Diagnosis and Benchmarking of the Processes and Activities of a Logistics Operator

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Master Dissertation

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“And more, much more than this
I did it my way”

Diagnosis and Benchmarking of the Processes and Activities of a Logistics Operator

Abstract

Any logistics operator, especially after the COVID-19 pandemic, must be able to adapt to the demands of the market and its customers. The logistics operator analysed in this dissertation is very competitive in the sector due to the high level of customisation it offers to its clients, the result of its business areas focused on the most diverse services as well as its sophisticated systems developed in-house. With the high growth it has experienced in recent years, it felt the need to create a project called "Diagnosis of Logistics Systems" to understand what the best strategy for the company is to continue to evolve its processes and systems in the future.

Thus, this research work aims to diagnose and carry out a benchmarking of the processes and activities of one of the platforms, based on the project of this logistics operator which is taking place at national level and in which the author of this dissertation is inserted, working on one of the sites.

Firstly, this research work began by presenting the logistics operator, as well as its mission and vision.

Next, a review of the bibliography considered relevant in logistics was carried out in order to acquire the knowledge and instruments necessary to carry out the proposed diagnosis and benchmarking.

In the third phase of the study, the processes and activities in practice in the operations of the platform in question were mapped. Inbound, Outbound, Reverse Logistics and Distribution processes were considered. Several field visits were required to complete this stage, as well as the use of mapping techniques.

Later, in the fourth phase, all mappings were analysed. The benchmarking carried out considered not only the knowledge acquired regarding the philosophies and methodologies currently applied in the logistics area, but also the demands of the market in the current transition to Industry 4.0. For the improvement opportunities identified during the benchmarking a Cost-Benefit analysis was also performed.

Finally, conclusions were drawn regarding the analysis of opportunities for improvement. Some future works were also suggested, which, occurring in parallel with the project, would not conflict with its outcome.

Resumo

Qualquer operador logístico, sobretudo após a pandemia do COVID-19, tem de ser capaz de se adequar as exigências do mercado e dos seus clientes. O operador logístico analisado nesta dissertação, é bastante competitivo no setor devido à elevada customização que oferece aos seus clientes, fruto das suas áreas de negócio focalizadas para os mais diversos serviços bem como dos seus sofisticados sistemas desenvolvidos internamente. Com o elevado crescimento que teve nos últimos anos, sentiu a necessidade de criar um projeto designado "Diagnóstico de sistemas logísticos" a fim de entender qual é a melhor estratégia da empresa para continuar a evoluir os seus processos e sistemas no futuro.

Assim, este trabalho de investigação visa diagnosticar e realizar um benchmarking dos processos e atividades de uma das plataformas, tendo por base o projeto deste operador logístico que esta a decorrer a nível nacional e no qual o autor desta dissertação está inserido a trabalhar num dos sites.

Em primeiro lugar, este trabalho de investigação começou por apresentar o operador logístico, bem como a sua missão e visão.

Em seguida, foi efetuada uma revisão da bibliografia considerada relevante na área da logística, a fim de adquirir os conhecimentos e instrumentos necessários para levar a cabo o diagnóstico e o benchmarking propostos.

Na terceira fase do estudo, foram mapeados os processos e atividades em prática nas operações da plataforma em questão. Foram considerados os processos de Inbound, Outbound, Logística Inversa e Distribuição. Foram necessárias várias visitas de campo para completar esta fase, bem como a utilização de variadas técnicas de mapeamento.

Mais tarde, na quarta fase, todos os mapeamentos foram analisados. O benchmarking realizado considerou não só os conhecimentos adquiridos relativamente às filosofias e metodologias atualmente aplicadas na área logística, mas também as exigências do mercado na atual transição para a Indústria 4.0. Para as oportunidades de melhoria identificadas durante o benchmarking realizou-se ainda uma análise Custo-benefício.

Finalmente, foram retiradas conclusões relativamente à análise das oportunidades de melhoria. Foram ainda sugeridos alguns trabalhos futuras que, ocorrendo em paralelo com o projeto, não entrariam em conflito com o seu resultado.

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During the preparation of this this dissertation, fortunately I had the support and encouragement of several people and entities without which this work would not have been possible. In this sense, I would like to thank:

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The remaining trainees that ensured that this work was done with professionalism, seriousness and as a team in the true meaning of the word.

My parents and my sister, without them none of this would be possible.

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Acronyms

AIDC - Auto ID Data Capture

BPMN – Business Process Modeling Notation

CBA – Cost Benefit Analysis

CSCMP - Council of Supply Chain Management Professionals

DDD – Desire Delivery Date

ERP – Enterprise Resource Planning

ICOL – Interface de Controlo da Operação Logística

IT – Information Technology

LAN – Local Area Network

PDA - Personal Digital Assistants

PL – Party Logistics

PO – Purchase Order

RF – Radio Frequency

RFID – Radio Frequency Identification

TMS – Transport Management System

WMS – Warehouse Management System

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Diagnosis and Benchmarking of the Processes and Activities of a Logistics Operator

1. Introduction

1.1. Company Profile - Rangel Logistics Solutions

Rangel Logistics Solutions, founded in 1980, is a company that has 42 years of experience in the logistics industry and prides itself on being able to integrate a wide range of services, providing the market with a One-Stop Shop solution for transportation and logistics (Rangel Logistics Solutions n.d.).

It began as a company specialised in customs dispatch and quickly established an international distribution and logistics network, winning the title of Global Logistics Operator for Expo 98 in 1998. As the organisation expanded, it achieved global coverage, supported by a global network of partners. Today, the company transports goods between more than 220 nations and territories by land, sea and air. In addition to Portugal, it has direct operations in Angola, Mozambique, Cape Verde, Brazil, South Africa, Mexico and Zambia (Rangel Logistics Solutions n.d.).

The company's success over the last 42 years can be attributed to its ability to adapt solutions to each set of activities and to optimize all logistics processes, using the most up-to-date, efficient, and customized technology. This has been possible due to Rangel's understanding of the specificities of the sector, its wide experience in systems integration, and its ability to adapt and respond to its clients' difficulties and strategic decisions (Rangel Logistics Solutions n.d.).

Rangel currently provides the following services: Customs Broker, Road Freight, Air & Sea Freight, Express, Contract Logistics, Custom Critical and FeirExpo (Figure 1) (Rangel Logistics Solutions n.d.).

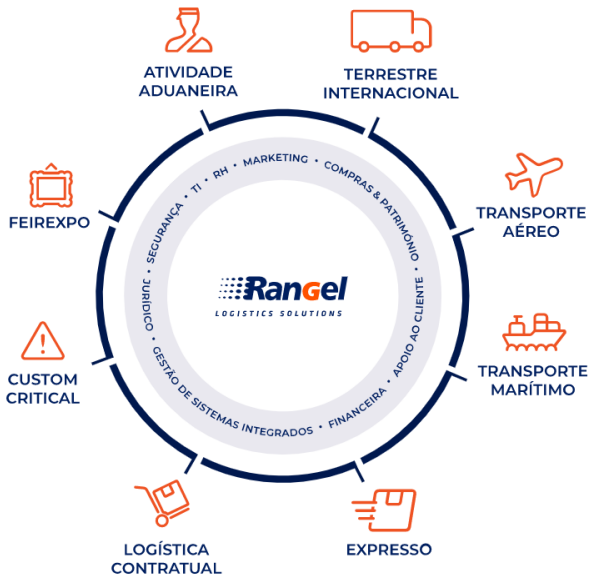


Figure 1 - Services provided by Rangel Logistics Solutions (Rangel Logistics Solutions n.d.)

This image taken from the company's web page, shows the 8 services mentioned above.

1.1.1.Mission

Rangel´s mission is: “We aspire to be a strong partner of the companies, helping them to obtain sustainable competitive advantages, through logistics solutions able to position their products in the market quickly, efficiently, and safely” (Rangel Logistics Solutions n.d.).

1.1.2.Vision

The Vision of Rangel is “The ability to offer an integrated and global logistics solution is our main asset. More than 37 years of experience, innovating systems, and a team of passionate professionals, allow us to create value, innovation, a unique offer and contribute to our client’s success. Be an integral part of our customers' business, understanding the industry where they operate and offering the best logistics solutions that suit the needs of each vertical market (or industry). Develop mutually rewarding relationships with employees, partners, suppliers, and customers” (Rangel Logistics Solutions n.d.).

1.2. Objective

Rangel's Contract Logistics unit, which focuses on storage and distribution logistics processes and offers the customer a variety of integrated supply chain services and solutions, is carrying out a project called "Diagnosis of Logistics Systems".

This project was born because Rangel is constantly growing and prides itself on offering solutions adapted to the requirements of a wide and varied range of clients, which has led to a great variability of processes and features in the system. In addition, the warehouse management system used in this unit - ICOL is developed in-house. This project has three phases.

The first phase of the project is to make a detailed survey of the AS-IS processes and features of the system in practice in the operations.

The second phase of the project is to make the systematization of the TO-BE processes and features of the systems.

In the third and final phase of the project, the goal is to evaluate the evolution strategy of the current systems. The result of this project could be to evolve the current tools or to carry out a market search for alternative solutions.

Thus, the objective of this dissertation is, from the project being developed at national level, with the objectives of each phase explained above, and since the author was working on the Montijo site for it, to carry out a benchmarking of the processes and activities of the various operations on this platform.

1.3. Methodology

To achieve the objective proposed in this dissertation, a methodology was defined.

The first task is to write about state-of-the-art contract logistics, this step will serve as the knowledge base for collecting all the data, for analysing and suggesting improvements, as well as for the possible conclusions that could be drawn in this dissertation.

The second step will be, aligned with the first phase of the project, to map the AS-IS processes and system features used in Montijo's operations. The method used will involve conducting a mapping in Swimlanes to understand the process and will then be adapted to the Word delivery format desired by the company.

After this stage, and with the data collected, a benchmarking of the processes and activities of the various operations will be carried out, considering the concepts and tools discussed in the bibliographical revision. Next, a qualitative cost-benefit analysis of the possible improvement opportunities identified will be performed.

Finally, conclusions will be drawn on the analysis of the proposed improvements and ways to continue this study will be suggested in the light of future work.

Observation and conversations with operators, as well as guidance from the project managers on what to search for, are the pillars of this strategy.

2. Literature Review

This chapter focuses on a review of the theoretical literature. Firstly, it reflects on the concept and origin of logistics. Then the importance of logistics management is also explained. Subsequently, a review is carried out on the logistics processes and the good practices to be followed in the elaboration of these flows. Since the company where the author is developing his project, provides contractual logistics services and functions as a 3PL partner in the Montijo site, a theoretical review is also carried out on these services, as well as the benefits and disadvantages for a company using them. Finally, a study is made of the various concepts, methodologies, and tools that will be used in this dissertation.

2.1. Logistics Concept

Nowadays, Logistics is a very complicated and advanced process, but it started years ago in a less advanced way. Logistics or Logistics Management is born for companies, institutions, and organisations with numerous military origins since operations such as: supply, transport, maintenance, evacuation, and hospitalisation of the wounded and complementary services, have led to the development of today's logistics services (Hopkins Distribution Company 2020).

Since the Middle Ages, vast supply systems, such as roads and warehouses, were utilised, with forts and castles functioning as storage depots. The expansion of railways and ships continued the development of logistics during the industrial revolution. The internal combustion engine cleared the stage for widespread usage of motorized transport during the First World War, resulting in a significant increase in industrial capacity. Furthermore, major advancements in transportation and communications occurred throughout World War II (Hopkins Distribution Company 2020).

Logistics shifted from military to business following World War II. Outbound processes were the first emphasis of physical product distribution. The logistics activities now include filling orders, product distribution, storage and warehousing, production planning, and customer care. The process of getting things from point A to point B spawned a whole business. Many businesses today outsource some or all their supply chain management functions, leading in the growth of third-party logistics firms to ensure efficient transportation and tracking of goods (Hopkins Distribution Company 2020).

With that being said, the concept of logistics has been evolving and no single definition has been attributed to it. Some definitions will be presented considering not only relevant authors in the logistics field, but also the CSCMP, a non-profit organisation of business personnel.

One definition is "Logistics is a strategic process (because it adds value, enables differentiation, creates competitive advantage, increases productivity and makes the organization profitable) of planning, implementing and controlling flows of materials/products, services and related information, from the point of origin to the point of consumption, according to the needs of the elements to be served by the logistics system in question" (Correia 2018).

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For Ronald Ballou "Logistics is the process of planning the flow of materials, aiming at the delivery of needs in the desired quality at the right time, optimizing resources and increasing quality in services" (Ballou 1999).

According to the Council of Supply Chain Management Professionals (CSCMP), "Logistics is the process of planning, executing and controlling the flow and storage of items effectively and efficiently in terms of time quality and cost of raw materials in preparation, finished goods and services, covering from the point of origin to the point of consumption, with the aim of meeting the consumer's requirements" (Correia 2018).

Following this definition, the same CSCMP defines "Logistics activity as including Inbound logistic and Outbound logistic management, fleet management, warehouse management, material management and its handling, order response management, logistics network design, project management, inventories, supply and demand planning and management of service providers" (Correia 2018).

This dissertation would like the reader to consider the following definition for logistics "Logistics involves getting the right product in the right form, in the right quantity and quality, in the right place and time to the right customer at the right cost" (John Mangan 2020).

2.2. Logistics Management

For many companies, the ability to efficiently match demand and supply is key to their success. Failure to do so could lead to loss of revenue, reduced service levels, impacted reputation, and decline in the company's market share. Since goods are manufactured in one or more factories, then transported to warehouses and distribution facilities for intermediate storage before being delivered to merchants or consumers, logistics plans must examine the interconnections of these many levels in this logistics network, also known as the supply chain, in order to cut costs and enhance service levels. Suppliers, production centres, warehouses, distribution centres, and retail outlets are all part of this network, as are raw materials, work-in-process inventories, and finished goods that flow between the facilities (David Simchi-Levi 2014).

