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E-commerce and internal logistics: Decathlon’s Case

Ana Beatriz Martins Cardoso

Master’s in management

Supervisor: Prof. Henrique O'Neill, Associated Professor at Department of Marketing, and Operations and General Management (IBS)
ISCTE- University Institute of Lisbon

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BUSINESS
SCHOOL

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Acknowledgments

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Resumo

Nos dias de hoje, com a entrada de cada vez mais *players* no mercado e a maior exigência dos consumidores, é muito importante que as empresas consigam entregar o melhor produto possível, na quantidade certa, no tempo certo, no preço certo e da maneira certa. Assim sendo, é fulcral que as empresas sejam capazes de melhorar os seus processos, de forma a entregarem qualidade e rapidez ao cliente, mas ao mesmo tempo consigam aumentar as suas margens de lucro.

A Decathlon é gigante no mercado do retalho desportivo, tentando sempre aumentar a sua quota de mercado através da conquista de novos clientes, apresentando produtos de qualidade a um preço acessível. Para além de vender os seus produtos nas suas 38 lojas físicas próprias, a empresa pretende aumentar cada vez mais o número de encomendas online, enviando a encomenda diretamente para casa do cliente ou dando ainda a opção de este a levantar numa loja Decathlon. Esta nova forma de comércio tem uma grande margem para crescer, e por isso, é de extrema importância que os processos de logística associados a estas encomendas online sejam cada vez mais eficientes, para que consigam fazer frente ao crescente número de encomendas, entregando a qualidade a que os clientes Decathlon estão habituados. Esta empresa aposta na melhoria contínua da sua cadeia de abastecimento, identificando oportunidades e querendo melhorar a sua performance, o que fez com que a realização deste projeto fosse possível.

Este trabalho começa por descrever os processos em prática no Centro de Aprovisionamento Regional da Decathlon Portugal, localizado em Setúbal, depois visa analisá-los e entender em quais deles poderão existir melhorias possíveis de implementar no curto-prazo, apresentar essas propostas de melhoria e o seu impacto depois da implementação.

Palavras-chave: Decathlon; Retalho Desportivo; Processos; Armazém; Melhoria Contínua; Eficiência

Sistema de classificação JEL: L81; L89

Abstract

Nowadays, with more and more players entering the market and consumers becoming more demanding, it is very important that companies are able to deliver the best possible product, in the right quantity, at the right time, at the right price, and in the right way. Therefore, it is crucial that companies are able to improve their processes in order to deliver quality and speed to the customer, but at the same time manage to increase their profit margins.

Decathlon is a giant in the sports retail market, always trying to increase its market share by gaining new customers by presenting quality products at an affordable price. In addition to selling its products in its own 38 physical stores, the company intends to increase the number of online orders, sending the order directly to the customer's home or giving the customer the option to pick it up at a Decathlon store. This new form of commerce has a large margin for growth, and so it is extremely important that the logistics processes associated with these online orders are increasingly efficient, so that they can cope with the growing number of orders, delivering the quality that Decathlon customers are used to. This company is committed to the continuous improvement of its supply chain, identifying opportunities and wanting to improve its performance, which made this project possible.

This work begins by describing the processes in practice at the Regional Supply Center of Decathlon Portugal, located in Setúbal, then aims to analyze them and understand in which of them there may be improvements possible to implement in the short term, present these improvement proposals and their impact after implementation.

Keywords: Decathlon; Sports Retail; Processes; Warehouse; Continuous Improvement; Efficiency

JEL Classification System: L81; L89

Index

Figure Index

Table Index

Glossary

Bac – Plastic box used to transport items

Bag – Plastic bag used to pack orders that contain small or non-fragile items (e.g. clothes)

Box – Cardboard box used to pack orders that contain larger or fragile items. There are different sizes of boxes to pack different products.

BPM – Business Process Management

CAC –Central Supply Center

CAR – Regional Supply Center

Cólis – Bar code identifier that can be used to identify pallets, racks, bacs, magnums, or others, to know location, weight, and others.

Consumables – All materials used for packing the orders (bags, boxes, tape, paper)

Direction - Combination of letters and numbers identifying a specific location on a shelf. (e.g. B.02.04)

IP Negative – It is a type of error generated to adjust the stock, in this case when there are less items physically than in the software.

IP Positive – It is a type of error generated to adjust the stock, in this case when there are more items physically than in the software.

IT - Information Technology

KPI – Key Performance Indicators

LC – Life Center

Magnum – Plastic box used to transport many items (equal to a bac, but of a much larger size)

MRO – Maintenance, Repair and Operations

Pális - Stand with wheels where the employees responsible for receiving the goods at @z put down their RFID reader, power bank and bar code reader.

RFID – Radio Frequency Identification

SAS – Service After Sales

SKU – Stock Keeping Unit

Symbol device – Bar code reader

UAT – An identification label that is printed and attached to the order after it is packed, which contains the customer's name, delivery method, address, and barcode.

1. Introduction

1.1. Introduction

This chapter aims to explain the significant problem of this study and describe all the context that surrounds it. Additionally, also intends to clarify the research question, the objectives of the project, the methodology used, the scope and finally present the structure of the document.

1.2. Problem Statement

Nowadays, logistics plays a strategic role within a company as it ensures that products reach consumers at the right time and in the right quantity. It helps companies with inventory control, purchase management, product storage, and order distribution. Logistics can determine whether a business is successful or not and contributes to one of the most important factors in the success of a business, which is the location (Heskett, 2014). If the company has well-defined logistical processes, it does not have to worry about missing products because the inventories are always well organized and sufficient to meet the demand, and the orders are delivered on time, which allows the company to control processes and reduce costs.

Another current and very important component to the success of businesses is e-commerce, once over the years, more and more people are shopping online. Currently, e-commerce is one of the most important Internet phenomena, mainly due to the increasing access to smart devices, which allows consumers to purchase goods and services electronically without barriers of time or space. The use of e-commerce should have as its main objective the maximization of the customer experience and to be successful, the fast and efficient delivery of the product is essential, once consumers value accessibility and convenience (Gramling et al., 2021). This innovative system of commerce allows companies to have a 24-hour sales channel, reaching a wider audience, serving customers at any location, reducing business costs, and facilitating the spread of the business.

Pordata estimates that by 2021, an average of 87,3% of households in Portugal had internet access (Agregados Domésticos Privados Com Computador, Com Ligação À Internet E Com Ligação À Internet Através De Banda Larga (%), 2022) and that 40,4% of the active population order via internet ("Inquérito À Utilização De Tecnologias Da Informação E Da Comunicação Pelas Famílias," 2022). This growth shows that this type of commerce has the potential to continue growing if companies go along with the development of their logistic processes to satisfy consumers.

Therefore, and because Decathlon is the largest sports goods retailer in the world it is extremely important that all its processes related to logistics are properly aligned, including those that belong to the e-commerce department, once its Portuguese logistics center besides stores provisioning

also ensures online orders delivery. With the Covid-19 pandemic, Decathlon perceived an exponential growth in its online orders, and although the number of orders slowed down, the company attached even more importance to the optimization of the processes required to dispatch these types of orders on time. Consequently, this project aims to identify those processes, recognize the main existing problems, and find possible solutions, in order to positively impact Decathlon's results.

1.3. Research Question

Taking into consideration all the surroundings related to the supply chain of Decathlon's online orders, with this project I propose to answer the following question:

"How can Decathlon's logistical processes related to online orders be more efficient?".

1.4. Objectives

To answer the research question, it is necessary to establish objectives, firstly the main objective followed by some specific ones. The main objective of the study is to find solutions to the significant issues encountered in the several logistical processes necessary for orders to be successfully delivered to Decathlon's online customers and to understand the impact of its implementation on the company's results. Thereafter, it is necessary to establish the following specific objectives in order to create a common thread and organize the research:

- Examination of the current operation of CAR Setúbal, particularly through the mapping of the e-commerce team processes on the basis of the SCOR Model;
- Characterization of the e-commerce logistical processes, based on the previous process mapping;
- Identification of the inefficiencies existing in the model;
- Prioritization of the inefficiencies in order to understand which are the most significant ones;
- Redesign of the process through the proposal and implementation of improvements in order to correct the inefficiencies;
- Assessment of the suggested improvements, comparing the processes before and after the implementation of improvements;
- Presentation of recommendations.

1.5. Methodology

The present work is an in-company project carried out with the support of Decathlon, that intends to suggest some improvements to the logistical processes required for online orders provisioning. Considering the research question to be answered and the study environment, action research

methodology is the most appropriate research method, once it requires “the researcher as an active participant in the situation under study” (Greener, 2008).

According to Bell et al. (2018), in this type of research, the investigator and the practitioner collaborate on the task of discovering and analyzing a company’s problems and exploring possible solutions to them. The intention of this project is to solve real problems that occur in Decathlon’s warehouse, depending on the e-commerce team since they are the practitioners that perform the actions understudy, essential for orders to be delivered on time, thus contributing to customer satisfaction and to the success of the organization.

Over the years, technology develops faster and faster, paving the way for further opportunities and new skills, thus elevating human capabilities. It is important for researchers to consider this advance and take advantage of it when rethinking work and processes (Birkinshaw, 2018).

According to Lewin (1958) to pursue an action research method it is necessary to follow three steps to carry out a reliable analysis:

- **Planning**: Initial diagnosis, collect data, feedback of results, and action planning;
- **Action**: Understand processes, action planning, and action steps;
- **Results**: Changes in behavior, data gathering, measurement.

With the constant evolution of technology, customer needs, and competition, a process becomes obsolete very quickly, going from a good process to a bad process (Dumas et al., 2018). For this reason, and fitting into action research, the BPM lifecycle will be used in this specific project. According to Dumas et al. (2018), this lifecycle is composed of six phases that are Process identification, Process discovery, Process analysis, Process redesign, Process implementation, and finally, Process monitoring and controlling.

To facilitate the understanding of BPM Lifecycle phases, the Supply Chain Operations Reference (SCOR) Model were used since it provides methodology, diagnostic and benchmarking tools, and can manage, improve and communicate supply chain management decisions within the company, with their suppliers, and with their customers (APICS, 2017). This model is useful because has a comprehensive view (level 1) of Plan, Source, Make, Deliver, Return and Enable, while can detail each one of the processes throughout the levels (APICS, 2022).

1.6. Scope

This study takes place at the Decathlon’s regional supply center in Setúbal. The topic under investigation was proposed by the center’s Director together with the Head of the e-commerce team since the company considers that Lean is one of the drivers for the good functioning of the supply chain since it contributes to a more efficient way of delivering its articles to its customers. As a result, there

is a constant concern regarding logistical process improvements, including those performed by the e-commerce team, which is always open to changes and upgrades.

1.7. Structure of Document

The present document is composed of the following 5 chapters:

Chapter 1: Introduction of the document, which aims to reveal and frame the problem, the research question, the objectives of the project, the followed methodology, and the structure of the work.

Chapter 2: Literature review, which brings together the main theoretical concepts that support this project, mentioning existing theories and models as well as instruments to answer the research question.

Chapter 3: Methodology, which intends to explain the followed direction and give some guidance during the thesis.

Chapter 4: Case Study, which focuses on the presentation and development of the project, introducing the company, identifying and mapping the logistical processes performed by the e-commerce team, enumerating and prioritizing the inefficiencies, and finally redesigning the processes, suggesting improvement proposals.

Chapter 5: Conclusion, which aims to expose the conclusions of the study, answering to the research question, and demonstrate the results of this project.

2. Literature Review

2.1. Introduction

Considering the main objective of the present study, which is to answer the research question - *"How can Decathlon's logistical processes related to online orders be more efficient?"* - it is crucial to have a previous context that supports the addressed topic, presenting the existing theory relevant to this study.

For this research to be successful, were use different platforms such Emerald, Scopus, ProQuest, B-ON and books that contain relevant information. In addition, resorted to keywords such as *supply chain, e-commerce, logistics, online orders, omnichannel warehouse, sports retail, operations management, process improvement, business process management, process redesign* among others.

2.2. Importance of Logistics and Supply Chain

Logistics is the part of the supply chain responsible for planning, executing, and controlling warehousing operations, point-of-origin information, and point-of-consumption information to meet customer needs by delivering the right product, in the right quantity, at the right time, and at the lowest possible cost (CSCMP,2013). Logistics activities include inbound and outbound transportation management, fleet management, inventory management, material management, order fulfillment, inventory maintenance, and supply and demand planning. Over the years, constant changes in the business environment have created opportunities for companies to improve their services and expand their negotiations across the planet. Thanks to increasing globalization, markets have become integrated, which means that companies have become more competitive and have developed modern and diversified products and services. Due to this phenomenon, supply chain management (SCM) has gained importance and the way it is managed is becoming more and more important (Teixeira et al., 2019). The term SCM was not always known. Since the 1990s, attention to the concept has been growing, and today it is considered the basic system of an organization that wants to operate in a competitive economy. As the concept has grown in importance, it has been further explored by various authors and different ideas have emerged. A supply chain is a group of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer (Teixeira et al., 2019). Supply chain management aims to plan all tasks related to the procurement of raw materials, processing materials, and all logistics management activities and ensure that there is no more rivalry between suppliers and distributors because when they work together, it is mutually beneficial (Tarigan et al., 2019). Involves coordination and collaboration between partners which can be suppliers, intermediaries, third parties as service providers and customers. All relationships in a supply chain result in a relationship between

a particular supplier and a particular customer, and these relationships aim to satisfy the end consumer (Gorane & Kant, 2016). Nowadays, there are even more products available to consumers, and all this is possible thanks to the excessive growth of the retail industry. In order to satisfy the demand, the retailer needs strong support from the supplier. To achieve this, according to Tarigan et al (2021), retailers, suppliers, and customers should be integrated by using various supply chain practices such as information technology. This is a supply chain tool that is designed to strengthen system linkages with buyers and suppliers in the company, distribution center, retailer, and beyond (Power and Simon, 2004 & Motwani et al., 2000 cited in Gorane & Kant, 2016) to improve supply chain performance and company outcomes. Supply chain practices are tasks performed by firms that are part of the supply chain to maximize firm outcomes and deliver the best results and include two streams, downstream (focus on the customer) and upstream (focus on the supplier) (Tarigan et al., 2021). In addition to information technology, these practices include agility, benchmarking and performance measurement, customer relationships, green SCM, information sharing, just-in-time manufacturing, lean thinking, organizational culture, outsourcing, postponent, reverse logistics (RL), supplier relationships, RFID, and vendor managed inventory (VMI) (Gorane & Kant, 2016).

2.3. Omnichannel Warehousing

The evolution of retailing has led to a new phase where the customer can seamlessly move between traditional and online channels. This has expanded over the years, and therefore the system responsible for distributing these types of orders has become a critical component (Kembro & Norrman, 2019). This omnichannel retailing is a process of optimizing the customer experience across multiple channels, contributing to shorter lead times while offering multiple delivery options such as home delivery, pickup points, click-and-collect, and others, and lowering overall logistics costs (Kembro & Norrman, 2020). Omnichannel warehousing is critical to meet customer needs and must integrate different types of flows for in-store replenishment (orders are scheduled, demand is indirect, and large quantities are handled) and for online customers (often single orders, demand is direct, and smaller quantities are handled - single items) (Kembro & Norrman, 2020).

According to Kembro & Norrman (2020), in order to decide on the warehouse configuration, it is first crucial to understand the context by studying customer, order and product characteristics, demand profile, assortment, and volume. In addition, the author suggests other contextual factors such as standardization of packaging, differentiation of orders and stock-keeping units (SKU) between store and online, size of in-store orders, the proportion of single item orders, and click-and-collect.

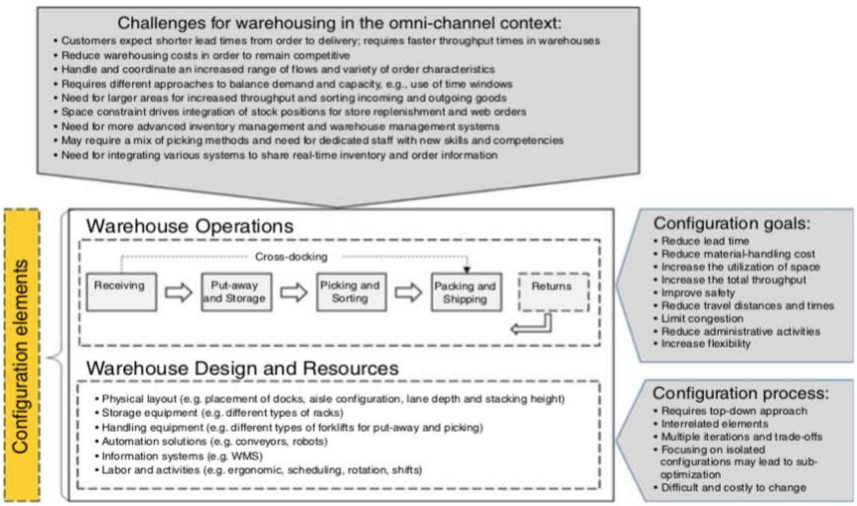

Figure 2.1 - Warehouse Configuration and challenges (Source:Kembro & Norrman, 2019)

Kembro and Norrman (2020) state that the contingency approach is gaining strength in warehousing theory. This approach aims to create a specific configuration adapted to the company's external environment to improve its processes and structures. According to Pfohl & Zöllner (1997), logistical tasks are affected by specific conditions owned by an organization such as environmental relations, product line, production, technology, and the size of the company.

2.4. Impact of e-commerce

E-commerce has greatly influenced logistics and supply chain management (LSCM) and thus the concept of e-commerce LSCM has emerged. This new concept is of great importance in modern logistics and can occur both between businesses (B2B) and between businesses and consumers (B2C). In the latter case, the company's website is a key element, as the consumer places an order there and the company then receives the order and ships the goods to the customer. E-commerce LSCM involves three main phases: replenishment of goods from manufacturers to warehouses, order processing in warehouses through sorting, picking, and packing, and finally, prompt delivery of orders. For the success of e-commerce LSCM, it is important to invest in advertising, hardware, software, and good customer service. As for the future technologies, the Internet of Things (IoT), Big Data analytics, and cloud computing should be in place to improve, transform, and implement e-commerce logistics in larger and small businesses (Yu et al., 2017). There are two major logistics models: the self-supply model and the outsourcing model. In the first model, companies choose to build their own logistics service network to manage their own logistics from warehousing to distribution. However, there are some disadvantages such as low profits, lack of capital, and pressure in managing logistics. In the second option, outsourcing can minimize the burden on companies. They do not need to invest a lot of money and can focus on their main business to increase competitiveness and results. Enterprises

can also reduce fixed assets, including warehouses, information systems, and other areas related to procurement logistics. However, there are also some problems, such as the lack of control because enterprises have to negotiate with logistics enterprises, logistics enterprises cannot meet customers' needs, enterprises are unable to capture the profits generated by logistics, and logistics enterprises are unwilling to propagate enterprises because their employees cannot introduce the functionalities of a product to consumers (Yu et al., 2017).

When choosing an online retailer, two important criteria for a consumer are price and fulfillment time. According to Zhang et al. (2019), new logistics methods such as distribution networks, physical facilities, and smart order fulfillment methods lead to faster order fulfillment times. Bezes (2016) conducted a survey where buyers choose between online and offline channels. He found that any perceived logistics risk negatively impacts the choice of online retailers and that faster order fulfillment is a critical success factor in online retailing.

An omnichannel retailer may pursue one or more of several strategies for fast fulfillment, including Buy Online and Pickup in Shop (BOPS), Buy Online and Fulfil from Shop (BOFS), Ship-to-Shop (STS), and fulfillment in distribution centers. Of these strategies, BOPS and BOFS are chosen by many retailers, but studies show that these solutions are not sufficient to achieve the required efficiency (Zhang et al., 2019).

