APPLICATION OF THE PROCESS MAPPING FOR IDENTIFICATION OF THE POTENTIAL FOR IMPROVEMENT IN SERVICE PROCESSES AT SCANIA CZECH REPUBLIC S.R.O.

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Abstract

The aim of this paper is to present the methodology of application of process mapping for identification of potential for improvement of business processes. The methodology will be presented on the case of optimization of service processes in the company SCANIA Czech Republic s.r.o. Continuous improvement of the efficiency of all business processes is a necessity for companies in the automotive aftersales sector. The pressure for efficiency is driven by the rise of sustainability, shortage of skilled labour on the labour market and ever increasing input prices among other factors. The proposed methodology will be presented using the case of optimization of service processes in SCANIA Czech Republic s.r.o. In the first phase, a thorough process map is developed using BPMN, which contains all the sub-processes including necessary documents, software used, responsible persons and the causation between the processes. In the second phase, barriers, waste and shortcomings in the current state with potential for improvement are identified. The identified shortcomings are linked in the process map to the sub-processes according to the place of emergence and the place of impact. Finally, measures are proposed to eliminate the gaps and achieve the desired future state. The proposed measures are evaluated in terms of the difficulty of implementation and potential benefits.

Keywords: Process mapping, BPMN, cause and effect analysis, continuous improvement, automotive service

1. INTRODUCTION

Efficiency and continuous improvement are crucial in today's business world, and optimizing business processes in the automotive aftersales industry is highlighted by several critical factors. The worldwide push for sustainability places greater expectations on organisations to refine their operations and minimize waste. At the same time, a shortage of skilled labour in the job market necessitates more efficient use of existing resources. Furthermore, the ongoing rise in input costs enhances the necessity for cost-effective operations. In order to tackle these issues, this paper proposes a methodological framework focused on implementing process mapping with BPMN to identify areas with potential for process improvement. The methodology for optimizing service processes at SCANIA Czech Republic s.r.o will be presented through a case study. In the first stage a comprehensive process map is created using Business Process Model and Notation (BPMN), which outlines the sub-processes, essential documents, software applications, responsible personnel, and causal connections between these elements within the service processes. The second stage aims to improve processes by identifying barriers, waste and shortcomings in the current state. These shortcomings are then connected within a process map, providing insights into the causes and effects on sub-processes. The resulting process map forms the basis for developing proposals to eliminate shortcomings and achieve the desired future state of processes. The proposed measures are assessed taking into account their potential benefits, challenges and costs of implementation. In this way, the methodology ensures that the proposed solutions are not only viable but also strategically aligned with the overall objective of optimizing business processes. By conducting a detailed analysis of the service processes at SCANIA Czech Republic s.r.o. this paper aims to showcase how this methodology enables organisations to address the requirements of a fastpaced and demanding business environment, resulting in both short-term efficiency improvements and long-term viability and competitiveness.

