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Utilizing Lean Thinking as a Means to Digital Transformation in Service Organizations

F.P. Santhiapillai¹ and R.M. Chandima Ratnayake¹

¹ University of Stavanger (UIS), Stavanger, Norway
Department of Mechanical and Structural Engineering and Material Science, University of Stavanger, Norway
felix.santhiapillai@uis.no, chandima.ratnayake@uis.no

Abstract - Digital transformation (DT) is gaining interest and changing citizens' expectations of service organizations' ability to deliver high-value, real-time digital services. However, from an organizational perspective, DT entails a continuum of transitions that emphasize cultural, organizational, processual and relational changes. Over the past few decades, Lean thinking has been a dominant part of many organizational philosophies and proven to be an important enabler, to cater for the aforementioned changes. With its focus on reducing organizational complexity and increasing value for the end-user, it can support DT through its systematized utilization of methods and tools for improvement. The purpose of this paper is to demonstrate the use of Lean thinking to develop and enhance service processes and its contributing effect to enable DT in service organizations. Accordingly, a conceptual process for Lean digital transformation (LDT) is developed and discussed. In order to test the developed LDT process, action research was conducted in a sales and service organization in Norway, where an after-sales process was selected for current-state analysis. The conducted study resulted in the development and commercialization of a software system, which has been licensed and implemented by approximately 100 users within a year. The findings of this study reveal a great improvement and innovation potential in utilizing Lean thinking to enable and drive DT.

Keywords: Lean thinking, digitization, digitalization, Lean digital transformation

1 Introduction

Digital transformation (DT) is gaining interest and changing citizens' expectations of service organizations' ability to deliver high-value, real-time digital services [1]. As computing capabilities have increased exponentially over recent decades, DT offers enormous value-creating opportunities, in terms of new services, products, processes and skills [2]. It is mostly associated with the effort of using new technologies to create or modify and improve processes and services, following the needs of customers, which goes beyond organizational digitization efforts [3, 4]. According to [4], DT evolves along a continuum of transitions, which is differentiated by digitization, digitalization and digital transformation, where digitization highlights the process of converting information into a digital format or the transition from analog to digital, whereas

digitalization is the utilization of digital technologies and digitized data to make changes in processes. Followingly, DT emphasizes the overall cultural, organizational, and relational changes, which constitute a complex field within organizational change management [4].

Over the past few decades, Lean thinking has been a dominant part of many organizational philosophies and proven to be an important enabler to cater for the aforementioned changes [5, 6]. It facilitates a common language and a systematic way of thinking that ensures a centralized focus on customer value and the elimination of waste, variation and/or overburden in an organization [7, 8]. Furthermore, Lean thinking emphasizes principles and tools, such as “pull” system, leveled flow, visual control, standardization, value stream mapping, etc., as enablers of process innovation [9]. For the support and implementation of new technology as a means to improve existing value-creation processes, Lean thinking can complement digitalization, as digitalization can benefit the pursuit of becoming Lean [10, 11]. However, there is a need to further explore the relationship between the two paradigms of Lean and DT and how they can influence or enable each other, from a practical perspective.

Lean thinking, the process of product design and development [12] and design thinking [13] together inspired the development (and modification during and after the project) of a holistic conceptual design for the process of Lean digital transformation (LDT) (Fig. 1). LDT illustrates the application of Lean thinking and tools relative to the transitioning process of DT and product design and development. In order to test and simulate the developed LDT process, an action research project was initiated in a sales and service organization in Norway. The action research strategy included a mixed-method approach of quantitative and qualitative analysis. This paper provides insight into and discusses the results of the presented LDT process.

