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Process Mining in Supply Chain Management

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Abstract

For a detailed discussion of process mining, the objective of this paper is the analysis of the successful implementation of process mining in the practical fields of supply chain management. The research comprises the investigation of use cases in companies that are already actively using process mining.

Purpose: This research aims to highlight the applicability of process mining in the supply chain management business field.

Research Methodology: In order to examine the applicability of process mining in supply chain management a research study was conducted among experts in this business field. Further, theoretical findings were compared to the results and evaluated.

Results: Process Mining can be applied very well in the SCM area. The advantages that arise primarily reflect significant potential benefits and improved process throughput times. The information that can be gained from the operational areas supported by process mining is suitable for reliable decisions, both in the tactical and strategic areas.

Limitations: The results on the application of process mining show a certain generalization and have to be adapted and adjusted to the respective application case.

Contribution: This study is useful, especially for the purchasing and logistics business area.

Keywords: *Process mining, supply chain management (SCM), supply chain processes, purchasing, logistics*

1. Introduction

Digital transformations within companies do not only have great impact on organizational structures, fields of activity and the understanding of culture and leadership, but also affect several business processes in general. One example it the introduction of new supply chain management (SCM) software tools, which result from a changed need for future requirements. The development of digital technologies has tremendously changed the work environment in many ways. New business models offer organizations huge opportunities to increase profitability. This leads to the fact that companies are increasingly undergoing a digital transformation in order to introduce digital technologies and further integrate them in the daily work *(Nasution, et al., 2018*). However, the implementation of new digital tools and systems requires a certain preparation within the organization. Digital advances have significantly changed the manner in which individuals convey and collaborate with their environmental factors. These upcoming new technologies influence each industry. Large numbers of these hierarchical designs are not, at this point independent because of the innovative turns of events. Digitalization has

touched almost each and every aspect of human life all over the world, greatly affecting supply chain processes *(Büyüközkan & Göçer, 2018)*. This influence of digitization on SCM especially through the implementation of the software-based tool called process mining, is the starting point of this research. Integrated, systems-wide optimization of operations and activities across the entirety of an enterprise is more crucial now than ever to a company's competitiveness. Globalization and modern communications technologies have provided many opportunities for improving supply chain performance *(Garcia & You, 2015)*. However, the same advancements also increase global competition and pressure on both established and emerging industries and companies to design and operate their supply chains as efficiently and cost effectively as possible (*Varma, et al., 2008)*. The main objective of this study is to highlight the use of process mining as a tool of process optimization in the business fields of SCM. The research question deals with the practice-oriented application of process mining for process analysis in the corporate context of SCM. The focus of this study is to show how this theoretical approach can be effectively used and applied in practice. Further, the goal is to find out how theoretical findings match the practical application and to find limitations of this approach.

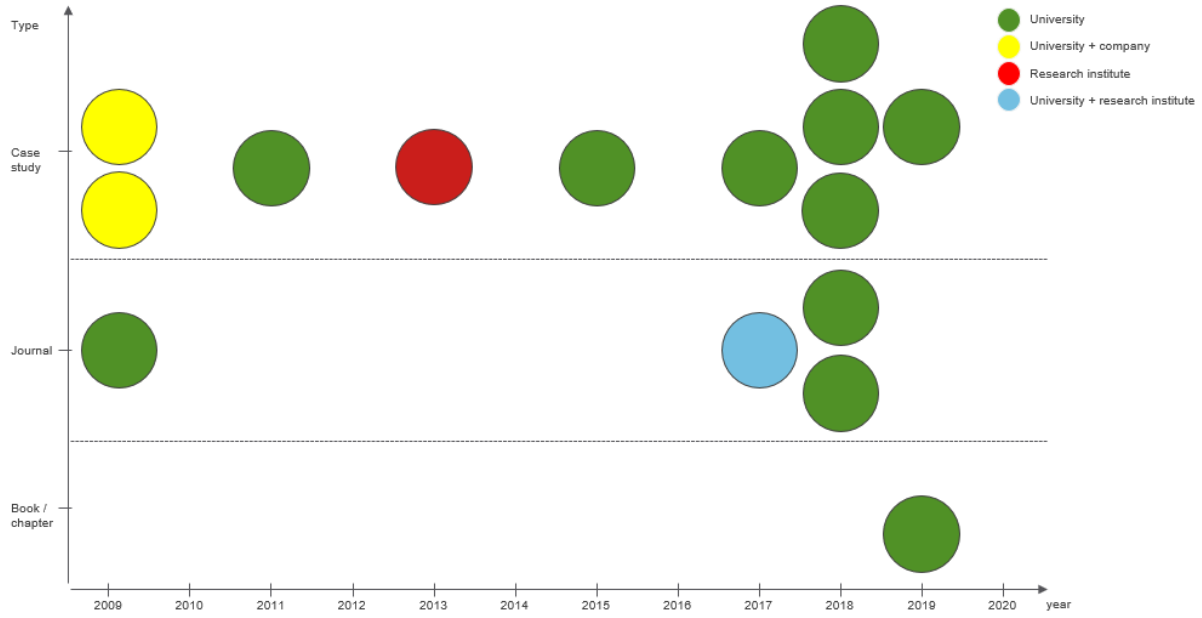
2. Literature review and hypothesis development