1.1 Literature review

Process analysis is a method that is used to examine and understand the various steps and components of a process in order to improve the efficiency of the process [1]. It involves breaking down a process into its individual tasks. The sequence and flow of these tasks are then analysed to identify areas for improvement. Process analysis can be applied to a wide range of fields, including computer science and analytics, as well as scalability and parallel computing [2]. Process mapping is a technique for visually representing and analysing the steps, activities and interactions involved in a process. It provides a clear and structured overview of the process flow, enabling a better understanding of how the process works and how it can be improved. Process maps typically use symbols and diagrams to represent process elements such as tasks, decisions, inputs and outputs [3]. By mapping the process, organisations can identify inefficiencies, bottlenecks and areas for improvement. It is a valuable tool for improving process transparency, communication and collaboration, ultimately leading to improved performance and cost savings [2,3]. BPMN, which stands for Business Process Model and Notation, is a standardised language and notation for modelling and documenting business processes. It provides a graphical representation that helps stakeholders understand, communicate and analyse complex processes clearly and consistently and identify areas for improvement, such as bottlenecks or inefficiencies. BPMN uses symbols and diagrams to represent different elements of a process, such as tasks, events, gateways and flows [4,5]. BPMN can be used for process mapping by visually representing the sequence, flow and interactions of activities within a process. It allows the identification of process steps, decision points and dependencies, providing a comprehensive view of the process flow [6]. In addition, BPMN can be used to optimise processes by analysing and refining the modelled processes. Through the use of BPMN, organisations can identify opportunities to streamline, automate or re-engineer processes in order to improve efficiency, reduce costs and improve overall performance. BPMN models can be analysed and optimised using techniques such as performance analysis, simulation and process redesign [7]. Root cause analysis is a systematic approach used to identify the underlying causes of problems or errors in processes. It aims to go beyond treating symptoms and instead focuses on identifying the fundamental reasons for problems. Root cause analysis helps organisations understand why problems occur and enables them to implement effective corrective actions to prevent recurrence. BPMN diagrams can help identify the sequence of events and activities that lead to a problem. This makes it easier to trace back to the root cause. In addition, BPMN can be used to document the identified root causes and their relationships within the process diagram. This documentation helps to communicate and share the analysis results with stakeholders, enabling a common understanding of the identified root causes and the proposed corrective actions [6,8]. Process mapping tools such as BPMN can be used to identify sources of waste and improvement opportunities in manufacturing services. By visually representing manufacturing processes using BPMN diagrams, organisations can analyse the process flow and identify activities that do not add value, resulting in waste [9,10,11]. These wastes can include overproduction, waiting, transportation, unnecessary motion, defects, and inappropriate processing. Through analysis of the BPMN diagrams, organisations can apply lean manufacturing principles and techniques to eliminate or reduce waste, such as value stream mapping, standardisation, visual management, 5S and continuous improvement [12,13].

2. CASE STUDY: PROCESS MAPPING OF SERVICE PROCESSES AT SCANIA CZECH REPUBLIC S.R.O.

The first phase of the research included process analysis. The focal point of the process analysis was to capture and map the processes in SCANIA Czech Republic s.r.o. truck service centre. The general methods were implemented such as time capture, historical data analysis, questionnaire surveys, and structured interviews to gather data and information. After initial observations and a workshops, the focus and boundaries of the process under investigation were identified. The process specifications resulted from brainstorming sessions with service centre staff at all management levels and aligning with the management's priorities and expectations. It was determined that the investigation would focus on the processes linked to individual orders and their ensuing service operations from the perspective of the service advisors. These personnel and their duties were recognized as essential to the effectiveness and output of the service centre, but they were found to be overburdened in the long run. Their advanced organisational, technological and communication skills were necessary but underutilised due to an overload of operative, administrative and low-value activities within the service centre. The primary goal was to eliminate unproductive tasks and maximise high-value activities performed by the service advisors, thus increasing company productivity. In order to achieve the objective of this research, it was imperative to document the service advisors typical workday. Subsequently, the activities observed were classified into different categories such as communication with the customer, mechanic, other service advisor, and storekeeper, pre-invoicing, invoicing, order work, ensuring service performance, operative, pauses, and substituting the storekeeper. These categories were then assessed according to the degree of waste and value added and were all mapped out for their relationships and causal links throughout the order. This was achieved with the assistance of the specialized software Modelio, which utilizes BPMN methodology for creating process maps. The boundaries of the investigated process were defined at the input by the origin of a need for a service operation, namely the receipt of a customer request and the placing of an order, and at the output by the fulfilment of the order and the return of the fixed car to the customer accompanied by invoicing for the carried-out service operations.

The methodology continually evolved during the course of the investigation due to newly discovered facts and connections. As a result, the creation of process maps was not a one-time activity, but rather a continuous iterative process. During the creation of the maps, several adjustments were made regarding process analysis perspectives, the shift of boundaries of the studied processes and the development of the overall logic of process and information flows recording. All of these factors led to the creation of process maps with great informative value for the set objectives. The focus was not on generic process maps intended to replace the standardized process diagram stipulated in corporate policies, but rather on a highly specific perspective on processes related to individual orders designed to identify root causes of deficiencies and discover areas with potential for improvement.

