Process Mining in Non-Governmental Organizations

180Degrees
CONSULTING
MUNICH

“Even though this report may appear to be the act of only 180DC Munich, it indeed was a team effort involving many individuals and organizations valuable for the final product. There are several people who have rooted for our team during the last few months. We wanted to express our gratitude to them for the support and guidance.

We would not have been able to put together this report without the important insights from our interview partners – representatives of NGOs and industry experts. Their comments constituted the basis of our report. We are thankful for the time they dedicated for the interviews and look forward to doing future projects together with them.

We are also grateful for the support and priceless feedback provided by our co-advisors from Celonis, our project mentor, and our consulting director.

Authors:

Layla Roche

Senior Student Consultant

MSc Management and Technology TUM

E-mail: layla.roche@180dcmunich.org

Simon Rudat

Senior Student Consultant

MSc Management and Technology TUM

E-mail: simon.rudat@180dcmunich.org

Bozhena Hryvnak

Senior Student Consultant

MSc Management TUM

E-mail: bozhena.hryvnak@180dcmunich.org

Contact 180DC Munich:

E-mail: projektakquise@180dcmunich.org

Facebook: www.facebook.com/180dcmunich

Website: www.180dcmunich.org

Munich, 20.07.2021

Outline

Executive Summary

Non-governmental organisations (NGOs) do invaluable work for society and the more effective these NGOs, the more they can contribute. But when processes are inefficient, NGOs and their created impact suffers. This report assesses what issues NGOs are facing in their processes and what part Process Mining can play in leveraging impact, efficiency, and transparency potentials.

In our report, we identified three challenges to be particularly severe in NGOs. These challenges comprise fundraising, marketing, and operations processes. We summarized the gained insights about unique needs of NGOs and tackled them with Process Mining technology. Process Mining creates process improvements by using historical event logs recorded by an information system.

NGOs can use the extracted knowledge from information systems to discover, monitor, and improve processes within the organization. We identified three use cases where Process Mining can enhance NGO processes:

- **Discovering** inefficiencies in the as-is-process by visualizing and analysing the donor journey
- **Monitoring** mailing performance by identifying deviations to the should-be process
- **Improving** inventory management by implementing automatic replenishment of goods for the distribution process in the warehouse

We conclude that Process Mining tools such as the one from Celonis are powerful to manage and analyse processes. However, it requires time-efforts (~10 weeks for value assessment) and a considerable amount of saved event logs. Implementing Process Mining early allow organizations to get their processes right from the beginning, without a need to modify existing structures and analyse large datasets. Additionally, already having simple data management tools in place, may allow organizations to smoothly transfer their data to Process Mining software.

1. Introduction

"We need a plan. But before we can have a plan, we're going to need a plan to make the plan. In order to have that, we're going to need to start a process. In order to start that process, we're going to need a committee." - @nonprofitssay on Twitter, 2021

Non-governmental organizations (NGOs) can shape our world by adding valuable contributions to the development and functioning of civil society. The more effective their work is, the more these organizations can contribute. It is, however, typical for these organizations to suffer from inefficiencies in processes, minimizing therefore generated impact. A potential improvement opportunity for NGOs could be the business-tested technology of Process Mining.

Process Mining is on the rise in corporate settings. Just recently, the market leader of Process Mining software Celonis has raised $1bn at a $11.1bn company valuation, making it the most valuable start-up in Germany (Konrad, 2021). While the corporate world has become highly interested in understanding the flaws and inconsistencies of their processes, it is unclear whether it could also help NGOs to create more transparent, efficient processes and thus more impact. But NGOs face unique challenges and often have differing values from traditional companies. To enable NGOs to utilize Process Mining, it is therefore necessary to develop an understanding of their unique needs and structures. On this quest, we set ourselves the guiding question: **What issues are NGOs facing in their processes and what part can Process Mining play in solving these?**

Before deep diving into Process Mining technology and data generation, we conducted interviews with NGO representatives as well as industry experts to identify possible inefficiencies in the existing structures. The NGO representatives allowed us to identify pain points in NGO processes and industry experts informed us about general current trends. In total, we conducted nine interviews. We would further tackle these inefficiencies in the use-cases to illustrate plausible improvement opportunities.