Literature review:

The literature analysis focuses on an insight into the existing literature analysis approach. The purpose of this analysis is to review empirical studies on process mining in SCM in order to understand the theoretical applications and limitations. Moreover, this literature analysis provides insights into the current knowledge as well as into potentially missing knowledge about process mining in SCM. Therefore, a systematic literature review methodology was implemented in this research. As a starting point for this approach, articles in a set of academic databases such as Springer, Google Scholar, Elsevier and Thomson Reuters were identified. In order to ensure completeness multiple additional databases were selected. In a first step, the above mentioned data bases were explored using the search criteria "process mining" on the one hand and "supply chain management", "SCM", "logistics", "transportation" on the other hand. The outcome showed that there exist more than 60,000 sources in the field of process mining and more than 100,000 sources in the SCM area. Combining the two key words, narrows the selection down to 15 sources, which include both terms. The following illustration briefly maps the journals, case studies and book chapters on the x-axis publishing year as well as category type on the y-axis. Furthermore, the colors show the professional background of the authors.

The number of publications started to increase around 2009. On top, it is also noticeable that in the last years process mining research changed from models and algorithms to an application-oriented view. The initial empirical studies proposed the first tools *(Herbst & Karagiannis, 2004*), and stated limitation such as "refinement of the process data preparation stage to better handle the problem of multiple executions of a node within the same process instance" *(Grigori, et al., 2004)*. Later on, studies concentrated on techniques for conformance checking (*Rozinat, et al., kein Datum*), process discovery, clustering and visualization *(Song & Van der Aalst, 2008)*. Two sources, which refer to the topic on this thesis in the best way are described in detail in the following:

Figure 1: Clustering of the literature analysis



source: Own illustration

The main focus of this journal is on the implementation of process mining in supply management, which is further characterized in the intra-organizational and interorganizational perspective. Schwaickardt and Pereira Dantas (2018) highlight that there are certain limitations existing for companies empirical research to both achieve all connections in a supply chain and further deal with growing process complexities with interconnectivity. Process mining enables the identification of inter-organizational processes, which consequently enable a wide view on the supply chain and possible support optimization measures. Supply chain optimization is the core element and objective of this case study. The research objective of this publication is to show that process mining is both, able to support the identification of the real processes happening in a company and to identify processes extracted through the logs of system. These are based on technologies in order to detect deviations or fraud, or in fostering the overall process improvement (*Schwaickardt & Pereira Dantas, 2018*).