From suppliers and production facilities through warehouses and distribution centres, retailers and shops, logistics management considers every facility that has an influence on cost and plays a part in ensuring that the product meets client criteria. Indeed, it is vital to account for the suppliers' suppliers and the customers' customers in various supply chain assessments since they have an influence on supply chain performance. Second, the goal of logistics management is to be efficient and cost-effective across the whole system; total systemwide expenses, from transportation and distribution to raw material, work-in-process, and completed goods inventories, should be kept to a minimum. As a result, the emphasis is on taking a systems approach to logistics management rather than merely cutting transportation costs or reducing inventory. Finally, logistics management involves many of the firm's operations, from the strategic to the tactical to the operational levels, because it revolves around designing, executing, and regulating the logistics network. Logistical choices are often grouped into three categories:

- **The strategic level** deals with decisions that have a long-lasting effect on the firm. This might involve decisions on the quantity, location, and capacity of warehouses

and manufacturing plants, as well as the material movement across the logistics network.

- **The tactical level** typically includes decisions that are updated anywhere between once every week, month, or quarter. This involves decisions on purchasing and manufacturing, inventory policies, and transportation techniques, as well as how frequently clients are visited.
- **The operational level** refers to day-to-day decisions such as scheduling, routing, and loading trucks (David Simchi-Levi 2014).

Next, the various logistics processes will be presented, considering the sub-processes that compose them and the activities necessary to carry them out.

2.3. Logistics Processes

Warehousing has two primary flows: Inbound logistics where goods from suppliers are received and stored, and Outbound logistics where goods are retrieved and shipped to end customers (Oracle NetSuite 2020). With that being said, this dissertation is going to analyse the Inbound process first.

2.3.1.Inbound

Inbound logistics is a process related to the movement of materials or finished inventory from the supplier to the purchasing organisation. These activities are an important focus area for Supply Chain cost savings, inventory optimization, and customer service. Supply Chain Management relies on Inbound logistics to dispose of inventory in the warehouse to satisfy customer orders (MAWEU 2016).

Inbound logistics activities:

- **Sourcing and procurement:** Identifying and analysing possible suppliers, negotiating, and managing suppliers are all part of the sourcing and procurement process.
- **Ordering/purchasing:** Purchasing the goods and materials required by the company in the correct quantity and at the appropriate time.
- **Transportation:** Choosing whether to transport items by truck, plane, train, or other means. This activity also entails deciding on incoming supply delivery pace, contracting with third-party carriers, and negotiating pricing and route with vendors.
- **Receiving:** Taking care of fresh materials as they arrive, unloading trucks and making sure they match the order.
- **Material handling:** Transporting received goods within the facility over short distances and staging them for subsequent use.
- **Putaway** is the process of moving items from the receiving port to storage. Everything is put away in its proper place by the staff.
- **Warehousing and storage:** Managing materials before they are sent to manufacturing or customer fulfilment.
- **Inventory management**: Determining the type and quantity of raw materials/items to keep, as well as their location.

- **Expediting:** Keeping track of the progress and timetable of items as they arrive at your plant.
- **Distribution:** Getting materials to where they need to go within the company.
- **Tracking:** Verifying information about incoming orders, such as their location and supporting papers such as receipts (Oracle NetSuite 2020).

2.3.2.Outbound

The purpose of Outbound logistics is to run as effectively as possible in order to maximize earnings. Outbound logistics is the storage and movement of goods from the place of manufacture to the point of delivery to the client. The warehousing expenses in the supply chain might be quite expensive. As a result, effective Outbound logistics management is critical for reducing waste and lowering operational expenses. If a warehouse's Outbound logistics are effective, it will be able to please clients more rapidly and earn a higher reputation (Eil 2022) (Oracle NetSuite 2020).

Outbound Logistics activities:

- **Warehouse and Storage Management:** In warehouse management, Inbound and Outbound logistics collide. For enterprises that sell finished items received from suppliers, Inbound logistics focuses on product acquisition, whereas Outbound logistics fulfils orders given directly to customers and delivers the products to retail outlets.
- **Inventory Management:** Inventory management, a procedure that finds the optimal location to store products in the warehouse for quick order fulfilment and the order picking and packaging operation, is aided by software. Inventory and order accuracy, as well as preserving product quality by avoiding damage, theft, obsolescence, or spoilage, are all aims of inventory management.
- **Transportation:** Depending on the nature of goods, several modes and techniques of shipping are used.
- **Delivery:** On-time delivery is critical to success. In addition, the customer's order must include the exact contents and quantities, and the shipment must not be lost or damaged during transportation.
- **Distribution Channels:** Outbound logistics management is influenced by the distribution networks via which products reach customers. Direct (when you sell directly to your consumers) and indirect (when you sell indirectly to your customers) distribution routes are the most common (when you sell through an intermediary such as a wholesaler or retailer). Direct to consumer, value-added resellers, dealer networks, dual distribution, omnichannel, and drop shipping are just a few of the distribution techniques available. Consider logistics complexity, cost, speed, quality, customer happiness, and control when selecting distribution channels.
- **Last-mile Delivery:** The last stage of an order's journey includes the final shipping leg and delivery. The last mile of delivery is typically the most expensive and inefficient. Home grocery delivery from a local store and package delivery by a common carrier are examples of last-mile logistics services. Shippers may handle many orders at once in the same way before the last mile. However, because each delivery is made to a specific location, each last mile delivery requires personalized attention. Last-mile services account for 41% of overall

supply chain expenditures, with deliveries to addresses dispersed over a suburban region or crammed into a congested city with limited parking.

- **Delivery Optimization:** Delivery optimization requires not only cutting costs but also meeting increased customer demands for speed and transparency. Route planning software organizes orders for delivery more efficiently, sorts products by route, draws the optimum route based on traffic, assigns routes to drivers between other factors (Oracle NetSuite 2020).

Figure 2 shows the sub-processes of Inbound and Outbound logistics:



Figure 2 - Inbound and Outbound sub-processes (Oracle NetSuite 2020)

2.3.3.Reverse Logistics

The goal of manufacturing companies is to deliver things to its clients through their factories. This movement of goods most often results in profit for all parties involved. These same businesses, on the other hand, do not want things returned for any reason. They don't plan for Reverse Logistics, or the transfer or return of products backwards, because these returns are expensive (Dennis W. Krumwiede 2002).

Reverse Logistics is a time-consuming and complicated process. Many companies with limited resources outsource their Reverse Logistics operations, which necessitates third-party partners to not only assist in the process of returning goods by scheduling collection and transportation, but also to collect customer information and track the status of returned items. Reverse Logistics differs by industry but is possible to identify the following activities (Dennis W. Krumwiede 2002) (Oracle NetSuite 2021):

- **Process the Return**: The return process starts when the consumer signals they want to return a product. This step should include return authorization and identify the product's condition. This process also involves scheduling return shipments, approving refunds and replacing faulty goods.
- **Deal with Returns**: Once a returned product arrives at your location or centralized processing centre, inspect it and determine its return category. (Note: If you have optimized Reverse Logistics, you should know where the product should go before it arrives.) Sort products into the disposition options: fix, resell as new, resell as a return, recycle, scrap or refurbish.
- **Keep Returns Moving:** Reduce your daily waste by sending repairable items to the repair department.
- **Repair:** After reviewing the returned item/equipment and determining whether it can be repaired, move it to the repair area. If not possible, sell any sellable parts.
- **Recycle:** Any parts or products that you cannot fix, reuse or resell should be sent to the area for recycling (Oracle NetSuite 2021).

In Figure 3 it is presented the flow of the Reverse Logistics sub-processes.

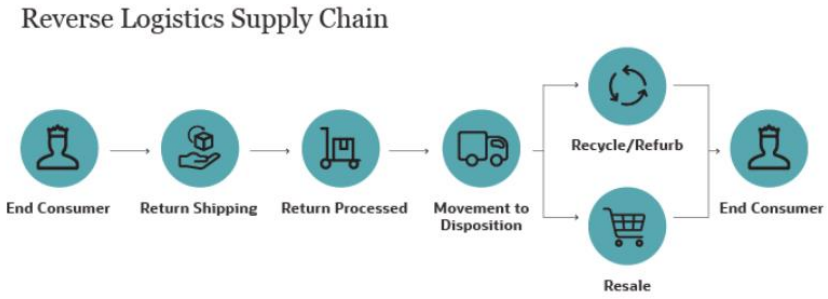


Figure 3 - Reverse Logistics sub-processes (Oracle NetSuite 2021)

2.4. Contractual Logistics Concept

Because of increased competition, rising customer demands, and the widespread use of e-commerce, logistics services have become more demanding. As a result, logistics outsourcing, also known as 3PL, 4PL, and 5PL, has emerged as the most cost-effective

option for companies, since it allows them to delegate a crucial area of their business to specialised partners (Rangel Logistics Solutions 2021).

The decision to outsource logistics has several benefits, including the ability to increase efficiency in an area where companies do not have a stronghold, while lowering prices. When it comes to outsourcing certain services, determining what levels of outsourcing will be employed is key. This is where Party Logistics, or PL, which is an abbreviation for the English word Party Logistics comes in. Several services should be considered in this way, including (Rangel Logistics Solutions 2021):

- Domestic Transport;
- International Transport;
- Customs Broker;
- Warehousing;
- Stock Management;
- Distribution.

The classifications are 1PL, 2PL, 3PL, 4PL, and 5PL, on a spectrum from a lower to a greater degree of service outsourcing, based on the logistical services it incorporates. It is apparent which operations stay on the company's side and which are the duty of the logistics partner using these degrees of outsourcing. The PL Pyramid from 1PL to 5PL might be described as a downstream change of functions in terms of logistics services (Figure 4) (Rangel Logistics Solutions 2021) (Jakubauskas 2010).

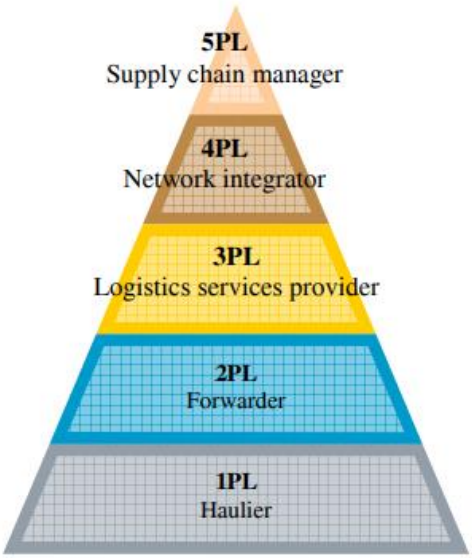


Figure 4 - PL Pyramid from 1PL to 5PL (Jakubauskas 2010)

On one side, the most basic level, 1PL, suggest that there is no outsourcing of services. In this case, it means that the company handles all logistical services in-house rather than outsourcing them.

In a 2PL, on the other hand, the corporation decides to assign solely the task of getting the items from point A to point B to the logistics partner. Some e-commerce organizations are looking for this solution to provide a quick response to clients in terms of delivery (Rangel Logistics Solutions 2021).

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3PL is referred to a company that outsources the logistics of collection, storage, and distribution in an operation that it manages. In other words, the company manages the entire product flow, while the logistics partner oversees keeping and controlling the products in the warehouse, packing them for delivery, and distributing them (Rangel Logistics Solutions 2021).

4PL refers to when the logistics partner oversees the full product flow and has total operational control. This partner understands the customer's needs and plans and uses that knowledge to manage the whole logistical chain, integrating the people, processes, and technology involved (Rangel Logistics Solutions 2021).

In the case of a 5PL, on the other hand, the partner is already an aggregator with a comprehensive view of the entire operation, generating, organizing, and implementing logistics solutions on behalf of several clients. It can handle several supply chains and brings together the demands of various 3PLs in this context. As a result, it assumes procurement responsibilities, negotiating for the customer's interest and assuring efficiency and better terms (Rangel Logistics Solutions 2021).

Since Rangel Montijo´s site works as a 3PL partner, both in Pharma and Multi-Client operations, for its customers, it is consequently critical to have a better understanding of the 3PL services.

2.4.1. Third-party logistics

In a 3PL, the partner is adding value by offering services that will have an impact on the business's performance and operational efficiency, albeit in a realm that is very closely tied to day-to-day transactions and operations. This is the most preferred logistics outsourcing option, with a high level of satisfaction. According to the "2021 Third-Party Logistics Study - The State of Logistics Outsourcing “, 88 percent of companies and 99 percent of 3PL partners believe the relationship is successful (Rangel Logistics Solutions 2021).

Companies benefits:

- A 3PL partner is specialist in doing what customers do not want to do (because the core business is not logistics).
- It helps companies transform fixed costs into variable costs.
- It gives companies flexibility since it helps in splitting responsibilities.
- It helps companies in an expansion phase that no longer have space in the factory and have begun to put their processes at risk.

Companies Drawbacks:

- It is important to select the 3PL provider that has the ability to provide better services. If companies cannot select reliable 3PL providers, they may suffer economic losses.
- Information sharing and apparent risk sharing between the parties is always required. However, related costs may increase if some information essential to the firm is leaked out (Jakubauskas 2010).

Diagnosis and Benchmarking of the Processes and Activities of a Logistics Operator

To decide whether it is useful to outsource its activities, the company defines logistics costs. Hence, logistics cost (per item) function is defined by this equation (Jakubauskas 2010):

$$LC = HC + MC \quad (1)$$

where: LC – logistics cost; HC – holding cost; MC – moving cost.

