

Improving Process Mining Maturity – From Intentions to Actions

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Appendix (available online via <http://link.springer.com>)

Appendix

Table 3: Relevant quotes for the dimension *Organization*

Organization				
Quote ID	Internal / External	Actions	Quote	Interviewee
O01-01	Internal	Conduct Proof of Concept	"We are now working on a first use case based on the experience we have already gained."	I5
O02-01	Internal	Improve process and data understanding by conducting a communication initiative	"[The corporation] is currently launching a major communication initiative on the subject of process management [...] which then forms the basis for process mining"	I5
O02-02	Internal	Improve process and data understanding by conducting a communication initiative	"We have completed a communication campaign. [...] We have made the campaign more human relatable, because process and data are rather abstract. We used every day working situations from real colleague [to show their relation to data and processes]."	I6
O03-01	Internal	Ensure everyone understands case-centric thinking	"It starts in the very banal question of which business object am I talking about? So there was a kick-off event with a very very good colleague of mine, we talked about it and in the first conversation he said, can we leave out this topic of Case ID and can we please only think with order items? So we then talked for a very long time about not rebuilding the standard of a CaseID, but saying that it is a new size. And we have to communicate this new size to the company. So it has to be somehow understandable for everyone what a Case ID is, because otherwise you move too far away from the standard."	I7
O04-01	Internal	Leverage synergies with big transformation projects	"So we will include that in the strategy [for a global ERP system]"	I5
O04-02	Internal	Leverage synergies with big transformation projects	"For us, the starting point was the ERP transformation. [...] That is an extreme tailwind for the transformation [to also gain sponsorship for process mining]. [...] But that can also be any other trigger point / major initiative."	I6
O05-01	Internal	Secure IT-Support	"We first discussed the added value that we see in this. IT also sees advantages for itself. Then we made it clear what we expect."	I5
O06-01	Internal	Set organizational embedding	"By the end of the day, you need someone who connects IT and business processes. Therefore, the organizational embedding is important and one should clarify - 'who does it [process mining]'"	I5
O06-02	External	Set organizational embedding	"The driving force usually comes from process management at the customer, if this is already present in the form. We also had projects that were purely IT-driven. From my experience, I have to say that these were the less successful ones, but basically you always have both roles in the projects, on the customer side. We actually require both sides."	I9
O06-03	Internal	Set organizational embedding	"Process mining is not directly assigned to a department, but rather to individuals who also work across departments."	I2
O06-04	Internal	Set organizational embedding	"We have a process management department that deals with classic process management, i.e. actually creates BPMN 2.0 diagrams and thus makes the company transparent. We have a digitalization strategy with a wide variety of areas and branches, but [process mining vendor] and process mining themselves stood on their own and can of course always be pushed forward on their own in any topic area that also covers the other areas."	I10
O06-05	Internal	Set organizational embedding	"The center of excellence [for process mining] was established in the finance department."	I11
O07-01	Internal	Raise awareness of PM among managers	"As part of a Lean training, we assembled bicycles and collected the data. Through PM, you could see afterwards how the process worked. Then the assembly was optimized, and you could see the effects straight away."	I5
O07-02	External	Raise awareness of PM among managers	"...and then we made the next appointment with the executives and presented them with what process mining actually is, but of course at a very high level in order to simply give an overview of what we hope to achieve from it and why and what we imagined."	I8
O08-01	External	Raise awareness of PM among employees	"With the customers, I would say, above all, that we often have to create the willingness first. The interest is perhaps there, but are they willing to act? But we also show there, that they really can see their processes. There is potential here that you can use and this is not to control and monitor, but rather it is intended to really support you in improving the processes and recognizing potential."	I8
O09-01	Internal	Secure budget	"We have a sponsor who says 'hey what can provide PM for me?' [...] In the constellation [of the first PoC], the sponsor was there in each case."	I6
O09-02	Internal	Secure budget	"In 2014, Process Mining Vendor 1 was used for the first time, but it was not introduced until 2021 with Process Mining Vendor 2. There wasn't enough money for it back then!"	I7
O10-01	Internal	Start several initiatives in the company and consolidate them afterwards	"[The agile work of individual projects, the findings of which are then consolidated in the group] is an approach that we have done well with."	I6
O11-01	Internal	Start one initiative and expand it onto the company afterwards	"No, we do it all centrally, they [other divisions] can't use it without us. So we have sovereignty over the system, we can decide who uses what and when, so to speak, and everything has to run centrally through us, including the data connection. The idea came from the research project and then our colleagues approached us. And yes, then we said, yes, we'd be happy to do it, then we also held a workshop directly with the other division, with the specialist department, in order to understand the process more closely, i.e., classically, really like a requirements workshop, we then went deep into the process so that we first understood what they wanted to map, what their requirements were."	I10
O11-02	Internal	Start one initiative and expand it onto the company later	"We expanded the topic to other use cases after the research project."	I4
O12-01	Internal	Develop core teams in the departments/divisions	"In IT [and the divisions], core teams are being trained that are available for mining"	I6
O12-02	Internal	Develop core teams in the departments/divisions	"Exactly, we now have a central Center of Excellence, which is now also anchored in the company's top management. And then there are satellites around it. For example, we are in the metering point operation, and we have another person in retail who does extensive process mining automation. I think we now have two more in receivables management and sales. And the idea is that this central core deals with typical system administrator issues. In the individual departments, so to speak, there are those who sit down with the end users."	I4
O13-01	Internal	Decide whether to include external consulting	"We have now spoken to external parties who can advise us on PM"	I5
O13-02	External	Decide whether to include external consulting	"The customers come from all sorts of areas; they are mostly larger companies because process mining is not necessarily cheap. Both the product and the associated consulting services, the skills are rarely available in-house to the customers from what I have seen, such that you can start it completely from scratch."	I9
O14-01	Internal	Establish BPM and process mining in parallel	"My impression is that you need process mining and classic BPM in parallel. Whenever something is done outside of the IT systems, I can't see it. But when I sit and talk with the people at the table, I can learn much more."	I11

