How can BPM and Lean practices accelerate Digital Transformation? Evidence based on a practical case

Mariana Carvalho
Department of Economics, Management, Industrial Engineering and Tourism (DEGEIT)
University of Aveiro
3810-193, Aveiro, Portugal
marianamaia@ua.pt

Leonor Teixeira
Institute of Electronics and Informatics Engineering of Aveiro (IEETA), Department of Economics, Management, Industrial Engineering and Tourism (DEGEIT)
University of Aveiro
3810-193, Aveiro, Portugal
lteixeira@ua.pt

Abstract

Companies have been facing many changes over the last decade related to the Digital Transformation, associated with Industry 4.0. Thus, it becomes a need to follow this trend by implementing standards that improve efficiency and work conditions. These improvements can be achieved through several ways, whereas management approaches such as BPM and Lean, often supported by technologies, may represent possible ways, thus contributing to organizational competitiveness. This paper presents a study developed in a company which is currently putting a lot of effort in standardizing its business processes and achieving higher maturity levels of I4.0. The main objective of this study is to illustrate how BPM can help companies prepare for the challenges of Digital Transformation. With the implementation of this work, it was possible to standardize a major process, which facilitated the execution of the tasks of the department's workers, giving them some of the tools they need to work consistently and less prone to errors or delays. The results of this study also proved that companies need to invest in business processes so that they can more easily implement I4.0 initiatives, namely those that interfere with the Human Factor, in waste-free environments.

Keywords
Digital Transformation, Industry 4.0, Business Process Management, Lean

1. Introduction
Nowadays, the challenge faced by organizations is centered on digitalization, which consists in the usage of new technologies to transform business processes, in an attempt to create significant additional value (Antonucci et al., 2020), thus emerging a new paradigm known as Industry 4.0. The challenges promoted by this new paradigm are strongly related to globalization (Xu et al., 2018) and seeking solutions and mechanisms to help organizations surviving highly competitive environments, while improving their adaptability and responsiveness to changes in their market (Marques et al., 2020; Uriona Maldonado et al., 2020).
However, it is not uncommon that the new technologies and trends provided by I4.0 and associated with the Digital Transformation (DT) might be implemented without the organization being ready to take full advantage of their benefits, i.e., without sufficient digital maturity to support this implementation (Machado et al., 2020). In order to contribute to overcoming this gap, some studies defend that these practices must be sustained by three important pillars - people, technologies and business processes - and must be implemented in waste-free environments, improved through Lean practices.
The Human Factor (people) plays a big role in DT because its systematic consideration can avoid negative consequences for individual employees, organizations and for society as a whole (Neumann et al., 2021; Salvadorinho

et al., 2021). Moreover, the advances provided by I4.0 still scare a part of the population, as uncertainty remains around job security, with future implications for both individuals and organizations (Butt, 2020). Furthermore, the fact that this DT blurs the differences between human and machine work, and also the lack of digital culture and training nowadays present in most organizations, may accentuate the uncertainties regarding the impact of DT (Ślusarczyk, 2018). Thus, it is essential to take the Human Factor into account in this transition process and consider the implementation of I4.0 as a support in decision making and control activities made by human resources (Cañas et al., 2021). In this sense, Neumann et al. (2021) mention the evident centrality of Human Factor in four of the eight I4.0 developmental priorities, which are: managing complex systems; safety and security; work organization and design; and training and professional development.

The DT's pillar of technologies is related to the sharp increase in global competitiveness, coupled with customer changes facing product requirements and specifications with shorter life cycles (Machado et al., 2020), which generates the need for the intelligent use of new technologies and practices (Froger et al., 2019; Ślusarczyk, 2018). Thus, it is important to have in mind that the technological change associated to the DT is rapidly transforming virtually all areas of human life, work, and interaction (Neumann et al., 2021).

Other important pillar of DT, that is the main focus of this paper, is related to business processes. To fully harness the potential of digitalization and to achieve higher maturity levels of Industry 4.0, organizations must systematically manage their business processes by understanding the relationship between them, resources used and people involved (Antonucci et al., 2020; Bibby & Dehe, 2018). Related to this matter Antonucci et al. (2020) report that more than 70% of organizations have already launched digitalization initiatives, yet only 1% of these companies have sufficient business process management capabilities to capture the value generated by the DT. This means that only 1% of these companies have their business processes under control, and many are focused on trying to improve them by using Business Process Management (BPM) (Antonucci et al., 2020). Moreover, all business processes can be targeted for improvement, including processes related to knowledge management and office work, since these also play a determining role in terms of overall organizational performance (Sousa & Dinis-Carvalho, 2021).

From the increasing technological evolution provided by Industry 4.0 also arises the need to decrease manufacturing costs, reduce non-value-added factors and eliminate waste (Doh et al., 2016). Thus, another phenomenon that has had a great influence on companies in recent decades is the Lean philosophy (Sony, 2018; Teixeira et al., 2019), which needs to be the base of this DT.

In order to illustrate this premise that facilitates the implementation of DT, this paper presents a practical case performed in the Department of Product Design and Development (DDD) of a Portuguese cistern company that has been continuously investing in innovation, as well as in the modernization and digitalization of its processes to remain competitive by achieving higher levels of maturity and standardization. Specifically, the department where this study took place was facing problems related to the lack of mapping and standardization of its processes, so it was crucial to identify the documents associated with the processes, the tools needed for the proper performance of each function and the respective responsible for them.

