
Improving the order fulfilment process of a make-to-order company: the case of CorkCo

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Internship report

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Bibliographic note

Mariana Afonso Duarte de Oliveira e Silva was born on the 26th November of 1996 in Porto, Portugal. She was always passionate about new challenges and languages. Although she did her high school education in the Science and Technology field she decided to start her higher education in a Translation and Administrative Assistance course at Instituto Superior de Contabilidade of Porto. Her first contact with the management world was during her Erasmus experience in Germany in the third year of her bachelor's degree. After that she became interested in learning more about management and decided to enrol in the Master of Management course in Faculdade de Economia of Porto.

In addition to her academic studies, she has always been involved in extracurricular activities while working part-time during weekends or during the summer holidays. She helped in the organization of a summer school about Technical Communications for two consecutive years and did other extracurricular internships that helped her develop capacities that otherwise she would not have acquired.

During her Masters' degree she had the opportunity of joining other projects, such as the Loreal Brandstorm where her group reached the national finals. More than just a challenge, it was yet another experience that helped her learn. In the final year of her Master's Mariana did a seven-month internship in the logistics department of a cork company, which served as the basis of this internship report.

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Abstract

Order fulfilment is one of the key processes in the management of the supply chain. It is understood to be a crucial business process for achieving and maintaining competitiveness. Companies therefore need to know how to satisfy orders efficiently.

This research emerged from an internship proposal, where the main aim was to improve the order fulfilment process of a cork company. The production process for the order fulfilment under analysis was the make-to-order (MTO) type.

In order to analyse the order fulfilment process of the company, semi-structured interviews were undertaken while using other data sources such as semi-direct observation and company documents. The main aim was to detect opportunities that could be worked upon to improve the overall process.

This research is relevant as it can contribute to the improvement of a company's order fulfilment process. Results show overall the main obstacles and problems in an order fulfilment process, in this specific case, and which developments were done in order to improve it.

This research provides some practical contributions. On the one hand it shows some improvement measures that can be taken into consideration in order to improve an order fulfilment process and on the other it explores the topic of order fulfilment and how it impacts on an enterprise.

Keywords: order fulfilment process, make-to-order, customer service, cork industry

JEL-Codes: L81, M11

Resumo

Order fulfilment é um dos processos chave no que toca à gestão da cadeia de abastecimento. É entendido como um processo crucial para os negócios, de forma a conseguirem atingir e manter um nível de competitividade com outros negócios. Assim, é importante que as empresas saibam como satisfazer as suas encomendas de forma eficiente.

Esta pesquisa surgiu de uma proposta de estágio, em que o objetivo principal era melhorar o processo de *order fulfilment* de uma empresa de cortiça. O processo de produção analisado foi o tipo *make-to-order* (MTO).

De forma analisar o processo de *order fulfilment*, foram realizadas entrevistas semiestruturadas, além de outros tipos de fonte de dados, como observação semidirecta e análise de documentos da empresa.

Esta pesquisa é relevante pois contribui para a melhoria de um processo de *order fulfilment* de uma empresa. Os resultados mostram de maneira geral os principais obstáculos e problemas num processo de *order fulfilment*, e quais foram os desenvolvimentos e melhorias, realizadas neste caso, para melhorar o processo.

Esta pesquisa fornece algumas contribuições práticas. Por um lado, mostra algumas medidas de melhoria que podem ser aplicadas para melhorar um processo de *order fulfilment*. Por outro lado, explora o tópico de *order fulfilment* e o seu impacto numa empresa.

Palavras-passe: processo de *order fulfilment*, *make-to-order*, serviço de apoio a clientes, indústria corticeira

Códigos JEL: L81, M11

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1. Introduction

One of the key processes in managing a supply chain is order fulfilment as customer orders are what makes the supply chain move (Croxtan, 2003). Orders must therefore be fulfilled efficiently and successfully to improve the supply chain management (Croxtan, 2003). Consequently managers must be aware of the order fulfilment process and understand how it plays a critical role in ensuring customer satisfaction (Aydın & Kahraman, 2019). Customer satisfaction is taken into consideration by the supply chain as it is influenced by the company's ability to fulfil its customers' demands. It is therefore important to understand the customers' requirements (Aydın & Kahraman, 2019).

It is possible to find papers exploring the topic of order fulfilment from the 90's to the present with most of them mentioning the importance of the process for the company. Lin and Shaw (1998) consider order fulfilment as one of the core processes supporting company operations. Kritchanchai and MacCarthy (1999) added that order fulfilment is understood as a key business process for attaining and preserving competitiveness. Meanwhile the world has evolved and technology is used to improve the order fulfilment process; tools such as EDI have begun to be used (Croxtan, 2003). Nowadays papers are therefore more focused on online order fulfilment or order fulfilment applied to online retailing (Nguyen, Leeuw, & Dullaert, 2018). It is a complex process where it is important to obtain the right metrics. Although it is considered as an activity that is connected to logistics, designing and performing an order fulfilment it is necessary to share knowledge with other departments within a company (Croxtan, 2003).

The main goal of this research is to analyse and improve the order fulfilment process of a Portuguese Cork Company, CorkCo (the original name of the company cannot be disclosed). The company wanted to decrease the wastage of paper and time. It was therefore necessary to map the current order fulfilment process in order to propose improvements in the make-to-order production process strategy.

Therefore based on a review of available literature, on interviews of CorkCo's employees and analysing a real-world company improvements are proposed along with the analysis and improvement of the order fulfilment process of the company being analysed.

A comparison between the standard framework and the company's framework is undertaken. The objective is to detect gaps and obtain solutions for solving those problems in order to improve the company's order fulfilment process.

This research is relevant not only for the topic but also because internships are beneficial for several parties. They are valuable for students to help them enter the job market. According to Gault, Leach, and Duey (2010) students that choose an internship are better prepared to enter the job market. The benefits are not only for the students as employers also benefit from them. Interns are usually associated with projects that otherwise would not be developed and by having interns work on such projects it permits the company to allocate full-time employees to focus on other important tasks (Maertz, Stoeberl, & Marks, 2014).

This report is divided into five chapters excluding this one. In Chapter 2 a review of literature concerning order fulfilment and production processes is presented. Chapter 3 is focused on the methodology. Chapter 4 focuses on the case study object/issue description, proposing three main improvement aspects. Lastly, improvement measures are applied and explored. The report finishes with chapter 5 by concluding and presenting some limitations and future research.

2. Literature review

In this chapter the relevant topics of research are presented. In section 2.1, the concept of order fulfilment is presented and in section 2.2. the production processes are analysed, and the different types are explained, as well as, the advantages and disadvantages of both processes. In the next section, 2.3., improvement process strategies are presented. The chapter ends with a brief discussion about relevant studies that relate to order fulfilment and make-to-order processes.

2.1. Order fulfilment

Order fulfilment is essential for supply chain management as filling in customer orders is what triggers the supply chain progression (Croxtton, 2003). Furthermore it is one of the core processes supporting the company (Lin & Shaw, 1998). It is also an important aspect of a company's competitiveness since it is part of its related activities (Espino-Rodríguez & Rodríguez-Díaz, 2014). Therefore, as Croxtton (2003) refers, orders must be fulfilled efficiently and successfully to improve supply chain management.

Lin and Shaw (1998) pointed out the importance of connecting the order fulfilment process (OFP) with the supply chain network (SCN) for three main reasons. Firstly, the order fulfilment cannot be controlled only by focusing on the company, but instead also on the other entities such as suppliers and distributors. The success of order fulfilment therefore requires coordination between the company and their network. Secondly it is also important to coordinate all the timings, since the overall goal is to deliver the customer order on time. Consequently, it is important to have a good management of the SCN. Thirdly, products can be different, which means that OFP can be different, depending on the product that the customer is requesting. The SCN has therefore to be adapted to the OFP in order to obtain the most efficient result (Lin & Shaw, 1998).

Order fulfilment in literature is a topic that has been studied for years regarding its own concept or associated with other issues. It is therefore interesting to analyse the different aspects that authors investigated throughout their studies, which is summed up on Table 1.

Table 1 - Studies related with order fulfilment

Approaches	Authors	Aim of the study
Analysis/ re-engineer of the process itself in or- der to improve it	Aydın and Kahraman (2019)	Optimization of order fulfilment
	Croxton (2003)	Analysis of the order fulfilment
	Kritchanchai and Mac- Carthy (1999)	Analysis of the responsiveness of the order fulfilment
	Lawson, Pil and Holweg (2018)	Analysis of a multi-modal order fulfilment process
	Leung, Choy, Siu, Ho, Lam, and Lee (2018)	Re-engineer of the e-order fulfilment process
	Lin and Shaw (1998)	Re-engineer the order fulfilment process in supply chain networks
	Shamsuzzaman <i>et al.</i> (2018)	Improvement of order fulfilment process in a telecommunications service sector
Customer related studies	Davis-Sramek, Mentzer and Stank (2008)	Order fulfilment service operations in the creation of durable retailer customer loyalty
	Espino-Rodríguez and Rodríguez-Díaz (2014)	Analysis and determination of the core activities of the order fulfilment process
	Nguyen, Leeuw, Dullaert (2018)	Analysis of the customer behaviour and order fulfilment in online retailing
Production processes influence	Jiao, Zhang and Pokharel (2005)	Analysis of order fulfilment in mass customization
	MacCarthy (2013)	Order fulfilment and its relationship with variety and customisation
	Shao and Dong (2012)	Comparison of order fulfilment performance in MTO and MTS systems
Information quality	Forslund (2007)	Creation of a scale for measuring information quality in the order fulfilment process

Source: Literature Review

As is noticeable from Table 1, recent studies focus on e-commerce or online retailing. That happens because the world nowadays is a world of digitalization (Leung *et al.*, 2018). This has led to a lot of changes not only in the manner that customers behave but also in the logistics industry. As a consequence it has been necessary to check order fulfilment in order to adapt the process to the times we are living in (Leung *et al.*, 2018).

Regarding the design of an order fulfilment process, according to Croxton (2003), it has to be borne in mind that order fulfilment has both strategic and operational elements. Strategic elements are thus responsible for managing the process. In other words, they are responsible for creating the OFP. These elements follow five steps: : i) review marketing strategy, supply chain structure and customer service goals, ii) define requirements for order fulfilment, iii) evaluate the logistics network, iv) define a plan for order fulfilment, and v) develop a framework of metrics (Croxton, 2003, pp. 22-26). Therefore the operational elements are the activities of the order fulfilment process (Croxton, 2003).

When designing an order fulfilment process, it can be measured in four different dimensions: efficiency, flexibility, robustness and adaptability. Firstly as regards efficiency, the main concern is the reduction of the order fulfilment cycle time (Lin & Shaw, 1998), which is extremely important to ensure the business's competitive advantages. However during the order fulfilment process, there are several steps that can increase its length, and therefore increase its cycle time. For example, when receiving customer orders, lack of information can be one of the problems. Also, the product that has been ordered can influence the length of the process, depending on the machine/workstation that is required for its production. These are examples of aspects that can increase the time (Xu, Zhao, Wu, Zhou, Ma, & Liu, 2016). Secondly, when there are changes in the process, it is important to minimize costs that are related to these changes and, therefore, flexibility. Thirdly, the order fulfilment needs to have the capacity to operate under uncertain conditions and needs to be robust for this. Lastly, it is important that by self-learning the process has the capacity to improve. It is therefore important that the process is adaptable (Lin & Shaw, 1998).

2.1.1. Activities

Although being considered as a logistics related activity, designing and performing an order fulfilment requires the sharing of knowledge with other departments within the

company (Croxtion, 2003). Order fulfilment therefore consists of different activities that are studied in several papers (Amer, Luong, Lee, & Ashraf, 2008; Croxtion, 2003; Espino-Rodríguez & Rodríguez-Díaz, 2014; Lin & Shaw, 1998) as demonstrated in Table 2 below.

Table 2- Order fulfilment activities

	[1]	[2]	[3]	[4]
Order entry	X	X	X	X
Customer control			X	
Stock/ Inventory control	X	X	X	
Production order	X		X	
Manufacturing			X	X
Storage	X		X	X
Preparation of the order		X	X	X
Invoicing/delivery note		X	X	
Shipping/ Transportation	X	X	X	X
Post Delivery activities		X		X
Measure Performance		X		

Source: Own elaboration based in [1] (Lin & Shaw, 1998) ; [2] (Croxtion, 2003); [3] (Espino-Rodríguez & Rodríguez-Díaz, 2014); [4] (Amer *et al.*, 2008)

By analysing Table 2 one notices that there are two activities that are common to the four studies: order entry and shipping/transportation. Regarding the activities, Espino-Rodríguez and Rodríguez-Díaz (2014), analysed these in a manner so as to understand which created value to the customer and which did not. They concluded that activities concerned with stock, order, storage are not core capabilities, while activities such as customer control, manufacturing and transportation were considered as core competences. Consequently, these latter activities are important to ensure competitive advantages.