After precisely and unambiguously determining the approach and perspective for developing process analysis and process maps. It was necessary to define the desired future state of the investigated process and on that basis identify the shortcomings of the current state and the barriers to transitioning to the future state. The desired future state was defined in two ways. Firstly, the aim of optimization measures was to achieve the streamlining of the work of service advisors. Secondly, the aim was to maximize the number of complete orders. A complete order is one which is planned, completed within the specified time, the vehicle is handed over for servicing by the customer on time, the service is carried out by the specified mechanic, the invoice is issued before the vehicle is driven away, the repair time does not exceed the plan, all spare parts are available during the service, and no additional servicing is required. One output from observation and measurement was the frequency of incomplete orders, and through a questionnaire survey among service advisors and mechanics, the causes of these incomplete orders were identified. The assumption for increasing the overall efficiency of the service centre was that incomplete orders are significantly more demanding for service advisors to process. The identification of shortcomings and causes of waste focused on the daily work routines of service advisors and the origins of incomplete orders. All identified shortcomings were discussed in the conclusion of the research, covering their causes, consequences, and impact on process efficiency. Desired future states of individual problem areas were outlined, and measures were proposed to eliminate the causes of the problem and achieve the desired state. The proposed measures were assessed based on their significance for improving efficiency and the demands for their implementation. These two factors were used to map all problematic areas into a significance matrix, which enabled the prioritisation of proposed solutions.

2.1 Application of BPMN Method of Identification of Cause and Effect Relationship in Service Processes

In this chapter, the use of BPMN for identification of cause of shortcomings and waste as well as their impact in the mapped process will be presented. First, the basic characteristics of the created maps will be presented. Subsequently, four identified problem areas will be showcased to illustrate how the results of time capturing, questionnaires, interviews and historical data analysis can be linked and visualised using the BPMN methodology. This approach helps to better understand the relationships and connections between individual sub-processes and the accompanying information flows. Process maps will also enable clear recognition of the areas of responsibility of individual workers for problematic sub-processes.