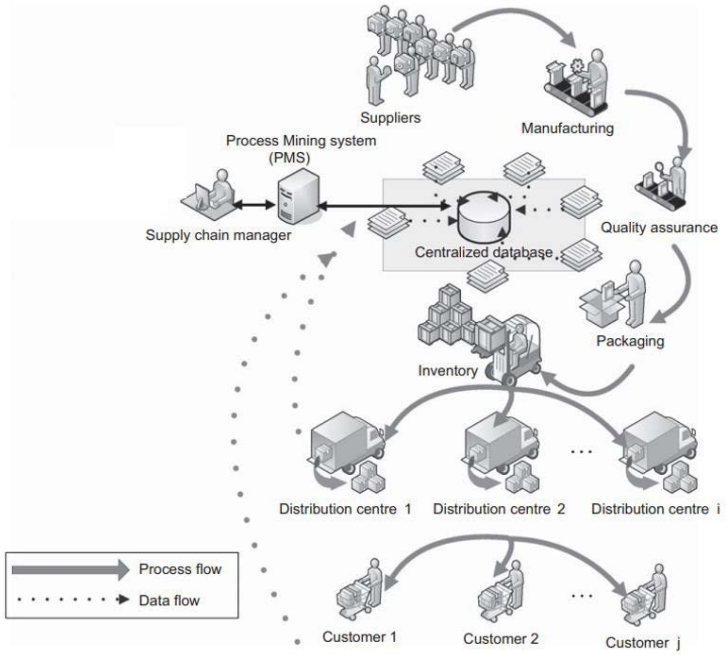
Lau et al.: "Development of a process mining system for supporting knowledge discovery in a supply chain network" (2009):

The main objective of this journal is the improvement of visibility and transparency of value added information in a supply chain network with the help of process mining. In order to achieve this, a process mining system is suggested to find out a set of association rules based, which are based on the daily captured logistics operation data within the network. This approach enables all levels of employees to improve their skills and insights in the current business environment. Once interesting association rules have been extracted, firms can identify the root-causes of quality issues in a supply chain and enhance efficiency by fine-tuning the configuration of process parameters in specified processes. As a conclusion, the authors mention that three process arguments (suppliers' lead time, size of material ordered and fixture angle of the machine) were necessary factors

connected to customer satisfaction *(Lau, et al., 2009).*

***Hypothesis development*:**
After reviewing the existing literature and theoretical knowledge on process mining and supply chain management, a hypothesis can now be formulated, which will then be tested in the next chapter. Processes in production and logistics show a higher amount of changes and variations, due to the fact that many participants and different goods and services are involved in the in logistic process. This dynamic behavior particularly requires well documented processes, but at the same time it also complicates process documentation *(Becker & Intoyoad, 2017)*. The SCM area includes many supporting processes, manufacturing of products, goods or services, however the focus of this thesis lies on the purchasing and the logistics processes.

Figure 2: Framework of a process mining system in a supply chain network



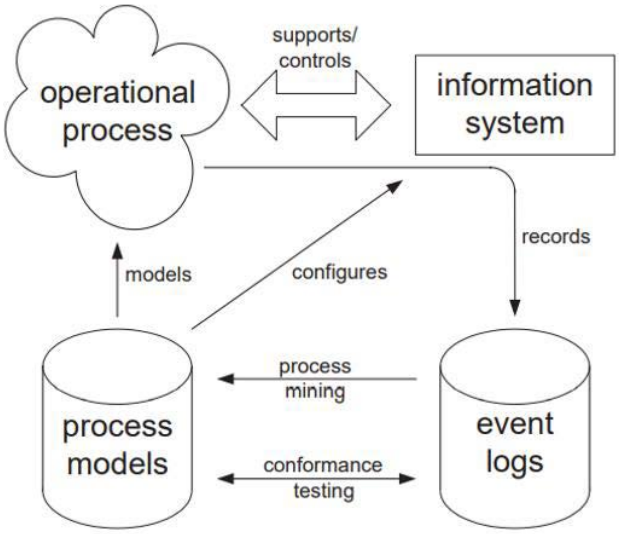
Source: Lau et al., 2009

The Figure 2 presents a typical process mining system framework from the historical process data captured in the purchasing department, the manufacturing department and the transportation department. The daily process data among the above functional departments is collected and stored in the centralized data warehouse. The customer satisfaction report is also collected and transferred into the data warehouse after the delivery of the finished products *(Lau, et al., 2009)*.