2.1.2. Product variety: approaches and problems

At present companies offer greater product variety to customers. This is because companies want to provide more choice to customers in order to compete with other businesses (Um, Lyons, Lam, Cheng, & Dominguez-Pery, 2017). Although it is a method

for attracting customers, it increases complexity and managerial costs (Pil & Holweg, 2004). This problem was pointed out in the late 90's by Kirchanchai and MacCarthy (1999), stating that developing an adequate process that can deal with volume and variety is complex. Therefore, and according to MacCarthy (2013), creating an effective and successful order fulfilment process has started to become a challenge.

Businesses feel the urge to compete by providing different levels of choice (MacCarthy, 2013). In order to do so, studies analyse what they denominate as order fulfilment strategies (MacCarthy, 2013; Pil & Holweg, 2004). According to MacCarthy (2013), it is necessary to analyse the demand characteristics across product ranges, in order to adapt and select different order fulfilment strategies. This happens because product variety is hardly static. Moreover, depending on the business sector, the rate of change varies. It usually evolves market forces when new products and variants are introduced or discontinued. Other aspects that affect variety and customisation are technological developments and innovations, especially in web-based sales channels.

2.2. Production processes

Due to market competitiveness companies feel intense pressure on their order fulfilment performance. To get better performance and therefore succeed, companies must decide on the production process most suitable for their product and market. The creation of an efficient production system is therefore one of the key challenges. It is thus important to bear in mind some questions, for example, the average waiting time, the order processing time (Shao & Dong, 2012), etc.

MacCarthy (2013) mentions four standard approaches that are mentioned in literature to describe how companies react to demand: Make-to-Stock (henceforth referred to as MTS), Assemble-to-Order (ATO), Make/Build-to-Order (M/BTO) and Engineer-to-Order (ETO). The main difference between the four is that MTS is forecast-driven while BTO and ETO are customer order driven, and ATO is initially forecast-driven until the decoupling point and driven by customer orders thereafter.

Jiang, Lee and Seifert (2006) however maintain that overall there are two main formats: mass production and mass customisation. In the first one, mass production is focused on the economy of scale as the main point is to produce for stock (which provides low manufacturing). The second one, mass customisation, has begun

being used in order to satisfy customer individualism. Focusing on their study, in relation with the approaches mentioned later by MacCarthy (2013), Jiang, Lee and Seifert (2006) in which they point out that mass customisation can be decoupled in two stages. Firstly, by MTS for certain base-product variants and then by MTO, for customers' based on individual orders. Nevertheless, mass production only has one stage: the make-to-order phase.

Focusing on MTO (or BTO), according to Lalmazloumian *et al.* (2013) can be a way for the company to benefit, as companies today need to compete in an extremely dynamic market environment while meeting customer satisfaction. Therefore, by waiting for orders from customers, there is a decrease in the cost of predicting what to keep in inventory.

MTO is a system that is commonly used for economies-of-scope, where the focus is the customer, and to fulfil its orders and wishes. The main objective of MTO is therefore to minimize the lead time, while coping and maximizing production. Although the authors mention MTO as an independent strategy during its study, they also point out that there is also the notion of an MTO system that has a mixed strategy, make-to-stock and make to order, that can be of benefit to the company and its customers. The idea behind this is that the basic parts of the product are produced in advance by a forecast and then once the customer confirms, the final product is conceived. By combining both strategies, although focussing mainly on BTO, this can increase the manner in which a company answers customers' orders, speeding things up. (Lalmazloumian et al., 2013). This idea was also proposed by Tanrisever, Morrice and Morton (2012) who analysed the hi-tech market and studied the capacity of flexibility of a make-to-order strategy.

2.3. Improvement processes strategies

There are several philosophies/methods to improve processes: Kaizen, Lean, JIT, Six Sigma, Lean Six Sigma and analysis of the waste (Antony, Douglas, & Douglas, 2015; Laureani & Antony, 2017; Ohno, 1988; Taghipour, Hoang, & Cao, 2020; Tennant, 2001; Titu, Oprean, & Grecu, 2010) In the sections below, those topics are explored.

2.3.1. Kaizen

Originally from Japan, Kaizen focused on the improvement of productivity, efficiency and quality; leading to an overall improvement that leads to business excellence

(Titu *et al.*, 2010). Unlike innovation, the Kaizen strategy is subtle and is a low-risk approach that is compensatory in the long run as a company does not bear large costs as before. It is also focused on the process, which means that if it does not work out that there was a failure in the process (Imai, 2012). The philosophy relies on improvement and the main idea being that every single day some improvement should somehow be introduced. Firstly, it is important to learn what the customer wants and to be aware of the competition's behaviour. It is very important that all members of the company trust each other in order to achieve a better service with lower costs.

Various studies (Agmoni, 2016; Oropesa Vento, Garcia Alcaraz, Maldonado Macias, & Martinez Loya, 2016) have shown that companies can benefit by implementing the Kaizen method. In the Oropesa Vento *et al.* (2016)'s study it was even demonstrated that customer satisfaction and productivity increased due to the implementation of Kaizen.

2.3.2. Lean, six sigma and lean six sigma

The lean concept emerged in 1913 (in the Ford Company) and was later developed in Japan in the 30's in Toyota industries. It consists of a methodology of improving systems so as to manufacture faster and with lower costs (Laureani & Antony, 2017). Later in 1954 Toyota implemented the technique of just in time (JIT) in order to improve its production and reduce wastage. JIT is a movement, that just like lean one, aims at cutting costs and helping companies competing with each other by having the required supplies at the exact moment that they are required (Taghipour *et al.*, 2020).

On the other hand, according to Tennant (2001), Six Sigma gathers methodologies and practices as well as tools and techniques in order to improve processes. It was first implemented by Motorola in the USA and was based on 1950's knowledge and on Japanese practices.

Summing up both concepts, lean manufacturing intends to reduce waste and six sigma to reduce variations in processes, such as waste production (Alhuraish, Robledo, & Kobi, 2017).

Lean Six Sigma is a methodology that helps improve to quality, speed, customer satisfaction and decrease costs. As is stated in its name mentions, it uses both the concepts and tools of Lean and Six Sigma in order to do so (Laureani & Antony, 2017).

Focusing on the tools used to improve processes - there are different tools which are used in Lean Six Sigma (Basu, 2009). As regards order fulfilment, it can be understood

from the Shamsuzzaman *et al.* (2018)'s study that the Value Stream Mapping and cause effect diagram are tools used to analyse the order fulfilment process.

In his book, Basu (2009) explains how to create a Value Steam Mapping (VSM) and its usage. In summary it is used to map the activities, from the initial state till it reaches the customer. Usually it is used as a means of understanding the current process and what can be improved.

To create a VSM, there are seven main steps that need to be followed. Firstly, it is important to select what is going to be improved and secondly, identify components of production (from the initial/production state to when it reaches the customer). Then, thirdly, it needs to map the process and note the quantitative data (times, rates, etc.). Following this, each activity is evaluated in order to determine if it adds value or not. Activities are then categorized as: "Value added"; "necessary non-value added" and "unnecessary non-value added". Finally, all the activities need to be analysed (Basu, 2009).

Basu (2009) also mentions the diagram as a type of tool. Another important tool for quality improvement is the cause and effect diagram as it analyses the causes that lead to a certain outcome (effect). It is also called fish-bone diagram due to its appearance.

2.3.3. Waste: improving process studies

Going back to the creation of the concept, based on lean thinking, Ohno (1988) in his book initially proposed seven main types of waste: "overproduction, time on hand (waiting), transportation, processing itself, stock on hand (inventory), movement, and defective products" (Ohno, 1988, page 20).

Then, according to Douglas *et al.* (2015), who did an extensive analysis with Ohno's ideas, additional types of waste were indicated by other authors. Antony *et al.* (2015) compiled all the information, and translate it to an academic example, by analysing other approaches of the topic. Finally, in Antony *et al.* (2015)'s paper the generic waste types are indicated as eight:

- Excess motion – people or equipment walking or moving more than necessary to perform the process;
- Excess transportation – the movement of materials not required to perform the processing;
- Underused people – not using the full abilities of people/employees;
- inventory – all parts, work-in-progress and finished goods not being processed;

- Defects – all work associated with identifying and correcting defects;
- Overproduction – production ahead of demand;
- Waiting – for the previous process step to deliver; and
- Over-processing – doing things that do not add value for the customer.

Based on this, Shamsuzzaman et al. (2018) identified three types of waste (waiting time, transportation and defects) on a company's order fulfilment process they analysed: the first one regards aspects that slowdown the process due to long waiting times between two consecutive tasks. Followed by unnecessary information chains. And finally, "defects" related to various aspects that were not done properly, creating wrong or incorrect information. To do so, they used VSM and cause-effect diagrams.

2.4. Make-to-order and order fulfilment

There are some studies that explore and analyse order fulfilment process in a make-to-order process. Table 3 below shows that:

Table 3 - Studies related with make-to-order and order fulfilment

Authors	Industry	Study synthesis
Ebadian, Rabbani, Jolai, Torabi, and Tavakkoli-Moghaddam (2018)	N/A	Analysis of company behaviour in a MTO strategy Creation of a decision-making structure for order entry
Lawson <i>et al.</i> (2018)	Automotive Industry	Combination of make-to-order and build-to-forecast and its impact on the order fulfilment
Pil and Holweg (2004)	Automotive Industry	Analysis of product variety and how it interferes in the order fulfilment strategy choice (comparison between MTO and MTS)
Shao and Dong (2012)	Machine Industry	MTO and MTS systems: comparison of order fulfilment performance on both cases

Source : Literature Review

In the Pil and Holweg (2004) study the focus was on the influence of internal and external variations of a forecast-driven system (make-to-stock) and order-driven system (make-to-order). The authors concluded that although there are many solutions for dealing with product variety management, the solution lies in the manner the company selects the order-to-delivery model for the product line. For example, if a company has a family of products that does not require customization it makes sense to select a build-to-forecast system.

Once again turning our attention to product variety Lawson *et al.* (2018) explored multi-modal order fulfilment in the automotive industry.

There is also another study that focuses on how companies behave when they have a MTO production process (Ebadian *et al.*, 2008). This study proposes a new comprehensive decision-making structure, pointing out that MTO increases the price and delivery time. It is therefore important to select which order should be accepted and which should not. This study showed the main difference between MTO and MTS, which is the consideration and selection that MTO requires in certain cases. On these topics there is also the study from Shao and Dong (2012), who compared the order fulfilment performance in a make-to-order strategy environment and in a make-to-stock one. Both processes were analysed in order to optimize the overall process. The study is useful to understand what the biggest differences between MTO and MTS are, and which features characterise MTO in a company.

3. Methodology

This research arose from an internship to improve the order fulfilment process of a company. This section explains the methodology approach used in the study.

The starting point was to select the most suitable method applicable. According to Yin (2009), the first and most important condition in selecting the method to be used is the type of question that the study aims to answer. Questions such as “How?” or/and “Why” are likely to be solved by a case study. In this specific case as it is a project that will be developed in a company and where the intention is to analyse the current order fulfilment process and determine which points can be improved and reorganized, the main questions will be focused on “how”. Questions such as: “How to improve the order fulfilment process of CorkCo.?”, “Why it is done this way?” and “How will this affect the company (...)?” require answers. Therefore according to Yin (2009) the method that best applies to this study is the case study. Overall what differentiates case studies from the other methods are in fact the direct observations and interviews, which will also be used in this case (Yin, 2009).

Moreover, some papers which studied similar topics also employed the case study methodology in their studies. For example, Leung et al. (2018), who re-engineered the e-order system to improve the process. They employed a case study, while performing a qualitative analysis and statistical data. Regarding improvement, Shamsuzzaman *et al.* (2018) explored lean tools in order to improve an order fulfilment process. This ends up having an objective that is very similar to the first main objective of this study.