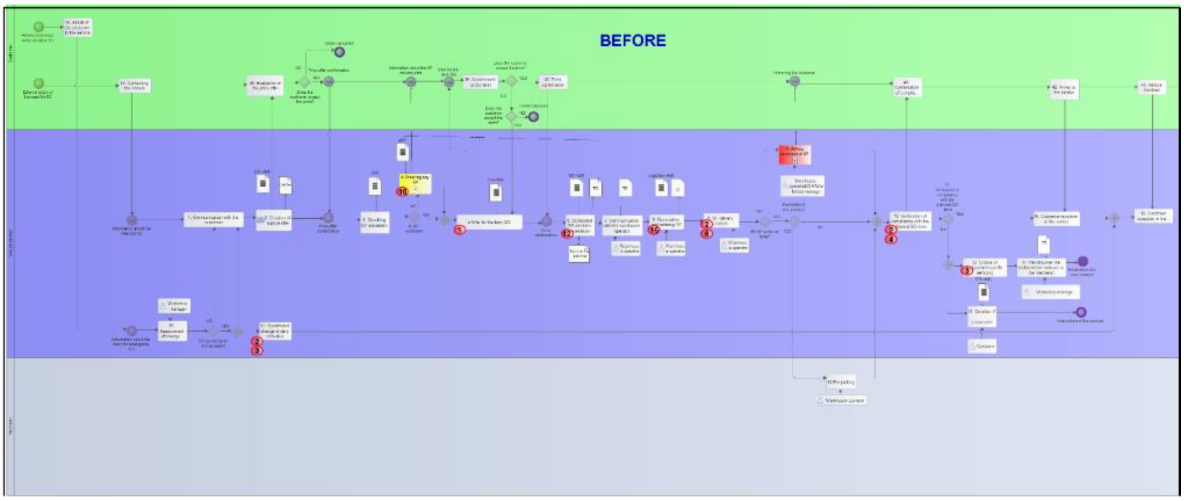

Figure 1 Process map - External origin of the need for service operation

The process maps document the specific progression of the order from the initiation of the service requirement to its fulfilment, as envisioned by the service advisor. The chief aim of the process maps was to methodically record the service advisor's actions pertaining to each service operation. The process maps are categorised into BEFORE/DURING/AFTER phases in accordance with the SCANIA lexicon. The process maps comprise three primary lanes which outline distinct areas of responsibility: the customer, service advisor, and mechanic. Each sub-process on the map has a unique number for easy orientation. Processes that involve other workers are only briefly outlined. Red circles on the process maps indicate place of origin of identified shortcomings and waste (the number in the circle represents the number shortcoming). **Figure 1** represents only a fraction of the complete map, focusing on the BEFORE stage of the process. For all identified issues, their causes were found and their places of origin were defined within process maps. This allowed for the relationships between causes and consequences of each problem to be traced, leading to a better understanding of the overall process. Thanks to this identification, specific targeted solutions could be effectively designed without resorting to general, blanket measures without clear purpose or intent. During the identification of partial processes in which problems arise and vice versa, the creation of four variants of process mapping notation generally occurred. These variants are further presented in selected cases. Variant 1 is shown in **Figure 3**, which includes a cutout from the process map, revealing that selected deficiency number 1 arises during partial process number 5. This deficiency subsequently negatively impacts all subsequent processes until the end of the order.

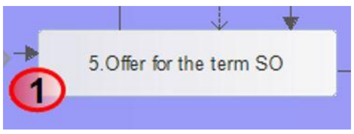

Figure 3 Variant 1 - Occurrence in the process map – Identified shortcoming 1

Variant 2 is depicted in **Figure 4**, which shows that the selected deficiency, number 8, arises during partial process 23. Additionally, it is evident that more than one issue can arise within a single partial process, as seen in partial processes 23 and 24. However, process maps only include points of deficiency occurrence, as a majority of them impact multiple processes, leading to a cluttered map. Upon investigation, it was found that deficiency number 8 has a direct impact only on partial process 27.

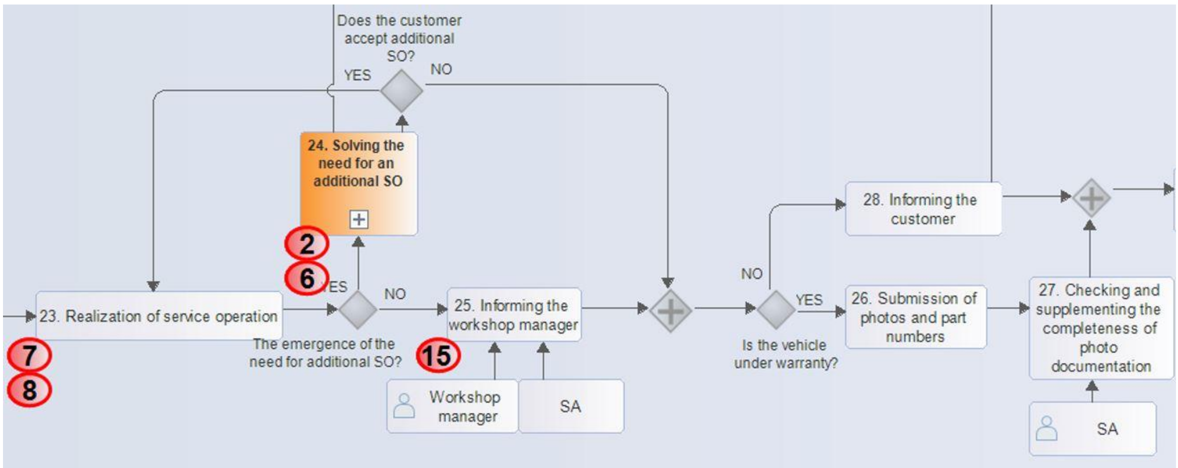

Figure 4 Variant 2 - Occurrence in the process map – Identified shortcoming 8

Variant 3 is illustrated in **Figure 5**. It can be seen that selected deficiency number 2 arises during different phases of the process. The figure shows that the cause of this deficiency appears in both process 9 and process 10, and it also occurs twice during processes 24 and 51 within the entire mapped process. In this variant, the nature of the impact of the arising deficiency is also different, in such a way that it negatively affects all sub-processes during the DURING phase.