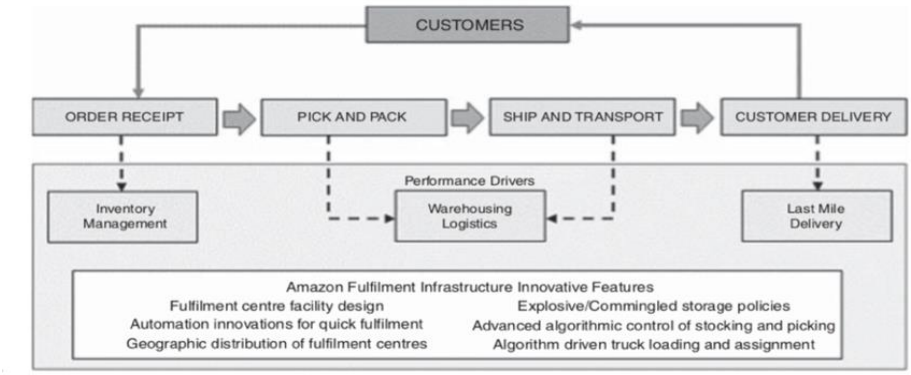

Figure 2.2 - E-fulfillment process and innovative features (Source: Zhang et al., 2019)

Figure 2.2. shows the four key features of the online order fulfillment process, and this sequence is common to all retailers. It also lists several innovative features, including the differentiators that are an essential part of the process design. As shown in Figure 2.2, the process is initiated by the receipt of a customer order. An efficient online retailer has a real-time inventory status and only accepts orders when there is fillable inventory. In this study, all tracked orders were fillable and therefore the results are independent of the inventory policy (Zhang et al., 2019). Zhang et al. (2019) consider order fulfillment time, along with digital marketing and online product selection, as key factors for success in online retailing. Supply chain and distribution managers at traditional

retailers have numerous options and design alternatives as they adapt their distribution networks and build new fulfillment facilities to accommodate the growth of online shopping.

2.5. Business Process Management

Business process management (BPM) is not a "one-size-fits-all" approach when solutions to practical problems (methods, models, or software) must be adapted to the characteristics of the problem. For all types of solutions, there is a prerequisite for their success, namely the identification of properties that can be used to characterize the specifics of the problem at hand. Four phases of BPM can be distinguished (Bucher & Winter, 2006, cited in Bucher & Winter, 2009): The first one is Process identification, design, and modeling: this phase involves the identification and thorough analysis of all activities and tasks within an organization. On this basis, processes (in the sense of structured sequences of activities) must be defined, designed, and modeled. If possible, all process participants should take part in this phase. Special attention should be paid to the interactions and interdependencies of the totality of an organization's business processes. The second one is Process implementation and execution: business process implementation involves establishing and/or adapting all activities, tasks, resources, and supporting information technologies (IT) necessary for smooth process execution. Training and ongoing support of process managers and process staff are also essential. The third one is Process monitoring and control: regardless of the level of process automation, it makes sense to monitor and control the execution of business processes in a timely manner, or preferably in real-time, so that corrective action can be taken in the event of process exceptions and failures. In addition, process performance indicators can also be used to support management decisions and/or guide process improvements. The last one is Process improvements: even the initial completion of stages one through three brings about far-reaching changes for an organization. However, the ongoing optimization of business processes and the process landscape must not be forgotten. BPM must be understood as a continuous approach to organizational optimization (Bucher & Winter, 2009).

2.6. Amazon case

Amazon is the largest American online retailer and an e-commerce and cloud computing company that started out selling books but now offers electronics, CDs, DVDs, furniture, video games, food, toys, and clothing, among other products. The company sells its products worldwide through its independent sales website. Amazon integrates inventory with its partners' warehouses so that it does not have to maintain a high level of inventory like physical retail stores and is located in districts where customers are concentrated, which allows it to save on warehousing and distribution costs (Zhang et al., 2019). Amazon has been a great success thanks to its advanced software systems and its random storage

method so that different products are located in different places in the warehouse. Amazon has a large business segment covering a wide range of products and has three different supply chain models because it plays three different roles: Seller, intermediary and comprehensive e-commerce service provider, so suppliers can choose the best way to work with the company. The core business is the first seller role, where Amazon is responsible for the front-end customer relationship and back-end logistics. The entire process includes picking, choosing, packing, shipping, and so on. As an intermediary, Amazon allows third-party sellers to promote their products on the Amazon website through the Marketplace (individuals and small businesses) and Merchants (large businesses) programs, not including warehousing, realization, and delivery.

The third role is that of e-commerce service provider, where Amazon provides technological frameworks, website design support, and store design experience for some businesses. (Zhang et al., 2019). Considering Figure 2, retailers differ in where and how e-fulfillment functions are executed. In the case of Amazon, the first two functions and parts of the third are performed in a fulfillment center, while the remaining functions are performed by the parcel delivery service.

Picking and packing as well as shipping and transportation are the key competitive advantages of Amazon's fulfillment operations. In Amazon's case, many parts of the delivery process are being done in-house. Advanced algorithms for loading trucks and assigning orders to coordinate the picking process so that the order of boxes loaded onto a trailer matches the order of delivery at street level.

2.7. RFID Technology applied to logistics pallets

Radio frequency identification is a coming out technology that is more and more used in supply chain management, once it plays a crucial part in supporting logistics and supply chain processes because of their capability to identify, discover and track information (Zhu et al., 2012).

This technology solution allows companies to move goods easily and quickly (Bottani & Bertolini, 2009), and pallets are not an exception. Pallet management, which involves direct and reverse logistic models, may represent a censorious activity for logistics provider companies and are used to ship products from a point to another.

RFID systems can enlarge efficacy in obtaining information about properties of a pallet, that can be physically identified and traced (Gnoni & Rollo, 2010). This technology can inform various stakeholders in real time, about the location and status of a good, being extremely efficient in terms of inventory and stock management, resulting in reduced costs and lead time, increased efficiency, and simplification of business processes (Zhu et al., 2012).

For this to be possible, it is necessary to use this technology directly on the pallets, using sensors capable of detecting the information on each pallet, through RFID tags through the microchip or directly to the RFID antenna (Bibi et al., 2017).

3. Methodology

3.1. Introduction

As mentioned in the first chapter, this section hopes to explain the followed direction in the elaboration of this project taking into account the objectives and the research question pretended to be answered. Therefore, presents the methodology used in the investigation as well as the investigation stages.

3.2. Investigation Methodology

Since it is an in-company project, the conducted investigation method is an action research methodology, since it allows simultaneously the processes of taking action and doing research. Usually acts on real management problems inside of a company aiming to add value to the organization and to the community (Bradbury-Huang, 2015).

This type of research required the active participation of the researcher that should explore all the business environments to which belong and understand what is happening around them (Greener, 2008). It also needs the involvement of those being researched (managers, employees, customers, and policy-makers), so that they collaborate with the researcher, exploring the business and finding deficiencies, in order to together propose solutions and contribute to the improvement of the practitioner's work, consequently increasing company's performance (Bell et al., 2018; Lewin, 1946).

According to Collis & Hussey (2013) in the action research method both the researcher and the practitioner must bear in mind that the world is always changing, they are also part of this evolution. Besides this, this type of methodology focuses on solving inefficiencies that really exist in a company, which means that people who daily work there are the most important for the problem to be fixed and the solution to be implemented (Saunders et al., 2015).

Specifically in this work, the various phases of the Business Process Management lifecycle are used as a guide to the structure. According to Szelągowski (2018), this lifecycle is a simplified overview of improving and managing processes in a company with the aim of mapping the main business processes and positively impacting an organization.

According to Dumas et al. (2018), there are seven different groups of stakeholders necessary in the BPM Lifecycle:

- **Management team**: Head of the company, the leaders who have connections and impact on the processes under study;
- **Process owners**: Responsible for planning, organizing, and monitoring the process under study, setting performance measures, leading enhancements, and ensuring resources for the proper run of their processes;

- **Process participants**: Employees who perform the process on a daily basis, in accordance to the organization's guidelines;
- **Process analyst**: Conducts the identification, discovery, analysis, redesign, implementation and monitoring of the process.
- **Process methodologist**: Experts who provide knowledge to the process analyst, helping to choose the best methods, tools and softwares to use in each phase of the BPM Lifecycle;
- **System engineers**: They collaborate with the process analyst to understand the system requirements, translate them into a system design, implement, test and deploy the system. System engineers also collaborate with the process owner and process participants to understand if the developed system meets their needs;
- **BPM group**: Is responsible for conserving knowledge and documentation that contain information regarding how to plan and execute BPM, ensuring that it is used to achieve the company's strategic objectives.

This way of standardizing processes has as main advantages improving business agility, reducing costs, increasing revenues, efficiency and visibility and creating a competitive advantage whereas it helps to recognize the importance of technology in BPM. Technology, especially IT, has an immense importance for process improvement. However, system engineers (who has a huge role for the task) must recognize that technology is a tool to manage and execute processes and by itself is not enough to a better performance, hence the need of collaboration between system engineers and process analysts (Dumas et al., 2018).

BPM Lifecycle's success depends on a wide variety of elements such as the strategic alignment between process improvement projects and the strategic objectives of a company and the clear definition of roles and responsibilities in BPM projects so that they are conducted in a consistent manner. Besides this, it is also important that managers and analysts have enough skills to perform a good work, that process participants are informed about this type of projects, and that the company can develop an organizational culture focused on change, capable of adapting and putting into practice the necessary improvements to improve organization's performance (Dumas et al., 2018).

In order to make the division by each type of processes more perceptible in each phase of BPM Lifecycle, the Supply Chain Operations Reference (SCOR) Model were used. According to APICS (2022) the processes required for supply chain to fulfill its objective of delivering orders to customers are the ones important in the SCOR Model. It admits six processes - Plan, Source, Make, Deliver, Return and Enable - mentioned as level 1 processes (APICS, 2022):

- **Plan:** Outline the activities involved in developing plans for the proper functioning of supply chain;

- **Source:** Describe the processes connected with order, deliver receipt and transfer of products, services, subassemblies and primal matter;
- **Make:** Outline the activities connected with the transformation of materials or creation of services;
- **Delivery:** Present the activities related to the designing, preservation and fulfillment os client's orders;
- **Return:** Outline the processes involved with the reverse flow of items;
- **Enable:** Present the activities related with the management of supply chain.

3.3. Investigation Stages

This section aims to present the required investigation stages to successfully conclude the proposed objectives of the present thesis. Therefore, the BPM lifecycle were followed as a central thread of the research, presenting the following phases:

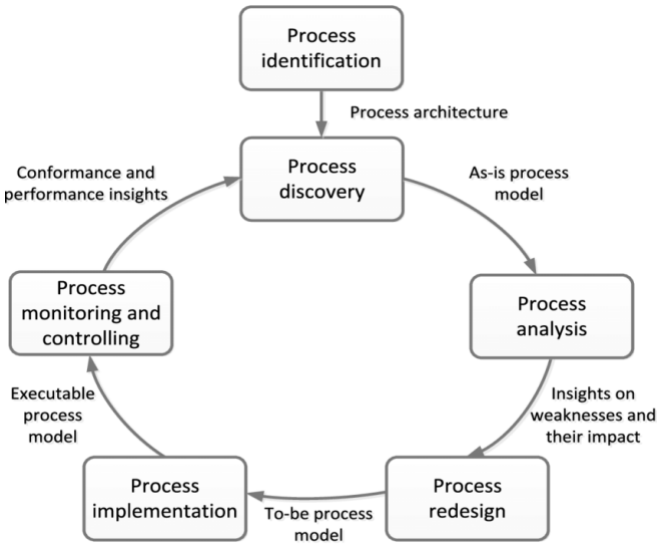

Figure 3.1 - The BPM lifecycle (Source: Dumas et al., 2018)

- **Process identification**: Here, the relevant processes for solving the proposed research question and consequently the problem within the organization are identified, delimited and interrelate;
- **Process discovery**: In this phase, the current state of each one of the pertinent business processes is presented, usually through as-is process models;
- **Process analysis**: In this phase, the existing problems in the as-is process models are analyzed and identified. This analysis aims to collect different issues in order to prioritize them based on their impact on the business and the cost and effort needed to solve them;
- **Process redesign**: Here, improvements and changes to be made in the processes in order to solve the problems found in the previous phase are identified, bearing in mind the

improvement of company's performance. The purpose of this phase is to achieve a to-be process model;

- **Process implementation**: In this phase, the necessary changes are prepared and performed to move from as-is process model to to-be process model, approaching two features: process automation and organizational change management;
- **Process monitoring and controlling**: Finally at this phase, so that it is possible to evaluate process's performance, it is necessary to collect and analyze data and compare it with that expected by the company. With this action it is possible to identify errors and deviations resulting into possible corrective measures.

In the first stage Process Identification, the required processes performed by Decathlon's e-commerce team are identified, so that they can fulfill their customer's orders. Thus, an interview was carried out with the head of the e-commerce team, namely through the question "What are the required processes for the order to reach the customer on time?" pointing out the various processes.

In the second stage Process Discovery, the processes are discovered through process mapping. For this, semi-structured interviews were carried out with the members of the e-commerce team during their perform (Annex A) and observation of each one of the processes. For the process mapping, the SCOR Model was used as a tool to structure the as-is process model, in order to encompass all the activities related to Plan, Source, Deliver, Return and Enable (Make is not considered since the e-commerce team does not have any process related to the manufacture of items).

In the third stage Process Analysis, issues in the fulfillment of online orders are collected, through the analysis of the diagrams prepared in the previous stage, observation of the processes within the company, and semi-structured interviews with the team (Annex A) where they list the main problems existing in their daily tasks. After collecting the existing problems in the company, the qualitative process analysis, and the quantitative process analysis (Dumas et al., 2018) are used to prioritize them, to understand which, the priorities to solve, taking into account the impact on the Decathlon's results and the costs and effort required to solve them.

In the fourth stage Process Redesign, solutions to improve processes are presented through interviews with e-commerce manager and team, to solve the issues selected in the previous stage. This stage aims to develop a to-be process model, with a view to achieving the ultimate research's goal of making processes more efficient enhancing business results.

In the fifth stage Process Implementation, solutions found in the previous stage are analyzed and the way in which these can be implemented are studied together with the team manager. This phase depends on the company's availability to implement the suggested solutions in practice while this research.

In the sixth stage Process Monitoring and Controlling, the process performance is evaluated, comparing the as-is process model with the to-be process model. To evaluate the proposals, data is collected from interviews with the team, observation, and t he analysis of KPI's (labour productivity, delivery promise, and dunning charge) that can measure the efficiency in orders dispatch. Besides this, some additional future advances to the processes are also suggested.

4. Case Study

4.1. Introduction

To better understand the context of this research, first of all it is necessary to study the company. In this regard, it is contextualized at an international level focusing on company's history, and then deepened at a national level focusing on the e-commerce department. After, all the steps mentioned in chapter 3 are followed in order to answer the research question.

4.2. Decathlon Group

The brand's story began in July 1976 in France when Michel Leclercq started to sell sports items in the parking area of a shopping center and aimed to follow the concept of equipping all athletes in the same store at a great price, from beginners to professionals. This concept wanted to cover 10 different sports in one store, and as "Decathlon" was an athletic competition in which each athlete participated in 10 different sports, this was the name chosen for the group of stores.

In 1982, it already had 10 stores in France and after 6 years, the brand's production went international with the opening of the first production office in Asia. At the end of the 20th century in 1996, Decathlon launched its first private labels, Tribord and Quechua (Decathlon, 2021).

In Decathlon, clients and employees have in common their passion for sports leading this company to be the largest sports retailer globally, working in 60 countries within 1718 stores, including 80 different nationalities, holding 69 warehouses, having 69 own brands, and employing approximately 105000 people.

Its mission is to create desire and make the pleasure and benefits of sport accessible to the greatest number of people, having in mind sustainability and environmental concerns. The market position that Decathlon has reached is also due to the internalization by all employees of the company's values: vitality, responsibility, generosity and authenticity, that contribute to a 98% job satisfaction rate.

4.2.1. Decathlon Portugal

Regarding the Portuguese market, Decathlon opened its first production center in the north of Portugal in 1993 but only opened its first store in 2000 at Amadora. Over the years, 38 stores have opened around the country and in 2011, the logistics center opened in Palmela, which after 1 year was relocated to Setúbal, measuring approximately 30000m2. In 2014, they started selling online on their website Decathlon.pt and after 3 years they signed a contract with RTE, the largest bicycle manufacturer in Europe, making Decathlon Portugal the largest bicycle producer in Europe (Decathlon, 2021).

Nowadays in Portugal, the group employs more than 1800 people, offering these people career development opportunities, once more than 60% of the support team came from the logistics center or from the stores. This company is based on its people, characterized by being young, dynamic, informal, and not afraid to risk, who have projects beyond their day-to-day work, social and environmental responsibilities, the possibility of an international progression, and an annual salary review. Apart from this, provide advantages such as a 30% discount all year on private labels, the possibility for each employee to be a shareholder and receive the respective benefits with the appreciation of the shares, health, and life insurance, and annual award according to the company's results, sports coupons, rewards for those who take friends to be employees and meal card with tax advantage. For all these reasons, Decathlon is proud that 98% of workers are happy at work.

Decathlon is a massive sports retailer that sells its products in-store and online, and therefore it needs to have a logistical center that responds to its needs while satisfying its customers. It is vital to bear in mind that with the pandemic, Decathlon's profits remained stable once with the closing of the stores, online orders had a huge increase from 2000 to 7000 orders per day. The growing of the orders caused some problems related to e-fulfillment, and for this reason, it is a current and fascinating topic that has a lot on its plate.

4.2.2. Decathlon Supply Chain

The supply chain of Decathlon is based on a pull system, since the end consumer is the one who triggers the logistical activities resulting from their purchase. This supply chain starts with a large group of suppliers, who supply the materials to Decathlon's production centers so that they can produce all the articles. In connection with these production centers, it is also important to mention the research and development center Oxylane Research in France, where thousands of prototypes are produced, observed and tested every year with the aim of responding to the current needs of athletes. After production, the products are shipped to continental supply centers (CAC), where they are kept until there is a need at regional supply centers (CAR). It is in these regional supply centers (CAR) that the orders are prepared to supply both, stores, and online orders, in order to reach the final consumer.

4.2.3. CAR Setúbal

To supply all the 38 stores in Portugal (Alcobaça, Almada, Amadora, Aveiro, Barreiro, Braga, Cascais, Castelo Branco, Chaves, Coimbra, Évora, Famalicão, Faro, Funchal, Gaia, Guarda, Guimarães, Leiria, Lisboa Centro, Lisboa Oriente, Loures, Maia, Matosinhos, Montijo, Ovar, Penafiel, Ponta Delgada, Portimão, Porto Boavista, Porto Centro, Quarteira, Santarém, Sesimbra, Setúbal, Sintra, Torres Vedras , Vila Real, Viseu) and five carriers (CTT, DPD, VASP, TTMB and Logic) that take the products to their clients' homes, Decathlon Portugal has a regional supply center (CAR) in Setúbal that works every day

for 14 hours, from 8 a.m. to 10 p.m.. It has 30 000 m2 of area and has 149 employees to deliver a daily average of 60000 items to the set of Decathlon stores and to the customers who order online.

The items are divided into three main categories, which are standard items (sector 86), bicycles (sector 89) and bulky items (sector 90). Currently, there are 9 teams working in CAR namely e-commerce, adventure, bulky, hiking, water, fitness, colrun (collective + running), dock and reception teams that are composed by full time and part time employees, but the majority are part time workers, usually students. There is an effort by the managers to facilitate student's situation, reconciling work hours with college hours as much as possible, thus encouraging young people to educate themselves. Besides this, Decathlon also motivates its people by assigning them individual responsibilities related to different areas such as mental health, IT, sustainability, lean, among others so that they contribute positively to the development of the company. In addition to this, it invests in its employees, having a specific training plan already structured, which everyone must follow in order to achieve the best possible performance in their functions. Decathlon offers its customers a wide range of products, providing approximately 52000 SKUs. Of these, 30988 SKUs exists in CAR Setúbal, of which 28352 SKUs are from sector 86, 2433 SKUs are from sector 90 and 213 SKUs are from sector 89.