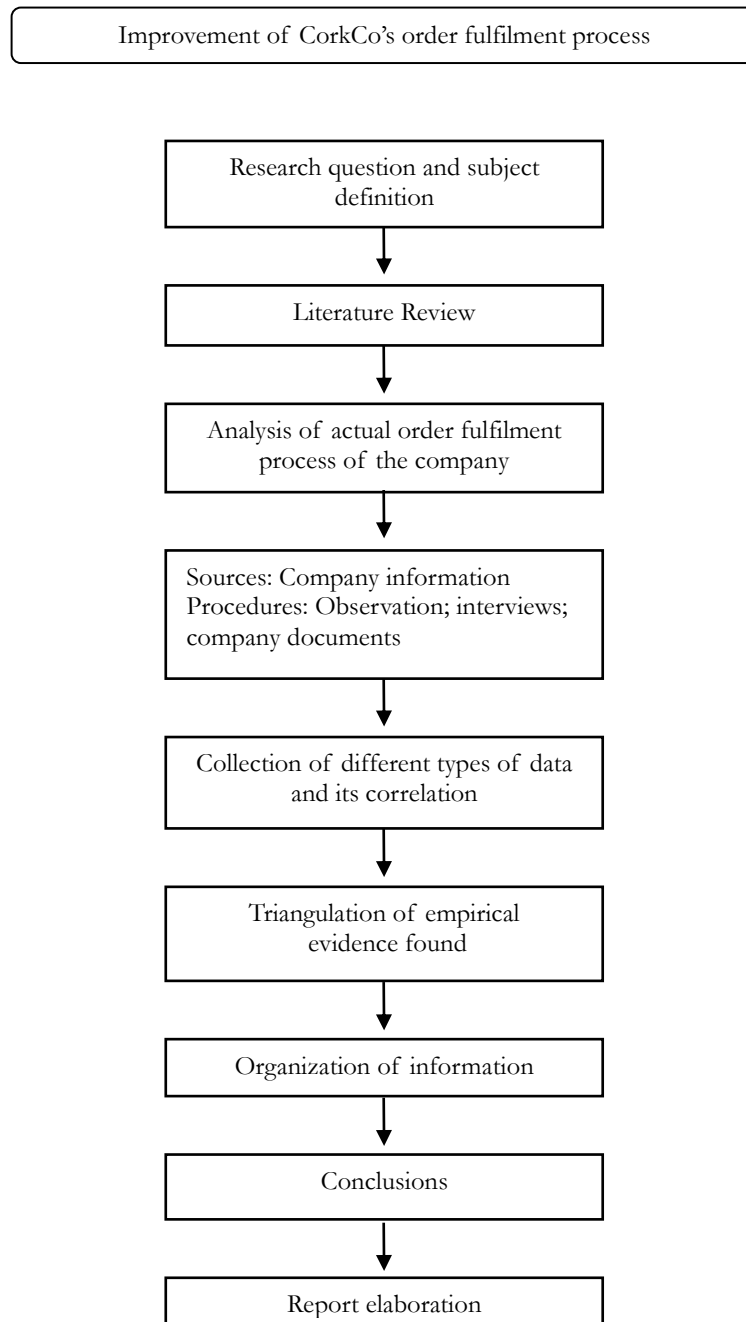
Other studies are, for example, Lin and Shaw (1998) analysing different SCN and creating a framework for all the different types of SCN. Then, there is Croxton (2003), who explained how to create a framework for a company and what activities are generally included in them. In this case she interviewed managers of different industries and worked with members of the Global Supply Chain Forum, in order to obtain information

3.1. Case study design | study phases

After defining the method of research, it is important to plan the case study. According to Yin (2009), the case study is the method that guides the researcher to collect, analyse and interpret observations. First, it is therefore important to design the case study,

then to prepare the collection of evidence, collect it and finally analyse it and prepare a report. In the end, it allows establishing causal relations between all the variables that are being studied (Yin, 2009). Regarding this case specifically the structure of the case study is summarized in Figure 1.

Figure 1- Study phases with a case study design



Source: Adapted from Yin (2009)

3.2. Data collection

In general, there are three main sources of data: interviews, observation, and documents (Polkinghorne, 2005). These will be precisely the sources for data used in this study.

Semi-structured interviews are one of the most widely used research methods. They are used to focus on the relevant context in order to extract knowledge regarding a specific topic. They also allow gathering data on the social reality in people's opinions, knowledge, perceptions, judgements, motivations, interpretations, experiences and relations (Mason, 2002). In this case as order fulfilment is a process which interacts with different departments (Croxtan, 2003), semi-structured interviews will be done with employees from different departments: customer service, warehouse, planning department and sales department since these have a constant impact on the order fulfilment process.

The logistics director will also be interviewed as she is aware of all the processes, as well as the manager of customer service. The intention is primarily to understand what the employees, director and manager think about the current order fulfilment process, and which aspects they would like to improve upon. Following this first stage, enquire of them what they would do if they could reorganize the process. Overall, the intention of the interviews will be to detect aspects that can improve the process, as well as understand how the process could be re-organized.

With regards to observation, it is a complex method that needs to be adequately planned and prepared. If done properly it can be very productive (Mason, 2002). Since this study will be supported by an internship, performing observation will be easier as the researcher is in daily contact with the company. Observation will therefore be carried out in the customer service department, in order to understand their main difficulties, and which ones they are communicating and those that they are not. It will be a method of checking the gaps in the process that are not mentioned during the interviews.

Also, there is the possibility of analysing organizational documents, which makes it easier to check how order fulfilment is performed and which are the result of using that order fulfilment process framework. Documents such as order confirmations, invoices and the documents used within the customer service department are proof and a source of data regarding struggles in relation to the order fulfilment process.

4. Case study: improving the order fulfilment process of CorkCo

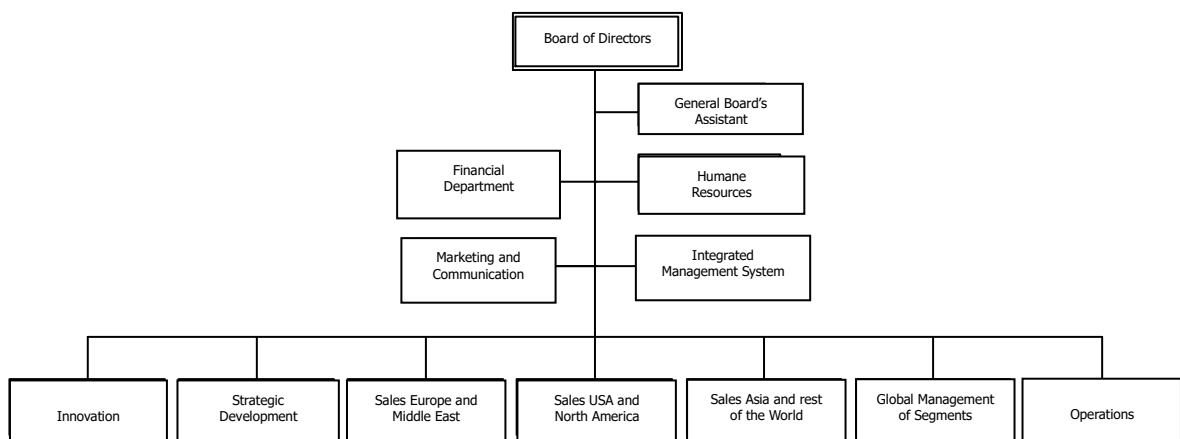
In this section, a description of the case study object, CorkCo, is provided. Firstly, a general overview of the company is presented. Then, a specific and more detailed explanation of the customer service department is provided as well as a detailed description of the order fulfilment process.

4.1. The company – CorkCo

As the company which was studied disallowed full disclosure it will be referred to as CorkCo as it is in the cork industry.

CorkCo is a Portuguese cork industry company based in northern Portugal. It is divided into seven main departments excluding Financial Department, Marketing and Communication, Human Resources, Integrated Management Systems, General Board's Assistant, and the Board of Directors. This structure is illustrated in the figure below (Figure 2).

Figure 2- CorkCo's organizational chart



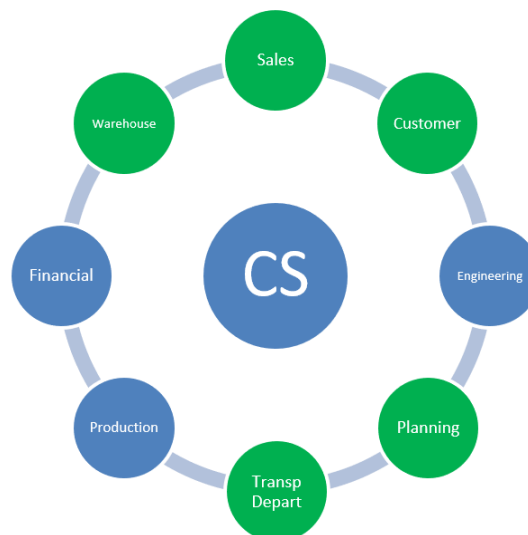
Source: retrieved from organizational documents

Customer service is a department which focuses on all issues related with completing the order fulfilment process. It is part of the operations department, being a part of logistics that is inserted in operations. It is therefore managed by the director of logistics.

The main tasks of the department are filling customer orders and evaluating customer satisfaction. The most extensive and complex task is filling customer orders since it is a process that takes several days or weeks when monitored from the day that the order was placed till the product is delivered. This process will be better examined and explained in section 4.2. The customer service team is therefore divided into two groups: registration and shipping. Since CorkCo has customers from all over the world, and from different industrial sectors, the registration team is divided into four main clusters: industry, retail, construction, and a general cluster that deals with Asian customers and other customers that do not fit in the other clusters. Each cluster is under the remit of one person. On the other hand, the shipping team is composed of five people with all of them dealing with all the processes, which are attributed in a random manner. This system was created in order to be more efficient. So, if anyone from the team is absent everyone else knows the processes and how to deal with that specific industry sector.

As mentioned by Croxton (2003), order fulfilment interacts with several departments within the company and that is exactly what also happens with the customer service. The figure below (Figure 3) shows the different types of interaction with other departments:

Figure 3- Customer service interactions

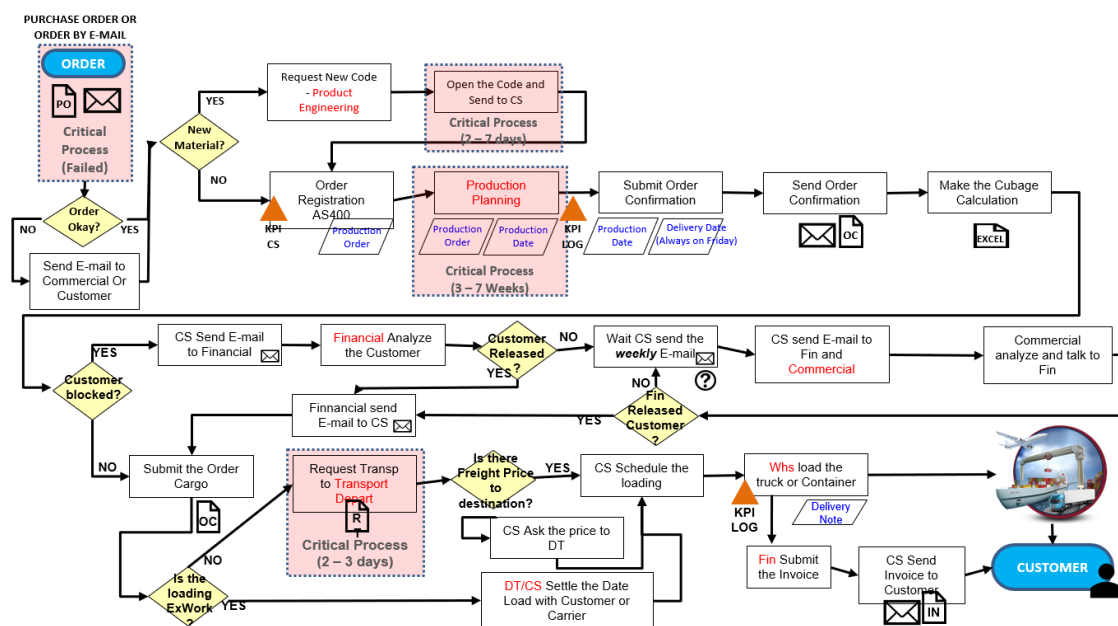


Source: retrieved from organizational documents

4.2. The CorkCo's order fulfilment process

The order fulfilment process starts when the customer service receives an order from a customer. Therefore, it is all based in a make-to-order system, since it all begins with a customer order. It is a very complex process that has different approaches varying from case to case. The company however established a general framework. It starts with an order, which can either be sent by a salesperson (who is in direct contact with the customer) or by the customer himself. The order is then processed by the registration team which registers the order in the enterprise software (ERP). When all the details are completed the order's process is transferred to the shipping team, which will be in charge of setting up the picking and transportation. The full process is further detailed in the figure 4 below.