Table 4: Relevant quotes for the dimension *Data Foundation*

Data Foundation				
Quote ID	Internal / External	Actions	Quote	Interviewee
D01-01	External	Create a common data understanding to identify the right and relevant process data	"However, the data had not yet been prepared for this at all and he had not looked at any of the data beforehand. That means, of course, you first have to understand, on the one hand, what the data means, how can I interpret it and, on the other hand, how do I get an event log from it. Which is a relatively high data processing step, until you really have such a unity, to which you can say, 'ok this is my process, I want to understand it in the whole, in the overall context across different information systems and recognize that a uniform ID was created each time.'"	18
D02-01	Internal	Check the initial data maturity	"First of all, we looked at whether we had the data for process mining. [...] We had major concerns about this and to some extent it is still the case."	15
D02-02	External	Check the initial data maturity	"...Make sure that we can extract the data as well. That was a very important point..."	19
D02-03	External	Check the initial data maturity	"So, that was just extremely old-fashioned. And even though we have the people who are extremely knowledgeable, the systems are old not only in terms of their design, but also in terms of the data base. So then it just lacks the transactional data that we need to be able to mine the processes."	19
D03-01	Internal	Address data gaps	"We reconciled where we have [data] gaps and then talked to the business partners how to deal with it: do we do a manual extraction or do we leave a black box there."	15
D04-01	Internal	Use automation to ensure the data quality	"The fact that the price changes are not entered as quickly as they come, especially during Corona, was challenging and we have quite a few price changes. Then we realized, crap, the data wasn't updated as quickly, but then we built a solution directly so that the robot [automation] can now make price changes and we therefore have better data quality again."	110
D05-01	Internal	Connect further systems iteratively	"Various systems were gradually integrated (ERP, secondary systems, workforce, etc.)."	14
D06-01	Internal	Connect the data to the process mining tool	"We have use the connectors [from process mining vendor] so far."	16
D06-02	External	Connect the data to the process mining tool	"That, that's how it usually starts and then the next steps are to sit down with the right people in smaller groups. These are then usually the system experts and administrators with whom we build the connector and try to load the data."	19
D06-03	Internal	Connect the data to the process mining tool	"We also have quite a few custom tables. Of course, we then had to take a close look at where the data was still in the raw tables, so that we might get to it. We really always went into the tables but some of it was quite the drama. In the end we always discussed it with the respective [inhouse ERP] consultant."	110
D07-01	Internal	Consider the process mining capabilities of new systems	"Parallel to the ERP transformation, the whole issue of data governance is being tackled because we see that we need to create a better foundation for ourselves."	16
D07-02	Internal	Consider the process mining capabilities of new systems	"The switching to the ERP system is a good opportunity to increase process mining activities."	13
D08-01	Internal	Create a data lake for process data	"Our data was originally solely extracted from the ERP system. [...] We further push data into a data lake and use it [the data lake] as the central repository and get data from there."	17
D09-01	Internal	Development of an open data platform	"We are now also on the project-accompanying committee of a research project that is concerned with building and designing a data platform or a connector for process mining, such that we are then more open to being able to rely on a wide variety of software solutions."	110
D10-01	External	Creation of an event-data infrastructure	"We have also done this in other contexts, such as setting up an event data infrastructure, which means that this topic was also clear in itself, and it was also easy to understand what data was actually flowing out of it, but it should then be completely compiled by a streaming platform so that it can later be used for mining."	18
D11-01	External	Manual data exports	"Another thing is less the data in itself, but rather how do we get the data out, which sometimes also has problems when you work with on-premises systems where we cannot connect the data and the system directly. Then we have to do it manually, which always causes something unpleasant and other problems. (...) Manual then means driving exports."	19
D12-01	Internal	Strive for perfection, deploy pragmatically	"First question is what do you understand by data quality? With 98% usable. 1% unusable due to customizing, which IT/PM department cannot explain. Additional percentage is caused by missing timestamp. Missing timestamp leads to complex rework. Due to that, I say: let pragmatism prevail and do not focus too much on it."	17