Thus, the main objective of this work is the standardization of business processes, so that they can be used as tools to respond to the challenges brought by digitalization, giving the organization a higher I4.0 maturity level, therefore proving the contribution of BPM in the achievement of Digital Transformation.

This paper has the following structure: the next section offers a theoretical background of this study, needed to understand the relations between Digital Transformation, BPM and Lean practices. Then, Section 3 specifies the methodology approach before moving to Section 4, where the practical case and the main results are presented. Finally, Section 5 intends to discuss the practical results, while also presenting some concluding remarks and suggestions for future work.

2. Theoretical Background

2.1 Digital Transformation in Industry 4.0

Digital Transformation is no longer a future trend, as it has become a necessity for companies to grow and remain competitive in the market. The fourth industrial revolution, also known as Industry 4.0, is at the heart of this transformation (Butt, 2020).

In recent years, the introduction of Industry 4.0 in a business environment and the communication among cyber-physical systems (CPS) (Pereira Pessôa & Jauregui Becker, 2020) enabled the beginning of the fourth industrial revolution. This term was initially presented in Germany in 2011 during an international fair about technology in Hannover and was intended to represent the growing trend of use of automation technologies in the industry (Chiarini et al., 2020; Teixeira et al., 2019; Tupa & Steiner, 2019; Xu et al., 2018). After that, the concept of Industry 4.0 was

quickly adopted in similar fashion all over the world (Halaška & Šperka, 2020) and nowadays it is strongly associated with computerization and decentralized communication (Teixeira et al., 2019).
The Industry 4.0 phenomenon can provide a viable array of solutions for the growing needs of informatization in manufacturing industries (Xu et al., 2018). In this sense, Industry 4.0 has increased the knowledge sharing and collaborative work, as well as flexibility, which consequently creates better customer experience and higher revenues (Butt, 2020). Teixeira et al. (2019) also see the concept of Industry 4.0 linked to the increase the productivity through the complete elimination of non-value-added activities, where processes automation is evidenced with real time information.
In this sense, the concept of Industry 4.0 is used to designate the new generation of connected, robotics, and intelligent factories. Essentially, the vision of Industry 4.0 is to give smart capabilities to the production and physical operations in order to create a more holistic and better-connected ecosystem (Sanchez et al., 2020; Sony, 2018).
Linked to this phenomenon, are other main concepts of Industry 4.0 such as cloud computing, internet of things (IoT), smart manufacturing, cyber-physical systems (CPS), big data analysis and artificial intelligence (Hou et al., 2020), as well as BPM (Sony, 2018), which represent important technological contributions that will revolutionize the way organizations will operate in the future (Teixeira et al., 2019).
The new trend is that businesses that are involved in the DT will need to share and exchange data, therefore one of the five main features of Industry 4.0 is integration (Xu et al., 2018). The integration aims to develop organizational strategies for sharing information and setting the ground for an automated supply and value chain (Butt, 2020; Sanchez et al., 2020). In this context, three kinds of integration possible in Industry 4.0 arise: horizontal; vertical; and end-to-end engineering integration (Halaška & Šperka, 2020; Sony, 2018). While the previous industrial revolution was focused on automation of machines and processes, the present revolution (forth IR) focusses on end-to-end engineering integration, as well as the complete integration of physical systems with virtual systems (Sony, 2018).
However, companies' level of preparation and the capabilities to use the benefits of Industry 4.0 are lower than the expected (Ślusarczyk, 2018). Therefore, to fight this lack of preparation, it is necessary to develop digital capacities capable of promoting integration and alignment between organizational objectives with processes, people and culture (Machado et al., 2020). In addition, companies should also find out their current level of I4.0 maturity, as it allows them to determine their areas of weakness and strength, prioritize opportunities for improvement and to create development plans (Bibby & Dehe, 2018). To facilitate the task of measuring and determining the level of maturity it is possible to use maturity models composed by levels that correspond to maturity phases, as shown by Santos & Martinho (2020) and presented in Table 1.

Table 1 - Maturity levels, adapted from Santos & Martinho (2020)

Level 0	low or non-existing degree of implementation: no I4.0 maturity
Level 1	pilot actions in planning or development
Level 2	implementation of actions initiated: it is possible to begin to observe some benefits
Level 3	partial implementation of actions, which increases the company's competitiveness
Level 4	advanced implementation of actions, with clear economic returns
Level 5	maximum level of implementation: the company is a reference in the application of concepts and the implementation of I4.0 technologies

2.2 About Business Process Management

Every organization has processes, which are the means for using the resources of an organization in a safe, replicable, and consistent way for the achievement of the organizational objectives (Uriona Maldonado et al., 2020). Therefore, understanding and managing these processes to ensure that they consistently produce value is a key factor for the effectiveness and competitiveness of organizations (Dumas et al., 2018). Business processes are present at all organizational levels and companies operate through them consciously or unconsciously, as not all are evident and visible to external customers (Butt, 2020; Carvalho et al., 2020).
In this context, Business Process Management (BPM) appears as a holistic management approach and one of the most comprehensive and extensive concepts available for companies to develop a competitive advantage through cost reduction and process excellence (Butt, 2020). It is also responsible for facilitating the identification and implementation of improvements, positively influencing the overall outcomes of an organization (Pejić Bach et al., 2019; Tupa & Steiner, 2019).
BPM provides governance to a process-oriented organization through the modeling, execution, and evaluation of business processes, with the goal of increasing agility and operational performance by eliminating activities that do

not add value (Butt, 2020; Uriona Maldonado et al., 2020). BPM involves the use of various methods, policies, metrics, management practices, and software tools to discover, analyze, redesign, implement and continuously monitor and improve an organization's business processes (Butt, 2020; Dumas et al., 2018).