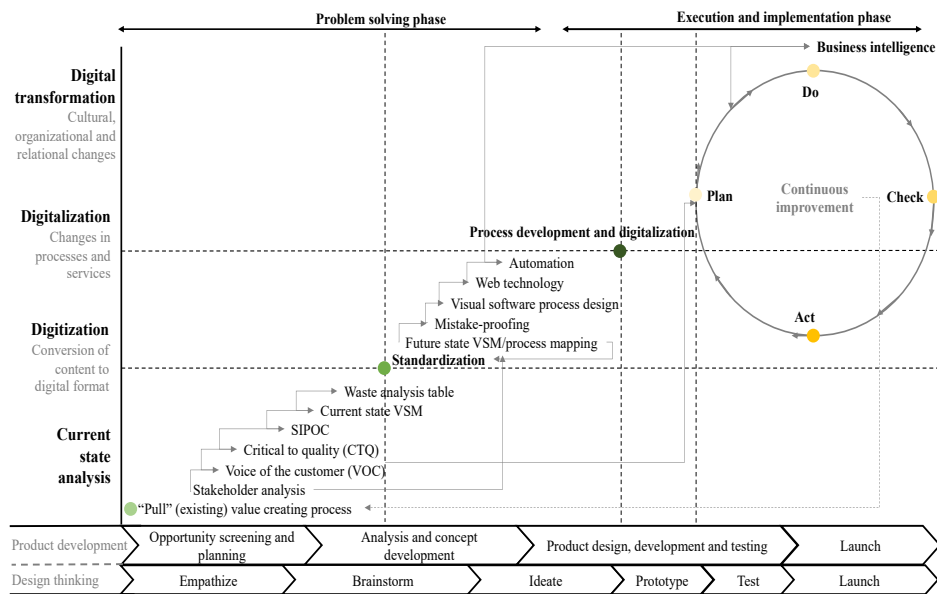


Fig. 1. Lean digital transformation process diagram

2 Organizational Challenge

The company in this study sells high-end products to a wide range of customer segments. It is a leading franchise, with 25 locations across Norway, whose products are supplied by multiple global suppliers. If its products are delivered with poor quality, or the product is damaged early in its estimated life span, for which the customer is not at fault, the customer has the right to demand a type of compensation under Norwegian law. A central part of the business is to have a customer-satisfying product claim process (PCP), if this occurs after sale. Their current PCP is largely manual and not standardized, which has led to the development of separate and different routines across their 25 locations. From a managerial perspective, there is a lack of total overview and control of all defects and cases that are created. The purpose of this study is to analyze their current state process. Furthermore, the objective is to introduce an improved future state solution for this sales and service organization.

3 Research Methodology

This study intends to generate explicit knowledge that will lead to informed and strategic action for a company. Accordingly, an action research strategy is chosen [14, 15]. The study uses a mixed-method approach, with a combination of qualitative and quantitative analysis [16]. As part of the method, unstructured interviews were conducted in workshops with one of the location's employees. Participants were chosen and categorized based on their position relative to operational, tactical and strategic levels in the organization. Accordingly, one "shop-floor" employee (SE) from the operational level, one product claim manager (PCM) from the tactical level and one location manager from the strategic level participated. However, due to time management and resource capacity, the PCM was the one to actively participate in all workshops. The PCM supplied with necessary input information regarding the PCP based on experience and expertise.

In order to identify the improvement potential, in the form of the digitization and digitalization potential, of the company's PCP, a current state analysis was first initiated. To provide a holistic understanding and snapshot of the PCP "before" and "after", this paper is limited to presenting the following analytical Lean tools: current state value stream mapping (VSM), waste analysis table and future state VSM. Furthermore, the following mathematical formulas for performance measures were applied [17], where cycle time (CT) is the actual time spent completing a task and lead time (LT) is the total time it takes to complete a task, which include CT and time spent on non-value-added activities (NVA) and non-value-added, but necessary activities (NVAN).

$$\text{Cycle time} = CT = T_p = \sum_{i=1}^n CT_i \quad (1)$$

$$\text{Lead time} = LT = T_p + \sum_{i=1}^n T_{NVA} + \sum_{j=1}^m T_{NVAN_j} \quad (2)$$

4 Findings and Results

4.1 Current state VSM

Fig. 2 illustrates the current state VSM, which is composed of 14 activities, where $T_p = 41 \text{ min}$ and $LT = 29 \text{ days} + 33 \text{ min}$. Of the activities, 71% (red icons in Fig. 2) are identified as activities that can be eliminated or improved. The process consists of three internal actors: SE, the PCM and the logistics manager (LM). The current information flow is considered not optimal, relative to the existing communication systems and the increasing inventory in the mailbox (yellow icons in Fig. 2).