It is important to understand the path that the articles take until reach the client's home. Items arrive from CAC in the morning, and the dock team receives them and checks if everything is correct, having two possible destinations, cross docking (dock team handles the entire process, taking care of placing the merchandise close to the door with the name of the store for which it is intended and invoicing) or going to the respective team, that receive the articles and store them. After that, each team is responsible for the picking process that occurs 3 times a day, at 8 a.m., 12 a.m., and 2 p.m., and can be done at D (Day), where the team's computer instructions only require items that have to be shipped that same day, and at D+1 or D+2, where items that have to be shipped the day after or two days after respectively are also required, with the aim of advancing work. There are two types of orders, orders placed by stores to supply their stock and orders placed on the website by end customers. The first ones are prepared by each team, which after picking (usually stores order boxes of articles instead of units of articles), group these boxes on pallets for each store, invoicing and leave them in the expedition zone, next to the door with the name of the store. As presented in Figure 4.1. the orders placed by end consumers on the website are prepared by the e-commerce team, which, in addition to the picking done in its own section (@z), also receives the items picked by the other teams. It is important to note that the bacs with the items only arrive at the e-commerce team after 1 hour (D) or 2 hours (D+1 or D+2) from the beginning of the teams' picking, and only at that moment the team can start its activity. Orders placed by end consumers can combine items from different teams, so it is necessary for the e-commerce team to sort the orders, joining the different items in a single order, pack and place them in the right carrier pallet (if the customer has chosen home delivery) or

place them on the pallet of the respective store (if customer has chosen store delivery). Then, leave them in the expedition zone, next to the door with the name of the store or the carrier. Finally, when the trucks arrive, dock team loads them with the orders, regardless of whether supply Decathlon's stores or belong to carriers. From here, the delivery of the order to the final customer no longer depends on the e-commerce team or on activities performed in CAR, but on the transport team and store employees in the case of in-store pick-up, and on the organization and speed of the carrier in the case of home delivery.

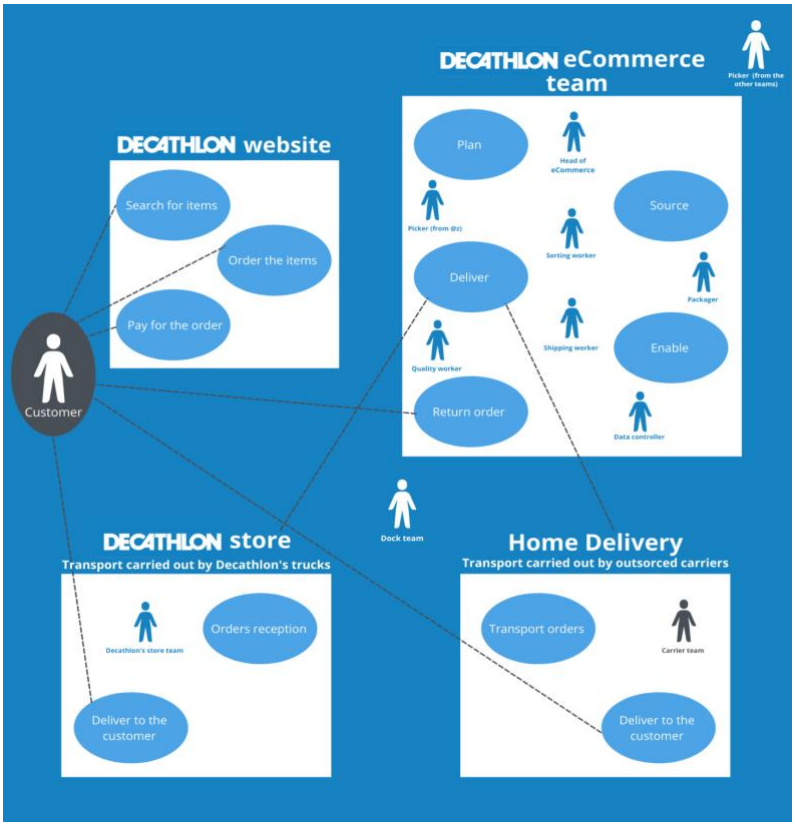

Figure 4.1 - Diagram of use cases of orders placed by final customer

4.2.4. E-commerce team

E-commerce team employs 39 people, mostly young people, who work daily so that customers receive their orders at the right time in their homes (45% of the orders) or to pick up in store (55% of the orders). In addition to mono, sorting, packing, and shipping processes, this team is also responsible for receiving and picking items from @z. Decathlon's website has a huge variety of items available, however many of them belong to higher ranges or are rarely sold, and therefore are not available in CAR stock. However, online customers can order them, being aware that the delivery time will be round 7 days, since the CAR have to place an order to CAC and wait until the article arrives to continue the processes until reach the client. These items that are ordered form CAC after being purchased and paid by the customers, when arrive at CAR are stored in @z zone, belonging to the e-commerce

logistics team. On the other hand, when the articles are in CAR stock, Decathlon promises to deliver them within 1-2 business days. In addition, the team also has a quality department, in which the anomalies that occur and online customer returns are managed.

The performance of the e-commerce team is measured through three main KPI's that are labour productivity, delivery promise, and dunning charge. The team has well-defined goals regarding their KPI's, which are a labour productivity between 26 and 29 orders per hour, a delivery promise above 95% (it is the most difficult to achieve, because it depends on the other teams, software issues that may occur, CAC errors, among others) and a dunning charge below 0,05%.

There are 6 types of orders, depending on the number of items and their typology.

- SMON: order composed by a standard size item (sector 86);
- MONO VOL (MBIK/SMVO): order composed of a single bicycle (sector 89) or a single bulky item (sector 90);
- SSTAS: order with more than one standard size item (sector 86);
- HETO: order with non-standard articles where larger boxes are used (sector 90);
- SVOL: order with several items, at least one of which must be a bicycle (sector 89) or bulky item (sector 90);
- SCLU: large orders placed by companies or schools.

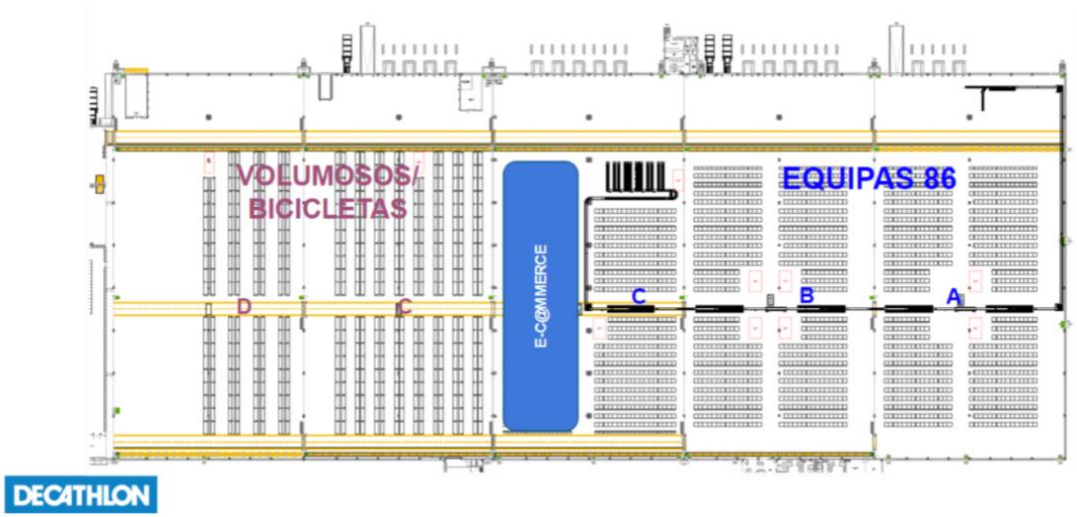

Figure 4.2 - Layout of CAC Setúbal (Source: Decathlon)

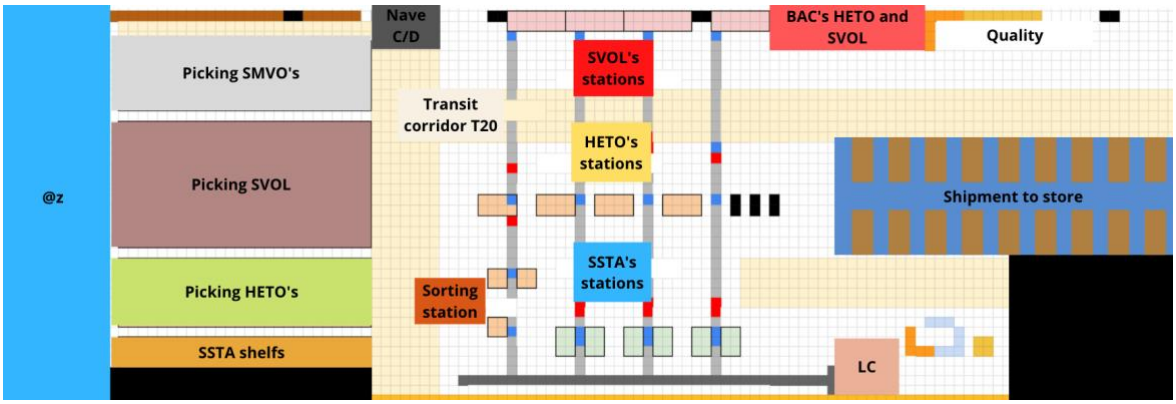

Figure 4.3 - Layout of e-commerce team zone in CAC Setúbal

As it is possible to see in figure 4.1. the warehouse is divided in 5 main naves, named from A to E, and in the upper part of the image are the several gates where the trucks dock to be loaded with orders. The e-commerce team is strategically located in the central nave, since after having each store's pallets ready with the orders that need to be shipped, they have to take them to each of the gates (each gate usually corresponds to one store) and thus reach each of the gates more easily and quickly.

It is also crucial to understand the current layout of the e-commerce team zone in the warehouse, presented in the Figure 4.3. The present layout was implemented during the realization of this project and aims at a greater capacity to dispatch orders, making the stations more dynamics between each other, increasing the efficiency. The layout change is the living proof that Decathlon listens to its employees once it was a member of e-commerce team, with lean as individual responsibility, who designed and suggested its implementation. The main change in the current layout compared to the old one was the change of stations responsible of sorting and packing bulky items to nave C (where all the other stations were already located), since in the past these stations were on the nave E, away from the rest of the team. This swap allowed the team to save time and improved communication between team members, as they now work altogether, in the same nave.

4.3. Process Identification

To start this study, it is necessary to identify and understand the required processes for the e-commerce logistics team's activity succeed. To this end, in an initial phase, some questions were asked to e-commerce team manager and to CAR manager, who promptly explained in an holistic way the functioning of the entire warehouse and identified the principal processes that occur during the operational activity of delivering orders to its customers.

The mentioned processes were related to plan, source, delivery, return and enable activities. It should be noted that "Make" is not included since Decathlon's e-commerce team only prepares the items for deliver, and therefore there is no type of production processes.

4.4. Process Discovery

This subchapter aims to discover the processes carried out by the e-commerce logistics team, with the objective of delivering orders to their customers in the promised time. To discover the present processes, different information obtained from employee's interviews were used together with process observation to achieve a well-structured process mapping. The process mapping was carried out using Bizagi tool, based on the SCOR Model, to assist in the structure and organization. It is important to keep in mind that the SCOR Model encompasses several processes and subprocesses, however in this project only those performed by the e-commerce team are mentioned (Annex B).

4.4.1. Plan

4.4.1.1. Level 1

Level 1 of the Plan in the SCOR Model contains all processes related to the planning of e-commerce logistics team activities, able to determine conditions and restorative actions to achieve supply chain goals.

4.4.1.2. Level 2

Level 2 of Plan in the SCOR Model involves the processes related to the planning of delivery activities since it is the type of activities that the e-commerce logistics team has the flexibility to plan (Annex C). Planning supply chain activities, source activities, return activities, and enable activities is the responsibility of Decathlon's e-commerce management department, instead of the logistics one.

4.4.1.3. Level 3

- Plan Deliver

Plan deliver (Annex D) starts with the identification, priorization and aggregation of delivery requirements through forecasts based on the months or seasons of the year and the load plan. After that, it is important to identify, assess and aggregate delivery resources such as equipment, materials, human resources and available working hours (the e-commerce team is dependent on the time of day that the picking is done and the speed of the other teams) and balance this type of resources and capabilities with the delivery requirements. Finally, the team is ready to establish delivery plans to satisfy their customers and achieve their performance measures.

4.4.2. Source

4.4.2.1. Level 1

Level 1 of Source in the SCOR Model contains all processes related to the sourcing activities of the e-commerce logistics team, including ordering, delivery, receipt, and transfer of raw materials.

4.4.2.2. Level 2

Level 2 of Source in the SCOR Model (Annex E) involves the processes related to sourcing stocked products, since all the items that the CAR orders from CAC are for stock.

4.4.2.3. Level 3

- Source stocked products

This process (Annex F) starts when a customer orders from Decathlon's website, and therefore it is necessary for the software to check if the item is available in CAR's stock. If the article is in stock, there is no need to source, however if it is not stock, the software places a automatically order to CAC. After approximately seven days, the article arrives at CAR and the dock team comes to the scene directing it to the e-commerce zone, so that the team can do its reception and storage in @z zone, finishing the source process.

4.4.2.4. Level 4

At level 4 of Source in the SCOR Model, the principal process performed by e-commerce logistics team is deepened.

- Reception and storage of items in @z

The reception and storage of items in @z (Annex G) starts when the dock team leaves the items into e-commerce zone. After that, the e-commerce team checks through the numeric codes if the boxes full of items belong to e-commerce team, once often the items inside the boxes belong to the bulky items team, and if that is the case, they forward the boxes to the correct team and the process ends as the reception and storage is not the responsibility of the e-commerce logistics team. In the other hand, if the boxes belong to e-commerce team, the responsible for their storage transports them closer to @z corridors, prepare and organize equipment to start the reception (RFID reader, *pális*, bar code

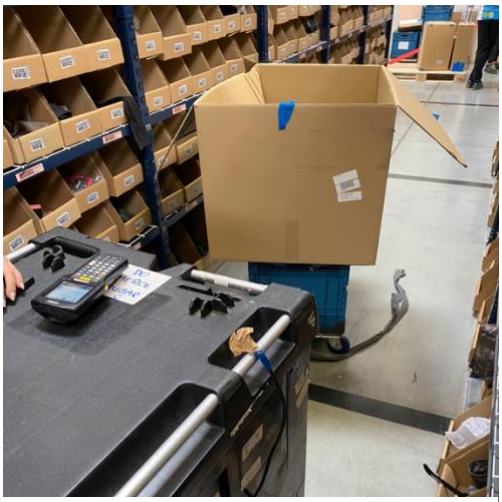

Figure 4.4 - Pális and BAC with wheels

Figure 4.5 - Pális, RFID reader, bar code reader and power bank

reader, power bank and a bac with small wheels, so the responsible can put the box that are storing on top of it, and walk through the corridors handily).

It is important that the responsible checks if all the equipment is working well before continuing the task. The next step is to pick one box, remove an article from it, check that the article is in good condition and pass it through the RFID reader, and then allocate it to an empty section with the bar code reader. Finally, the responsible checks if the box is empty and if informatically any item is missing. If the box is not empty and there is any article missing, the responsible generates a positive IP to correct the stock and adjust the inventory and allocate the extra item to an empty section with the bar code reader, finishing the process. If the box is empty and there is an article missing, the responsible generates a IP negative to correct the stock and adjust the inventory, finishing the process. If the box is empty and there is no article missing, the process ends because it is successfully completed.

4.4.3. Deliver

4.4.3.1. Level 1

Level 1 of Deliver in the SCOR Model contains all processes related to the delivery of e-commerce logistics team activities.

4.4.3.2. Level 2

Level 2 of Deliver in the SCOR Model (Annex H) involves the processes related to deliver stocked products and deliver make-to-order products, once although Decathlon does not source make-to-order products, it possesses SAS (Service After Sales) department, responsible for the customization of items.

4.4.3.3. Level 3

- Deliver stocked products

Deliver stocked products (Annex I) starts when a customer order stocked products (after sourcing activities) it is necessary to understand if the item is in @z zone (belonging to the e-commerce team) or if it belongs to the stock of the rest of the warehouse (belonging to the other teams). If it belongs to e-commerce team, the team picker must proceed to the picking in @z, if it belongs to other team's stock, the respective picker picks the articles. Besides this, it is crucial to check if the order has more than one article in its composition, if so, the next step is to sort the order (performed by sorting responsible), followed by its packaging (performed by packaging responsible) and subsequent shipping (performed by shipping responsible). If the order is only composed by an article, the Mono responsible prepares the order and routes it for shipment. Finally, the dock team is responsible for loads the trucks,

Decathlon's trucks if the customer has chosen pick-up in store and carrier's trucks if the customer has chosen home delivery.

- Deliver make-to-order products

Deliver stocked products (Annex J) starts when after the sourcing activities, a customer orders a make-to-order item, and it is then necessary to understand if the item belongs to the @z stock (e-commerce team) or to the other warehouse teams so that the picker from each of the teams can then proceed to picking process. In both scenarios, there is a fictitious picking in @z of the customization service purchased by the client, to invoice it. Besides this, it is crucial to check if the order has more than one article in its composition, if so, the next step is to sort the order (performed by sorting responsible), followed by its packaging (performed by packaging responsible) but in this case with the care of not sealing the package. If the order is only composed by an article, the Mono responsible prepares the order and does not seal the package. In both situations, after the packaging, there is a contact via email with SAS to inform of the need for customization, and an e-commerce member physically goes to SAS, hands the package to the person in charge, who should take it to the customization. When this task is finished and the package properly sealed, there is a new contact via email to inform that the order is ready, and at that time an e-commerce member goes back to the SAS and collects the order. Then, the order is routed to the shipping area and finally is loaded onto the trucks by the dock team, Decathlon's trucks if the customer has chosen pick-up in store, and carrier's trucks if the customer has chosen home delivery.

4.4.3.4. Level 4

At level 4 of Deliver in the SCOR Model, the main processes performed by e-commerce logistics team are deepened.

- Picking @z process

The **picking of items in @z** (Annex K) starts with the preparation and organization of equipment to start the activity (RFID reader, tablet, printer, power bank and bacs transporter). Then, it is important

Figure 4.6 - Bac transporter

Figure 4.7 - Tablet, printer, RFID reader and power bank

to understand if it is a Mono order picking (if so, use a single magnum and place the various items in it) or orders with more than one item (in this case, use different bacs so that the items are separated according to the sorting groups they belong to). After that, the picker should verify if all the equipment is working, and if so, follow the route indicated and calculated by the tablet. When following this route, should stop at the indicated corridor, next the right shelf and *direction* take the item out of the indicated direction, pass it through the RFID reader and place it into the recommended bac or magnum. Often, due to reception or inventory error, the tablet asks to pick an item in a specific direction, however the picker finds an empty direction or a wrong/misplaced article, and therefore must generate an IP negative to correct the stock. Finally, when all the requested items by the tablet have been correctly picked, the process ends.

- Sorting process

The sorting of orders (Annex L) starts when bac with the items arrive by conveyor containing another team's picking together with the bac derived from @z picking. The responsible members for the sorting process start by doing a bacs sorting, verifying in data studio software which are the first orders that must be shipped, which normally are the orders to be picked up at the stores, since the decathlon trucks leave throughout the day to supply the stores, while the carrier trucks usually leave at the end of the day. Then, they organize all the bacs in groups in order of priority and pick the first group that

Figure 4.8 - Bacs sorting - separate groups of bacs per pallet

Figure 4.9 - Shelves to separate the orders

must be shipped early. After that, the sorting responsible organize the required equipment (computer, RFID reader, shelves (each shelf has 18 partitions which give rise to 18 orders, and they use a maximum of 3 shelves per sorting - 54 orders), bar code reader), beep one bac of the group, take the article out of the bac, pass it across RFID reader and place it in the right partition and shelf indicated by the computer. If the employee repeats the process until all the bacs in the group are empty, and computationally there is no missing items (all the orders are complete) the process ends. However, there are several times errors during this process, like when all the bacs are empty, but an item is computationally missing, in which case the sorting responsible generates a picking error (missing article), analyze which team made the error, and physically go to the team's nave to pick up the missing item and continue with the process normally until it is finished. Another common error happens when the bacs still have items, but informationally none are missing, which leads to generate a picking error (extra item) and place it on a shelf destined for picking errors, so that at the end of the day the articles are returned to the respective teams. Finally, another quite common error happens when the bacs still have articles, and informatically there are articles missing, but they are not the same, leading to generate a picking error (switched article), place the extra item on the picking errors shelf, analyze

which team made the mistake, physically go to the team and pick the item and continue with the process normally until it is finished.

