



# Progressing from Process Mining Insights to Process Improvement: Challenges and Recommendations

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**Abstract.** Many organizations have adopted process mining to analyze their business processes, gain insights into their performance, and identify improvement opportunities. Several academic case studies and reports from practice leave no doubt that process mining tools can deliver substantial value to organizations and help them to realize improvements. However, both organizations and academics have also realized that the path from obtaining insights via process mining to realizing the desired improvements is far from trivial. Existing process mining methodologies pay little to no attention to this matter and mainly focus on how to obtain insights through process mining. In this paper, we address this research gap by conducting a qualitative study based on 17 semi-structured interviews. We identify seven challenges pertaining to translating process mining insights into process improvements. Furthermore, we provide five specific recommendations for practitioners and stakeholders that should be considered before starting a new process mining initiative. By doing so, we aim to close the gap between insights and action and help organizations to effectively use process mining to realize process improvements.

**Keywords:** process mining · insights to action · process improvement · challenges

## 1 Introduction

Over the last years, many organizations have adopted process mining to analyze their business processes, gain insights into their performance, and identify improvement opportunities [19, 33]. Countless academic case studies [33] and reports from practice [19] leave no doubt that process mining tools can deliver substantial value to organizations and help them to realize improvements with respect to relevant performance indicators, such as throughput time [43], conformance [22], or customer satisfaction [14]. However, both organizations and

academics have also realized that the path from obtaining insights via process mining to realizing the desired improvements is far from trivial [16]. In fact, moving beyond diagnostics has been identified as one of the current key challenges of process mining [1]. Existing process mining methodologies, such as Process Diagnostics [9], L\* [42], or PM<sup>2</sup> [15], pay little attention to this matter and mainly focus on how to obtain insights through process mining. Some recent papers have contributed to the discourse by investigating how process mining insights can trigger automated actions [6, 28, 29]. They, however, take a rather technical perspective and do not consider organizational concerns or challenges.

In this paper, we address this research gap and set out to understand the challenges that arise on the path from translating process mining insights into process improvements. Specifically, we aim to answer the following research question: “*Which challenges do organizations face when translating process mining insights into process improvements?*”. To answer this question, we conducted a qualitative study based on semi-structured interviews with 17 process mining experts. In this way, we were able to detect seven challenges that organizations have to overcome in this context. Based on the identified challenges, we further derive five specific recommendations that can help organizations making a successful transition from process mining insights to process improvements. With the detected challenges and recommendations, we contribute to the stream of process mining literature that is concerned with process mining methodologies [9, 15, 42]. Specifically, we extend their scope by providing guidance for the final step in a process mining project.

The rest of the paper is structured as follows. Section 2 introduces the background and the research gap. Section 3 describes our research method. Section 4 presents the identified challenges of translating process mining insights into process improvements. Section 5 reflects on our findings and provides the recommendations we derived. Finally, Sect. 6 concludes the paper.

## 2 Background

In this section, we discuss the background of our research. Our objective is to demonstrate to what extent existing research focuses on the translation of process mining insights into process improvements. To this end, we first review existing process mining methodologies. Then, we reflect on how process mining insights have been used across different studies.

### 2.1 Process Mining Methodologies

The effective use of process mining for process improvement is often a complex endeavor that goes way beyond the use of process mining software [16]. Process mining methodologies, therefore, aim to provide a reference structure for the application of process mining by defining a number of specific steps. Among others, those steps include scope definition, data collection, the application of process mining techniques such as discovery and conformance checking, result

analysis, and process improvement [16]. Several such process mining methodologies have been defined in the past, the most prominent being the process diagnostics methodology (PDM) [9], L\* [42], and PM<sup>2</sup> [15].

While these methodologies differ with respect to several details, they have two main things in common. First, they propose a similar high-level flow involving steps such as data collection, application of process mining techniques, and result analysis. Second, they only pay little attention to how process mining insights can be translated into process improvements. At the same time, however, they acknowledge that this step is important. The authors of PDM highlight that the interpretation of the insights identified through their methodology is critical but lies in the responsibility of the organization [9]. The authors of L\* explain that their methodology can lead to four different improvement actions: redesigning, adjusting, intervening, and supporting. Yet, they only discuss a few examples of what each action entails and do not reflect on how those actions can be implemented [42]. Also, the authors of PM<sup>2</sup> explicitly acknowledge the importance of process improvement based on the obtained insights by including a step called *process improvement and support*. They, however, argue that the realization of such improvements is typically done in the context of a separate project [15].