Since the exploratory nature of our paper calls for a qualitative research approach, we conducted interviews with partners based on a mix of theoretical and convenience sampling. We used a semi-structured interview approach for our interviews, for which a topic guide was prepared beforehand, still allowing a certain degree of flexibility to place a focus on the topics that the interviewee knew much about. After one pilot interview (included in the sample), we made minor changes to the interview guide. The meetings were pre-scheduled to 45 min. As COVID-19 restrictions hindered us to meet with our interviewees in person, we conducted all interviews online. We triangulated our interview findings with further external data such as information from the respective homepages, existing reports, and relevant blog posts. While we took most of the interview partners from our own network at 180 Degrees Consulting (180DC) Munich, we also contacted large NGOs, where we obtained particularly interesting insights.

The main part of this report we start by introducing the fictitious NGO "Wildy" that was created as a simulation of all our interview partners to address their needs and wants and

improvement possibilities, while not revealing the real names. Next, we elaborate on what Process Mining is and its necessary implementation steps. To describe Process Mining technology, we are referring to market-leading software from Celonis. Our decision to build the report based on Celonis software is justified by the successful experience of its utilization by consultants from 180DC Munich. Their work included analysis and optimization of the donor journey for an NGO. Further in the report, we will illustrate, three use cases of Process Mining related to the NGO challenges identified through the interview process. Throughout the text, we refer to Wildy, the imaginary case study, to emphasize the practical relevance of these use cases. Finally, we close our research paper with a conclusion and food for thought for NGO-enthusiasts just like we are.

2. Wildy

Founded in 2004 in Munich, Wildy contributes to preserving wildlife and biodiversity in Namibia. Wildy's staff includes one hundred team members and around five hundred volunteers, many of whom are below the age of thirty-five. While the headquarter is based in Munich, Wildy works intensively with local partners in Namibia. Catherine is the Co-Director of the NGO. In the last couple of weeks, she has prepared a retrospective view on potential process inefficiencies and improvement opportunities.

Disclaimer! We made up this case study and Wildy does not exist. It embodies the common characteristics and challenges of the NGOs that we interviewed.

Like many other NGOs, one concern for Catherine has been the fundraising process. One issue is the acquisition and retention of permanent donors, which led to unregular funding streams in the past. She attributes part of the problem to the overhead caused by many repetitive tasks in the fundraising department. Furthermore, their donor management system cannot present available data well to derive meaningful insights of their donors. Without the possibility to analyse and monitor the process, donor interaction remains a black box. Representatives of the fundraising team report they feel like they are only "reacting rather than acting" to the inefficiencies in the process.

The second challenge Catherine identified relates to their marketing activities. Non-digital marketing channels remain a significant means to engage donors. One of their most successful channels has been physical mailing. Commonly, Wildy sends out mailings on special occasions such as Christmas and customizes them to specific target groups. Currently, the marketing team tracks the performance via an Excel sheet, which is unsuitable for the high number of data points. To continue benefiting from successful mailing campaigns, Wildy needs to implement a new process that unburdens the team from tedious mail preparation.

Another striking problem Catherine identified is the on-site operations and distribution process. Wildy has difficulties to execute the on-site process in Namibia, while having the headquarter in Munich. To name just one example, Wildy had suffered from false deliveries of educational materials about biodiversity for a school in Namibia. That can partly be led back to a lack of capacities, which was even amplified by the travel restrictions imposed as a response to the COVID-19 pandemic.

Catherine heard about the possibilities of a rising technology called Process Mining. She wonders whether it could solve some of her challenges and asks 180DC Munich to assess its potential for Wildy.

3. Process Mining

3.1 Definition

With the increasing amount of data gathered in enterprises through information systems Process Mining has constantly gained importance in the context of business in the last years. Managers have benefited from this technology through process improvements given by the enhanced understanding of the company's core processes (Zelst et al., 2020).

