis Approach
- Case Study Representation
- Conclusions and Future Work

Introduction

- Organizations must comply with complex regulations, e.g., Sarbanes Oxley, Basel III, stress testing or liquidity risk

- High-risk organizations, e.g., power plants, chemical refineries, demand containment and mitigation of risks

- These challenges are multidisciplinary research and are captured by "Governance, Risk management and Compliance" (GRC), where:
  - **Governance** – involves generic principles, guidelines, and decisions made by the board for ethical criteria, transparency, protection of reputation and proper treatment of the interests of all stakeholders.
    Also includes operational supervision.
  - **Risk** – denote any situation or event that may cause harm to the enterprise or any of its stakeholders
  - **Compliance** - is the implementation of all externally imposed (legal) regulations in day-to-day operation

- Demand for efficiency and effectiveness for organization operation

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GRC principles

To address GRC topics well, we must apply five principles (Racz framework and our work):

- Principle 1: Business-Process Driven
- Principle 2: Design for GRC
- Principle 3: Prescriptive Control
- Principle 4: Enterprise Operational Analysis
- Principle 5: Enterprise Operational Control

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State-of-the-art for Process Mining

Process mining is a process analysis technique for extracting process knowledge purely based on data as registered by corporate systems.

Three types (purposes) of process mining:
– Discovery of the actual process
– Conformance (compliance) to reference model
– Enhancement of a process extended with process knowledge.

Related problem:
– Do we find everything that is relevant?
– Mining data is expensive in resources
– Quality of data is an issue

A bottom-up approach of very relevant challenges.

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Problem definition

- Process mining (PM) supports all GRC principles

- Quality issues related to data registration and extraction:
  - Data is scattered over multiple applications
  - No process-aware data registration
  - Incomplete and inconsistent data registration

- Without effective data registration and extraction, PM will not attain its full potential in supporting GRC
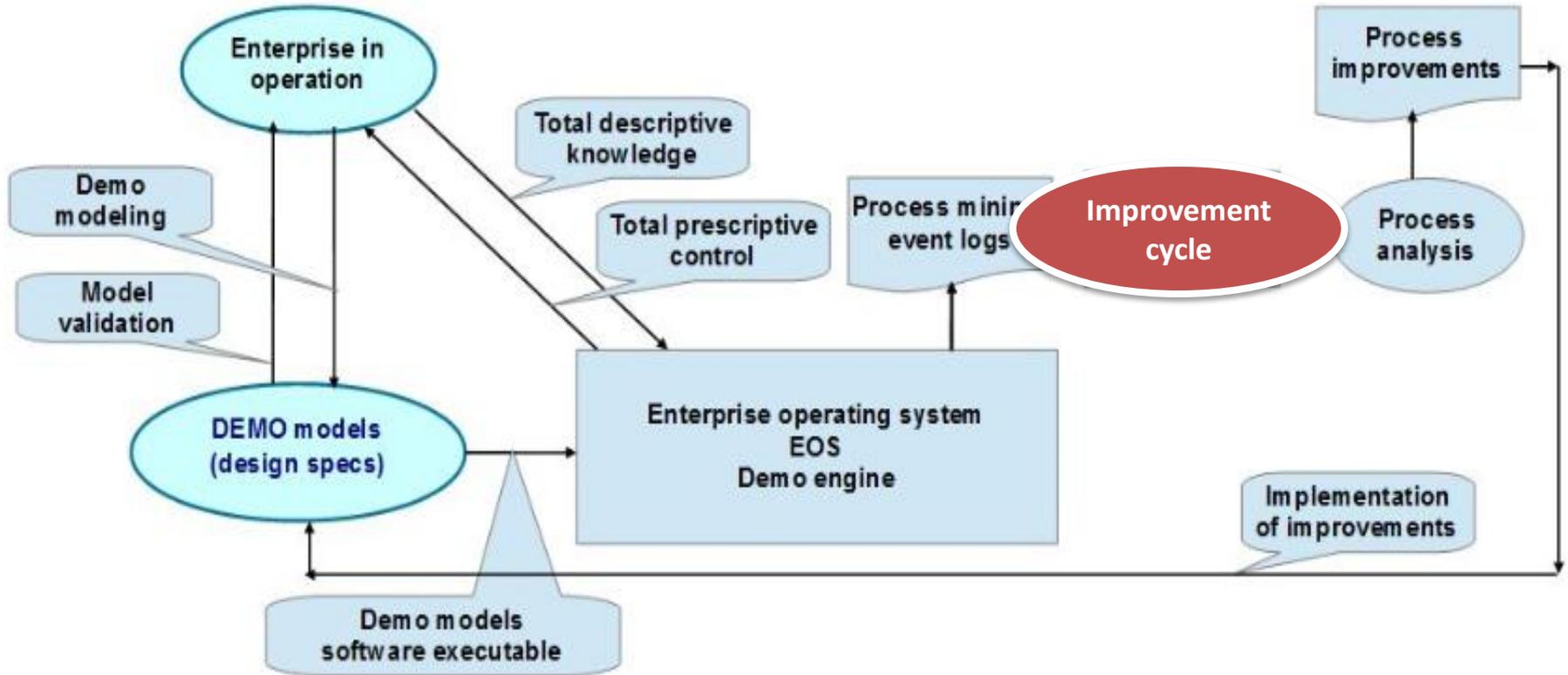
Approach: proposition to use DEMO as a solid foundation