- Mono process

The process of preparing the Mono orders (Annex M) starts when bacs that contain picking of Mono orders picking arrive by a conveyor with other team's picking together with the bacs derived from @z. The responsible members for the sorting process start by doing a bacs sorting, verifying in data studio software which are the first orders that have to be shipped. Then, they organize all the bacs in groups in order of priority and pick the first group that has to be shipped early. After that, the sorting responsible organizes the required equipment (computer, RFID reader, consumables, adhesive tape, and printer) and inserts the number of the group in the computer. Then, the mono responsible takes the articles from the bac, places them on the counter, passes the article across the RFID reader, and packs it in the suitable consumable, according to the size and typology of the article, it can be packed in different bags (when they are ordered to be picked up at the store, the articles are packed in a reusable bag) or different boxes. Then, seals, stick the printed *cólis* with customer's information in the package, places it on a pallet to be forwarded to those responsible for the shipping process and after repeating it with all articles inside of the bac, tidies up its station by replenishing consumables and disposing of trash, all items will be packed, and the process is over. If an item is missing, the mono responsible generates a sorting error, places the item in a bac, and leaves it near the quality department, so that can finally tidy up its station ending the process.

- Packing process

The packing of orders (Annex N) starts when the sorting of the orders is complete (each order is already separated in each partition of the shelves). The packer picks a shelf in the same order of priority, and prepares all the equipment (computer, RFID reader, consumables, adhesive tape and printer) and insert the number of the shelf in the computer. Then, the packer takes the articles from the partition indicated by the computer (according to the order of priority), and places them on the counter. After, pass the articles across the RFID reader and packs them in the suitable consumable, according to the size and typology of the articles, they can be packed in different bags (when they are orders to be

Figure 4.10 - Packed orders (boxes)

Figure 4.11 - Packed orders (bags)

picked up at the store, the articles are packed in a reusable bag) or different boxes. Then, seals, sticks the printed *cólis* with customer's information in the package, places it on a pallet to be forwarded to those responsible for shipping process and after repeating it with all the partitions and tidies up its station by replenishing consumables and disposing of trash, all orders will be packed, and the process is over. If any partition does not contain all the items, it should informationally contain or some order is missing, the packer generates a sorting error, places all items related to the order in a bac, leave it near quality department, so that can finally tidy up its station ending the process.

- Shipping process

The shipping of orders (Annex O) starts when the packaging process is complete, that is when the pallets with the packed orders arrive at the shipping station. The shipping responsible has to make sure that all the necessary materials for the process are prepared (at least 43 pallets because is necessary at least one per store and their corresponding UAT and at least one per carrier, 38 bacs (at least one per store and their corresponding UAT), 3 magnums (one per carrier that transports items from sector 86 and their corresponding UAT), computer, bar code reader, plastic to close the pallet, and a forklift). Then there are two options, shipping to store and shipping to carrier. In both cases, the responsible proceeds to sort packages, separating them according to the store or carrier to which they should be shipped. This sorting is divided into bag sorting and box sorting, as the bags are sorted in bacs in the first case and magnums in the second one, and the boxes are sorted directly on the shipping pallets, according to the store or carrier. The shipping responsible must always keep an eye on the shipping plan, which dictates at what time each store or carrier will be shipped and prepare the orders according

to the priority it dictates. When the shipping time for a certain store or carrier arrives, the person in charge informally confirms whether all the orders that have to be shipped that day for that store or carrier are on the pallet or in the bac/magnum and if everything is correct, closes the bac and merges its UAT with the one on the pallet, thus creating a single UAT for the store or carrier. Then, proceeds to invoice the orders, and attach the document along with the bac to the pallet, so that the pallet contains all the orders (boxes and bags) and documentation. Finally, closes the pallet with plastic so that it is well conditioned, and takes it to the dock area so that later the dock team loads the truck and the pallet or pallets, if it doesn't fit in one, continue its way. If one or more orders are missing, the person in charge will have to look for the order at the packing stations, or even call the store to which the order should be shipped to find out if by mistake the order has already been sent before but has not been scanned. If they find the order, they continue the process normally, otherwise, they will have to send an email to the responsible department to ask for a new order to be placed so that the items are picked again, and all the processes are repeated.

4.4.4. Return

4.4.4.1. Level 1

Level 1 of Return in the SCOR Model contains all processes related to moving items from a customer back through Decathlon’s supply chain.

4.4.4.2. Level 2

Level 2 of Return in the SCOR Model (Annex P) involves the processes related to delivering return excessive products, MRO products, and defective products. There is no source return products process since it is the CAC that supplies the CAR, both being part of the Decathlon company, which facilitates and simplifies transactions between them. Therefore, if the CAC sends an item that is changed, or in the wrong quantity, the CAR keeps it in inventory and places a new order to CAC with the items it needs. If it is a defective item, CAR proceeds to destroy it, assuming the loss and ordering the article again.

4.4.4.3. Level 3

- Deliver Return defective product

This process (Annex Q) begins with the customer's desire to return a product because it is defective and with the consequent contact with Decathlon through the digital channels so that can then deliver it to one of the stores or to a pick-up point so that it can be transported to the CAR by Decathlon's trucks (store) or by a carrier (pick-up point). After that, the e-commerce team receives the defective

product and checks it, and then takes it to the destruction zone for disposal. Finally, the Decathlon's e-commerce management department proceeds to return the money to the client, ending the process.

- Deliver Return MRO and excess product

It is important to mention that to simplify, the deliver return MRO and excess product processes are grouped into one, since regardless of the type of return (MRO or excess), the process made by the e-commerce team is always the same. This process (Annex R) starts with the customer wanting to return a product because it came in an excessive quantity (excess product), or for any other reason they may have for wanting to do so (MRO product). Thus, the client communicates it through digital channels and delivers the product in question to one of the stores or to a pick-up point so that it can be transported to the CAR by Decathlon's trucks (store) or by a carrier. After that, the e-commerce team receives the MRO or excess product and checks it, and then takes it to a dedicated magnum for all returns, so that the quality responsible can redirect the product to the respective team and generate a IP positive, in order to increase the stock. Finally, the Decathlon's e-commerce management department proceeds to return the money to the client, ending the process.

4.4.5. Enable

4.4.5.1. Level 1

Level 1 of Enable in the SCOR Model contains all processes related to the monitoring and management of information, human resources, and the performance of Decathlon's supply chain.

4.4.5.2. Level 2

Level 2 of Enable in the SCOR Model involves the processes related to manage Decathlon's supply chain performance, data, information, and human resources. There are many other facilitators of the company's activity, however, in the scope of this project only those performed by the e-commerce team are addressed.

4.4.5.3. Level 3

- Manage Supply Chain Performance

Manage supply chain performance starts with the initiate reporting through the measurement of the duration of the logistical activities performed by the team (reception, picking, sorting, packaging, and shipping), calculation of the productivity, promise and complaint rate and inventory counts. Later, the reports are carefully analyzed, reviewing the reported performance, and finding root causes, analyzing existing gaps in the performance so that it is then possible to prioritize these causes according to their contribution to the activity. After, different kinds of corrective actions are developed, documented, and tested (organizational changes, process improvements, technology introduction and equipment

repairs) so that they can finally be approved and implemented in the day-to-day life of the e-commerce team's workers.

- Manage Supply Chain Human Resources

Manage supply chain human resources starts with the identification of the skills and resources needed to perform the job well, followed by the identification of the skills and resources available. To have access to possible candidates, the e-commerce team advertises a vacancy on Decathlon's MYJOB platform, and after receiving the resumes, there are 4 stages of recruitment. The manager starts with a resume scanning, followed by a phone interview, a group interview and finally a final interview. Then there is a skill and resource matching, to determine the candidate or candidates that should be hired, and consequently the trainings they should receive. As for the trainings, there is a schedule that indicates the order and which trainings each employee should attend, either immediately after being hired or during their duties, in order to acquire new knowledge. Finally, it is also important to include performance evaluation, which is done through eight individual meetings, shorter and less formal, an annual interview, and a mid-year interview, which are more in-depth meetings in which priorities are discussed, quality indicators are analyzed, and talk about what went well and what went wrong.

- Manage Supply Chain Technology

Manage Supply Chain Technology includes two different types of technology. Firstly, we consider information technology that aggregates all the software that helps the e-commerce team perform its work that is AS400 and Twist. In addition, production technology is also considered, which include equipment that assists in the work, such as the forklift, pallet wrap machine, conveyor, RFID reader, printer, computer, tablet, and the bar code reader. These supports are used in almost all the processes required for customers to receive their orders in the comfort of their own homes, often in conjunction with each other to make the team's work as efficient as possible.

4.5. Process Analysis

After a deep understanding of the logistical processes performed by Decathlon’s e-commerce team, it is essential to identify and analyze the existing issues. For this investigation, it is used a qualitative process analysis and a quantitative process analysis.

4.5.1. Qualitative process analysis

In order to make a quantitative process analysis resort to the stakeholder analysis and issue documentation, which is a technique that starts by gathering information about the issues that affect the company's results, considering the perspectives of different stakeholders. After the identification of the problems, it is necessary to organize the information, to understand its qualitative and quantitative impact. Therefore, an issue register is used, which presents a detailed analysis of each

problem and its respective impact in the form of a table and after that, the information is grouped in a Pareto chart (Dumas et al., 2018).

Issue 1: Outdated productivity measurements Priority: It is not possible to quantify Process: Enable Description: Organizational action plans advance faster than productivity measurements Data and assumptions: This problem has an impact on the organization of the team, namely in the preparation of the schedules, since these are prepared according to the forecasts, so that the manager knows how many workers to allocate to each of the posts. Therefore, it is not possible to numerically quantify the impact of this problem, since it is a matter of better organization and planning. Qualitative impact: Decathlon puts the action plans (macro and micro improvements) into practice but does not measure as regularly as it implements these plans. Therefore, often bad decisions are made thanks to outdated measurements. Quantitative impact: It is not possible to quantify
Issue 2: Picking delays Priority: 2 Process: Plan Description: Delay in other teams picking causes the team to have less operational time Data and assumptions: Normally, 5 people start their work at 10 a.m. (the time when picking should be delivered to the e-commerce team to start sorting and packing) but often, the other teams can only deliver the picked items for an average of 1 hour late (the hourly price is 13€), which causes the e-commerce team to have idle employees. Qualitative impact: If picking was not delayed, the e-commerce team would have more time to prepare their orders, they could organize their time differently, fulfilling their promise to their customer, and increasing efficiency. Quantitative impact: 5*1*365*13=23725€ per year
Issue 3: Loss of time transporting @z merchandise Priority: 4 Process: Source Description: Loss of time transporting the merchandise that arrives from CAC every morning to @z area Data and assumptions: Every morning, the person responsible for receiving the articles arriving from the CAC loses an average of 15 minutes transporting the articles. In addition, the e-commerce team pays the dock crew 15 minutes a day to transport the goods from the dock to near the crew.

Qualitative impact: Loss of time by the worker responsible for receiving and storing @z items arriving from CAC (take the pallet truck or the stacker and transport all the pallets to @z corridors), since the dock team drops off the merchandise in the beginning of e-commerce zone (near the shipping area). Quantitative impact: 0,5*365*13=2372,5€ per year
Issue 4: Bulky items shipment Priority: 1 Process: Deliver Description: Shipping orders with at least one bulky article is expensive Data and assumptions: Annually, approximately 5040 hours are required to precede the order shipment process. To ship bulky orders 46% of time and money is required (bulky orders account for only 16% of total orders). Besides this, on average, 2,46 plastic wraps are spent per day at a price of 6,5€ each, which adds a cost of 15,99€ to the daily total. Qualitative impact: Loss of time and fatigue of the people in charge of shipping the bulky items since they are very heavy. Quantitative impact: 5040*0,46*13+15,99€*365=35975,55€ per year
Issue 5: Distinguishing the orders Priority: 3 Process: Deliver Description: Difficulty in shipping station distinguishing the orders Data and assumptions: Every day, those in charge of shipping orders waste an average of 42 minutes looking for orders that must be shipped to the corresponding stores at the time stipulated by the loading plan. Qualitative impact: Often, the shipping responsible has little time to find missing orders since there is a shipping schedule for each of the stores. Since all orders, whether for pick up in store or home delivery, have the same exterior appearance, there are more errors and wasted time looking for them. Quantitative impact: 0,7*365*13=3321,5€ per year

Table 4.1. Issue register of Plan Process

Considering the problems that are possible to quantify monetarily, a pareto chart was constructed, with the objective of understanding which situations are the most significant and most urgent to intervene in. Based on annex S, it is concluded that the shipment of bulky items and the delay in picking correspond to 91% of the total impact (in euros).

4.5.2. Quantitative process analysis

Quantitative analysis is a very important tool because it aims to further detail the information in order to make an informed decision. In this project, we used flow analysis, which groups several techniques that aim to inform about the performance of the process through the performance of each of its tasks.

In this case, we will focus on flow analysis for cost, starting by assembling a table with the different tasks for each process, calculating the processing time for each of them, and the value per hour, which in this case is 13€, obtaining the resource cost, which is the cost associated with the human resources performing the task. It is also important to keep in mind other costs that may exist to complete each of the tasks because it is only with the sum of resource costs and other costs that the total cost is calculated (Dumas et al., 2018).

Task	Resource cost	Other cost	Total cost per day	Total cost per year
Waiting time for the picking (5 employees) - 1h	1*5*13€=65€	0€	65€	365*65€=23725€

Table 4.2. Cost calculation table for picking delays

Total cost per year=23725€

Task	Resource cost	Other cost	Total cost per day	Total cost per year
Time paid to the dock crew to transport the goods - 15m	0,25*13€=3,25€	0€	3,25€	365*3,25€=1186,25€
Transport the merchandise from the place where the dock team leaves it to the @z area - 15m	0,25*13€=3,25€	0€	3,25€	365*3.25€=1186,25€

Table 4.3. Cost calculation table for loss of time transporting @z merchandise

Total cost per year = 2*1186,25=2372,5€

Task	Resource cost	Other cost	Total cost per day	Total cost per year
Prepare required materials - 30m	0,5*13€=6,5€	2,46*6,5€=15,99€ (on average, 2,46 plastic wraps are spent per day at a price of 6,5€ each)	6,5€+15,99€=22,049€	22,49€*365=8208,85€
Associate pallet/bac with an UAT (store) - 20m (55%)	0,33*13*0,55=2,38€	0€	2,38€	2,38€*365=868,7€
Bag/package sorting (store) - 6h (55%)	6*13*0,55=42,91€	0€	42,91€	42,91€*365=15662,15€
Check missing orders (store) - 10m (55%)	0,17*13*0,55=1,22€	0€	1,22€	1,22€*365=445,3€
Look for lost order (store) - 24m (16,5%)	0,4*13*0,165=0,86€	0€	0,86€	0,86€*365=313,9€
Invoice (store) - 1h18m (38,5%)	1,3*13*0,385=6,51€	0€	6,51€	6,51€*365=2376,15€
Close the pallet (store) - 36m (38,5%)	0,6*13*0,385=3€	0€	3€	3€*365=1095€
Bring the pallet until the dock (store) - 30m (38,5%)	0,5*13*0,385=2,5€	0€	2,5€	2,5€*365=912,5€
Associate pallet/bac with an UAT (carrier) - 10m (45%)	0,17*13*0,45=0,98€	0€	0,98€	0,98€*365=357,7€
Bag and package sorting (carrier) - 2h10m (45%)	2,17*13*0,45=12,7€	0€	12,7€	12,7€*365=4635,5€

Task	Resource cost	Other cost	Total cost per day	Total cost per year
Check missing orders (carrier) - 6m (45%)	0,1*13*0,45=0,59€	0€	0,59€	0,59€*365=215,35€
Look for lost order (store) - 15m (9%)	0,25*13*0,09=0,3€	0€	0,3€	0,3€*365=109,5€
Invoice (store) - 10m (36%)	0,17*13*0,36=0,78€	0€	0,78€	0,78€*365=284,7€
Close the pallet (store) - 12m (36%)	0,20*13*0,36=0,94€	0€	0,94€	0,94€*365=343,1€
Bring the pallet until the dock (store) - 5,1m (36%)	0,085*13*0,36=0,4€	0€	0,4€	0,4€*365=146€

Table 4.4. Cost calculation table for bulky items shipment

Total cost per year = 8208,85 +868,7+15662,15+445,3+313,9+2376,15+1095+912,5+357,7+4635,5+215,35+109,5+284,7+343,1+146=35974,4€

Task	Resource cost	Other cost	Total cost per day	Total cost per year
Check on the software which station the order was last in - 7 minutes	0,12*13=1,56€	0€	1,56€	365*1,56€=569,4€
Search in the station - 30 minutes	0,5*13=6,5€	0€	6,5€	365*6,5€=2372,5€
Search in the pallet -	0,4*0,17*13=0,	0€	0,884€	365*0,884€=32

Task	Resource cost	Other cost	Total cost per day	Total cost per year
10 minutes (40%)	884€			2,66€
Generate an error - 3,6 minutes (20%)	0,2*0,06*13=0,156€	0€	0,156€	365*0,156€=56,94€

Table 4.5. Cost calculation table for distinguishing the orders

Total cost per year = 569,4+2372,5+322,66+56,94=3321,5€

4.6. Process Redesign

4.6.1. Outdated productivity measurements

The outdated productivity measures are serious for the organization of the team since they serve as a basis for organizing the team according to forecasts and times of the year when it is known in advance that the work will be more (summer, Christmas, and sales). If these are up to date, it is possible to allocate the right number of workers, so that there are not too much work and not enough people or the opposite.

In terms of data, it is necessary to take into account that in this project were used, when possible, data provided by Decathlon, but also data collected and calculated during the course of the study, as shown in Annex T. This data collection took place at CAR Setubal, by monitoring and timing each of the e-commerce processes sorting, packaging, sorting, mono process, reception and picking of @z articles, on average once a week for 6 months. In this way, it was possible to obtain real and current data, which allowed a real understanding of each of the processes as a whole, but also in order to understand the impact of each of its activities on the total time.

In addition to the timing of each of the processes, times were also measured for the activity of sorting orders by the correct store pallet in march, making a comparison between the time used in the sorting of SSTAS and mono orders between pallets and that used in the picking of bulky orders. In this way, it was also possible to calculate the time spent on shipping in the month of march for sector 86 and bulky orders, making a comparison with the percentage of shipped orders and then arriving at the impact in euros of shipping each type of order.

Therefore, in order to update the productivity measurements, and after the times measured as explained above, the values presented in table 4.6. were obtained, in order to better allocate resources and consequently improve the performance of the e-commerce team.

	Outdated productivity measure	Up-to-date productivity measure	Difference
Sorting (articles per hour)	300	329	+29
Packing (orders per hour)	30	36	+6
Mono (orders per hour)	80	86	+6
Shipping (orders per hour)	100	101	+1
@z Picking (articles per hour)	120	122	+2
@z Reception (articles per hour)	90	168	+78

Table 4.6. Comparison between outdated and up-to-date productivity measurements

The differences verified in the table 4.6. show that over time, the e-commerce team has been implementing enhancements in training its employees, betting on technology and better planning to make their processes more efficient. However, these improvements have been implemented but the associated new productivities have not been counted, with the result that the measures are not up to date and may give rise to errors in staff allocation. When analyzing the differences in table 4.6. it is possible to see that the biggest differences are found in sorting items and receiving items in the @z zone. In both cases, this difference is justified by the fact that the team invested in RFID readers, which allows these activities to be performed using them most of the time, which greatly increases employee productivity.

4.6.2. Picking delay

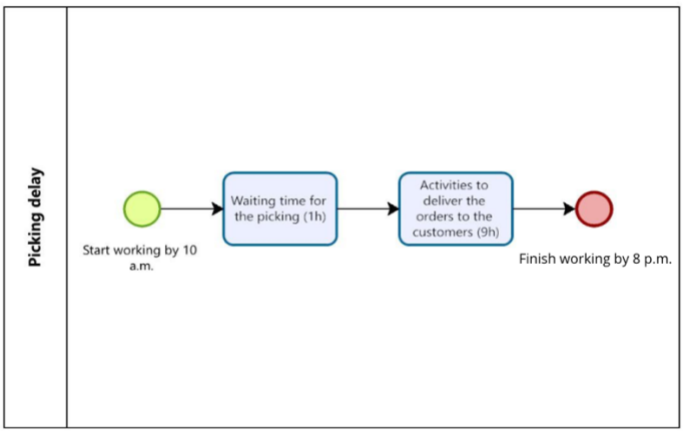

Figure 4.12 - Picking delay process

To begin with, it should be noted that picking is done 3 times a day, at 8 a.m., 12 a.m., and 2 p.m.. The first picking of the day should arrive at the e-commerce area by the conveyor at 10 a.m., and therefore and for that reason, every day 5 employees start to work at 10 a.m., nevertheless the picking is delayed by an average of 1 hour since it is the one that usually brings the largest number of articles, since it covers all orders placed during the night. It is also important to keep in mind that the last carrier is usually shipped around 8 p.m., which gives the team an average of 9 hours to prepare and ship all their orders, as can be noted in Figure 4.12.