Process Mining creates these improvements by using historical *event logs* as shown in Table 1, which consist of events recorded by the organization's information system. The event logs include information like the user initiating the event, timestamps, and other data attributes such as costs. Moreover, each event refers to the execution of an activity as a part of a whole case, which is a process instance such as a customer order (Aalst et al., 2006), (Aalst, 2012)

Case id	Timestamp	Activity	Resource	Transactional	Cost	···
⋮	⋮	⋮	⋮	⋮	⋮	···
12373	30-7-2019 11.02	Register request	Barbara	Start	50	···
12373	30-7-2019 11.12	Register request	Barbara	Complete	50	···
12374	30-7-2019 11.32	Register request	Jan	Start	50	···
12374	30-7-2019 11.44	Register request	Jan	Complete	50	···
12373	30-7-2019 12.12	Check ticket	Hajo	Start	100	···
12374	30-7-2019 14.16	Examine casually	Jorge	Start	400	···
12375	30-7-2019 14.32	Register request	Josep	Start	50	···
12374	30-7-2019 14.16	Examine casually	Jorge	Complete	400	···
12373	30-7-2019 14.42	Check ticket	Hajo	Complete	100	···
12375	30-7-2019 14.32	Register request	Josep	Complete	50	···
12375	30-7-2019 15.42	Examine thoroughly	Marlon	Start	600	···
12373	03-8-2019 11.18	Examine thoroughly	Barbara	Start	600	···
12375	03-8-2019 12.42	Examine thoroughly	Marlon	Complete	600	···
12373	03-8-2019 15.18	Examine thoroughly	Barbara	Complete	600	···
⋮	⋮	⋮	⋮	⋮	⋮	···

Table 1: Historical Event Logs

Source: Zelst et al., 2020, p. 4

Organisations can then use that extracted knowledge to discover, monitor, and improve processes. For the discovery technique the behaviour observed in an event log is being explained through an automatically created process model as pictured in Figure 1. Each rounded rectangle represents an activity, while the arrows indicate the order of the activities. The thicker arrows indicate the "should-be"-process, the desired process the organization is aiming for, while the thinner arrows represent potential deviations. By seeing the actual

process and its problems, Process Mining can then be used to discuss problems among stakeholders and generate process improvement ideas. One main advantage of having the process modelled automatically instead of mapping it manually is the time that can be saved. (Aalst, 2012)

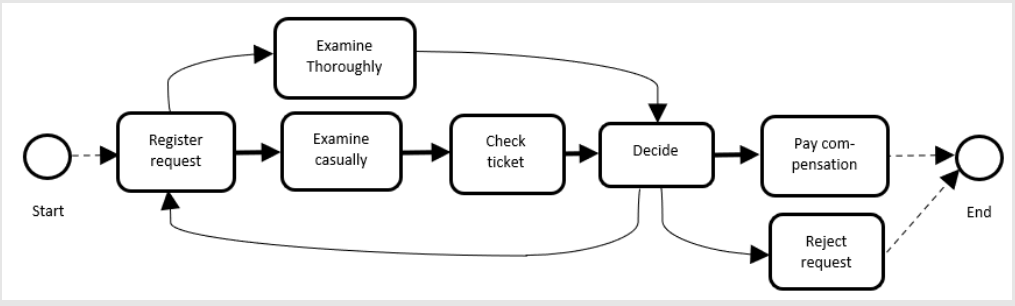

Figure 1: Process Model based on the Event Log in Table 1

To use Process Mining for monitoring, the organization can compare the as-is-process from the event log with the should-be-process to check whether they conform each other. (Aalst, 2012) The process from Figure 1 shows that in the as-is-process not every process follows the same activities. Sometimes activities are redone, skipped or replaced. By identifying the differences, the organization can see the impact of the deviations on the process, for example how much extra time is needed for the additional steps or what activities sometimes must be redone.

Finally, Process Mining can be used for enhancement, where the should-be-process is being extended or improved by using the process recorded in the event log. Therefore, the main bottlenecks can be avoided, and a more efficient should-be-model can be created. (Aalst, 2012)

3.2 Implementation

This chapter describes the how to get started with Process Mining. We illustrate the path of an organization implementing Process Mining, based on the market-leading software from Celonis (Celonis a). We thereby hope to give the reader a broader picture on the use of Process Mining. The path is applied to the use cases presented in chapter 4.

Info box 1: KPIs

Key performance indicators are a way of monitoring goals and achievements. You can follow your progress and measure the impact of your actions. 180DC Munich has also used it in a previous process mining projects with a German NGO.

To measure the effectiveness of a campaign organized by Caritas, for example, the donor lifetime value (an average value of the cumulative donations of a person including potential future donations) was used.