This lack of attention with respect to the translation of insights into improvements is also discussed in a relatively recent meta study of process mining case studies by Emamjome et al. [16]. They point out that the last phase of process mining projects is only superficially considered in the analyzed studies and, hence, has a low degree of “thoroughness”. They conclude that most case studies they analyzed fit somewhere between the following two categories: 1) “the studies provide insights without any recommendation”, and 2) “the studies provide some recommendations on how to improve the process(es), but do not refer to any implementation”.

To understand how process mining insights are actually used in real-life cases, we review respective literature in the next section.

## 2.2 Use of Process Mining Insights

The value an organization can realize through process mining highly depends on what the organization does with the obtained insights. Recognizing this, many researchers investigated how process mining insights are used or can be used. In general, we can distinguish three main categories for the use of process mining insights: 1) supporting process understanding and documentation, 2) improving the investigated process, and 3) improving information system(s) supporting the investigated process. Below, we briefly elaborate on each category.

Using process mining insights to support *process understanding and documentation* relates to the explorative use of process mining. Simply put, process mining can help organizations to understand what is going on inside their organization. Besides the discovery of the control flow [5], i.e., the order of activities, process mining can also help to uncover how resources interact [4] or to identify business rules [10, 22]. Some authors highlight the importance of writing [30] and presenting [31] reports based on the acquired process mining

insights, yielding documentation creation, reviewing, or updating. For a more comprehensive overview, we refer the interested reader to the literature study from Garcia et al. [37].

In line with the main objective of process mining, many authors aim to use process mining insights to *improve the investigated process* by generating respective recommendations. Such recommendations can be generic and refer to process change or, simply, redesign [18,27]. Some, however, are more specific and include preventing a specific activity from happening [14], eliminating an activity [3], or increasing the frequency of a specific activity [10]. Works focusing on the resource perspective suggest actions such as adding resources [12,13] or increasing resource involvement [38].

As the execution of many processes is supported by one or more information systems, process mining insights can also reveal how to *improve those information systems* in different ways. Some authors discuss rather general aspects such as improving the information system's usability [23,35,40]. Other studies report on redefining [39] and adjusting [25] specific feature settings to be more permissive or restrictive based on thresholds identified through process mining. There are also studies reporting on testing new information system features [21] or identifying opportunities for implementing automation [17,32].

The brief review above illustrates that process mining insights can provide valuable input for both understanding and improving processes and the associated information systems. However, what is currently missing is a clear path towards implementation. As an example, consider a scenario where process mining insights are used to recommend the introduction of an additional quality check in a process. While this recommendation is useful, especially because it is based on a data-driven analysis of the underlying process, putting this recommendation into action is far from trivial. Among others, this requires commitment from both the process manager and the process participants, proper communication of the changes, an allocation of the required resources, additional training, etc. While several authors discuss the importance of communication [2,26,44] and also training in such contexts [43], these concerns are generally only superficially considered. As a result, it remains unclear which challenges need to be overcome to translate insights (or recommendations based on insights) into process improvements.

With this paper, we aim to close this gap by identifying and understanding the challenges that occur in this context. In the next section, we explain the methodology of our study.

### 3 Research Method

To identify and understand the challenges that need to be overcome to translate process mining insights into process improvements, we interviewed 17 experts with several years of industrial experience in process mining projects. Below, we describe our research method. Specifically, we elaborate on the definition of the target population and the interview protocol, the data collection, and the data analysis.

### 3.1 Definition of Target Population and Interview Protocol

Driven by our research question, our target population included process analysts, business analysts, and researchers with experience in process mining projects in industry. We defined our semi-structured interview protocol consisting of a set of predefined open-ended questions inspired by [8, 11]. The intention was to understand the interviewees’ experiences and perspectives related to what happens with process mining insights after they have been acquired. We conducted a test run of our interview protocol with two participants that are not part of this research. With this test run, we verified that the predefined questions were well suited to obtain the desired insights.