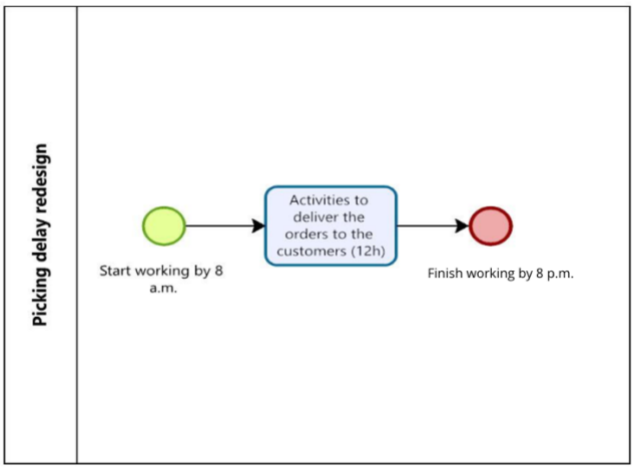

Figure 4.13 - Picking delay redesign

The proposal presented in Figure 4.13. would be to make a change in the hours of picking, doing only twice a day, at 12 a.m. and 7 p.m., to still be able to supply the stores, but also to streamline the work of the e-commerce team. This way at 7 p.m. the teams start picking the items and finish it before they go home, making it complete and ready to be worked. On the next day, at 8 a.m. when the CAR opens, the e-commerce team can start sorting right away since they have the items ready, increasing the operational hours from 9 hours to 12 hours. This increase in uptime helps the e-commerce team to ship a greater number of orders, making fewer mistakes and delivering a package to the customer in the best possible condition.

4.6.3. Loss of time transporting merchandise

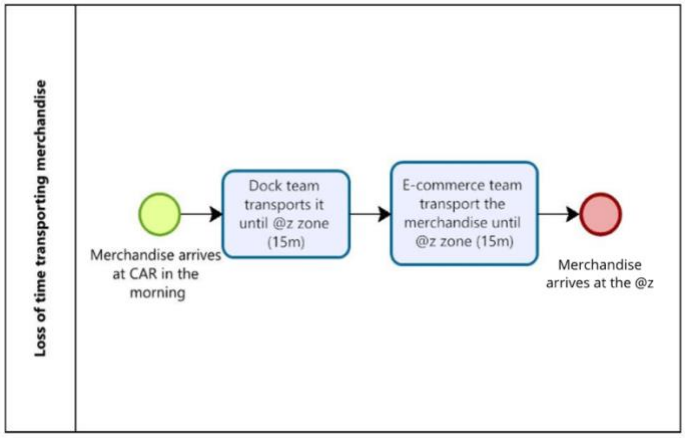

Figure 4.14 - Loss of time transporting merchandise

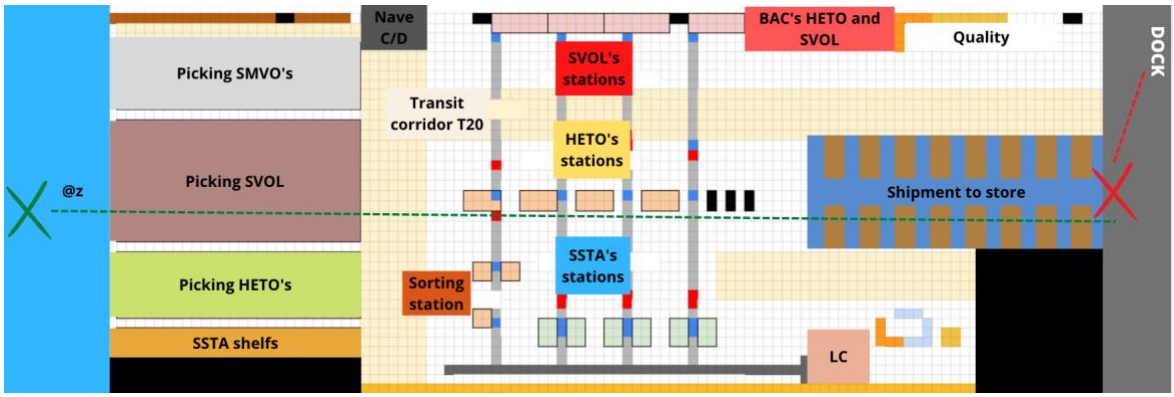

Figure 4.15 - Path that the merchandise follows to reach @z area)

Every day goods arrive at the CAR from the CAC, and they have to be put away in their place. The products that arrive for the e-commerce team belong to @z and therefore have to be received and stored in that area. As can be seen in the Figure 4.14, currently both teams, from the dock and e-commerce, transport the merchandise to the place where it should arrive, each taking an average of 15 minutes. In Figure 4.15 is possible to observe the concrete path of the merchandise, because first the dock team receives the products, loads the stacker with them and unloaded it at the beginning of the e-commerce area that is near the shipping area (red path and red cross). After that, the e-commerce team picks up those products and once again, loads the stacker with them, takes them to the @z zone (green path and green cross) and unloaded it, so the same merchandise is double loaded and unloaded, and travels a longer way than it could go, for a total of 30 minutes on average.

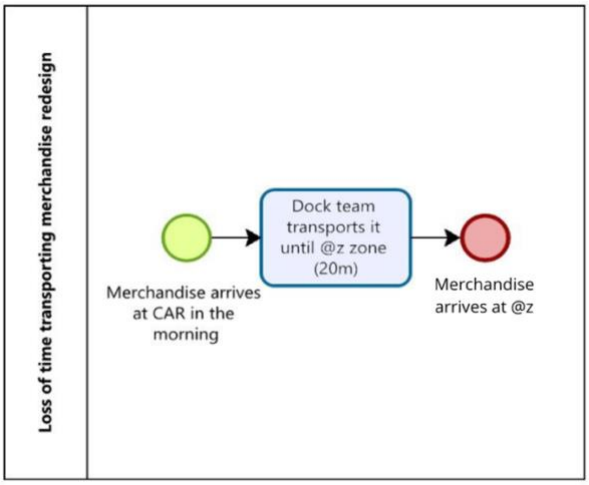

Figure 4.16 - Loss of time transporting merchandise redesign

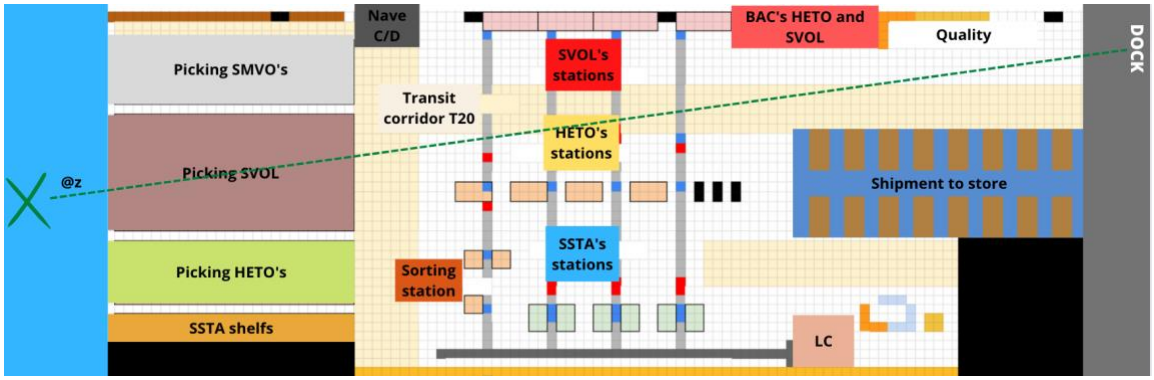

Figure 4.17 - Proposal of the path that the merchandise follows to reach @z area

The proposal would be to shorten the path that the merchandise take until reach the @z area, and as shown in the Figure 4.17, if the path were completely taken by the dock (green path and green cross), the goods would only be loaded and unloaded once, making this path much more efficient. Thus, as can be seen in the Figure 4.16, the total time used with this transport is on average 20 minutes, 10 minutes less than with the previous solution. In monetary terms, it is also advantageous for the e-commerce team, because even if it have to pay the pier team an extra 5 minutes a day, end up saving 15 minutes of time on its own team having a total annual cost of 1581,67€.

4.6.4. Bulky items shipment

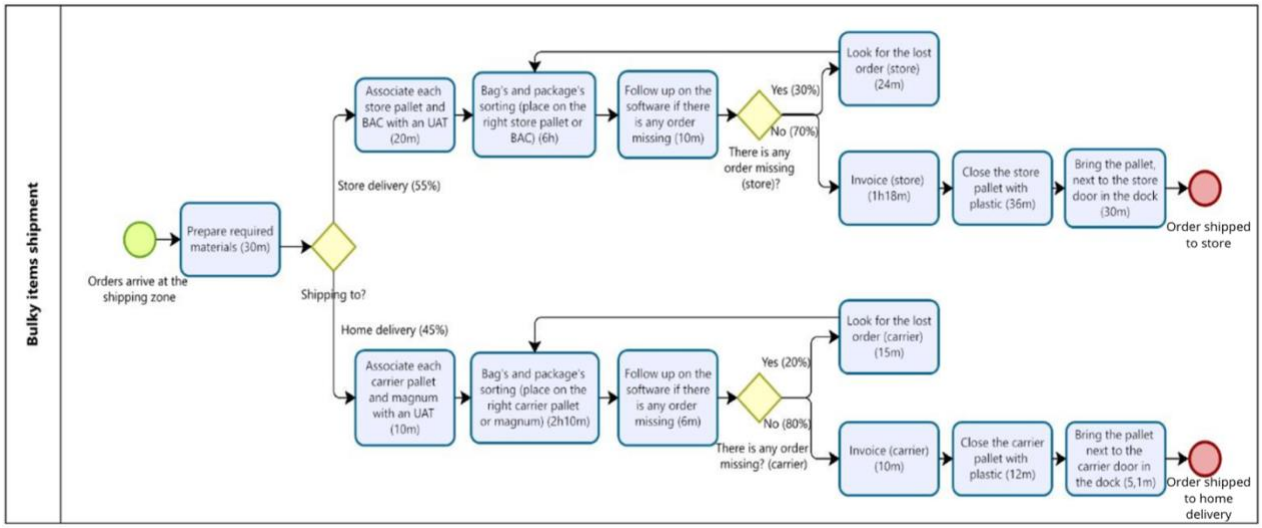

Figure 4.18 - Bulky items shipment

As seen above in 4.5.1. and 4.5.2. annually, about 35975€ are spent on the shipment of bulky orders (about 46% of the total amount spent on the shipment of all orders, sector 86 and sector 89 and 90), however, orders with bulky items (sector 89 or 90) only account for 16% of total orders, and the remaining 84% are orders with sector 86 items. This means that 46% of the time and money is spent shipping only 16% of the orders, which becomes quite a significant point when you want to achieve efficiency. Thus, it is important to consider the shipping process for bulky orders shown in Figure 4.18, which basically follows the normal shipping route, just like non-bulky orders. However, it is important to remember that bulky items usually have a large weight, volume, and size, as in the case of bicycles, billiard tables, or gym equipment, which must be transported and loaded onto pallets just like items from the sector 86. Therefore, the proposal to improve this process is based on reducing the movement of the team's employees with these heavy orders, which take a lot of time and wear out the employees physically.

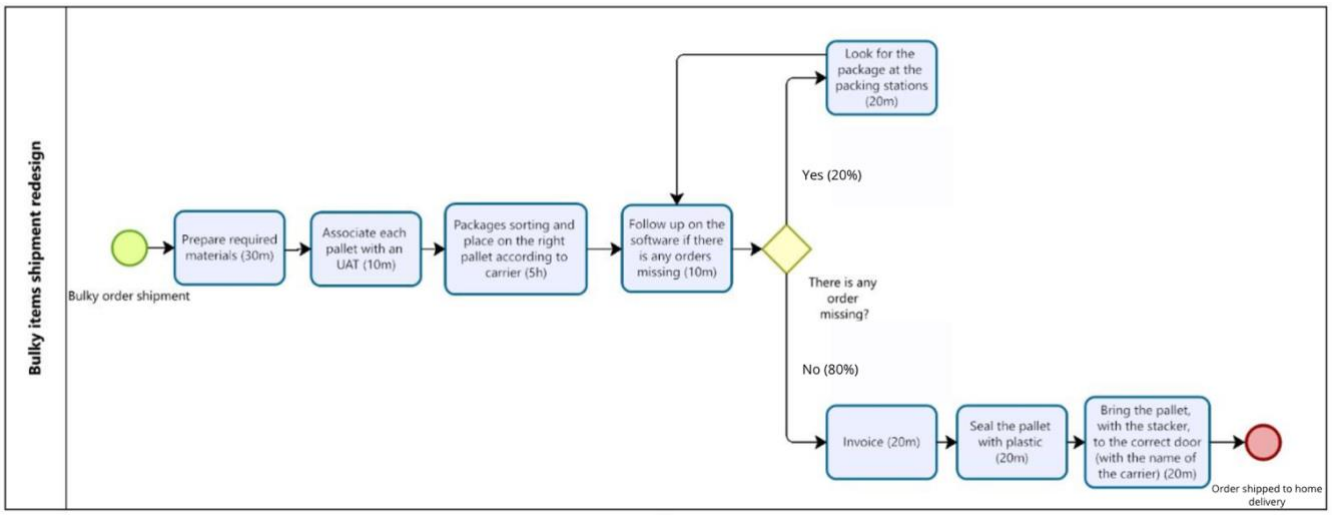

Figure 4.19 - Bulky items shipment redesign

As shown in Figure 4.19, the proposal is to stop sending bulky orders for pick up in store, and prefer home delivery. Thus, employees no longer have to divide orders by 38 store pallets, and focus only on the division between 3 carriers who ships all the bulky items from Vasp, Logic and TTNB which significantly contributes to the decrease of the amount of pallets to be shipped, also saving plastic wrap. In addition, when the orders arrive at the stores for pick up, the employees have to organize and store them until the customer picks them up, which also causes wear and tear to the store employees, and takes up a lot of space, making it impractical.

From the customer's perspective, it is also more comfortable to receive an item of this type in the comfort of their home, since they do not have to travel, load, and unload an item of this type.

Finally, it is important to consider the main competitor Sportzone, who privileges home delivery of large volume items, since the shipping cost that customers pay to pick up at its stores (51€) is higher than if they choose home delivery (50€) as can be seen in Annex U. Taking into account Annex V, it is possible to conclude that Decathlon presents more attractive shipping costs than the main competitor, charging 29€ per home delivery, thus concluding that if they decided to stop with the pick-up in store method, they would continue to present a cheaper shipping option for home delivery than its main competitor.

4.6.5. Distinguishing the orders

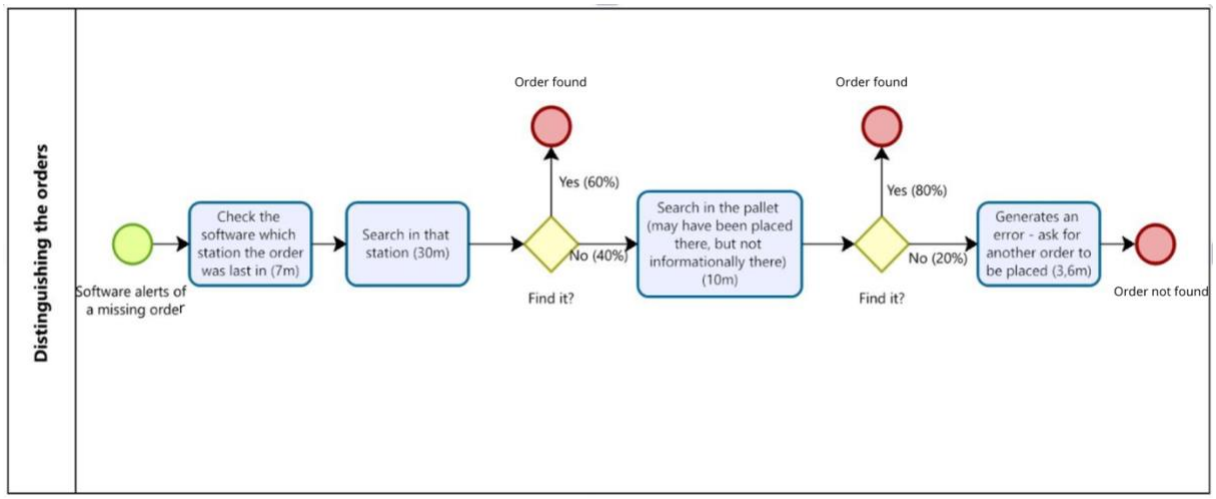

Figure 4.20 - Distinguishing the orders

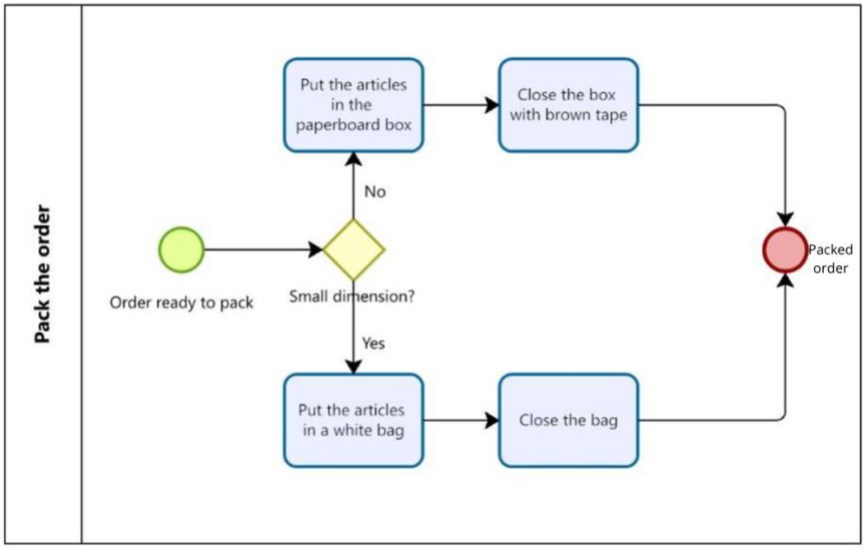

Figure 4.21 - Pack the order

As shown in Figure 4.20 every day about 42 minutes is lost at the shipping station looking and distinguish lost orders. Since the e-commerce team handles thousands of orders a day, it would be important that the orders that must be shipped to the store and those that have to be shipped to the carrier are easily distinguished to decrease the mentioned time. For this distinction to be implemented, we have to consider the sub-process of order packing (not to be confused with the total packaging process previously described in 4.4.3.4.) present in Figure 4.21.