Celonis recommends an agile approach for discovering, monitoring, and improving processes within a company by picking one process and focusing on solutions that have a substantial impact compared to their effort. Moreover, to start off small an organization should collect time-stamped event logs from their information systems (like Salesforce or any desktop applications) and use three key steps, namely creating a planning framework, building a team, and starting with the implementation.

For the first step a clear foundation for the Process Mining strategy is needed within the organization, deciding on the strategic goals and KPIs. Those KPIs should be tied to the goals and business outcomes. If Catherine for example wants to aim for the **outcome** of increasing the donor retention, a **KPI** that could be used as a measurement are the engagement opportunities for donors.

When building a team, clear roles and trainings, a governance structure and active reporting are needed. Wildy can decide to either build a dedicated centralized process mining team or develop decentralized process mining capacities within their teams. Due to practical reasons Wildy decides to not create a whole new department, but to include the technology in the finance, marketing, and logistics department, which are the business areas they want to use Process Mining for. The team lead for Process Mining is also the person responsible for the department's outcomes, as recommended by Celonis. The team is responsible for identifying an **execution gap** and the **root cause** behind that gap with the help of Process Mining.

Therefore, certain call-to-actions are being recommended by the team. Based on those recommendations Wildy needs the right implementation plan, which can create strategic changes within 10 weeks. (Rautenburger & Liebl, 2020) Catherine, for example, must be notified of highly motivated donors that lack recent engagement opportunities. If Wildy would not use the identification of a problem's root causes to turn the consequently derived recommendations into **action**, nothing would change for the organization.

4. Use Cases

After having described what Process Mining is and how to implement it within an organization, we give examples on how it may solve challenges that appear during execution of standardised practices through Process Mining. Throughout our report, you got to know about many difficulties that Wildy had to overcome. Most of them come under repeating patterns, therefore we decided to group those into three categories, namely donor journey, mailings, distribution. The solution to Wildy's problems fits into the framework of discovering, monitoring, and improving in the following way:

- Within the donor journey process, we discover root causes of process frictions caused by errors and inefficiencies.
- In the area of mailings process, we monitor deviations between the should-be-model and the as-is-model to identify improvement opportunities in the current process.
- Within the process improvement in the distribution department, we remove frictions through standardization or optimization.

4.1 Donor Journey

Catherine highlighted the unreliability of funding opportunities. While donors finance a considerable portion of the activities, Wildy does not really know their donors and respective behaviours. A widespread practice in the corporate world is to map *customer journeys* that

illustrate the cross-channel experience a customer has while engaging with the brand. Nowadays, NGOs also have multiple touchpoints with their donors. Not only in the offline world but also through social media they are always communicating with their donor base. One of Wildy's overarching goals is to increase the amount of regular donations in the long term.

The beginning of the implementation marks the formulation of relevant KPIs. KPI definition is a process, which the team should align closely to the organisation's goals. One approach to derive meaningful metrics is by putting oneself into the shoes of a typical donor through the creation of *personas* (see Info box 2). Personas improve brainstorming and encourage to think creatively. Exemplarily, Wildy's persona commits to the organisation but is terribly busy and does not find much time to fill out a transfer form. Thus, a crucial KPI to optimize for is the time between two donations.

Info box 2: Building personas

A persona is a fictional character created to represent user types engaging with a website, brand, or product in a similar way. 180DC Munich has used the approach in many projects to get a better understanding of a client's user. Exemplarily, in a project related to donor behavior for an NGO in the field of refugee support, we defined "Steffi the careerist". She is 45 years old and has decent wealth. She rarely has time for social media and wants crystal clear information on how her donation is used.

Based on personas, organizations can derive meaningful KPIs and make better decision regarding marketing content, product features, and website design.

The next step is to identify pain points in the process. As donor journeys can be very heterogenous and complex, visualization through Process Mining tools is indispensable to find the needle in the haystack. By investigating various process variants of the as-is process, Wildy realizes that an increasing number of donors complained that they have not received a donation confirmation.

By zooming in on the specific piece in the process, Wildy identifies that these donors have not received a confirmation because their donation never arrived. As it turns out, most of these donors made typos on their transfer forms so banks could not process the transaction.

As a response, Wildy can implement a direct debiting scheme, in which the donor allows the organisation to deduct money from the bank account regularly. Resultingly, the amount of regular donations would increase significantly.