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The Enterprise Operational Analysis Approach
The key constructs

| Enterprise in Operation | DEMO models | DEMO engine | Enterprise Operating System (EOS) | Process mining tools | Process Analysis |

The Enterprise Operational Analysis Approach

The key constructs   Assessment of GRC principles

Enterprise in Operation

DEMO models

Principle 1: Business-Process Driven
Principle 2: Design for GRC

DEMO engine

Enterprise Operating System (EOS)

Principle 3: Prescriptive Control

Principle 4: Enterprise Operational Analysis

Process mining tools

Process Analysis

Principle 5: Enterprise Operational Control

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Case Study overview

- Was performed on data extracted from the DEMO BPM Engine of Formetis as implemented at one of their customers.

- Encompasses a process of connecting households and companies to the energy grid at a semi-public organization that delivers energy and utility services.

- The process mining tool Disco (Fluxicon®) is used

Case study objectives

- The case study consists of several steps in which the suitability with respect to process mining is checked for:

  1. the quality of **data registration of the DEMO BPM Engine**

  2. the quality of **data extraction from the DEMO BPM Engine**

  3. The application of process mining on data extracted from the DEMO Engine for **detective**, **corrective**, and **preventive** aspects of GRC

Transactional Data Registration

- DEMO BPM Engine automatically registers various atomic communication facts surrounding a specific activity or transaction performed by each individual actor:
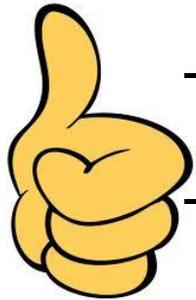
  - insight can be gained in both executed transactions as well as initiated but eventually non-executed transactions.
  - All communication surrounding a specific transaction has actually taken place, either manually or automatically (and are distinguished – **ENSURES HIGH DATA CONSISTENCY**)

- The only remaining concern is that only communication acts are considered surrounding the actual work performed and that the actual moment of statement of work is only as reliable as the moment the resource enters it into the system

Data Extraction

- All data required for process mining is stored in a single central database: DEMO BPM Engine
- Desired auxiliary data residing in connected applications can also be retrieved when required

- However, a trade-off has to be made between required effort and impact
- In this case study, we decided to use only the information readily available in the DEMO BPM Engine