Purchasing processes:
Purchasing processes are a very important section of the value chain of various companies. This section describes the operational, tactical and strategic levels of the purchasing process and the respective application of process mining. The operational purchasing process deals with the procurement of goods and services, which are needed in order to obtain a firms daily operations such as contract management, delivery management and addressing any complaints. The main aspects in operational purchasing are demand determination, supplier selection, order monitoring and the invoice process. According to van der Aalst (2005), the illustration below shows the connection between an operational process and process mining and illustrates the way operational processes support information systems and indicates how information systems control operational

processes. These information systems create event logs which are the basis of the application of process models through process mining. As stated, different information systems log events related to activities in the operational process *(Van der Aalst, et al., 2005)*.

Figure 3: Tackling business alignment from operational processes to process models



Source: Van der Aalst, 2005

Given this knowledge from on the correlation of general operational processes and the creation of information systems for the applicability of event logs in order to build process models through process mining, the assumption is that the operational purchasing process in particular is also able to be reflected by process mining *(Van der Aalst, et al., 2005)*. This is supported by the fact that the previously detected theoretical criteria for application can be confirmed.

Besides the operational process, this section will cover the aspect of application of process mining in the tactical purchasing process. This chapter turns out to be very interesting as there is no literature background on any applicability of process mining in the tactical level of purchasing. The assumption is, that process mining can be applied in some areas of tactical purchasing but not in all. The question if and how process mining can be used in the tactical purchasing process is difficult to answer due to the fact that the literature does not refer to any application cases. The identified criteria for a successful applicability of process mining can be applied in parts.

After the operational and tactical purchasing process, this chapter describes the application of process mining to the strategic purchasing process. Strategic purchasing is essential in corporate planning in order to decrease a company's costs *(Chen, et al., 2004)*. However, similar to the tactical process, the strategic purchasing process is hard to realize through process mining. Moreover, there is no literature available, which states the concrete application of process mining to a case in the strategic purchasing process. Based on this unavailable theoretical findings, the assumption is, that process mining cannot be applied to the strategic level.

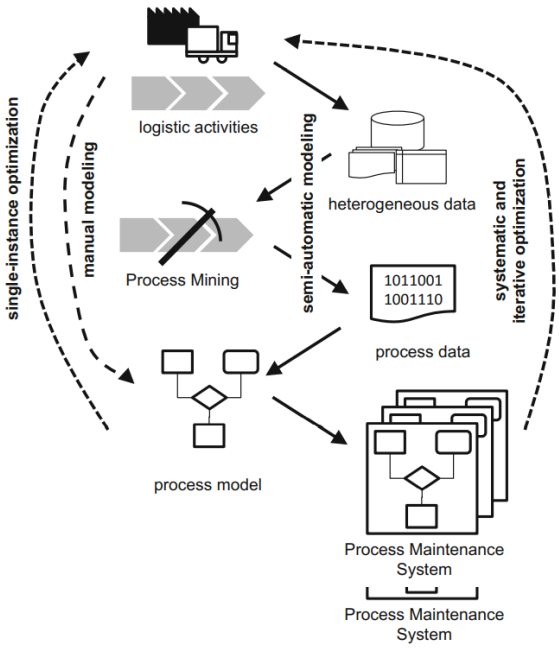
Logistics processes:

Besides the above explained purchasing process, this research will further highlight the application of process mining to logistics and especially cover the processes of inbound, production and outbound logistics. To begin with, Intoyoad and Becker (2018) mention that the implementation of process mining for production and logistics should consider the complexity and dynamics. Further, the compound data

sources, and the quality of event data are an important requirement. The complexity results of the complexity of the products and items needed for the production and the various participants. This dynamic behavior particularly requires well documented processes, but at the same time it also complicates process documentation *(Intayoad & Becker, 2018*). Logistics has the opportunity to greatly benefit from the application of process mining, because the identification and tracking of goods in the supply chain involves many IT systems. However, the IT landscape in logistics is heterogeneous because the data are scattered.

among different specialized systems for various purposes of different companies *(Intayoad & Becker, 2018).* The following illustration shows the correlation of process mining in logistic processes. In general the authors assumption is that process mining can be applied for inbound, production and outbound processes.