4.2 Mailings

Running successful non-digital marketing campaigns is one severe challenge for Wildy. Like many NGOs, a crucial offline marketing channel remains physical mailing. By tracking incoming donations resulting from a mailing, Wildy built up a data set with thousands of transactions from various mailing campaigns over the years. Analysing these transactions helps to find answers to strategic questions that Wildy is curious about: Which donor groups respond best to mailings, where are possibilities for donation growth, which mailing campaigns underperform?

The starting point is to derive relevant KPIs to optimize for. Typical KPIs related to mailing campaigns include conversion rates, response rates, donor acquisition rates, costs per impression, opt-out rates, and return on investment.

Subsequently, Wildy can gain a general understanding of potential process gaps by defining a should-be process and comparing it to the actual one. The should-be process broadly describes the mailing activities and their connections in an ideal world. In a simple scenario, a should-be process could look like Figure 3.

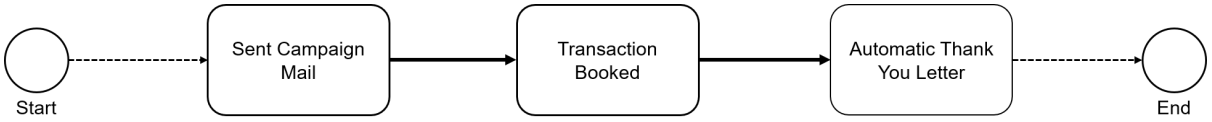

Figure 3: Simple version of target-process (own illustration)

Eventually, Wildy can visualize the as-is mailing process as executed in Wildy's IT systems in real-time and explore all existing process variants. Given that Wildy has been running mailing campaigns for many years and has grown in complexity, we expect many process variations in place. We see that the most common process variants tend to look like Figure 4. The visualization unveils variations such as cancellations that the system double-booked and campaigns which addressees received multiple times. Another variation relevant for Wildy relates to thank-you letters, which stakeholders received without placing a donation.

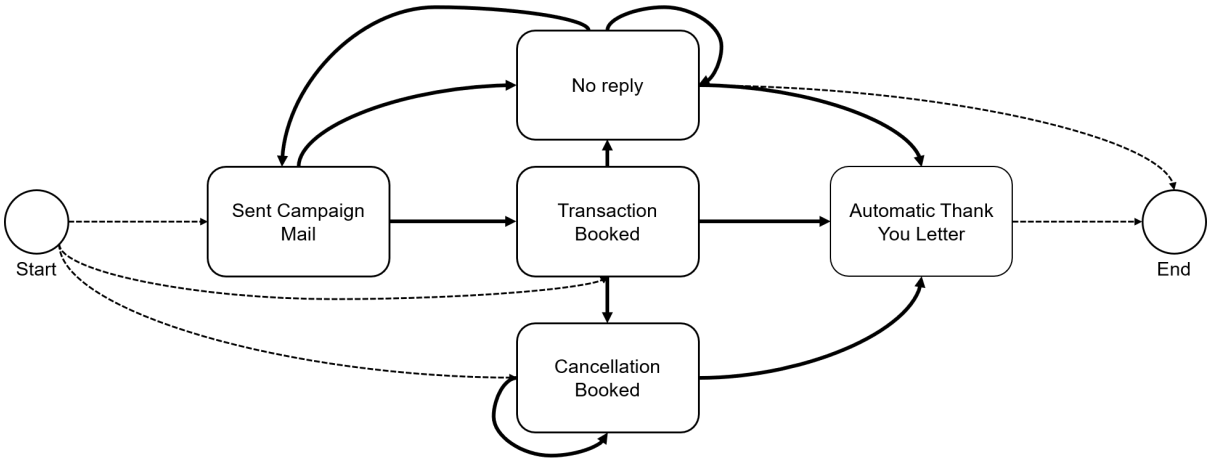

Figure 4: Process variants

By deep diving into the process of sending out thank-you letters, Wildy discovers that the system matches transactions to donors through a combination of their first and last name. Therefore, donors with the same name both receive thank-you letters even if only one of the two persons donated.

It is likely that these inefficiencies have a negative effect on the KPIs defined in the previous steps. By introducing a unique identifier for every donor, Wildy solves the problem of false thank you letters and aligns the as-is process closer to the target process. Consequently, opt-out rates decrease, and the organisation can eliminate a reason for underperforming campaigns through monitoring.