Business process modelling as part of BPM has shown its potential in administrative environments formed by processes with a high digital nature (Erasmus et al., 2020) and it offers features such as enabling its users to create, modify and annotate additional data in process models, as well as the possibility of storing and sharing process models from a repository (Uriona Maldonado et al., 2020).

Hewelt et al. (2020) refer that one of the most significant aspects that impact business process modelling is the task-extraneous characteristics, which include the way the content is presented and its means of modeling, such as the notation used. Carvalho et al. (2020) also mention that business processes are usually represented by visual languages and graphic representations, which generates models from natural languages, such as texts, or technical languages, like Business Process Model and Notation (BPMN). This notation is capable of representing complex processes flows and has reached a standard level of penetration and benefits from a global support from organizations (Erasmus et al., 2020).

2.3 About Lean and related concepts

Despite the benefits associated with the DT, the daily volume of unstructured data in this type of environment may generate noise, as isolated data does not provide any added value (Teixeira et al., 2019). At the same time, the changes brought by BPM and business process modelling require the use of specific tools to also reduce waste and the non-value-added activities (Uriona Maldonado et al., 2020). In this context, Lean practices can be used to minimize such waste and to sustain performance improvement, as it is one of the most widespread manufacturing strategies in the last three decades (Chiarini et al., 2020; Sony, 2018).

Lean Thinking is a concept with more than one hundred years (Xiong et al., 2019) and it can be defined as a business approach that uses “unconventional methods”, and whose main objective is to maximize outputs with minimal failures and maximum quality, with the use of minimal inputs, such as human effort, inventory space and investment value (Razmak et al., 2021).

Waste or the Japanese equivalent term “MUDA” plays a major role in Lean (Sony, 2018) and it can be defined as any human activity which absorbs resources but creates no value, regardless of whether it is generated by manufacturing or non-manufacturing processes (Sony, 2018; Xiong et al., 2019). In this sense, Lean integrates a set of management tools in order to identify and eliminate the seven well-known types of waste (MUDA) proposed by Ohno: transportation; inventory; motion; waiting; overproduction; over processing; and defects (Sony, 2018; Teixeira et al., 2019; Xiong et al., 2019). An eighth type of waste known as unused human talent was later included when Lean Management was introduced in the western world (Sony, 2018; Xiong et al., 2019).

Lean approach solutions can be used not only in manufacturing processes’ improvement, but also in non-manufacturing processes, by the identification, removal of waste and optimization of the process throughout the whole value chain. Therefore, in the past years, some researchers and lean practitioners have paid more attention to non-manufacturing processes and they have already identified benefits related to reducing the waste flow and saving money for businesses, as it maximizes the value of participants’ relationships and communication throughout the value chain (Xiong et al., 2019). However, in administrative and knowledge work environments it becomes more challenging to identify and measure waste, as well as to evaluate the performance of the improvements implemented (Sousa & Dinis-Carvalho, 2021).

In a context of Lean, standardization refers to the consistency in which process steps, methods, and procedures are performed repeatedly in the same way every time and identifies the sequence by which work should be completed (EL-Khalil et al., 2020). The purpose of standardization is to manage the workflow through eliminating non-value-added activities and by making operational problems, abnormalities, and production standards visual (EL-Khalil et al., 2020), therefore trying to reach the optimum functioning of the organization (Chandrayan et al., 2019). The results improve operational efficiency and effectiveness and facilitate the entrance of new employees (Chandrayan et al., 2019; EL-Khalil et al., 2020). Standardized work consists of text-based task instructions that precisely describe how job task activities must be executed (EL-Khalil et al., 2020) and it should be at the top priority in the development of DT to fully enjoy its potential (Hou et al., 2020).

Lean process standardization may require the 5S technique, work instructions and procedures, visual management tools, as well as line-side presentations (EL-Khalil et al., 2020). Therefore, in the context of this work it is important to highlight the 5S technique. 5S is an organizational management technique that enabled just in time (JIT) manufacturing as an integral part of Kaizen – a component of Lean Manufacturing (Hou et al., 2020). The name “5 S” is derived from the Japanese words *Seiri*, *Seiton*, *Seiso*, *Seiketsu* and *Shitsuke*, which, in English are denominated as sort, set in order, shine, standardize, and sustain (Hou et al., 2020; Uriona Maldonado et al., 2020). 5S can also be seen as a housekeeping technique used to keep the workspace ergonomic, clean and safe (Uriona Maldonado et al., 2020), thus improving the working conditions into a more productive and managed ecosystem with high quality standards, which offer greater performance and efficiency, as well as minimal wastage of manpower (Hou et al., 2020).