Figure 4- CorkCo current order fulfilment process



Source: retrieved from organizational documents

The figure above shows the full process from the moment that a customer order is placed with customer service until it is shipped and received by the customer. The white rectangles show the normal tasks performed by customer service, while the yellow figures show the different possibilities during the process. For example, when the customer order arrives by email it can be acceptable or not. If not, they need to send an email to sales or to the customer in order to clarify the order. The orange rectangles demonstrate the KPI's of

the department, which will be the points where the department will be evaluated. The tasks that are highlighted with a red square are critical processes, which are the processes that take more time and that do not depend exclusively on customer service. The first one, related to the customer order, it is processed by the sales department, which means that the customer service has no direct influence on that. Then, the second critical process is the production planning, which has to do with the planning department. Depending on the lead time it can take to three to seven weeks for the product to be produced to be shipped. Just like this one, there is the “open task and send to cs” that is a task that is done by the product engineering. Lastly, there is the task that needs to be performed by the transportation department. So, as explained those tasks are not under the control of the customer service but are extremely important for obtaining an efficient order fulfilment process. Regarding the icons, where there is a sheet it means that specific task is related to a specific document, as for example the “Send order confirmation” is related to the action of sending the order confirmation. When the icon is an envelope, it means that it sent by email. The other files pointed out here are: the Order Cargo, Requisition of transportation and Invoice. The email exchange are in the beginning when the order arrives, then to send the order confirmation, confirming if a certain customer is blocked or not and then finally when sending the invoice. The actions of sending invoices and order confirmations are automatic actions, that are performed by excel tools. It will be explained later on.

In order to improve the process, the whole process is analysed in order to detect gaps. However, the main focus will be on “the cubage calculation”, since it is a crucial step for both teams. The cubage calculation is made in order to understand the dimensions of the products. This is relevant for matters of transportation and fares and is extremely important in order to ensure that the order gets to the customer in a timely manner. If the dimensions of the product are wrong this can get the product held up at Customs, or having to pay penalties. The calculation is currently made using an Excel tool. However, the intention is to analyse that tool and the process, in order to appraise what can be changed or improved.

4.2.1. The registration team

The process starts with a request from a customer. It can be by email, through a customer Order Purchase or have the order written down on the email. Then it is necessary to analyse if it is a product that is already in the system or if a new code needs to be

created. If so, it is necessary to require a new code to the product engineer department. This process is made internally, by a platform. If the code already exists, it is possible to start the order registration. Regarding that, all the information about the order is inserted in the ERP and then a new order production is opened in the system. From this point on, this information goes to the planning department, where they plan when the order can be produced and be ready. It can take several days. Then, when a date is stipulated, it is possible to send the order confirmation to the customer. For doing so, an Excel is used in order to send it automatically to the customers. Usually, an order takes among 3 to 7 weeks to be produced.

After all this, it is necessary to do the cubage calculation, in order to obtain the dimensions and volume of what will be shipped. This calculation is based on the information in the system. There are some references of the current measurements and dimensions on the ERP, but the majority of the orders' dimensions are calculated from theoretical data. To do so, since it is a very long process to do it manually, an Excel tool was created to calculate the dimensions. However, as this company has different products and very complex ones, most of the products have some errors in the calculations. Therefore, in the end they must be checked. As mentioned before, it is one of the crucial steps of the whole process.

4.2.2. The shipping team

As the name indicates, the shipping team deals only with issues related to order shipping such as receiving information from their registration colleagues. That information is transmitted by a form that is filled by one of the members of the registration team. It contains the most important information of the order: the means of transport, dimensions of the order, quantity, price, and other important data. With this information the process is started by checking if the customer is blocked in the process or not. If this is the case, it is necessary to send an email to the financial department in order to understand the reason for it. This can take days and many exchanges of emails. After the customer is released, a cargo order is placed. Depending on the Incoterms defined for each order, the process advances accordingly. If it is *ex-works* (which means that the customer will be picking up his own order) it is only important to define a date with the customer carrier and schedule the loading on the company schedule. If it is another Incoterm that requires transport, it is

necessary to submit an order confirmation and wait for the transport department's answer as well as asking for the freight cost. After all is agreed, the picking is scheduled.

4.3. Analyzing the order fulfilment of CorkCo and recommendations

In this section, the order fulfilment process of CorkCo is analysed to detect which aspects can be improved upon. Firstly, as far as data collection is concerned, methods as semi-indirect observation, documental observation and semi-structured interviews are explored. Then, more analysis as the VSM and cause and effect diagram/fishbone analysis are developed. At the end of this section, improvement aspects are presented.

Summing up, the main aim of the section is to detect aspects of the order fulfilment process that can be improved upon and applied.

4.3.1. Semi-indirect observation

During two weeks at the start of the internship, every member of the customer service was observed for a day in order to understand and track their work as well as the gaps in the process.

As mentioned before, customer service is the only department that tracks the order fulfilment process from start to finish. They initiate the process by doing the registration of the order, and then follow the process until its end. So, this analysis was made exclusively in that department.

As Croxton (2003) mentions, filling in customer orders is what puts the supply chain in motion. Furthermore, he mentions that orders must be filled efficiently and successfully. According to Xu *et al.* (2016), there are several steps that can increase the length of the process, as for example, lack of information. So, one important aspect was to understand the dynamics of the process and how the department works and interacts with all the departments involved in the order fulfilment process. Therefore, more than just observing and understanding their work, the observation was focused on problems that would be possible to notice while observing their tasks. Thus, the questions that are analysed during observation will be focused on aspects that interrupt/disturb their work. The objective is to understand where the work needs to be improved. Therefore, like Shamsuzzaman et al. (2018) who analysed an order fulfilment process using a lean six sigma tool; questions were posed based on the types of waste mentioned in the literature.

(Antony *et al.*, 2015; Ohno, 1988). In this analysis only five types of waste will be taken into consideration as this information will be extracted through observation. Therefore, only excess motion, excess transportation, defects, waiting and over processing will be analysed. Over production, inventory and underutilised people will be analysed further on, during the interview. The information gathered during those two weeks is summarized in Table 4 below:

Table 4 - Semi-indirect observation questions/results

Questions	Type of waste	Answers
Is the work interrupted by others?	Excessive movement	Yes
What types of activities are performed by the department that are not part of the process?	Excess transportation	Asking for articles codes Invoice questions
Biggest complaints	-	Lack of information a lot of unnecessary emails waiting for info slow systems
Do they interrupt the normal workflow due lack of info?	Waiting	Yes
How do they solve it?	Waiting (solving that problem)	Ask other colleagues send emails call
Do they use paper as a support?	-	Yes, for almost all the tasks
Where do they spend most time?	Over processing	Checking Emails in order to obtain information
Where do they have to check for most errors?	Defects	Customer orders by email process exchange cubage calculation
How does the team communicate?	Excess transportation	Usually by email

Source: semi-indirect observation of the Customer Service

It is therefore possible to observe that in general all the types of waste that were analysed in this section, were in fact a problem of the customer service process. Therefore, they will be a problem in the order fulfilment process. There is waiting time due to lack of information, which as mention before is referred by Xu *et al.* (2016) as a problem. Then there is over processing, which means more work than it is required, since they need to check hundreds of emails per day in order to extract information. Furthermore, there is excess transportation, and excess motion.

Overall, the main gaps were:

- Slow tools (Excel)
- Lack of information
- Interactions with too many departments

Regarding the first point, the customer service uses four main tools in Excel: order confirmation, orders portfolio, cubage calculation and invoicing. Since the tools are connected by a query to the ERP ¹, they take a long time to update. Therefore, it takes about five minutes to open the Excel sheet, then about 10 to 15 minutes to update it, which means that in total per day, every time that they open the Excel sheet, it takes about 20 minutes to have everything ready to start working with that tool. More than that, since Excel sheets have a lot of macros and formulas, the percentage of error is huge. That was one of the complaints while being observed. However, these are very important tools that need to be used daily.

Lack of information, it is another complaint because as shown on Figure 3 on section 4.1., they interact with a lot of departments in the company, in order to perform their daily tasks. That was something that Croxton (2003) pointed out, that in order to execute the order fulfilment it is necessary to share knowledge with several departments of the company, which can lead to an increase of time. So, it was possible to notice that they are constantly sending emails to clarify doubts or information, which as Croxton (2003) referred increases the process on time.

On the other hand, since the customer service is the one who deals with the order of the customer, it needs to get in touch with a lot of departments, not only to clarify information, but also to inform about for example trucks registration plates, contact the

¹ Query to the ERP – a connection made to obtain data from the ERP in an EXCEL sheet.

warehouse, talk with salespeople, among other tasks. So daily, half of their time is spent on email inbox, answering and reading emails.

Taking all the information into consideration, it was possible to start detecting specific aspects of the process that needed to be improved:

- Excel tools needed to be faster and with less errors
- Communication needed to be improved in order to make the process faster
- More clear information

Based on the next analysis, these three main aspects will be further developed in order to ascertain the main objectives of improvement.

4.3.2. Documental observation

Regarding documental observation, from the beginning that documents started to be analysed. So, firstly, One Point Lessons (documents explaining the process) were analysed in order to comprehend the process. Then, tools that were used daily were examined in order to understand how usable the tools were. Then, other documents, regarding processual matters, as order confirmations and invoices were analysed.

As mentioned before, Customer Service has three main tools all based in Excel related to the three following points:

- Order confirmation
- Cubage calculation
- Invoice

It implies that the process is based mainly on those tools, which means that it helps to understand the process since all the information is on those Excel tools. On the first tool, it sends automatically the order confirmation to the customer, the second one, as explained before, does the calculations that are necessary to obtain the dimensions of the pallets and contains information to exchange the process from one team to another (registration team to shipping one). Lastly, regarding the invoice, like the first tool, it sends automatically the invoices to the customer. They also have other tools, to follow up the orders and lead time. On the first instance, while checking those tools, what was stated during the observation was exactly what was analysed while using those tools. They were

slow and since they have a lot of data and formulas, there were a lot of errors that needed to be analysed. That resulted in an increase of time.

Also, other documents that were analysed were the Key Performance Indicators (KPI). It helps to understand how the process is evaluated and what the main points in the process are. However, since the order fulfilment is very extensive, the only KPI that were examined were the ones from customer service since they cover all the order fulfilment process as explained before.

At the start of the internship the customer service had eight KPI related to:

- % OC sending performance (weekly)
- % OC sending (YTD)
- % OC sending (by cluster)
- Order registration <2 days (weekly)
- Order registration by cluster
- Shipping processes (that are made per week)
- % Invoicing
- Emails to read (daily)
- Medium time of complaint's registration
- Quantity of complaints

Analysing those KPI's it was possible to understand how the customer service was evaluated and what was being measured and controlled. So, for example, as mentioned before in the observation section, one of the biggest complaints were the fact of having a lot of emails to read, and it is one of the things that they are evaluate for. Also, it is possible to analyse that the time that the customer service itself takes to perform their tasks is evaluated as well.

So, by these analyses it was possible to reinforce the idea of improving the excel tools and improving their information flow/communication.

4.3.3. Semi-structured interviews

In order to highlight the gaps in the process, some workers of the customer service that deal with register and shipping were interviewed as well as the customer service's

manager, the logistics chief, a salesperson and a worker from the Warehouse. The complete interview guide can be seen in Annex 1.

Overall, they are people that have worked in the company for more than five years, except for three members that work there for about a year. Regarding experience of these workers in other companies, with the same function, 40% had experience while the other 60% did not. But overall, what they said regarding the process is that in the other company the process was faster due to faster tools. Process timing was also highly mentioned, they all said that the current order fulfilment was slow and explained why, in their opinion, it happened.

As mentioned before, the intention of the interview was to understand how each one perceived the current order fulfilment and what they think could be improved. Regarding the answers, all of them said the process was slow and pointed out problems as delays, organization of the team, ERP and communication errors. Another aspect that was mentioned was the fact that sometimes customer service needs to wait for answers, which make them not able to proceed with one task. For example, registration of an order: if the codes of the items are new, they need to be asked to the engineering department, which make them wait for a long time. So, instead of one day, they had to wait more time, before being able to register the order. That makes the process become slow, and according to the salesperson that is one of the most common customer complaints. As mentioned by Aydın and Kahraman (2019), order fulfilment process plays a critical role in ensuring customer satisfaction.