4.3 Distribution of Goods

As mentioned before Wildy has issues in its on-site distribution process in Namibia. As Catherine herself is sitting in her office in Munich, it is hard for her to always tell, what exactly is happening in her processes in Namibia. This is specifically affecting one of the essential tasks of her organization, namely the distribution of bundles of educational material about biodiversity to different schools in Namibia.

The current simplified should-be-model of Wildy's distribution process in the warehouse is depicted in Figure 5. This means that this is the model Wildy created as the distribution process they are aiming for.

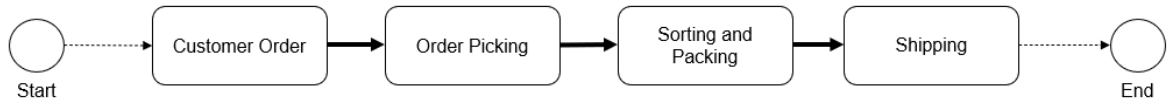

Figure 5: Should-be-model of the distribution process

One use case of Process Mining here therefore is to increase the productivity in Wildy's warehouses in Namibia, where the materials are stored. To measure the productivity the KPI "Pick per Hour" is used, which is quite low in Wildy's case.

With the help of Process Mining Wildy can identify a gap that is responsible for this low KPI, namely the missing availability of certain items from the bundle of materials in the warehouse. The root cause is that the warehouse is systematically missing the correct inventory, such as specific books, to fulfil the successful and complete distribution of the educational material.

Consequently, a concrete action that is identified and suggested to Catherine is to notify the team on-site in Namibia to update inventory levels. This should then automatically trigger replenishments when only a certain number of items is left.

This means that Catherine should improve her should-be-model. To avoid the missing availability, she includes a further activity, namely the updating of inventory levels. Consequently, her new target process looks like the model in Figure 6.

Figure 6: Improved Should-be-model of the distribution process

5. Conclusion

In this paper, we have identified three typical NGO challenges and derived Process Mining use cases to tackle these challenges (see Figure 7). These use cases indicate that Process Mining is a promising technology not only for companies but also for many NGOs.

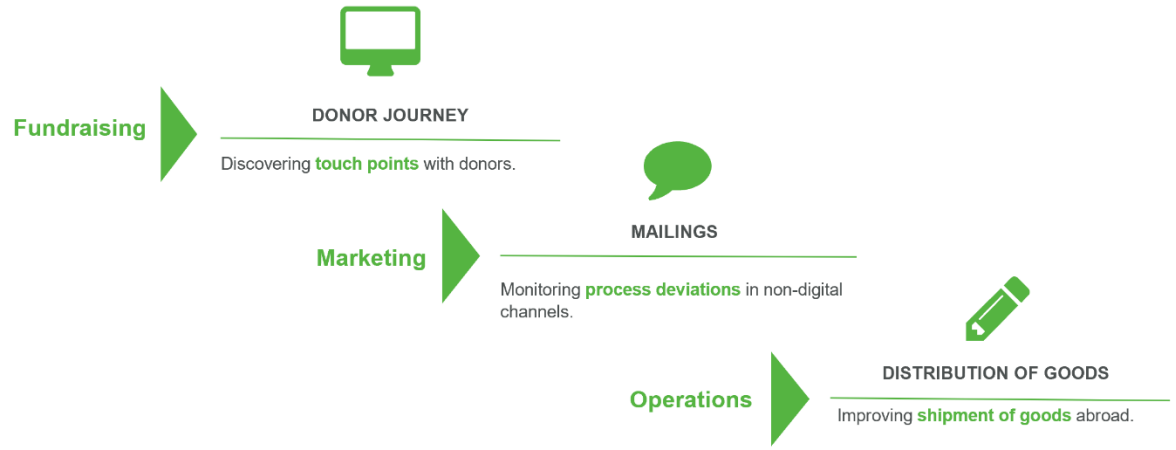

Figure 7: Identified use cases and solutions

We have particularly looked at Celonis, the market leader of Process Mining technology. Celonis allows a holistic view into process data of organisations. It can integrate real-time information and automate activities. These unique characteristics make it an exciting product. The prerequisite is to have a critical number of clean event logs.