2.4 Relationship between Digital Transformation, BPM and Lean

BPM can be seen as a powerful ally in the adoption and management of the challenging Industry 4.0 properties, such as autonomy and decentralization (Halaška & Šperka, 2020). In this sense, Butt (2020) argues that BPM can be used to minimize the resistance to the DT, and it can give organizations the necessary confidence to accelerate this change. Moreover, BPM is often employed as a driver of integration of vertical and horizontal value chains that characterize Industry 4.0 (Halaška & Šperka, 2020), by articulating business processes that cross the boundaries of individual business functions (Erasmus et al., 2020). To address the relation between BPM and DT, Antonucci et al. (2020) have analyzed the association between BPM capabilities and the benefits of digitalization, proving the existence of positive and significant correlations between these two elements. Thus, as BPM capabilities increase, the benefits of digitalization are expected to increase as well (Antonucci et al., 2020). Several other papers in this line can be found in the literature (Castro & Teixeira, 2021; Fernandes et al., 2021; Salvadorinho & Teixeira, 2021a).
While organizations implement Industry 4.0, they must also integrate it with Lean in order to deliver optimum benefits (Sony, 2018). Although these practices marked the industry in different generations and rely on different types of tools to achieve their goals (Salvadorinho et al., 2021; Salvadorinho & Teixeira, 2020a; Teixeira et al., 2019), Lean and DT represent two types of organizational concepts that aim to support the operational excellence (Teixeira et al., 2019) as they both utilize decentralized control and aim to increase productivity and flexibility (Sony, 2018).
Sony (2018) presents an integration framework between the three types of integration of Industry 4.0 and the five principles of Lean. In this sense, the alignment of Lean principles and vertical integration in Industry 4.0, can add value to the customer, and the resources which are integrated can be used in the best possible manner. The Lean principles can also serve a mechanism for cooperation and coordination between all the different organizations within the horizontal integration perspective. Lastly, in the context of the end-to-end engineering integration, these principles can act as means for designing self-guided optimum product path through various value-added streams (Sony, 2018).
BPM and Lean Management are also connected as they are both recognized for improving organizational performance through continuous improvement, while focusing on the customer and process standardization (Uriona Maldonado et al., 2020). In addition, Dumas et al. (2018) refer that Lean is a discipline that complements BPM.
In short, it is possible to conclude that the concepts Digital Transformation, BPM and Lean are related to each other, as there is a clear importance in the existence of properly defined and mapped business processes, in an environment absent from waste with the integration of approaches associated with Lean, so that the implementation of a competitive Digital Transformation strategy can be initiated (Salvadorinho & Teixeira, 2021b, 2020b). Figure 1 represents the three previously mentioned pillars of DT and shows how these concepts are articulated and work betters together towards the same end: increasing productive and industrial efficiency, by the means of DT.

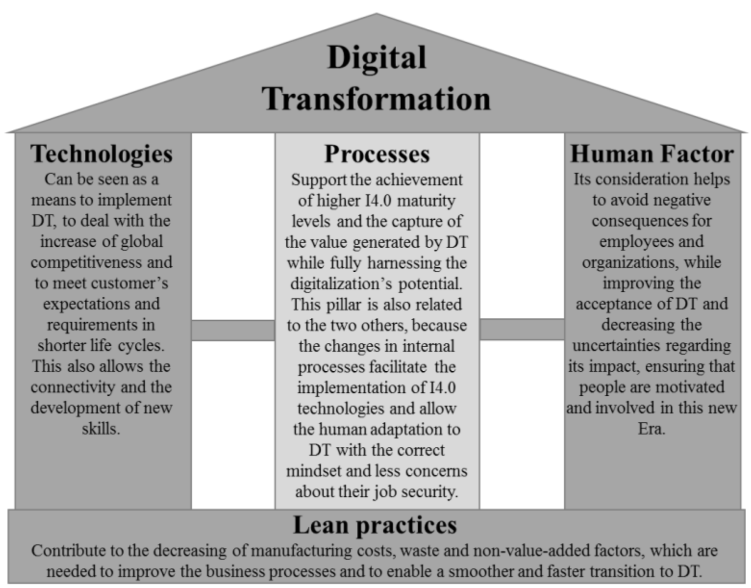

Figure 1 - Pillars of Digital Transformation

3. Methodology Approach

In this study, a methodological approach based on action-research was followed. This methodology aims to intervene in practice when solving a problem and, at same time, to contribute to the development of knowledge (Collatto et al., 2018; Coughlan & Coghlan, 2002). In this sense, one of the challenges that researchers face is the need to engage in the implementation of the action, while remaining sufficiently distant to reflect on it (Coughlan & Coghlan, 2002). From this perspective, researchers are not only observing something happening, as they actively work to make it happen (Coughlan & Coghlan, 2002) while working cooperatively with participants in identifying the problem, analyzing data, planning and implementing actions and presenting an assessment (Collatto et al., 2018).

The approach of this methodology applied to this practical case is composed by the phases of diagnosis, planning, action and evaluation. Thus, in the diagnostic phase, the problem and objectives of this study were initially defined, after the integration in the company. This phase also allowed the definition of the theoretical framework of the research. It was then necessary to plan and implement actions for the standardization of DDD's processes, which was possible by following the BPM life cycle proposed by Dumas et al. (2018). This method is widely mentioned in the literature and aims at managing business processes from its creation to its analysis and improvement (Froger et al., 2019), consisting in the steps shown in Figure 2.