Curiously in question 4.7, when asked if the process needed to change, 33% answered that the new ERP would solve it, 17% said no, 33% talked about the team organization, and 17% told that it has to do with the company philosophy.

The conclusion of this interviews is that although the members can highlight problems, they say that the hugest problem has to do with delays of information, or delays of production. In the end it is not the process that needs to be changed but some processes in between. For example, they gave an idea of organizing the team in another way, and tasks that could be done by other people. But the process is highly implemented and cannot be changed. Therefore, when asked if a generic process would make sense, only 33% said yes, while the others said that no, or that it depends of the ERP system. For example, the Logistics Chief pointed out that the order fulfilment is related to the ERP system, and that are parts of the process that cannot in any type of company come in

another order. Which means that overall, the process follows up the same order, even in a make-to-order or make-to-stock.

As on the observation section, in order to detect waste types and therefore improve the process, eight specific questions based on different types of waste were made. The answers of those questions are summarized in the table 5.

Table 5- Questions regarding types of waste

Question	Answer
6.1. What makes the process slower?	Registration (33%) - 33% (asking for codes) 17% (Production)
6.2. Which part time is lost deliberating information, resulting in a movement of unnecessary information?	Financial blocking (100%)
6.3. Which is the part that results in an excessive usage of paper? Or in the exchange of emails with many attachments?	Registration (100%) However, due to fact that the team started to work in home office, there is not that type of waste of paper anymore.
6.4. Regarding the archive, during the process: information is kept for more time than the necessary?	No (100%)
6.5. Which part of the process creates more problems, leading to constant corrections?	Registration (100%)
6.6. Do you consider that the process is not balanced? That is to say, that the work is not proportional equilibrated during the process? In which part?	No – 33% There is some type of standardization on the shipment, which helps. yes – 67%
6.7. On the process, which is the part that is only a procedure that does not add value that can be changer or eliminated?	Email selection, interaction between the transportation department
6.8. Which is the part that in your opinion is not in the correct order? That is to say, which part is made too late or too soon in the process?	Cubage calculation (50%) Everything ok (33%) Customer verification financial block (17%)

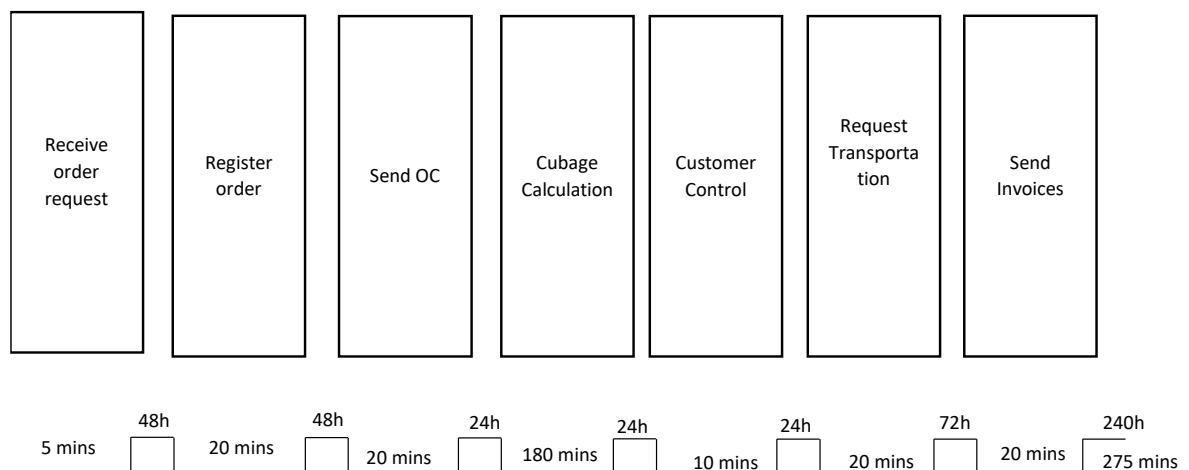
Source: semi-structured interviews

4.3.4 Other analyses

In order to understand the process and its deficiencies, more than just extracting data, two analyses were made: Value Stream Mapping and Fishbone Analysis. Both are Lean Six Sigma tools (Basu, 2009), which help to understand how quality, speed and customer satisfaction can be improved (Laureani & Antony, 2017).

The first one, just like the other analysis is carried out focusing only on the steps that the customer service undertakes. The second one, is focused on all the processes and all the departments that the customer service has contact with. In this last analysis the intention is to observe how all the departments interact and which the main general problems are. Both analyses are undertaken and explained below.

Figure 5- Value Stream Mapping of the Customer Service



Source: Direct observation and company documents

Firstly, it is important to mention that all processes, depending on the type of product, can take more time than the one stated in Figure 5. For example, it can take a couple of days to obtain the codes for registering the order, which means that those 48 hours between “Receive order request” and “Register order” can increase. It also applies for example between “Request Transportation” and “Send Invoices” since it can take almost 2 weeks. Those 2 weeks mean that the transportations are being requested with time and that the information between the register team and the shipping team is flowing in a fast way. Having this said, 72 hours is the shortest amount that they have to request transportation, since they have to request it 2 days before the actual day of the transport

and then the invoice is sent on the day after to the customer, which makes the 3 days. That is the shortest time that a normal process can bear. So, it is important to observe this analysis as an average, where the 240 hours can increase due to multiple reasons. However, those 240 hours are times that are not directly dependent from the customer service.

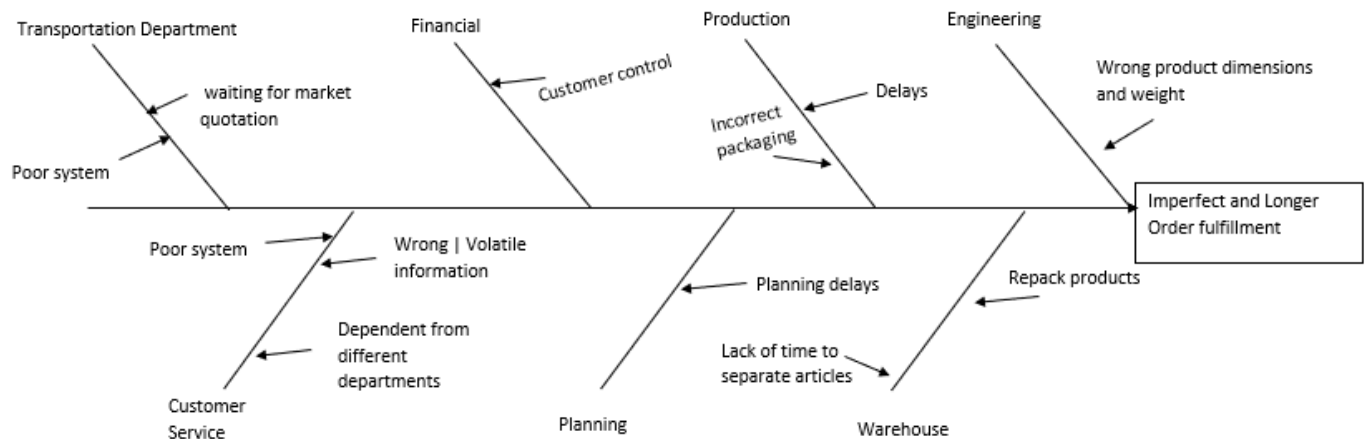
Therefore, taking this data into consideration only 275 minutes are used in the process, which means that the full process takes less than the 8 hours of a workday. In the end it is not the process itself that is slow, but the waiting time between the tasks that slows down. That is why delays were so often mentioned during interviews, because these delays slow down the whole process. It is also possible to conclude that the process that takes the most time is the cubage calculation. If this task were shorter, it would allow the process to be faster.

However, as already mentioned, order fulfilment is a process that interacts with different departments (Croxtton, 2003). This is very clear when observing this VSM since it is only focused on the customer service tasks. Nonetheless, the process itself can be slower due to the tools, and for example there are estimates of time on the VSM that can vary greatly. For example, depending on the product and complexity of the order, the cubage calculation can take up to five hours. Therefore, the whole process would increase in time.

This analysis therefore helps to have a clearer idea of the time that is currently spent on the daily tasks of the customer service, and thus on the process since it starts and finishes here.

On the other hand, with the Fishbone Analysis it is possible to analyse the full process and find what causes an imperfect and longer order fulfilment. Figure 6 shows exactly that analysis.

Figure 6 - Fishbone analysis of the CorkCo's order fulfilment



Source: Direct observation and company documents

On this diagram, all the aspects that delay and create errors on the order fulfilment are mentioned. Those aspects are explained below:

Customer service: as mentioned before the poor system, as for example slow tools, as well as the lack of information and the dependency of the department regarding external information of other departments, makes the team very exposed to errors, which leads to an imperfect and longer order fulfilment.

Financial department: it appears in the process when the customer service detects that the customer is blocked for some reason, and it creates a chain of emails, between the sales department, the financial department, and the customer service. More than wasting time on those emails, it creates more volume of emails, which interferes on the customer service, and consequently on the process itself.

Planning: the delays regarding planning (when the order would be produced) was an aspect that was mentioned a lot and point out as one of the reasons that has impact on the order fulfilment.

Engineer: During the process were also detected some problems with weights and measures that were wrong and needed correction. Also, since the customer service uses an Excel sheet to do the calculations, there are some fields that need to be filled by the engineering department.

Production: More than the delays while producing, one thing that was mentioned during the interviews, is the fact that sometimes the pallets are wrongly packed, and when they arrive to the warehouse need to be packed again.

Warehouse: During the interviews one thing that was pointed out was the fact that sometimes, due to delays of all the process they do not have enough time to separate the items, which delays the final process of loading the truck. Also, sometimes they must unpack the pallets due to height limits (for example air transport).

Transportation Department: The way that the process is done, was also commented as being a poor process. Because when a transportation requisition is made, when changes need to be done, they need to ask the department to return the process (which makes the process longer).

Regarding different types of waste, through the interviews it was possible to detect the following types:

Excess motion: a lot of communications at the same time | too much interaction

Waiting: lack of information

Excess transportation: Information that goes through Customer Service that did not need to go, as for example asking to unblock the customer

Therefore, this analysis helped to support the analyses mentioned before, and show the problem with the overall order fulfilment process. On the next section, 4.4. those aspects will be worked on, and the improvements will be showed as well as the results.

4.4. Conclusions and improvement aspects

After extracting and analysing the collected data, it was possible to determinate aspects that could be improved. Some improvements are related to the type of system that CorkCo uses, others related to the type of process that was being followed and lastly due to the type of communication framework that was used. Those suggestion aspects are mentioned on Table 6.