Holding cost is the sum of rent (RC) and inventory (IC) costs:

$$HC = RC + IC \quad (2)$$

Moving cost is the sum of transport (TC) and handling costs (HC):

$$MC = TC + HC \quad (3)$$

Hence, the logistics cost is defined as the sum of four main variables:

$$LC = RC + IC + TC + HC \quad (4)$$

There is no need to say that, if a 3PL partner can provide lower Logistics Costs than those that the company will have if it takes care of it itself, the decision should be to contract these logistics services.

2.5. Warehouse Management Systems

A warehouse management system, also known as a WMS, is primarily designed to handle the transportation and storage of goods inside a warehouse as well as the processing of related activities including shipping, receiving, put-away, and picking. The purpose of a warehouse management system, a database-driven computer program, is to increase warehouse productivity by managing cutaways and to ensure accurate inventory levels by documenting warehouse transactions. Based on real-time data on the level of bin utilization, the systems also manage and optimize stock (Ramaa.A 2012).

To effectively track the movement of goods, it frequently uses Auto ID Data Capture (AIDC) technologies, including barcode scanners, portable computers, wireless LANs, and possibly Radio-frequency identification (RFID). Once data has been gathered, it is either synchronized in batches with or wirelessly transmitted in real time to a centralized database (Ramaa.A 2012).

Literature distinguishes three types of warehouse management systems:

- **Basic WMS:** This system is apt to support stock and location control only. It is mainly used to register information. Storing and picking instructions may be generated by the system and possibly displayed on RF terminals. The warehouse management information is simple and focuses on throughput mainly.
- **Advanced WMS:** Above the functionality offered by a basic WMS, an advanced WMS is able to plan resources and activities to synchronize the flow of goods in the warehouse. The WMS focuses on throughput, stock and capacity analysis.
- **Complex WMS:** With a complex WMS the warehouse or group of warehouses can be optimized. Information is available about each product in terms of where it is located (tracking and tracing), what is its destination and why (planning, execution, and control). Further, a complex system offers additional functionality

like transportation, dock door, and value-added logistics planning which help to optimize the warehouse operations as a whole (Ramaa.A 2012).

It can be said that ICOL, the WMS of this logistics operator, is a “Complex WMS”, as defined previously. With that being said, it is going to be presented the impact of industry 4.0 in a WMS, in order to understand to where this system can evolve next.

2.5.1.Industry 4.0 in Logistics Management

The hub where commodities move via a supply chain has always been the warehouse. However, they must also be a significant source of competitive advantage for logistics providers in the current economic environment. The implementation of the Industry 4.0 paradigm will bring about significant changes in how today's warehouses operate. Particularly, the adoption and effective use of Warehouse Management Systems (WMS), which will change warehouse operations into the future needs of Inbound logistics in line with the Industry 4.0 paradigm (L. Barreto 2017).

The integration that is necessary among the many supply chain players and stakeholders will provide complete coordination and alignment between all phases of the value chain. For instance, transports will be able to inform the intelligent warehouse management system of their location and expected arrival time so that it can choose and prepare a docking slot, maximizing just-in-time and just-in-sequence delivery. The WMS will assign storage space automatically based on the delivery details and will make a request for the necessary machinery to move the goods to the desired location on its own. Tags will send signals to the WMS after pallets have been moved to their designated place in order to enable real-time visibility into inventory levels, which may help avoid expensive out-of-stock situations, as well as enhancing the management decision capability towards adjustments that might be needed to increase clients’ service level (L. Barreto 2017).

Considering the nature of this dissertation, it becomes extremely relevant the search for theoretical foundations that support the aspects that will be developed throughout it, both on how the processes will be mapped and on how they will be analysed. In this sense, the following presents the philosophies and methodologies that are currently present at the base of any company and its workers.

2.6. Lean

Lean is characterized as the systematic elimination of waste by all organization members from all components of the value stream. Cost-reduction is a common term used to describe lean. By enhancing efficiency, cutting expenses incurred because of eliminating non-value-adding stages and inefficiencies in the processes, as well as reducing cycle times - and generating profit for the business - lean aims to make organizations more competitive in the market. If a company produces exactly what is required, in the correct quantity, at the appropriate time, it can achieve these outcomes without sacrificing effectiveness. "Lean manufacturing" aims to eliminate waste in all aspects of production, including supplier networks, customer connections, product design, and factory management (Naslund 2008).

Diagnosis and Benchmarking of the Processes and Activities of a Logistics Operator

The foundation of the lean methodology is the mapping and analysis of process activities. Value stream mapping is the term used in the lean methodology. The entire process required to generate the product is included in the value stream. The "flow of value" to these companies is represented by the value stream. The analysis is based mostly on identifying processes that enhance the product's value or processes that fall under the category of “muda”, the Japanese word for waste. Waste can be discovered throughout the value stream, especially when the product is transferred between departments. Overproduction, waiting, transportation, improper processing, excess inventory, superfluous motion, and flaws are seven common types of waste (Naslund 2008).

Another way to explain lean is as a pull system. The approach encourages the factors required for high-quality product production to meet market demand with just modest levels of inventory. Holding costs are reduced since products are only manufactured to satisfy anticipated demand and materials do not arrive until they are required. Companies have significantly shortened lead times, considerably decreased raw material, work-in-process, and finished goods inventories as a result, and significantly boosted asset turnover. The lean process consists of these five fundamental steps (Naslund 2008):

1. Define value and all the value adding features in a given process.
2. Identify the “value stream”, the chronological flow of activities that add value.
3. Force the activities to flow without interruption. Any non-value adding activities should be removed or minimized (in the case that non-value adding activities are required, their impact to the process is minimized).
4. Allow the customer to “pull” the product or service through the process, akin to Just In Time manufacturing.
5. Continuously pursue perfection of the process by revisiting the steps again in a continuous loop. Go through the steps repeatedly to ensure that the process is as improved as it can (Naslund 2008).

2.6.1.Kaizen Continuous Improvement

The Japanese Kaizen philosophy is a type of Continuous Improvement that focuses on making tiny, incremental improvements with immediate effects.

Every issue is viewed as an opportunity for progress with this philosophy. The Kaizen Daily Sheet is one of the major instruments of this methodology. It enables the involvement of employees, who should be rewarded for exposing inefficiencies and operational problems as they are the ones who can detect them most effectively.

This attitude aims to act before issues arise to decrease waste and boost efficiency. It is based on the "idea that any part of a process can be improved, and that the individuals closest to it are best able to identify the changes that need to be made" (Naslund 2008).

Once the significance of this philosophy is established as a means of promoting continuous improvement, efforts are typically made to embed it in corporate culture. This brings us to the significance of using a variety of tools and methodologies in this context (Naslund 2008).

2.7. Business Process Modeling Notation

BPMN is a visual modelling language used to characterise business process workflows in business analysis systems. It is an open standard notation for graphical flowcharts, which is used to design business process workflows. It is a well-liked and understandable graphic that all business stakeholders, including business users, business analysts, software engineers, and data architects, can easily interpret (Visual Paradigm n.d.).

BPMN enables us to clearly and consistently record and document business processes inside an organization, ensuring that all necessary parties, such as process owners and business users, are involved. The team can respond to any faults found in the processes more successfully as a result. Both technical and non-technical stakeholders may readily understand BPMN's extensive and yet rich notations. Businesses and organizations can benefit greatly from business process modelling since it (Visual Paradigm n.d.):

- Provides businesses with the capability of defining and understanding their procedures through Business Process Diagrams.
- Provides a standard notation that is readily understandable by all business stakeholders.
- Is simple to learn yet powerful enough to depict the potential complexities of a business process (Visual Paradigm n.d.).

2.7.1.BPMN Notation

BPMN uses diagrams with a variety of graphic components to explain the processes. Users may easily comprehend a process' logic thanks to its graphic portrayal (Visual Paradigm n.d.).

It was primarily created to create and interpret basic and complicated business process diagrams. For this reason, the BPMN standard organizes the graphic components into categories; as a consequence, users who deal with business process diagrams may quickly identify the elements (Visual Paradigm n.d.).

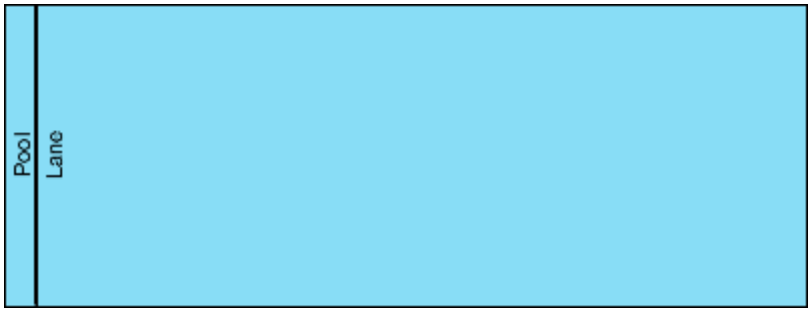


Figure 5 - Swimlane Notation (Visual Paradigm n.d.)

Figure 5 shows the Swimlanes notation that will be used in this dissertation.

2.8. Cost-Benefit Analysis

Businesses employ a systematic procedure called cost-benefit analysis to choose which options to take and which to ignore. The cost-benefit analyst adds up the potential benefits anticipated from a circumstance or course of action before deducting the overall expenses related to that course of action (Hayes 2021).

Prudent managers perform a cost-benefit analysis to assess all the costs and profits that a company might produce from the project before starting a new project. The analysis's findings will determine if the project is financially feasible or whether the business should move forward with a different initiative (Hayes 2021).

A cost-benefit analysis should begin with compiling a comprehensive list of all the costs and benefits associated with the project or decision.

The costs involved in a CBA might include the following:

- Direct costs include labour used directly in production, inventory, raw materials, and production prices.
- Examples of indirect costs include rent, utilities, managerial overhead costs, and electricity.
- The decision's intangible costs, such as how it will affect clients, staff members, or turnaround times.
- Opportunity costs, such as the difference between developing a facility and buying one, or alternative investments.
- Cost of potential risks such as regulatory risks, competition, and environmental impacts (Hayes 2021).

Benefits might include the following:

- Increased sales and revenue due to increased manufacturing or new product.
- Intangible advantages like higher worker morale and safety, as well as customer pleasure through better product selections or quicker shipping.
- Competitive advantage or market share gained as a result of the decision (Hayes 2021).

To each point on the cost-benefit list, an analyst or project manager should assign a monetary value, being very careful not to underestimate costs or overstate benefits. When putting a value on both costs and benefits for a cost-benefit analysis, a conservative approach is best suited with a conscious attempt to eliminate any subjective tendencies when computing estimations (Hayes 2021).

Finally, to see if the advantages outweigh the expenses, the outcomes of the total costs and benefits should be quantitatively compared. If so, moving on with the project would be the sensible choice. If not, the company should revaluate the project to see if it can be modified to raise benefits or lower costs in order to make the project profitable. If not, the business should probably steer clear of the project (Hayes 2021).

3. AS-IS Mapping of the processes and features of the systems in practice in operations

As previously defined in the work methodology, the second step was, aligned with the first phase of the project, to map the AS-IS processes and features of the systems in practice in the operations.

Since it was intended to perform AS-IS mapping of operations at the process and systems level, no customers were identified and possible divergences of processes due to different requirements were addressed as variants. Furthermore, no locations were identified in the AS-IS mapping as the two Pharma's operations are to some extent standardised, so it was possible to gather the AS-IS mapping of these operations into a single document, even if they take place in different locations.

Regarding the processes that were mapped in each operation, and as presented in the previous chapter, the Inbound, Outbound, Reverse Logistics. In addition, a Distribution process was also considered and the justification for this decision will be given below.

Finally, since an AS-IS mapping was being done, the identified sub-processes were adapted to reflect the terms used in the operations. Thus, for each process, it was felt necessary to draw a parallel between the sub-processes identified during the project and the sub-processes presented in the literature reviewed above.

3.1. Warehouse Explanation

The Montijo site is composed of two Pharma warehouses, designated T1 and T4, and a Multi-Client warehouse, designated T3. It is important to start by understanding how do the warehouses at Montijo´s site work. For that, a layout of T1 warehouse is presented (Figure 6):

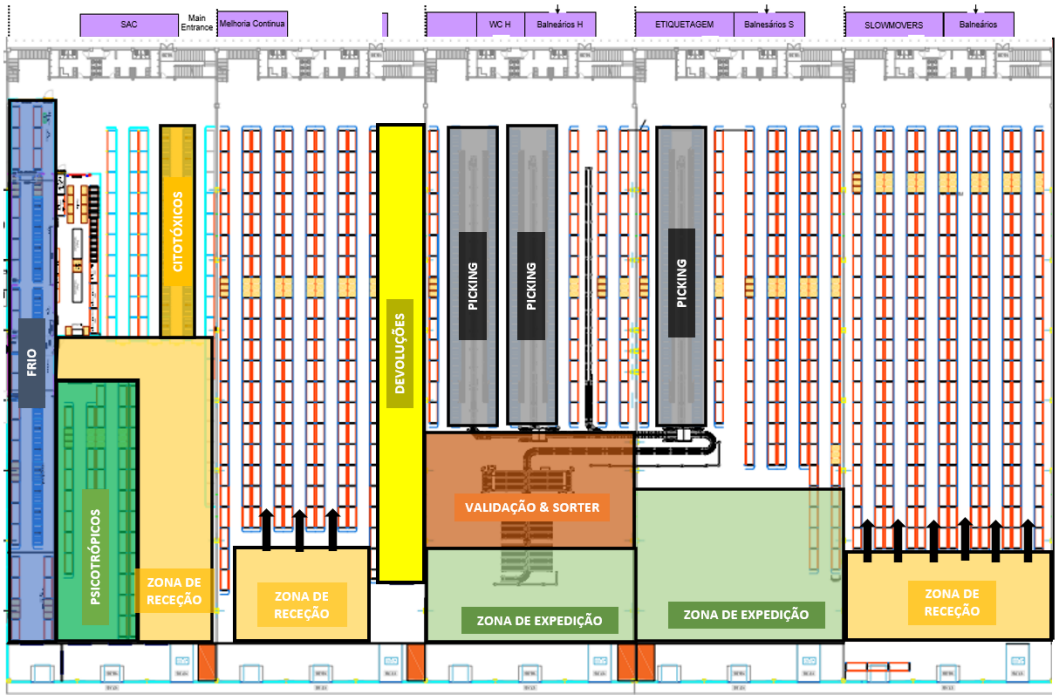


Figure 6 - Layout of T1 Warehouse (Martins J.)