### 3.2 Data Collection

We sent personal invitations to potential participants via e-mail and LinkedIn. In total, we interviewed 17 process mining experts. Table 1 provides an overview of the interviewees. It shows the interviewees’ job title (where PM stands for *Process Mining*), experience with process mining in years (cf. column *Exp.*), as well as the continent, size and domain (where IT stands for *Information Technology*) of the organization they work for. The interviewees have an average

**Table 1.** Interviewees’ demographics

Ref.	Job title	Exp.	Organization		
			Continent	Size	Domain
I1	Business Analyst	5–10	Asia	201–500	Oil and Gas
I2	PM Consultant	10–15	Europe	51–200	IT
I3	Transformation Consultant	5–10	Europe	1k–5k	IT
I4	PM Consultant	5–10	Europe	1k–5k	IT
I5	PM Product Owner	10–15	Europe	1k–5k	Finance
I6	Researcher/PM Consultant	10–15	Europe	1k–5k	Education
I7	Researcher/PM Consultant	15–20	Europe	1k–5k	Education
I8	PM Specialist	5–10	Europe	>10k	Public
I9	Senior Manager	10–15	Europe	>10k	Finance
I10	PM Specialist	10–15	Europe	>10k	Audit
I11	PM Specialist	10–15	Europe	>10k	Public
I12	PM Product Owner	15–20	Europe	>10k	Healthcare
I13	PM Product Owner	5–10	North America	1k–5k	IT
I14	PM Consultant	5–10	North America	>10k	IT
I15	PM Analyst	1–5	Oceania	1k–5k	Food
I16	Researcher/PM Consultant	10–15	Oceania	1k–5k	Education
I17	PM Product Owner	5–10	South America	51–200	IT

of seven years of industrial experience with process mining. Eleven of them also obtained a PhD in the process mining field and, therefore, also had additional exposure to the subject. The interviewees used a large variety of process mining tools including ARIS Process Mining, Celonis, Fluxicon Disco, Minit, PAFnow, ProM, UpFlux, UiPath Process Mining, and SAP Signavio.

The interviews were conducted as follows. First, we asked the participants a couple of questions about themselves such as “*What is your role with respect to process mining in your organization?*” and “*For how long have you been working with process mining?*”. Next, we asked general questions about the process mining projects, such as “*What usually triggers the use of process mining in your organization?*” and “*What are usually the expected insights from the stakeholders of a process mining initiative?*”. Then, we asked them to share some details about process mining projects they have been involved with and to talk about the process that was under investigation, the effort that was required to acquire the insights, and which main insights were obtained. Finally, we asked: “*What happened to the process mining insights after they have been acquired?*”. On average, the interviews lasted 54 min.

### 3.3 Data Analysis

Each interview was audio-recorded and transcribed. Then, we anonymized the transcriptions by removing any information that could reveal the interviewees’ identity or the organization they worked for. We conducted a qualitative coding using four main steps [11, 36]. First, we familiarized ourselves with the interviews by reading them and taking general notes. Second, we re-read the interviews and wrote memos. For example, when an interviewee talked about the customer expectations being much different from the process mining outcomes such that they decided to discontinue the project, we added memo notes such as “expectation” and “project ends”. Third, we reviewed our codes to identify possible connections among the codes or the possibility of merging multiple codes into higher-level categories. Finally, we identified multiple categories concerning challenges relating to translating process mining insights into process improvements.

## 4 Findings

In this section, we present the findings of our study. In total, we identified seven specific challenges that can impair an organization’s ability to translate process mining insights into process improvements. We classified these seven challenges into three main categories: 1) organizational commitment, 2) expertise, and 3) expectations. In the subsequent sections, we elaborate on each category in detail and illustrate the respective challenges by using quotes from our interviews. An overview of the three main categories and the seven challenges, as well as the number of supporting interviewees for each category, is depicted in Fig. 1.