Table 6 - Suggested improvements

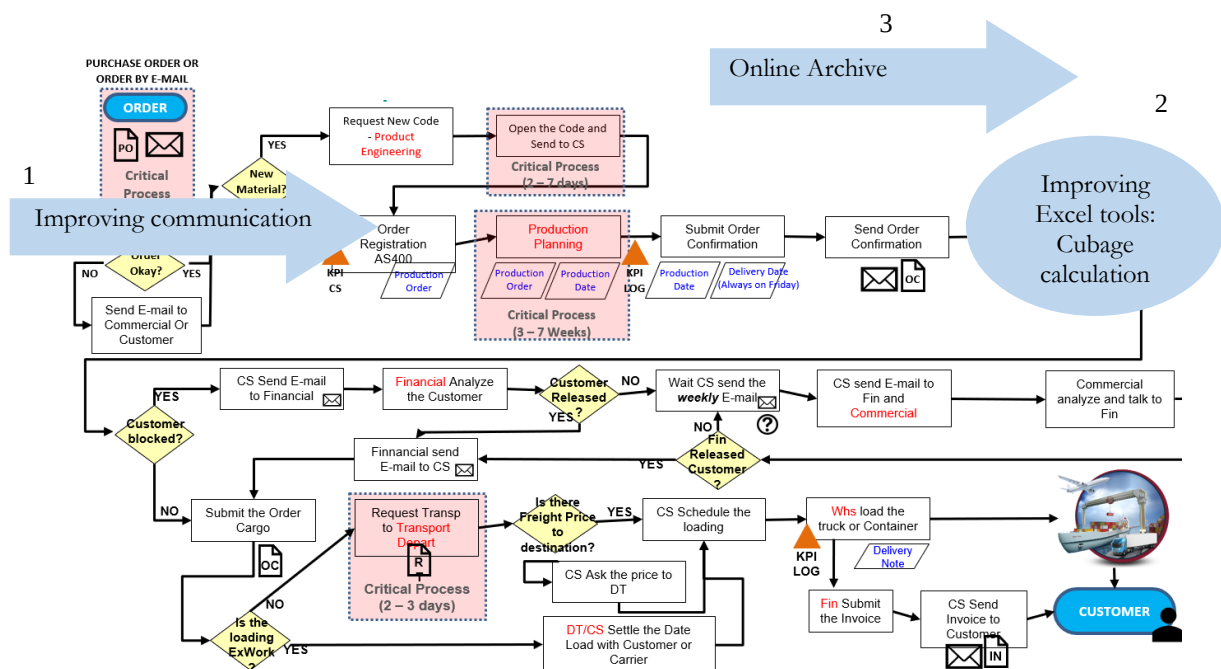
Problem	Type of problem	Improvement suggested
Email selection	Processual	Creation of an email selecting tool
Slow tools	System related	Improvement of the actual tools
Customer verification	Processual	Doing the verification before the process starts
Cubage calculation	Processual	Measure and weight the articles before shipping
Interruptions	Communication	Different organization of the team
Lack of information	Communication	Creation of tools to improve it
Dependence of other departments	Communication	Different organization of the team Change of the process
Planning delays	Processual	Work with finished products
Poor system	System related	Check what can be improved in the system

Source: retrieved by interviews and observation

However, due to the limited time of the internship, three main aspects were chosen to be improved since they were the ones that created biggest impact on the process according to the customer service team and the analysis made. Those are:

- Improving communication (1)
- Improving Excel tools (2)
- Online archive (3)

Figure 7- Explanation of aspects to be improved



Source: retrieved by company's documents with indications of which parts of the process would be improved

As it can be seen on the Figure 7 the improvements influence the order fulfilment process on different phases. Starting from the beginning, point 1 will allow to have more information and improve the communication. Then, on point 2, one of the tasks that take more time will get its time reduce. Lastly, regarding to the last point, the online archive, ranges all the process since it will contain all the information regarding the full processes. On the next section the improvements done in each aspect will be mentioned and explained.

4.4.1. Cubage calculation

Since the first weeks of internship, cubage calculation was pointed out by the customer service department as one of the main aspects that needed to be improved. As mentioned before, it is one of the most important aspects.

The cubage was made through an Excel sheet that contained a lot of data and had a lot of mistakes. Therefore, in order to improve it, it was important to analyze the process and detect where the errors were and why.

It was important for CorkCo, since although they were changing their ERP system, the cubage calculation is something important for the company, due to the fact of the variety of products. As mentioned by Um et al. (2017), in order to compete with other business, companies want to provide more choices to the customers, and that is precisely what CorkCo does. However, since it is necessary to request the transportation before having the packaged product, it led to several problems. That means that having an effective and successful order fulfillment starts to be a challenge when having a different range of products (MacCarthy, 2013). Therefore, it was important to work on this tool.

In order to do the transportation requisition, they need the dimensions of the pallet (e.g. 1 PAL 1200X800X1500 mm), what is not done automatically by the ERP, and will not be done by the future ERP. So, what the EXCEL tool does is to calculate the dimensions based on the packaging size (cartons, boxes, pallets, bags, among others) as well as the dimension of the products.

Regarding the process of improvement, it was an extensive process divided in three phases: understanding the tool, correcting the errors, and on the end improving it.

Therefore, concerning the first phase, the tool started to be used and the current dimensions of the product were compared with the ones that were calculated by the tool. There were products that had the wrong dimensions, but a lot of them were not even

calculated at all. So, after understanding how the Excel calculated and where the data was, the second phase started. On this phase, errors were communicated to the department of engineering who would correct or give information in order to correct those errors. The errors could be caused by wrong information or lack of update on some fields. After working on correcting those aspects, a new version of the Excel tool was launched and tested by the registration team. Then after the validation it started to be used. Afterwards, it was developed another version, which could calculate some products that had some special features that the normal version could not calculate. As for example, some bags of granulated cork.

Overall, with the changes made through the internship, the sheet had and an improvement of 40% on the calculations. More than that, one hour daily was reduced. Therefore, it means that the analysis made before on the Value Stream Mapping of the 180 hours decreased to 120 hours.

4.4.2. Improving communication

During interviews and observation, one of the main aspects pointed out was the communication between departments and how it should be improved. For example, when the customer service receives an order it does not have a special rule. It comes by the system of the customer (Purchase Order), or if the customer does not have a system, it comes through an email or the customer calls the respective salesperson asking for the product. Therefore, those type of orders can be received with lack of information (only with the customer name, articles and quantity). What does it imply?

It implies that the customer service needs to seek information, what can take about 20 minutes, instead of just looking to the order request and register the order. Therefore, in about 10 orders that they register daily, they spend 200 minutes looking for information, if it arrives by an email.

In order to do improve this process, a form for registering orders was created and tested on the company. The idea was to understand how the customer and the salesperson would think about the tool. On the annex 4 it is possible to find print screens of the tool.

Overall, some tests were made with some customers and the feedback was very positive. The formulary was developed on Excel, with a very simple and user-friendly interface, as showed in the figure below.

Figure 8- Print screen of the form

Please select the items that you wish to purchase. The items' list is based on the items that have been purchased before. If the item is not in the list, please write it down in the comments.

Payment Conditions: 60 days payment

Delivery Conditions: C/D Change

Packaging quantity

Item	Unit	Price/Unit	Quant.	Price
Item	Unit	Price/Unit	Quant.	Price
Item	Unit	Price/Unit	Quant.	Price
Item	Unit	Price/Unit	Quant.	Price
Item	Unit	Price/Unit	Quant.	Price
Item	Unit	Price/Unit	Quant.	Price
Item	Unit	Price/Unit	Quant.	Price
Item	Unit	Price/Unit	Quant.	Price

Comments:

Confirm Order Cancel

Source: Order Form

When opened, the Excel leads the customer to a form as the one showed on the print screen above. The items that are showed on this tool is the ones that the customer usually buys. Therefore, this tool has as target group customers, which usually buy the same products. Then, on the formulary the customer can visualize the final price of the product, check the quantities for packaging and correct the delivery address.

It was created as a pilot test, which means that essentially the idea was to get the customer feedback as mentioned before. Mainly because as (Aydın & Kahraman, 2019) point out, it is important to understand the requirements of customers.

So, although it was made to be a test it allowed to get some ideas for the new ERP implementation, which can be implemented soon. Also, it gave the opportunity to test it with some customers and understand how they would react if they started to use a platform/tool to order their products.

4.4.3. Online archive

More than improving the order fulfilment process, the intention of the internship was also to decrease the use of paper, which lead to the creation of an online archive. The process consisted on an analysis of how the archive was made (see Annex 5).

As mentioned before, the customer service is divided in two teams: registration and shipping. The processes are exchanged between the two teams, and in order to so, registration must forward all the information regarding the process so that the shipping team can request transportation and deal with all the issues regarding shipping. They therefore supply a specific sheet that contains all the information as well as the dimensions

of the article. Since processes are attributed randomly to the shipping team, it is not possible to know where the process is without asking the colleagues. So, when the process where archived it was not possible to know in which folder the process was. In order to so, the registration team or other member needed to ask the shipping team who had that specific process. So, more than reducing paper, the online archive also had an impact on that.

Therefore, after the implementation of this measure, it is possible to find all the processes in one folder and one only. More than that, it allows that anyone who knows the name of the invoice can look it up. Then, it allows keeping up all the information in one place, which means that the percentage of losing a file decreased. Also, due to the fact of COVID-19, it also helped, since it was implemented before the virus, so the team was already used to do some type of online archive.

4.5. Overall improvements, results and impacts for the company

Summing up what was explained through the section 4.4., by improving the three aspects referred above (cubage calculation, order form and online archive), it helped the company to save up time and reduce the usage of paper. Going back to the Fishbone Analysis, it focused precisely on three points mentioned on the analysis:

- Poor System
- Wrong | Volatile information
- Dependent from different departments

One of the biggest complaints of the team of the customer service was precisely the poor system that they had. Slow tools that took a long time and which had a very high rate of mistakes that created a poor system in general. More than that, even worse than the time it took, was the information that needed to be rectified and the information that they needed to look up to perform their tasks since they were very dependent from other departments. Therefore, with Excel tools improvements, the creation of the order form for the customers and the online archive, it led to seven main improvements:

1. Spend less time updating tools
2. Spend less time looking up for information
3. Accurate information
4. Improving the communication between CorkCo and the customers

5. Improving the communication between customer service and the sales department
6. Better organization
7. Reduce the usage of paper

Regarding the first one, 'Spend less time updating tools', a quick observation has been done before and after the implementation of the improved Excel tool (for cubage calculation) and the results of the improvement were less one hour per day performing those tasks. Before, they took about three hours per day and after the implementation of the improvements on the Excel they started to spend about two hours. Also, regarding their feedback they all said that quickness, easy access, accurateness, and general layout improved.

Concerning 'Spend less time looking up for information', with an effective Excel tool, the orders form and an online archive that they can look up easily, it allows them to spend less time looking up for information. For example, before if they wanted to look up for information regarding a past process they needed to look up on their email inbox emails regarding the process (which would take a long time) or to get up of their sit and look up on folders on the shelves that had a lot of process. Right now, they only need to go to one folder online and they have all the information regarding that process.

Regarding the third improvement, 'Accurate information', before the Excel of cubage calculation was improved, they needed to rectify a lot of information since the calculation was not accurate. For example, there were some products that were more complex, and the tool calculated a completely different dimension. For instance, there were some items that the Excel sheet calculated with a height of 3000 mm, which is unacceptable since the trucks and containers only accept until 2500 mm. Since they knew that the information was not accurate, they needed to check if everything was ok, and when it was not, they needed to calculate with a calculating machine while checking the information on the ERP, which took them a lot of time. Regarding the form for the customer it was also one way of help them with the information since they had all the information they needed on that report. For instance, before a customer would send an email writing something like "Please send me 4000 unities of product X" and the customer service needed to validate that information to proceed with the order registration. With the report it provides already the numerical code of products on the ERP, as well as the prices and all the information that is required to register the order.

Concerning the point 'Improving the communication between CorkCo and the customers', the form for placing customers' orders helps the customers to get information that otherwise they would have to ask. For example, dimensions information, quantity per packaging. All that information is on the form and help them to understand how they can improve their order, since they can check how much boxes, pallets or bags they are ordering. Also, it helps the customer to keep track of their orders and avoids the creation of emails chains about quantities or prices of products that are already on the system and priced.

Regarding the next point, also connect with communication, 'Improving the communication between customer service and the sales department', by using the form, the report that is created and sent to the customer service has all the information required to put the order in the system. Therefore, it helps to improve the communication between the customer service and the sales area since it will reduce the number of phone calls and emails to clarify information that are not explained. Indirectly this measure even improved one of the problems detected in the Table 6, which was "email selection". Since they would have less emails of the sales area it would help them to select those emails.

About 'Better organization', it was also something that was improved. This point concerns the online archive, since it helped them to have the processes information in one place only. Therefore, instead of looking up for the information of the processes on the email inbox or in folders, they know that all they must do is to go the shared folder online and look up the process for the number of the invoice.

Regarding the last point, 'Reduce the usage of paper', all the improvements helped to reduce the overall usage of paper because since the system had the correct information of the cubage calculation, they did not need to print other documentation to help them calculate. The same happened with the order form. It helped them to only print the form instead of a couple of emails with all the information. And lastly, regarding the online archive, since everything is online, things that are on the system do not need to be printed to be saved, since it is all joined online.

Therefore, all these improvement helped to gain a major efficiency on the team of customer service, which improved the overall order fulfilment process. By reducing the time of tasks, it improved the time of the overall process, which is presented in the Figure 5.

5. Conclusion

Order fulfilment is seen as a key factor for reaching and keeping competitiveness, which increases customer satisfaction. It is a complex process, that is connected to logistics, but in order to execute it is necessary to share knowledge with several departments of the company, which can lead to an increase of time, due to lack of information. More than that, product variety, can increase the challenge of having an successfully and effective order fulfilment.

This internship report intended to help CorkCo to improve its order fulfilment process by analysing its process and detect the aspects that could be worked on. In order to do that, semi-structured interviews were undertaken while using other data sources such as semi-direct observation and company documents.

Regarding that, after analysing different aspects of the customer service, three majors' improvements were worked on:

- . Improved tools (cubage calculation tool)
- . Better communication between customer service/customers/ sales department
- . Faster information

By improving those three aspects it reduced the time of the process and improved the order fulfilment. Therefore, with less time on those tasks it allows the team to dedicate themselves to the customers. More than that, by getting results on those tasks, it reduced the wastage of paper and time.