This image helps to understand, in a simplified way, which areas are necessary to consider in this mapping, since these areas are common to the three warehouses under analysis:

- Reception Areas;
- Storage Areas;
- Picking Areas;
- Validation and Sorter Areas;
- Expedition Areas;
- Return Area.

Not clear in the image, there is also a Planning Department that takes care of placing the orders for production in the WMS and a Customer Service Department to meet client's needs. In the case of Pharma's operations, it is also important to mention the existence of a Technical Department whose function is to guarantee product quality, as well as a Distribution Department (Pharma has its own fleet, unlike the Multi-Client) that deals with documentation and route planning.

For each area and department there is a team leader who has at his disposal operators and/or administrative staff to carry out the work both at the operational level and on an IT system level. Each warehouse also has a supervisor responsible for the operations.

Finally, in addition to these zones and departments, it is also important to mention that all these warehouses have, as system features, mass zones, these are virtual zones where products are allocated, during the Inbound process to entry de IT system or whenever it is required to segregate damaged/out-of-date/returned products, so that orders are not placed on them.

3.2. Inbound

Regarding the Inbound process, the author started by trying to understand which sub-processes occurred from the moment the client communicated that Rangel would receive the goods until the moment that those goods entered the stock. The sub-processes identified (although some do not occur in all operations) were the following: Planning, Check-In, Unloading, Check-Out, Checking and Reception, PO Entry and Storage. In Figure 7 a parallel is drawn between these sub-processes and those of the literature reviewed in the previous chapter concerning the Inbound process:

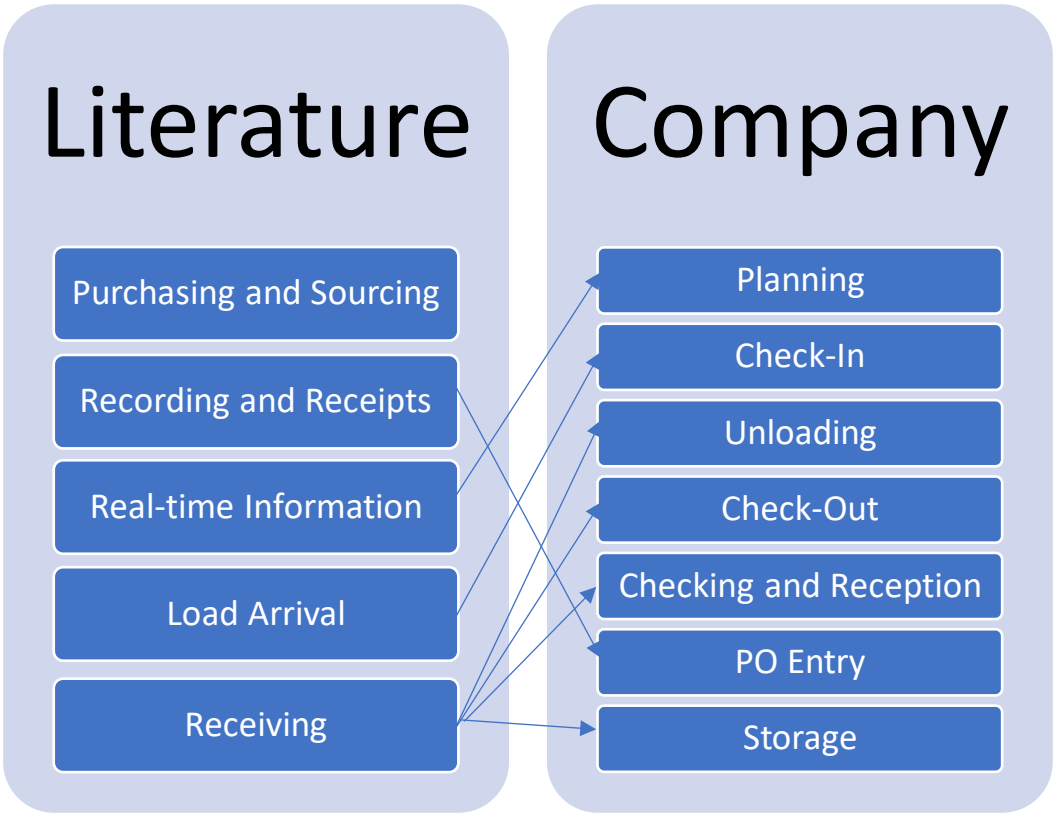


Figure 7 - Parallel to the literature sub-processes

As can be seen from this image, since Rangel operates as the 3PL partner, the first sub-process of purchasing goods from suppliers was not considered.

Figure 8 maps out the Inbound sub-processes identified in this project and gives an overview of who oversees carrying them out:

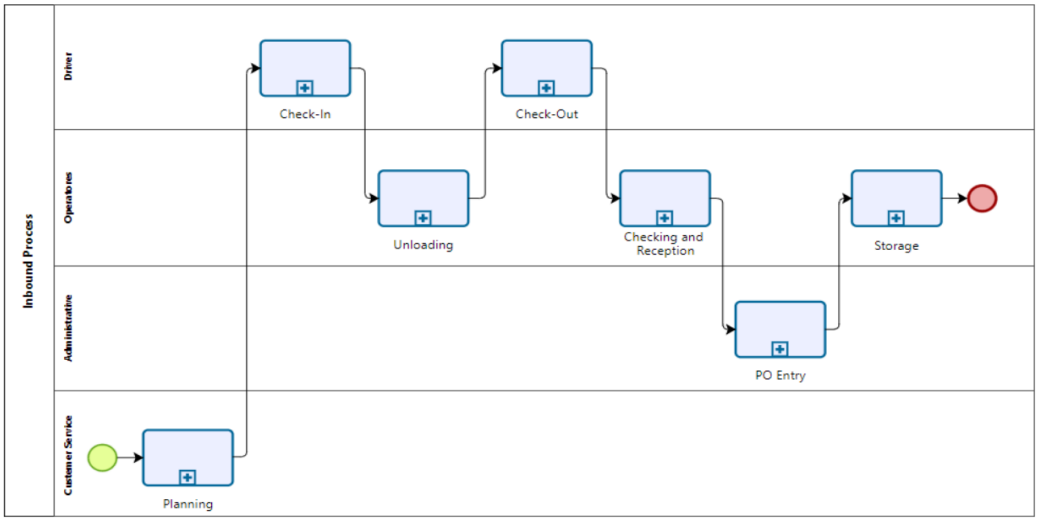


Figure 8 - Mapping of the Inbound sub-processes

Next, the Inbound process will be described, based on what was done within the company's project.

3.2.1.Pharma Operations

Starting with the Pharma Operation, the Inbound micro planning sub-process is not a necessary step since operations accept all goods arriving at the Montijo site for unloading, provided there is capacity for this in the two Pharma warehouses.

Check-in sub-process is controlled. The documents delivered by the driver are always checked, as well as whether the truck is climate controlled or not. If it is, it is allocated to the cold discharge dock, if not, it is allocated to the other docks according to their availability.

Unloading is quite fast and consists only of checking the number of pallets unloaded according to what appears on the Transport Guide and recording incidents to inform the customer via email, should they occur.

During the Check-Out, the unloading start and end times are entered in the Transport Guide, the documents are separated for Rangel and for the driver and then released.

Checking and Reception starts next and includes the creation of an unloading plan, for the received truck, occurring, on the part of the operators, the checking of the state of the goods and the recording of the counting and confrontation of the same. At the end of these activities, it is also necessary to randomly send a received product to the Technical Department so that they can check that everything is in conformity. These checking activities are carried out "blind" as required by the customers.

In turn, the PO Entry relates to the reception and entry into the system of the Purchase Order of the goods, by the administrative staff. These activities occur after the operators deliver the documents, used to check the status of the goods and to record their count during verification. The administrative checks that the documents filled out by the operator are in accordance with the Purchase Order that is in the system and that the Technical Management has already released the batch into the system. The Purchase

Order may have arrived in the ICOL system through an interface with the customer or it may have been necessary to create it manually using the data from the Packing List, depending on what was contracted with the customer. The PO is then associated with the unloading plan, a mass area is assigned to the goods, the PO is submitted for production and validated. After validation, the goods are visible to the customer so that he can place orders for them. At the end of this sub-process, the administrative staff must also digitalise the documents delivered by the driver and the documents filled in by the operators so that they are in the system and associated with the unloading plan.

Finally, Storage is the transfer of goods to the racks after all previous sub-processes have been completed, with the help of Trilateral/Retractable/Stacker and RF scanners.

For a better understanding of how the process were mapped, please refer to the documents prepared for the company project - Annexes I and II. Please note that these documents are confidential, so they will not reveal specific names or dates, nor will they be presented in their entirety. Also, as an example, only Pharma's Inbound and Outbound process will be presented.

3.2.2.Multi-Client Operation

In the Multi-Client operation, the Planning sub-process exists for some customers. The booking happens through the reception of an email with information about what is expected to arrive in the coming weeks/months.

At Check-In, the documents delivered by the driver are checked and they are allocated to the unloading dock according to availability.

At unloading, the number of pallets unloaded is checked to see if they are in accordance with what is shown on the Transport Guide and, if they occur, the incidents are recorded, and the customers are informed.

During the Check-Out, the unloading start and end times are filled in the Transport Guide, the documents are separated for Rangel and for the driver and then released.

The Checking and Reception starts next and includes the creation of an unloading plan for the received truck, the registration of the count and the confrontation of the same.

Next, in the Purchase Order Entry sub-process, the goods are received and entered the system after verifying the quantities received by comparing the Packing List/Invoice with the PO. The PO may have been received by email and need to be uploaded into the system or it may have been received by interfacing the client's system with ICOL, depending on what is contracted with the customers. Entering the PO, as explained before, consists of associating it with an unloading plan, assigning a mass zone to the products received, submitting it for production and subsequent validation (this last step puts the goods available for the customers to place order on them, even if they are still in a mass zone).

Finally, Storage involves transferring the goods to the racks. In the case of T3 this storage can occur in two ways: by placing the goods in a mass zone during PO entry and then transferring them to a rack position when all sub-processes are completed or by using a pre-production/reception map during the sub-process PO entry. The choice of which

variant to use depends on the urgency of the customer to have the goods available in stock and when the urgency is high the first variant is used.

3.3. Outbound

For the Outbound process, the author identified the following sub-processes: Communication between Rangel and Client, Planning, Picking, Checking, Sorting and Order Completion. In Figure 9, again, a parallel is drawn between these sub-processes and those of the literature reviewed in the previous chapter concerning the Outbound process. Note that the Distribution sub-process is in this Figure to parallel the literature reviewed above, but will be mapped later as an independent process:

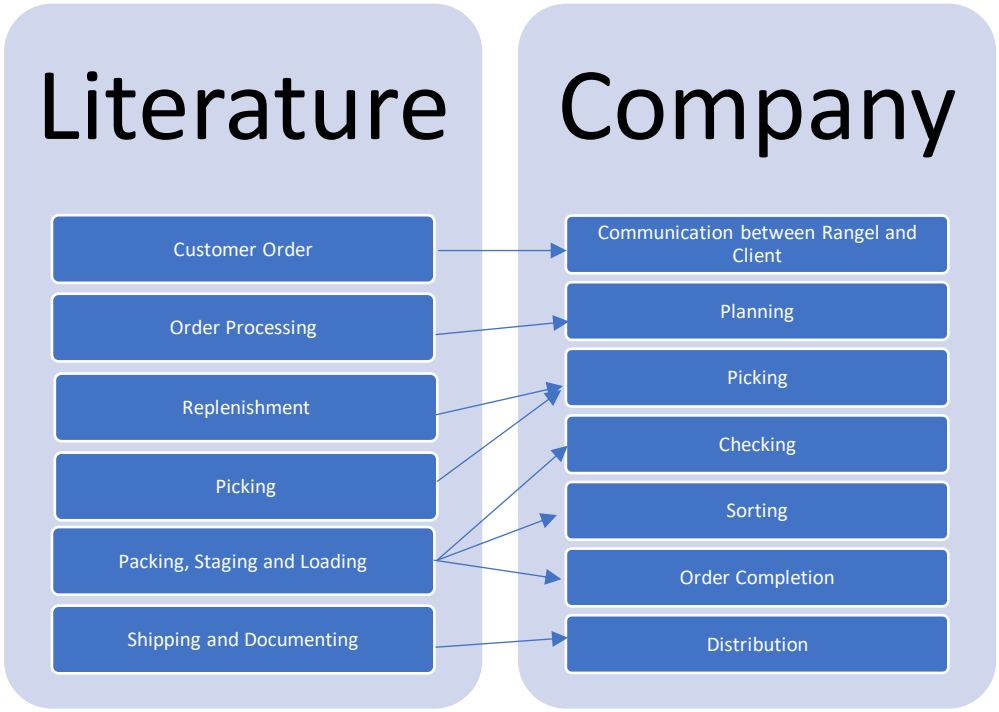


Figure 9 - Parallel to the literature sub-processes

Once again, Figure 10 maps out the Outbound sub-processes identified in this project and gives an overview of who oversees carrying them out:

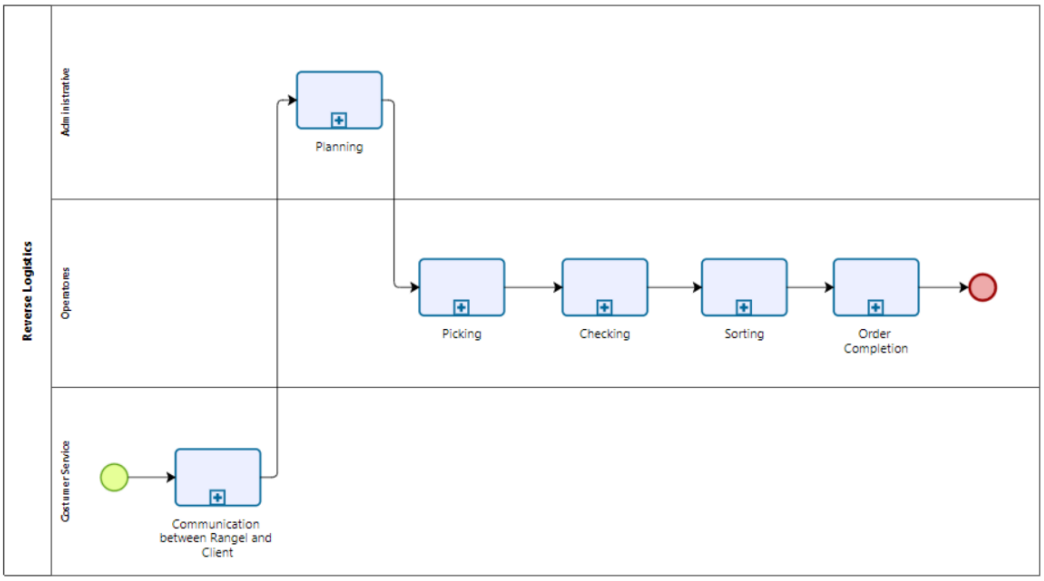


Figure 10 - Mapping of the Outbound sub-processes

Next, it is time to describe the Outbound for both operations, once again based on what was done within the company's project.

3.3.1.Pharma Operations

The sub-process Communication between Rangel and Client, in the Pharma operation, consists in the communication by the customers to the Customer Service Department, of the orders they want to have produced. This communication can be made by interface, by the My Rangel portal or by email and, in the case of the latter, it is the Customer Service Department who has to manually create the order in the ICOL.

Planning is carried out by an administrative person and the quantity of orders that are planned for production depends on what is contracted with the customer. There are customers that work based on Cut-Off's and others based on the Desired Delivery Date – DDD´s. To decide which orders to inject for production, the administrative must analyse not only the Cut-Off's and the DDD´s of the customers but also the capacity of the operation.

The next step is Picking and consists of the actual production of the orders after they have been injected. It is up to the operators to proceed with their production. Pharma warehouses have three picking models. The complementarity of these models enables production time to be optimised, since the WMS, depending on the quantities, divides the orders into the three picking models: unit picking, box picking and pallet picking.

The choice of which customers to produce is made by the team leader of the operators and considers the size of the orders to be produced. To assist in this decision, the team leader have access to ICOL Online, a tool where it is possible to consult all orders that are waiting to be produced, both in unit picking and box/pallet picking. Note that, with respect to unit picking, there are three variants, single order picking (picking list), picking by light and multi order picking.

It should be noted that in the picking sub-process, operators also make the replenishments automatically generated by the WMS when planning the production of orders.

The next step is the checking of the boxes that were picked-up. All the boxes from unit picking need to be validated. The boxes from box picking and pallets from pallet picking are validated during picking. So, in this step, occurs the validation of the boxes from unit picking and the checking by weight of the boxes from the box picking. The validation of the unit picking can be done by weight, manually, in a feature of system or automatically with a RF Scanner.

During Sorting, the boxes are inserted in the conveyor before the invoicing scale so that their weight can be invoiced to the customer, when this is contractually agreed. Next, the boxes go through a sorter that, on reading the order label, accesses the postcode and routes it on the conveyor to the corresponding zone or circuit so that the operators can start forming the pallets. The pallets formed can be mono-mono (mono customer, mono order) or multi-multi depending on the number of volumes of that order.

Lastly, to finalize the orders, it is necessary to create the master label representing all the volumes on that pallet. It should be noted that if the order is for export, the Packing List is also created, although, as will be discussed later, Pharma has a Distribution department that handles all the remaining documents. If the orders are for wholesalers, the GS1 label is also created per reference block/batch before the pallet is filmed with transparent film.

3.3.2.Multi-Client Operation

The sub-process Communication between Rangel and Client, in the Multi-Client operation, consists in the communication by the customers to the Customer Service department, of the orders they want to have produced. This communication can be made by interface or placed in Portal My Rangel.

Planning is carried out by an administrative person and the quantity of orders that are planned for production depends on what is contracted with the customer. There are clients that work based on Cut-Off's and others based on DDD's. To decide which orders to inject for production, the administrative must analyse not only the Cut-Off's and the DDD´s of the customers but also the capacity of the operation.

The next step is Picking and consists of the actual production of the orders after they have been injected. It is up to the operators to proceed with their production. Multi-Client warehouses also have three picking models. The complementarity of these models enables production time to be optimised, since the system ICOL, depending on the quantities, divides the orders into the three picking models: unit picking, box picking and pallet picking. With respect to unit picking, there are two variants, single order picking (picking list) for urgent orders and multi order picking. Note that the picking is done, sometimes, with Rangel labels, although the Distribution will be done by outsourced carriers. This depends on what type does Rangel WMS has with the carrier's system. There are cases in which the integration is complete, and it is possible to do the picking with the carrier's shipping label, there are cases where the integration is almost complete, and the label will be printed after validation of the orders.

Again, it should be noted that in the picking sub-process, operators also make the replenishments automatically generated by the WMS when planning the production of orders.

The next step is the checking of the boxes that were picked-up. All the boxes from unit picking need to be validated. The boxes from box picking and pallets from pallet picking are validated during picking. So, in this step, occurs the validation of the boxes from unit picking, this validation can be done by weight, manually, in a feature of system or automatically with a RF Scanner.

After checking, the boxes go down a conveyor and when they reach the operators responsible for sorting them, the only criteria they have when forming the pallets is what is the distributor that is going to deliver them. The pallets formed can be mono-mono (mono customer, mono order) or multi-multi depending on the number of volumes of that order.

For orders that will be shipped by carriers where system integration is not complete, the label of the transporter in question was printed after validation to be used in the s process and now is the time to paste these labels on top of Rangel´s ones and film the pallets for all the orders. From here the Distribution is integrated with the system of the transporters subcontracted for this purpose.

3.4. Reverse Logistics

The sub-processes identified by the author about Reverse Logistics were Communication between Rangel and Client, Planning, Check-In, Unloading, Check-Out, Reception, Identification and Segregation, Return Processing and Destination. Once again, in Figure 11 it is represented the parallel between the sub-processes identified in the AS-IS mapping of the companies' operations and the sub-processes reviewed in the literature above:

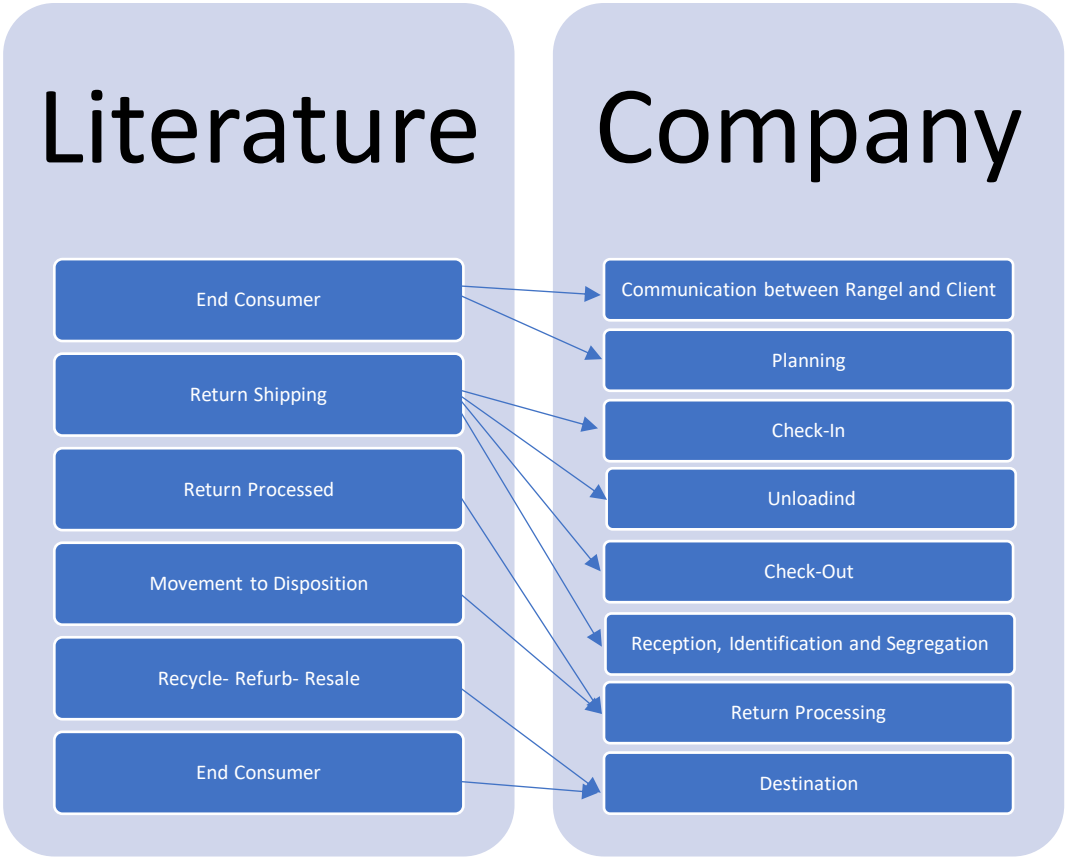


Figure 11 - Parallel to the literature sub-processes

In Figure 12, it is represented the mapping of the Reverse Logistics sub-processes identified in this project:

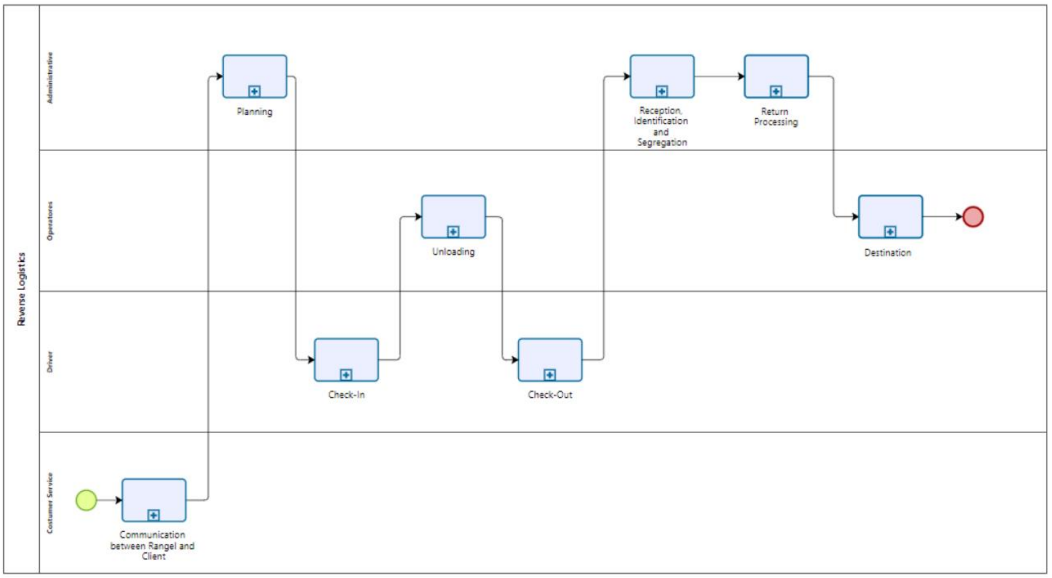


Figure 12 - Mapping of the Reverse Logistics sub-processes

This dissertation is going to present next the Reverse Logistics processes for the Pharma and Multi-Client operations, based on what was done in the company's project.

3.4.1.Pharma Operations

In the Pharma operations, the communication between Rangel and the Client occurs when the Client wants Rangel to carry out a collection. It should be noted that in this process, the designation "Client" refers to the client of the customer to whom Rangel has dispatched the orders during the Outbound process.

The planning of these collections is done by the Pharma Distribution department, since the Pharma operation, unlike the Multi-Client operation, has its own fleet.

The check-in sub-process, in turn, relates to the arrival of the goods at the Rangel warehouses, whether this is a pick-up by Rangel (mentioned above), a return at the door by the customer or merely an order that has not been dispatched because a cancellation has occurred and therefore has to be treated as a return. In this sub-process the documents are also checked.

The load is then unloaded.

At the check-out, the documents are separated for Rangel and for the driver, after being duly completed.

The next sub-process is Reception, Identification and Segregation. The returned cargo is duly identified and an administrative person enters this cargo into the system. This entry in the system must identify the reason for the return as well as the operation to which the return will be subject. The operation that the clerk identifies for each reason for return is contracted with the customer.

Next, a return label is printed and attached to the returned volumes, whose function is to identify them while they are under the Reverse Logistics process. Finally, the returned volumes are segregated in a specific area, per customer.

After some time and depending on the amount of work that the administrative staff is subject to, the returned volumes are picked up again to effectively take place the return process. In this sub-process, firstly, a check is made of what was returned. Then, the customer is notified of everything that was returned so that they can validate the processing of the return. Finally, the products are segregated a second time, awaiting the customer's validation. Once the validation is done, the returns are associated with an unloading plan, submitted for production and validated. After this last activity, the returned products are in stock but in a state that does not allow the customer to place orders for them.