Table 5: Relevant quotes for the dimension *Peoples' Knowledge*

People's Knowledge				
Quote ID	Internal / External	Actions	Quote	Interviewee
P01-01	Internal	Conduct trainings for the process mining tools	"Yes, we did traings with the process mining vendor."	I5
P01-02	External	Conduct trainings for the process mining tools	"For example, 2-day training is usually part of the standard package that we sell on the consulting side, simply so that the project participants on the customer side can experience it for themselves."	I9
P01-03	Internal	Conduct trainings for the process mining tools	"If I could choose, I would let you [interviewer/ science] tell us more again. That's more fair and objective somehow."	I3
P01-04	External	Conduct trainings for the process mining tools	"Exactly, on the one hand we of course have training that you can do."	I8
P02-01	External	Adapt the training to the department	"Yes, the content is a bit different. So the departments often want to understand this, want to understand where their processes come from and what methods we use to recognize the processes. While the data science department mainly want to know, where exactly does the data come from in detail, how do we prepare it, which algorithm is used? Yes, everything behind it has been adapted a little, of course always to the target group."	I8
P03-01	External	Use other employees as multipliers.	"As we called it, 'Train The Trainer', training courses . In this way we really try to create the multipliers on the customer side."	I9
P03-02	Internal	Use other employees as mulitpliers.	"I and my colleagues help other colleagues to use the tools in the context of larger appointments."	I4
P04-01	Internal	Reuse of experiences as new trainings	"We're also documenting these things [experiences] clearly now, that we have some kind of short training."	I5
P05-01	Internal	Involve process participants in the process of building the analysis	"End users were included in the creation of process mining analyzes so that these [the analysis] are actually used in the end."	I4
P06-01	Internal	Externalize PM knowledge	"The results and implementation for process mining are well documented. This is particularly important because interfaces change regularly."	I4
P06-02	External	Externalize PM knowledge	"For certain processes, we simply passed on the software vendor's wiki to new employees."	I1
P06-03	External	Externalize PM knowledge	"I've done a lot of that now, that I documented it in the wiki at the customer's site. The findings that we made, even how we prepared the data. That way everything is written down once collected."	I8
P07-01	External	Differentiate between a technical and a functional documentation of process mining	"[We wrote] a documentation sheet that describes our data interpretation process as well as the techniques and methods that were used in projects. This way, they [the consultancy clients] have the collected knowledge or they can look it up."	I8
P08-01	Internal	Gather best practices	"In documentation [of knowledge] we typically record lessons learned [by a central person]."	I6

Table 6: Relevant quotes for the dimension *Scope of the Process Mining Activity*