Through the interviews and the other analysis, it was possible to conclude that the order fulfilment is very dependent of the ERP system. Therefore, it means that even if the company wanted to do the things in different ways, if they have a certain type of ERP that would not be possible, or they would have to adapt the ERP to themselves. Therefore, it is important to take actions to improve the order fulfilment and make it faster and more efficient.

Regarding the limitations of this study, it was hard to have an overall view of the processes since they were planning to exchange to a new ERP system, where many changes were going on. That applied mostly on the end of the internship, which made it not possible to implement the order's form since it was planned to be applied in a different way after the new ERP was implemented. So, it was only tested in order to understand how

customers would react and which benefits it could bring to the company. The other improvements were applied and were planned to be used even after the ERP change.

Finally, as future research it would be interesting to undertake the same analysis in other companies, with different types of production, in order to understand if this is common with all the companies. In addition, it would also be interesting to explore the topic of the cubage calculation, since it can help other companies that do not have a standardized product or that like CorkCo work with unfinished goods.

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Annex 1– Semi-structures interviews table info

Name:				Age:			
Literature abilities:				Working years within CorkCo:			
Question	Author	Detail	CS worker	CS Manager	LOG Manager	WHS Worker	Sales-person
Questionnaire about the current order fulfilment process							
1. Describe the current process from the moment when the order is received until the product arrives to the customer. 1.1. Which is your role in the process? Which is your job/task? 1.2. Since you work in the company the process is the same? 1.3. If not: what has changed regarding the current process?	No reference	- Understand company background and current state as well as the role of each one of the interviewed on the process - Perceive when was the last big change in the order fulfilment process - Validation of the presented scheme (Figure 5)	X	X	X	X	X

2. Have you worked in place where you had to deal with registration and shipping of orders? 2.1. If yes: Do you consider that this process is different comparing with what was done in the other company? 2.1.1. Which are the biggest differences? (activities/performance order/communication order, among other)? 2.1.1.1. If yes: What was the impact of those differences on the process? For instance: execution time, flexibility, changing adaptability, resistance).	Lin and Shaw (1998)	- Understand personal interpretation of the current process from employees who have been working there for less than half a year - Understand the main differences between the process applied currently at the CorkCo and other companies, in order to understand if the process is similar or not - Try to obtain a comparison between the current process and other process focusing on the aspects mentioned by Lin and Shaw (1998): efficiency, flexibility, robustness and adaptability. Those aspects are used in their paper	X	X			
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		to evaluate an order fulfilment process in its creation state.					
3. Do you consider it would make sense the creation of a general framework of all the necessary steps (from the reception of the order until it is shipped) for a make-to-order process? In other words, imagine that you would work in another company and that company had the same process of CorkCo (make-to-order, i.e., it only produces when there is an order a not and not for stock). Imagine that your job on the company was creating from scratch the process from the moment that	No reference	- Obtaining personal opinion of each one of the interviewed in order to understand if it makes sense to create a specific framework for a general make-to-order order fulfilment process	X	X	X	X	

the order is received until it shipped. Do you think it would help to have a generic guide? Even in a make-to-order process that all the orders are different? Why?							
Questionnaire about general problems in the process							
4. From the moment that an order is made until it is received by the customer, what is your perception of the current state of the process? 4.1. Regarding the duration of the process? 4.1.1. Are there aspects that delay the process? (For example, lack of information on a customer order?) 4.1.2. How would you improve the aspects that you	Leung <i>et al.</i> (2018) Lin and Shaw (1998) Espino-Rodríguez and Rodríguez-Díaz (2014), Lin and Shaw (1998)	- Based on papers where the process was reengineered, the idea is to understand if reengineering the process would improve the overall work - Understand how people perceive which activities are more important - Espino-Rodríguez and Rodríguez-Díaz (2014), analysed the activities, in a way of understanding	X	X	X	X	X

mentioned? 4.2. Regarding flexibility, i.e., the possibility of changing some phase/procedure or activity without that interfering with the process, it is possible? 4.3. Does the process has currently the capacity to bare changes/problems/ uncertainties? 4.4. And regarding activities? Do you believe that there are activities that are unnecessary? And for the customer? Which are the activities that do not add value to the customer? 4.5. Regarding interactions, do you consider that there are a lot of interactions between the different stakeholders of the	MacCarthy (2013)	which created value to the customer and which did not. - Lin and Shaw (1998) pointed out that when designing an order fulfilment process, it was possible to evaluate the process in four dimensions: efficiency, flexibility, robustness and adaptability. - To design and execute an order fulfilment it is necessary to share knowledge with other departments of the company (Croxtton,2003) - Also, as mentioned by MacCarthy (2013), due to the growth of product va-					
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process? Does it interfere with your work? 4.6. Does the fact of having a lot of product variety interfere and jeopardize the process? 4.7. Analyzing these aspects, do you think that for improving the process it has to be completed changed? Or in your point of view it is only necessary to change some aspects?		riety, creating an effective and successfully order fulfilment process has started to be a challenge.					
5. Regarding the process and its impact on the customers, which are the biggest complaints regarding the general process? 5.1. Which are the biggest flaws on the process that deprive the customer of having a	Aydın and Kahraman, (2019)	- According to Aydın and Kahraman (2019) order fulfilment plays a critical role in ensuring customer satisfaction therefore it is important to understand which is the relationship in the process	X	X	X		X

better service?							
Questionnaire about specific problems in the process – based in the current scheme							
6. Observing the current process, which is the most critical part of the process? Please exemplify parts of the process that you consider critical. 6.1. What makes the process slower? 6.2. Which part time is lost deliberating information, resulting in a movement of unnecessary information? 6.3. Which is the part that results in an excessive usage of paper? Or in the exchange of emails with too much annexes?	Shamsuzzaman <i>et al.</i> (2018)	During Shamsuzzaman <i>et al.</i> (2018)'s study it was detected three main types of waste in the process regarding information: waiting time, transportation, defects. - Focusing on the overall eight types of different types of waste, Douglas et al (2004) have made an analysis of the main types of waste and how it can be translated in different scenarios. Therefore, questions were made using the study of Douglas.	X	X	X	X	X

6.4. Regarding the archive, during the process, is there information that is kept for more time than the necessary? 6.5. Which part of the process creates more problems, leading to constant corrections? 6.6. Do you consider that the process is not balanced? That is to say, that the work is not proportionally equilibrated during the process? In which part? 6.7. On the process, which is the part that is only a procedure that does not add value that can be changed or eliminated? 6.8. Which is the part that in							
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your opinion is not in the correct order? That is to say, which part is made too late or too soon in the process?							
7. Would you like to add/comment something more about the order fulfillment that has not being referred? Any problem or phase/part that has not been mentioned?	No reference						
Reorganization of the general tasks							
8. Imagine that you are creating a process for a company. Please organize the 12 sections hereunder: Order entry Customer control Stock/ Inventory control Production order Manufacturing	Lin and Shaw (1998); Croxton (2003); Espino-Rodríguez and Rodríguez-Díaz, (2014) Amer <i>et al.</i> (2008)	- Based in the activities stated by several authors (Lin and Shaw, 1998; Croxton, 2003; Espino-Rodríguez and Rodríguez-Díaz, 2014; Amer <i>et al.</i> , 2008, the idea is to ask the interviewed to put it in the best order to obtain inside feedback how	X	X	X	X	

Storage Preparation of the order Invoicing/delivery note Shipping/ Transportation Post Delivery activities Measure Performance Which would be the ideal order? How would you interact them? How would be the communication? Moreover, the different parties, how would they be organized? You can add or remove parts of the process, considering what you think it is more appropriate. 8.1. If the process was make-to-stock, would you change the way you organized it? Why?		activities should be placed together in a make-to-stock process. - Understand if the organization of the process would be different if it was a make-to-stock process					
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Annex 2 - Semi-structured interview guide in Portuguese

GUIÃO DE ENTREVISTA

O presente guião apresenta perguntas com o intuito de estudar e analisar o processo atual de “order fulfilment” (processo que começa com a receção da encomenda até a mesma ser recebida pelo cliente), de forma a verificar aspetos que podem ser melhorados.

Todos os dados recolhidos serão tratados com TOTAL ANONIMATO e confidencialidade, de forma agregada e apenas serão usados para efeitos deste estudo. Ao responder, lembre-se que apenas queremos saber a sua opinião, pelo que não existem respostas certas ou erradas. Por favor responda de acordo com a realidade da empresa. Obrigada pela disponibilidade e colaboração.

Apresentação

Nome:

Idade:

Habilitações Literárias:

Tempo a trabalhar na empresa:

1. Descreva o processo atual desde a receção da encomenda até o produto ser recebido pelo cliente.

1.1. Qual é o seu papel no processo? Qual a sua função/trabalho?

1.2. Desde que se encontra na empresa, o processo é o mesmo?

1.3. Se não: o que mudou em relação ao atual?

2. Já trabalhou noutra empresa numa função em que lidasse com registo e expedição das encomendas?

2.1. Se sim: Considera este processo diferente em comparação com o que era feito na outra empresa?

2.1.1. Quais as maiores diferenças (nas atividades/ordem de execução/forma de comunicação, etc.)?

2.1.1.1. Se sim: Qual era o impacto dessas diferenças no processo? (ex: tempo de execução, flexibilidade, adaptação à mudança, resistência)

3. Considera que faria sentido a criação de um guião geral dos passos necessários (desde a receção da encomenda até a mesma ser recebida pelo cliente) para um processo produtivo make-to-order? Ou seja, imagine que ia trabalhar para outra empresa e que essa empresa tinha o mesmo processo produtivo que a CorkCo (make-to-order, ou seja, produz apenas quando há uma encomenda e não para ter artigo em stock). A sua função era criar de raiz o processo, desde a receção da encomenda até a mesma ser recebida pelo cliente. Considera que ajudaria ter um guião genérico dos passos do processo? Mesmo num processo make-to-order, em que todas as encomendas são por norma diferentes das anteriores? Porquê?

- MELHORIAS -

No geral, quais são os problemas do processo de order fulfilment da CorkCo?

4. Desde que a encomenda é colocada até que o produto é rececionado pelo cliente, qual é a sua perceção do estado atual do processo:

4.1. Em relação à duração do processo?

4.1.1. Considera que há aspetos que atrasam o processo? (Por exemplo, falta de informação da encomenda de um cliente?) Se sim, quais?

4.1.2. Como melhoraria cada um dos aspetos que mencionou?

4.2. Em relação à flexibilidade, isto é, à possibilidade de alterar alguma fase/procedimento ou atividade, etc. sem que isso implique um aumento dos custos do processo, considera que é possível?

4.3. Considera que o processo atual tem capacidade de suportar mudanças/problemas/incertezas? Porquê? O que faria para tornar o processo mais forte, de forma resistir a situações incertas?

4.4. E em relação às atividades? Considera que há atividades desnecessárias? E para o cliente? Quais são as atividades que menos valor acrescentam para o cliente?

4.5. A nível de interações, considera que há muitas interações com os diferentes intervenientes do processo? Isso interfere com o seu trabalho?

4.6. Julga que o facto de haver muita variedade de produtos também influencia e prejudica o processo?

4.7. Analisando estes pontos todos, considera que para melhorar o processo tem que ser totalmente reformulado? Ou no seu ponto de vista basta alterar alguns aspetos?