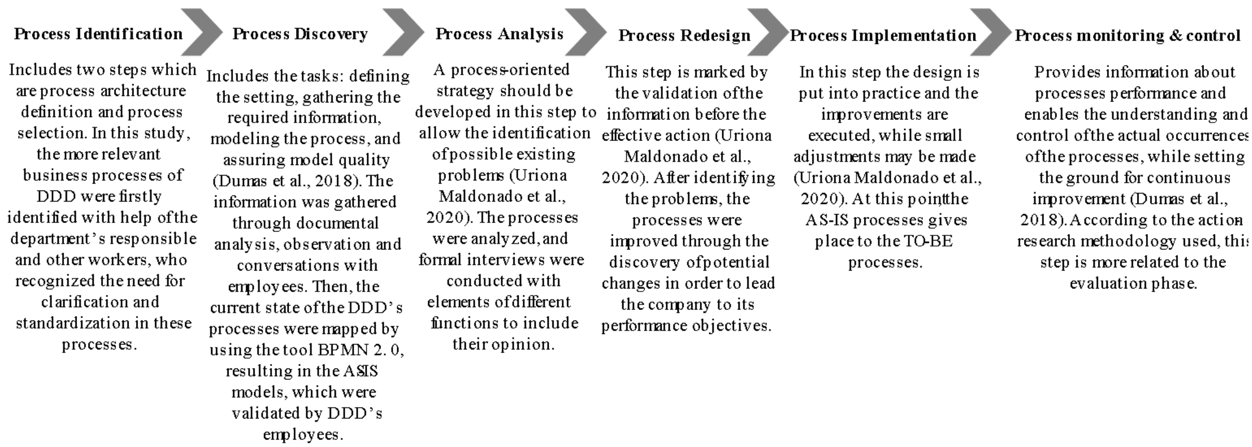

Figure 2 - Steps of BPM life cycle

4. Practical Case

A practical case was developed in order to solve a problem related to the lack of standardization, which generates waste and inefficiency, showing how companies can accomplish higher levels of I4.0 and processes maturity by having well-established BPM and Lean practices.

This study was developed in the Department of Product Design and Development (DDD) of a cistern company founded in 1954 in Aveiro. This company is currently devoted to the design, industrialization, production and commercialization of cisterns and mechanisms for the ceramic industry. Having this in mind, the Department of Product Design and Development has an important role in the organization, since it is responsible for developing new products and improving existing ones. This company has been continuously investing in innovation, as well as the modernization and digitization of its business processes to reach higher levels of maturity and standardization, which according to Halaška & Šperka (2020), are factors associated with the Digital Transformation.

To accomplish the proposed objective, it is important to mention that DDD uses a project approach, divided into three levels according to its complexity. A level 1 project has a higher level of complexity and more information to be collected and processed, while on the other end of the scale a level 3 project has a simpler treatment. The macroprocess of level 1 and 2 projects can be subdivided into four phases, as shown in Figure 3.

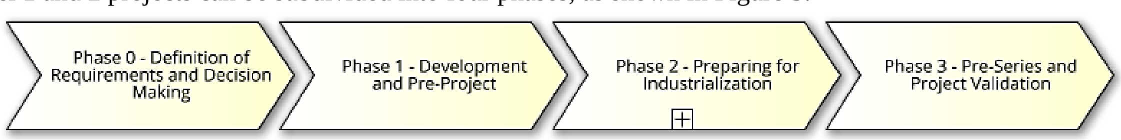

Figure 3 - Macroprocess of Level 1 & 2 Projects of DDD

After collecting the information through document analysis, observation and informal conversations with employees with different functions within the department, all the processes from these phases were mapped using as software tool with the BPMN 2.0 standard. Although the need for clear, available and standardized information, as well as the improvement opportunities identified is transversal to all the macroprocess, the presented paper is focused only on the Phase 2 process, as an example. Thus, to understand the results of this work it is important to examine the AS-IS model of the DDD's Phase 2 process, which is graphically represented in Figure 4, where it is possible to see: the tasks of every participant; the utilization of the company's ERP system to make the material requisitions and the purchase orders; as well as the documents used and created.
Nowadays, the concept of multi-functional teams is one of the key aspects of problem solving and decision making related to the design and development of new products (Venkatamuni & Rao, 2010). As it can be seen in the AS-IS model, this type of teams is present in the Phase 2 process, which makes it even more difficult to represent. Consequently, there was a need to include two other models that illustrate the subprocesses of the validation of acquired samples and the means of assembly, as shown in Figure 5 and Figure 6, respectively. It is relevant to mention that the subprocess of the validation of the means of assembly does not involve any workers from the DDD, therefore there is not any improvement measure suggested for it.