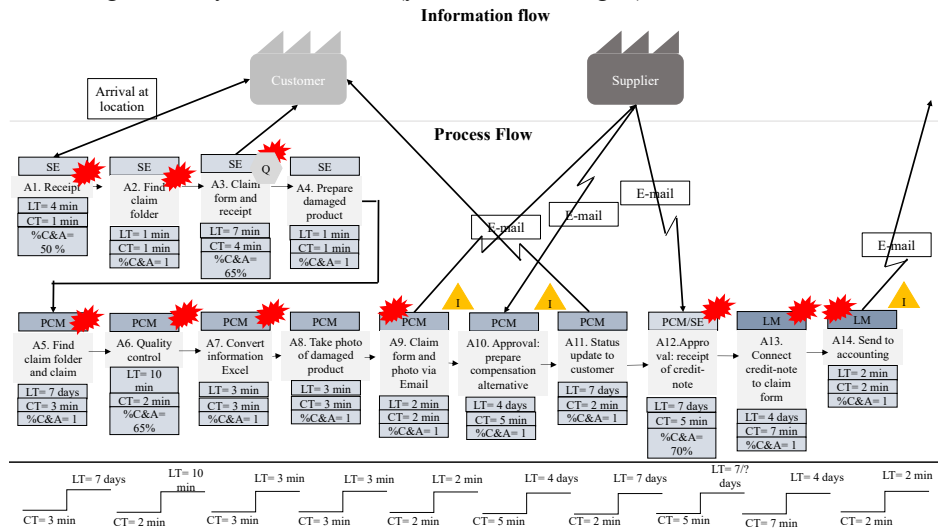


Fig. 2. Current state value stream mapping of claim process

4.2 Waste identification and analysis

Based on the current state VSM, constraints, operational waste (OW) and root causes are identified and analyzed. The PCM supplied the necessary information with as much detail as possible to accomplish the aforementioned. Table 1 provides a summarized description of some of the identified OW, NVA and NVAN.

Table 1. Waste analysis table

OW	NVA/NVAN	Description
Over-processing	A1-A3. Manual document handling and excessive paperwork	Finding folder in cabinet and filling out a one-page claim form, one for the PCM and a receipt for the customer. A duplicate is stored in a secondary folder for ongoing cases. When the customer returns to collect his/her product, the SE must find the secondary folder and the correct duplicate matching the given receipt (see Inventory and Transportation).
Over-production	A7-A9. Over-production of the same data/information	The same information is processed on three platforms for storage and communication. The original claim form is converted to/in secondary claim form, Excel and email.
Defect	A3. Defects in generated claim case, which are first	There are 40 SEs that can receive and generate a case in the first stage. The PCM observes variation in handling of this stage, due

Rework	identified when PCM revises claim form after first handover from store employee	to lack of experience among the SEs, e.g. information is missing, or, as the initial claim form is handwritten, PCM often experiences unintelligible handwriting, which causes rework and information hunting (see Rework).
	A6. Rework or correcting as a result of identified defects	Repercussions from Defects, when information is lacking or unintelligible, the PCM must go through the initial information and supply what is missing; this may mean finding the right SE for additional information or extracting the information from their systems.
Transportation	A1-A11. Information hunting and excessive processing	Establishing a communication channel with customer based on a physical claim receipt has often led to situations where customer returns to store and has lost the given receipt. This causes information hunting and an additional process for validation. Communication with customer is made through phone first when the supplier has made an evaluation. However, their experience is that customers often make contact via phone to ask for the status on their case; as any one of the 40 SEs may answer, it becomes difficult to provide an adequate answer, as only the PCM knows the status. Internal transmittal of information is not optimal, causing disturbances and poor customer experience.
	A9-A14. Information is converted to three different platforms	Handling an average of 45 claims each month with different suppliers has resulted in a complex and unorganized inventory system in their service mailbox. There are no established systems for providing an overview of collected credit notes from suppliers. Their Excel sheet has also become complex and lost its function.
Inventory		

Table 2 illustrates how the activities identified from the current state VSM (Fig. 2) and analyzed in the waste analysis table (Table 1) are evaluated and structured relative to value added (VA), NVA and NVAN. This provides an overview of which activities to eliminate or improve, according to their value creation, and, further, a foundation for future state VSM.

Table 2. Waste elimination and improvement table

Activity	VA	NVAN	NVA	Digital improvement	Eliminate
A1	●			x	
A2			●		x
A3	●			x	
A4	●				
A5			●		x
A6		●		x	x
A7			●		x
A8	●			x	
A9	●			x	
A10		●		x	
A11	●			x	
A12		●		x	
A13			●		x
A14			●		x
100%	42.9%	21.4%	35.7%		

4.3 Future state VSM

The future state PCP is composed of seven activities overall (Fig. 3), meaning, 50% of the activities from the current state VSM are either eliminated or improved. The presented waste in Table 1 is eliminated or reduced, resulting in an estimated $T_p = 15.1 \text{ min}$ and $LT = 11 \text{ days} + 3.1 \text{ min}$. Furthermore, the new PCP facilitates optimal resource utilization, by releasing LM from the process.