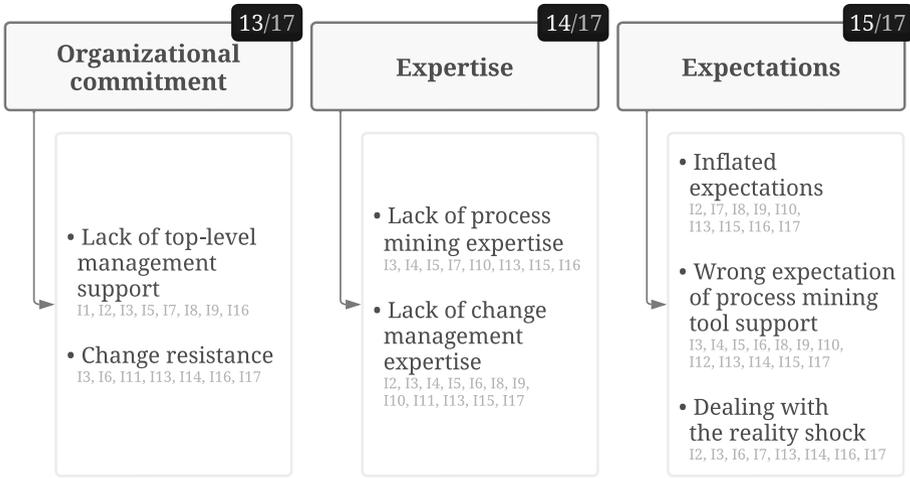


Fig. 1. Overview of the identified challenges

#### 4.1 Organizational Commitment

The fact that change requires organizational commitment has been emphasized in BPM literature for a long time [7, 20, 41]. However, our interviews revealed that this awareness is often limited when it comes to the application of process mining. We identified two specific challenges in this context: lack of top-level management support and change resistance.

**Lack of Top-Level Management Support.** Several interviewees highlighted that, without support from top-level management, process mining projects do not yield much besides acquiring insights about the analyzed processes. For instance, Interviewee I2 pointed out that *“in order to have changes, you do need some top-level support because you need a budget. Another reason why you need top-level support is for them to be able to say that now it’s part of the vision and we should spend time with it, it is part of the initiatives to actually improve this”*. This point is also supported by interviewee I16, who reported on a project where process mining insights were successfully translated into process improvements: *“(…) but you need to understand that this is the head of the organization. He wants to improve the process. If he wasn’t the CEO, if he was a developer, for example, I do not think he would be able to make this change.”*

Interviewee I3 also emphasized the importance of involving a manager or director (i.e., non c-level managers) who can understand and deliver the insights to their team because *“then you get into the normal psychology of human change by having an ambassador, a leader who says we need to change, and supports the work required to change”*. Similarly, I8 stated that *“the organization started to check and act upon process mining insights because there was a new program manager that really believed in process mining”*.

Change Resistance. Resistance to change is a well-known and well-studied phenomenon [34]. In our interviews, we encountered both individual as well as organizational resistance to change. As for individual resistance, the interviewees mentioned instances of resistance that can be related to *habit* and *fear of the unknown*. *Habit* describes the problem of people resisting change because they need to alter the way they work. Resistance due to a *fear of the unknown* is more abstract and can be attributed to the uncertainty that individuals experience when changes are introduced. As for organizational resistance, interviewees mentioned instances of *structural inertia* and *threat to established power relationships*. *Structural inertia* refers to changes that interfere with the organizations' mechanisms built to produce stability in the work processes. The *threat to established power relationships* occurs when these power relationships are at risk because of the redistribution of the responsibility for decision-making.

Interviewee I6 described a case that relates both to *habit* and *structural inertia*: "... it is important to grow confidence on process mining with smaller suggestions for improvement first, and really think through which kind of recommendations of improvements to make, because asking someone to change the way that he or she works might not be the smartest way of going for it". Interviewee I6 also shared an interesting reflection on how they handled the anticipated resistance to change: "the stakeholders already know that I am not going to try to replace anyone or any decision, I will try only to support or try to provide information or ways for them to do their work just as they were doing before but with very small changes. Just then is when people start accepting the suggestions to change". This example highlights how important it is to involve someone in which the affected people in the organization trust. In this particular case, the interviewee has been responsible for different process mining projects in the organization for almost four years.

Interviewees I13 and I14 also described examples of *fear of the unknown*. I13 mentioned that "... some people get 'cold feet' about going forward with process mining projects because people will demand responses from them later and they are just afraid to take the responsibility". Similarly, I14 pointed out that "people are too scared of having to change". They both also mentioned cases of people impeding the process mining project by hiding information. Interviewee I13 stated that "sometimes we could show people up in the value chain, directors, the potential value of process mining, and they would sponsor our conversations with the operations team who, however, didn't want their directors to know everything that was going on within operations. They didn't want to be monitored. Then, they told their directors that they did not have all the data or did not find anything meaningful". Interviewee I14 also shared a case where information was hidden by managers, stating that "managers know they can do better, but they also know that their bosses do not know they can do better. So they can play 'life easy', and using process mining would take this advantage away from them".