Data extraction sample

- Minimum requirements for process mining: CaseID, Activity, Timestamp

```
1  Case ID,Transaction,Resource,Communication Act,Timestamp,Process Status
2  1,B-T0101,persoon14,RqAck,02/01/2013 15:46:36,1
3  1,B-T0101,rule,Pm,02/01/2013 15:46:36,3
4  1,B-T0101,persoon14,Cl,03/01/2013 10:48:08,0
5  1,B-T0101,persoon40,RqAck,08/05/2013 14:47:44,1
6  1,B-T0101,rule,Pm,08/05/2013 14:47:44,3
7  1,B-T0101,persoon40,Cl,08/05/2013 14:47:48,0
8  1,I-T0102,persoon14,StAck,02/01/2013 16:33:31,6
9  1,I-T0102,rule,Ac,02/01/2013 16:33:31,11
```

Process Mining for GRC

Detective Compliance Perspective:
- Control flow with two subprocesses
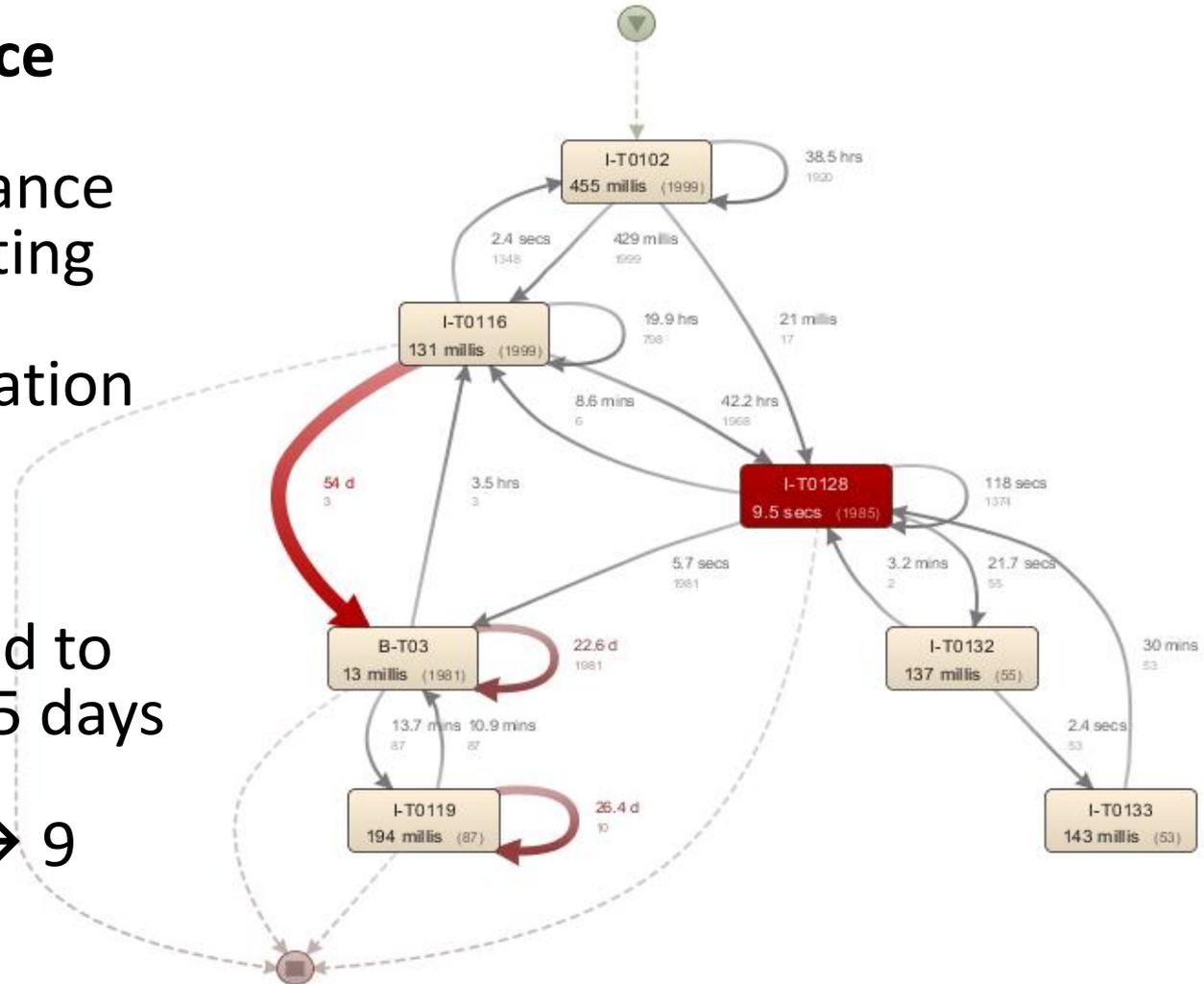- Allows for comparison to reference model to pinpoint deviations
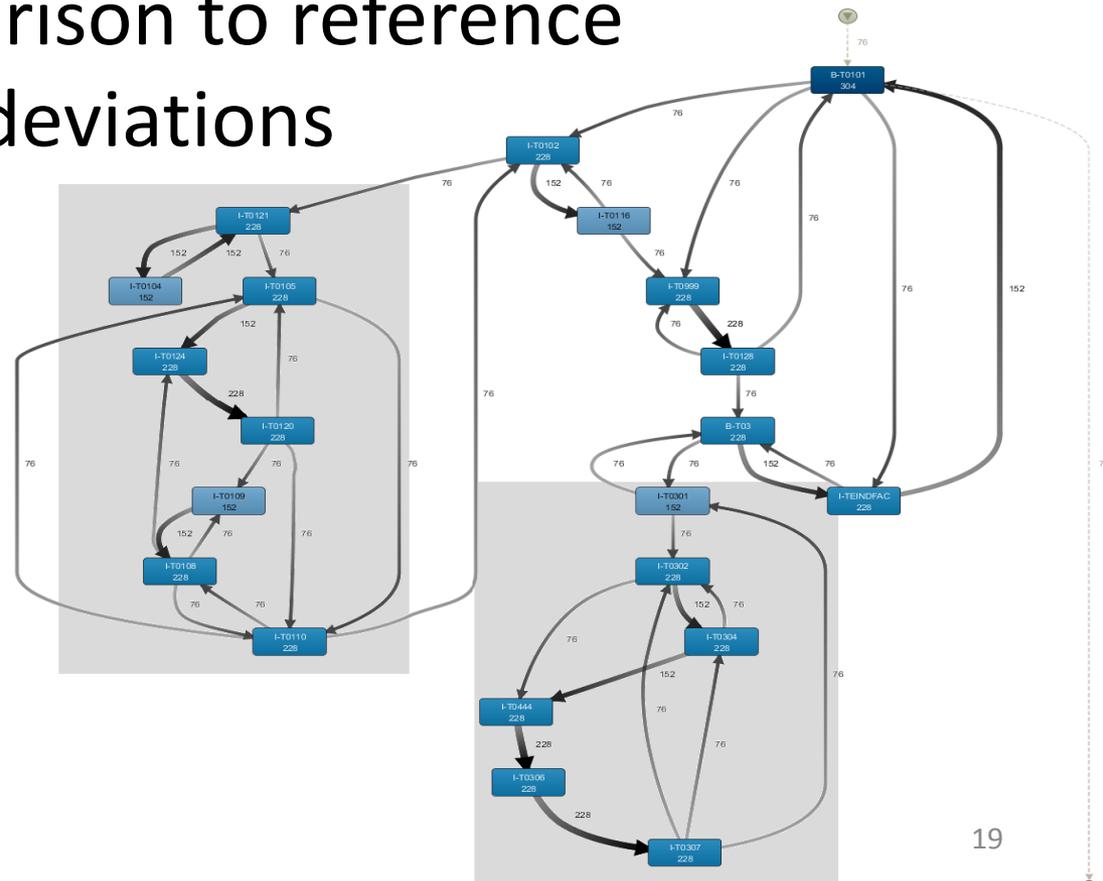
Process Mining for GRC

