How to Leverage Process Mining in Organizations - Towards Process Mining Capabilities

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Abstract. Process mining is a fast-growing technology concerned with managing and improving business processes. While the technology itself has been thoroughly scrutinized by prior research, we are only beginning to understand the managerial and organizational implications of process mining. Creating such knowledge is essential for a successful adoption and use of process mining in organizations. We conduct a qualitative-inductive interview study to explore how process mining can be leveraged in organizations. To this end, we systematically examine the needs and experiences of practitioners with process mining at different levels, including heads of process mining, process analysts, and data engineers. Complementing our tutorial, this article provides a theoretical background, outlines our research approach, and presents preliminary findings.

Keywords: Process mining · Organizational implications · Process mining capabilities

1 Introduction

Process mining draws on process event log data to visualize, analyze, and improve business process work [8]. It is associated with a range of economic benefits that are, for example, tied to significantly increased customer satisfaction or cost reduction [3].

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While research in this field has been mainly concerned with technical matters, several recent works called for research around managerial and organizational aspects of process mining [e.g., 10], in order to leverage the full potential of process mining [11]. Understanding the organizational perspective involved in process mining is crucial to capitalize on the possible benefits of the technology [4, 7].

In this short paper, we explore how process mining can be leveraged in organizations successfully. We consider individual stakeholders and the respective capabilities that they need in order to capitalize on the benefits of process mining. To this end, we conducted an interview study with practitioners to assess and analyze their expectations, needs, and capabilities concerning process mining in organizations. We focused on various organizational roles that deal with process mining, namely heads of process mining, process analysts, and data engineers. Key to our findings is that each role is linked to specific tasks that, in turn, translate into different expectations, use cases, and required capabilities.

2 Research Background

Process mining, a technology at the interface of data mining and Business Process Management (BPM), is a relatively new and high-in-demand technology that uses actual process data stored in information systems to display, analyze, and monitor the performances of business processes. Along with process visualization, it can be used for conformance checking, process analysis, and process enhancement [8]. A recent study by Deloitte highlights the practical relevance of process mining; 95% of the companies surveyed stated that they had either already implemented process mining or were planning to do so [2].

Extensive research has been conducted with the primary focus of improving existing or developing new algorithms [e.g., 1, 8]. However, in addition to the development and improvement of algorithms, there are also non-technical aspects that are crucial for the adoption and management of process mining [10]. To this end, recent research has focused on the practical implications of process mining, including project success factors [6], methodologies to conduct projects [9], case studies, or Delphi studies [7]. Despite these works, we are only beginning to understand how process mining is adopted, used, and managed in practice [3, 10], and what potentials it bears for identifying, understanding, and intervening into processes [5, 11]. Specifically, there is a lack of research around the capabilities and competencies that are required to successfully implement and scale process mining.

3 Research Method

We conducted an interview study to examine capabilities associated with process mining. We interviewed participants across different industries to eliminate bias from our results, which allows us to create a more nuanced view on how process mining can be leveraged in organizations successfully. To this extent, our research focused on three different roles. One of them relates to the strategic matters, such as selecting processes to be mined or defining use cases (head of process mining). The other two roles are concerned with

operative tasks, such as analyzing results or improving accuracy (process analyst and data engineer).

Our interviews were semi-structured, and the interview protocols were divided into several parts; they included general information about the aim of the project, general questions about the implementation of process mining in the participants' organization, questions about the participants' tasks, necessary skills for completing those tasks, and technologies that are used. The interviews were conducted both in person and online. Each interview lasted for around one hour. So far, we interviewed six participants, from five different companies and four different industries. We only selected participants, who work for companies that already have a process mining team in place. As a result, the participants were three process analysts, two heads of process mining, and one data engineer. We provide more information in Table 1.

Table 1. Information about interviewees

Role	Responsibility	Industry	Company size
Head of process mining	Translating company-wide strategic goals into tangible targets and driving the adoption of process mining in the organization	1. Manufacturing 2. Energy	1. 31 000 employees 2. 20 000 employees
Process analyst	Building and developing actionable insights	1. Automotive 2. Manufacturing 3. Insurance	1. 100 000 employees 2. 15 000 employees 3. 13 000 employees
Data engineer	Driving the technical implementation of process mining and providing ongoing technical support	1. Automotive	1. 100 000 employees

4 Preliminary Results

4.1 Role-Related Tasks, Technologies, and Skills

In the following section, we will present our preliminary results. We derive the capabilities required for process mining by taking a closer look at the tasks, technologies, and skills for each role as shown in Table 2.