Figure 4: Process mining in logistics mining in



Source: Becker, Lütjen and Porzel, 2017

The term inbound logistics covers all aspects of raw material, finished products and supplied items from a producer to a fulfillment center, storage or retail shop. The inbound logistics process can e.g. restock bestseller products for special seasons and handle returns. Exemplary in the case of Celonis and the Volkswagen Group, the implementation of process mining in the form of an industrial cloud made it possible to optimize the entire production chains of VW.

The automotive supply chain, including inbound logistics processes are vulnerable for bottlenecks, which can result in a significant loss of revenues. However, the Volkswagen Groups aim is to change that. Thus the company has decided to apply the process mining software from inbound logistics to production and process planning. Its initial goal is to interconnect all of Volkswagen's plants as well as supply chains globally in order to enable data interchange between systems and

plants, which allows the creation of a fast growing amount of industrial software applications for the global plants. This is of great impact especially for the inbound logistics processes as each location will be able to allow suppliers and partners to create a platform enabling to contribute their solutions and helps the Volkswagen Group to achieve global efficiencies in its plants in connection with its suppliers. Furthermore, the above-mentioned application criteria assume to also find application in the inbound process.

Besides the inbound process, this chapter will cover the applicability of process mining in the production and manufacturing field. Manufacturing organizations are facing growing business, production, and process complexity across the board, from increased regulatory standards to supply chain volatility to the explosion in available data within production organizations. Process mining enables delivering quality while managing costs by maximizing execution capacity across the production processes of organization. Furthermore, Celonis helped the Swedish-Swiss energy and automation technology group ABB in 2020 to accelerate their production and logistics. Alike in any multinational company, ABB's supply chain consists of a comprehensive network of external and internal processes which are by a multiple of ERP and many other business critical systems. With process mining, ABB has been able to gain transparency and control over their end-to-end supply chain, which spans over 100 countries and 2000 reporting units. The transformation of ABBs digital supply chain in April 2020 initially had to face some challenges, like the connection of over 40 ERP systems and handling terabytes of process data. However, the successful implementation of process mining in their production allowed ABB to get insights of their global footprint of their business network performance as well as the ability to move towards a fully digitized supply chain network performance. Other benefits, which can be achieved through process mining in production are reduced inventory costs, boosted sales processes, improved productivity, on-time deliveries of products and services, optimized equipment usage and increased capacity.

The last process for process mining, which will be described is the outbound process. Even though, the above described VW case does not only cover the inbound but also the outbound logistics process, the common literature does not include much information about it. Due to the fact, that outbound logistics in several areas has the same sub process steps as inbound logistics, the assumption would be that the application is also suitable for outbound logistics.

3. Research methodology

The qualitative method of expert interviews was chosen to collect the data. People from industrial sectors and consulting were chosen as interview partners. Following, the method for the conduction of the expert interviews and the characteristics of the arranged sample is briefly presented. The method, which was chosen for the qualitative research is the expert interview, which focuses less on the mere collection of facts but more on subjective interpretations and assessments. Expert interviews therefore also provide the added value of contributing insights into how organizations and systems work, which is reflected in the research interest of the study conducted here. Their expertise is often tied to professional positions, but this does not always have to be the case.

The data analysis follows the idea to consider different opinions and application experiences with the topic of process mining in practical. For this reason, the persons selected for the interviews were recruited among numerous executives in industry and consulting companies, all of whom were already confronted with the implementation of process mining in the SCM area. This can be regarded as a reasonable set of principal informants, given their position and knowledge. The conducted interviews with the executives had a structured format. Each interview with the representatives addressed the

questions of the organizational structure and the way they have implemented process mining, what the resulting outcome was and what consequences had been taken from this emerging transparency as well as answering the question what they would have done differently when it comes to the implementation phase. Furthermore, the theoretical background was also double checked with the interview partners in order to see whether the practical application is consistent with the theoretical findings. This paper explored the collected data in an iterative fashion, moving back and forth between the conducted interview transcripts and the emerging patterns and theoretical models. The method used to evaluate the interviews is based on the qualitative content.