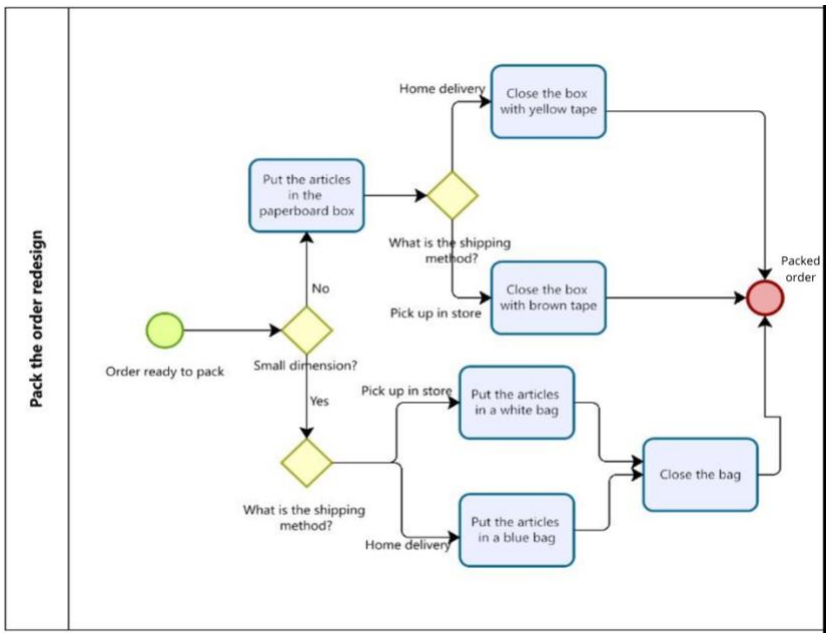

Figure 4.22 - Pack the order redesign

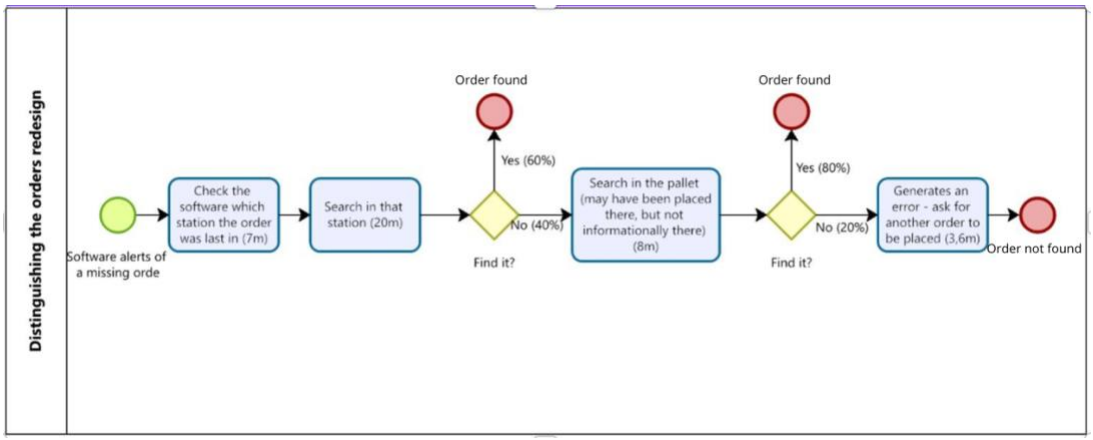

Figure 4.23 - Distinguishing the orders redesign

Therefore, it is crucial to redesign the process as shown in Figure 4.22, so that there is a clear visual differentiation between orders for home delivery and those for pick up in store, both when they are packed in bags and when they are packed in cardboard boxes. It turned out that the cost of the yellow tape would be the same as the brown tape, and that the price of the blue bags is the same as the white bags, so on a monetary level, this measure would have no negative impact. Nevertheless, as can be seen in Figure 4.23, this measure would be quite advantageous in terms of time, since with this solution the duration of the distinction will become approximately 31 minutes per day (saving 11 minutes daily), which will give an annually total cost of 2451,58€.

4.7. Process Implementation

Arriving at this phase of the process analysis, comes the need to understand how each of these improvements can be implemented.

Starting with the updated productivity measures, these are crucial to the team's decisions and forecasts. Once the process execution times were timed from january until may 2022, and the average values for the current productivity were calculated for each process, they were communicated to the e-commerce team management for input into operational decision making and future forecasts.

Regarding picking delay, the proposal to change the hours at which picking is done by the remaining teams was approved. Therefore, in march 2022, the adventure, bulky, hiking, water, fitness and colrun teams have updated its picking schedule starting their picking activities at 12 a.m. and 7 p.m. For this change to have been implemented successfully, the leaders of each of the teams had to coordinate the team, adapting their schedule to the new picking times, and passing them the necessary recommendations to make this change successful.

It is important to keep in mind that this entire project was developed in conjunction with the e-commerce team, and all the proposals were checked and approved by the head of the department. All proposals correspond to an existing problem, and therefore it is expected that their implementation

will bring an advance for the e-commerce team to the corresponding process, making the team save resources, become more efficient and increasing their KPIs, labour productivity and delivery promise. As such, the proposals regarding the problems related to the loss of time transporting @z merchandise, bulky items shipment, and distinguishing the orders are waiting for a possible implementation. Hereinafter, it will be explained in general terms, which procedures are necessary for the following proposals to be implemented, if so, decided by those responsible.

Overall, for the proposal regarding time saving in the transportation of goods to the @z to be implemented, an agreement would be needed between the e-commerce and the dock teams, where an amount would be established that the first team would pay to the second one.

For the proposal regarding the shipping of the bulky items to be implemented, there would have to be a new contract with the carriers so that they would be prepared to ship the giant items in such quantity. In addition, it would also be important to implement marketing policies on the website, so that customers would understand the benefits of this practice and feel more attracted to it.

Finally, regarding the proposal to change the physical appearance of the orders so that they are easier to distinguish, it would be important that the employees receive further training. This training should show the new correct way of packing orders and the colors associated with each type of transport.

4.8. Process Monitoring and Controlling

Finally, in this last phase of our analysis, it is only possible to consider the proposals that were implemented in the team's daily routine. Thus, starting with the updating of productivity per process, this measure brought improvements in management, organization, and staff allocation. These measures will be more noticeable when the team feels the need to hire specially to cope with an increase in orders, which occurs at specific times of the year, such as black Friday, Christmas, or sales.

As for the change in picking hours that occurred in March, this proved extremely beneficial to the increase in the team's KPIs, since according to the table 4.7., there was a very significant increase in them, especially in the delivery promise, compared to the period before this implementation. It is possible to conclude that the implementation of this improvement was significantly beneficial to Decathlon, since as the same warehouse opening hours, it was possible to increase operational time. With this increase, it is viable to increase shipping of orders, allowing the team to fulfill the delivery promise to its customers.

Month	Labour productivity (%)	Delivery promise (%)
January	32	76,41
February	28	80,35
March	28	91,30
April	32	90,40
May	36	93,52
June	32	92,73
July	32	92,02
August	29	93,67
September	34	92,58

Table 4.7. - Labour productivity and delivery promise among the year

5. Conclusion

This entire project was developed at CAR Setúbal, namely in the e-commerce team, responsible for delivering Decathlon products to clients who buy from their homes. This sector has a growing trend, becoming more and more popular with consumers, which creates the need to make it increasingly efficient. Thus, this work aimed to answer the research question *"How can Decathlon's logistical processes related to online orders be more efficient?"*, in a perspective of taking advantage of the available resources, so that the suggestions could be effectively implemented, contributing to the increase of Decathlon's performance.

At an early stage, specific objectives were set to organize the research, and at this final stage, it is important to consider their achievement.

- Examination of the current operation of CAR Setúbal, particularly through the mapping of the e-commerce team processes on the basis of the SCOR Model: objective achieved, thanks to the construction of flowcharts in Bizagi (following the mentioned Model), based on the observation and interviews of the executors of each of the processes and their timing;
- Characterization of the e-commerce logistical processes, based on the previous process mapping: objective fulfilled, since a narrative was elaborated in 4.4., based on the flowcharts, which characterizes in greater detail each of the processes;
- Identification of the inefficiencies existing in the model: objective fulfilled, since after understanding the process, a reflection was made in order to find the following problems: outdated productivity measurements, picking delays, loss of time transporting @z merchandise, bulky items shipment and distinguishing the orders;
- Prioritization of the inefficiencies in order to understand which are the most significant ones: objective achieved, once qualitative and quantitative analyses were elaborated that calculated the monetary impact of the problems, and periodized them;
- Redesign of the process through the proposal and implementation of improvements in order to correct the inefficiencies: objective reached in point 4.6, in which an improvement proposal was presented for each problem redesigning the process and trying to improve the performance of each of the issues;
- Assessment of the suggested improvements, comparing the processes before and after the implementation of improvements: Objective partially met, since in 4.7. it was mentioned, in a general way, how the improvements were/could be implemented, if Decathlon was able to do so;
- Presentation of recommendations: This goal will be tightened next.

In terms of recommendations, and in addition to the proposals for improvement mentioned in the previous points, it should be noted that Decathlon tries to cultivate its employees. To this end, the company invests in employees 'training and giving them the opportunity to play an active role, accepting their proposals for improvements and new ideas, and this effort must be maintained, so that talents are retained, and new ones attracted. As for the operational part, it would be important that there was a greater maintenance of the operational equipment, namely through the acquisition of RFID reader since these are crucial for the increase of productivity, namely in the @z. In addition, it is of utmost importance that employees are made more aware of how important it is to clean their workstation and replenish it with consumables, as this increases efficiency, especially at the packing station. It would also be extremely interesting if there were an investment in RFID technology for the shipping pallets. Since all of Decathlon's articles already have an RFID tag, it would be very efficient if the pallets automatically recognized them through this technology, and there would be no need for manual unit association, which takes time and can lead to errors due to forgetfulness. This measure is also associated with the problem of order distinction, since with this method it would no longer be possible for the order to be physically on the pallet, and informatically not. This would be a very pertinent issue to be studied in a future project, as would the elaboration of a more in-depth study on the problem of shipping bulky items, looking not only at the e-commerce team's point of view, but also at the extra costs of transporting a much larger number of orders via carrier versus what it costs.

References

Agregados domésticos privados com computador, com ligação à Internet e com ligação à internet através de banda larga (%). (2022, July 29). Pordata. https://www.pordata.pt/portugal/agregados+domesticos+privados+com+computador++com+ligacao+a+internet+e+com+ligacao+a+internet+atraves+de+banda+larga+(percentagem)-1158

APICS. (2017). Supply Chain Operations Reference Model.

APICS. (2022). SCOR Model. Association for Supply Chain Management. https://scor.ascm.org/processes/introduction

Bell, E., Bryman, A., & Harley, B. (2018). Business Research Methods. Oxford University Press.

Bezes, C. (2016). Comparing online and in-store risks in multichannel shopping. International Journal of Retail & Distribution Management, 44(3). https://doi.org/10.1108/ijrdm-02-2015-0019

Bibi, F., Guillaume, C., Gontard, N., & Sorli, B. (2017). A review: RFID technology having sensing aptitudes for food industry and their contribution to tracking and monitoring of food products. Trends in Food Science &Amp; Technology, 62, 91–103. https://doi.org/10.1016/j.tifs.2017.01.013

Birkinshaw, J. (2018). What to expect from agile. Sloan Management Review, 59, 40–43

Bottani, E., & Bertolini, M. (2009). Technical and economic aspect of RFID implementation for asset tracking. International Journal of RF Technologies: Research and Applications, 1(3), 169–193. https://doi.org/10.1080/17545730903159034

Bradbury-Huang, H. (2015). The Sage Handbook of Action Research. Sage Publications Ltd.

Bucher, T., & Winter, R. (2009). Project types of business process management. Business Process Management Journal, 15(4), 548–568. https://doi.org/10.1108/14637150910975534

Collis, J., & Hussey, R. (2013). Business Research. Palgrave Macmillan.

CSCMP. (2013). Supply Chain Management Definitions and Glossary. CSCMP. Retrieved October 27, 2021, from https://cscmp.org/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms.aspx

Decathlon. (2021). Quem somos. Decathlon. Retrieved October 19, 2021, from https://corporate.decathlon.pt/quem-somos/?gclid=Cj0KCQjw8eOLBhC1ARIsAOzx5cE6McmRrRHOrrl_rum-xL7nNrVTzZPxLiDu8ObPTjuI6amprfu9-OAaAifEEALw_wcB

Dumas, M., la Rosa, M. L., Mendling, J., & Reijers, H. A. (2018). Fundamentals of Business Process Management. Springer Publishing.

Gnoni, M. G., & Rollo, A. (2010). A scenario analysis for evaluating RFID investments in pallet management. International Journal of RF Technologies, 2(1), 1–21. https://doi.org/10.3233/rft-2010-001

Gorane, S. J., & Kant, R. (2016). Supply chain practices. Benchmarking: An International Journal, 23(5), 1076–1110. https://doi.org/10.1108/bij-06-2014-0059

Gramling, K., Orschell, J., & Chernoff, J. (2021, May 11). How E-Commerce Fits into Retail's Post-Pandemic Future. Harvard Business Review. https://hbr.org/2021/05/how-e-commerce-fits-into-retails-post-pandemic-future

Greener, S. (2008). Business Research Methods. BookBoon.

Heskett, J. (2014, August 1). Logistics—Essential to Strategy. Harvard Business Review. https://hbr.org/1977/11/logistics-essential-to-strategy

Inquérito à utilização de tecnologias da informação e da comunicação pelas famílias. (2022). In *INE*. https://www.ine.pt/ngt_server/attachfileu.jsp?look_parentBoui=465024825&att_display=n&att_download=y

Kembro, J. H., & Norrman, A. (2019). Warehouse configuration in omni-channel retailing: a multiple case study. International Journal of Physical Distribution & Logistics Management, 50(5), 509–533. https://doi.org/10.1108/ijpdlm-01-2019-0034

Kembro, J. H., & Norrman, A. (2020). Which future path to pick? A contingency approach to omnichannel warehouse configuration. International Journal of Physical Distribution & Logistics Management, 51(1), 48–75. https://doi.org/10.1108/ijpdlm-08-2019-0264

Lewin, K. (1946). Action Research and Minority Problems. Journal of Social Issues, 2(4), 34–46. https://doi.org/10.1111/j.1540-4560.1946.tb02295.x

Pfohl, H., & Zöllner, W. (1997). Organization for logistics: the contingency approach. International Journal of Physical Distribution & Logistics Management, 27(5/6), 306–320. https://doi.org/10.1108/09600039710175895

Saunders, M. N. K., Lewis, P., & Thornhill, A. (2015). Research Methods for Business Students (7th Edition) (7th ed.). Pearson.

Szelągowski, M. (2018). Evolution of the BPM Lifecycle. Communication Papers of the 2018 Federated Conference on Computer Science and Information Systems. https://doi.org/10.15439/2018f46

Tarigan, Z. J. H., Jiputra, J. A., & Siagian, H. (2021). The effect of supply chain practices on retailer performance with information technology as moderating variable. International Journal of Data and Network Science, 47–54. https://doi.org/10.5267/j.ijdns.2020.11.003

Teixeira, A., Costa E Silva, E., Lopes, C., & Santos, J. F. (2019). Supply Chain Purchasing Domain Optimization in a Portuguese Retail Company. Operational Research, 199–214. https://doi.org/10.1007/978-3-030-10731-4_14

What is Business Process Management (BPM)? Benefits & Examples (2020). (2022). Happy Fox. https://www.happyfox.com/what-is-business-process-management/

Yu, Y., Wang, X., Zhong, R. Y., & Huang, G. (2017). E-commerce logistics in supply chain management. Industrial Management & Data Systems, 117(10), 2263–2286. https://doi.org/10.1108/imds-09-2016-0398

Zhang, J., Onal, S., Das, R., Helminsky, A., & Das, S. (2019). Fulfilment time performance of online retailers – an empirical analysis. International Journal of Retail & Distribution Management, 47(5), 493–510. https://doi.org/10.1108/ijrdm-10-2017-0237

Zhu, X., Mukhopadhyay, S. K., & Kurata, H. (2012). A review of RFID technology and its managerial applications in different industries. Journal of Engineering and Technology Management, 29(1), 152–167. https://doi.org/10.1016/j.jengtecman.2011.09.011

Annexes

Annex A

Managers • How do the processes in the CAR work? • How does the supply process work?
Workers • How does your day-to-day work? • What are the main difficulties in your job? • In what ways could your work be simplified?