We can see some commonalities across the different roles. For example, each role indicates that communication skills to talk with a multitude of stakeholders are an important part of their daily job. Furthermore, it is important to understand the department's needs and align them with the capabilities needed for process mining. As such, the ability to quickly understand a domain problem and translate business requirements into technical requirements is key. Additionally, we found that data analysis is not only performed

Table 2. Core tasks, technologies, and skills of process mining practitioners

Role	Tasks	Technologies	Skills
Head of process mining	• Communication with departments • Coordination and team leadership • Enabling of continuous process mining usage • Implementation of KPIs • Data preparation and analysis	• Process mining tool	• Communication skills • Data science and statistics skills • Programming • Project management • Translation of business requirements into technical requirements
Process analyst	• Communication with departments • Data preparation and analysis • Internal sales • Presentation of results	• Cloud • Process mining tool • Process modeling tool • Python • SQL	• Communication skills • Data preprocessing, analysis, and visualization • Domain and business knowledge • Programming • Project management
Data engineer	• Communication with departments • ETL operations • Data preparation and analysis • Process and data understanding	• Cloud • Process mining tool • Python • Spark • SQL	• Communication skills • Domain and business knowledge • Problem solving mindset • Programming

by process analysts. All roles reported to engage in some form of data preparation and analysis, albeit to varying degrees. Similarly, both process analysts and heads of process mining perform tasks related to project management. This overlap in tasks of the respective roles is also reflected in the technologies used. All roles use a process mining tool (e.g., Celonis) or a process modeling tool (e.g., Adonis) for their core process mining activities. There is a strong overlap between data engineers and process analysts as both roles use programming languages such as Python or SQL as well as some cloud technology (e.g., AWS).

There are, however, also clear differences between the roles. Heads of process mining reported, for example, that they are hardly involved in the technical realization of process mining projects and their work revolves more around managerial tasks. On the contrary, data engineers primarily engage in the technical implementation of process mining projects. Accordingly, the skillset is the most technology-oriented out of all roles. Process analysts can be located between these two roles and, thus, have the broadest requirement profile. They must continuously perform a balancing act between

technical and business matters related to process mining. This is also reflected in the skillset, which includes technical skills (such as programming) as well as business-related skills (such as project management). When asked for their backgrounds, process analysts had diverse prior experiences ranging from business administration to statistics studies.

4.2 General Observations

In addition to role-specific insights, we report on general observations that we made across all interviewees. These are summarized in Table 3.

Table 3. General organizational implications of process mining

Reported benefits	Main goals	Challenges	Future use cases
• Easier and faster process improvement • Increased process transparency	• Cost minimization • Resource minimization • Risk minimization • Transparency maximization	• Commitment • Data quality • Discrepancy between model and reality • Internal resistance	• External data incorporation • Data streaming • Real-time data availability • Stronger specialization

All interviewees reported that prior to the use of process mining, knowledge about processes was only implicitly represented. Process deviations and their underlying causes were often unknown. While process improvement initiatives were potentially successful, the interviewees reported that the procedure was tedious and lacked standardization. To this end, there was agreement across all interviewees that process mining enabled the companies to improve processes in easier and faster ways. Also, it was reported that process transparency had been increased. However, we observed that these advantages are accompanied by several challenges. For instance, interviewees stated that some processes cannot be optimized by applying process mining techniques, which is mainly due to a multitude of unavoidable process deviations caused by human behavior. One interviewee, for example, indicated that process interruptions are caused by customers being able to contact them, which leads to a complicated process model. Another common challenge of process mining that we identified is a lack of commitment in companies. We found that this manifests itself, for example, in a lack of resources. Another challenge that was reported concerns internal resistance. According to the interviews, employees often feel monitored by the presence of process mining and refuse to support the technology because they are afraid that their domain knowledge will become obsolete. Lastly, process mining success is perceived to be hindered by a lack of data quality. However, the interviewees remain optimistic about the potential of process mining within their respective company. Most notably, a lot of potential is seen in the further development of data sources. One interviewee stated that external data sources such as weather forecasts should be incorporated. Also, it was suggested that companies should move from

batch processing to stream processing whereby data is available in real-time. Lastly, we found that process analysts are required to be generalists as their portfolio of tasks is versatile. As a result, the interviewees expect a stronger specialization of the roles as the technology matures.

5 Conclusion

In this paper, we investigated how process mining can be leveraged in organizations. We conducted a qualitative-inductive interview study to examine practitioners' needs and experiences at different levels. We identified core competencies, tasks, and skills of practitioners who have different roles with regards to process mining, as well as general organizational implications that were reported across all roles. Our preliminary results show that process mining is advancing as an essential part of modern management in order to cope with the ever-increasing dynamics in contemporary organizational work. Overall, it is crucial that those who deal with process mining have the necessary skills and competences to make process mining successful. In future research, we aim to expand these preliminary findings by creating a deeper understanding about necessary capabilities of process mining stakeholders.

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