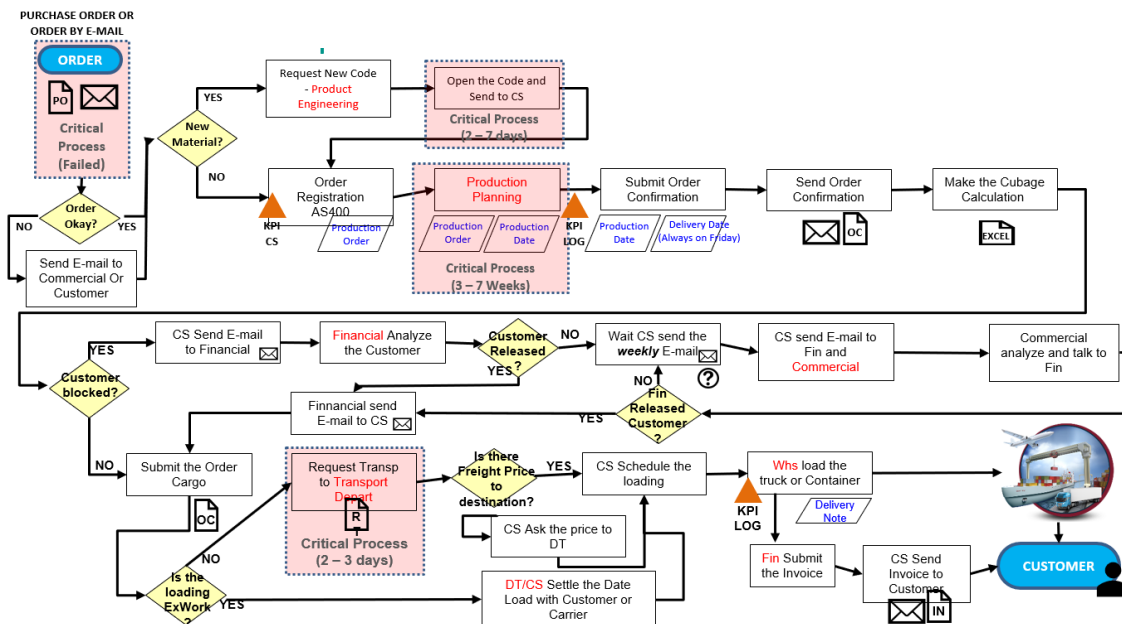
5. Relativamente ao processo e ao seu impacto nos clientes, quais são as maiores queixas em relação ao processo geral?

5.1. Quais são os maiores lapsos do processo, que impedem o cliente de ter um melhor serviço?

- EM CONCRETO -

Quais são os aspetos do processo que podem e devem ser trabalhados?

6. Observando o processo atual (apresentando abaixo), qual é a parte mais crítica do processo? Por favor exemplifique partes do processo que considera críticas



6.1. O que faz o processo ser mais lento?

6.2. Qual é a parte em que se perde mais tempo a deliberar informação, resultando num movimento de informação desnecessário?

6.3. Qual é a parte que resulta num uso excessivo de papel? Ou então, numa troca de documentos e emails com anexos em excesso?

6.4. A nível de arquivo, durante o processo há informação que é guardada por mais tempo que o necessário?

6.5 Qual é a parte do processo que cria mais problemas, levando a correções constantes?

6.6. Considera que o processo é não balanceado? Ou seja, que o trabalho não está proporcionalmente equilibrado ao longo do processo? Em que parte?

6.7. Dentro do processo qual é a parte que é apenas um procedimento que não acrescenta valor, podendo ser trocado ou eliminado?

6.8. Qual é a parte do processo que em sua opinião não está na ordem correta? Ou seja, que é feito demasiado tarde ou cedo no processo?

7. Gostaria de acrescentar/comentar algo mais sobre o processo de order fulfilment que não tenha sido referido? Algum problema, fase ou parte que não tenha sido referida?

- ORDENAÇÃO DO PROCESSO -

8. Imaginando que está a planear de raiz o processo para a CorkCo, organize as 12 partes de forma a obter um processo mais eficiente e rápido. Qual seria a ordem ideal? E como as interrelacionava? Como seria a comunicação? E os intervenientes, como se organizariam? Pode acrescentar ou retirar partes, consoante o que considerar melhor.

Registo da encomenda

Controlo do cliente

Controlo do stock

Ordem de produção

Produção

Armazenamento de produtos

Preparação da encomenda

Faturação

Requisição de transporte

Transporte

Atividades realizadas depois da entrega

Avaliação do desempenho

8.1 Se o processo fosse make-to-stock, alteraria a maneira que o organizou? Porquê?

Annex 3 - Semi-structures interviews table with general answers

Semi-structured interviews	
Questions	Overall answers
1. Describe the current process from the moment when the order is received until the product arrives to the customer. 1.1. Which is your role in the process? Which is your job/task? 1.2. Since you work in the company the process is the same? 1.3. If not: what has changed regarding the current process?	1.1. 25% Chiefs / 50% (Customer service – 25% Register / 25% Register and shipping) / 12,5% Salesperson / 12,5% Warehouse 1.2. 75% - No 25% - Yes 1.3. The process from Customer Service was different. It used to be one person in charge for all process. Now the process is divided by 2 teams: register and shipping.
2. Have you worked in place where you had to deal with registration and shipping of orders? 2.1. If yes: Do you consider that this	2. 40% - Yes 60% - No 2.1. In one of the examples given, the differences were in the tools, which were faster. Another one, was the fact that the products were weighted and measured after production, which would prevent errors if those information's are created based in theoretical knowledge.

process is different comparing with what was done in the other company? 2.1.1. Which are the biggest differences? (activities/performance order/communication order, among other)? 2.1.1.1. If yes: Which was the impact of those differences on the process? For instance: performing time, flexibility, changing adaptability, resistance).	Also, the customer service manager pointed out that the company that she worked there were a difference between the logistics and the customer service functions. 2.1.1. Due to those differences, all the ones that worked in other companies pointed out that process was faster and better.
3. Do you consider it would make sense the creation of a general framework of all the necessary steps (from the reception of the order until it is shipped) for a make-to-order process? In other words, imagine that you would work in another company and that company had the same process of CorkCo (make-to-order, i.e., it only produces when there is an order a not and not for	33 % - Yes 50% - Depends of the ERP No – 17%

stock). Imagine that your job on the company was creating from scratch the process from the moment that the order is received until it shipped. Do you think it would help to have a generic guide? Even in a make-to-order process that all the orders are different? Why?	
4. From the moment that an order is made until it is received by the customer, which is your perception of the current state of the process? 4.1. Regarding the duration of the process? 4.1.1. Are there aspects that delay the process? (For example, lack of information on a customer's order?) 4.1.2. How would you improve the aspects that you mentioned? 4.2. Regarding flexibility, i.e., the possibility of changing some	4.1.1. 100% answered that the process is slow due to: - Delays (production, new products) - The way the team is organized - ERP errors - Communication errors 4.2.1. Several measures were pointed out: - Creation of a portfolio for clients - Creation of internal logistics department (internal transportation department)

phase/procedure or activity without that interfering with the process, it is possible? 4.3. Does the process has currently the capacity to bare changes/problems/uncertainties? 4.4. And regarding activities? Do you believe that there are activities that are unnecessary? And for the customer? Which are the activities that do not add value to the customer? 4.5. Regarding interactions, do you consider that there are a lot of interactions between the different stakeholders of the process? Does it interfere with your work? 4.6. Does the fact of having a lot of product variety interfere and jeopardize the process? 4.7. Analyzing those aspects, do you	-Customer service team organization - Analyse communication with other departments 4.2. 66% - No 17% - Depends 17% - Yes, in processual aspects 4.3. Yes (100%) 4.4. 100% - Yes 4.5. Yes. For example, asking to unblock the clients (Customer control) –100% 4.6. – Yes 100% They create a lot of nose, due to how the process is made 4.7 – Yes (100%) Although some believe that the problem is the time it takes to ask for a new code, and note to have several types of product
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think that for improving the process it has to be completed changed? Or in your point of view it is only necessary to change some aspects?	
5. Regarding the process and its impact on the customers, which are the biggest complaints regarding the general process? 5.1. Which are the biggest flaws on the process that deprive the customer of having a better service?	5. Delays (100%) Sometimes some problems with the products (defects) but mainly due to delays 5.1 Delays (100%) – When the products are new it is required to ask for new codes, which takes a long time. Then the time for planning, it all delays the order registration.

6. Observing the current process, which is the most critical part of the process? Please exemplify parts of the process that you consider critical. 6.1. What makes the process slower? 6.2. Which part time is lost deliberating information, resulting in a movement of unnecessary information? 6.3. Which is the part that results in an excessive usage of paper? Or in the exchange of emails with too much annexes? 6.4. Regarding the archive, during the process, is there any information that is kept for more time than the necessary? 6.5. Which part of the process creates more problems, leading to constant corrections? 6.6. Do you consider that the process is not balanced? That is to say, that the	6.1. Registration 50% Codes request – 33% 17% - Production 6.2. Financial control 6.3. Registration (100%) However, due to COVID-19 there is not such waste of paper 6.4. No (100%) 6.5. Register (100%) 6.6. 33% - No Yes – 66% Some of them told that the process after cubage calculation was more standard. However, it was harder.
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work is not proportionally equilibrated during the process? In which part? 6.7. On the process, which is the part that is only a procedure that does not add value that can be changer or eliminated? 6.8. Which is the part that in your opinion is not in the correct order? That is to say, which part is made too late or too soon in the process?	6.7. Email sorting and transportation department 6.8 Cubage calculation (50%) Everything is ok (33%) Customer control (17%)
7. Would you like to add/comment something more about the order fulfilment that has not being referred? Any problem or phase/part that has not been mentioned?	Other comments: Online platform for order confirmations. One critical aspect is the EXCEL sheets that are too heavy.
8. Imagine that you are creating a process for a company. Please organize the 12 sections hereunder: Order entry Customer control	• Order entry • Cubage Calculation • Stock control (make to stock) • Manufacturing

Stock/ Inventory control Production order Manufacturing Storage Preparation of the order Invoicing/delivery note Shipping/ Transportation Post Delivery activities Measure Performance Which would be the ideal order? How would you interact them? How would be the communication? Moreover, the different parties, how would they be organized? You can add or remove parts of the process, considering what you think it is more appropriate. 8.1. If the process was make-to-stock, would you change the way you organized it? Why?	• Storage • Preparation of the order • Shipping/ Transportation • Invoicing/delivery note • Post Delivery activities • Measure Performance
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Annex 4 – Order form print screens: explanation

The 'Order' form has a teal header bar. Below it, a grey box contains the instruction: "Please select the items that you wish to purchase. The items' list is based on the items that have been purchased before. If the item is not in the list, please write it down in the comments." Below this, there are two input fields: "Payment Conditions" with "60 days payment" and "Delivery Conditions" with "CIF". A "Change" button is next to the delivery conditions. To the right is a "Packaging quantity" button. The main area is a table with columns: Item, Un., Price/Un., Quant., and Price. There are six rows, each with a dropdown arrow in the 'Item' column and '0' in the 'Quant.' column. At the bottom, there is a "Comments:" label and a text area. At the very bottom are two buttons: "Confirm Order" (green) and "Cancel" (red).

1 – Where the customer chooses the items that he wants to buy

This screenshot is similar to the previous one, but with a "Packaging quantity" popup window open. The popup has a teal header and contains the text: "In this area it is possible to obtain the information regarding packaging quantity in order to optimize your chosen quantity." It has an "Item" dropdown, a "Quantity" input field, and a "Back" button. The background form is slightly dimmed.

2 – Quantities can be checked in order to know how much can be ordered in on pallet/bag/cartoon

The 'Order Validation' form has a teal header. It contains a grey box with the instruction: "Please confirm the information below. If you need to correct some fields use the buttons ('Correct Delivery Address' or 'Correct Order') below. After confirmation, proceed by clicking on 'Send Order'." Below this are fields for "Name" (Customer test), "Delivery Address" (Street Padre Manuel, 23), "Billing Address" (Street Padre Manuel, 23), and "VAT number" (502546257). There is a "Your reference" field and a "Know more | Change it" button. Below is an "Order_" section with a table showing item details and a "Total" row. At the bottom are four buttons: "Send Order" (green), "Correct Delivery Address" (grey), "Correct Order" (grey), and "Cancel" (red).

3 – Confirmation of the order

This screenshot is similar to the previous one, but with a "Microsoft Excel" popup window open. The popup has a teal header and contains the text: "A purchase order has been created and must be sent to the commercial. A sequential number has been created to register your order through this toll. If you added your reference, it will be included in the purchase order." It has an "OK" button. The background form is slightly dimmed.

4 – Conclusion

Annex 5 – Archive information

Registration team				
Workers	Archive?	What ?	What is sent to the shipping team?	Archive organized by:
1	yes (+/-)	The processes for one months	Only the sheet with the information	Arrival
2	no	-	Only the sheet with the information + order email or other files	-
3	no	-	Only the sheet with the information + order email or other files	-
4	no	-	Only the sheet with the information + order email or other files	-

Shipping team				
Workers	Archive?	What ?	For how long?	Archive organized by:
1	Yes	Information given by the registration team	International (1 year) National (1 month)	Invoice number
2	Yes	Information given by the registration team	1 year	Invoice number
3	Yes	Information given by the registration team	2 to 3 months	Invoice number
4	Yes	Information given by the registration team	Until the folder is full and it is necessary to destroy the oldest processes	Invoice number