Table A.1 - Questions from the semi-structured interviews

Annex B

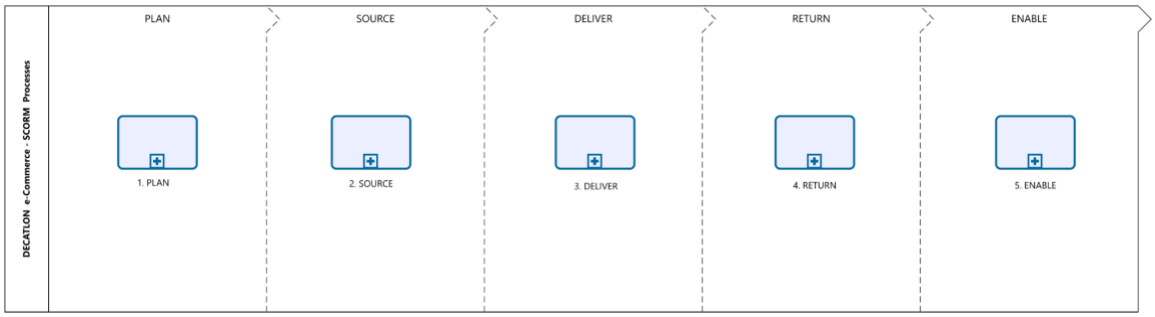

Figure A.1 - SCOR model of e-commerce team activity

Annex C

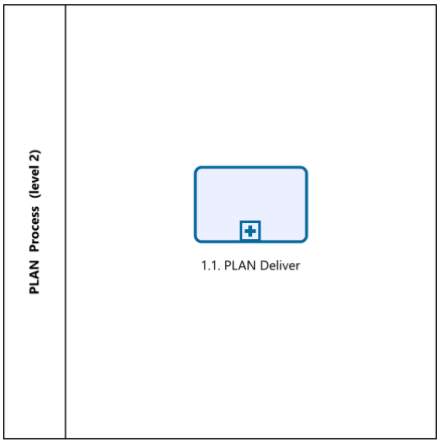

Figure A.2 - Plan (level 2) in SCOR model

Annex D

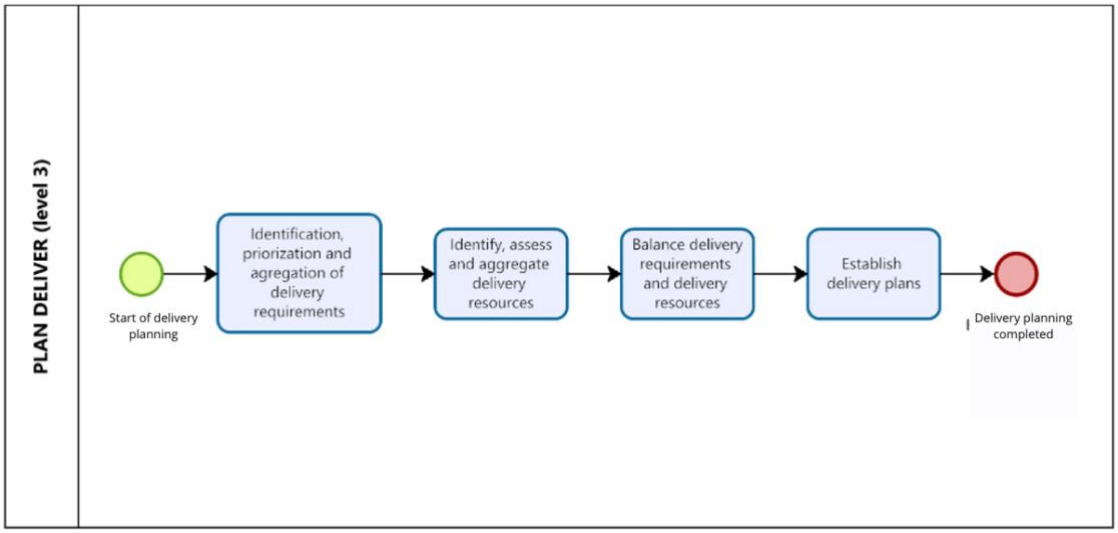

Figure A.3 - Plan Deliver (level 3) in SCOR model

Annex E

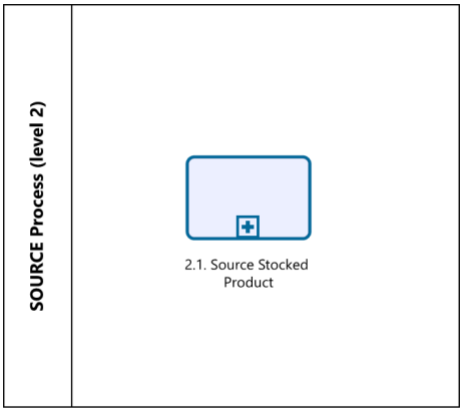

Figure A.4 - Source (level 2) in SCOR model

Annex F

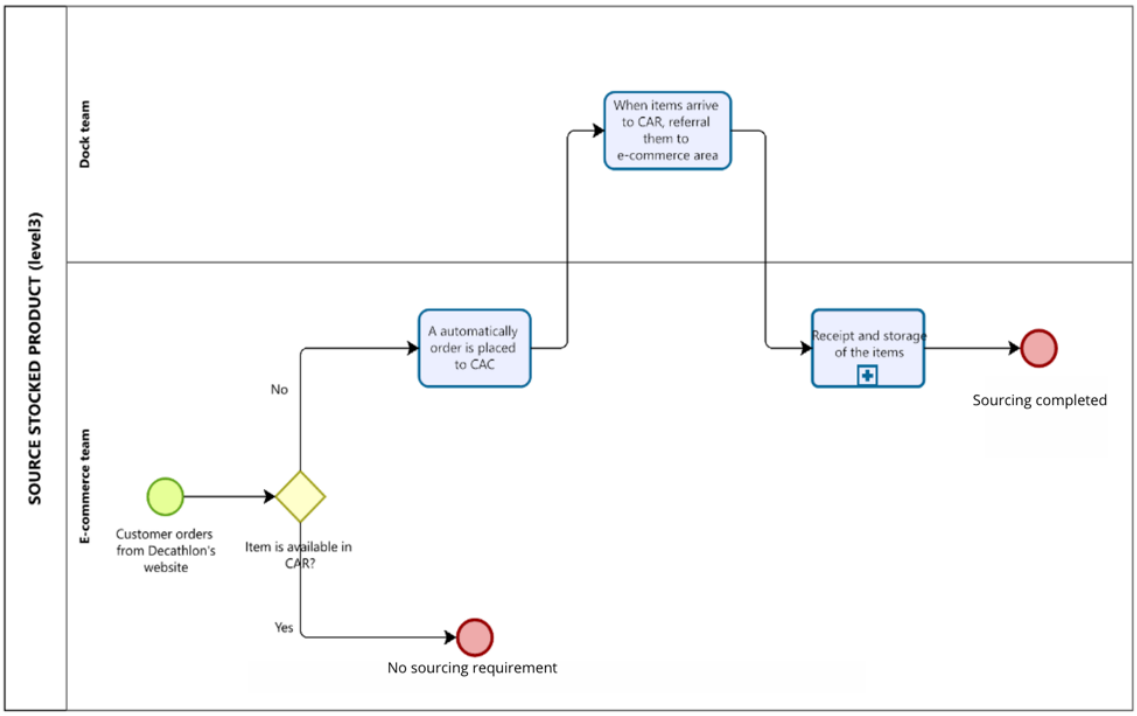

Figure A.5 - Source stocked product (level 3) in SCOR model

Annex G

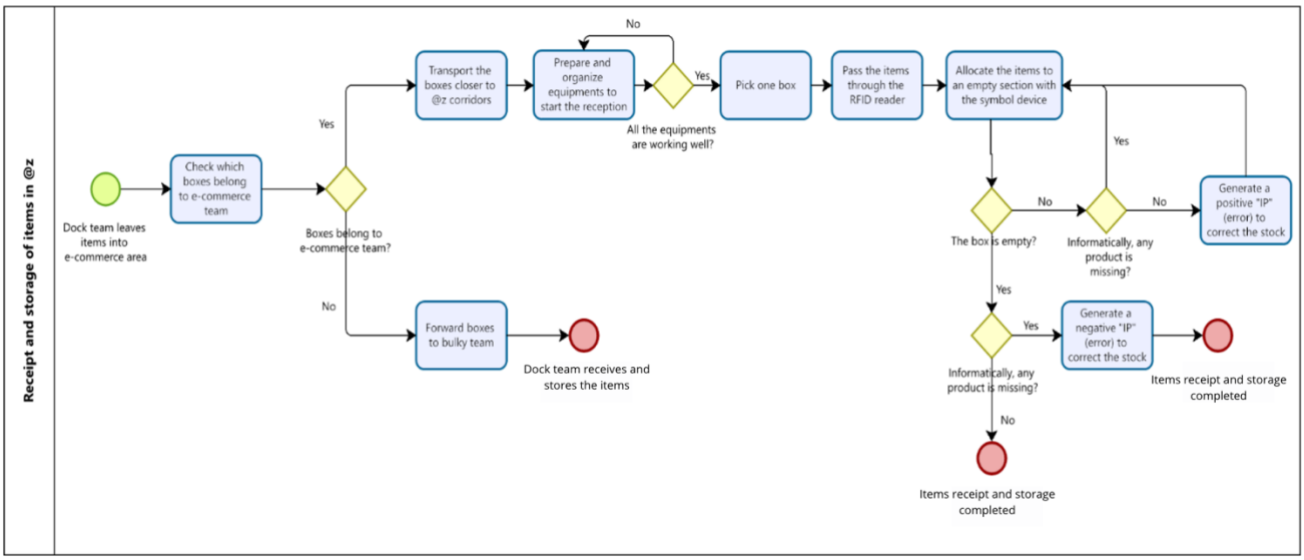

Figure A.6 - Receipt and storage of items in @z (level 4) in SCOR model

Annex H

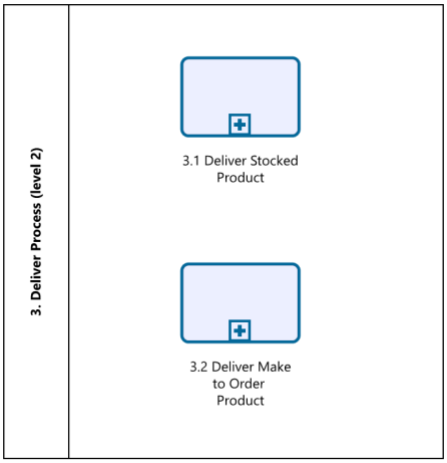

Figure A.7 - Deliver (level 2) in SCOR model

Annex I

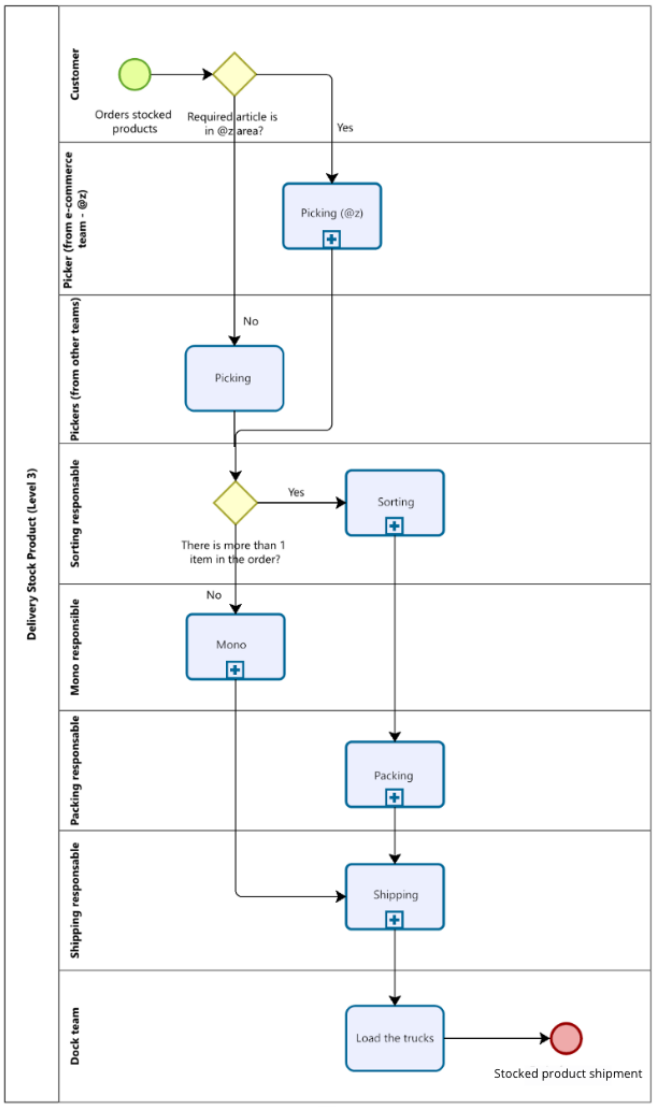

Figure A.8 - Deliver stock product (level 3) in SCOR model

Annex J

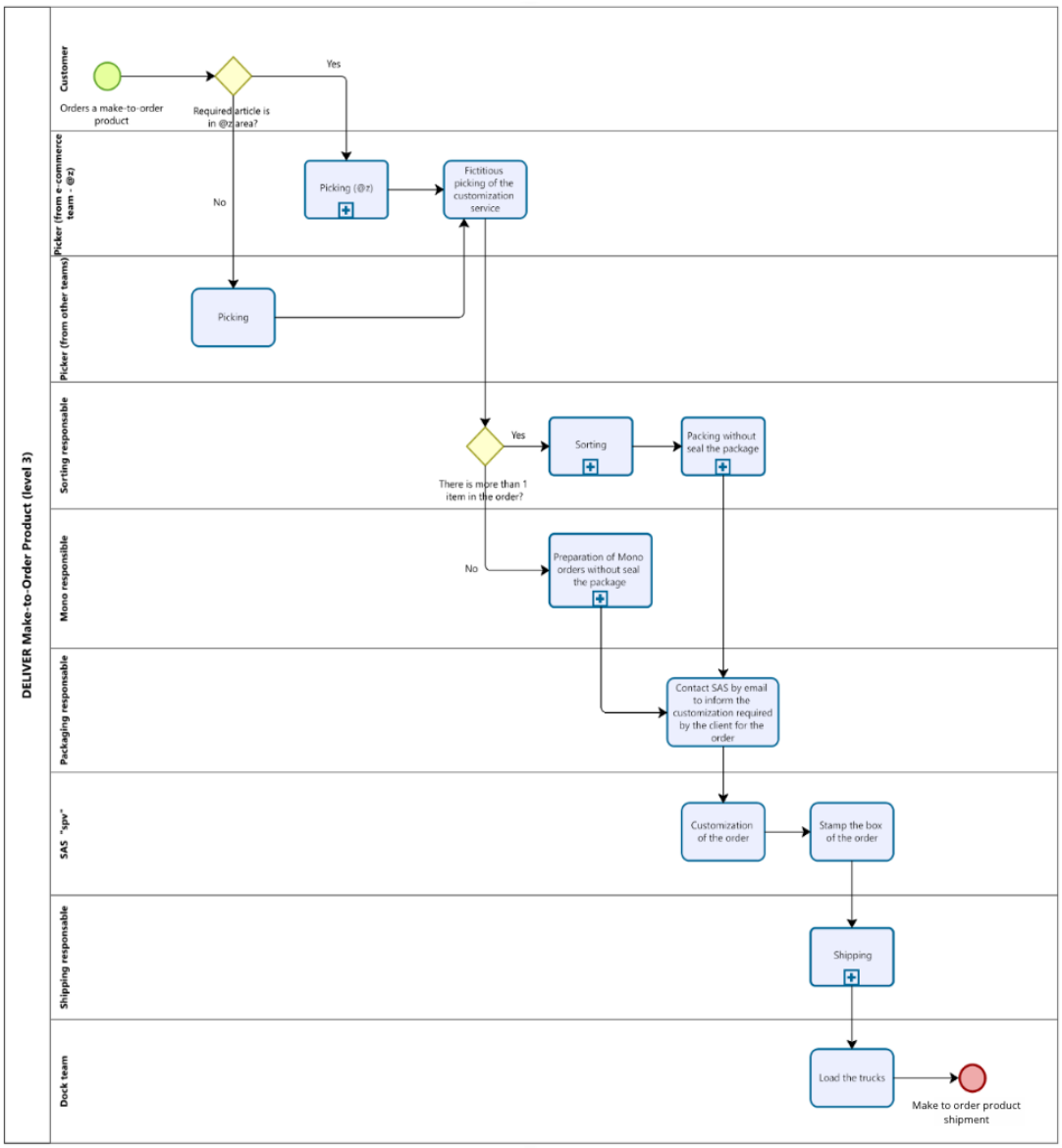

Figure A.9 - Deliver make-to-order product (level 3) in SCOR model

Annex K

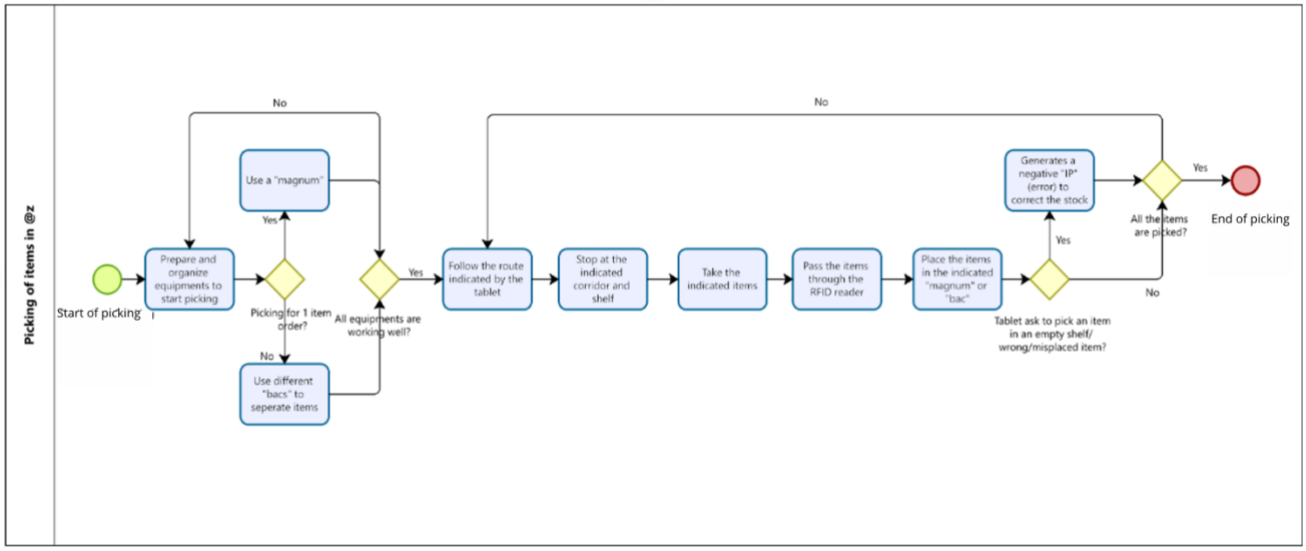

Figure A.10 - Picking of items in @z (level 4) in SCOR model

Annex L

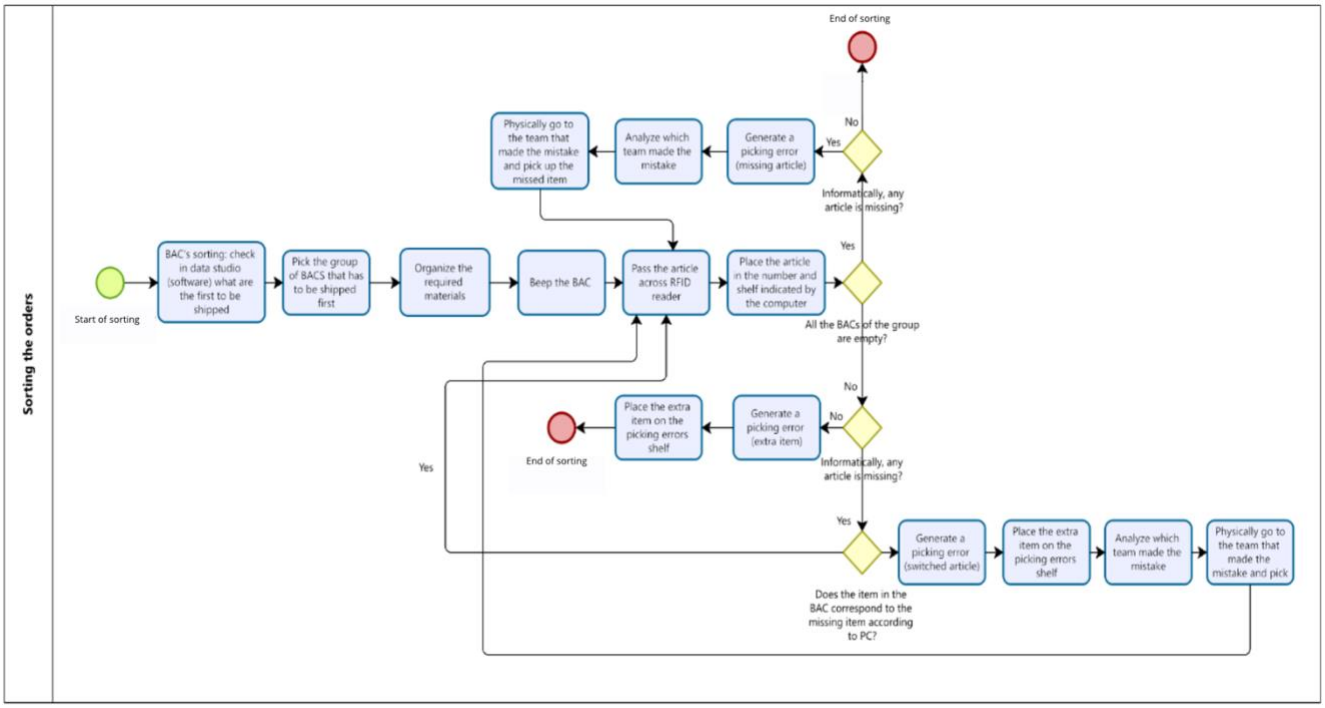

Figure A.11 - Sorting process (level 4) in SCOR model

Annex M

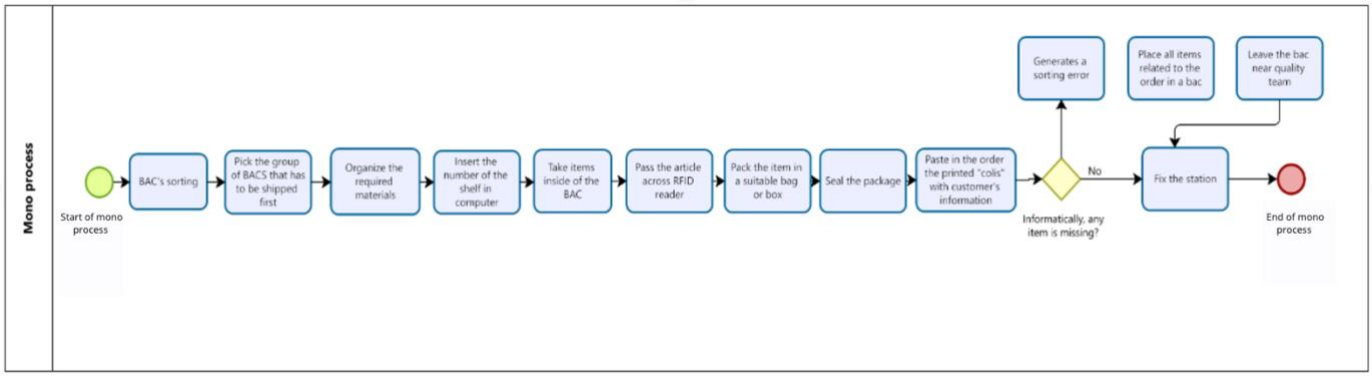

Figure A.12 - Mono process (level 4) in SCOR model

Annex N

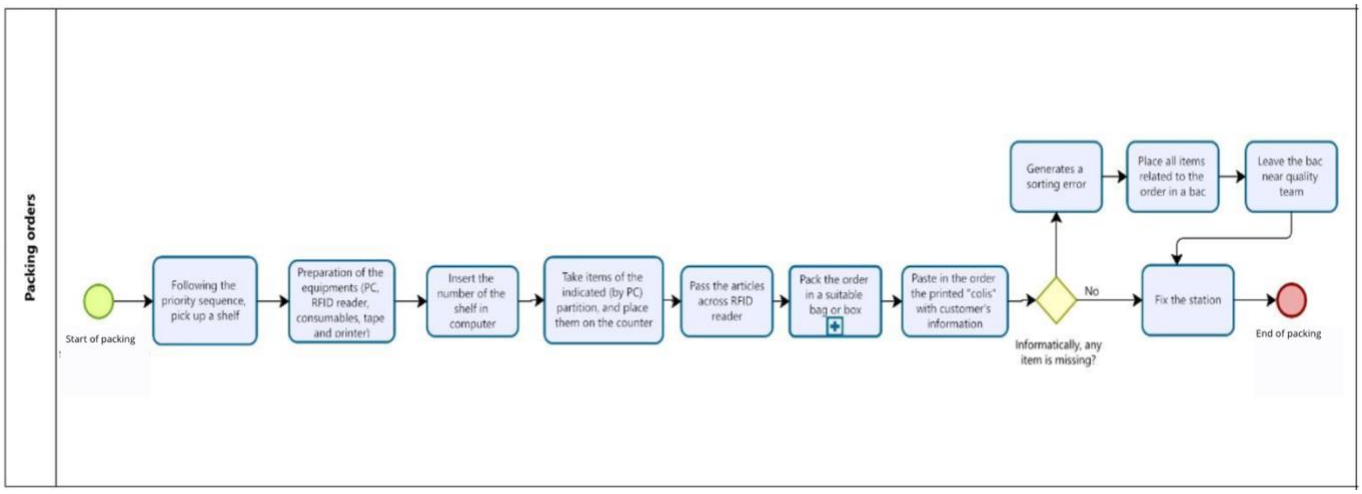

Figure A.13 - Packing process (level 4) in SCOR model

Annex O

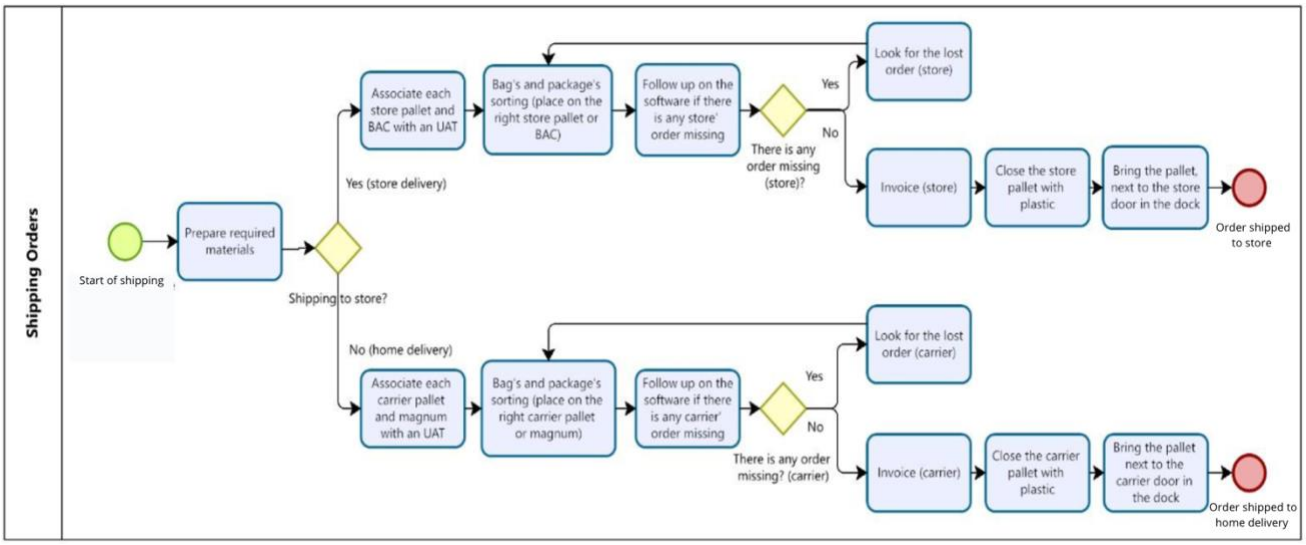

Figure A.14 - Shipping process (level 4) in SCOR model

Annex P

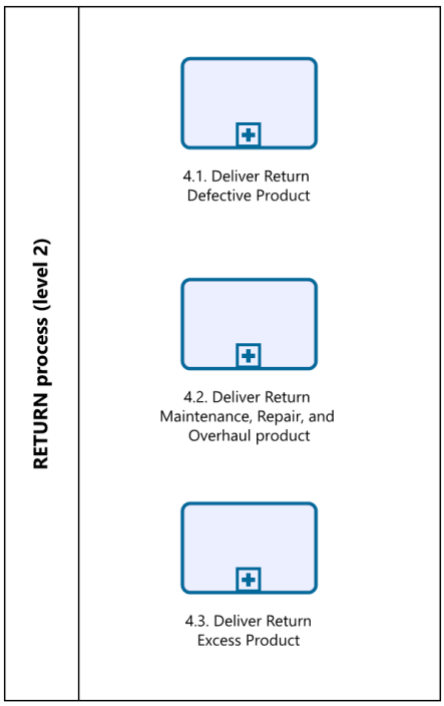

Figure A.15 - Return (level 2) in SCOR model

Annex Q

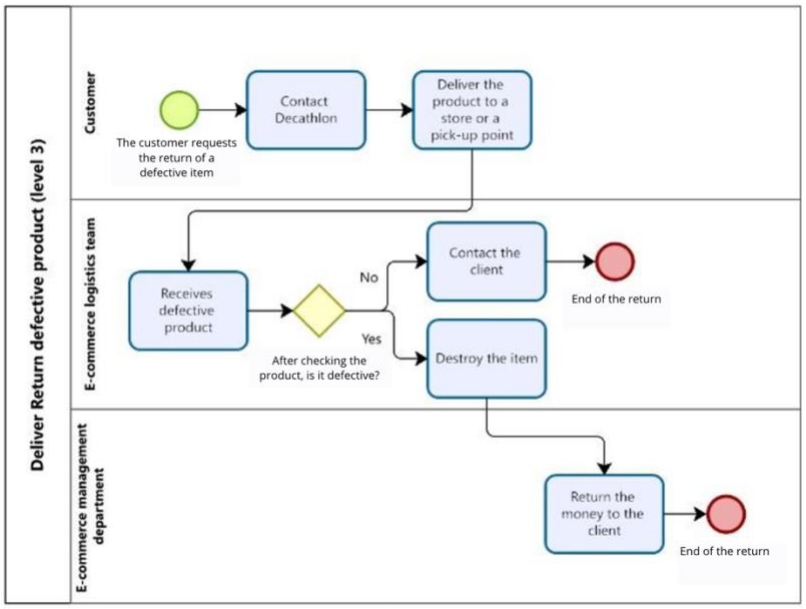

Figure A.16 - Deliver return defective product (level 3) in SCOR model

Annex R

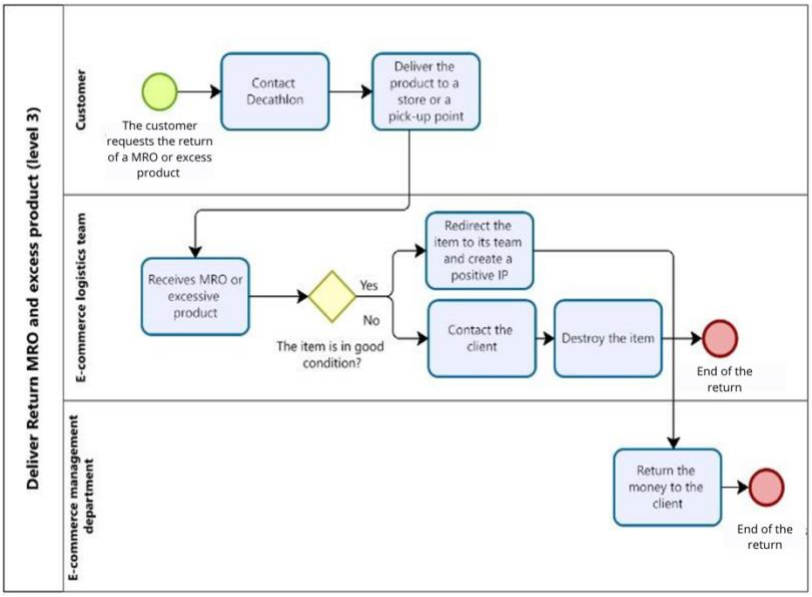

Figure A.17 - Deliver return MRO and excess product (level 3) in SCOR model

Annex S

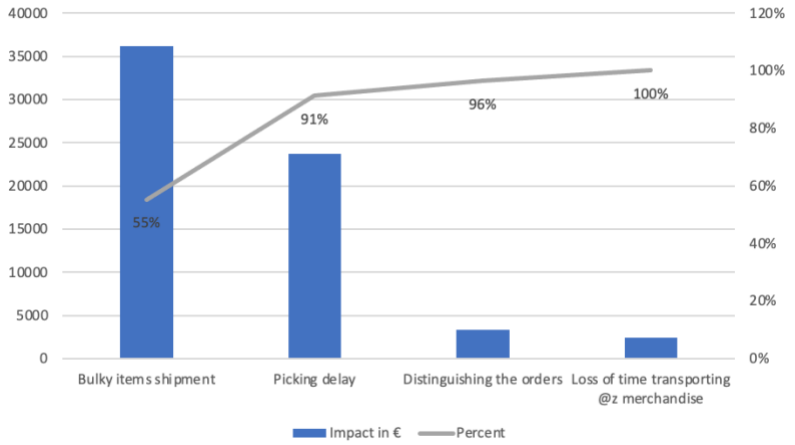

Figure A.18 - Pareto chart

Annex T