Scope of Process Mining				
Quote ID	Internal / External	Actions	Quote	Interviewee
S01-01	Internal	Identify use cases based on business requests	“So far, we’ve [selected processes] at the behest of the sponsor or the stakeholder group.”	I6
S02-01	Internal	Identify use cases based on the systematic screening of End-To-End processes regarding the data and business benefit	“We went through the end-to-end process and looked at where is the data, what can we measure, [...] what brings the business forward?”	I5
S03-01	Internal	Identify use cases based on business benefit	“The BPM identifies the most important business variables for us. We consider these more strongly.”	I7
S04-01	Internal	Identify use cases based on showcasing PM capabilities	“[As a Data Analytics team] [we] are looking for an additional 2-3 smaller cases to show the possibilities [of process mining]. Departments that are interested in this we support/consider more.”	I7
S05-01	Internal	Showcase PM capabilities / results to generate business requests	“We join the quarterly meetings of the BPM team. [...] There, we showcase our ‘service’ [the process mining initiative], and invite the BPM team to contact us if help is needed.”	I7
S05-02	Internal	Showcase PM capabilities / results to generate business requests	“Through the presentation and communication of the other process mining projects, new use cases are constantly emerging because more and more people from other departments are contacting us.”	I4
S05-03	Internal	Showcase PM capabilities / results to generate business requests	“Through input from department heads or from certain people who simply have good ideas there. That’s why it’s actually always a pretty sure thing that new use cases emerge.”	I2
S06-01	Internal	Create guidelines for identifying use cases	“Is this a process, is this a problem that I can solve with PM. Then we need to look at whether that’s a useful use case.”	I5
S06-02	Internal	Create guidelines for identifying use cases	“Ultimately, with a project charter that we look at each use case separately, we describe what the use case is, what data we need for it and what roles are involved and what the expected results are.”	I6
S07-01	Internal	Identify the appropriate Process Mining techniques for your use case.	We primarily used process discovery. Conformance checking wasn’t a big focus because our processes are highly standardized.	I4
S07-02	External	Identify the appropriate Process Mining techniques for your use case.	“... and they just want a little bit of transparency. [...] and quite common theme is to increase automation. [...] And then I would really say process conformance.”	I9
S07-03	External	Identify the appropriate Process Mining techniques for your use case.	“Exactly, so mainly Discovery. As soon as that is established and we also show what other options will be available. We are also partly there with predictive process monitoring, yes. I actually haven’t used conformance checking in practice. The main reason is that we have not gone through the complete process definition, but rather used process discovery to create a model, which was compared to the expectations. We simply didn’t have the proper basis for conducting Conformance Checking”.	I8
S07-04	External	Identify the appropriate Process Mining techniques for your use case.	“For the first discovery, we often just used simple Python visualization. To simply show what your processes look like and then build on that.”	I8
S08-01	External	Expand the scope based on research	“What we often do is that we hold a workshop or arrange an appointment with the customer in which we present what we think is really cool and which we believe could also be of great use, and above all we do research and development. And then I at least present it to the customer and talk about whether it is of interest.”	I8
S09-01	Internal	Expand the use cases iteratively	“Step by step, depending on where interesting topics lie and where people are interested. So we also noticed with the whole process mining initiative that people have to have the time and the desire, because “it is more work and then you have to change somehow afterwards with the findings” or “you have to start something and Don’t just look at the beautiful picture and say, yes, good”.	I10
S09-02	External	Expand the use cases iteratively	“So it was really iterative that we said we would sit down together. For example, in the first step we visualized the data that was already available and could be prepared relatively easily and then iteratively sat down with the customer to see what the next steps would be and which use cases you would like to deal with.”	I8
S10-01	External	Conduct regular meetings to iteratively discuss process mining results	“We primarily used process mining and therefore first of all to control and monitor the processes, but then ultimately to gain knowledge from them. What can I do with my process, would I like to have any optimization potential? I would like to change some parameters and see what effect the whole thing has, for this we have regular appointments or workshops in which the results are presented. After discussing the process picture and looking at it, how can we now draw insights from it that will help us?”	I8
S11-01	Internal	Assess the requirements in a dedicated preparation phase	“Individual project evaluation criteria and planning measures can only be transferred to the next project to a limited extent due to the different nature of the processes and people involved. [...] Before the project starts, a dedicated preparation phase should be carried out in each case to evaluate the organizational and technical framework conditions.”	I11