However, such sophisticated software comes with a cost. It requires patience and time-efforts to implement. Organisations can assess the value of Process Mining for their organisation in around 10 weeks (Rautenburger & Liebl, 2020). These 10 weeks may be stressful as the organisation needs to integrate the data, design first dashboards, and get familiar with the key features. The benefits are highest when the NGO has not analysed these data thoroughly before. We recommend starting with a historic data subset and ignore features such as real-time data integration and automation initially. If the organisation can upload their data via spreadsheets, they have found the sweet spot of the data size for their value assessment.

If you are an NGO and consider using Celonis to analyse your processes, reach out to the 180DC Munich branch. We have certified students to conduct pilot projects. In a 10-week project, we integrate a pre-defined data set and evaluate the potential of Process Mining for your organisation.

The implementation effort raises the question whether for smaller NGOs, implementing Process Mining is like using a sledgehammer to crack a nut. A bottleneck of NGOs like Wildy is capacity. Resultingly, NGOs with up to seventy team members often still rely on Excel spreadsheets to maintain their activities such as the fundraising. Although they are well-educated about the latest technology, understandably it is not a top-of-mind problem next to all other challenges such as closing a new partnership, acquiring new donors, and

submitting the next grant application. Additionally, most funders are not willing to pay for costly software. Thus, there is a broad acceptance problem in terms of financing means to an end for NGOs.

It is to say, that implementing Process Mining early also yields advantages. It allows organisations to use the technology from scratch and align processes effectively right from the beginning. The longer an organization waits, the more difficult it is to modify existing structures. This is particularly true for processes as it highly affects the routines of people. Organisations which have in place a simple donor management tool should discuss the introduction of Process Mining. This rule of thumb has the pleasant side effect that the data from the tool may serve as the initial data baseline for a Process Mining use case.

Are you not convinced about Process Mining? As technology students, we love it when people recommend new tools to us. We expect that to be the same for NGOs. Therefore, we asked all interviewees which software they have implemented and what they think could be useful for other NGOs, too. Table 2 provides a non-exhaustive list of software tools mentioned by our participants. We have also added tools that we frequently use at 180DC Munich. It goes without saying that we do not profit by mentioning the tools and do not make any explicit recommendation.

Tools	Fundraising mgmt.	Communication and collaboration	Data science and mgmt.	Human resources	Document mgmt.	Task mgmt.	Learning and gamification	Marketing channels
Excel	■							
Fundraising Box	■							
Outlook		■						
Zoom		■						
WhatsApp		■						
Microsoft Teams		■						
Miro		■						
Microsoft Access			■					
Amazon Web Services			■					
Timebutler				■				
Airtable				■				
Google Drive					■			
OneDrive					■			
Trello						■		
Mentimeter							■	
Kahoot							■	
Twitter								■
Linkedin								■
TikTok								■
Newspaper								■
Television								■
Nebenan.de								■
Facebook								■
Instagram								■

Table 2: Tools used in NGOs

6. References

Aalst, W. (2006). *Business Process Mining: An Industrial Application.* Information Systems, 32(5), 713-732. https://doi.org/10.1016/j.is.2006.05.003.

Aalst, W. (2012). *Process Mining: Overview and Opportunities*. ACM Transactions on Management Information Systems, 99(99). http://doi.acm.org/10.1145/0000000.0000000

Blaxell, R. (2019). *The Manifesto of the Data-Ink Ratio*. Speedwell. https://speedwell.com.au/insights/2019/the-manifesto-of-the-data-ink-ratio

Celonis, a. *The Ultimate Guide to Process Mining*. https://www.celonis.com/ultimate-guide

Celonis, b. *The Big Book of EMS Use Cases*. https://www.celonis.com/ems/resources/bigbook

Konrad, A. (2021, June 17). *Celonis Raises $1 Billion At $11 Billion Valuation, Making It New York's —And Germany's — Most Valuable Startup*. Forbes. https://www.forbes.com/sites/alexkonrad/2021/06/02/celonis-process-mining-raises-at-11-billion-valuation/?sh=16c85d7d2acd

Rautenburger, L., & Liebl, A. (2020, September 2). *On the journey to the Hybrid Customer with Process Mining*. Celonis. https://www.celonis.com/blog/hybrid-customer-with-process-mining

Zelst, S. (2020). *Event abstraction in process mining: literature review and taxonomy*. Granular Computing, 6, 719–736. https://doi.org/10.1007/s41066-020-00226-2