4. Results and discussions

The processing of information in various systems has become an essential fundament in the 21st century. These systems allow that processes in many different areas of entrepreneurial activities can be conducted. One of the main elements for every business is the understanding of the own business processes and their continuous improvement. The implementation of these processes generates a huge amount of data in different systems, whereas the complexity is in pursuing and deeply understanding these processes what creates a challenge for every firm *(Beheshti, et al., 2016)*. Also, Van der Aalst confirms this statement and describes the extraction and derivation of valuable information from data as a central challenge for companies today. Especially in a global world in which purchasing behaviour is characterized by internationality, the SCM segment where many individual processes meet requires even more to follow and understand every single process.

Process mining exactly starts at this point and enables the identification and optimization of processes based on real log data. Thus, transparency can be created which illustrates how processes for companies work in reality.

The aim of this research is to exactly highlight the concept of process mining and evaluate the applicability in the SCM area. The core elements of the research are based on the literature analysis as well as expert interviews which focused on different topics within this field. The content presented in the discussion is prepared in the order of the research question. This part explains the similarities as well as differences of theoretical findings and practical applicability. Afterwards the research question will be answered briefly as a summary.

The first question which addressed the reasons why companies decided to implement process mining was answered by the experts according to the theory, which also indicates that the main targets are process optimization, creation of transparency, automatization, efficiency and further digitization as well as increased throughput times, error source identification and reduction.

The results were pretty clear in terms of objectives as the main motivation was to increase optimization what is logically also the focus of a process optimization tool such as process mining. Regarding the general project framework it was noticeable that the process implementation took place for purchase-to-pay, order-to-cash, and the IT service management process, which was also not surprising due to the fact that the interviewed persons all work in purchasing or logistics departments. Furthermore, the results from the interviews indicated, that there was a pilot project taking place in each case and that this pilot project was organized in the same way as the normal project, which followed afterwards.

Other ways to conduct a pilot project would be a proof of value or a feasibility study before the real project starts. Some experts also mentioned that the tool provider Celonis conducted a feasibility study before entering the project. All interviewees mentioned as also in theory described the main implementation stages and said that their projects took 4-6 months.

The main chapter of this research covers the processes. The first question in this

chapter concerns the purchasing processes. As expected from the theory it is noticeable that the interviews confirmed the assumption that process mining is best applicable for the operational purchasing process due to the fact that the critical criteria for successful application such as the frequency per year as well as the fact that each process has a high amount of single steps and that the process must be system-based and the data therefore exportable and available suits the operational purchasing process best.

The tactical process was as supposed from theory point of view only applicable in parts. The interviews showed that these parts can be specified and are e.g. the commodity management process, which can derive a commodity strategy in the end. This addresses the question how to implement the goal of a commodity group and the tasks derived from them meaning if all articles within the material group should be treated in the same way and may even be served by one supplier on a strategic view.

Another part of the tactical purchasing process which can be represented through process mining is the supplier management process, which includes the quality of the product and the price of the supplier as well as the on-time delivery and constant price regulations without changes. This knowledge is a good complement to theory and gives a precise statement of how process mining can be applied in the tactical domain. Theory has assumed that it is possible to map tactical purchasing processes, but has not indicated how to narrow this down, as the theory generally assumes broader applicability, what is often only partially refuted in practice. Theory provides a broad view, but it often cannot be applied in practice, because companies are not yet ready for technical or administrative reasons.

The theoretical analysis of the applicability for the operational and partly also tactical processes was confirmed and supplemented and specified by the interviews in the tactical area. The applicability in the strategic area is refuted, as it is difficult to identify process chains here although some elements are system-based. However, companies can use the insights gained strategically, such as KPI tracking, which can be derived from the results obtained from operational and tactical purchasing processes, what can positively influence the business strategy in the longer term. Besides the purchasing process, the logistics processes and especially the inbound, production and outbound process were reviewed within the interviews. Furthermore, the question was if the applicability is easier or more difficult for each of the three processes.