Detective Compliance Perspective:
- Process performance processing and waiting times
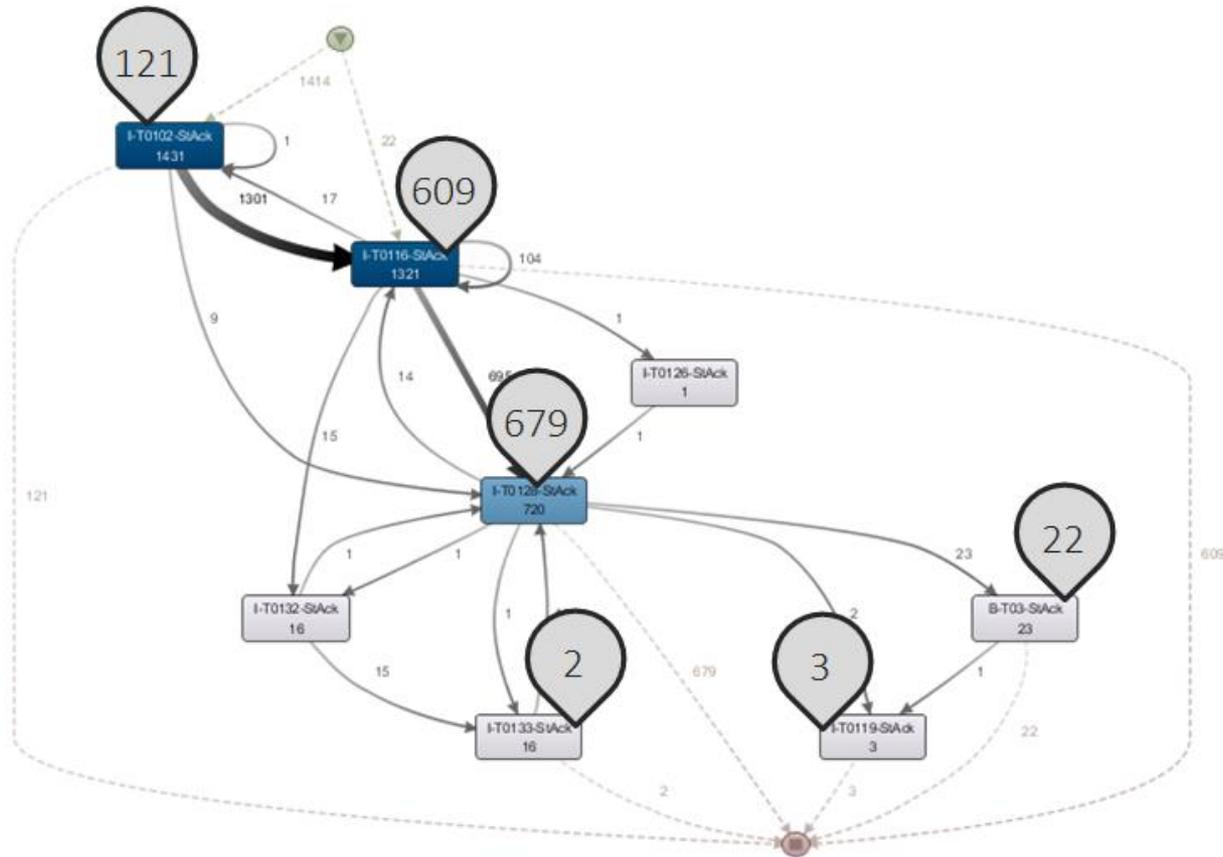- Allows for verification of SLAs

Results:
- Part of process had to be performed ≤ 15 days → 96% adhered
- 4-eyes principle → 9 violations found

Process Mining for GRC

Corrective Compliance Perspective:
- Map of ongoing cases
- Allows for monitoring and corrective actions to assure ongoing business

Process Mining for GRC

Preventive Compliance Perspective:

- Allows for verification of compliance with rules and regulations at design time