## 4.2 Expertise

Realizing process improvements through process mining requires the organization to have certain expertise at its disposal. On the one hand, it is critical that the process mining insights can be properly understood and interpreted, i.e., there is a need for process mining expertise. On the other hand, identified weaknesses must also lead to effective changes in the organization's processes, i.e., there is also an immanent need for change management expertise.

**Lack of Process Mining Expertise.** Several interviewees pointed out that, according to their experience, the output of process mining tools can hardly be properly interpreted without an employee who is capable of understanding both process mining as well as the domain. Interviewee I4 mentioned that in one of the organizations they worked on, the organization had *“purchased the license, and they were supposed to use the tool themselves, but they weren't able to generate any findings or insights”*. While the interviewee, having several years of process mining experience, was not specifically hired for that project, they had to step in to prevent the process mining project from being canceled.

Interviewees I5 referred to *“the need for a process mining expert working in the project, especially one that can also learn or previously know about the domain”*. Similarly, interviewee I16 stated that *“process mining is a good tool for communication within the team if they are interested from the beginning, but process mining needs a good process analyst and involvement of a domain expert”*. Also, interviewee I7 mentioned that *“you need a process mining expert who can translate the event log data into insights to the organization”*, and interviewee I13 mentioned that the *“big blockers to buying and using process mining are that companies over and over again say that they do not have the people to analyze what process mining is showing them”*.

**Lack of Change Management Expertise.** Several interviewees highlighted that there are different cases that demand for an (impartial) change management expert. In some cases, there is a lack of technical expertise and no commitment from the stakeholders to work on the changes. For example, interviewee I4 mentioned that the proposed changes based on process mining insights were never implemented because *“it tends to be complicated making changes and running two configurations in the same live data. We did not have the expertise to make these changes, and the stakeholders didn't want to commit with their own resources to do it”*.

In other cases, as reported by interviewee I11, there is a lack of financial support and of a manager with company-wide access. Interviewee I11 mentioned that the impact they could make was *“initially small to nonexistent, because they needed a strong manager to bring widespread process mining initiatives in the organization, make these initiatives continuous and more effective, but this manager was not there”*. Interviewee I11 also mentioned that when there was a *“strong manager”*, related to the financial department of the company, he was capable of implementing a company-wise widespread process mining

initiative. According to the interviewee, this manager had broad access to different departments and financial support.

Finally, as raised by interviewee I17, there should be an impartial change manager to deal with political-related aspects that are harming the company: “... [we] should put someone capable to do the change management in the company to recover the lost money caused by inefficient employees”. This, however, did not happen because, in this case, “a very well related person, that does not follow good practices can be protected by their peers. We can detect such behaviors, but nothing happens, and the project ends”.

### 4.3 Expectations

We found that the application of process mining is often associated with high expectations and partially also with misconceptions. We identified three main challenges in this context: inflated expectations, wrong expectation of process mining tool support, and dealing with the reality shock.

**Inflated Expectations.** Several interviewees highlighted the importance of being aware of the effort required to translate process mining insights into improvements, and not expect that process mining will magically improve the process.

Interviewee I13 shared that “people have been disappointed with process mining in the past, but mostly because either they had inflated expectations or they underestimated the work that needs to go into turning insights into something useful”. According to interviewee I17, “the most successful projects have a good alignment between expectations and insights”. The interviewee mentioned that they drive this alignment based on previous experience and previously defined templates building on expected and acquired insights.

Interviewee I2 suggested to handle inflated expectations by starting the process mining project small: “oftentimes it is difficult to turn process mining insights into value, because if you find something, then you might not know, for example, the person whose responsibility this is to pick it up. It also might be a not known pain point, which would lead you to first needing to convince people that actually what you found is true. So, my approach is to typically start small, not with the biggest money maker process, to start gaining some trust in the solution and start with problems that people already know and about which they might already have some hypothesis”. According to interviewee I2, starting small also makes it easier for the company to acquire experience using process mining and understand how fast the company is in implementing, analyzing, and getting value out of the process mining project. Similarly, to narrow down stakeholder’s expectations, interviewee I9 mentioned that “before starting any project we always sit together with the client, ask them about their priorities, and also whether there is any specific challenge that they would like us to focus on, or that they would like more insights about or more recommendations about”.

**Wrong Expectation of Process Mining Tool Support.** This challenge relates to the problem that stakeholders still see process mining as a

“*full-fledged process improver setup*”, which is not the case. Therefore, process mining methodologies and advocates should consider including change management initiatives as one of its stages, or at least provide initial guidance regarding the effort required to move process mining insights into action.

Interviewee I4 mentioned that “*process mining should not be the only tool or artifact for process improvement. It should be aligned with other tools and initiatives for that. Data itself is not enough to really understand the underlying problem. With data and process mining we can, most of the time, describe the problem well, but we can't really say how to improve it; there needs to be some sort of process understanding that then is used to finally improve the process*”. Interviewee I12 highlighted that “*process mining is a tool to support process redesign initiatives in the organization. So, an advice for making process mining more usable, the process should be analyzed and then there should be a second phase to work upon improvements based on what we saw*”.

Also interviewee I15 highlighted that “*the limitation of the tool compared to the expectations of the stakeholder is a challenge. Process mining requires a few stages to actually bring value to the customers: we need to build the data model, then do the analysis, then, based on the insights, think of how to turn insights into action. And the action part is the challenging part for business. Turning insights into action is certainly a pain point for most businesses. Turning insights into action involves different departments; it involves how the business operated before and how they are going to operate in the future, and the most challenging part is that it involves multiple departments, and it really depends on how the senior managers are going to do. It really depends on how you manage your company*”.

Interviewee I13 shared a situation that they went through when after they showed their process mining tool to a friend that was working at a big tech company, this friend asked them: “*are you telling me that I should pay you money for you to show me my problems and not solve them? Really?*”. According to I13, “*there is a need for expectation management and, of course, this inflated-expectations is not a problem exclusive to process mining. And as long as process mining is not something that is well understood by the market, inflated expectations will always be there*”.

**Dealing with the Reality Shock.** Process mining is a “*big mouth*” and it will uncover “*hard truths to swallow*”. While some interviewees mention that “*it is easier for managers trying to use process mining to say that it doesn't work than to accept the insights it can deliver*” (I13) and “*process mining is too truthful*” (I14), interviewee I3 suggests a mean to deal with the reality shock: “*you need to involve your customer because then they evolve in the way of thinking at the same rate as you. If you don't do that and you simply take the data, go back to your cave and start analyzing it, you come back conceptually and mentally three steps ahead of them, and if you then just drop it on them, they could be very defensive because you basically tell them their process is a mess, and that's very often what it is. So, you need to take them along on the journey.*”.

The reality shock can occur for the organization conducting a process mining project to understand and improve their own processes, for the process participants, and it can also be for service providers or process analysts. An example of

a reality shock for the organization, interviewee I6 shared a case where the nurses of a hospital were highly stressed with their work. The managers of the hospital did not understand how that could be, considering how much idle time the nurses had, based on usual process discovery-related insights acquired. The interviewee decided to look more closely at the daily work of the nurses by conducting observation sessions. They learned that the idle time was just a reflection of limited data availability related to their daily work process. The managers learned the hard way that process mining can only show what is included in the event log. All the times, the nurses needed to hurry to a patient's room to attend to a patient's call had not been recorded in any information system.

An example of a reality shock for the process participant, also shared by interviewee I6, related to long waiting times for an emergency room. At first, the physicians were not enthusiastic about the process mining project that was started by the management team. The interviewee learned that one of the reasons for this long wait was that physicians switch context too often. In other words, the doctor has a certain amount of patients in the waiting room; one has an orthopedic problem, the other one has a cardiac problem, the other a neurological problem, etc. The physicians did not notice, but they were taking too long to think of the different special reasons related to different patient needs. The interviewee suggested them to group patients per type of complaint and analyze each group together. They applied the suggestion to one department and could see the waiting time of all patients reduced by 20%. Thereafter, the physicians started to accept the technique.