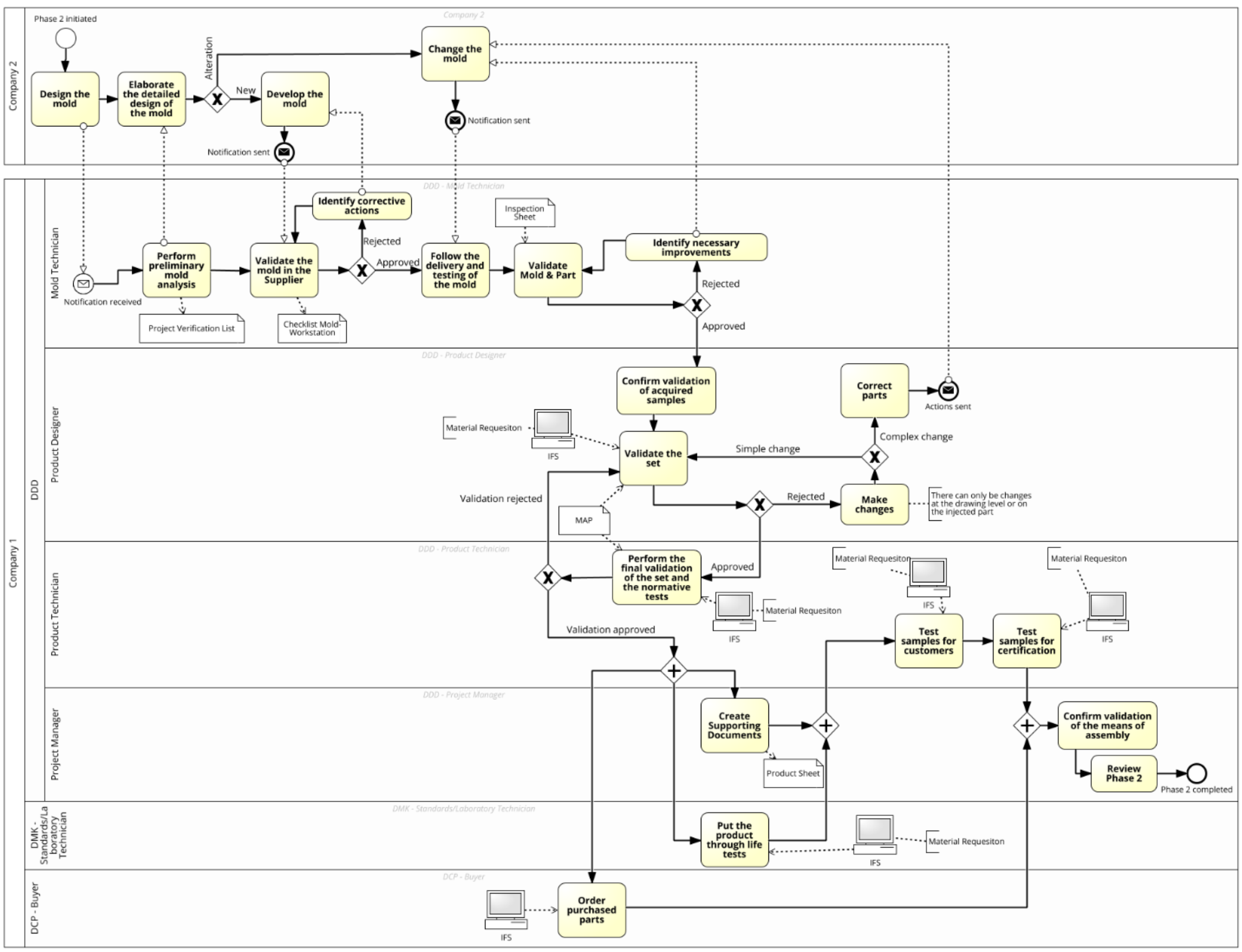

Figure 4 - Phase 2 Process (AS-IS)

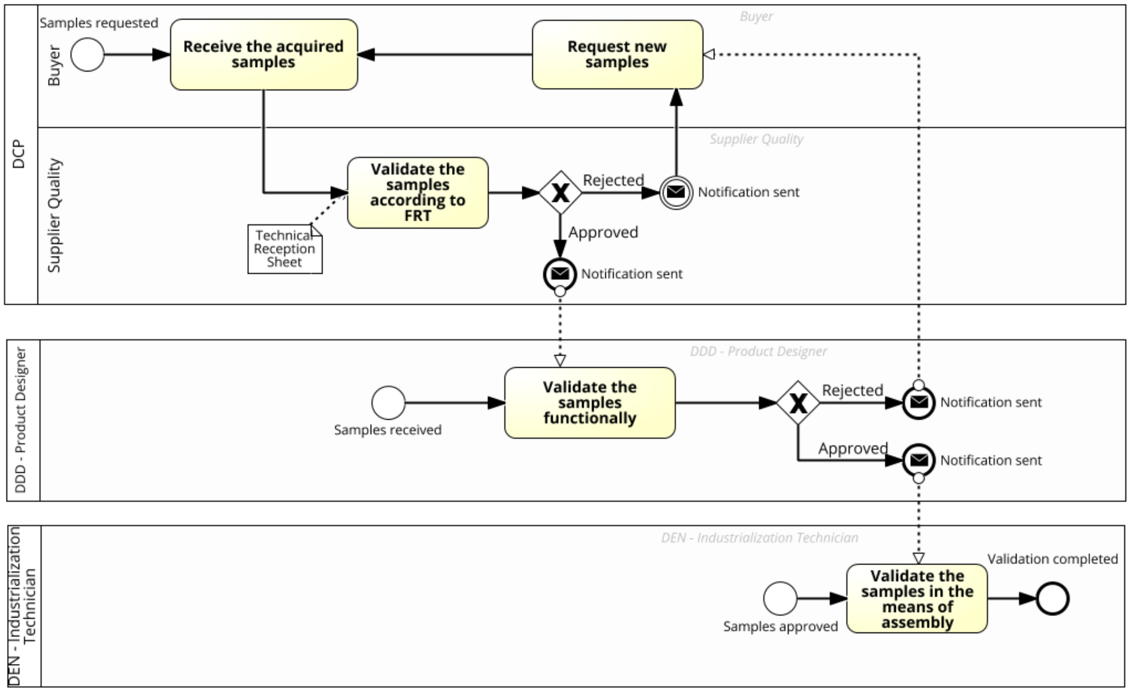

Figure 5 - Subprocesses of the Validation of Acquired Samples (AS-IS)