This study found out that the application for the inbound, production and outbound process is equally feasible and there are no differences between the processes in terms of difficulty to map. Due to the fact that the processes often include similar process steps, the theory states a generic applicability. In contrast, the expert interviews revealed that outbound logistics is more difficult to implement. However, the result slightly differs compared to the theory, what might be based on the individual perception of the interview partners, who made this statement for their specific case.

The theory states that the production line in particular can be supported very well with process mining, since there are many tasks and operations in this area that are controlled by systems containing a lot of analysable data. New technologies such as RFID make it possible to read and store data automatically and without contact by means of electromagnetic waves. In addition, exactly this area is very interesting, since each component can be tracked, which is, however also associated with a higher complexity in the execution. The fact that outbound logistics is more difficult to support in practice is based on the many manual steps and the therefore arising complexity, according to the experts. This reflects a small deviation from the theory, which does not describe any major differences, largely due to the assumption of many identical process steps. However, it depends on the industry and the individual standardization. For a company like Amazon, e.g., an application of process mining in the outbound process would be

very recommendable. Furthermore, the interviewees were asked if certain application criteria must be given in order to ensure a successful implementation. It was confirmed by the practitioners that the frequency of the processes plays a major role and it is also advantageous if a process has many individual steps, but it does not necessarily have to be more than 1,000. This contradicts the theory, but it should be noted that this does not create a major gap.

From the practice it resulted that the criteria of high frequency of processes and the fact that processes must be system based and the data therefore exportable and available are decisive for the successful application in any case and thus the theory was confirmed. The last criteria stated that process mining is best suitable for processes which are at least partially automated. This again indicates a small deviation between theory and practice. While the theory indicates that process mining is best applicable when the process for it is already at least partially automated, this does not correspond to the statements of the interview partners, who all stated that this does not necessarily have to be the case. In practice, process mining is often the basis for process automation. This results from the fact that the greater increase in value lies in the processes that have not yet been automated and companies first tackle the processes with the highest potential. The assumption is that processes that are already partially automated are probably easier to map in process mining tools, but this is not perceived as an absolutely necessary criteria in practice.

Further, the question was how the processes for the application were identified and selected, and how the data for them were generated. Generally speaking, the processes for which the greatest potential was seen were selected. In addition, it is known that companies also tend to implement processes that are as simple and less complex as possible at the beginning in order to evaluate whether the implementation would be worthwhile for more complex processes and whether this is even feasible in the given process landscape. In terms of challenges and successes regarding process mining the challenges of the companies were in comparison to the theory very concrete and less general. One example is that the implementation took a long time due to the fact that the individual departments had to cross check the results after the programming phase and a high capacity of the employees was needed. In theory, this is not described in such concrete terms and is more general. In addition, the statements from practice are often individual statements that are very specific. With regard to the successes, it should be noted that these reflect the theoretical results very well and statements such as increased efficiency, higher throughput times and recognition of error sources can be found in both theory and practice.

The last chapter of the extensive survey addressed the outlook and further planning of process mining. Since the interviewees stated that no other processes are planned apart from the warehouse management process and the master data analysis process, which may be supported by process mining in the future, there is no comparative basis for discussion. Whereas it is to notice that especially the warehouse management process including the central storage facilities would be very interesting to represent with process mining due to the fact that this includes many small activities, which are system based and trackable and thus very good to map.

Furthermore, the warehouse management process offers many optimization opportunities such as the shrinkage rate, the inventory accuracy and turnover rate, the cost of carrying inventory, the receiving cycle time, the packaging accuracy rate, and the rate of customer returns. When asked whether additional extensions of the tool would be desired in the future, the answers were either that the interviewees would like to have the option to link different processes from different systems and thus obtain a more comprehensive result and to illuminate linked process chains with each other or in addition they indicated the desire for higher

automation and especially an integrated robotics function was suggested.