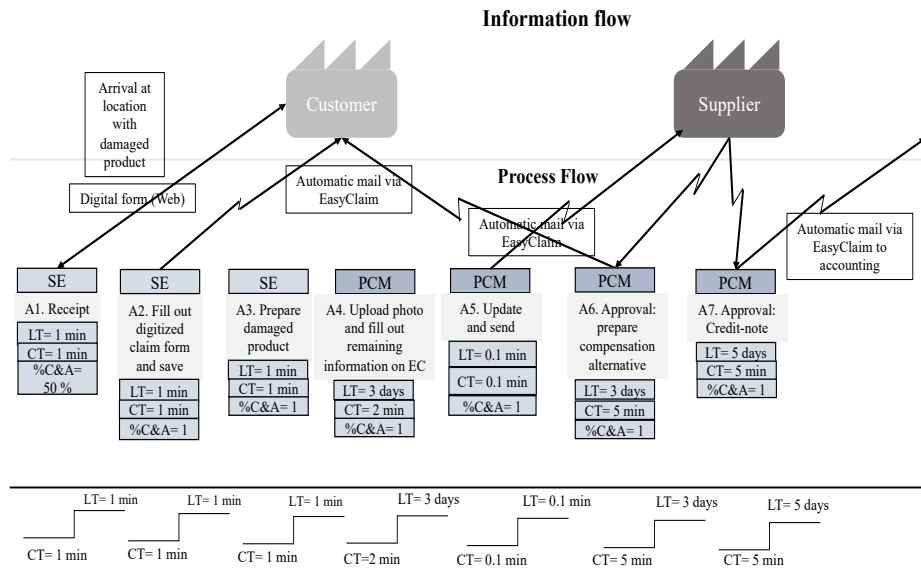


Fig. 3. Future state VSM

5 Discussion and Conclusion

The testing and implementation of the presented LDT process (Fig. 1) resulted in the development, launching, commercialization and specialization of a lead incident management system within the domain of customer (& supplier) relationship management (CSRM), which goes by the name, Easyclaim [18]. Within a year, this software system has been licensed by two leading service and sales organizations and implemented by approximately 100 locations or users in Norway. Section 4, Findings and Results, provides a snapshot of the entire LDT process and summarizes the current state analysis phase and the improvement that was made for the company. The digitalized PCP is composed of seven activities overall (Fig. 3), meaning, at least 50% of the activities from the current state VSM are either eliminated or improved (Fig. 2). In the digitalized PCP, LT is reduced by approximately 62%, where 35.7% of the activities (NVA) are eliminated and 21.4% of the activities (NVAN) are either integrated as part of a VA activity or improved (Table 2).

The findings of this study also reveal and confirm that standardization and conversion of input information at the point of entry enables digitization. This further

allowed creative utilization of digital technologies to restructure and digitalize the company's existing PCP. For instance, as the process was brought into a computerized platform, functionalities, such as mistake-proofing, automation, a notification and prioritization system and visual process management, were integrated, to improve the PCP. Furthermore, from a strategic perspective, the digital transition facilitated the introduction of business intelligence providing business-critical information, such as detailed analysis of the company's products (e.g. defects and variations), economic loss, suppliers, case processing time, etc. – information used for strategic negotiations and decision-making.

DT also entails organizational and relational changes; accordingly, stakeholder analysis and voice of the customer (VOC) were continual in the LDT process. Having a clear overview of the central actors or users with a high level of interest and power of influence in the PCP, and connecting or relating their needs to the different phases or stages of the LDT process (along both axes), facilitated the detailed customization of the user interface and experience. This particularly resulted in effective system- and user-alignment, reduction of resistance to change from employees and ultimately efficient organizational implementation of the digitalized system.

However, challenges and a further need for system and PCP customization were expected and experienced when transitioning to and operating in the testing and implementation phases of the new software system and digitalized PCP. In order to be flexible and adapt to changes, the continuous improvement cycle of PDCA (plan, do, check and act) was integrated as an iterative process for/in these phases. This particularly facilitated the structured re-visiting of previously conducted/implemented phases and/or tools, the modification and/or improvement of the established product and/or process information, and the identification and integration of additional value-creating processes and functions complementing the software system and the digitalized PCP.

Based on the conducted action research (and product design and development project), this study confirms that Lean thinking and tools enable and support DT, which can contribute to improving existing value-creating processes in an organization. From a practical perspective, the results of this study validate the developed and implemented LDT process. However, further research shall explore its theoretical foundation or validity and integrate it with other disciplinary domains or processes, such as software engineering. In order to develop, adapt and modify the presented LDT process, further research shall also test and/or implement it in other service organizations, such as in the public sector, which is less digitally evolved compared to the private sector [19, 20].

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