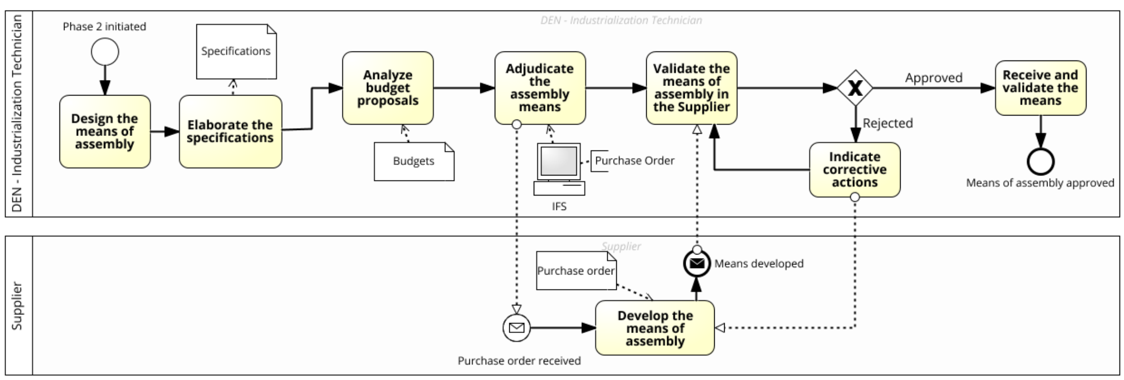

Figure 6 - Subprocesses of the Validation of the Means of Assembly (AS-IS)

4.1 Identification of problems and implementation of improvements

By analyzing the AS-IS models, the existing problems and non-value-added activities become clearer, and this analysis can be explained by using the 8 types of waste shown in Table 2. Thus, it was possible to discover that the identified problems are mainly related to the lack of information and registration documents, the need to redistribute responsibilities in some tasks and, finally, the high number of material requisitions carried out in the context of certain tasks of this process.

Table 2 - Existing problems according to the 8 types of waste

Type of waste	Identified waste in the practical case
Overproduction	- Unclear or missing work instructions
Waiting	- Lack of available information, which results in people waiting for the correct information as they need to ask their coworkers. - Waiting for other tasks to be completed (such as validations). - Waiting to receive the requested materials.

Transportation	- Moving materials to perform tests or validations.
Over-processing	-Problems in the validations may result in design alterations.
Inventory	- Poor stock management results in unnecessary material requisitions.
Defects & Rework	- Defective acquired materials or defects in the mold.
Motion	- Unnecessary movement to seek information due to the lack to documentation.
People	- The lack of standard complicates the job performance.

Before being implemented, all the suggested improvements were presented to the DDD for approval and illustrated in the TO-BE models.

Lack of information and registration documents

As it can be seen in the AS-IS models, many tasks lack information and registration documents. The information documents allow the tasks to be carried out in the same way, as detailed work instructions provide process standardization by ensuring each job task is executed consistently and repetitively (EL-Khalil et al., 2020). On the other hand, the registration documents allow the recording of values obtained in tests, thus enabling them to be consulted in the future if the need arises. In addition, this type of documents also provides the record of problems that may occur in tasks such as validation, so it is easier to identify what went wrong and where improvements are needed. To solve this problem, the necessary documents were identified and created or improved.

Redistribution of responsibilities

Through the analysis of the AS-IS models it was possible to identify another problem: the poor distribution of responsibilities in some tasks, causing the need of restructuring and separating some tasks into smaller ones. Therefore, the task “Validate Mold & Part” was divided in these two new mentioned tasks to provide a more specific validation of both the mold and the injected parts by performing a visual, functional, and dimensional analysis. This division allows the responsibilities to be split between the Mold Technician and the Product Designer and it is improved by filling a new registration document created. Another restructuration is related to the task “Test samples for certification” as its responsibility changed from the Product Technician to the Standards/Laboratory Technician. This change allows the Product Technician to be more available to perform the task “Test samples for customers” according to the new specifications that were included in one of the improved work instructions.
In the subprocess of validation of the acquired samples, a similar change was also made. The task “Validate the samples functionally” performed by the Product Designer is more complex, and therefore more likely to fail the validation, and with the implementation of the new registration document is it easier to identify the problems. In this sense, if this task is performed before the other task “Validate the samples to FRT”, the DCP can request new samples with more specifications sooner, therefore avoiding waits and possible delays in the process.

High number of material requisitions

In Table 2 and Figure 2 it was possible to notice the high number of material requisitions as a visible problem which results in waste such as waiting, excess of unused material in the department and an unnecessary cost. The proposed solution to solve this problem is related to the creation of a small space to store material by using the 5S’s technique. This change eliminates the need for material requisitions in the tasks “Perform the final validation of the set and the normative test” and “Validate the set”, which are the ones that contribute the most to the excess inventory and represent 30% of the costs associated with material requisitions for DDD.
Despite the challenges brought by the implementation of this 5S methodology,

Figure 7 - Before & After the 5S implementation

its benefits were almost immediate and the DDD's employees were receptive and respectful of this space, which was beneficial for themselves because since this alteration they have avoided several material requisitions. This improvement was the most visual and evident of the set of proposals implemented in the process, and some of the changes resulting from this 5S project are represented in Figure 7.