The last process that occurs is called Destination and concerns what is done with the returned products after customers' validation of the return. The Destination of the returned products can be: return them to stock, relabel and return them to the customer, relabel and return them to stock, destroy them or simply return them to the customer.

3.4.2.Multi-Client Operation

In the Multi-Client operation, the communication between Rangel and the Client does not occur. Furthermore, the planning of these collections is not necessary, as clients take care of everything with the distributors.

The check-in sub-process, in turn, relates to the arrival of the goods at the Rangel warehouses, whether this is a return at the door by the customer or merely an order that has not been dispatched because a cancellation has occurred and therefore has to be treated as a return. In this sub-process the documents are also checked.

The load is then unloaded.

At the check-out, the documents are separated for Rangel and for the driver, after being duly completed.

The next sub-process is Reception, Identification and Segregation. The return products are properly identified, however, it is not necessary to put them in the system, since it is done by the customers by interface,

Then, in the Return Process, the products are associated with an unloading plan, submitted for production, and validated. With this validation, the products enter the stock but with a state consistent with their reason for return, so you cannot place orders on them.

The last process that occurs is called Destination and concerns what is done with the returned products, customers' validation of the return. The Destination of the returned products can be: return them to stock, destroy them or simply return them to the customer.

3.5. Distribution

As seen previously in the literature review, Distribution is normally considered an Outbound sub-process. However, it is usually a service, in contract logistics, that is outsourced, as in the case of the Multi-Client operation.

In the case of Pharmaceutical operations, as at the time of its start-up, there were no carriers capable of meeting the demands of this industry, Rangel decided to create a specialized department to handle Distribution and decided to develop its WMS in order to have features to keep up with this innovation.

Thus, given its importance in the industry, the Pharma Distribution will be mapped as a process in this dissertation.

3.5.1.Pharma Operations

For these operations, the sub-processes identified in the project were the following: Planning, Generate Documentation, Sorting, Check-In, Loading, Check-Out, Delivery and Closing of the day. In Figure 13, it is represented the respective mapping that was done:

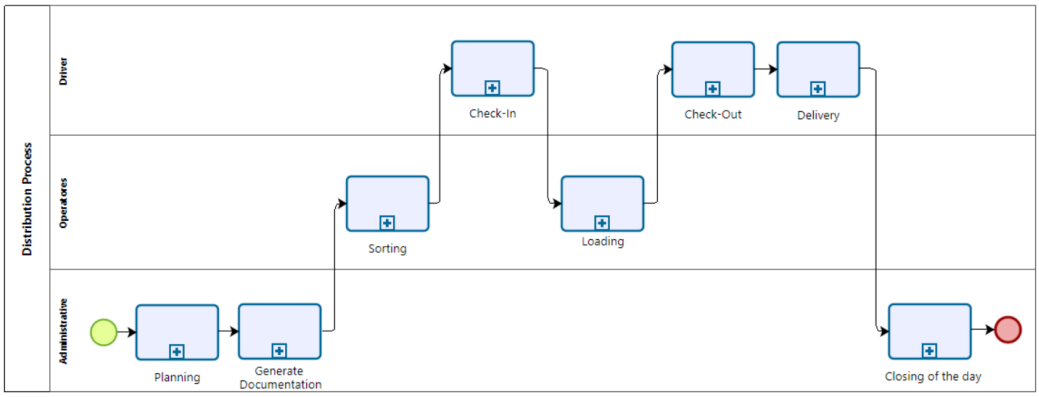


Figure 13 - Mapping of the sub-processes of Pharma Distribution

The first sub-process of Pharmaceutical Distribution is Planning. The company's WMS has previously defined circuits, according to postal codes, for this purpose. In addition, drivers and trucks are assigned to each circuit, every day, by the administrative staff.

The administrative staff starts planning for the next day on the day before. In this planning, using the company's WMS, they select, for each circuit, all orders and pickups that have the zip codes for that circuit. At around 00h, they need to start distributing the orders for the circuit in the WMS among the trucks in terms of size and weight.

The next shift arrives at dawn and has the task of planning the orders and pickups that are pending. For this, the first shift, the second shift, and in individual cases, subcontractors authorized by Technical Direction are used. When planning the second round, the postal codes of the pending deliveries and pickups are no longer considered, but rather the availability of the vans/trucks that have already completed their circuits.

The next sub-process is Generate Documentation and already occurs for all deliveries and pickups. The administrative staff responsible for this step needs to generate delivery notes/invoices/collection list, transport guide and travel maps, if they are deliveries. If they are pickups, they need to generate return notes, transport waybills, and volume labels. In addition to this documentation, if the transport is to the islands, a manifest is required.

During the day, parcels passing through the sorter are sorted according to zip code zones. At the end of the day, go down to the sorter to be classified according to the circuits. This sub-process is called sorting.

At Check-In, Truck Loading and Check-Out, the folders are delivered to the driver with the correct documentation and the trucks sealed.

The next sub-process of Distribution is the Delivery itself, for that, in the Distribution department there is a screen where you can see the location of all the trucks/trucks in a real time map, besides providing information about their temperature and speed.

In this sub-process, driver communication is also essential. The drivers are responsible for reading the respective code on the PDA, depending on whether it is a delivery or a non-delivery, so that the information is automatically integrated into the WMS. The driver must also ensure that all deliveries are signed for and close the delivery in the PDA. Automatically the information is integrated into the WMS. In addition, as

soon as the last delivery is made, the driver should also close the day in the PDA by changing the status to "Completed". If the PDA malfunctions, the driver must contact the Traffic Department to manually update the status of the deliveries.

The last sub-process is called Closing of the day. Here, drivers bring back undelivered shipments, folders containing Customer documentation, proof of delivery, and refunds due.

4. Benchmarking of the operations processes and activities

The European Commission's definition of benchmarking states that it is a "continuous and systematic process that allows the comparison of the performances of organisations and respective functions or processes against what is considered the best level, aiming not only at matching performance levels, but also exceeding them" (Economias 2017).

Taking this definition into account and adapting it to this dissertation, the objective of this chapter is to compare all the processes and activities mapped in the previews chapter, considering the concepts, methodologies and instruments presented in the bibliographical review. A cost-benefit analysis of possible improvements that may be proposed during the benchmarking performed will also be carried out.

4.1. Inbound

The Inbound process is the same in both Pharma warehouses, despite some variants, and identical, in certain extent, to the Multi-Client Inbound process. During the benchmarking of this process and its activities it was concluded that there are some sub-processes that would benefit from further development and/or standardization, which are presented below.

4.1.1.Planning

Starting with the Planning sub-process, in Pharma operations, there is flexibility to receive the cargo without pre-scheduling. This practice aligns with Rangel's idea of adapting to its customers, in this case, to their timelines.

For the Multi-Client operation, since the pre-scheduling is needed, it is done by email with Inbound orders planned for next weeks/months. This solution has margin for improvements in order to give visibility to the customers of available slots for pre-scheduling.

Thus, regarding the planning sub-process, a booking functionality should be developed in the WMS, in order to improve the Multi-Client operation and to give this possibility to Pharma operations, in case one day they are needed.

4.1.2.Check-In

In the Check-In sub-process, the criteria for truck allocation is their temperature in Pharma operations. If the truck is climate-controlled it is allocated to the cold dock, if not, the truck is allocated according to the availability of the docks, just like in the Multi-Client operation. This "method", although it works, should be rethought.

At Pharma Montijo's warehouses, there are different storage areas, which are parameterized to receive products from a certain family. The term "family" is used to

group products according to their characteristics. For example, there are environmental products, cytotoxic products, psychotropic products, cold products, and each type constitutes a family of products.

An improvement would be needed to manage the non-cold docks by family in order to guarantee proximity of receiving with put-away process. Thus, it is suggested the development of a feature in the company's WMS that allows the management of the docks according to the storage areas and the typology of the products.

4.1.3.Unloading e Check-Out

The unloading and Check-Out sub-processes are basically the same in both operations and are in line with what is standard for this type of activity.

4.1.4.Checking and Reception

The checking and reception sub-process is the one that presents the greatest differences between the Pharma and the Multi-Client operation.

Starting by the checking activity, in the case of Pharma, it is carried out not only on a quantitative level but also on a qualitative level and always "blind", while in the Multi-Client operation this checking is only done on a quantitative level and with the help of a packing list.

Would it be advantageous for the Multi customer operation to perform the same procedures as Pharma in the checking and reception sub-process? In terms of performing a blind checking, one could say yes, since the use of a packing list or invoice can bias the operator's count towards the result. In addition, a qualitative analysis of the goods could also be advantageous, as it could protect the company in the future against, for example, claims.

Thus, and since new WMS systems already help on the qualitative and quantitative checking activity, digitizing how the qualitative evaluation is done and using the mobile extension of the company WMS, ICOL Mobile, from an RF Scanner for counting purposes, are small steps that would improve the checking activity, especially since they are already done internally at other company sites nationwide.

4.1.5.PO Entry

To enter the Purchase Order, as explained above, there is the need for the administration to compare the documents filled in blind by the operator with the Packing List and then compare the Packing List with the PO (which may have been entered into the system manually or by interface), in the case of Pharma. In the case of Multi-Client there is only the need to compare the Packing List with the PO.

The opportunity for improvement identified for this sub-process is related to what was proposed in the topic 4.1.5, i.e., if the quantitative conference was done

informatically, using the mobile extension of the company's WMS through an RF Scanner, it would not be necessary all these verifications by the administrative staff.

In addition to the hitches mentioned above due to manual checks by the back office on whether the quantities received and the quantities supposed to be received are correct, there are also hitches due to the actions that can be taken if the quantities are wrong. If too little quantity has arrived, the administrative can submit the PO to production because the system automatically generates a new PO with the quantity that did not arrive. In case too much quantity has arrived, the same functionality does not exist, and it is necessary to either contact the customer to resend a new PO, or create a new PO manually, depending on what is contracted with the customer.

Thus, it might be interesting to develop a functionality in the WMS that allows the submission of a PO in case more quantity arrived, and with the creation of a new PO with what arrived in excess.

4.1.6.Storage

About put away, this sub-process in the multi customer is done in two ways, either put away through the pre-production map or put away through a transfer by mass zone, unlike Pharma that only has the latter.

In this sub-process, a possibility for evolution would be to standardize the way of storing and use only the transfer by mass zone (since it allows the customer to see the products in stock even before the operators have put away the goods received in the Racks).

To make these transfers, operators consult the WMS for empty spaces; however, although this "method" works, there is a Dynamic Pallet Allocation feature in the WMS that needs to be developed, but that would make this activity faster and more rigorous.

4.2. Outbound

The Outbound process is the same in both Pharma warehouses, despite some variants, and, just like Inbound process, identical, in certain extent, to the Multi-Client Outbound process. During the benchmarking of this process and its activities and taking into account Lean methodology, an attempt was made to eliminate as much as possible their variability, as well as evolving the current WMS into one with characteristics that are more similar to those of Industry 4.0.

4.2.1.Communication between Rangel and Client

The Communication between Rangel and the Customer sub-process is fairly standardized in all operations, the orders can reach Rangel through an interface with the customer's computer system or by the customer placing them on the Rangel's Portal. Only in the case of the Pharma operation is it necessary for the company's Customer Support Service to manually create the order in the WMS.

These 3 ways depend on what is contracted with the customer. However, in order to eliminate process variability as well as time spent on unnecessary activities, it would be appropriate to eliminate the variant of manual order creation by the Rangel customer service, through a renegotiation of the contract and by trying to show the customer the advantage of, for example, learning how to use Rangel's Portal to place orders.

4.2.2.Planning

As for planning, this sub-process is the one of the entire Outbound processes of both operations that needs the most development.

The activities required to plan the order production are all at the WMS level, however, for all of them several Excel files are needed that are extracting data from the company's database to show in real time to the person responsible for order planning.

These Excels show, among other things, how much has already been produced from each customer, the Cut-Off's and DDD's of the customers, which orders are missing to justify in case of production failure, the number of splits, etc. All information that either cannot be extracted from the WMS or the system feature needs development because it is not intuitive/easy to interpret.

Thus, it would be good for the company to develop the WMS in a way that it shows all the necessary data, in real time, to the administrative staff that deals with planning, to be at the level of the industry 4.0 WMS.

4.2.3.Picking

Regarding the Picking sub-process, the high variability of methods turns out to be beneficial, since the WMS can optimize production time by dividing the production of orders into pallet picking, box picking and unit picking. This WMS functionality is used in both Pharma and Multi-Client operations. Furthermore, there are 3 unit picking variants that allows de method to be aligned with the type of orders that each customer places.

However, one of the unit picking variants, in the case of the Pharma T1 warehouse, is not optimized to the fullest when comparing the unit picking of the T4 warehouse and the Multi-Client warehouse. In warehouse T1, when preparing boxes for unit picking in the picking by light variant, it's necessary to use trays with a weight label (so that in the next sub-process it's possible to check them by weight), which delays the operation in question because it's necessary to remove the trays from the boxes after their validation and then it's necessary for an operator to put them back in the box preparation area to be used again. In warehouse T4, for example, there is a scale that weighs and places a weight label directly on the box.

The standardization of this method of preparing boxes when picking at the unit for what happens in the T4 warehouse, although it is necessary to assess whether the investment would pay off, at the outset is an asset, since it would maximize the operators' productivity by not making them spend time on secondary tasks.

Finally, in Pharma operations, inventories are carried out every day. Therefore, with regard to picking, it is also suggested that picking be performed with an immediate

cycle count, so that there is no need for a dedicated team to carry out inventories at the end of the day. Note that cycle counting is a warehouse process that you can use to audit on-hand inventory items. This improvement would require development in the WMS, but it would be advantageous in terms of allocating human resources.