- Leads to optimal design and continuous fine-tuning of the WFMS during execution time to the actual behavior of end users
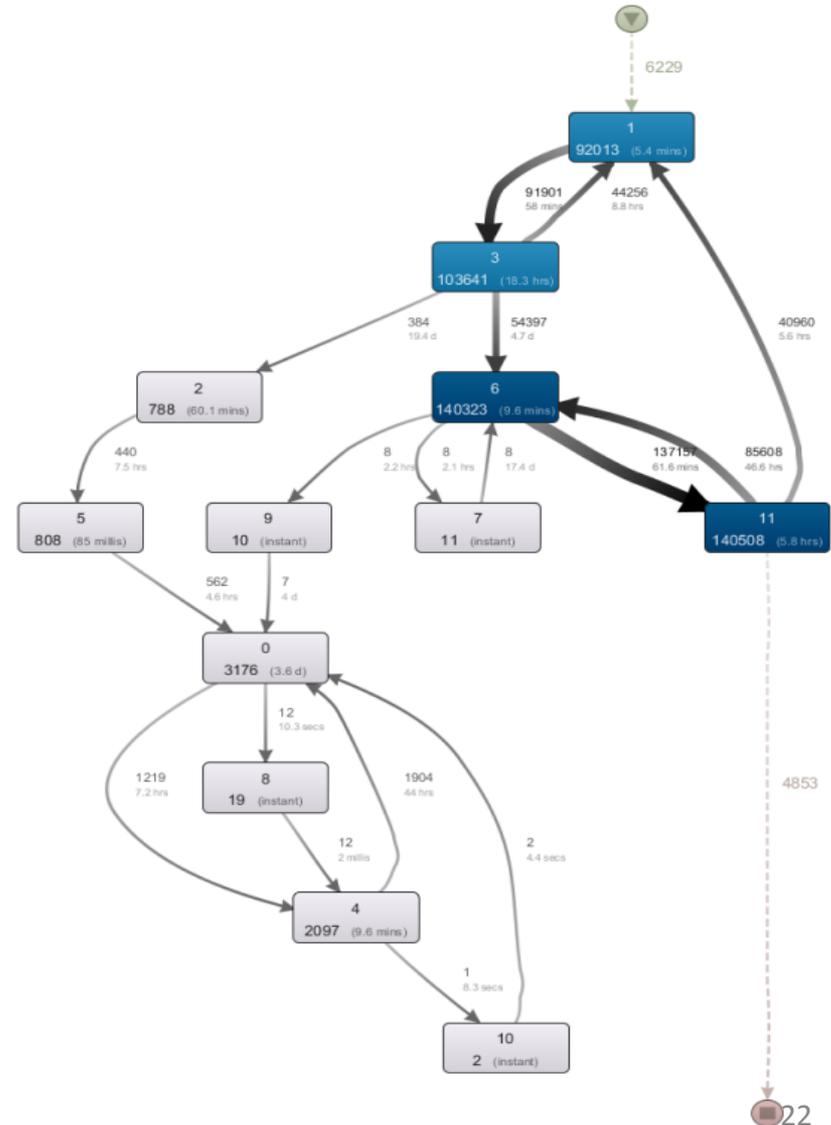
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Conclusions

- Five GRC principles proposed: (1) Business process driven, (2) Design for GRC, (3) Prescriptive control, (4) Enterprise Operational Analysis, (5) Enterprise Operational Control

- A top-down approach, starting from the engineering of an enterprise using DEMO models, model simulation and validation

- EOA is a mandatory capability to address GRC, efficiency and effectiveness challenges. It combines process mining with DEMO and the EOS and resolves many quality issues w.r.t. data registration and extraction:
  - Complete, consistent, and detailed registration
  - Single-source, efficient and reliable extraction
  - Enables data-driven process analysis on various granularity levels and without elaborate preprocessing
  - Enables harmonization between ForMetis and customers

Future Work

- Only one business case has been analyzed with positive results (valuable insight in the daily operation offered to the management).

- Extend design for GRC to support GRC ontologies at design time

- R&D for support of predictive analytics in PM at real-time for GRC

- Additional multidisciplinary research on GRC

Thank you

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Q&A