On top, it was also said that it would be advantageous if the tool immediately gives an indication based on the results whether e.g. machine learning is applicable, or in the next step applies it immediately. It should be added here that this is already available in parts in a version from the vendor Celonis in the form of the Action Engine. However, if companies are only at the beginning of their implementation phase and have not yet been able to exploit the full scope of the tool, this application, has probably not been used yet. The Action Engine conducts measures automatically depending on the predefined rules. However, it does not suggest which process can be automated but after the manual selection an automatization and start of workflows is possible.

Furthermore, the so-called transformation centre, offers companies the option to create KPI reports and an overall view on performance goals. Apart from that, the statements about the influence of process mining in daily work correspond to the theoretical statements about the applicability, such as the message that process mining helps to identify problems early and to achieve improvements and drives standardization. All interviewed persons emphasized that process mining is definitely recommendable and an innovative, helpful and value adding tool, which however is more complex than expected.

5. Conclusion

In order to answer the overall guiding question how process mining can be applied in the SCM and which processes are best suitable for the application and what the challenges and results of process mining are, the following will give a briefly explanation. The evaluation of the interviews has shown that the applicability for the purchasing processes can best be mapped for the operational process, whereas the tactical can be mapped in parts and the strategic in contrast cannot be mapped.

This results from the fact, that the process chain of the operational processes fulfils all criteria for applicability, i.e. frequent execution of the processes with many individual activities, as well as the fact that the processes are system based and the data is available and exportable. In addition, some parts of the tactical process can be mapped, which can also be represented systemically. Although the strategic purchasing process cannot be represented, the results of the application from the operational and tactical process can be used for a strategic evaluation.

The inbound, production and outbound processes showed that, as assumed in theory, all three processes can be represented very well, although the expert interviews mention that the outbound process is the most difficult due to many interruptions and manual steps. The explanation of the basics of process mining already showed which aspects are central for a successful application. In addition, the author was able to identify criteria from the literature that also represent a challenge in the application.

On the one hand the expert survey of a significant number of international companies helped to evaluate and complemented these factors and criteria and determine the limitations of practical applicability compared to theoretical findings on the other hand. At this point, the research question is once again addressed and answered as a summary.

From the expert interviews and the theoretical analysis of the existing literature, it can be deduced that the applicability criteria, which are decisive for the implementation of process mining in the purchasing process, are fully applicable to the operational process, whereby the tactical process can only be mapped in parts and the strategic process is not applicable.

In addition, it can be said for the logistics processes, which are in this thesis predefined as the inbound, production and outbound processes can be represented very well. However, the expert interviews made it clear that there is a slight deviation from theory here and that the outbound process is more difficult to represent due to many

interruptions and non-systemic elements.

In addition, the interviews provided valuable insights into the organization of process mining implementation projects, the reasons for implementation, an illustration of the processes that are already supported with process mining, as well as obstacles and successes during implementation. Moreover, the interviewees gave information about whether processes should be supported with process mining in their company in the future, what influence process mining has on their daily work, whether they would recommend process mining and if they would like to see further extensions of the tool in the future.

Limitation and study forward

This research is on the one hand based on a comprehensive literature analysis and on the other hand on expert interviews conducted in order to discuss the practice-oriented application of process mining. Especially the deep insight into the application at the interviewed companies as well as the systematic summary of the literature on the explicit topic of process mining in SCM offer an added value.

However, neither the literature analysis nor the survey can claim to be complete. Furthermore, the analysis shows that the process criteria do not fundamentally differ from the existing approaches for the implementation in practical use. Nevertheless, the comparison and the summary of the existing approaches from theory and practical application create an added value since this does not yet exist to this extent.

In summary, it should be noted that the presented results on the application of process mining show a certain generalization and have to be adapted and adjusted to the respective application case. The explanations in this research have shown that process mining has the potential to bring transparency into the processes of a company. In the course of digitalization, automation and changing market conditions, it is crucial that companies know and understand their process landscape. This can be achieved to a large extent through the transparent representation of processes by means of process mining. Due to the increased demand for process mining, the dynamics in the market are constantly increasing and a certain lack of clarity already prevails today. It is precisely in this area that the present work offers added value and can potentially serve as input.

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