4.2.4.Checking

The next sub-process is checking. In terms of validating the picking boxes by unit, the existence of so many methods is beneficial since, for example, if the scales used for checking down, it is possible to validate the contents of the orders manually or in the system. There is only one method, the automatic validation of the box using the RF Scanner, which should be deactivated because it may lead to operators using it improperly.

On the other hand, the way in which the check of boxes from picking by box occurs in Pharmaceutical operations and in Multi-Client operations should be standardized.

This is an additional step that would bring more advantages than disadvantages, since, in addition to protecting the service level of the Multi-Client operation, there is already a scale to validate the unit picking, it would only be necessary to start using it, with the necessary adjustments for this purpose as well.

4.2.5.Sorting

The sorting sub-process is quite different in the Pharma operation and in the Multi-Client operation.

In the case of the Pharma operation, as the company has its own Distribution fleet, orders are sorted by zone during the day and at the end of the day, before the trucks are loaded, by circuits.

In the case of the Multi-Client operation the orders are only sorted by the carrier that will distribute them and that sorting is done by the operator responsible for it, by reading the order label that is glued on the box and that says the name of the carrier.

So, this sub-process, for having different levels of demands regarding what each operation does, it is not possible to make a realistic comparison.

4.2.6.Order Completion

This sub-process has some differences between Pharma operations and Multi-Client operation.

In Pharma operations, it is necessary to create the master label that will represent the pallet and, sometimes, it is necessary to create a GS1 label if the orders are for stockists/wholesalers.

In Multi-Client operations, since the transport is outsourced, it is only necessary to place, on top of the Rangel labels used in the picking, the corresponding carrier labels that were printed by integration of the Rangel WMS with the carrier's system after all validations have been done and to film the pallets. From this point on, the transportation oversees the outsourced company.

In terms of standardization, between the Pharma and Multi-Client operations, there is not much to do since they have such different principles. In terms of improvement, in the Multi-Client operation, the number of process steps would reduce if all carriers had a complete integration with Rangel WMS, since it would allow picking to be done immediately with the carrier's shipping label.

4.3. Reverse Logistics

This process is quite different both within the Pharma operations and when compared to the Multi-Client operation. We will first look at this process within the two Pharma operations and then benchmark it against the Multi-Client operation.

4.3.1.Pharma Operations

Starting with Pharma's operations, there are two ways of processing returns. One is through the use of the WMS, while the other is through a Web page, to which only Rangel and the Customer in question have access. This webpage is called Cockpit and was developed specifically for returns processing, integrated not only with Rangel's WMS but also with the client's ERP.

The difference between both is mainly the way returns are processed. Whereas in the case of returns processed by the WMS, the customer cannot access them and the administrative staff must send the customer a map or file in Excel with information about the return in order for him to validate it and only then do the administrative staff introduce the returned products into stock, in the case of returns through the Cockpit, the customer has access to the status and information about the return via the web page and can quickly validate it. Then, after validation by the customer, the administrative staff only has to open the WMS and enter the returned products into stock since all returns information appears in the WMS via the Cockpit interface.

Thus, returns processed in the Cockpit not only reduce the number of steps required in the process by eliminating the need to send Excel sheets or maps containing return information to the customer, but also make it possible to easily consult any return process. Note that when referring to the entry into stock, the returned products obviously enter a state corresponding to the reason for the return, i.e., if they are products to be reintegrated, they enter the free state, but if they are products to be destroyed, they enter the damaged state and it is not possible to place orders on them, among other examples.

It would be interesting to develop this customer interface mechanism, which already exists for one of the customers, making it available for the others.

4.3.2.Pharma vs Multi-Client Operations

The difference between Pharma's operations and multi customer operations in the Reverse Logistics process starts even before the operations arrive at the warehouses. In the case of Pharma, as there is its own fleet, Rangel can be asked to carry out a collection, and this contact is made through the customer service and the planning is done by the Distribution department. In case of Multi-Client operations, the returns are brought in by subcontracted carriers without a previous booking. Although it is again present here the fact that Rangel provides a service that adapts to the clients' timelines, as in Pharma's Inbound process. This sub-process in the Reverse Logistics of the Multi-Client operation could also be improved with what was suggested in sub-chapter 4.1.1. in terms of the development of a booking feature in the WMS.

In terms of the return procedure, the Multi-Client sub-process ends up being faster because after the conference is made, the customer is informed about the returned products and in what conditions and these, by interface, give input of them in the WMS, having only the administrative to give order to store them and proceed with the input of them in stock.

The process of communication with the customer remains the same as in the WMS method of Pharma operations, but the entry of the returned products is by interface, which makes it faster but not as effective as the use of the Cockpit, which should become the standard for all Reverse Logistics entry.

4.4. Distribution

Distribution is a totally different process in the two operations and since, in the case of the Multi-Client operation, it is subcontracted to other transportation companies, only Pharma's Distribution process will be analysed in this dissertation.

Regarding Pharma's Distribution process, the entire process is carried out using the company's WMS, which has been developed way beyond the functionalities required to a WMS.

Starting with the way the circuits are pre-defined, the system gathers the closest postal codes and defines a circuit, obviously the proximity of the postal codes that are gathered will be greater the greater the number of circuits you want to define.

However, despite efficiently performing this division of circuits, the routes that the trucks will take are not optimized, that is, the travel map that is printed after planning the deliveries and pick-ups that will be made in each circuit, takes into account the order in which they were planned and not the optimal route in terms of travel time.

Thus, with the integration with traffic information, more optimised routes could be managed. However, and as previously mentioned, this functionality is already outside the usual scope of a WMS, so it is interesting for the company to study the possibility of integrating, in Pharma's Distribution process, a TMS.

4.5. Cost-benefit analysis of the proposed improvements

To analyse the impact of the identified opportunities, a cost-benefit analysis was performed. This analysis did not consider quantitative but qualitative costs and benefits and was validated by the Head of the Project Management Office of Rangel Logistics Solutions.

Starting with the Inbound process, as can be seen in Table 1, it was considered that:

- Both the cost and the benefit of standardising the conference and reception process, whereby there would be a blind, qualitative, and digital quantitative conference, were low. In terms of costs, this is justified because, on the one hand, the practice of blindly carrying out quantitative and qualitative checks already exists in the Pharma operation, so it was only necessary to roll it out to the Multi-Client operation and, on the other, to do it digitally consisted only of starting to use the mobile extension of the WMS through an RF scanner. The benefit would also be low because, although these improvements are good practice, they are not required by the Multi-Client operation customers.
- The possibility to automatically create a PO with the quantity that came in excess when submitting the original PO for production, would have low cost since this already happens in the system when the quantity comes in less and the benefit would be medium since it would reduce the contacts with the customers to request a new PO, increasing the speed of the process.
- The feature of dynamic pallet allocation would have low cost since this already exists in the system. In terms of benefit, it is quite high because it would allow a storage with many fewer steps and optimized.
- For the booking feature, some investment would be required as it would need to be developed from scratch, the benefit would be medium as the customers of the Pharma operation appreciate the availability of the operation to collect at any time. In the case of the Multi-Client operation, this feature would be a considerable evolution considering the current method.
- For the yard management, this feature would have a development cost a little higher than the booking one since it would have to consider more factors. In terms of benefit, it would be considered medium, since Montijo's warehouses do not have such a large number of unloading docks that would put at risk an operation that does not manage them.

Table 1 - Cost-Benefit Analysis Inbound Process

Inbound		Benefit		
		Low	**Medium**	**High**
Cost	**Low**	Standardisation of Qualitative and Quantitative Conference done Blindly and Digitally	Create PO with excess quantity automatically	Dynamic Pallet Allocation
	Medium	-	Booking	-
	High	-	Yard Managment	-

With regard to the Outbound process, as can be seen in Table 2, it was considered that:

- Both the replacement of the trays with weight and the standardisation of the checking by weight of the boxes of the picking at checkout, would have an investment cost considered average because although they already exist in other operations of the Platform it is always necessary to invest in equipment, one could not simply roll out good practices as in other situations. In terms of benefit it would be low, once, in the case of the productivity gains of not using trays it would be slight and the checking by weight of the boxes from the picking to the box, would still add another step to the Multi-Client operation not being a customer request.
- With regard to no longer creating orders manually in the WMS by customer service and the complete integration of the company's WMS with the outsourced transporters, it was considered that the cost would be low as there are already customers for whom this is used and, since it was not necessary to invest in new equipment, it was only necessary to roll out these practices to the remaining customers. In terms of benefit, this was medium as the time that is currently lost creating orders manually or picking with a label and then changing to the transporter's label is still considerable.
- Developing a picking tool with immediate cycle count would have a significant cost, since this functionality does not currently exist in the WMS, and the benefit would also be medium, since although it would no longer be necessary people to make inventories at the end of the day, the productivity of order production would fall slightly since it would be necessary this additional step.
- The cost of developing tools in the WMS that help in real time planning is considered medium, since the functionalities that are needed have already been identified and it was already possible to programme them in Excel files, but there would always have to be some investment to develop them in the WMS. The benefit on the other hand would be very high because it would decrease the

number of files that the administrative department has open and that it needs to constantly check when planning orders.

Table 2 - Cost-Benefit Analysis Outbound Process

Outbound		Benefit		
		Low	**Medium**	**High**
Cost	**Low**	-	1 - Drop manual order creation 2 - Complete integration with subcontracted transporters	-
	Medium	1 - Labelling scales to replace trays 2 - Standardisation of checking by weight for boxes picked by box	-	Developing the WMS planning tools
	High	-	-	-

The opportunity for improvement suggested for the inverse logistics process, as can be seen in Table 3, would have a low cost once it already exists for one of the clients, being only necessary to roll it out to the others. In terms of benefits it would be medium since, in terms of speed of response of the returns, as the standard method by the WMS, depends on the speed of the customer to validate the processes of the other side, so, the great benefit of the use of Cockpit would be then the fact of not being necessary to send sheets or maps in Excel for the customer to validate the return, because everything can be done by interface on the site, which in addition keeps a record and would later make it faster to consult any process of return.

Table 3 - Cost-Benefit Analysis Reverse Logistics Process

Reverse Logistics		Benefit		
		Low	**Medium**	**High**
Cost	**Low**	-	Cockpit Standardisation	-
	Medium	-	-	-
	High	-	-	-

Finally, about the possibility of integrating a TMS into the Distribution process of the Pharma operation, it was considered, as seen in Table 4, that the cost would be high since, for the software being sought, with the aforementioned requirements and the respective implementation, the investment would have to be high. In terms of benefits, it was considered to be medium since Pharma's Distribution currently, although it could still be optimised, is a reference at national level and was born due to a market need.

Table 4 - Cost-Benefit Analysis Distribution Process

Distribution		Benefit		
		Low	**Medium**	**High**
Cost	**Low**	-	-	-
	Medium	-	-	-
	High	-	Integration of a TMS from another Business Line for Pharma Distribution	-

5. Conclusions and Future Works

The exponential growth of Rangel in recent years, the high customization that offers all its customers from various industries, the fact that its WMS is of internal development, led to the unit of contractual logistics of the company had the need to create the project "Diagnosis of Logistics Systems".

As explained before, this project is global and applied to all operations has 3 distinct phases and will end with the decision of either changing the WMS or developing the current one.

As the author was involved in the first phase of the AS-IS mapping project of the processes and system features in the Montijo site operations, he proposed in this dissertation, based on what he developed for the company, to perform a benchmarking of the processes and activities of this same site.

The mapping was exhaustive, always starting with the mapping in BPMN format of all the processes analysed, both for Pharma and Multi-Client operations, having transposed it to word, since this was the format defined by the company for this purpose.

Through the mappings carried out, it was possible to conclude that, despite some variations in some sub-processes, the Inbound and Outbound processes for the Pharma operations were standardised and identical to the processes practiced in the Multi-Client. Therefore, it was decided, when analysing the processes, to go to the sub-process level to perform the benchmarking.

The biggest differences were found in the Reverse Logistics and Distribution processes. Regarding the first, there are differences in terms of systems and the way communication with the client is done. As for the second, in the case of the Pharma operations, the Distribution is done by Rangel itself and in the case of the Multi-Client this is outsourced (therefore it was not analysed).

In all the analyses, Lean concepts and project mapping and analysis tools were always taken into account, as well as the requirement to evolve the company towards a WMS compatible with Industry 4.0 requirements. At the same time, it was also tried to never to lose sight of the fact that the company cannot lose its main competitive advantage, i.e. the high level of customisation it offers to customers, if it tries to reduce the variability of all processes too much.

In terms of the proposed improvements, these were analysed based on a qualitative cost-benefit analysis. Relatively to the analysis made, it can be concluded that of the improvement opportunities proposed, those that should be implemented in a near future, having in mind that there is a project going on in parallel and that one of the possible results of it can be to change the WMS and it would not be reasonable to have a high investment to be in vain in the future, would be those that were identified as having a low cost and a medium or high benefit, that is, the designated quick-wins:

- Create PO with excess quantity automatically;
- Dynamic Pallet Allocation;
- Drop manual order creation;
- Complete integration with subcontracted transporters;
- Cockpit Standardisation.

As a future work for other dissertations, it would be interesting to implement the quick wins identified and analyse their impact on the company, since, as explained when defining them, they are improvements that can be applied immediately and will not oppose the result of the project, whether this is changing the WMS or evolving the current one.