As an example of a reality shock for the process mining service provider, interviewee I13 shared an example related to a credit card sales process. In essence, the process was concerned with selling a credit card to clients in a physical store. Part of the selling process was a credit analysis to check the customer's credit status. The analysis revealed that every time a human was involved in the credit analysis, it took double the time to close the sale, and the likelihood of a successful sale decreased. After analyzing the credit analyst's actual work, the interviewee noticed they were very fast. They further investigated this inefficiency and learned that whenever a manual credit analysis was triggered, the client in the store was said to wait and would walk around the store and eventually simply leave. The interviewee suggested a very simple solution to this problem (e.g., offer coffee to the client or talk to them for a while), but "*once the manager of the credit checking group realized that it wasn't the credit analysis that was delaying the process, it was not his fault and he didn't care about making any changes anymore and they did not continue using process mining after that*".

## 5 Recommendations

The findings from our interviews reveal that translating process mining insights into process improvements comes with substantial challenges. Our interviews also highlight that it is likely that the transition from insights to improvements

is never made if these challenges remain unaddressed. It is not particularly surprising that several of the challenges we identified relate to phenomena that have been made in the context of change management, such as resistance to change [24]. Yet, process mining projects, and hence also the associated challenges, differ from traditional change management projects, digital transformation projects, and process redesign initiatives. Most importantly, in process mining projects, the insights that provide the starting point and argument for changes are acquired through software. Naturally, this does not only change the nature of change resistance but also calls for specific expertise for interpreting results and implementing changes. As existing process mining methodologies have paid little to no attention to these aspects [16], we derived five recommendations that organizations should consider when starting a process mining initiative. The recommendations provide specific input on how process mining projects should be prepared, set up, conducted and who should be involved. Specifically, our derived recommendations for process mining projects in practice are the following:

- R1 - Engage top-level management support:** Top-level management support should be secured before the start of the process mining initiative. It is essential for getting appropriate financial support, conveying the importance of the initiative, and ensuring the ability to actually implement the required changes.
- R2 - Be ready to face resistance to change:** Resistance to change must be expected in every process mining initiative and should be handled appropriately. We found that it is particularly about communication. If people understand which changes will be implemented and why, they are much more likely to support their implementation. Handling fears and concerns, therefore, is a critical activity.
- R3 - Have process mining and domain expertise at your disposal:** One of the critical steps in every process mining initiative is the interpretation of the acquired results. This requires an individual who is familiar with both process mining and the respective domain of the organization. Such a person should be either hired or educated on time.
- R4 - Have change management competence at your disposal:** Translating process mining insights into process improvements requires change. Hence, it is essential to have change management expertise available in the organization. Such a change manager will follow up on the recommendations of the process analyst (see R3) and develop a strategy on how to successfully implement the desired changes.
- R5 - Manage expectations:** Expectations among several stakeholders of a process mining initiative are often unrealistic. Therefore, it is important to manage expectations with respect to the outcome and also the effort that will be required to realize process improvements through process mining. People need to be aware that process mining is a tool and will not magically improve processes without any effort.

The recommendations stem from the identified challenges (cf., Sect. 4). For convenience, Table 2 presents which recommendations address which challenges.

**Table 2.** Recommendations to challenges mapping

R1	R2	R3	R4	R5	Challenge
•					Lack of top-level management support
	•				Change resistance
		•			Lack of process mining expertise
			•		Lack of change management expertise
				•	Inflated expectations
				•	Wrong expectation of process mining tool support
				•	Dealing with the reality shock

## 6 Conclusion

In this paper, we investigated which challenges organizations face when translating process mining insights into process improvements. To this end, we conducted a qualitative study involving 17 interviews with process mining experts. Based on these interviews, we identified seven challenges, which we turned into five specific recommendations that organizations using process mining should consider. Among others, we highlighted the importance of top-level management support and the availability of expertise with respect to process mining, the domain, and change management. After all, turning process mining insights into improvement requires change and, therefore, also a respective commitment from several levels of the organization.

Naturally, our study is subject to limitations. Most importantly, our study is qualitative and, hence, limited in terms of generalizability. We, however, attempted to mitigate this concern by involving process mining experts that worked in different organizations and settings, have used different process mining tools and approaches, and faced different problems in their organizations. Other biases, e.g. with respect to the analysis, we mitigated by jointly building the data collection protocol, and jointly conducting, reviewing, and discussing the coding effort related to the data analysis. Therefore, we are confident that our results appropriately reflect the challenges organizations face, and provide valuable input about how process mining insights can be translated into process improvements.

In future work, we aim to validate our findings in the context of a large case study. Furthermore, we plan to incorporate our findings into a comprehensive proposal for a process mining methodology.

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