Process	Quantity of articles	Time (in minutes)	Average (in minutes)	Average (in hours)
Sorting	244	55,40	4,40	264,26
Sorting	30	13,30	2,26	135,34
Sorting	215	67,07	3,21	192,34
Sorting	305	39,33	7,75	465,29
Sorting	110	12,06	9,12	547,26
Sorting	100	18,22	5,49	329,31
Sorting	21	6,29	3,34	200,32
Sorting	205	32,1	6,39	383,18
Sorting	234	31,5	7,43	445,71
Mono	64	46,42	1,38	82,72
Mono	58	39,07	1,48	89,07
Shipment	12	6,25	1,92	115,20
Shipment	24	20,08	1,20	71,71
Shipment	39	17,26	2,26	135,57
Shipment	188	168,9	1,11	66,79
Shipment	37	18,33	2,02	121,11
Shipment	45	20,66	2,18	130,69
Shipment	112	74,42	1,50	90,30
Shipment	202	214	0,94	56,64
Shipment	389	191	2,04	122,20
Shipment	174	138	1,26	75,65
Shipment	463	140	3,31	198,43
Shipment	134	130	1,03	61,85
Shipment	424	322	1,32	79,01
Reception @z	145	75,32	1,93	115,51
Reception @z	20	6,23	3,21	192,62
Reception @z	52	13,06	3,98	238,90
Reception @z	23	14,06	1,64	98,15
Reception @z	5	8,22	0,61	36,50
Reception @z	22	8,36	2,63	157,89
Reception @z	143	44,33	3,23	193,55
Reception @z	69	20,59	3,35	201,07
Reception @z	75	20,48	3,66	219,73
Reception @z	58	15,18	3,82	229,25
Picking @z	96	35,14	2,73	163,92
Picking @z	35	18,54	1,89	113,27
Picking @z	29	13,46	2,15	129,27
Picking @z	23	12,25	1,88	112,65
Picking @z	44	19,2	2,29	137,50
Picking @z	2	1,02	1,96	117,65
Picking @z	2	1,49	1,34	80,54
Packing	16	57,48	0,28	16,70
Packing	6	22,06	0,27	16,32
Packing	18	24,32	0,74	44,41
Packing	15	24,52	0,61	36,70
Packing	5	8,05	0,62	37,27
Packing	15	20,32	0,74	44,29
Packing	21	20,16	1,04	62,50

Average sorting	329,22
Average mono	85,90
Average shipping	101,93
Average reception @z	168,32
Average picking @z	122,11
Average packing	36,88

Figure A.19 – Updated productivity measurements

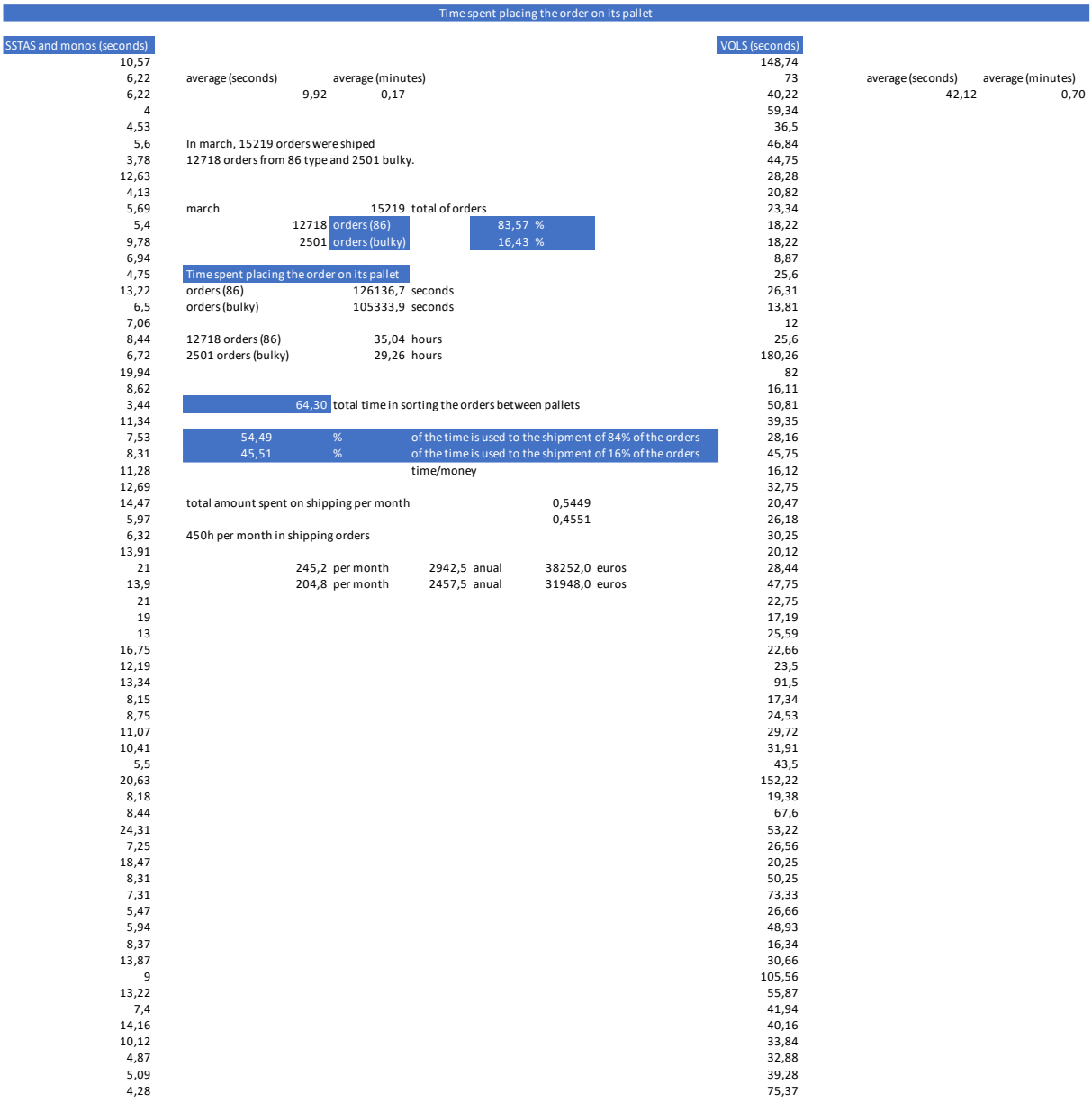

Figure A.20 – Time spent sorting orders among pallets

Annex U

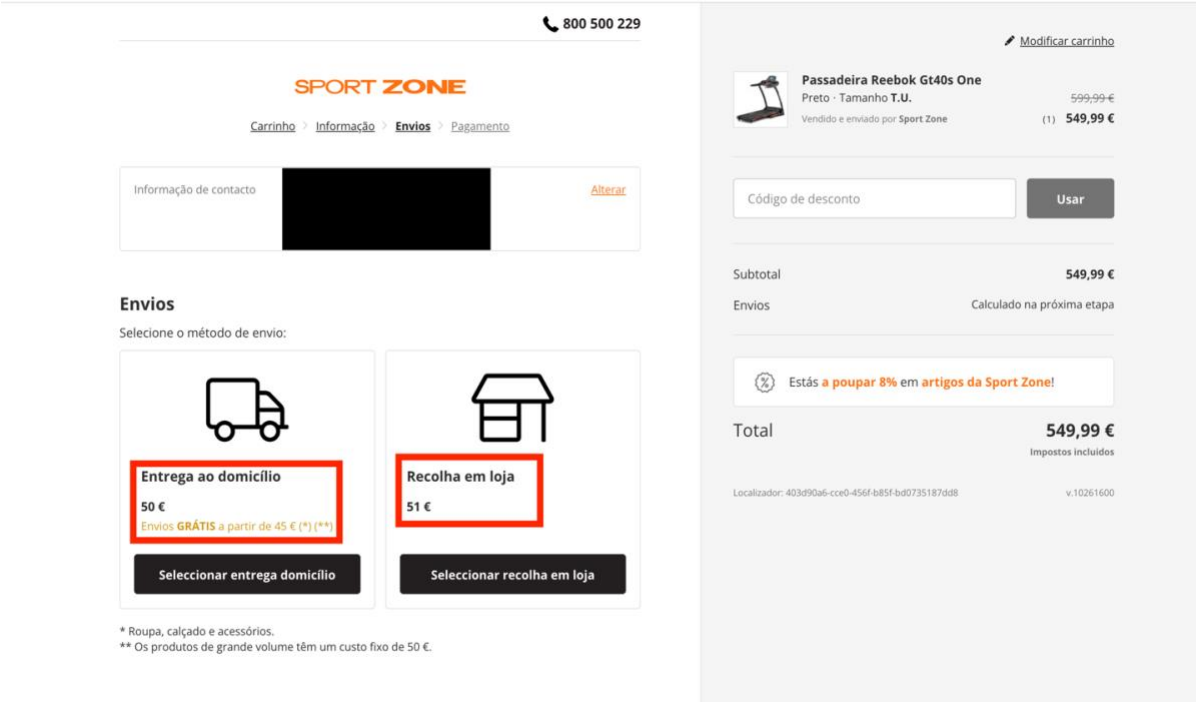

Figure A.21 - Sportzone shipping costs

Annex V

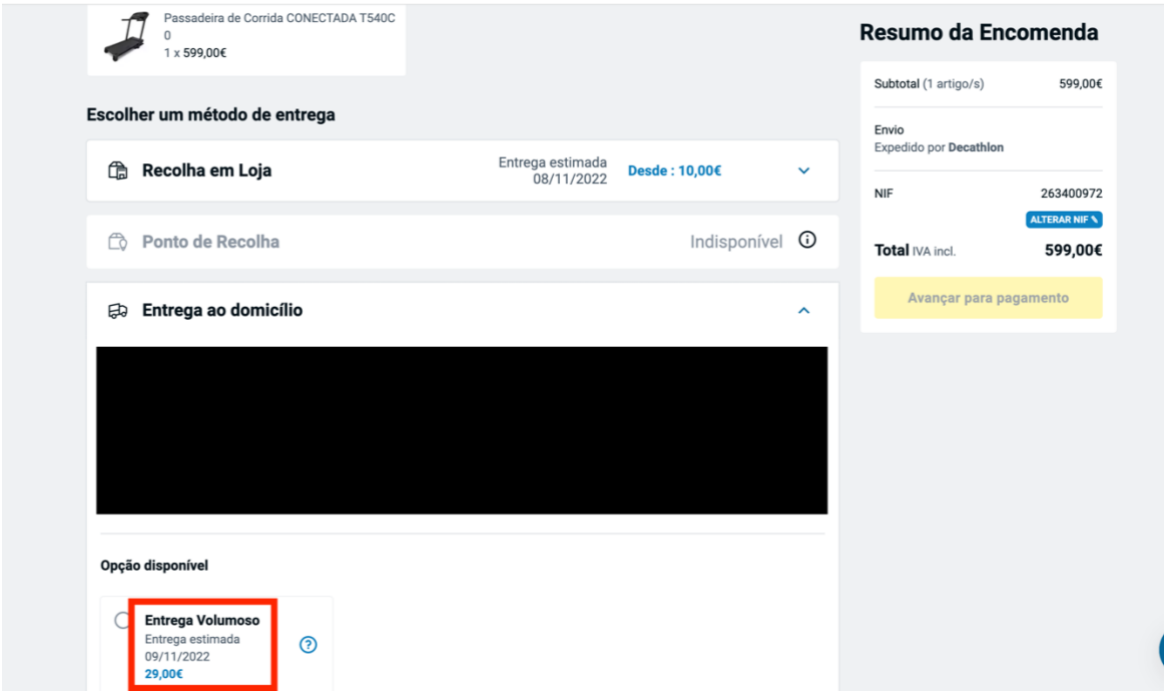

Figure A.22 - Decathlon shipping costs