Table 7: Relevant quotes for the dimension *Governance*

Governance				
Quote ID	Internal / External	Actions	Quote	Interviewee
G01-01	Internal	Select the right tool for your purpose	"I then looked at the various providers, we then ran a pilot with the process mining vendor and then I said I would like to have another look over the competition before we decide on anything and yes, then the decision actually fell on the competitor."	I10
G02-01	Internal	Involve the works council	"We then took a colleague [from the works council] into the project group."	I5
G02-02	Internal	Involve the works council	"In order to avoid the potential for anxiety, the works council was involved from the start."	I7
G03-01	Internal	Set up an operating agreement for the data usage	"With a clean operating agreement, we should have resolved the issues of who can use which data and what can be done with it."	I5
G04-01	Internal	Set up an interim agreement for the first projects	"For now we have set up an interim agreement."	I5
G05-01	Internal	Ensure data security	"Since we are operators of critical infrastructure, information security and data security must be given top priority. However, subtleties were initially ignored in order to get the project off the ground."	I4
G05-02	External	Ensure data security	"This is often a sensitive topic, also purely for data protection reasons, that certain areas are only allowed to see their own data. We also had cases where sensitive data was available because we work with government institutions, in some cases, and then we have to make it clear in advance that the data does not end up with us [process mining vendor] in the first place. But at the core there are the people who later build the dashboards, it has to be very clear that they are only allowed to see, what they should see, be it the data from their own country or the data from their own specialist area, and then there are the people who prepare the data, and some of them shouldn't have access to the results, but have to work in scripts, but not in the analysis itself."	I9
G05-03	Internal	Ensure data security	"The IT [department] has taken on a counter role in the long term and voted against using a cloud tool from a third-party provider and giving this provider (broader) access to a data lake. On the one hand, this is due to IT security reasons and, on the other hand, to possible implications if a change of provider is to be carried out."	I11
G06-01	External	Ensure the project handover	"There are the technical people who are familiar with the data, then there are the experts who are familiar with the processes, and these are also the roles that, after the project is completed, will continue to advance the topic and also the rights-management."	I9
G06-02	External	Ensure the project handover	"So if the capacity is there for us to hand it over, then we are happy to hand it over, we also take people on board early on, directly, so that they get to know the methods right from the start, know how the whole thing is structured, the entire thing. In my opinion, knowing the infrastructure is actually the most desirable thing; it spreads knowledge early on and offers companies the opportunity to carry out process mining themselves."	I8
G07-01	External	Define a rights management	"Analyzes are currently tied to roles, but could and should be available to everyone in the future."	I1
G08-01	Internal	Define roles	"There is a triad: IT does the entire enterprise architecture from technology, information management, and all the way to the business architecture. The BPM should then start at the business architecture and say: 'this is what our process looks like, this is how we would like to have it mapped in the system.' It then implements strategy goals and also parts of the modeling and primarily does the requirements management. We [data analytics] come last, where it's really about continuous improvement, data procurement and then really controlling as such."	I7
G08-02	External	Define roles	"So we have, I would say, IT experts, and we have the specialists in their field, those are, roughly speaking, the two large roles that would later work with the tool."	I9
G08-03	Internal	Define roles	"But apart from that, we have distributed business users, i.e. colleagues can use and apply the analyses, however, adapting them something only we in our department [analysts] can do. That should also remain with us for the time being."	I10
G08-04	External	Define roles	"Hmm, so it's often the case in smaller projects that it's up to the data science department or the IT department, depending on how much of the project is split up. In principle, they are also allowed to do this. The departments also look at the data and can of course filter and analyze it, but they can't connect new data themselves, for example."	I8
G08-05	External	Define roles	"In another project I was on, there was a very clear separation. There was this one process excellence team, they were the process owners. The departments were able to monitor and analyze the processes, but everything was arranged by this one team."	I8
G08-06	Internal	Define roles	"We have defined so many different role models [...] depending on the project and the type and suspension of the process [...]. With the experience from previous projects, the role model evolves"	I11