5. Discussion and Conclusion

As previously mentioned, the Digital Transformation associated with Industry 4.0 has been causing changes in organizations, particularly in those which intend to remain competitive in the market. The company in which this work was developed fits into this range of companies that need to implement a set of initiatives to increase its digital maturity through the standardization of its business processes in order to facilitate the adaptation to the new reality, enhanced by the digitalization era.

Thus, the practical study based on the mapping and standardization of DDD's business processes enabled the elimination of variability in the execution of tasks and increased the coordination and stability, ensuring that all employees know their responsibilities and follow the same rules. In other words, with this study it was possible to conclude that implementing this type of solutions decreases errors and gets the Human Resources more comfortable and motivated in their tasks, since these simple but impactful management tools help in the execution of day-to-day tasks. These practical results are also related to knowledge management since the standardization and increase of documents has helped to convert the tacit knowledge into procedures and practices that can be learned and explained, which is helpful for new workers, so they do not feel the need to ask questions constantly (EL-Khalil et al., 2020).

In general, the results reinforce the importance of the technologies-processes-human factor trio as pillars in the implementation of DT. However, this paper was more focused on the pillar regarding the business processes and the contribution of BPM in the implementation of DT, as a powerful ally that minimizes the resistance to this transformation and gives organizations the confidence to accelerate this change, especially in environments free of waste and improved through Lean practices. Moreover, this pillar is also related to the two others, because the changes in internal processes facilitate the implementation of I4.0 technologies and allow the human adaptation to DT with the correct mindset and less concerns about their job security. This second statement is defended by Cañas et al. (2021), by pointing out the importance of people in DT. In this sense, this paper has also shown a particular relevance in the relation between the Human Factor and BPM in the transition to DT, as the DDD's workers became more motivated and accepting of this change because they feel more involved in the preparation and adaptation to DT, by contributing to the improvement and standardization of the processes. In fact, if people are not motivated and disbelieve the benefits of these improvements, the transition process to DT will surely fail.

Furthermore, it is possible to conclude that this work supports the results found in the theoretical background, since it defends that companies might need to have bases to correctly implement DT and reach higher levels of maturity (Machado et al., 2020). This can be proven because the mapping of these processes allowed the identification of non-value-added tasks and the waste present in them, which in certain situations were even identified in light of Lean philosophy, and some of these problems were also solved through Lean tools. Moreover, having standardized and improved processes contributed to operational efficiency and effectiveness, as defended in the literature (Chandrayan et al., 2019; EL-Khalil et al., 2020). Therefore, the relation between BPM and Lean concepts was verified, which in turn serves as a basis for the implementation of Digital Transformation, thus also meeting the contributions of Salvadorinho & Teixeira (2020b).

According to Santos & Martinho (2020) this company fits in the level 2 of I4.0 maturity, since it has already started the implementation of actions and it is already possible to start observing some benefits brought by them. However, with the standardization of processes made in the DDD, which should be continued to other departments, as well as the increase of people's motivation, this company is more prepared to progress to higher levels, ensuring some competitiveness in the market.

As DT is still a recent trend, most companies are not yet culturally and socially prepared for this transformation because they are not familiar with the technology available and fear the change and uncertainty regarding the replacement of human labor, which was felt during the implementation of this practical case. Moreover, this study was only conducted in a company with well-rooted Lean practices and that allows the implementation of new ones. Thus, it would be relevant to analyze this kind of approaches in environments without Lean practices to see if different difficulties were felt. It would also be interesting to focus more on the Human Factor as a pillar to determine the adequate profile of people more prepared for the Digital Transformation.

Overall, the findings of this study are considered to be relevant for all organizations intending to implement I4.0 initiatives. Therefore, it is expected that this work can be used to support other similar situations in companies that want to reach higher levels of maturity of Industry 4.0 and increase their standardization, through BPM and Lean techniques. However, the presented information cannot be entirely generalized since it is a single practical study.

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Biographies

Mariana Carvalho is a master student of Industrial Engineering and Management in University of Aveiro, Portugal. Her research interests are in the area of Industry 4.0 and Digital Transformation. She has been involved with these issues through her working experience in tasks associated to Business Process Management within a Portuguese company.

Leonor Teixeira graduated in Industrial Engineering and Management, received a MSc. degree in Information Management, and a PhD in Industrial Management (Information Systems area), in 2008, from the University of Aveiro, Portugal. She is currently an Associate Professor of the Department of Economics, Management, Industrial Engineering and Tourism (DEGEIT) at the University of Aveiro. She is also a researcher (Integrated Member) at the Institute of Electronics and Informatics Engineering of Aveiro (IEETA) and collaborator at Research Unit on Governance, Competitiveness and Public Policies (GOVCOPP) of University of Aveiro. Her current research interests include Industrial Management in general, and in Information Systems applied to Industry in particular. She has over 200 publications in peer-reviewed journals, book chapters and proceedings, and has several communications at international scientific conferences, some of which as invited speaker. She serves as a member of Program Board and Organizing Committees for several Scientific Committees of International Conferences and has collaborated as reviewer with several journals. She is associated with IIIS and APSI/PTAIS.