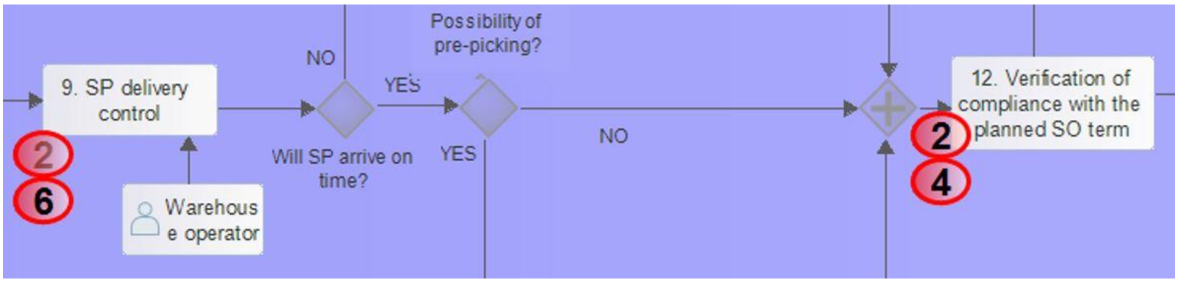

Figure 5 Variant 3 - Occurrence in the process map – Identified shortcoming 2

Variant 4 comprises all shortcomings where the exact location of their causes could not be unequivocally determined on the process map. These are general issues of organizational, administrative, or IT nature. These problems typically occur throughout the entire process, both in terms of cause and effect.

3. CONCLUSION

This article presents the results of a research study focused on optimizing service procedures at the service centre of SCANIA Czech Republic s.r.o. The study aimed to conduct a thorough process analysis and develop process maps using BPMN methods as the basis for identifying shortcomings and finding their root causes and consequences. Initially, it was necessary to define the limits of the process under investigation and determine the perspective and level of detail when modelling the processes. This methodology underwent continuous development throughout the research due to its cyclical and iterative nature. A methodology was gradually developed for data collection and process mapping. The ongoing results of the mapping, including the current methodology, were periodically presented and discussed at controlled workshops with the research team and selected representatives of the company. Thanks to this periodic validation and verification of emerging models and utilized methods, the established goals were achieved and the informative value of the outputs was maximised. The first section of the article includes a literature review in which the fundamental concepts of process analysis, process mapping, BPMN, and root cause analysis are defined. The second section presents the focus, objectives, methodology, and progress of the research. The third section of the article presents examples of BPMN process mapping implementation as a tool for analysing causes and effects of process deficiencies. This section provides a general overview of the map creation process and its logic. Finally, four variants of deficiency cause recording in the process map are presented. The application of the presented methodology enabled the identification of causes and consequences of selected deficiencies based on clearly described and clearly visualized relationships and connections between individual processes. This led to the proposal of targeted, specific optimization measures that will improve all processes, increase the productivity of the service centre, and eliminate waste. The proposed measures were evaluated in terms of their impact on efficiency, cost-effectiveness and complexity. The improvement process should definitely not end here, and the resulting methodology should be periodically applied and continuously updated. After all major causes of waste have been eliminated and the desired efficiency of service advisors' work and the frequency of incomplete orders have been reduced to a necessary minimum, it would be appropriate to analyse and optimize service operations performed by mechanics in the workshop in a similar manner. In the future, this methodology could be generalized and applied to various processes across all areas of operations at SCANIA Czech Republic s.r.o.

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