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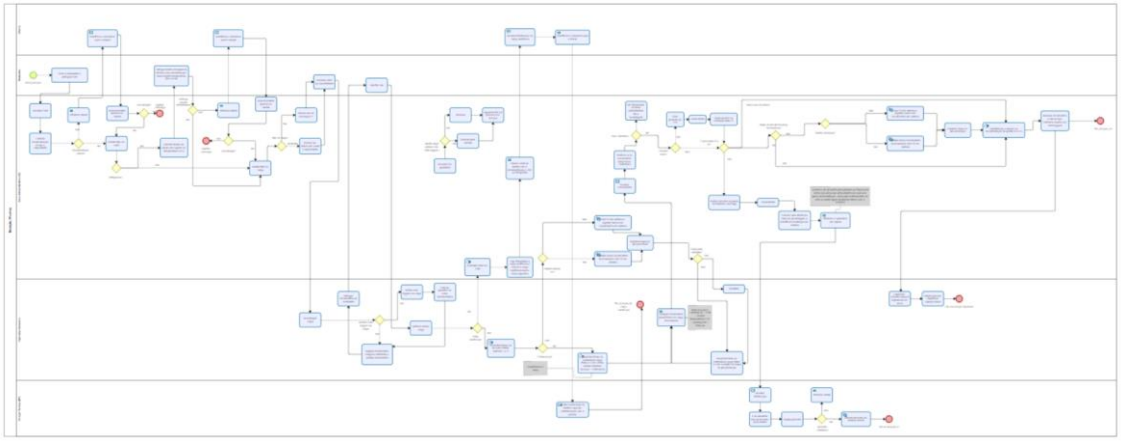
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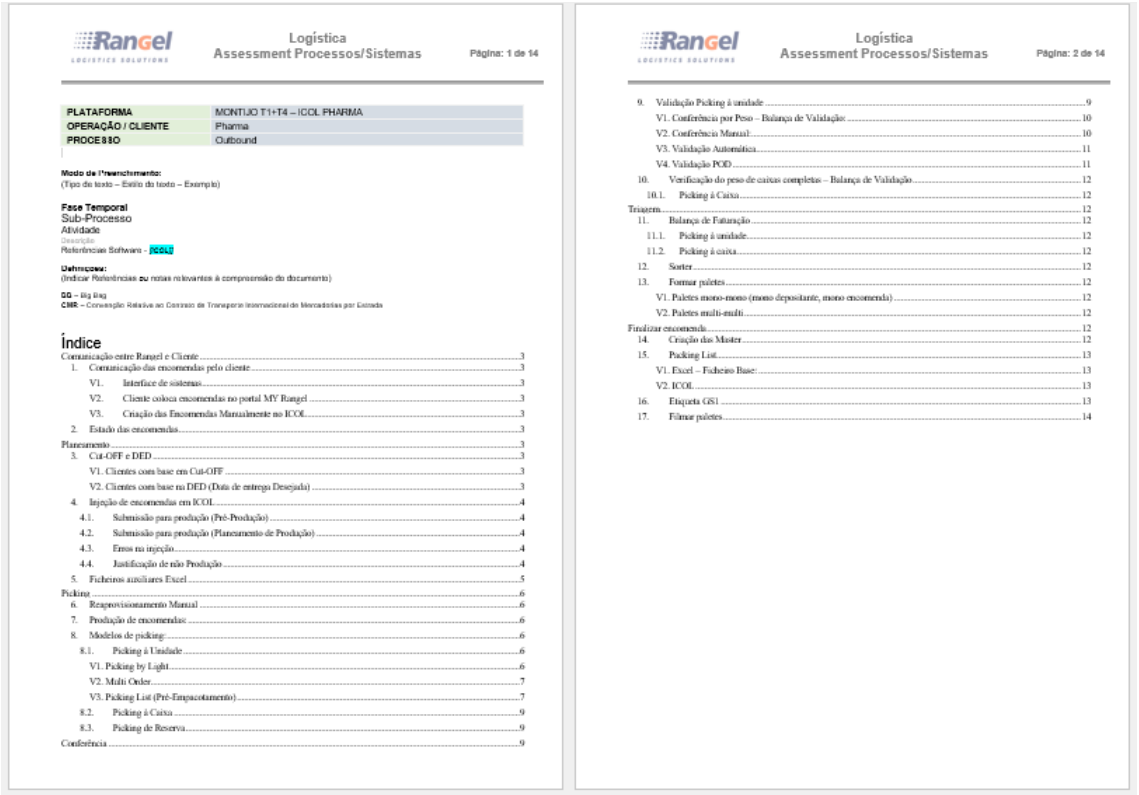
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Appendix

Annex I - Inbound Pharma Mapping



Annex II - Outbound Pharma Deliverable



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PLATAFORMA	MONTIJO T1+T4 – ICOL PHARMA
OPERAÇÃO / CLIENTE	Pharma
PROCESSO	Outbound

Modo de Preenchimento:
(Tipo de texto – Estilo do texto – Exemplo)

Fase Temporal
Sub-Processo
Atividade
Descrição
Referências Software - ICOL

Definições:
(Indicar Referências ou notas relevantes à compreensão do documento)

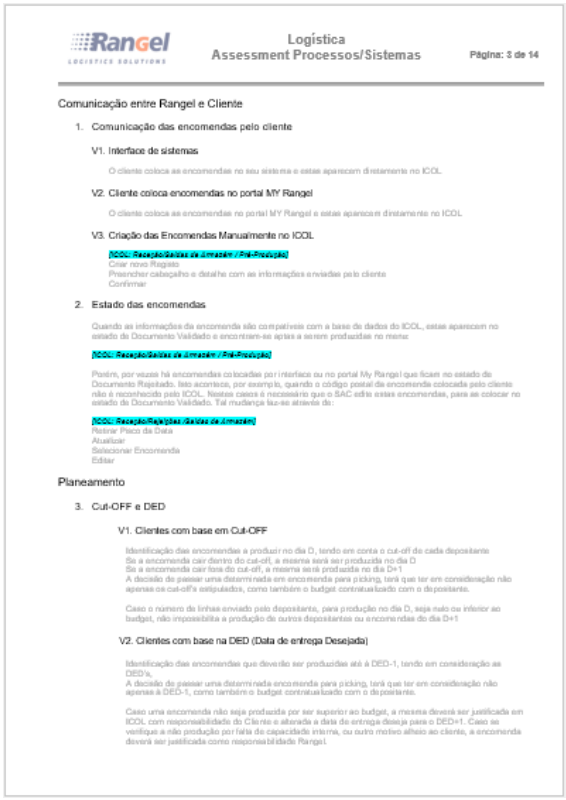
SG – Big Bag
CMR – Convenção Relativa ao Contrato de Transporte Internacional de Mercadorias por Estrada

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Rangel LOGISTICS SOLUTIONS

Logística
Assessment Processos/Sistemas

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Comunicação entre Rangel e Cliente

1. Comunicação das encomendas pelo cliente

V1. Interface de sistemas

O cliente coloca as encomendas no seu sistema e estas aparecem diretamente no ICOL

V2. Cliente coloca encomendas no portal MY Rangel

O cliente coloca as encomendas no portal MY Rangel e estas aparecem diretamente no ICOL

V3. Criação das Encomendas Manualmente no ICOL

[ICOL: Receção/Saídas de Armazém / Pré-Produção]
Criar novo Registo
Preencher cabeçalho e detalhe com as informações enviadas pelo cliente
Confirmar

2. Estado das encomendas

Quando as informações da encomenda são compatíveis com a base de dados do ICOL, estas aparecem no estado do Documento Validado e encontram-se aptas a serem produzidas no mesmo

[ICOL: Receção/Saídas de Armazém / Pré-Produção]

Porém, por vezes há encomendas colocadas por interface ou no portal My Rangel que ficam no estado de Documento Rejeitado. Isto acontece, por exemplo, quando o código postal da encomenda colocada pelo cliente não é reconhecido pelo ICOL. Nestes casos é necessário que o SAC edite estas encomendas, para as colocar no estado do Documento Validado. Tal mudança faz-se através de:

[ICOL: Receção/Rejeitadas /Saídas de Armazém]
Rastrar Pisco da Data
Atualizar
Selecionar Encomenda
Editar

Planeamento

3. Cut-OFF e DED

V1. Clientes com base em Cut-OFF

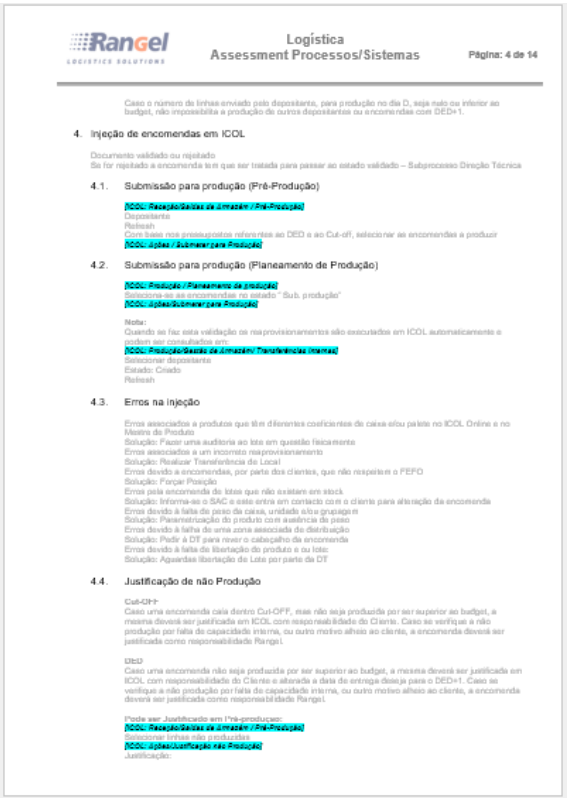
Identificação das encomendas a produzir no dia D, tendo em conta o cut-off de cada depositante
Se a encomenda cair dentro do cut-off, a mesma será ser produzida no dia D
Se a encomenda cair fora do cut-off, a mesma será produzida no dia D+1
A decisão de passar uma determinada em encomenda para picking, terá que ter em consideração não apenas os cut-off's estipulados, como também o budget contratualizado com o depositante.

Caso o número de linhas enviado pelo depositante, para produção no dia D, seja nulo ou inferior ao budget, não impossibilita a produção de outros depositantes ou encomendas do dia D+1

V2. Clientes com base na DED (Data de entrega Desejada)

Identificação das encomendas que deverão ser produzidas até à DED-1, tendo em consideração as DED's,
A decisão de passar uma determinada encomenda para picking, terá que ter em consideração não apenas à DED-1, como também o budget contratualizado com o depositante.

Caso uma encomenda não seja produzida por ser superior ao budget, a mesma deverá ser justificada em ICOL com responsabilidade do Cliente e alterada a data de entrega deseja para o DED+1. Caso se verifique a não produção por falta de capacidade interna, ou outro motivo alheio ao cliente, a encomenda deverá ser justificada como responsabilidade Rangel.



Rangel LOGISTICS SOLUTIONS

Logística
Assessment Processos/Sistemas

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Caso o número de linhas enviado pelo depositante, para produção no dia D, seja nulo ou inferior ao budget, não impossibilita a produção de outros depositantes ou encomendas com DED+1.

4. Injeção de encomendas em ICOL

Documento validado ou rejeitado
Se for rejeitado a encomenda tem que ser tratada para passar ao estado validado – Subprocesso Direção Técnica

4.1. Submissão para produção (Pré-Produção)

[ICOL: Receção/Saídas de Armazém / Pré-Produção]
Depositante
Refresh
Com base nos parâmetros referentes ao DED e ao Cut-off, selecionar as encomendas a produzir
[ICOL: Ações / Submeter para Produção]

4.2. Submissão para produção (Planeamento de Produção)

[ICOL: Produção / Planeamento de produção]
Selecionar as encomendas no estado " Sub. produção"
[ICOL: Ações/Submeter para Produção]

Nota:
Quando se faz esta validação os reaprovisionamentos são executados em ICOL automaticamente e podem ser consultados em:
[ICOL: Produção/Saídas de Armazém/ Transferências Internas]
Selecionar depositante
Estado: Criado
Refresh

4.3. Erros na injeção

Erros associados a produtos que têm diferentes coeficientes de caixa e/ou palete no ICOL Online e no Mestre do Produto
Solução: Fazer uma auditoria ao lote em questão fisicamente
Erros associados a um incorreto reaprovisionamento
Solução: Realizar Transferência de Local
Erros devido a encomendas, por parte dos clientes, que não respeitem o FEFO
Solução: Forçar Posição
Erros pela encomenda de lotes que não existam em stock
Solução: Informa-se o SAC e este entra em contacto com o cliente para alteração da encomenda
Erros devido à falta de peso da caixa, unidade e/ou agrupagem
Solução: Parametrização do produto com ausência de peso
Erros devido à falha de uma zona associada da distribuição
Solução: Pedir à DT para rever o cabeçalho da encomenda
Erros devido à falta de libertação do produto e ou lote:
Solução: Aguardar libertação de Lote por parte da DT

4.4. Justificação de não Produção

Cut-Off
Caso uma encomenda caia dentro Cut-OFF, esse não seja produzida por ser superior ao budget, a mesma deverá ser justificada em ICOL com responsabilidade do Cliente. Caso se verifique a não produção por falta de capacidade interna, ou outro motivo alheio ao cliente, a encomenda deverá ser justificada como responsabilidade Rangel.

DtD
Caso uma encomenda não seja produzida por ser superior ao budget, a mesma deverá ser justificada em ICOL com responsabilidade do Cliente e alterada a data de entrega deseja para o DED+1. Caso se verifique a não produção por falta de capacidade interna, ou outro motivo alheio ao cliente, a encomenda deverá ser justificada como responsabilidade Rangel.

Pode ser Justificado em Pré-produção:
[ICOL: Receção/Saídas de Armazém / Pré-Produção]
Selecionar linhas não produzidas
[ICOL: Ações/Justificação não Produção]
Justificação: