Ecole des Hautes Etudes Commerciales d'Alger

EHEC

Final thesis for the completion of the Master's degree in Commercial Sciences

Option: Supply chain and distribution management

THEME:

Try to optimize the order preparation process for a logistics provider Study case: Logistics platform NUMILOG-BOUIRA

Prepared by:

ALIOUANE Omar

BOUCHEKARA Adel

Supervised by:

Dr. Feriel HATTOU

Lecturer "A" at EHEC

10th promotion

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List of abbreviations

1PL: First party logistics.

2PL: Second party logistics.

3PL: Third Party Logistics.

4PL: Fourth Party Logistics.

5PL: Fifth Party Logistics.

ABC: Activity Based Costing.

ADM: Administrative agent.

AFNOR: French association of standardization.

AGV: Automatic Guided Vehicle.

APS: Advanced Planning System.

AS/RS: Automated Storage and Retrievals System.

AVS/RS: Automated vehicle Storage and Retrieval System.

DN: Delivery note.

DPP: Detail Picking Pick.

DPS: Detail Picking from Stock.

EDI: Electronic data interchange.

ERP: Enterprise Resource Planning.

GDS: Inventory management.

HRD: Human Resources department.

IRIS: Initiative, Respect, Integrity, Solidarity.

KPI: Key Performance Indicators.

LPF: Logistics platform.

LTM: Logistics Team Leader.

OD: Unloading Order.

OF: Order form.

OOP: Order of preparation.

OPL: Logistics operator.

PCC: Picking in Complete Packaging.

PDA: Personal Digital Assistant.

POO: Preparation of orders.

PPE: Personal Protection Equipment.

RADM: Head of Administration.

RFID: Radio Frequency Identification.

RLC: Regional logistics center.

SC: Supply Chain.

SCM: Supply Chain Management.

SCOR: Supply Chain Operations Reference model**.**

WMS: Warehousing Management System.

REFLEX: Reflex WMS is a warehouse software that is part of the logistics operations optimization logic.

SPSS: IBM® SPSS® Statistics is a powerful statistical software platform.

Abstract

Order preparation is a crucial part of warehouse logistics and is considered a time and resource-consuming step. Order preparation can be a competitive advantage for many companies, and it is the process that expresses the performance level of the logistics platform since 60% of operational costs in warehouses are attributed to this crucial process.

In this dissertation, we aim to optimize this process to better meet the company's objectives and meet the requirements of customers who trust NUMILOG. For this we opted for a quantitative approach using a method of estimation of the means and confidence intervals with the software SPSS but also the reorganization of the warehouse with the method ABC which minimizes the picking paths.

Keywords: order preparation, optimization, logistics, warehouse, logistics platform.

Résumé

La préparation des commandes est une partie cruciale de la logistique de l'entrepôt et est considérée comme une étape de temps et de ressources. La préparation des commandes peut être un avantage concurrentiel pour de nombreuses entreprises, et c'est le processus qui exprime le niveau de performance de la plate-forme logistique puisque 60% des coûts opérationnels dans les entrepôts sont attribués à ce processus crucial.

Dans ce mémoire, nous visons à optimiser ce processus pour mieux atteindre les objectifs de l'entreprise et répondre aux exigences des clients qui font confiance à NUMILOG. Pour cela nous avons opté pour une démarche quantitative en utilisant une méthode d'estimation des moyennes et des intervalles de confiances avec le logiciel SPSS mais aussi la réorganisation de l'entrepôt avec la méthode ABC qui minimise les chemins de prélèvements.

Mots-clés : préparation des commandes, optimisation, logistique, entrepôt, plateforme logistique.

ملـخص

إعداد الطلبات هو جزء حاسم من لوجستيات المستودعات ويعتبر عملية تستهلك الوقت والموارد. يمكن أن يكون إعداد الطلبات ميزة تنافسية للعديد من الشركات، وهو العملية التي تعبّر عن مستوى أداء المنصة اللوجستية، حيث يُعزى 60٪ من التكاليف التشغيلية في المستودعات إلى هذه الخطوة الحاسمة.

في هذه الأطروحة ، نهدف إلى تحسين هذه العملية لتحقيق أهداف الشركة بشكل أفضل وتلبية متطلبات العملاء الذين يثقون في NUMILOG. لذلك اخترنا نهجًا كميًا باستخدام طريقة لتقدير المعدل و مجالات الثقة مع برنامج SPSS ولكن أيضًا إعادة تنظيم المستودع باستخدام طريقة ABC التي تقلل من مسارات الانتقاء.

الكلمات المفتاحية: إعداد الطلبيات، والتحسين، الخدمات اللوجستية، والمستودع، ومنصة الخدمات اللوجستية.

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General introduction

Logistics is a function whose goal is the satisfaction of expressed or latent needs, under the best economic conditions for the enterprise and for a given level of service.

In this changing environment, companies have had to adapt their supply chain to ensure their place in a highly competitive environment. This development was particularly felt in distribution warehouses, an important performance lever for companies of all sizes and sectors.

The management of these warehouses leads to productivity and traceability issues, which condition the satisfaction of the end customer. As a result, this management must be both service-level, profit-oriented and managed efficiently. The level of service is the main priority of the warehouses and order preparation being the customer warehouse interface, this activity must be privileged.

The profit orientation is done by a pursuit of productivity in all the activities present within the warehouse and finally the efficient steering is done by checking the various indicators deemed adequate.

The company NUMILOG is a CEVITAL subsidiary that subcontracts the logistics and transport for its internal customers such as (CEVITAL, Numidis etc). And its external customers (DANONE, PALMARY etc).

The Bouira PLF represents the largest and most important platform for NUMILOG because its strategic location allows it to be more flexible to exchanges, so the performance of NUMILOG depends mainly on the BOUIRA PLF. He therefore seeks to optimize the order preparation process in order to be more responsive to demand through an irreproachable quality service (to better satisfy his clients).

The main objective of this research work is to try to optimize the order preparation process. To do this, we opted for an analysis of order preparation processes, storage processes, as well as the products receiving process. The study we want to do is intended to answer a main question that is the problem of our research and that is:

« How can we optimize the order preparation process for a logistics provider? »

From this main question arise the following secondary questions:

- Is the product receiving process optimal and sufficient to achieve Numilog's objective?
- Is there a significant relationship between the number of packages prepared and the preparation time?

- Is Numilog well-organized in its warehouse to facilitate picking?

In light of the questions asked and related to the topic of our study, we opted for the following hypotheses:

H1: The product receiving process is suboptimal, and Numilog is not achieving its objective due to load disruptions.

H2: There is a positive correlation between the number of packages prepared and the preparation time.

H3: Numilog has a good warehouse organization facilitates picking.

In order to best respond to our problem and according to the objectives of our research: we opted for a quantitative study to analyse process of preparation of the orders and the processes related with it as the process of reception and storage of the products. For the theoretical side we inserted ourselves in a thorough literature search through the consultation of books, articles, journals, websites and some academic works (thesis, doctoral thesis), also internal documents of the company. And also, of the statistical methods of sampling and estimation we have used the software SPSS for them, we also calculate the distance covered by the logistic operators and finally a technique of analysis of the operation of storage named: Pareto analysis 20/80 or the ABC method.

We have structured our work into three main chapters as follows:

The first chapter: entitled «**From logistics to supply chain management**», talks about logistics and in particular downstream logistics and supply chain and it will be divided into two sections: the first section will be dedicated to the General overview of downstream logistics after we have a talk on supply chain and supply chain management and difference between these two.

The second chapter: entitled «**Theoretical concepts about the logistical warehouse**», also has two sections, the first one dealing specifically with logistic warehouses, the second section will focus on the order preparation process.

The third chapter: and the final chapter are the practical part of our research which is entitled «**Analysis of the results research**» and it have three sections begin with the presentation of the company NUMILOG these activities missions...etc after we start an existing analysis on the current state of order preparation process and other processes related to it and

the third section is called attempts to improve the order preparation process in this section we have the solutions and recommendations.

And finally, the conclusion of chapter where we have to confirm or reverse the hypotheses of our research.

Chapter 01: From logistics to supply chain management

Introduction

Supply chain management and downstream logistics are critical to organizational success in today's globalized business environment. This chapter explores the critical role of supply chain management and downstream logistics in optimizing operations and improving customer satisfaction. He talks about the definition, objectives and processes of downstream logistics, as well as the distribution of finished products to customers. The chapter discusses the concept of supply chain and supply chain management, citing the differences and benefits of adopting a supply chain management approach. In addition, he explores the benefits and limitations of outsourcing logistics and highlights the importance of optimizing supply chain processes to gain a competitive advantage in the marketplace.

Key points discussed in the chapter:

- Definition, objectives, and processes of downstream logistics
- Distribution and delivery of finished products to customers
- The concept of the supply chain and supply chain management
- Differences between supply chain and supply chain management
- Benefits of implementing a supply chain management approach
- Advantages and limitations of logistics outsourcing
- Importance of optimizing supply chain processes for competitive advantage

Section 1: General overview of downstream logistics

Logistics is the most important aspect of supply chain management which involves the planning, implementation and control and storage of goods and services as the ease of delivery of products from point of origin to point of consumption. The main objective of logistics is to ensure that products or services reach customers on time, in exact quantity and quality and at the lowest possible cost. this logistical process includes a set of activities including shipping, warehousing, inventory management and order processing. In logistics there is downstream logistics which is a sub-process of logistics which focuses on activities related to the distribution and delivery of finished products to customers. In this chapter, we discuss downstream logistics and its definition, objectives, key processes, channels, distribution channels and distribution networks. We will also discuss the different types of logistics outsourcing, their advantages and limitations.

1. Definition of logistics

Nowadays, several definitions of logistics have been subject to literature. We will mention some definitions that seem to us the most important and that mark the evolution of the logistics concept.

"Logistics refers to the transportation and storage of materials, parts and products in a supply chain. Logistics includes inbound and outbound processes to and from warehouses, as well as internal and external materials handling and transport operations. It also includes the execution of services and the transfer of information between the various stages of a supply chain."[1]

But also, Logistics is the set of activities aimed at efficiently and cost-effectively delivering a quantity of products to the location and time where there is demand.

"The management of the physical and information flows that are associated with materials and products, from the point of raw material acquisition to the point of final consumption"[2]

We add a final definition that states *"Logistics is the process of planning, implementing, and controlling the efficient and cost-effective flow of raw materials, in-process inventory,*

[1] HERAGO (Sunderesh) and others: *Operations, Logistics and Supply Chain Management*, 1st ed, 2019, p.33
[2] HARRISON, (A) and VAN HOEK, (R): *Logistics Management and Strategy: Competing through the Supply Chain. Prentice Hall*, 1st ed, 2011, P.03

finished goods, and related information from point of origin to point of consumption for the purpose of meeting customer requirements."[3]

1.1 Synthesis of definitions

From the above definitions we can summarize that Logistics involves the planning, organization, execution, and control of the flow of goods or services from the point of origin to the point of consumption to meet customer demand, while minimizing costs and maximizing efficiency. It encompasses various activities such as transportation, warehousing, inventory management, order processing, and distribution.

"Logistics concerns the management of the flow of goods and services from their point of origin to their point of consumption in order to satisfy customer requirements. It is concerned with the planning, organization, and control of these activities, as well as the information flows that support them. Logistics activities include transportation, warehousing, inventory management, order processing, and distribution. Logistics systems are designed to ensure that products are available to customers in the right quantity, at the right time, and at the right place, while minimizing costs and maximizing customer value."[4]

1.2 The different types of logistics

There are several types of logistics depending on specific activities and objectives:

- **Procurement logistics:** It focuses on the purchase and reception of raw materials, spare parts, and supplies necessary for the production of goods or services.
- **Production logistics:** It concerns the management of production flows, from production planning to the assembly and final packaging of products.
- **Distribution logistics:** It encompasses all activities related to the preparation, packaging, shipping, and delivery of products to customers.
- **Reverse logistics:** Also called returns logistics, it manages the process of recovering, repairing, reusing, or recycling products returned by customers.
- **Green logistics:** It focuses on sustainable logistics practices, aiming to minimize environmental impact while ensuring business profitability.

---

[3] BALLOU H. (Ronald): *Business Logistics/Supply Chain Management: Planning, Organizing, and Controlling the Supply Chain*,5th ed, 2003, P.04

[4]LAPORTE G. (Ghiani) and others :(2013*). Introduction to logistics systems management*, 2nd ed, In the intro of the book

- **Military logistics:** It consists of managing the flow of material, equipment, and personnel necessary to support military operations.

So, there are indeed different types of logistics until the concept of supply chain brought some unity in this field.

1.3 The objective of logistics

The objective of every supply chain should be to maximize the overall value generated. The value (also known as supply chain surplus) a supply chain generates is the difference between what the value of the final product is to the customer and the costs the supply chain incurs in filling the customer's request.[5]

Supply Chain Surplus = Customer Value – Supply Chain Cost

2. Different parts of Logistics

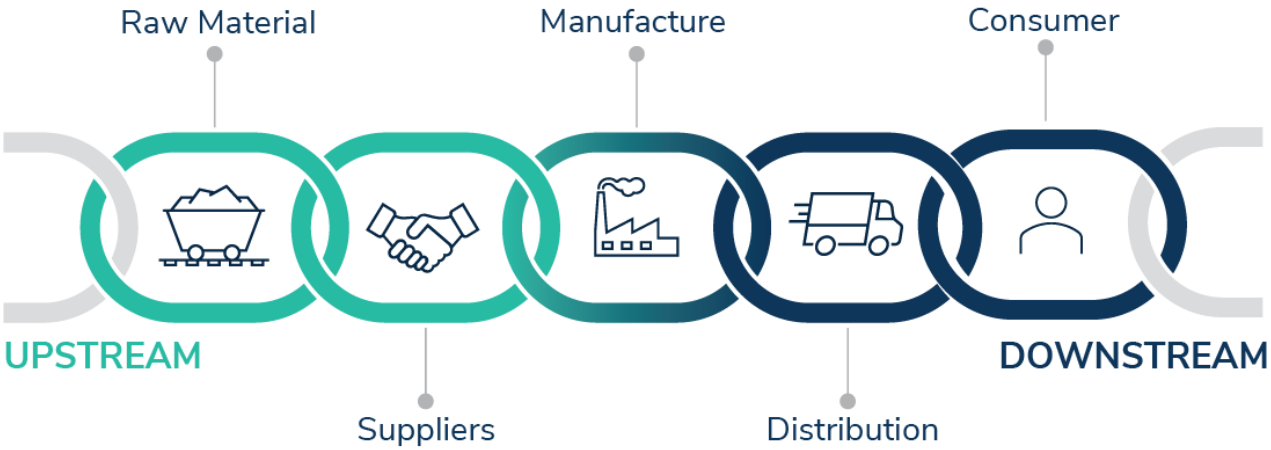
Logistics can be split into two main areas: upstream and downstream. Upstream logistics activities are those that start with the sourcing of raw materials and end with the delivery of products to the manufacturing facilities. Downstream logistics activities include the management of finished goods, the outbound distribution of finished products to customers and the associated information flows.[6]

- **Upstream logistics:** refers to the processes involved in obtaining and managing the raw materials, parts, and other inputs needed for production. This includes activities such as sourcing, procurement, and inbound transportation.

- **Downstream logistics:** refers to the processes involved in delivering finished products to customers. This includes activities such as transportation, warehousing, and order fulfilment.

[5] CHOPRA (Sunil) and MEINDL (Peter): *Supply Chain Management: Strategy, Planning, and Operation*, 5th edition, 2015, P.03
[6] HARRISON (Alan) and VAN HOEK (Remko): Logistics *Management and Strategy, 2011*, P.04

Figure 1.1: Diagram explained the difference between upstream and downstream logistics



Source: https://www.youredi.com/blog/the-importance-of-process-integration-and-data-connectivity-in-upstream-and-downstream-supply-chain

2.1 Downstream logistics

"Downstream logistics refers to the management of the flow of finished goods and services from the point of production to the point of consumption, including transportation, warehousing, distribution, and delivery. It is concerned with ensuring that products are delivered to customers in a timely, efficient, and cost-effective manner."[7]

2.1.1 Downstream logistics activities

- **Transportation Management:** This involves the coordination and management of the transportation of goods from one location to another, using various modes of transportation such as trucks, ships, trains, and planes. This activity also includes route planning, carrier selection, and tracking of shipments.
- **Warehouse Management**: This involves the management of warehouses, including receiving, storing, and shipping of products. This activity also includes inventory control, order picking, and storage optimization to ensure timely and efficient delivery of goods.
- **Order Processing**: This involves the processing of customer orders, including order entry, order confirmation, and order tracking. This activity also involves the coordination of order fulfilment, including picking, packing, and shipping of goods to the customer.

[7] YEO, (T. S) and TAN, (C. K.) : «The role of downstream logistics in supply chain management», in international Journal of Engineering Business Management, N4, 2012, p1-8

- **Inventory Management:** This involves the management of inventory levels, including inventory tracking, inventory control, and inventory optimization. This activity ensures that the right amount of inventory is available to meet customer demand while minimizing inventory costs.
- **Customer Service:** This involves providing excellent customer service to ensure customer satisfaction, including responding to customer inquiries, resolving customer complaints, and providing after-sales support.
- **Reverse Logistics:** This involves the management of product returns, including the processing of returns, disposition of returned products, and management of returned inventory. [8]

2.1.2 Characteristics of downstream logistics

Downstream logistics is a critical component of the supply chain that involves the delivery of finished products to end-users or customers. It encompasses a range of activities, including transportation, warehousing, distribution, and delivery, and is characterized by several key features. These characteristics include a strong focus on customer service, coordination and collaboration among various stakeholders, complexity due to the management of multiple channels, increasing reliance on technology, and a cost-conscious approach to improving efficiency and profitability. Understanding these characteristics is essential for effective downstream logistics management and for ensuring the satisfaction of end-users or customers.

Downstream logistics is characterized by:

- **Focus on customer service** - Downstream logistics is focused on delivering products to customers in a timely, efficient, and cost-effective manner. This requires a strong focus on meeting customer expectations for delivery speed, accuracy, and convenience.
- **Coordination and collaboration** - Downstream logistics involves coordination and collaboration among various stakeholders, including manufacturers, retailers, distributors, and transportation providers, to ensure the smooth flow of goods through the supply chain.

[8] CHOPRA (Sunil) and MEINDL (Peter): *Supply Chain Management: Strategy, Planning, and Operation*, 6th ed, 2015, P.44-51

- **Complexity** - Downstream logistics can be complex, as it involves managing multiple channels of distribution, transportation modes, and inventory levels to meet customer demand.
- **Technology-driven** - Downstream logistics is increasingly driven by technology, including the use of warehouse management systems, transportation management systems, and GPS tracking systems to improve visibility and control over the supply chain.
- **Cost-conscious** - Downstream logistics is also focused on managing costs and optimizing efficiency, as this can help to improve profitability and competitiveness in the marketplace.

2.1.3. Circuits, channels, and distribution networks

Circuits, channels, and distribution networks are key components of the supply chain that enable the delivery of products and services to customers

2.1.3.1 Definition of concepts

- **Circuits (or retail circuits):** refers to the various distribution channels through which goods and services are sold to consumers. These circuits may include physical stores, online marketplaces, or direct sales.

- **Channels:** refers to the different avenues or pathways through which goods and services are distributed from producers or manufacturers to end-users or consumers. These channels can include wholesalers, distributors, retailers, and intermediaries.

- **Distribution networks:** refers to the interconnected system of organizations, individuals, and processes that work together to move products from manufacturers to end-users or consumers. This network may include warehouses, transportation providers, and logistics companies, among others. [9]

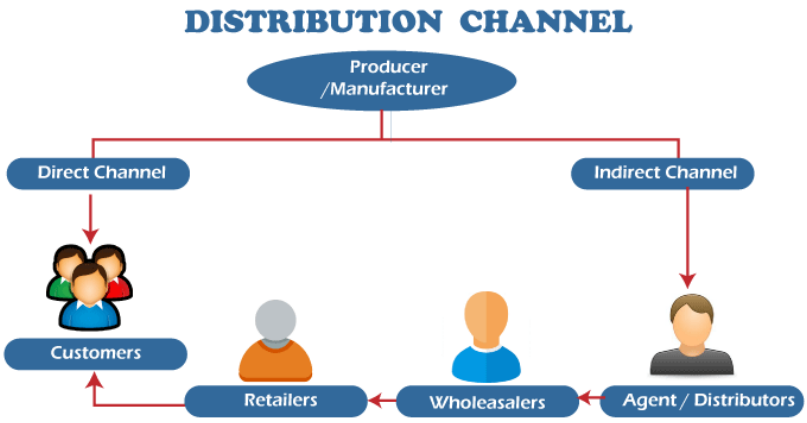
2.1.3.2 The types of distribution channels

A channel of distribution is the way products and services are passed from the manufacturer to the final consumer. It is made up of the entities involved in getting products and services to final customers and can involve a variety of intermediary firms, including wholesalers, distributors, or retailers. Decisions regarding the distribution channel are critical

[9] (FR/ENG) KOKLER (P) et DUBOIS (S): *marketing management*, 9éme edt, Paris, 1997, p. 501

to a company's success, as they are directly related to the ability for the organization to access the final customer.[10]

Figure 1.2: Types of distribution channels.



Source: https://www.javatpoint.com/distribution-channel 24/03/202314:43

- **Direct channel** structure is one where the transaction is directly from the producer to end user or final consumer. An example might be a farmer that sells directly to the final consumer, as at a farmers' market. Another example is the sale of jet aircraft that are custom designed and sold directly to the airline. This channel usually gives the company greatest control on how the product is being designed for the final customer. However, distribution costs incurred by the manufacturer are higher, making it necessary for the firm to have substantial sales volume, market concentration, or higher product cost.[11]
- **Indirect channels** are those that use intermediaries, such as wholesalers and retailers, to sell to final consumers. In this case the external institutions or agencies (e.g., carriers, warehouses, wholesalers, retailers) assume much of the cost, burden, and risk. The manufacturer receives less revenue per unit than with the direct channel, but it also carries lower risk.[12]

3. Supply chain outsourcing

In today's competitive environment, all businesses are under pressure to seek a competitive advantage. Therefore, companies face the challenge of deciding whether it is more

[10] SANDERS R. (Nada) : *Supply Chain Management: A Global Perspective*, 2nd Edition, 2018, p.87
[11] Ibid.
[12] Ibid.

advantageous for them to produce themselves or to outsource. This decision involves the idea of specializing in tasks where the company has the most knowledge and resources, including human and technical resources.

3.1 Definition

Supply chain outsourcing refers to the practice of transferring certain logistics and supply chain management activities to external service providers. This may involve outsourcing activities such as transportation, warehousing, inventory management, and order processing, among others. Supply chain outsourcing is often used by companies seeking to reduce costs and increase operational efficiency.

Outsourcing describes the deliberate movement of a series of connected business processes to a third party who manages them on behalf of the company. The classic processes were IT, warehousing and distribution, facilities management, and payroll, and to these can now be added: call centers, manufacturing, web-development, home shopping, credit cards, and even merchandising and design. In these movements the commercial risk and assets are usually passed to the outsourcing company.[13]

While the term outsourcing originally referred to buying materials or components that were previously made in-house, it is now also commonly used to refer to buying materials or components from suppliers instead of making them in-house. In recent years, the trend has been moving toward outsourcing combined with the creation of supply chain relationships, although traditionally firms preferred the make option by means of backward or forward vertical integration. Backward vertical integration refers to acquiring upstream suppliers, whereas forward vertical integration refers to acquiring downstream customers. For example, an end-product manufacturer acquiring a supplier's operations that supplied component parts is an example of backward integration. Acquiring a distributor or other outbound logistics providers would be an example of forward integration.[14]

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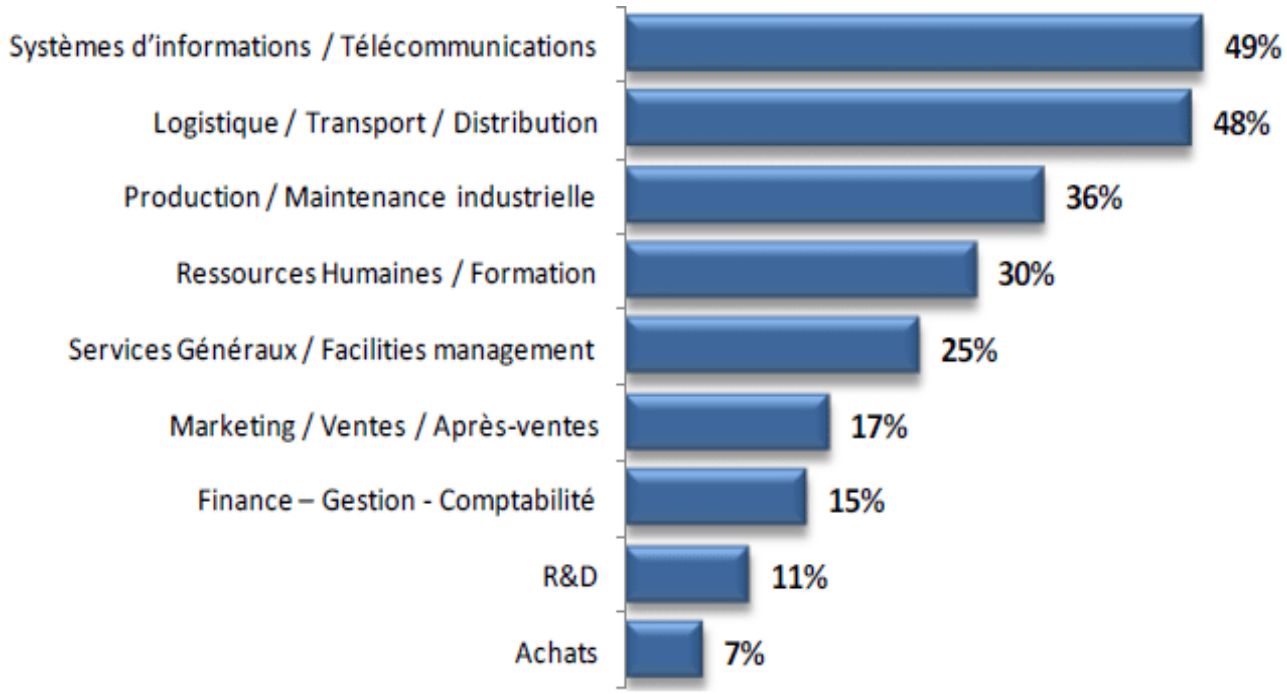
[13] WATERS (Donald) : *GLOBAL LOGISTICS New directions in supply chain management*,6th ed, 2010,p.165
[14]WISNER D. (Joel) and TAN (Keah-Choon),LEONG G. (Keong) : *Principles of Supply Chain Management A BALANCED APPROACH*, 3rd ed, 2011, p.53-54

Figure1.3: Chart represents the percentage of outsourcing in different functions.



Source: https://www.researchgate.net/figure/Les-fonctions-les-plus-externalisees-Cegos-janvier-2011-La-definition-generalement_fig4_330312305 24/03/2023 15:28

3.2 Differentiating between outsourcing and subcontracting

- **Outsourcing** involves contracting with an external service provider to perform a business function or process that would otherwise be done in-house. The external provider assumes responsibility for performing the work, often using their own staff and resources. Outsourcing is typically a strategic decision, made to achieve cost savings, access specialized expertise, or improve operational efficiency.
- **Subcontracting**, on the other hand, involves hiring an external party to perform a specific task or component of a larger project, while the overall responsibility for the project remains with the original company. Subcontracting is often used to fill a skills gap or to meet a specific project requirement, and is generally considered a tactical decision.

In summary, outsourcing involves delegating an entire function or process to an external provider, while subcontracting involves delegating a specific task or component of a project to an external provider.

3.3 Reasons for outsourcing

You may have heard these reasons:

- We do not have the management expertise.
- We need to jump the learning curve.
- We want to move fast.
- The area requires major re-engineering.
- We do not have the management resources.
- We pay too much to do it ourselves.
- It is not core.
- The business is going through major change, and we need to make more areas variable cost.
- We need to focus our resources for training, investment, time etc. [15]

Outsourcing logistics services can be expensive, and it requires more coordination and dependence on outsiders who may not be reliable. For this reason, large virtual retailers usually have their own physical warehouses and distribution systems. Other virtual retailers are creating strategic alliances with logistics companies or with experienced mail-order companies that have their own logistics systems.[16]

3.4 The different actors in logistics outsourcing

Logistics outsourcing involves various actors, including the client company, the logistics service provider (LSP), and potentially other third-party providers:

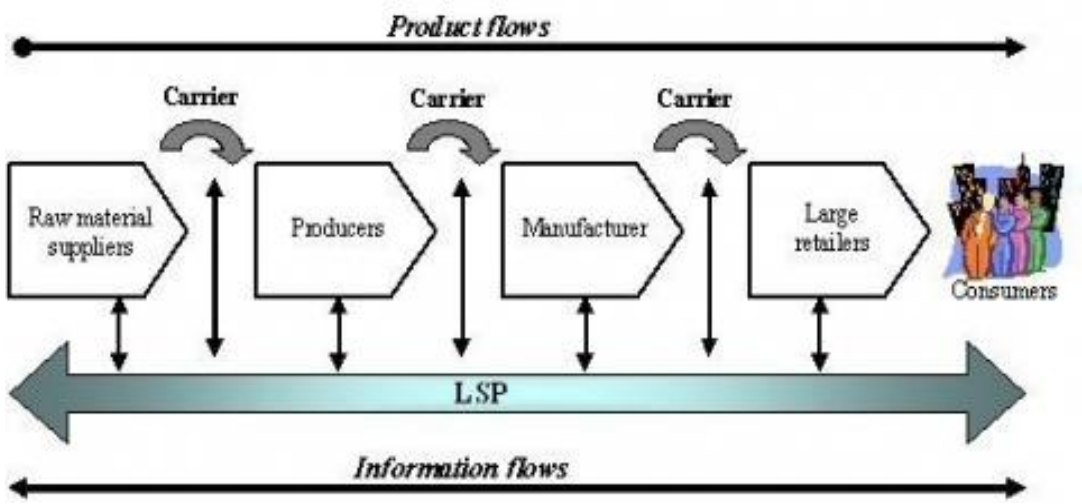
- **Client Company:** The client company is the organization that seeks to outsource its logistics activities to a third-party provider. This company is responsible for defining its logistics needs and requirements, selecting an appropriate logistics service provider, and overseeing the logistics operations to ensure they meet its expectations.
- **Logistics Service Provider (LSP):** A logistics service provider (LSP) is an outsourced company that provides supply chain management services such as transportation, warehousing or distribution services. It includes 3PL, 4PL and LLP. LSPs offer many

[15] Op.cit *GLOBAL LOGISTICS New directions in supply chain management* 6Ed p.166
[16] TURBAN (Efraim) and others : *Electronic Commerce: "A Managerial and Social Networks Perspective*, 8th ed, 2015, p.566

benefits including access to vital analytics, expertise in new industry technology and the ability to create and deliver value to end-user customers and consumers.[17]

- **Third-Party Providers:** Third-party providers are external organizations that the logistics service provider may engage to perform specific logistics functions or services. For example, the LSP may outsource transportation services to a carrier or sub-contract warehousing services to a specialist provider. These third-party providers are responsible for delivering their contracted services to the LSP, who in turn is responsible for delivering the overall logistics services to the client company.

Figure 1.4: A conventional representation of the supply chain and role of LSP



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3.5 Different Levels of Logistics Service Providers

Logistics service providers are companies who provide a range of logistics activities for their clients. They might operate distribution centers, manage the delivery of the product through their transport fleets or undertake value-adding services such as re-packing.[18]

- **First-Party Logistics Provider (1PL):** Refers to an organization that manages its own logistics activities, such as transportation, warehousing, and order fulfilment, without outsourcing any of these activities to a third party.

[17] https://www.penskelogistics.com/insights/logistics-glossary/what-is-a-logistics-service-provider (consulted on March 24, 2023 at 11:10 p.m)
[18]CHRISTOPHER (Martin) : *Logistics and Supply Chain Management Creating Value-Adding Networks*, 3rd ed, 2004, p. 295

- **Second-Party Logistics Provider (2PL):** Refers to a company that provides logistics services to another company, but only in specific areas, such as transportation or warehousing. The second-party logistics provider does not provide a full range of logistics services.
- **Third-Party Logistics Provider (3PL):** Refers to a company that provides a broad range of logistics services to other companies, such as transportation, warehousing, order fulfilment, and supply chain management.
- **Fourth-Party Logistics Provider (4PL):** Refers to a company that acts as a supply chain integrator and manages the entire logistics process for its clients. This includes overseeing multiple third-party logistics providers and coordinating all aspects of the supply chain**.**
- **LLP (lead logistics providers) and LLM (lead logistics managers):** Recently, a new type of logistics service provider has emerged, called Lead Logistics Provider (LLP), which is considered a blend of the services offered by 3PL and 4PL, hence its other name of 5PL. The LLP performs functions similar to those of 4PL, but distinguishes itself from the latter by not relying on other logistics service providers, as it has all the physical means to successfully carry out the project.

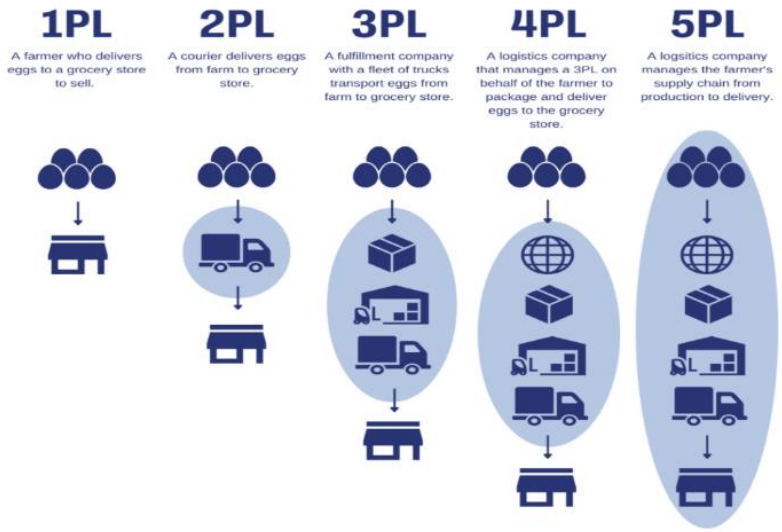
Table 1.1 : Comparison of Logistics Service Providers Across Different Service Levels.

Typologies of LSP	**Characteristics and nature of the offer**	
1PL	• Subcontracting of transport or storage	**3PL**
2PL	• Classic provider • Performing simple physical operations related to transportation and storage	
3PL	• Value-added services including in addition to transportation, operations of industrial, commercial, informational and administrative characteristics • Use own resources (means of transport and storage)	
4PL	• Dematerialized LSP • Having virtually no own assets • Mobilize resources from other partners • Total control of information flows • Groups a network of skills	

	• Develops Customized logistics solutions	
LLP & LLM	• Only partner of the principal • Uses subcontractors • Supervises logistics flows over a wide area	

Source: 6th International OFEL Conference on Governance, Management and Entrepreneurship New Business Models and Institutional Entrepreneurs: Leading Disruptive Change - Dubrovnik, April 2018

Figure 1.5: the distinctions between logistics providers



Source: https://www.falconfulfillment.com/blog/1pl-2pl-3pl-4pl-5pl-logistics-providers-explained/ 25/03/2023 15:24

3.6 Advantages and limitations of logistics outsourcing

In this part we are talking about the advantages and limitations who block the logistics outsourcing:

3.6.1 Advantages

- Reduces logistics costs like the figure 1.6 says.
- Allows for specialization and efficient use of core competencies.
- Provides economies of scale and scope.

- Offers better demand balancing and diversified customer portfolios.
- Reduces capital investments and fixed costs.
- Allows for flexibility and responsiveness.
- Enables concentration on core competencies and sustainable competitive advantage.
- Reduces strategic and operative risk. [19]

Figure 1.6: Structure of logistics costs before and after outsourcing



Source: ALLYN INTERNATIONAL SERVICES INC., Presentation support for its activity, 2009

3.6.2 Limitations

- Loss of control over logistics processes.
- Dependence on the reliability and quality of the logistics service provider.
- Possibility of conflicts of interest between the firm and the service provider.
- Potential negative impact on company culture and employee morale.
- Difficulty in finding the right service provider and negotiating favourable terms.
- Risk of losing important knowledge and expertise related to logistics.
- Potential difficulties in integrating outsourced logistics with the firm's overall strategy and operations.

[19] DEEPEN M.(Jan) : *Extract from Logistics Outsourcing Relationships Measurement, Antecedents, and Effects of Logistics Outsourcing Performance*, 2007, p.21-24

Outsourcing logistics operations can bring both advantages and limitations. The advantages include lower costs, improved operational efficiency, access to specialized expertise, and enhanced scalability. However, there are also limitations to consider such as the loss of control over the logistics process, communication barriers, and the risk of quality issues. Therefore, companies should weigh these advantages and limitations carefully when deciding whether to outsource their logistics operations. Ultimately, the decision should be based on the specific needs and circumstances of each company.

In conclusion, downstream logistics plays a critical role in ensuring that products are delivered to customers efficiently and effectively. By managing the flow of goods and services from the point of production to the point of consumption, downstream logistics helps organizations reduce costs, improve customer satisfaction, and increase competitiveness. A comprehensive understanding of downstream logistics is essential for any organization that seeks to optimize its supply chain and enhance its overall performance. Outsourcing logistics operations can provide numerous benefits, such as cost savings and increased flexibility, but it also comes with certain limitations that organizations should consider before making outsourcing decisions. Therefore, careful consideration and evaluation of logistics outsourcing options are necessary to ensure that the organization's goals and objectives are met. [20]

Section 2: Supply Chain "SC" and Supply Chain Management "SCM"

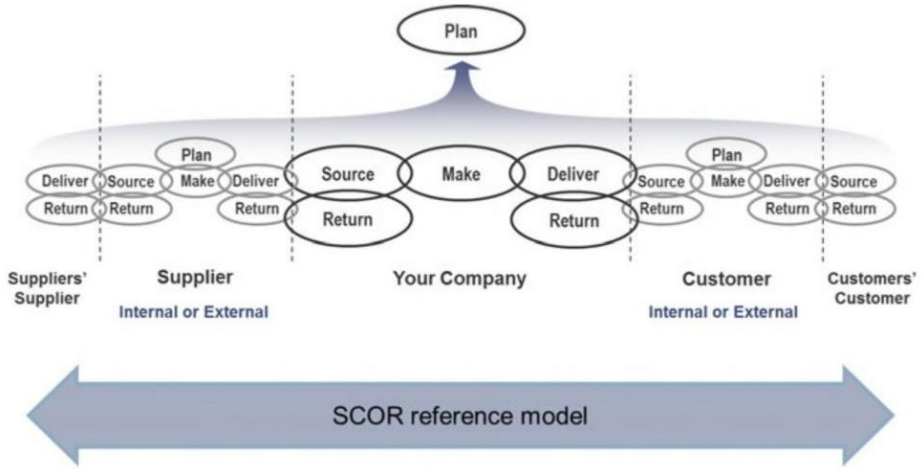
In today's globalized and interconnected business environment, supply chain management has become an increasingly critical aspect of organizational success. The supply chain plays a crucial role in ensuring that products and services are delivered efficiently, cost-effectively, and with high quality to customers. As such, organizations are placing greater emphasis on optimizing their supply chain processes to gain a competitive advantage in the market. However, the transition from a traditional supply chain to an optimized supply chain management approach can be complex and challenging. In this section, we will explore the definition of the supply chain and supply chain management, the key differences between supply chain and supply chain management, and the benefits and challenges of implementing a supply chain management approach.

[20]DEEPEN M.(Jan) : *Extract from Logistics Outsourcing Relationships Measurement, Antecedents, and Effects of Logistics Outsourcing Performance,* Op.cit, p.21-24

1. Definition of SC "Supply Chain"

The supply chain can be described in different levels of detail as will be outlined below when discussing the Supply Chain Organizations Reference Model (SCOR-model). For a first characterization, a supply chain will be considered here as a network of organizations exchanging materials, service and information in order to fulfil customers' demands. In a broad sense, the organizations are companies (legal entities).[21] We can see Figure 1.7.

Figure 1.7: The Supply Chain Operations Reference Model SCOR



Source: SCOR model of end-to-end supply chains (Poluha 2007)

The supply chain is the set of linked processes that take place from the initial acquisition and delivery of raw materials, through the manufacturing, distribution, wholesale, and delivery of the product to the customer. The supply chain includes vendors, manufacturing facilities, logistics providers, internal distribution centres (such as warehouses, distributors, and wholesalers), and any other entities that are involved, up to the final customer. In some cases, the supply may be larger at both ends because of the inclusion of secondary suppliers and the customers of the company's immediate customers.[22]

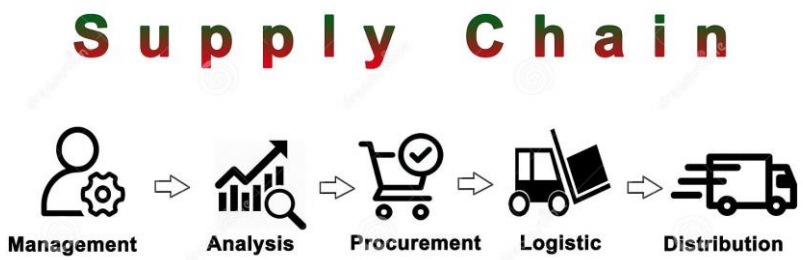
Therefore, the supply chain is the interface formed between customers and suppliers through some activities such as plans, acquisition, storage, distribution, and service, thus to satisfy the needs of the interior and exterior customers. The supply chain and the concept of the sale channel in marketing have both differences and similarities. The supply chain includes all corporations and enterprises involved in supply, production, distribution and sales before the

[21] ENGELL (Sebastian) *Logistic Optimization of Chemical Production Processes*, 2007, P.04
[22]Turner (Leslie),WEICKGENANNT B. (Andrea) and COPELAND (Mary Kay) : *Accounting Information Systems: Controls and Processes*, 2019, P.524

product reaching customers. Therefore, its definition contains the concept of sale channel. The supply chain regards equally the upstream suppliers (supply), middle producers (manufacture) and transporters (storage and transport), and downstream consumers (distribution).[23]

From the three definitions provided, it can be synthesized that the supply chain is a network of organizations and processes involved in the creation and delivery of a product or service to the end customer, encompassing various stakeholders, processes, and activities from raw material acquisition to final delivery, with the goal of satisfying the needs of both interior and exterior customers through efficient, cost-effective, and high-quality delivery.

Figure 1.8: Components of the supply chain



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1.1 Key elements of Supply Chain

The supply chain refers to the network of individuals, organizations, resources, activities, and technologies involved in the production, distribution, and delivery of goods and services to customers. The key elements of a supply chain are the various components that make up this network, including suppliers, manufacturers, distributors, retailers, customers, transportation, inventory management, information technology, quality control, and sustainability.

- **Suppliers:** The organizations which make decisions about how many goods to supply are variously known as suppliers, sellers, producers, businesses, firms and enterprises.[24] We can also say the entities that provide the raw materials or components necessary to create the final product.
- **Manufacturers:** The organizations that take the raw materials or components and transform them into finished goods.

[23] QIN (Zheng) : *Introduction to E-commerce*, 2010, P.241
[24] LIPSEY G. (Richard), HARBURY (Colin) : *First Principles of Economics*, 2nd Ed, 1992, P.53

- **Distributors:** the distributors are the ones in contact with the manufacturers, the intermediaries that transport and store the finished products before they are sold to end-users.
- **Retailers:** Retailers the businesses that sell the products directly to consumers.[25]
- **Customers:** The end-users of the products who purchase them from retailers.
- **Transportation:** refers to the method or means used to transfer goods from one location to another within the supply chain network. This could include various forms such as road, rail, air, or sea transportation.
- **Inventory management:** the process of overseeing the ordering, storage, tracking, and control of the goods and materials that an organization uses in its operations. The main objective of inventory management is to ensure that the right quantity of products is available when needed while minimizing the costs associated with holding excess inventory.
- **Information technology:** (IT) refers to the application of digital tools and systems to manage the flow of information within the supply chain network. IT plays a critical role in enabling the sharing of data and information between various stakeholders in the supply chain, including suppliers, manufacturers, distributors, and retailers.
- **Quality control:** is a systematic process implemented to ensure that the products or services provided by an organization meet the desired quality standards at each stage of the supply chain. This process involves monitoring and evaluating the quality of the products or services at various stages, including raw materials procurement, production, storage, and distribution.
- **Sustainability:** the integration of environmental and social factors into the processes and practices involved in the production, distribution, and delivery of goods and services. This includes assessing and managing the impact of the supply chain operations on the environment, such as reducing waste and emissions, as well as considering the social impact of the supply chain activities, such as ensuring fair labor practices and ethical sourcing.

1.2 Supply Chain flow

The main function of a company is to purchase, manufacture, distribute and sell products to customers in order to make a profit. These processes of procurement, production, and distribution of tangible goods generate material, informational, and financial flows. The

[25] ZENTES(Joachim), MORSCHETT (Dirk) and SCHRAMM-KLEIN (Hanna) : *Strategic Retail Management: Text and International Cases*, 2nd Ed, 2016, P.142

concept of flow implies movement, evaluation, speed, and efficiency in the supply chain. The management of these flows is a key element of the Supply Chain, which consists of three types of flows: the material flow, the information flow, and the financial flow. These three flows are interconnected and must be efficiently managed to ensure the proper functioning of the supply chain and customer satisfaction. We can see those flows in figure 1.9.

1.2.1 Material flow

Material flow includes the flow of raw materials, components, semi-finished products and final products over both a short and long distance. Facilitating the flow of different raw materials, components, semi-finished products and final products to fulfil production and supply demands. Material flow includes horizontal and vertical delivery and additional activities like loading, unloading, etc.[26]

Material flow activities in the supply chain can be categorized into two types:

- **Internal material flow**, which occurs within the company's site, between different plants, between plants and warehouses, within technological processes, or between machines. The internal material flow is facilitated through the use of material flow machines and equipment.
- **External material flow**, which involves the transportation of goods over long distances outside of the company's site. External material flow is carried out by transport vehicles such as road vehicles, railway wagons, inland waterways, or sea vessels.

1.2.2 Information flow:

Logistics includes movement of whatever information is needed to sustain its own operations[27]

Refers to the sharing of data and communication among various entities involved in the supply chain process. The primary objective is to enhance the overall efficiency, accuracy, and performance of the supply chain by enabling real-time visibility into key aspects of the process such as inventory levels, production schedules, shipping and delivery schedules, and demand forecasting.

1.2.3 financial flow

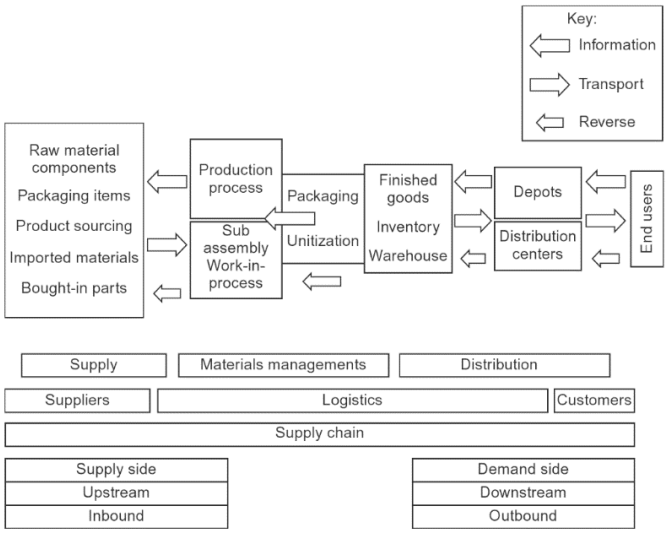
[26]KOVÁCS (György), KOŠŤÁL (Peter) : *MATHEMATICAL DESCRIPTION OF MATERIAL FLOW MATERIALS SCIENCE AND TECHNOLOGY*, 2016, P.14
[27] WOOD F. (Donald) and others : *International Logistics* , 1995, P.10

The financial flow, which is the money flow, is depicted in the money payment by the firm to the household of its money income, and by the household to the firm for its purchase of goods and services.[28]

Financial involves the transfer of funds between the various parties involved in the supply chain process, which includes payment for goods and services exchanged. It is crucial for mitigating financial risk, ensuring timely payments, and enhancing the overall efficiency of the supply chain.

- **Reverse flow:** in a supply chain refers to the movement of goods or materials in the opposite direction of the traditional flow, from the customer back to the supplier or manufacturer. This may occur due to product recalls, warranty claims, repairs, or recycling of used products.

Figure 1.9 : Logistics flow and some of the different logistics terminologies.



Source: Reza Farahani (2011) Logistics Operations and Management: Concepts and Models P.12

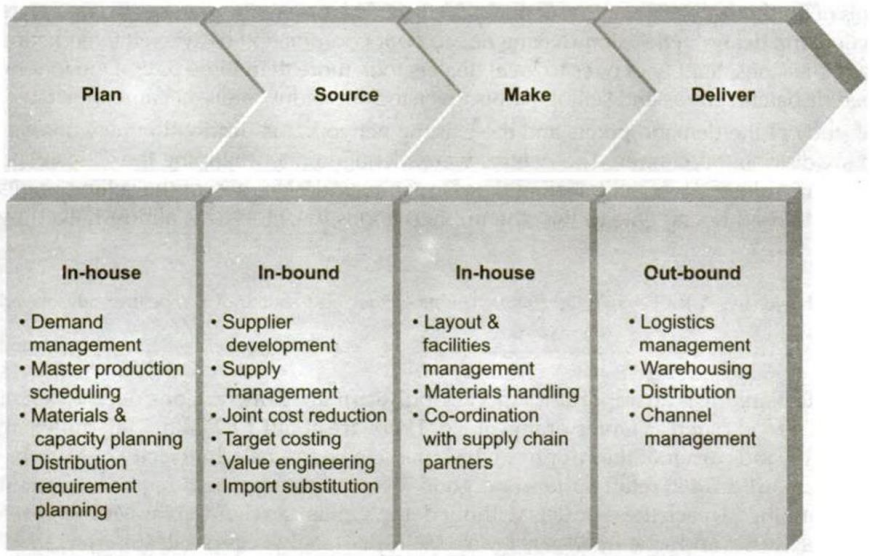
1.3 Supply Chain processes

There are four generic processes involved in any supply chain.[29] We can see it in figure 1.10.

There are many processes involved in managing a supply chain, but four crucial processes that are considered critical for effective supply chain management are:

[28] PAGOSO (Cristobal) : *introductory MICROECONOMICS*, 1994, P.13
[29] MAHADEVAN (B) : *Operation Management: Theory and Practice* , 2009,P.448

Figure 1.10: Process view of supply chain and it relations with SC component.



Source: B. Mahadevan (2009) Operation Management: Theory and Practice P.448

1.3.1 Planning

All supply chain activities should be planned, so the Plan process connects with all of the others.[30]

Effective planning in supply chain management involves assessing current and future demand for products, analyzing the availability and capacity of resources, and developing strategies to manage supply and demand fluctuations. This process includes identifying potential risks, such as supply chain disruptions, and developing contingency plans to mitigate these risks.

The planning process also includes developing production schedules that optimize the use of resources and minimize waste, as well as managing inventory levels to ensure that the right number of products are available when and where they are needed. Effective planning can help to reduce costs, improve delivery times, and enhance customer satisfaction.

- **Strategic planning**

Involves developing long-term strategies and plans for the supply chain as a whole, typically covering a period of several years. The main goal of strategic planning is to set the overall direction and vision for the supply chain, and to develop a roadmap for achieving its

[30] STANTON (DANIEL) : *Supply Chain Management for Dummies*, 2nd Edition, 2020, P.68

goals and objectives. Strategic planning is typically carried out by senior management and involves a high-level view of the entire supply chain.

- **Tactical planning**

Includes developing detailed plans and schedules for the medium-term operation of the supply chain, typically covering a period of several months to a year. The main goal of tactical planning is to optimize the use of resources and to ensure that the supply chain functions efficiently and effectively. Tactical planning is typically carried out by mid-level managers and involves a more detailed view of specific areas of the supply chain.

- **Operational planning**

This type of planning involves managing the day-to-day activities of the supply chain, such as production scheduling, inventory management, and logistics planning. The main goal of operational planning is to ensure that the supply chain functions smoothly and efficiently, meeting customer demands and delivering products and services on time and within budget. Operational planning is typically carried out by front-line managers and involves a detailed view of specific processes within the supply chain.

1.3.2 Sourcing

Sourcing is the first stage of any supply chain cycle. Sourcing precedes any procurement and is part of the procurement cycle.[31]

Sourcing is the process of identifying, evaluating, and selecting suppliers to provide the goods and services necessary for a company's operations. It involves determining the most cost-effective and reliable sources of inputs, assessing supplier performance, negotiating contracts and pricing, and managing supplier relationships. Effective sourcing is crucial for ensuring a reliable supply of inputs, maintaining product quality, reducing costs, and achieving competitive advantage in the marketplace.

- **Procurement**

Procurement is a vital functional domain within the broader scope of supply chain management, akin to manufacturing and distribution. Its primary focus is to ensure that the necessary goods and services are procured to enable the company to produce and deliver its products or services to customers.

[31]HINES (Tony), BRUCE (Margaret) : *Fashion Marketing* ,2nd Ed, 2007, P.32

At a tactical level, procurement is responsible for optimizing key value drivers such as price competitiveness and service levels. Through careful supplier selection and negotiation, procurement can help the company to achieve cost savings, improve delivery times, and enhance the overall quality of goods and services.

Moreover, procurement holds significant strategic potential to drive innovation and create value for the organization. By collaborating with suppliers and building strategic partnerships, procurement can help to identify new technologies, processes, and ideas that can lead to significant improvements in costs, performance levels, and competitive advantage. [32]

1.3.3 Production and operations

Production and operations are integral parts of the supply chain process that involve the conversion of raw materials and components into finished goods and services ready for sale. These processes encompass production planning, scheduling, and control, as well as the management of resources such as labor, equipment, and inventory.

In supply chain management, the effective management of production and operations is crucial for the success of any organization that produces goods or services. It plays a vital role in reducing costs, improving quality, and achieving a competitive advantage in the market. This involves various activities such as predicting demand, managing inventory levels, optimizing production processes, and ensuring prompt delivery of products and services to customers. By managing production and operations efficiently, companies can minimize waste, increase efficiency, and enhance customer satisfaction, which ultimately leads to greater profitability and long-term success. The types of production include mass production, batch production, job production, and continuous production we can see it in figure 1.11.

- **Mass Production**

This involves producing a large volume of standardized products using an assembly line or other highly automated manufacturing process. It is often used for consumer goods that have a high demand and a low degree of customization.

- **Batch Production**

This involves producing a limited quantity of products at a time, often in response to a specific customer order or demand. It is often used for products that have a moderate level of customization and require specialized manufacturing processes.

[32]SKIPWORTH (Heather) and others : *Logistics Management and Strategy*, 6th Ed, 2019, CHAP09

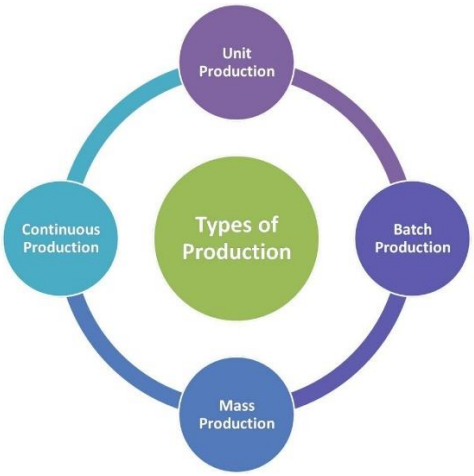
- **Job (Unique) Production**

This involves producing a single, unique product at a time, often in response to a specific customer order. It is often used for products that require a high degree of customization or have complex manufacturing processes.

- **Continuous Production**

This involves producing a product continuously without interruption, often using a highly automated manufacturing process. It is often used for products that have a very high demand and require a standardized manufacturing process.

Figure 1.11: Types of productions.



Source: https://www.marketing91.com/wp-content/uploads/2018/02/Types-o-production-5.jpg.jpg 13/04/2023 18:45

1.3.4 Distribution

For marketers in general, distribution refers to the physical supply of goods from the place of manufacture through various channels to the point of sale.[33]

Distribution is the strategic process of managing the movement of goods and services from the point of production to the point of consumption, through various channels and circuits. That we talk about in the first section of our thesis and figure 02 can illustrate them, with the goal of maximizing customer satisfaction while minimizing costs. It involves a range of activities, including transportation, warehousing, order fulfillment, and delivery, as well as the integration of these activities into a cohesive and efficient network. Effective distribution management requires a deep understanding of customer needs, market demand, and logistics

[33] PIKE (Steven) : *Destination Marketing*,1st Ed, 2008, P.278

capabilities, as well as the ability to adapt to changing conditions and emerging trends. The ultimate objective of distribution management is to create value for both customers and the organization by ensuring timely delivery of high-quality products and services, while also optimizing the use of resources and minimizing waste.

2. Definition of SCM "Supply Chain Management"

Therefore, the supply chain management refers to the various activities and processes to plan, coordinate, operate, control and optimize the whole supply chain system, whose object is to deliver the right product needed by the customer to the right place in the right time, with the right quantity, the right quality and the right state, meanwhile to make the total cost minimum.[34]

Supply chain management encompasses the planning and management of all supply chain operations. Importantly, it also includes the coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies.[35]

Supply chain management, which has become another area of consulting in operations, is the process of developing and managing a firm's total supply system, including internal and external components. It includes and expands the activities of the purchasing function and the procurement process from a strategic perspective. Materials management concentrates on the coordination and control of the various materials activities.[36]

2.1 Synthesis of definitions

Based on these three definitions, supply chain management can be defined as a set of activities and processes that involve planning, coordinating, operating, controlling, and optimizing the entire supply chain system with the aim of delivering the right product to the right place, at the right time, in the right quantity, quality, and state while minimizing the total cost. It encompasses the planning and management of all supply chain operations, including the coordination and collaboration with channel partners such as suppliers, intermediaries, third-party service providers, and customers. Additionally, supply chain management includes the development and management of a firm's total supply system, expanding the activities of the

[34]QIN (Zheng) : Introduction to E-commerce, 2010, op.cit, P.241
[35]ZIJM (Henk) and others : *Operations, Logistics and Supply Chain Management*, 2018, P.33
[36] KUBER (Milan) : *MANAGEMENT CONSULTING A Guide to the Profession*, 4th Ed, 2002, P.372

purchasing function and procurement process from a strategic perspective, and coordinating and controlling various materials activities.

2.2 Key elements of SCM

The South African National Treasury provides guidelines for implementation of the SCM policy. The framework for the SCM system constitutes demand management, acquisition management, logistics management, disposal management, risk and performance management.[37]

- **Demand management:** Demand management is the initial element of SCM, involving the fulfillment of needs identified in the strategic planning process, comprehensive assessment of necessary resources, consideration of key components in demand management, closer collaboration with end-users, bid specification committees, and procurement methods.
- **Acquisition management**: involves the procurement process, including the evaluation of bids through bid committees and consulting registers for defaulters, as well as utilizing a range of procurement systems. Other key elements include establishing the total cost of ownership of assets, bid adjudication, and the appointment of consultants.
- **Logistics management:** Effectively manage the acquisition, movement, and storage of materials through strategic planning; Ensure efficient fulfillment of orders and smooth flow of goods, services, and related information from the point of origin to the point of consumption through logistics management.
- **Disposal management:** This element of SCM involves the effective management of assets that are no longer needed, which includes planning for obsolescence, creating a database of redundant materials, inspecting materials for re-use, and determining the most suitable disposal strategy and methods of execution.
- **Risk management:** Focuses on managing unforeseen or unintended consequences of a decision. It involves identifying, assessing and avoiding risks, as well as providing adequate cover for residual risks. The goal is to minimize the impact of risks on the supply chain and ensure business continuity.
- **Supply chain performance:** The monitoring of progress and conducting retrospective analyses to assess adherence to processes and achievement of objectives. The National Treasury template is utilized for performance measurement.

[37] PENGZHONG (Li) : *Supply Chain Management*, 2011, P.80

2.3 Supply Chain Management evolution

Over time, supply chain management has evolved from a fragmented and separate set of tasks into a more integrated and comprehensive approach. In the 1960s, supply chain management was identified as a critical area for productivity improvement due to its highly fragmented nature. Logistics tasks were consolidated into two distinct functions related to materials management and physical distribution in the 1970s and 1980s, which further integrated into a true sense of logistics in the 1990s due to globalization.

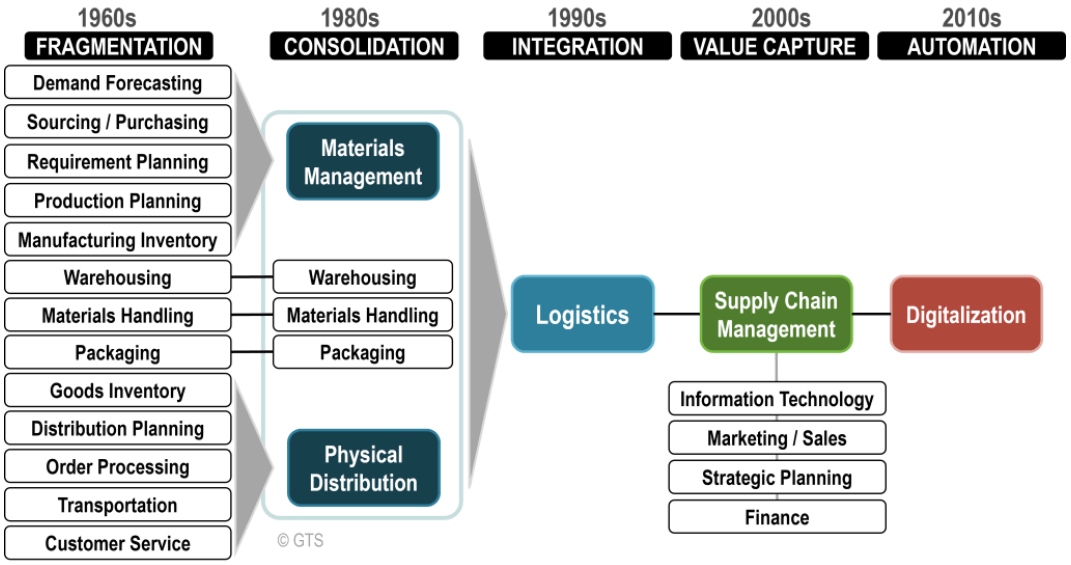
However, it was the advent of information and communication technologies that allowed for a more complete integration of supply chain management. This enabled the integrated management and control of information, finance, and goods flows, leading to a range of new production and distribution systems. Supply chain management has become a complex series of activities focused on value capture and competitiveness, and automation has become a dominant element in the evolution of both physical distribution and materials management.

Logistics activities were initially divided into separate functions such as supplying, warehousing, production, and distribution, but with the new management principles, firms adopted a more integrated approach to respond to the demand for flexibility while minimizing costs. Additionally, outsourcing and offshoring provided new manufacturing opportunities in developing economies, leading to further consolidation of management activities related to production. The resulting spatial fragmentation became a by-product of economies of scale in distribution. [38]

We can see this evolution in figure 1.12.

[38] https://transportgeography.org/contents/chapter7/logistics-freight-distribution/evolution-supply-chain-management/ (consulted on April 14, 2023 at 03:05 p.m)

Figure 1.12: The Evolution of Supply Chain Management.



Source: https://transportgeography.org/contents/chapter7/logistics-freight-distribution/evolution-supply-chain-management/ 14/04/2023 15:05

2.4 The difference between SCM and Logistics

Logistics used to refer to the activities related to the delivery of finished products from the factory or dealer to the customer. However, it has now been integrated into the concept of Supply Chain Management (SCM), which aims to optimize the management of information flows along the supply chain from the supplier's supplier to the customer's customer. SCM is present at all levels of the company, from operational (for the management of physical flows of goods, for example) to tactical (for defining organizations and piloting these flows in the medium term) and strategic level (for defining the major long-term orientations). A synthetic definition of SCM could be to plan the entire activity of the company, from purchasing to production and distribution of products, based on customer demand.

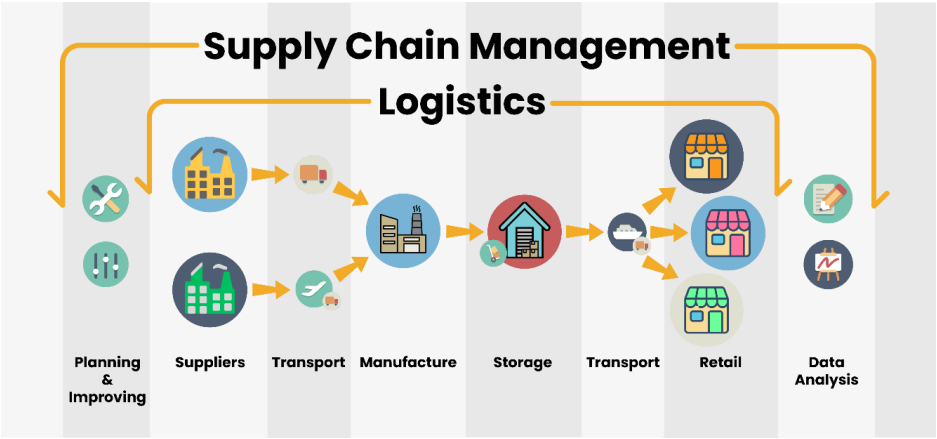
SCM is not a function of the company, nor is it a service that can be purchased from a service provider, nor is it an IT module. It is a working method that aims to ensure the management and synchronization of all processes that allow one or more customer/supplier systems to take into account and respond to the expectations of end customers (from the supplier's supplier to the customer's customer). [39]

Therefore, SCM includes all activities associated with the flow and transformation of goods from raw materials to finished products delivered to the end-user, as well as associated

[39] LOUNIS (Amira) : *L'apport de l'optimisation du processus de la préparation des commandes dans l'amélioration de la performance logistique*, memoire de master 2 (option: SCM), EHEC KOLEA,2022

information flows. SCM is defined as the integration of these activities in order to generate a competitive advantage for the company by putting customer satisfaction at the heart of the system. And we can see the difference between them in the figure 1.13.

Figure 1.13: The difference between Logistics and Supply Chain Management (SCM).



Source: https://www.wtagroup.com/shipping-resources/the-difference-between-logistics-and-supply-chain-management-scm 14/04/2023 15:25

2.5 Logistics/SCM interactions

Logistics and supply chain management are interdependent concepts that play a critical role in ensuring the efficient and effective movement of goods and materials.

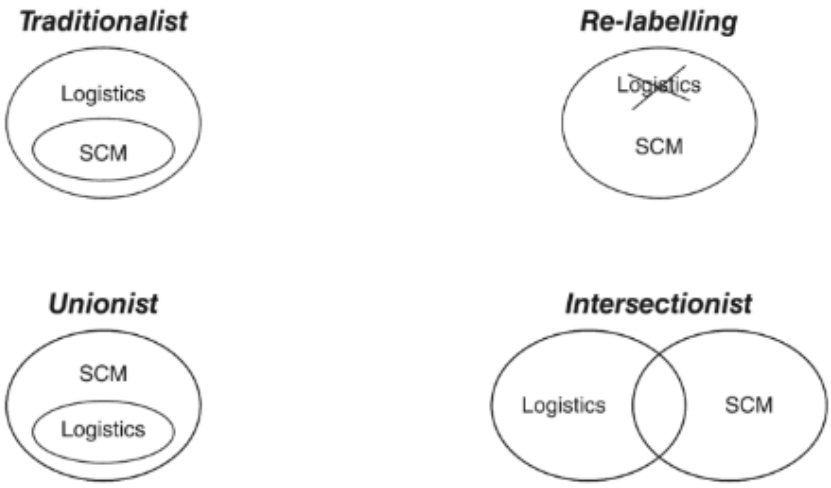
2.5.1 Relationship between Logistics and SCM

There are different perspectives or approaches to the relationship between logistics and SCM. One traditionalist view regards SCM as a subset of logistics, as if it were an add-on to logistics. On the other hand, the re-labelling view contends that logistics has been re-labelled by the more recent term SCM. However, becoming a professional logistics company requires more than just a name change. The unionist view sees logistics as part of a wider entity, SCM. Finally, the intersectionist view suggests that there is overlap between parts of both logistics and SCM, but also that each has parts that are separate and distinct. In summary, while there are varying perspectives on the relationship between logistics and SCM, it is generally accepted that effective SCM requires effective logistics management, as logistics is a critical component of the overall supply chain process, and that a well-designed logistics system can contribute to customer satisfaction and loyalty. [40]

[40]MANGAN (John), LALWANI (Chandra) : *Global Logistics and Supply Chain Management*, 3rd Ed, 2016, P.13

We can see this relationship in figure 1.14.

Figure 1.14: Four perspectives on logistics versus SCM.



Source: According to Larson and Halldorsson (2004)

2.5.2 Advantages and Obstacles of Implementing SCM

The implementation of SCM can bring several advantages, but it also poses some obstacles that need to be overcome.

2.5.2.1 Advantages

- **improved efficiency:** SCM enables organizations to optimize their processes and reduce inefficiencies, leading to faster and more cost-effective production and delivery of goods and services.
- **Increased profitability:** By optimizing processes and reducing costs, SCM can help organizations increase their profitability and competitiveness.
- **Better collaboration:** SCM fosters collaboration between suppliers, manufacturers, distributors, and retailers, leading to better coordination and communication across the supply chain.
- **Enhanced customer satisfaction:** SCM helps organizations improve their responsiveness to customer needs, leading to better customer satisfaction and loyalty.
- **Greater visibility:** SCM provides greater visibility into the supply chain, enabling organizations to identify and mitigate risks, reduce waste, and improve overall performance.

2.5.2.2 Obstacles

- **Complexity:** SCM can be complex, involving multiple stakeholders, processes, and technologies, which can make implementation challenging.

- **Resistance to change**: Implementing SCM often requires changes to existing processes, which can meet with resistance from employees who are comfortable with the status quo.
- **Cost:** Implementing SCM can be expensive, requiring investments in technology, training, and infrastructure.
- **Lack of expertise:** Implementing SCM requires specialized knowledge and skills, which may not be readily available within the organization.
- **Cultural barriers:** SCM often requires cultural changes, such as greater collaboration and communication across different departments and organizations, which may be difficult to achieve.

In conclusion, SCM is a critical component of modern business operations, involving various activities and processes that aim to optimize product and service delivery. The evolution of SCM has been driven by factors such as globalization and technology, leading to the development of new practices and tools. Although logistics and SCM are related, they have distinct focuses. Implementing SCM can bring many benefits, such as increased efficiency and profitability, better collaboration, and enhanced customer satisfaction. However, organizations may face obstacles, such as complexity and resistance to change. To overcome these, organizations need to invest in technology, training, and infrastructure, while fostering a culture of collaboration and communication across the supply chain.

Conclusion

In conclusion, this Chapter has delved into the crucial role of supply chain management and downstream logistics in achieving organizational success. The first section provided a comprehensive exploration of downstream logistics, encompassing its definition, objectives, main processes, circuits, channels, and distribution networks. Additionally, it discussed various types of logistics outsourcing, outlining their advantages and limitations. The second section delved into the definition of the supply chain and supply chain management, highlighting the key distinctions between the two concepts. Furthermore, it shed light on the benefits and challenges associated with implementing a supply chain management approach.

In summary, this chapter has explored the multifaceted aspects of supply chain management and downstream logistics. By emphasizing their importance and providing guidance on implementation, it has aimed to equip organizations with the tools and knowledge necessary to enhance their operations and achieve a competitive edge in the dynamic business environment.

Chapter 02: Theoretical concepts about the logistical warehouse

Introduction

This chapter focuses on two vital aspects of logistics and warehousing: warehouse types and the order picking process. Understanding different warehouse types is essential for optimizing storage and operational efficiency. Similarly, mastering the order picking process plays a critical role in achieving operational excellence and customer satisfaction. Let's explore the key points covered in this chapter:

- Warehouse Types:
  - Importance of understanding warehouse types for efficient operations.
  - Exploration of conventional, automated, and hybrid warehouses.
  - Benefits of selecting the most suitable warehouse type for inventory management and order fulfilment.
- Order Picking Process:
  - Significance of order picking in logistics and warehousing.
  - Systematic retrieval of items to fulfil customer orders accurately and efficiently.
  - Optimization of picking strategies to reduce errors and improve supply chain performance.

Section 1: Overview of the logistics warehouse:

This section offers a concise analysis of warehouse types, emphasizing their distinctive structures and layouts. Understanding the various warehouse types is essential for optimizing storage and operational efficiency in logistics. We explore conventional warehouses, which rely on manual processes and offer flexibility, automated warehouses that leverage advanced technologies for improved efficiency, and hybrid warehouses that strike a balance between cost-effectiveness and automation. By selecting the most suitable warehouse type, businesses can enhance inventory management, streamline order fulfilment, and achieve greater overall supply chain performance.

1. Definitions

In the upcoming section, we will discuss the precise definitions of a warehouse, warehousing, and a logistics platform.

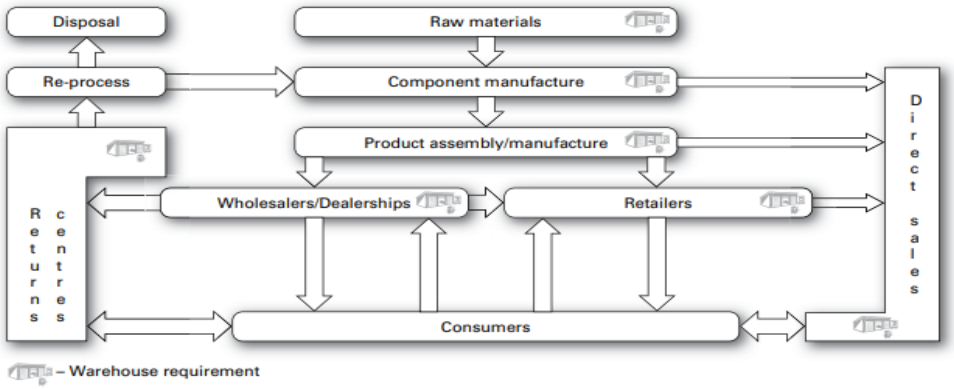
1.1. Definition of the warehouse

A warehouse is an important part of a firm's logistics system that is used to store products (e.g., raw materials, parts/components, goods-in-process, finished goods) at and between the point of origin and the point of consumption. It provides information to management on the status, condition, and disposition of items being stored to create time and place utility for the firm's customers. The traditional functions of a warehouse include (Receiving, Pre-packaging, Put away, Cross-docking, Unitizing) [41]

1.2. Definition of warehousing

The process of storing and handling goods and materials in a facility specifically designed for the purpose of storing them for a period of time, during which they may be processed, distributed, or transported [42]

Figure 2.1: warehousing in supply chain



Source: Warehouse Management_ A Complete Guide to Improving Efficiency and Minimizing Costs in the Modern p7-13

[41] HOKEY (min): *the essentials of supply chain management*,_1st ed, 2015, p.176
[42] Handfield, (R. B), Nichols Jr (E. L.) : *Introduction to supply chain management*, 1999, P.40

1.3. Definition of a logistics platform

Platforms or Cross-Docking (other frequently used names) are places where goods are received and then quickly sent out again. It is rare to have reconditioning operations on these platforms because the objective is to redirect flows according to another destination. The use of platforms is decisive in optimizing the supply chain because it allows for massification of flows regardless of the distance and diversity of suppliers and customers, and thus achieves transportation savings. These logistics tools are especially used in the case of controlling flows on an international scale [43]

2. The role of a warehouse

Warehousing is an important and inseparable part of marketing. Its importance can be viewed on account of the following advantages.

- It serves to safeguard the stocks of the merchant who has only a very limited space at his own place.
- It offers facilities for the unloading of incoming articles in bulk until they are moved to shops in small lots.
- It enables the merchants and producers to provide better services to their customers most economically, with the least expense and more quickly.
- It offers judicial movement of goods which helps stabilize the prices.
- It helps in determining the channel of distribution.
- It helps in maintaining continuous sales and in avoiding 'out of stocks' conditions and hence increases the sales volume.
- It facilitates easy transfer of the ownership of the goods stored in a warehouse.[44]

3. The distinction between warehouse and platform

The distinction between a warehouse and a platform is that a warehouse is primarily used for storing goods for an extended period of time, while a platform (such as a hub or cross-docking facility) is used for the rapid transfer of goods. Warehouses are used to store goods until they are needed, whereas platforms are used to receive goods, sort them, and then quickly distribute them to their final destination. Platforms are designed to handle large volumes of

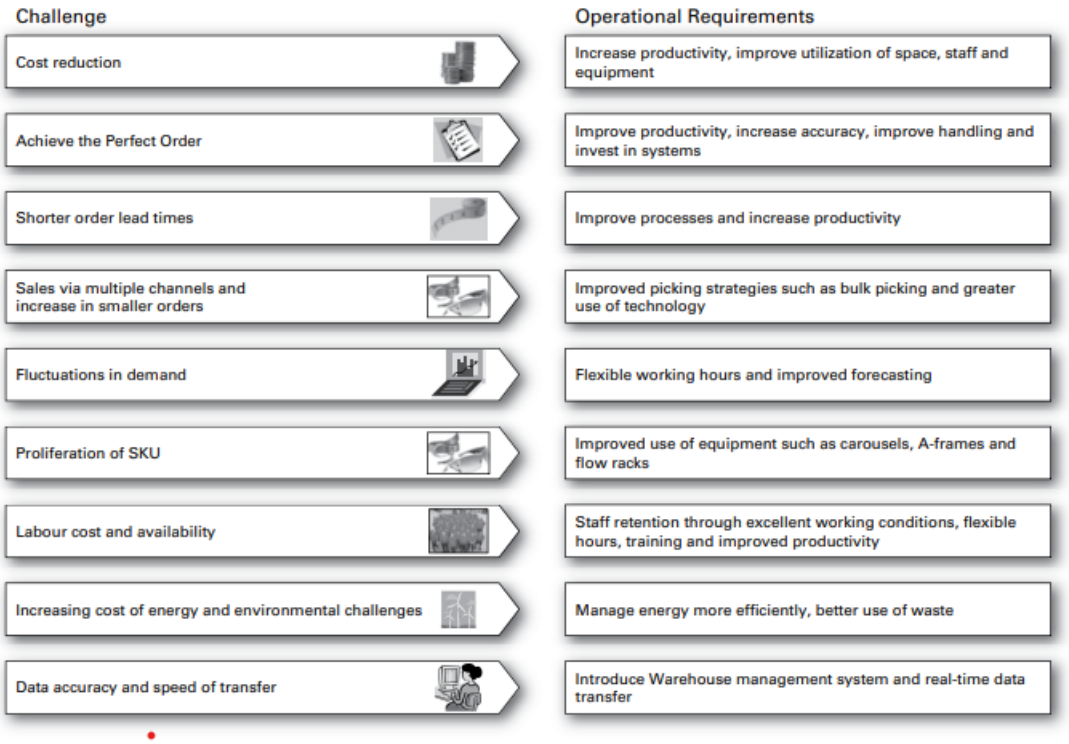
[43] MOCELLIN (Fabrice): *Gestion des stocks et des magasins*, DUNOD, Paris, 2011, p.120-121.
[44] PIMOR (Yves) et FENDER (Michel) ; logistique, production, distribution, 5eme ed, 2008, p.204

goods in a short period of time, while warehouses are designed to manage smaller volumes of goods over a longer period of time. The purpose of a platform is to quickly move goods through the supply chain, while the purpose of a warehouse is to provide long-term storage and inventory management.[45]

4. Warehouse challenges

In the upcoming figure, we will delve into the various challenges encountered in warehouse operations. These challenges encompass a range of factors that can significantly impact the efficiency and effectiveness of warehouse management. We will examine issues such as inventory management, space utilization, labor optimization, order accuracy, technology integration, supply chain visibility, and customer expectations. By understanding and addressing these challenges, organizations can enhance their warehouse operations and drive overall business success. [46]

Figure 2.1: warehouse challenges



Source: adapted from Dematic Corporation 2009

[45] https://www.easyship.com/blog/distribution-center-vs-warehouse (consulted on March 29, 2023 at 10:10 p.m)
[46]RUSHTON (Alan), Croucher (Phil) and BAKER (Peter) : *The Handbook of Logistics and Distribution Management Understanding the Supply Chain*, 1ST ed, 2014, p.43-46

5. Types and categories of warehouses

In the following section, we will explore the various types and categories of warehouses.

5.1. Types of warehouses

Warehouses and platforms can serve different purposes: reducing transportation costs by concentrating and then distributing flows of goods, positioning goods near consumption locations, storing goods for specific periods of time, etc. Some warehouses and platforms are set up to serve specific functions:

- **Raw materials storage**

Raw materials and components are stored in warehouses located either close to the extraction point or close to the manufacturing point to ensure continuous production. Examples of such materials include plastics, precious metals, sand, aggregates, and other essential items.

- **Intermediate, postponement, customization or sub-assembly facilities**

These Warehouses are used to temporarily store products at various stages of production and to customize them before final delivery to the customer. These facilities play a critical role in the supply chain by enabling companies to efficiently manage their inventory and meet customer demand.

- **Finished goods storage**

Warehouses are responsible for storing finished products on behalf of manufacturers, wholesalers, and retailers, serving as a buffer or safety stock for companies. This allows companies to build up inventory in anticipation of new product launches, expected increases in demand, and seasonal fluctuations. By providing a reliable supply of products, warehouses play a vital role in ensuring the smooth operation of the supply chain.

- **Consolidation centres and transit warehouses**

Consolidation centers receive products from different sources and amalgamate them for onward delivery to the customer or onto a production line. This can include just-in-time centers where automotive parts are delivered to a warehouse where they are brought together and sequenced for delivery onto the production line.

They can also be retail stock consolidation warehouses where products from different suppliers are consolidated for onward delivery to the stores. Rather than deliver part-loads to

the Retail Distribution Centers (RDC), manufacturers deliver to these facilities where their stock is consolidated with other suppliers for onward delivery to the RDC. These differ from cross-dock centers in that product can remain in the center for a period of time awaiting call-off from the final destination. Many of these consolidation centers are operated by third parties.

- **Transshipment or break-bulk centers**

Transshipment centers serve as a critical link in the supply chain by receiving products from suppliers in large quantities and breaking them down into smaller, manageable quantities for onward delivery to various locations. These centers play an important role in optimizing transportation costs and reducing lead times by consolidating shipments and providing a central location for distributing products to their final destinations.

- **Cross-dock centers**

Cross-dock centers are increasingly viewed as the future of warehousing due to their ability to move goods quickly through the supply chain, which is critical for efficient consumer response and quick response within the retail industry. In a cross-docking operation, products are delivered to the center already labeled and ready for onward delivery. The items are quickly identified and consolidated with other deliveries, and then prepared for dispatch as soon as possible, ideally on the same day as receipt. While cross-docking is seen as an efficient strategy, there are several barriers to its successful implementation, including warehouse management systems support, quality control systems, supplier and carrier reliability and cooperation, warehouse design, and uncertain demand. Cross-dock warehouses and transshipment centers are also utilized in outlying geographic areas to transfer products onto local distribution vehicles. Perishable items such as fruit, vegetables, meat, and fish are typical products that require quick movement through the supply chain. A recent study by Motorola in 2013 showed that 31 percent of companies practiced cross-docking, and this was expected to increase to 45 percent by 2018.

- **Sortation centers**

Sortation centers are primarily utilized by letter, parcel, and pallet distribution companies. These centers collect goods from all parts of the country, which are then delivered into hubs or sortation centers for sorting by zip or post code. The sorted items are consolidated and then delivered overnight to their respective distribution areas for onward delivery. In recent years, retailers have also increasingly adopted automated sortation centers, where pallets are de-layered upon entry, and mini-load systems are used for temporary storage and retrieval.

Finally, automated pallet building occurs upon exit. These automated systems help retailers to optimize their operations by improving speed and accuracy, reducing labor costs, and increasing efficiency throughout the supply chain.

- **Fulfilment centers**

The rise of e-commerce has led to a corresponding increase in the number of customer fulfilment centers, which are specialized warehouses designed to handle high volumes of small orders. These centers are equipped with advanced technology and optimized workflows to enable efficient and accurate order picking, packing, and shipping. An example of such a center is the fulfilment operation of i-herb.com, an internet retailer that has developed a highly automated and streamlined process for fulfilling customer orders. The use of customer fulfilment centers has become increasingly important as consumers demand faster and more convenient delivery options, making it essential for retailers to have agile and responsive supply chains in place**.**

- **Reverse logistics centers**

Reverse logistics centers are specialized warehouses that handle the process of returning goods from the end consumer back to the manufacturer or supplier. They play a critical role in managing the reverse flow of products through the supply chain, including managing returns, repairs, refurbishments, and recycling of products. Reverse logistics centers are designed to handle the unique challenges associated with reverse logistics, such as managing returned products, assessing their condition, and determining the appropriate next steps. These centers often involve complex processes and technologies to ensure that products are efficiently and effectively handled, with the goal of minimizing waste and maximizing the value of returned products. Effective management of reverse logistics is becoming increasingly important for companies to maintain customer satisfaction and brand reputation, as well as to comply with regulatory requirements for product returns and environmental sustainability.

- **Public sector warehousing**

In addition to commercial warehousing, there are also warehouse operations that support public sector entities, the armed forces, and non-profit organizations. Due to the increasing occurrence of natural disasters, third-sector organizations are opening warehouses in strategic locations to be closer to affected areas and respond more quickly. Public sector warehouses store supplies for local government facilities such as schools and offices, including items like stationery, furniture, and computer hardware. These warehouse operations can be owned,

leased, or operated by third-party companies on behalf of a principal. Third-party logistics providers operate warehouses that are either dedicated to a single customer or shared by multiple customers. Shared-user or public warehouses can accommodate companies with different products but common customers, those with the same or similar products delivering to common customers, those needing similar types of service, and those requiring the same environmental conditions. Shared-user warehouses offer companies the opportunity to benefit from economies of scale by sharing resources and reducing costs. [47]

5.2. Categories of logistics warehouses

The structure and management mode of a warehouse differ depending on the type of activity and especially the type of products that will be stored inside it. We have tried to present below the most representative storage facilities. However, there is a great diversity of them subject to flow constraints and specificities of the stored products, the case of products intended for heavy industry being a good example.

5.2.1. Standard warehouse

A warehouse is first and foremost a geographical location, a nodal point of a logistics system. It is equipped with physical structures. It is from these structures that it will be possible to receive, store, prepare, and deliver goods.

Logistics warehouses are classified into different categories:

Class A:

- A height greater than 9.30 m.
- A maneuvering area with a depth greater than 35 m.
- One dock for every 1000m2 of warehouse.
- A minimum ground resistance of 5 T/m2.
- Heating system.
- A fire suppression system.

Class B:

- A height greater than 7.50 m.

[47]GWYNNE (Richards) : *Warehouse Management A Complete Guide to Improving Efficiency and Minimizing Costs in the Modern warehouse,* 2nd ed, 2014, p.7-13

- A maneuvering area with a depth greater than 32 m.
- One dock for every 1500 m2 of warehouse space.
- A minimum floor resistance of 3 T/m2.
- A fire suppression system.

5.2.2. Sorting platform

This type of warehouse is designed solely for the dispatch of goods arriving from point A in a truck (or any other means of transport) and where a portion of the merchandise is immediately transferred to another truck (or another means of transport) bound for a geographic point B. This is the principle of cross-docking, which can be defined as a logistics operation that does not rely on the warehouse stock. The operation takes place from dock to dock.

Special facilities are required, such as a large number of docks, a large floor space for maximum fluidity, and a high level of integration with information systems between the supplier, logistics provider, carrier, and end customer or distributor.

a) The objectives of cross-docking

Cross-docking has four main objectives:

- Accelerating the flow of goods
- Eliminating stocks between the manufacturer's factory and the retailer's points of sale
- Rationalizing transportation between different sites
- In short, cross-docking adapts industrial just-in-time methods to the supply strategies of large-scale distribution.

b) There are two types of cross-docking flows

➢ **Cross-docking type 1**

Delivery units (usually pallets) are unloaded from incoming vehicles and directly loaded onto outgoing vehicles. These flows are commonly used in the retail sector. Suppliers prepare pallets for each store, deliver them to the cross-docking platform, which then distributes the pallets to the recipient stores.

➢ **Cross-docking type 2**

Products (usually delivered on pallets) are unloaded from vehicles, sorted (for example, by breaking down the pallets), reconditioned, and then loaded onto outgoing vehicles.

5.2.3. Warehouse related to the notion of ventilation

In order to achieve performance, quality of service, and profitability, a warehouse dedicated to ventilation requires great responsiveness and good organization. This involves preparing customer orders using only the goods or products that have just been delivered to the warehouse and therefore have not yet been stocked.

However, it should not be confused with cross-docking, a technique where the goods do not undergo any break in transit. This type of warehouse is generally used for managing fresh products with relatively short expiration dates. [48]

6. Warehouse areas

The warehouse areas will be of different sizes and specific activities of one type or another will be carried out there depending on the needs of the warehouse.

6.1. Loading and unloading area

The reception and dispatch of goods is a crucial area within a warehouse facility. It provides direct access for goods transport vehicles, such as trucks, trailers, and containers. Loading and unloading areas are essential for faster and more efficient handling of unit loads, but they require adequate space to ensure safe and simple operations.

If integrated within the warehouse, this area includes loading and unloading bays that require strict planning control to avoid truck congestion. When located outside the warehouse facility, it must have ample floor space for vehicle maneuvering, parking, and quick movement of goods transport trucks.

6.2. Goods reception area or warehouse entrance area

After the goods have been received and unloaded, the reception area of the warehouse is where a quantitative check (to ensure the correct number of units) and a qualitative check (for quality level, condition of the goods, etc.) is conducted. Once this control has been completed,

[48] CORAZE (Mathieu) : *les bases de la gestion logistique au sein d'un entrepôt*, 2003, p. 5

the goods are sorted and distributed to another area of the warehouse. By separating the reception area from other areas, the control and sorting tasks can be performed more precisely.

6.3. Repackaging area

The repackaging areas within warehouses are typically designated for the purpose of repackaging or palletizing goods. These areas may be required when there is a need to reconfigure the unit loads to fit a different storage system or when hygiene and health reasons dictate a repackaging or re-palletizing process. In some cases, the repackaging area may be integrated into the entrance area of the warehouse for more efficient workflow.

6.4. Warehouse quarantine area

The use of quarantine areas is more prevalent in warehouses operating in the agri-food or pharmaceutical industries, where the products require a thorough and analytical quality control process before they can be stored.

6.5. Storage area

The deposit area is a crucial and intricate part of a warehouse, requiring consideration of the rotation requirements and the nature of the goods. For heavy items like concrete bricks, direct stacking on the floor may be necessary, but it has limitations in terms of strength, height, and ease of stacking. Therefore, an industrial racking system is a viable option that fully optimizes the warehouse space both horizontally and vertically, while also accommodating the characteristics of the stored products. Direct access can be prioritized through adjustable pallet racking, or fewer work aisles can be utilized through compact systems like drive-in racking or mobile pallet racking.

It is important to ensure that the storage area complements the picking or order preparation area, if applicable.

6.6. Picking or order preparation area

The picking or order preparation area is responsible for preparing the product for its transfer to the shipping area. It's important to note that not all warehouses have this option, as it's only necessary if the configuration of the goods being shipped is different from when they were received.

The picking area may either be a separate area within the warehouse or integrated into the storage area. There are various solutions available for picking, including carton flow racking systems and long span shelving.

6.7. Area for dispatch and outflow control

The dispatch area of the warehouse is responsible for the packaging of goods that have been picked and prepared for shipment. In this space, the goods are also verified and inspected to ensure that they match the order specifications and customer requirements. Furthermore, the dispatch area serves as a holding area for the accumulated goods that will be loaded onto vehicles and transported out of the warehouse.

6.8. Warehouse technical area

The technical and mechanical equipment used in warehouse operations, such as forklifts and pallet trucks, are maintained in this area. It is advisable to keep the technical area slightly separate from other areas of the warehouse for safety reasons.

6.9. Warehouse administrative area

This area of the warehouse serves as the organizational management hub, housing the offices of warehouse managers, administrative personnel, customer service representatives, and carriers. Additionally, this area includes the service spaces for the warehouse team, such as changing rooms, a canteen, and meeting rooms. [49]

7. Storage and handling methods

In the upcoming section, we will explore the different techniques employed for storage and handling within a warehouse.

7.1. Storage methods:

Storage methods refer to the techniques and practices used to store goods, materials, or inventory within a warehouse or distribution center.

- **Pallet Racking**

[49] https://www.ar-racking.com/en/blog/main-areas-of-a-warehouse/ (consulted on April 09, 2023 at 05:20 p.m)

Pallet racking systems are widely used for efficient storage of palletized goods. They consist of upright frames and horizontal beams that support multiple levels of pallets. This method allows for easy access to individual pallets and efficient use of vertical space.

- **Shelving**

Shelving systems are used for storing smaller items that don't require pallets. They can be adjustable, allowing for customization based on the size and shape of the items being stored. Shelving is often used for storing small parts, boxes, or items that need to be easily accessible.

- **Mezzanine Floors**

Mezzanine floors involve the construction of an intermediate level within a warehouse. They provide additional storage space without expanding the footprint of the facility. Mezzanines are commonly used for bulk storage or as additional picking areas.

- **Bin Storage**

Bin storage utilizes bins, totes, or containers of various sizes to store smaller items. These bins can be stacked or placed on shelves, making it easier to organize and access individual items. Bin storage is commonly used in order picking or for storing components or spare parts.

- **Bulk Storage**

Bulk storage methods involve storing large quantities of loose or unpackaged items. This can include bulk bins, silos, or storage tanks for liquids, powders, or granular materials. Bulk storage is commonly used for commodities like grains, liquids, chemicals, or construction materials.

- **Cold Storage**

Cold storage refers to specialized storage facilities equipped with refrigeration or freezing systems. These facilities are used to store perishable goods such as food, pharmaceuticals, or chemicals that require temperature-controlled environments.

7.2. Storage handling equipment

Different storage equipment can be used to store goods in a warehouse or logistics platform.

Several types of RACK can be distinguished:

- **Conventional or single-depth rack**

A conventional or single-depth rack is composed of a single row of storage in depth so that the stored loads are immediately accessible. The location of a pallet in a rack is called a cell.

- **Double-depth rack**

A double-depth rack consists of two rows of storage in depth, and the movement of the load located at the front of the aisle is necessary to reach the one located in the second row.

- **Dynamic accumulation rack**

A dynamic accumulation rack consists of several rows of storage in depth (usually two to five rows). The different aisles are slightly inclined and equipped with gravity rails or rollers that allow the movement of loads between the different rows. Storage can be done from one aisle or two circulation aisles. In the case of two aisles, one can be reserved for storage and the other for destocking. Accumulation storage is suitable for products stored in large quantities.

- **Silo**

A silo is a closed container, usually made of metal or concrete, used to store bulk products such as liquids or powders (cement, flour).[50]

7.2.2 Handling Equipment

Thanks to technological advancements, companies can invest in increasingly efficient handling equipment. The use of new tools or handling equipment can significantly improve the speed of operations and thus increase the competitiveness of organizations.

- **Simple manual handling equipment**

A simple manual cart, tray trolley, or rolling platform may be sufficient for relatively light loads.

- **Pallet truck**

One of the most common and well-known handling equipment in logistics, it allows for the movement of a pallet over a short distance (accompanied pallet truck) or medium distance (rider pallet truck).

- **Stacker**

[50] LE MOIGNE (Rémy) : *Supply Chain Management : achat, production, logistique, transport, vente*, 2 éme édition , DUNOD , MALAKOFF, 2017, p. 274- 275

Used to place pallets on shelves (or remove them from shelves). It can reach a maximum storage height of six meters. Like the pallet truck, it can be an accompanied, rider, or folding platform type.

- **Reach truck**

Capable of lifting pallets to a height of more than 10 meters and can move in narrow aisles.

- **Order picker**

Allows for the operation of order picking. The operator moves the order picker from location to location to pick products from racks, whether on the ground or at height. The operator can be accompanied or carried, and the equipment is designed to minimize the risk of MSDs (musculoskeletal disorders).

- **The AGV (Automatic Guided Vehicle)**

A type of automated cart that performs handling tasks independently, thanks to guiding stations that allow it to move, adjust its trajectory, and even change its behaviour if necessary.

Initially used primarily in large industrial sites where the return on investment is faster, AGVs are increasingly being deployed in logistics facilities.[51]

8. The key processes of a warehouse

A storage facility performs various essential activities to ensure its smooth operation. In this section, we will outline the primary operations carried out within the warehouse.

8.1. Receiving

This stage involves physically unloading incoming shipments and comparing them to purchase orders. The received goods are recorded in the computer system, and additional activities like unpacking and repackaging may be performed to prepare them for warehouse operations. Quality control checks may also be conducted at this stage. The goods are then stored in the warehouse.

[51] BARBARA (Lyonnet) et SENKEL (Marie Pascale) et CLAMENS (Sylvie) : *Supply Chain Management*, DUNOD, Malakoff, 2019, p.45

8.2. Reserve storage

Goods are typically taken to the reserve storage area, which often occupies the largest space in warehouses. This area holds the majority of the warehouse inventory in identifiable locations. When needed, goods are retrieved from reserve storage either directly for marshalling (e.g., if a customer requires a full pallet) or to replenish a picking location.

8.3. Order picking

When an order is received from a customer, the warehouse staff retrieves the required goods from the warehouse in the correct quantity and within the specified timeframe to meet service level agreements. An order may consist of multiple order lines, each requesting a specific quantity of a particular product. If the order line is for a full unit load, it can be directly retrieved from the reserve storage area. However, if the order line is for less than a unit load, the goods are typically retrieved from the picking location. In warehouses with low stock quantities, the reserve and picking stock may be combined, and goods are picked from this consolidated area. Order picking is a critical warehouse operation in terms of cost and service, as it requires a significant portion of warehouse staff and greatly impacts order accuracy.

8.4. Sortation

In some cases, it is efficient to batch multiple orders together and treat them as a single order for picking purposes, especially for smaller order sizes. In such situations, the picked batch needs to be sorted to separate individual orders before dispatch.

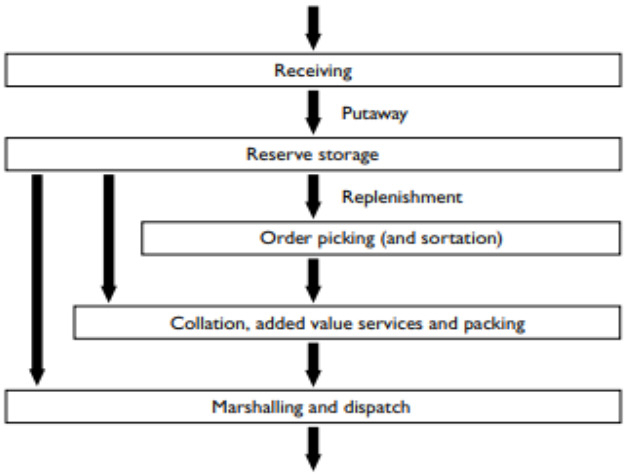
8.5. Collation, added value services, and packing

Goods need to be collated and assembled into complete customer orders before dispatch. If the goods are not directly picked into the dispatch containers (such as roll cages or cartons), they are assembled or packed together after picking. For instance, goods may be sent to a packing station where they are packed into cartons. These cartons may then be stretch- or shrink-wrapped onto wooden pallets in preparation for transportation. This stage may also involve additional activities such as final production postponement, kitting, and labeling, which add value to the products.

8.6. Marshalling and dispatch

Goods are marshalled together in the dispatch area to form vehicle loads. They are then loaded onto outbound vehicles for onward dispatch to the next point in the supply chain, such as a trans-shipment depot or a freight forwarder's depot for groupage/consolidation.[52]

Figure 2.3: warehouse main process



Source: The Handbook of Logistics and Distribution Management Understanding the Supply Chain Alan Rushton Phil Croucher Peter Baker-Edisi-1-2014 p260

In conclusion, understanding the different types of warehouses, including Raw materials storage and Reverse logistics centres, is essential for optimizing storage and operational efficiency in logistics. Each warehouse type offers unique characteristics and benefits. By selecting the appropriate warehouse type, businesses can enhance space utilization, improve inventory management, and streamline order fulfilment processes. This knowledge enables companies to achieve greater operational efficiency and gain a competitive edge in the logistics industry.

Section 02: Concepts related to the order picking process

The order picking process is a critical operation within the realm of logistics and warehousing. It involves the systematic retrieval of items from their storage locations to fulfil customer orders accurately and efficiently. This section provides a concise introduction to the key concepts related to the order picking process, highlighting its significance in achieving operational excellence and customer satisfaction. By understanding the intricacies of order

[52]RUSHTON (Alan), Croucher (Phil) and BAKER (Peter) : *The Handbook of Logistics and Distribution Management Understanding the Supply Chain*, 1ST ed, 2014, op.cit, p.260

picking, businesses can optimize their picking strategies, reduce errors, and enhance overall supply chain performance

1. Order picking in a logistics platform

Many aspects related to these platforms should be standardized to optimize the entire logistics chain, especially the order preparation process, as the perceived performance of a logistics platform is generally reflected in the order preparation performance.

It is important to standardize different aspects of these platforms to ensure optimal logistics performance, with a particular emphasis on order preparation as it is often seen as the key performance indicator for a logistics platform.

1.1. The importance of order picking in logistics

The preparation of orders is recognized as the costliest activity in terms of capital intensity and labour in a warehouse. It is a true value-added operation, consisting of collecting the items stored in the warehouse and grouping them before shipping them to customers. Successfully streamlining and optimizing this task allows for increased productivity and improved service quality, ultimately enhancing the company's brand image (by picking the right references in the correct quantities, sending orders within negotiated deadlines, etc.).

1.2. What is an order picking

The picking process involves preparing the products requested by customers to be shipped as orders, which can be delivered to the end customer, sent to the production plant, or to other warehouses or stores. The goal is to deliver:

- The correct product references
- The correct quantities
- In good condition
- On time

To achieve this, it is important to consider factors such as seasonal demands, storage capacity, accessibility, drainage, security, water, and services such as electricity and telephone.

Successfully rationalizing and optimizing this task leads to increased productivity, improved service quality, and ultimately, a better brand image for the company. This includes selecting

the correct products in the correct quantities and shipping orders in accordance with negotiated delivery times with customers.

The necessary information for order pickers includes:

- Picking addresses for the items to be prepared
- Quantities to be picked
- Zones where the items should be grouped
- Order picking instructions

1.2.1. The role of the order picker

- Under the supervision of a team leader, the order picker in a warehouse gathers the necessary information for preparation and collects the products by picking them from various storage locations, usually with the help of a self-propelled driver's cart.
- To carry out these activities, the order picker selects the equipment and supplies necessary for shipping (pallets, hand trucks, pictograms, packaging, etc.) from the documents provided to them. They pick the items by checking their compatibility, packaging, and quantities, package them by balancing the weight, carry out any necessary additional packaging, and make the order available after checking and/or weighing it. They affix labels on the packages or pallets.
- They record each operation in a computerized management system. The order picker plays an important role in ensuring traceability of goods as they are the last link before the goods are shipped to the customer.
- They must adhere to hygiene and safety rules, quality procedures, and meet deadlines.

1.2.2. Methods of assigning order pickers

The following table provides an overview of the different methods of assigning workers, along with their respective advantages and disadvantages.[53]

[53] La préparation de commandes / le picking (faq-logistique.com) (consulted on April 15, 2023 at 11:20 p.m)

Table 2.1: The different methods of assigning workers

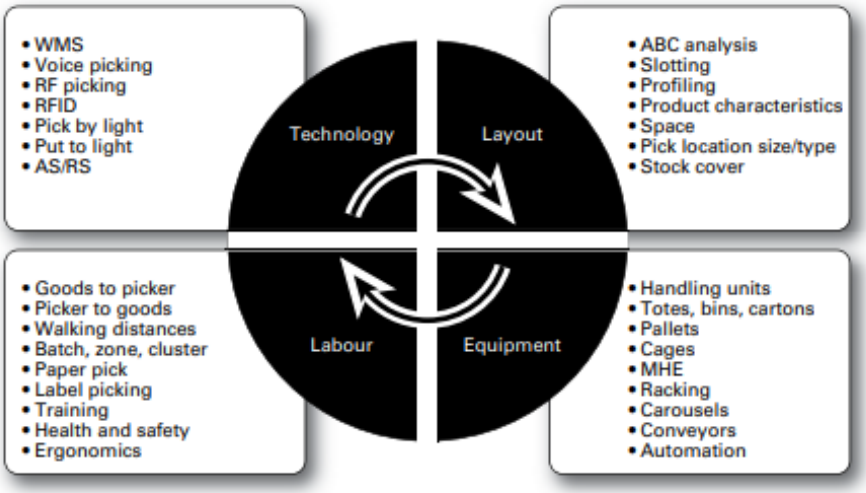
	Un préparateur	Plusieurs préparateurs
Une commande	The order picker takes the responsibility Fewer movements Better reliability Simplicity Simplicité	Moins de déplacements Risque d'erreurs dues à l'habitude des préparateurs de travailler dans leurs zones Moindre possibilité de suivre l'activité des préparateurs
	Moindre optimisation des trajets	
	Fatigue et risque d'erreurs	
Plusieurs commandes	Optimisation des trajets	Optimisation des trajets Moindre de déplacement
		Risque d'erreurs dues à l'habitude des préparateurs de travailler dans leur zone

Source : La préparation de commandes / le picking (faq-logistique.com)

2. Order picking process

Picking is a method used to prepare orders, where the process involves carefully selecting the products requested by a customer from their designated storage areas and consolidating them before packaging.

Figure 2.4: Picking interrelationships.



Source: [La préparation de commandes / le picking (faq-logistique.com)]

2.1. Selection's strategies

There are three categories of selection strategies: picker to goods, goods to picker, and automated picking. In the picker to goods strategy, the preparer physically moves to the items for selection. In the goods to picker strategy, the items are brought to the preparer for selection. Finally, in automated picking, the selection process is carried out automatically without the direct involvement of a human preparer.[54]

2.1.1. Picker to goods

In this process, the picker is responsible for taking one order or a portion of an order and navigating through the warehouse to collect the required items. They can travel on foot with a cage or trolley, or use a pallet jack or fork lift truck if dealing with larger items on pallets. The picker follows a designated route or pick path, which can be indicated through a paper pick list, instructions on a radio data terminal, or voice commands.

The orders can consist of individual items, full cartons, full pallets, or a combination of these. Depending on the size of the items, piece pick items are typically stored on shelves, carousels, or flow racks. Full cartons may be stored on pallets in pick locations, shelving, or flow racking.

[54] GWYNNE (Richards) : *Warehouse Management A Complete Guide to Improving Efficiency and Minimizing Costs in the Modern warehouse,* 2nd ed, 2014, op.cit, p.97-102

One advantage of picking individual orders is the minimal handling involved, as the products move directly from storage to dispatch in a single movement. This remains the most commonly used method of picking. However, orders with multiple SKUs and long distances between picks can be labour-intensive. In some cases, a second person may be required to check the order before it is dispatched, which is discussed further in the chapter on dispatching.

- **Cluster picking (sort whilst picking)**

To minimize travel time, operators have the option to bring multiple orders into the warehouse simultaneously and pick items into separate compartments on their trolleys or cages. In certain operations, powered pallet trucks capable of carrying two pallets at a time may be used, or tugs and tractors can be employed to move multiple pallets through the picking aisles. This approach helps streamline the picking process and increase efficiency by reducing the number of trips required to retrieve items from different locations in the warehouse.

- **Batch picking**

Batch picking involves operators picking products for multiple orders simultaneously. Instead of individual clusters of orders, these orders are consolidated into a single pick list. Once picked, the items are later separated and allocated to their respective orders. In some cases, pickers may be directed to the reserve storage area to retrieve full pallets or layers of pallets to fulfill the order quantities.

There are two alternatives in picking strategies: pick by line and pick to zero. Pick by line may result in surplus items being returned to stock when full pallets or cartons have been picked. For example, if a batch of 10 orders requires a total of 100 units, and a full pallet holds 120 units, the additional 20 units are returned to the reserve storage area or transferred to the forward pick area. On the other hand, pick to zero ensures the correct number of items (100 units in this case) are picked and allocated to customer orders until the lines and units are exhausted. This is also known as bulk picking.

Batch picking offers advantages such as reduced travel time and potentially increased accuracy due to the involvement of two people in the pick and allocation process. However, it is a two-stage process and may not be suitable for managing time-sensitive orders.

Implementing batch picking can significantly increase the number of lines picked per hour, although consideration must also be given to the collation of the items.

This system can be employed in cross-dock operations, where products are picked and allocated upon arrival at the warehouse. This eliminates the put-away and replenishment aspects of the operation, leading to improved throughput and accuracy.

Orders can be batched in various ways. For example, mail order or e-commerce operations may batch by single order lines or single items. This approach is often seen in televised home shopping, such as the QVC channel, where different products are promoted at specific times, resulting in a large number of orders for a single product. These orders can be consolidated into one pick list, and large quantities of the product can be picked in one go. Shipping labels are then attached to each item for dispatch.

Similarly, orders containing similar items can be batched together, and orders can also be split based on the location of the products in the warehouse.

Batching orders can be done manually, but most modern Warehouse Management Systems (WMSs) have the capability to facilitate this process.

Technologies like put-to-light systems can be utilized to ensure accuracy. As the bulk-picked products are brought to the sorting or consolidation area, each product line is scanned, and lights indicate the quantity of each product to be placed into a tote or container for shipment. This approach is particularly effective for delivering to multiple retail stores, where each store has its designated cage, tote, or dispatch area.

- **Wave picking**

In wave picking, orders are combined and released at specific times during the day, often aligned with vehicle departures, replenishment cycles, shift changes, product locations, service requirements, and priorities. This approach allows for workload balancing by grouping and releasing orders either by time or by specific areas.

Orders can be released at different times to different zones based on the time required to pick those orders. However, a drawback of wave picking is the need for an additional step in the process to bring the partial orders back together. Nonetheless, as mentioned earlier in the context of batch and zone picking, this method enables a second check on product codes and quantities, enhancing accuracy and quality control.

- **Zone picking**

The articles are picked from the same storage zone to save time. This method is almost similar to batch picking, but it involves sorting the order items by their storage location in the pick lists.

The execution of order picking can vary based on the storage policy. There are several allocation policies for storage space:

Dedicated (Fixed) Storage: Each item to be stored is assigned one or more fixed locations. This approach is often recommended when product turnover is low and when advanced technology for inventory tracking and management is not available. The main drawback of this approach is that it theoretically requires a large amount of space to accommodate the maximum required inventory.

Random Storage: Products are positioned randomly based on the availability of storage locations. This allows for better utilization of the available space. However, it requires an intelligent computer system to track the products during picking. Additionally, the picking process may involve longer distances travelled.

Random Storage by Zones or Classes: This policy involves defining multiple classes of items based on their sales volume (ABC Classification) and assigning any available position within the class to each item entering the storage zone. This policy serves as an intermediate approach between random storage and dedicated storage. It is determined by the characteristics of the stored products.

2.1.2. Goods to picker

Using a goods-to-person system can provide significant advantages. While there are various configurations for such systems, most designs offer the following benefits, as stated by Dematic (2009):

- Eliminate picker travel time, use less labor.
- Omit the dedicated pick face.
- Reduce system footprint.
- Product security.
- Ergonomic workstations.
- Speed in order selection
- Accuracy.
- Decoupled workstations.

- High-utilization workstations
- Sequencing.
- Order profile.
- Efficiently accommodates SKU growth. [55]

2.1.3. Automated picking

Warehouses can have varying degrees of automation, both in terms of the technology employed (types of machines used) and the extent to which automation is implemented within the warehouse (the number of items stored in the machines and the number of movements generated by these machines). While manual warehouses, often referred to as "traditional" warehouses, are still prevalent in the industrial environment, automation has been gaining momentum in recent decades with the emergence of machines dedicated to storing items and facilitating order picking for customers. This section focuses on the literature related to the main automated order picking systems. We will review and discuss the literature on these different systems, and then focus on the systems that are of interest to us, namely Carousels and Vertical Lift Modules (VLMs). For a comprehensive study of the literature on Automated Storage and Retrieval Systems (AS/RS), [56]

The benefits of automation include the following[57]

- Increased utilization of space and reduced space requirements.
- High bay, narrow aisle systems that can reach heights of up to 30 meters.
- Random storage capability.
- Higher density storage for refrigerated products, resulting in cost reduction due to lower energy requirements.
- Improved control over inventory.
- Pallet tracking facilitated by advanced Warehouse Management Systems (WMS).
- Savings in labor and energy.
- No need for heat and light unless necessary for product integrity.
- Minimal supervision required.
- Continuous operation, 24 hours a day, 7 days a week.

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[55]GWYNNE (Richards) : *Warehouse Management A Complete Guide to Improving Efficiency and Minimizing Costs in the Modern warehouse,* 2nd ed, 2014, op.cit, p.103-104

[56] LEFER,(Jean-Baptiste) : *Optimisation de la politique de stockage dans la zone de Picking de La Redoute* , Mémoire de projet recherche, 2008, Centrale Paris.

[57]GWYNNE (Richards) : *Warehouse Management A Complete Guide to Improving Efficiency and Minimizing Costs in the Modern warehouse,* 2nd ed, 2014, op.cit, p.105

- Enhanced product security.
- Utilization of high bay areas and adherence to first in, first out principles.
- Reduced human intervention.
- Improved safety and elimination of manual handling.
- Decreased risk of accidents.
- Ability to handle hazardous or harsh environments, such as refrigerated storage.
- Integration of systems for coordinated product flows, preventing bottlenecks.
- Consistent performance levels.
- Ongoing review and optimization of operations.

2.1.3.1 Automated Storage and Retrieval Systems (AS/RS)

Have been extensively studied since their introduction in the 1960s and have evolved significantly. Throughout this manuscript, we will continue to use the term AS/RS, which is commonly used in the literature. Implementing AS/RS systems offers benefits such as reduced labor costs, increased floor space utilization, and decreased picking error rates compared to traditional systems. Basic AS/RS versions typically consist of two rows of racks where items are stored, and each item is directly accessible by the AS/RS. AS/RS systems come in various forms and types, depending on the platform's requirements and sizing. The following sections focus on the literature regarding order picking using automated machines derived from AS/RS. We will specifically examine two subclasses of AS/RS: Autonomous Vehicle Storage and Retrieval System (AVS/RS) and Shuttle Based Storage and Retrieval System (SBS/RS).

2.1.3.2. Automated Vehicle System and Retrieval System (AVS/RS)

New concepts of AS/RS have emerged to meet specific customer requirements, such as increased throughput or time constraints. The Autonomous Vehicle Storage and Retrieval Systems (AVS/RS) consist of autonomous vehicles that facilitate horizontal movement within aisles on each level, while a lift platform enables vertical movement at each end of the aisles. Multiple aisles can be present to minimize waiting time for the operator. The vehicle travels between storage locations to retrieve the container, and the lift platform positions itself at the appropriate height to retrieve the container and bring it to the level of the operator. Malmborg (2002) has developed analytical models for evaluating cycle times and vehicle utilization for storing or collecting a list of references. Kuo et al. (2007) proposes a model to estimate resource utilization and implementation costs of AVS/RS. They evaluate 12 scenarios based on the

number of vehicles, platforms, aisles, and the probability distribution for the average cycle time of vehicles. Kuo et al. further extends this model by considering various class-based storage policies. Marchet et al. (2012) focus on cycle times and waiting times. They use open queueing networks for modeling and simulation to validate their approach. They simulate 15 scenarios with different AVS/RS characteristics. The optimal AVS/RS configurations tend to have shorter aisles to optimize vehicle movement, lower racks for cost-effective vertical movement, and minimize empty travel.

2.1.3.3. Shuttle-Based Storage and Retrieval System (SBS/RS)

SBS/RS is a relatively new concept primarily used for bin storage. This type of AS/RS is similar to AVS/RS, with the main difference lying in the equipment used for horizontal movement. In SBS/RS, it is mobile shuttles that perform the movement, whereas AVS/RS utilizes autonomous vehicles. Lift platforms are also employed, similar to AVS/RS. The concept of Cycle Completing Double Command (CCD) means that the machine can perform both storage and retrieval in a single cycle, distinguishing it from Single Command Cycle (SCC), where only storage or retrieval can be done per cycle. A cycle involves the machine starting from the initial point and performing one action in the case of SCC or two actions in the case of CCD before returning to the starting point (typically where the order picker is stationed). Carlos and Vis (2012) focus on scheduling aspects and evaluate throughput (i.e., the number of orders collected or the number of storages performed per unit of time) using a specific type of SBS/RS with two platforms. Lehrer et al. (2015) and Lehrer (2016) define analytical models to calculate cycle times, which are divided among the various waiting times for each component, as well as the collection and storage times. The average time for both SCC and CCD operation modes is determined based on machine characteristics (number of aisles, length of storage spaces, and number of shuttles).

There are various picking strategies that can be employed in warehouse operations, depending on product nature, throughput speed, and the company's budget. The picker-to-goods method remains the most commonly used approach in warehouse operations. However, the goods-to-picker method is gaining traction as automation becomes more sophisticated and affordable. It is likely that multiple strategies will be utilized in today's warehouses to better adapt to the requirements of multi-channel distribution.

2.2. Order picking methods

There are a numerous modes of order picking. As mentioned above, a relevant choice is based on the analysis of flow, volume, and nature.[58] And the following table can illustrate them:

Table 2.2: Order picking methods

Methods	Preferred destination	Features
Pick to light: In this setup, the boxes or bins from the detailed picking area are placed in dynamic compartments. Each compartment has a micro-terminal that instructs the picker on the specific item to pick and the quantity required.	• Numerous detailed picks • Less commonly used for picking complete boxes • Organization that can be reserved for high-rotation items (Class A, possibly Classes A and B)	• Significant investment justified by substantial flows • Excellent productivity • Very low error rate • Micro-terminals can fulfill other ancillary functions such as inventory control assistance, lot number input, etc.
Pick and pack: In this organization, customer cartons are predetermined and labeled prior to the start of picking. As the items are picked, they are placed in the respective customer carton.	• Many individual items pick.	• Requires a pre-packaging computer function • Avoids a second handling of items at the end of the preparation chain

[58]ROUX (Michel), LIU (Tong) : optimisez votre plateforme logistique, 4eme ed, Paris, 2010,p.302-303

Pick then pack: This organization is in contrast to the previous one. The picked items are placed in (or on) an intermediate fixture and then transported to the end of the line where they are packaged.	• Relatively low number of detailed picks • No computerization on-site • Items requiring special packaging (strapping, wrapping, bundling, etc.)	• Does not require pre-packaging computerization • Requires a second handling of the items at the end of the preparation chain to place them in the final packaging
Pick to belt: In the pick to belt system, the focus is on picking complete cartons from floor pallets and transferring them onto a conveyor that transports them to the end of the line or the detail preparation area. If needed, the operator can affix the shipping label to the carton before placing it on the conveyor. However, if the labels are not applied beforehand, the packages will require sorting at the end of the line, which is similar to the Pick to sort method.	•A large number of complete cartons are picked. •The cartons are identified using barcodes, which can be either product codes or customer codes.	• Requires a relatively significant investment that needs to be justified by the volume of operations • Offers excellent productivity levels

Pick by line: The pick by line method involves breaking down wave orders into individual lines and then performing the picking for all lines with the same reference simultaneously. This approach requires the implementation of Put to light or pick and sort systems at the end of the process.	• Large preparation zones • Significant wave sizes	• Minimizes the number of movements for pickers (estimated reduction of 20 to 40% in movements) • Requires sorting at the end of the process for individual items and potentially for PCBs
Put to light: This method provides assistance for manual sorting in a pick then pack system. After the items are picked, they are delivered in bulk at the end of the process (following a pick by line, for example). The barcode scanning enables an automated system to determine the corresponding order and indicate to the picker which box or compartment the items should be placed in.	• The number of detailed item picks is relatively low. • The items are labeled with barcodes.	• It requires computerization of the preparation process. • The system itself is not expensive, except for the computerization aspect.

Pick and sort: This organization follows a Pick by line system. It involves sorting the picked items that arrive in bulk at the end of the process and assigning them to their respective orders.	• Many full boxes pick • Full cartons with barcodes (product code or customer code)	• Requires preparation computerization • Requires an outbound sorter

Source: optimisez-votre-plateforme-logistique Michel ROUX Tong LIU p302/303 4eme edition

2.3. Factors for optimizing order picking

To achieve efficiency and effectiveness in the order picking process (in terms of costs, lead time, and quality), the following approaches can be applied. [59]

2.3.1. Reducing travel distance

By adopting an ABC classification and storage arrangement for references (placing the most frequently ordered references in easily accessible locations), and by following preparation routes that minimize the need for the picker to visit the same area multiple times (optimized picking order), the length of travel can be reduced. This approach aims to streamline the picking process and improve overall efficiency.

2.3.2. Limiting order breaks

The objective is to minimize disruptions in the order fulfillment process. This can be achieved by maintaining accurate records of inventory movements, implementing a reliable warehouse management system, and ensuring efficient replenishment of picking areas.

- By accurately recording goods movements in real-time (requiring discipline from pickers and forklift operators).

[59] https://www.faq-logistique.com/Preparation_commandes.htm (consulted on April 25, 2023 at 4:25 p.m)

- By using a real-time warehouse management system.
- By efficiently replenishing the picking areas.

2.3.3. Limiting the risk of damage

The goal is to minimize the risk of damage during the order fulfilment process. This can be achieved by designing order preparation area that separate incompatible products and by following a specific order of picking that considers the weight and density of the items.

- By implementing order preparation area that respect the nature of the products (avoiding simultaneous handling of toxic items with food items, for example).
- By picking items in an order that respects their weight and density (during preparation, placing denser items below fragile items).

2.3.4. Optimizing the accessibility of items

- Avoid placing heavy items at high heights.
- Avoid storing items too deep within the shelves.
- Implement order preparation aisles that allow preparers to cross paths and overtake each other.
- Avoid launching too many order preparations simultaneously in the same area to prevent congestion in front of high-demand picking locations.

In conclusion, the order picking process is a crucial aspect of logistics operations. It involves retrieving items from storage to fulfil customer orders accurately and efficiently. By understanding the significance of order picking and implementing effective strategies, businesses can optimize their operations, reduce errors, and enhance customer satisfaction. Mastering the order picking process is essential for achieving competitive advantage and operational excellence in the dynamic world of logistics.

Conclusion

In conclusion, understanding different warehouse types and the order picking process is essential for optimizing storage, operational efficiency, and customer satisfaction in logistics. By selecting the appropriate warehouse type, businesses can enhance space utilization, improve inventory management, and streamline order fulfilment. Similarly, mastering the order picking process allows for efficient retrieval of items and reduced errors. By focusing on these aspects, businesses can achieve operational excellence and gain a competitive edge in the logistics industry

Chapter 03: Analysis of results research

Introduction

This chapter presents an analysis of the host organization's product reception and order preparation processes, along with proposed solutions for optimization. The first section provides an overview of the organization where the practical internship takes place. The second section examines the activities involved in product reception and order preparation. Finally, the third section proposes solutions to enhance the efficiency of these processes.

Section 1: Presentation of the host organization

This section presents a detailed analysis of the host organization’s activities as well as the creation and missions. By exploring the various activities undertaken by the organization, we aim to gain a comprehensive understanding of its operations and the scope of its involvement in the industry. In addition, we examine the organization’s founding principles, mission statement and overall objectives, highlighting its unique contributions and importance in the marketplace. With this analysis, we can lay the foundation for a deeper exploration of the role of the organization in the logistics provider market.

1. Company Presentation

Before presenting NUMILOG, we consider it important to discuss its origin, the CEVITAL Group.

1.1. The CEVITAL Group

The aim of this section is to provide a description of CEVITAL Group's logistics requirements.

1.1.1 General Presentation

CEVITAL is a family-owned company founded in 1998 with private funding. The company is legally organized as a joint-stock company (SPA) and has a rich history, values, and accomplishments that have contributed to its success and reputation. Today, CEVITAL is the leading agro-food group in Algeria and the third-largest in Africa. It has gone through significant milestones to become the diversified conglomerate it is today, with 26 subsidiaries operating in various sectors, such as agro-industry, retail, automotive, logistics, and manufacturing.

CEVITAL Agro-industry is the current leader in sugar and vegetable oil production in Africa and the Mediterranean region. Its high-quality products are exported to numerous countries, including Europe, North Africa, West Africa, and the Middle East. CEVITAL is a major player in the sugar market, as its exports account for one-third of the total sugar exported by the European Union. Since 2010, CEVITAL has exported over 3 million tons of sugar to more than 40 countries, representing over 10% of the EU's total sugar production.

CEVITAL's clients include multinational companies such as Coca-Cola, Kraft Food, Danone, Ferrero, Barry Callebaut, Andros, Refresco, Nutriset, and many others. With a turnover of $3.5 billion, CEVITAL aims to reach $25 billion by 2025.[60]

1.1.2 The main activities of CEVITAL[61]

The CEVITAL complex started its operations in May 1998, with oil packaging being its first activity in December of that year. Civil engineering works on the refinery commenced in February 1999, and it became operational by the end of the same year. The core activities of CEVITAL are centered around the production and commercialization of vegetable oils, margarine, and sugar. The company's activities can be summarized as follows:

- Oil refining
- Oil packaging
- Margarine production
- Manufacturing of PET (Poly-Ethylene-Terephthalate) packaging
- Sugar refining
- Cereal storage
- Cogeneration
- Flour milling and soap production under study.

1.1.3 Missions and Objectives

[60] The Cevital Group (cevital-agro-industrie.com) 14/05/2023 13:22
[61] GUENDOUL (Samah) et LARBI (Samira); le rôle de la logistique dans les opérations d'exportations, cas cevital Master's thesis international trade and logistics option, University of Bejaia, 2017/2018, pp. 63-64.

The main mission of the company is to develop the production and ensure the quality and packaging of oils, margarines, and sugar at competitive prices, with the aim of satisfying and retaining customers. The objectives pursued by Cevital can be summarized as follows:

- Expanding its products throughout the national territory.
- Optimizing its job offers in the labor market.
- Encouraging agriculture through financial assistance for local production of oilseeds.
- Modernizing its facilities in terms of machines and techniques to increase the volume of production.
- Positioning its products in the foreign market through their exportation.

1.2 The creation of SPA NUMILOG[62]

Created in 2007, Numilog is a subsidiary of the CEVITAL group which belongs to the industry sector, and more specifically to the logistics and services SBU (strategic business unit) with dedicated resources to meet the logistics and transport needs of companies. It positions itself as a key player in the logistics chain in order to support any industrial company (from all sectors) in consolidating goods flows and optimizing activities, thanks to a team of transport and logistics experts and a range of modern infrastructures and tools (geolocation, traceability and advanced technologies).

In order to ensure the transportation of its various goods, CEVITAL used to rely on external logistics providers, while each of its subsidiaries had its own structure on the logistics side. The transportation costs were becoming too expensive and were weighing heavily on the subsidiaries' treasuries. Therefore, CEVITAL created Numilog in 2007 in order to reduce the costs associated with transport and logistics needs.

Numilog targets customers who care about service quality and defines itself as a long-term partner for companies. Special attention and treatment are given to specific needs in order to provide adapted solutions for the Supply Chain. It brings all its expertise to its customers, supporting them in the development of their projects and the optimization of their activities, thanks to a team of professionals and modern and automated infrastructures.

[62] Cevital » NUMILOG 14/05/2023 22:24

With operational deployment in 2012, NUMILOG has 3 logistics platforms (Oran, Constantine and Bouira) with a total storage area of approximately 100,000 m², 3 transport agencies (Bouira, Bejaia and Oran), as well as a distribution network, 35 CLR (Regional logistics centres) spread across the country. It offers a complete service from collection and storage, with a capacity of up to 150,000 pallets, including 35,000 under temperature control, to the distribution of products throughout the country.

In 2014, Numilog opened up to the external market to offer its expertise. In 2016, Numilog had a global workforce of over 1355 employees (Management, drivers, logistics agents, operational agents), with a fleet of over 800 vehicles of all types (200 tractors, 500 refrigerated trailers, 50 container carriers, 20 refrigerated units), enabling 500 daily deliveries for wholesalers, distributors, shopping centres and roadside relays.

Today, Numilog has a turnover of 75 million euros, 1400 employees, but above all 12 years of expertise, value creation and reliable and sustainable partnerships in the field of logistics services.

1.3 NUMILOG a Comprehensive Overview[63]

A Comprehensive Overview of NUMILOG's Strong Infrastructure and Efficient Workforce:

- **Workforce:** 1400 employees, including supervisors, drivers, logistics agents, and operations agents.
- **Infrastructure:** 5 regional operating centres (BOUIRA, ORAN, CONSTANTINE, SETIF, BEJAIA) with a distribution network covering the entire national territory, 7 transport agencies (BOUIRA, BEJAIA, CONSTANTINE, ORAN, SETIF, TIZI OUZOU, ALGER), 30 Regional Centres (CLR) strategically located across the national territory to reduce delivery times, 190,000 m2 of logistics space (including 45,000 m2 of temperature-controlled space), a fleet of 950 trucks (including market trucks, flatbeds, container carriers, refrigerated trucks, and tankers) with 762 drivers and 188 managers, and a TMS (Transport Management System) used to manage the fleet.
- **Technical resources:** NUMILOG uses a:
  - Warehouse Management System (WMS) to ensure product quality and traceability,

[63] Internal documents

- TMS (Transport Management System),
- Geolocation,
- Radio frequency,
- Onboard terminals.

1.4 NUMILOG's Missions[64]

NUMILOG ensures to fulfil its missions and maintain its values. The missions of NUMILOG are as follows:

- To satisfy clients and support their success.
- To provide innovative support.
- To ensure a reliable and long-lasting partnership.

NUMILOG's values are summarized in four letters, IRIS, each letter corresponding to a specific meaning:

- I: Initiative.
- R: Respect.
- I: Integrity.
- S: Solidarity.

1.5 NUMILOG's Activities

NUMILOG's activities can be summarized in three main tasks:

- Supporting the development of CEVITAL Group's activities through logistic services.
- Providing comprehensive logistic services to economic and industrial players nationwide.
- Offering consulting, support, and logistic solutions.

NUMILOG assists clients in their development by leveraging years of professional knowledge and experience in planning and organizing transportation and logistics operations.

1.5.1 Transport activities

Based on the needs and distribution strategy of its clients, NUMILOG offers tailored solutions and customized levels of service for its activities. Through its control center, NUMILOG can efficiently manage deliveries nationwide and optimize transportation costs on

[64] Numilog - Présentation 2020 14/05/2023 22:45

a global scale. To achieve this, NUMILOG provides route solutions and ensures a high level of service quality to meet customer satisfaction.

- **Design and implementation of new schemes:**

NUMILOG leverages the expertise of its engineering team to provide its clients with tailored master plans and transportation strategies. They assist clients in planning, anticipating, and improving their operational indicators while considering production, supply, and distribution constraints. By doing so, NUMILOG helps its clients effectively integrate these factors into their overall operations for enhanced efficiency and performance.

- **Organization and optimization of flows and resources:**

NUMILOG offers the option to manage transportation on behalf of its clients. Through this outsourcing arrangement, clients can fully dedicate themselves to their core business while maintaining cost control.

NUMILOG takes charge of coordinating and synchronizing their carriers, effectively managing freight procurement costs, and integrating their own fleet into its optimization schemes. This allows clients to streamline their transportation operations and achieve greater cost efficiency.

- **Upstream and downstream flow transfers in ambient and temperature-controlled environments:**

With a fleet of 800 trucks, comprising its own vehicles and a network of partner carriers meeting NUMILOG's standards, the company provides secure and reliable transfers with real-time traceability. The fleet includes vehicles for fresh produce, refrigerated units (both positive and negative temperatures), container carriers, flatbeds, and tankers. This enables NUMILOG to offer its clients a service that ensures safe and reliable transfers throughout the national territory all year round.

- **Seasonal operations:**

NUMILOG supports its clients during peak periods and provides the necessary resources to ensure smooth operations.[65]

1.5.2 Logistics activities

NUMILOG provides its clients with its resources and expertise in storage, handling, and other value-added services to optimize costs and ensure product traceability throughout the entire process.

[65] https://numilog.dz/transport/ 15/05/2023 12:20

- **Analysis and optimization of facilities**:

NUMILOG offers tailored solutions to bring your inventory closer to consumption centres and balance your flows. It also provides support in optimizing your warehouses by improving space utilization and storage processes.

- **Storage in ambient and multi-temperature environments:**

NUMILOG operates four internationally compliant logistics platforms located in Bouira, Oran (Hassi Ameur), Constantine (El Khroub), and Sétif. These platforms offer over 190,000 square meters of ambient storage space, including 45,000 square meters of temperature-controlled storage. Within these facilities, NUMILOG ensures product quality and traceability through its integrated Warehouse Management System (WMS).

- **Logistics services:**

NUMILOG delivers high-quality handling and other logistics services at its own sites or at client locations. It provides necessary technologies such as WMS, Radio Frequency, traditional or dynamic storage systems, order picking services (Voice Picking), co-packing, allocation of logistics agents, pallet management, interface study between ERP (Enterprise Resource Planning) and WMS, and integration of products into the WMS.

- **Stored flows and just-in-time flows:**

When clients need to optimize their external flows, NUMILOG adapts to their specific requirements, eliminates waste in their flows, and provides guidance in redirecting their flow types.

1.5.3 Global solutions

NUMILOG offers a comprehensive approach that combines both transportation and logistics to:

- Support its clients in implementing their distribution strategies.
- Assist clients in their growth and provide advisory services.
- Invest in clients' success by developing customized logistics solutions.

NUMILOG ensures the successful implementation of these solutions through project-based deployment, managed by teams experienced in project management, ensuring timely delivery, cost control, and quality assurance.

1.6 NUMILOG's international locations

To enable the exportation of its products, CEVITAL, the parent company of NUMILOG, had to establish its international logistics network. NUMILOG then implemented new logistics and transportation resources dedicated to international operations. In 2015, NUMILOG set up operations in Morocco by leasing a 5000 square meter warehouse in Casablanca, with the primary objective of supporting the expansion of its subsidiary, Brandt, in the Moroccan market. In 2016, NUMILOG established its presence in France under the name "CTLOG" with a capital of 100,000 euros. Located near the ports of Marseille and Fos-sur-Mer, as well as on the Paris-Spain-Italy highway axis, this presence is crucial for the marketing of CEVITAL and Brandt products (household appliances) in France. NUMILOG outsources distribution to transporters. In 2019, NUMILOG expanded its distribution network by entering the Tunisian market, and plans to establish a presence in Italy in the near future. And we can see it in the figure XX.

Figure 3.1: The current locations of NUMILOG



Source: Internal documents

1.7 The logistics platform in Bouira[66]

The logistics platform in Bouira is one of the three logistics platforms operated by Numilog for its transportation and network logistics services. It is located on the Nessis road, 3 km southwest of the city of Bouira. The total storage area of the platform is 75,000 m², with 43,000 m² already utilized for ambient temperature storage and 28,000 m² designated for future operation as temperature-controlled storage. Additionally, there are 4,000 m² of administrative areas. The platform consists of 15 cells, with 9 cells operated by UNODIS, DANONE, CEVIFOOD, and SOBCO, and 6 cells dedicated to temperature-controlled storage.

The platform is equipped with 92 docks and 6 shipping/receiving ramps, with a storage capacity of 60,000 to 80,000 pallets depending on the storage mode used.

[66] Internal documents

The platform has 6 administrative blocks, 5 of which are equipped as follows and we see in Figure XXX:

- B0 - Administrative block dedicated to management and support functions.
- B1 - Maintenance department.
- B2 - CEVIFOOD administration.
- B3 - UNODIS administration.
- B4 - Transportation agency.
- B5 - Danone and SOBCO (Palmary) administration.

Figure 3.2: Satellite image of the NUMILOG logistics platform in Bouira.



Source: Satellite image from google earth.

1.7.1 Information's about the LPF BOUIRA

The table above shows some information about NUMILOG-BOUIRA LPF, including its total area, storage capacity, types of storage, and its workforce.

Table 3.1: NUMILOG-BOUIRA Information Card

Total surface area	75 000 m²
	28000 m² under controlled temperature.
	43000 m² ambient area.
	4000 m² administrative space.
Storage capacity	60000 pallets minimum depending on storage mode modulation
	20000 under controlled temperature.
Storage type	Mass, Palletize, Accumulation
Effective	429 people (year 2021)

Source: Internal documents.

1.7.2 The four folders of LPF BOUIRA[67]

The products currently stored in this LPF come mainly from four clients, two of which are internal clients and the other is an external client. For this reason, we divide them into four folders at the management level: Cevi-Food, UNODIS, DANON, and SOBCO Palmary.

The warehouses of the platform are presented in the table below:

Table 3.2: The four warehouses of NUMILOG BOUIRA.

Warehouse	Characteristics
CEVIFOOD warehouse	This warehouse plays a crucial role in storing CEVITAL's products, including sugar, oil, margarine, juice, and water.

[67] Internal documents.

	It serves as the primary hub for physical and informational flows, making it the most important and profitable activity for the BOUIRA platform. Moreover, it acts as the distribution channel for CEVITAL's products, strengthening the connection with the parent company.
UNODIS warehouse	This warehouse is the largest among the four, with a total area of 40,000 m2. It is specifically designated for storing UNODIS client's products, encompassing approximately 3000 to 4000 references, including items from the household goods, beverages, groceries, cosmetics, and various other categories.
DANONE warehouse	This warehouse is designated for storing products from the client Danone, such as Danette, Activia, Oikos, cereals, biscuits, and others. It is a recent activity that occupies ambient surfaces with controlled temperatures.
SOBCO (PALMARY) warehouse	This warehouse is specifically dedicated to storing Palmary's products, including spreads, MAXON biscuits, and KOOL biscuits, which are the market leader in mosaic biscuits. This brand has significant potential for development, and the warehouse plays a key role in its expansion.

Source: Developed by ourselves from data provided by NUMILOG 2023

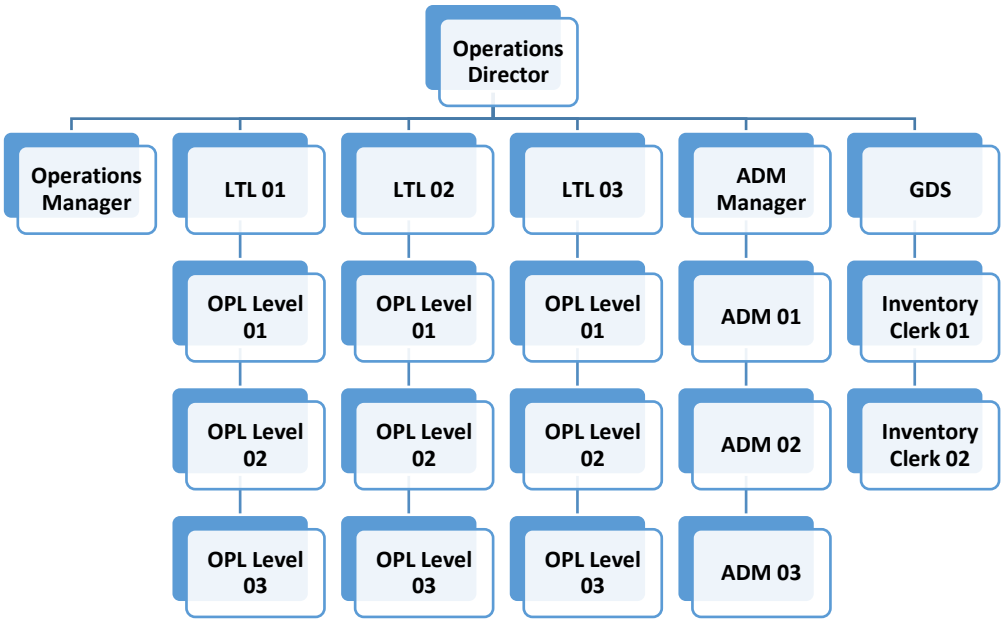
1.8 The reason to choose the UNODIS folder

On the first day of our visit to NUMILOG company in Bouira, we had the opportunity to meet the Operations Manager. We discussed our research topic with him and he asked us some questions to help us select one of NUMILOG's most important customers, namely UNODIS, CEVIFOOD, SOBCO and DANONE. After the interview, we decided to choose UNODIS as the selected customer:

UNODIS SPA (ex NUMIDIS), operating under the brand name UNO, is a subsidiary of the CEVITAL Group. Established in January 2007, UNODIS is a prominent player in the Algerian retail sector with a nationwide presence. With a registered capital of 7,500,000,000 Algerian dinars, UNODIS has successfully expanded its operations by establishing various types of stores, including supermarkets, hypermarkets, and convenience stores. This strategic approach enables UNODIS to effectively meet the diverse needs of its customers and enhance the daily lives of families.

Our research focuses on the UNODIS database, which is one of the most crucial datasets managed by NUMILOG. The significance of the UNODIS database stems from the nature of the stored products and the extensive range of product references it handles. Within NUMILOG, the UNODIS operations represent the most vital and lucrative aspect. We chose to investigate this database as the logistics operations associated with UNODIS, particularly the order processing, are of utmost importance in the overall process and require significant time investment, directly impacting customer satisfaction.

Figure 3.3: The representative organizational chart of UNODIS employees.

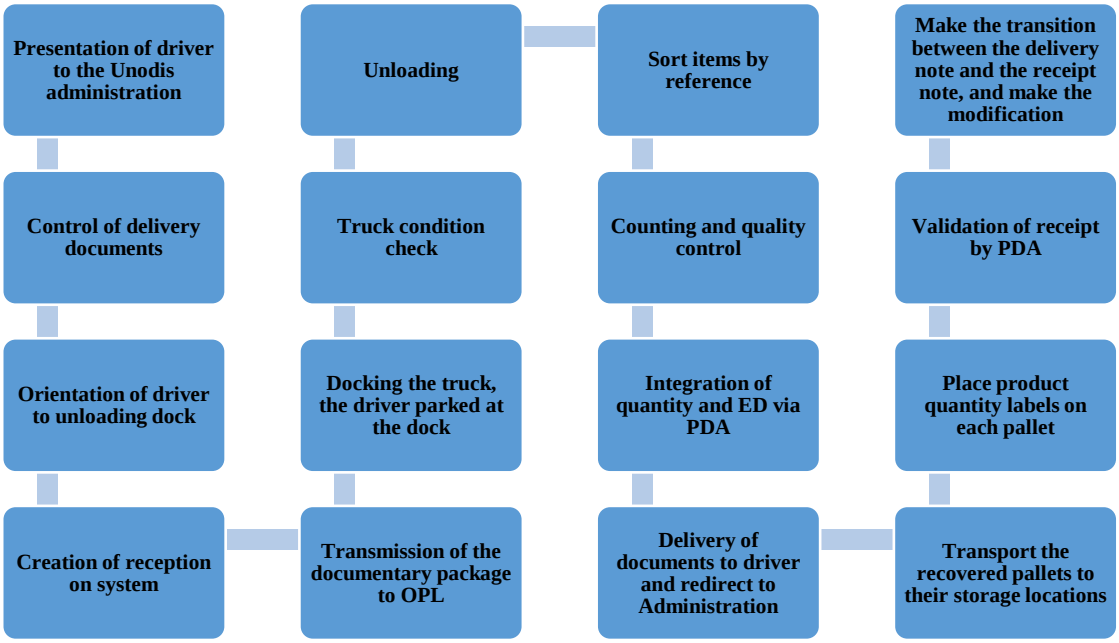


Source: Develop by ourselves with the help of internal documents.

2. The warehousing process of UNODIS

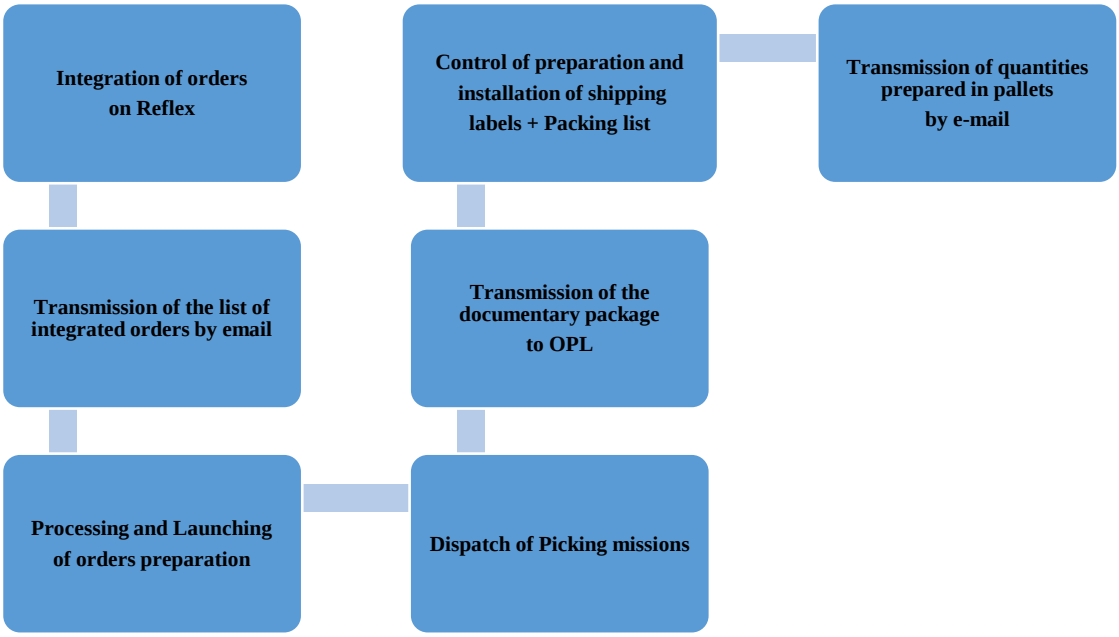
The efficient management of the warehousing process is important to ensure the smooth flow of operations and timely delivery of products. At UNODIS, the warehousing process contain three significant stages: product receiving, stock placement, and order preparation. These stages form the foundation of an effective supply chain management system, enabling UNODIS to handle large volumes of products efficiently. This research has purpose to delve into the intricacies of each stage, exploring the various strategies, technologies, and best practices employed by UNODIS to optimize their warehousing operations. By understanding the key components of this process, organizations can gain valuable insights into enhancing their own warehousing practices, leading to improved customer satisfaction and overall operational excellence.

Figure 3.4: Products receiving Process.



Source: Develop by ourselves with the help of internal documents.

Figure 3.5: Orders Preparation Process.



Source: Develop by ourselves with the help of internal documents.

2.1 The product receiving process

The reception process at UNODIS is seamlessly integrated through the REFLEX[68] interface, starting from the docking of freight vehicles and concluding with the registration of the goods in the Reflex computer system and their placement into stock. This process ends at 03:00 PM usually the overall reception process is divided into several stages, including: [69]

- **Driver Presentation to Administration:** The driver presents a bundle of documents (such as delivery notes, bill of lading, and invoices) to the administration for verification.
- **Delivery Document Check:** The delivery documents are thoroughly examined to ensure accuracy and completeness.
- **Driver Guidance to Unloading Dock**: The driver is directed to the designated unloading dock.
- **Unloading of Goods:** The goods are unloaded from the vehicle.
- **Item Dispatching onto Pallets:** Each item is carefully organized and placed onto pallets.
- **Delivery Inspection:** The delivery is inspected, including item counting and quality control checks.
- **Product Validation with Embedded PDA:** Product validation is performed using a handheld device (PDA) connected to the REFLEX system.
- **Computer Validation on REFLEX:** The validated products are then recorded and validated in the REFLEX system.

This streamlined process ensures efficient reception of goods at UNODIS, incorporating both manual checks and digital validation methods to maintain accuracy and enhance operational effectiveness.

When the driver arrives at the platform, they are first checked at the security checkpoint. Then, at the administration, their destination is verified, specifically if they are intended for the BOUIRA platform, UNODIS in particular. If they are not destined for this platform, they are directed to another destination. Afterwards, their presence in the supplier reception schedule is checked.

[68] Reflex WMS: Warehouse Management System software

[69] LOUNIS (Amira) : L'apport de l'optimisation du processus de la préparation des commandes dans l'amélioration de la performance logistique, memoire de master 2 (option: SCM), EHEC KOLEA,2022

Following that, the document package is inspected, which includes the purchase order (PO), the delivery note (DN), and the invoice. The reception is verified by comparing it with the purchase order in REFLEX. If the reception is integrated, everything is fine. Otherwise, the client is contacted to integrate it into the system.

If the inspection is satisfactory, the documents prepared by the administrative agent (DN, PO, OD) are passed on to the LTM (logistics team leader). The team leader then contacts the driver to determine the available dock.

The Operational Logistics Operators (OPL) come into play at this stage. They begin unloading the goods and sort them by item onto pallets. Then, they physically check the received goods by comparing them to the purchase order, also verifying the Base Calculation Price (BCP) and the Expiry Date (ED). This is done using a Personal Digital Assistant (PDA), where the products' barcodes are scanned, quantities and ED are recorded. The ED is mandatory for food, cosmetic, and drug products. Once the reception is validated in embedded mode, support labels are printed on a Zebra printer and affixed to each pallet.

After the physical reception in embedded mode, the administrative agent performs a final document verification to ensure the conformity of the quantities received compared to those ordered. Validation of the reception in the system is done on day J+1 before noon.

In case of damaged goods, a return form must be immediately filled out. If there is an excess quantity, the client's input is considered. If the client accepts the unordered quantity, an additional purchase order is generated. In such cases, the input of the UNODIS coordinator is important. Once the PDA validation is completed, the forklift operator takes over for stock placement.

For items labeled as "holding," they are stored in a specific area called the "holding zone" or "prison zone" while awaiting quality testing. If the product is compliant, it is transferred to the standard zone. Otherwise, the product goes through the "REJECT" zone.

- Quality control is a crucial step that may take time but is necessary to ensure product quality. If any discrepancies such as extra products, near expiration dates (ED), or unallocated items are identified, they are segregated in the holding zone for further scrutiny and verification.[70]

[70] Internal talk with OPL.

2.2 The stock placement

The physical stock placement of the merchandise involves transporting it from the reception and control area to the predetermined storage zone as defined by REFLEX. It is ensured that the storage conditions are adequate, utilizing appropriate handling equipment such as pallet jacks or forklifts, to store the goods.

The allocation of storage zones is done based on product families and by aisle. It is strictly prohibited to mix grocery and drugstore items together, and this is configured through the Warehouse Management System (WMS).

In order to ensure better warehouse management reliability with WMS, NUMILOG needs to conduct various types of inventories:

- Daily inventories consist of:
  - Stock locations impacted by withdrawals on the previous day (J-1).
  - Picking locations affected on the previous day (J-1).
  - Stock placement locations for receipts from the previous day (J-1).
- A weekly inventory is conducted to monitor both empty and occupied locations.
- There are targeted inventories specifically focused on articles with delivery anomalies.
- Exceptional inventories are performed based on client requests.
- Discrepancies are analyzed, and stock records are regularly updated over time.

2.3 The order preparation process

The order placement should be done on the day (J) before 12:00 PM to ensure delivery on the day (J+2). The main steps involved in order preparation are as follows:

- **Launching preparation operations:** After a briefing with the team leader, the order preparation operations typically begin at 2:00 PM. During this briefing, the daily objectives are set, and common errors for each profile are discussed. The aim is to be close to the Order Pickers/Operators (OPLs) and make them feel comfortable in a familiar environment.
- **Physical preparation:** Once the operations are launched, the OPLs start the physical preparation of the orders. This involves gathering the required products for each order based on the specified quantities. The OPLs need to follow established procedures to ensure accuracy and efficiency in the preparation process.

- **Preparation closure**: After all the orders have been prepared, it is essential to proceed with the closure of the preparation. This includes a final check of each order to ensure its correctness and completeness. Any errors or omissions should be rectified before delivery.

In summary, order preparation begins at 2:00 PM following a briefing with the team leader to set objectives and discuss specific errors related to each profile. The Order Pickers/Operators (OPLs) then carry out the physical preparation of the orders, following established procedures. Finally, the preparation is closed with a final check of each order before delivery.[71]

The order preparation process at NUMILOG (NUMIDIS file) generally goes through the following steps:

- **The order preparation process:** Firstly, the customer NUMIDIS places their order, which is integrated into the REFLEX WMS information system. The ADMs process this order by confirming the availability of the ordered products in the stock. Then, the ADMs initiate an ODP to the logistics team leaders to have the orders ready on time.
- **Launching of preparation operations:** The logistics team leader starts the preparation operations according to the ODP received from the ADMs and assigns picking tasks to the preparers, considering the order of loading priority.
- **Physical preparation:** The OPLs initiate the physical preparation of the merchandise and start picking the items, validating them using a handheld terminal (PDA). They transport the pallets to the preparation area to package the assembled pallets with film for protection during shipment.
- **Closure of preparation:** The logistics team leader checks the completion of the picking tasks.
- **Preparation control:** The OPL verifies the conformity of the prepared products in terms of quantity and quality. Various material and human resources are used to carry out the logistics operations, At the operational level, there are different levels of logistics operators, distributed as follows:
  - **OPL Level 1:** Logistics agent responsible for handling goods.
  - **OPL Level 2:** Logistics agent who works with a PDA (Personal Digital Assistant) to prepare and control the orders that will be shipped subsequently.
  - **OPL Level 3:** Logistics agent who operates forklifts and clamps.

[71] Internal documents.

In conclusion, the presentation of the host organization has provided us with valuable insights into their mission, values, and overall structure. Through this section, we have gained a comprehensive understanding of the organization's goals, objectives, and the important work they are engaged in.

Section 2: Analysis of the existing UNODIS-NOMILOG activities

In this section, we will focus on the receiving products process and the order preparation process within the UNODIS-NOMILOG system. Our objective is to identify any anomalies and problems that may exist in these processes. Let's begin with an introduction to provide context for the analysis.

1. Analysis of the existing

This is the project phase during which we will audit the existing process and computerized data.

1.1 Research Methodology

In my research methodology, I employed a quantitative approach using the SPSS software. I extracted a sample from the product reception process and calculated the duration of each step. Subsequently, I performed an estimation using SPSS and the normal distribution, based on a sample size of 30 Receptions, to estimate the total duration of a complete reception process. I also utilized the company's computerized data.

In the order preparation process, I conducted an ABC Pareto ranking based on three criteria. Additionally, I calculated the correlation between the number of prepared packages and the preparation time. Finally, I computed several key performance indicators (KPIs).

1.2 The tools used

The tools used to collect data included various methods and technologies, which were instrumental in obtaining the necessary information for the research project

1.2.1 Sampling

to estimation of the characteristics of a population you should observing a portion of the entire population and the Sampling allows us to do it.

In commercial studies, there are two types of Sampling: probabilistic sampling and non-probabilistic sampling.

- **Probabilistic sampling** is a sampling approach in which the researcher selects some criteria and randomly selects members of a population. With this selection, all members have an equal chance of participating in the sample choice.
- **Non-probability sampling:** in this method the researcher chooses members for research at random during the sampling process. This method of sampling is not a fixed or predetermined selection process. As a result, it is difficult for all segments of the population to have equal chances of being included in a sample.

  In our research we use the non-probabilistic sampling by taking 30 receptions randomly.

1.2.2 Estimation

The more refined the definition, the more accurate the estimate.[72]

Estimation is the process of providing a numerical value for an unknown quantity based on information collected from a sample. If a single value is calculated for the unknown quantity, the process is called point estimation. If an interval is calculated that is likely, in some sense, to contain the quantity, then the procedure is called interval estimation, and the interval is referred to as a confidence interval. Estimation is thus the statistical term for an everyday activity: making an educated guess about a quantity that is unknown based on known information. The unknown quantities, which are called parameters, may be familiar population quantities such as the population mean μ, population variance o2, and population proportion л. For instance, a researcher may be interested in the proportion of voters favoring a political party. That proportion is the unknown parameter, and its estimation may be based on a small random sample of individuals. In other situations, the parameters are part of more elaborate statistical models, such as the regression coefficients Bo, B1, B, in a linear regression model.[73]

[72] Steve McConnell (2006) Software Estimation: Demystifying the Black Art P.103
[73] Neil J. Salkind (2010) Encyclopedia of Research Design, P.419

1.2.2.1 The normal distribution[74]

The normal distribution is a fundamental concept in statistical inference. It is fully described by two parameters: the mean, denoted as μ, and the standard deviation, denoted as σ. These two parameters determine the center and width of the distribution. Essentially, once the location of the distribution's center and its spread are known, all relevant information about the distribution is conveyed. The general shape of the curve remains consistent, following a symmetrical bell-shaped pattern. Understanding the normal distribution and its parameters allows for meaningful analysis and predictions in various statistical and scientific applications.

1.2.2.2 The sampling distribution of the mean

The sampling distribution of the mean refers to the distribution of sample means obtained from multiple random samples of the same size drawn from a population. It is a concept in statistics that helps us understand how sample means vary and behave. when we take multiple random samples from a population and calculate the mean of each sample, the distribution of these sample means is called the sampling distribution of the mean. It is often approximated by a normal distribution, especially when the sample size is sufficiently large, due to the Central Limit Theorem.

1.2.3 Pareto analysis

Pareto analysis is a technique used for business decision-making, but which also has applications in several different fields from welfare economics to quality control. It is based largely on the "80-20 rule." As a decision-making technique, Pareto analysis statistically separates a limited number of input factors—either desirable or undesirable—which have the greatest impact on an outcome.

Pareto analysis is premised on the idea that 80% of a project's benefit can be achieved by doing 20% of the work—or, conversely, 80% of problems can be traced to 20% of the causes. Pareto analysis is a powerful quality and decision-making tool. In the most general sense, it is a technique for getting the necessary facts needed for setting priorities.

And we talk about it more in the section 03.

[74] https://www.southampton.ac.uk/~mb1a10/stats/FEEG6017_4.pdf 28/05/2023 15:10

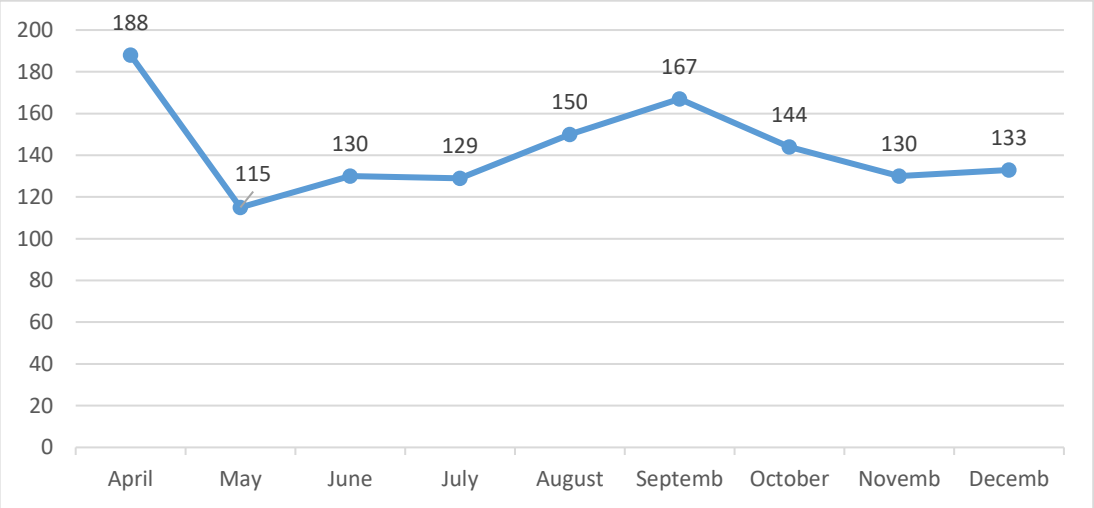
1.3 The product receiving process analysis

For the product receiving process, you used the computer data provided by the company. Subsequently, you took a random sample of 30 receptions and used SPSS to estimate the duration of a complete reception and calculate confidence intervals

1.3.1 Computerized data

UNODIS Ex-numidis change its name in April 2022 so the data provided is from April to December 2022.So we can see the receptions of 2022 in the figure below:

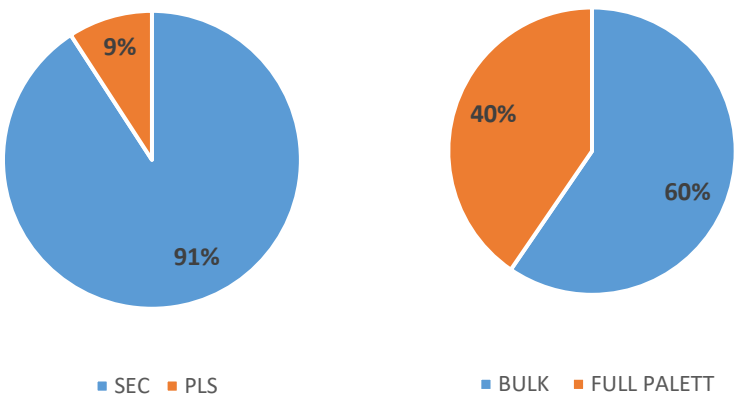
Figure 3.6: Receptions of 2022.



Source: Elaborated by ourselves.

- From the previous figure we can see that Unodis receptions Varies between 100 and 200 receptions per month with a mean of 142 receptions per month.
- An average of 2935 pallets per month, and an average of 140 pallets per day.
- We have two types of receptions of dairy products (PLS) and dry food products (SEC) on these two types we have bulk products and in full pallet we can see this distribution in the following figure.

Figure 3.7: Distribution of PLS and SEC, Bulk and in full pallet.



Source: Elaborated by ourselves.

- We can see that the dry products have a proportion of 91% so we must concentrate on them and specially on the bulk part which has a proportion of 60% of the receptions of 2022.
- In the product receiving process, there are four significant durations: unloading time, item sorting per pallet, palletized load control, and stock placement, based on the data from 2022[75], here is what we have found:
  - **Unloading time:** 2.92 min / pallet
  - **Item sorting per pallet:** 1.63 min / pallet
  - **Control:** 1.97 min / pallet
  - **Stock placement:** 2.41 min / pallet
  - **Total:** 8.93 min / pallet

1.3.2 The objectives of NUMILOG

Product receptions take place from 6:00 a.m. until 3:00 p.m., with a one-hour lunch break. This gives us a total period of 480 minutes. On average, we handle between 7 and 8 receptions per day. So, each reception takes between 60 to 68 minutes on average. And 18 pallets per hour.

1.3.3 Our sample

We are monitoring the product receptions from the driver's arrival at the administration until the products are placed in stock. For this purpose, we have selected a sample of 30 complete

[75] Internal documents.

receptions to apply estimation using the normal distribution, with a margin of error of 5% and a confidence interval of 95%.

Our sample encompasses all types of UNODIS products, which are distributed across five categories: household goods, cosmetics, grocery, beverages, and dairy products.

Table 3.3: Distribution of our sample according to product categories.

Sample Type	Sample size	% Receptions	% Full pallet	% Bulk
household goods	3	10%	6.67%	3.33%
cosmetics	4	13.33%	3.33%	10%
grocery	10	33.33%	10%	23.33%
beverages	3	10%	10%	0%
dairy products	10	33.33%	6.67%	26.67%
Total	30	100%	36.67%	63.33%

Source: Elaborated by ourselves.

- So as the computerized data precedes the bulk part always takes the large part in the NUMILOG - UNODIS receptions.

1.3.4 Estimation and confidence interval

To estimate the durations of the reception processes, we have used the normal distribution with parameters μ as the mean and σ as the standard deviation. We have also utilized SPSS to calculate the confidence intervals, which provide a range within which the duration of a complete reception can vary.

The durations are as follows:

- Waiting Time.
- Document Control and Computer Processing.

- Driver Orientation at Unloading Dock.
- Unloading of Goods.
- Sorting Each Item onto Pallets.
- Counting and Shelf-Life Control (ED).
- Stock Placement.

1.3.4.1 Waiting Time

Time the driver waits before going to the administrative agent to control the documents and computer processing.

Table 3.4: Waiting Time Confidence Interval**.**

Waiting Time				
			Statistic	Std. Error
Xi	Mean		1.47	.414
	95% Confidence Interval for Mean	Lower Bound	0.62	
		Upper Bound	2.31	

Source: Our sample data, "Results obtained by the SPSS Software".

- So, the time each driver waiting ranges from 0.62 minutes to 2.31 minutes.
- And the average is 1.47 minutes.

1.3.4.2 Document Control and Computer Processing

This is the phase in which the administration checks the documents and processes the reception on the REFLEX software to see if he's on the schedule or not.

Table 3.5: Document Control and Computer Processing Confidence Interval**.**

Document Control and Computer Processing				
			Statistic	Std. Error
Yi	Mean		4.47	1.679
	95% Confidence Interval for Mean	Lower Bound	1.03	
		Upper Bound	7.90	

Source: Our sample data, "Results obtained by the SPSS Software".

- So, the administrative time takes from 1.03 minutes to 7.90 minutes for control and computer processing.
- And the average is 4.47 minutes.

1.3.4.3 Driver Orientation at Unloading Dock

During this step, the administrative agent selects a dock where the driver can unload the products, taking into account the time required for the driver to reach the dock.

Table 3.6: Driver Orientation at Unloading Dock Confidence Interval**.**

Driver Orientation at Unloading Dock				
			Statistic	Std. Error
Zi	Mean		18.53	2.635
	95% Confidence Interval for Mean	Lower Bound	13.14	
		Upper Bound	23.92	

Source: Our sample data, “Results obtained by the SPSS Software”.

- The process of dock selection and truck positioning by the administrative agent and the driver typically takes anywhere between 13.14 and 23.92 minutes.
- And the average is 18.53 minutes.

1.3.4.4 Unloading of Goods

In this phase, the logistics operators carry out the unloading of the customer's truck, opting to either unload the goods onto pallets or in bulk.

Table 3.7: Unloading of Goods Confidence Interval**.**

Unloading of Goods				
			Statistic	Std. Error
Ci	Mean		14.20	1.527
	95% Confidence Interval for Mean	Lower Bound	11.08	
		Upper Bound	17.32	

Source: Our sample data, “Results obtained by the SPSS Software”.

- The unloading process by the logistics operator typically takes between 11.08 and 17.32 minutes to complete.
- And the average is 14.20 minutes.

1.3.4.5 Sorting Each Item onto Pallets

In this step, the logistics operator meticulously organizes each product onto a pallet, ensuring unambiguous storage.

Table 3.8: Sorting Each Item onto Pallets Confidence Interval**.**

Sorting Each Item onto Pallets				
			Statistic	Std. Error
Bi	Mean		11.73	2.522
	95% Confidence Interval for Mean	Lower Bound	6.58	
		Upper Bound	16.89	

Source: Our sample data, "Results obtained by the SPSS Software".

- The process of item sorting by the logistics operator typically takes anywhere between 6.58 and 16.89 minutes to complete.
- And the average is 11.73 minutes.

1.3.4.6 Counting and Shelf-Life Control (ED)

Prior to printing the Zebra labels, it is essential for the logistics operator to inspect the received products and verify their expiration dates.

Table 3.9: Counting and Shelf-Life Control (ED) Confidence Interval**.**

Counting and Shelf-Life Control (ED)				
			Statistic	Std. Error
Ti	Mean		13.97	1.728
	95% Confidence Interval for Mean	Lower Bound	10.43	
		Upper Bound	17.50	

Source: Our sample data, "Results obtained by the SPSS Software".

- The process of counting and verifying the expiration dates of the items by the logistics operator typically takes between 10.43 and 17.50 minutes to complete.
- And the average is 13.97 minutes.

1.3.4.7 Stock Placement

During this step, the logistics operator effectively organizes the products in stock, ensuring the presence of the required tools and equipment.

Table 3.10: Stock Placement Confidence Interval**.**

Stock Placement				
			Statistic	Std. Error
Wi	Mean		24.93	2.843
	95% Confidence Interval for Mean	Lower Bound	19.12	
		Upper Bound	30.75	

Source: Our sample data, "Results obtained by the SPSS Software".

- In this process the logistics operator took 19.12 min to 30.75 min to place the received products in their places.
- And the average is 24.93 minutes.

➢ Returning to the objective of Numilog, which is: 60 to 68 minutes for each reception, Hold it.

➢ According to the sample, the durations were found as follows:

- **Unloading time:** 2.17 min / pallet
- **Item sorting per pallet:** 1.84 min / pallet
- **Control:** 1.55 min / pallet
- **Stock placement:** 3.21 min / pallet
- **Total:** 8.77 min / pallet

➢ Our sample is representative because the durations closely align with the computer data, and the sample size is 30. The normal distribution is applicable. Therefore, here is the confidence interval for the total reception time, which is the sum of the previous durations, using SPSS.

Table 3.11: Total durations Confidence Interval**.**

Total

			Statistic	Std. Error
Xi	Mean		-	-
	95% Confidence Interval for Mean	Lower Bound	62.02	
		Upper Bound	117.21	

Source: Our sample data, "Results obtained by the SPSS Software".

- In order for Numilog to achieve its objectives, each reception should take between 60 and 68 minutes. However, the data found indicates that each reception takes between 62 and 117 minutes. Therefore, there are issues or anomalies that will be discussed in the following section.

1.3.5 the anomalies found

Based on the tracking of these 30 receptions throughout the internship period, we have identified recurring issues that require attention with the observations of those 30 receptions. These issues primarily revolve around time constraints, and it is crucial to thoroughly discuss them along with their impact, which are the following:

- Command out of schedule
- Internal communication
- ADM agents do not have personal protective equipment (PPE)
- Allocation of operators to the dock
- Semi-trailer is not compatible with the ramp
- Reception of half pallets in bulk
- Shortage of empty pallets
- Damaged pallets
- Excessive motion (tools far away)
- Forgot to charge the handheld device (PDA)
- Forgot to change the ZEBRA frequency
- Barcode integration for products is missing
- Uno does not merge additional loading dock assignments
- Value in Logistics (VL) and shipping boxes (PCB) do not match the physical count
- Dock ramp occupied
- Missing ZEBRA device
- Bundle matching for BC (Bill of Consignment) and BL (Bill of Lading)

- Product returns not compatible with storage
- Allocation of operators for unloading the dock
- Cardboard separation missing

We have identified 20 issues that result in time loss during product reception. We have measured both the duration and count frequency of these time losses with chronometer.

We can illustrate them in the following table:

Table 3.12: The issues found within the product receiving process.

Problems:	**Total time losses:**	**Frequency per 30 receptions:**
Command out of schedule	17 minutes	3.33%
Internal communication	85 minutes	40%
ADM agents do not have personal protective equipment (PPE)	12 minutes	10%
Allocation of operators to the dock	124 minutes	43.33%
Semi-trailer is not compatible with the ramp	5 minutes	3.33%
Reception of half pallets in bulk	13 minutes	6.67%
Shortage of empty pallets	60 minutes	43.33%
Damaged pallets	9 minutes	13.33%
Excessive motion (tools far away)	43 minutes	40%

Forgot to charge the handheld device (PDA)	17 minutes	13.33%
Forgot to change the ZEBRA frequency	52 minutes	36.67%
Barcode integration for products is missing	71 minutes	33.33%
Uno does not merge additional loading dock assignments	17 minutes	10%
Value in Logistics (VL) and shipping boxes (PCB) do not match the physical count	12 minutes	6.67%
Dock ramp occupied	321 minutes	50%
Missing ZEBRA device	102 minutes	70%
Bundle matching for BC (Bill of Consignment) and BL (Bill of Lading)	20 minutes	10%
Product returns not compatible with storage	29 minutes	13.33%
Allocation of operators for unloading the dock	77 minutes	13.33%
Cardboard separation missing	4 minutes	3.33%

Source: Elaborated by ourselves with EXCEL.

- We can see that there are issues with losing a significant amount of time due to high footfall. Rules are necessary for the company to achieve its objectives.

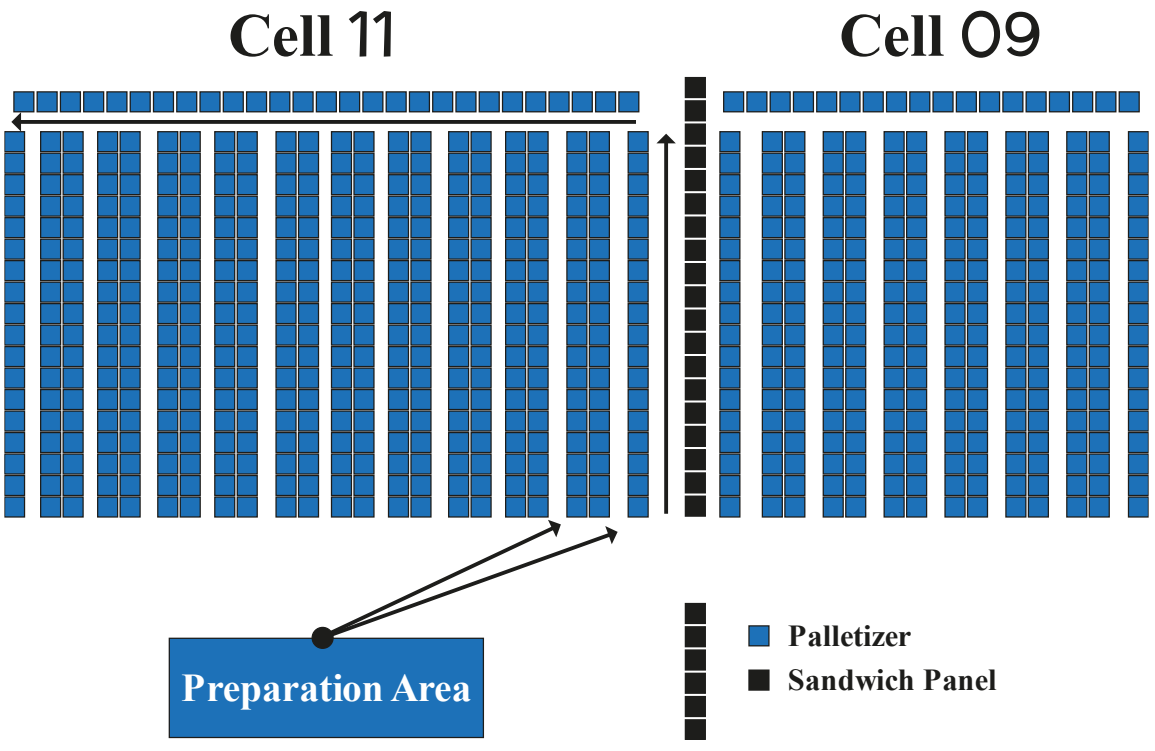
- On the 30 receptions retained, Numilog loses 1090 minutes, with an average of 36 minutes for each reception. Can you see where the time is lost? We will discuss solutions to resolve these issues in the third section.

1.4 Analysis of the order preparation process

In this part, we will discuss the order preparation process for the UNODIS customer, including how the products are stored, the types of storage, the types of picking, and the tools used.

In a previous section, we discussed that order preparations are initiated on day "J" before 12 p.m. to ensure delivery by day "J+2". The logistics operators begin the physical preparation process at 2 p.m., utilizing specialized tools. Now, let's illustrate how NUMILOG distributes the items to cells 09 and 11, which are dedicated and specialized for UNODIS product storage.

Figure 3.8: Presentation of storage area unodis cell 09 and 11.



Source: Elaborated by ourselves Using Adobe illustrator.

Numilog stores the UNODIS products throughout cells 09 and 11, with the storage primarily located at ground level, specifically on level 0. This ensures easy accessibility and efficient handling of the products within the designated storage areas.

1.4.1 Storage policy at UNODIS

During the observation period, we noticed that UNODIS utilizes two storage methods, namely:

- **Dedicated storage:** which involves assigning a consistent location for each product reference. This storage method is exclusively reserved for the picking zone, ensuring that each item has a designated and fixed position.
- **Random storage:** where incoming products are assigned to any available location within the warehouse. This method is typically applied to the reserve zone, allowing a single product reference to have multiple reserve locations.

1.4.2 The product allocation policy

The allocation of a specific product reference is determined based on factors such as the brand, code, and other relevant criteria while ensuring compliance with product families and storage constraints. For new references, the allocation is carried out randomly to any available and suitable location, taking into account the product family (e.g., avoiding the storage of food products with household cleaning items). This ensures efficient utilization of space while maintaining proper categorization and segregation of products within the warehouse.

- Before moving on to the discussion of picking types, it is important to calculate the distribution of products between cells 09 and 11 based on their respective product families.

Table 3.13: distribution of products between cells 09 and 11.

Product families	Cell 09	Cell 11
household goods	**28.57%**	**8.34%**
cosmetics	**57.15%**	**0%**
grocery	**0%**	**70.83%**
beverages	**14.28%**	**20.83%**

Source: Elaborated by ourselves.

- We have observed that the grocery and cosmetics family occupy the majority of cells 09 and 11.

1.4.3 Types of picking at NUMILOG

Numilog utilizes three types of picking methods, which are as follows:

- **DPP:** Detail Picking Pick (if the item is located at level 0).
- **DPS:** Detail Picking from Stock (if the item is not located at level 0).
- **PCC:** Picking in Complete Packaging (picking by pallet).

➢ The most commonly used method is DPP (Detail Picking Pick).

1.4.4 Correlation test

To measure the relationship between two or more quantitative variables we should use a statistical test called correlation, A positive number means that high values in one variable are associated with high values in the other variable; a negative correlation means inverted relationships so high values in one variable are associated with low values in the other variable.[76]

➢ **Correlation test between the number of packages and preparation time:**

In the following step, we use the SPSS software with data collected to test if there is a relationship between number of packages prepared and preparation time. The purpose is to determine if these two variables are related.

Table 3.14: The relationship between the number of packages Xi to be picked per order and the picking time of these packages Yi.

Order Number	Number of packages	Preparation time
01	48	59
02	60	66
03	270	105
04	75	72
05	165	86

[76] Action Research in Education: A Practical Guide (2019) Sara Efrat Efron, Ruth Ravid P.203

06	180	95
07	108	74

Source: Elaborated by ourselves.

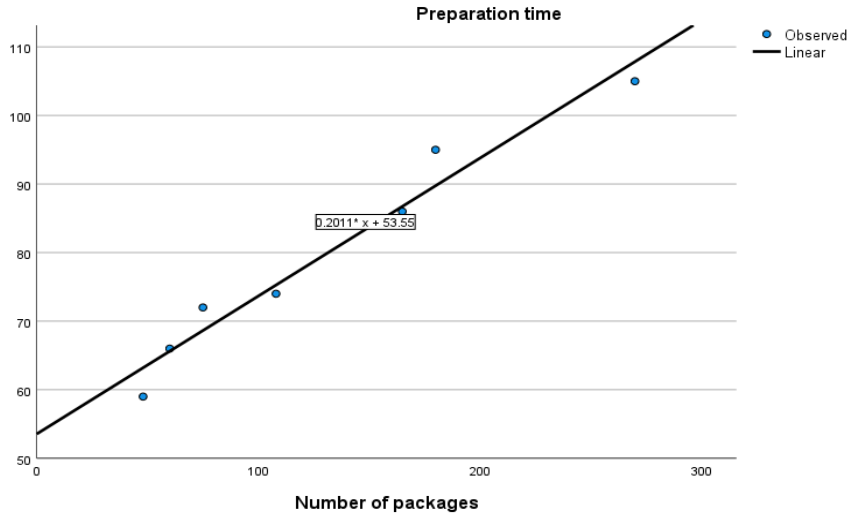
Table 3.15: Correlation test between the number of packages and preparation time.

Correlations			
		Number of packages	Preparation time
V10	Pearson Correlation	1	.979**
	Sig. (2-tailed)		<.001
	N	7	7
V11	Pearson Correlation	.979**	1
	Sig. (2-tailed)	<.001	
	N	7	7

Source: Elaborated by ourselves, "Results obtained by the SPSS Software".

- r = 0.979.
- The correlation coefficient, r = 0.978, is close to 1, indicating a strong positive correlation between the number of packages to be prepared for each order and the picking time. To determine the average change in the value of Y when X increases by one unit, we used Excel to derive the regression equation, Y = aX + b.

Figure 3.9: The regression line between packages prepared number and the preparation time



Source: Elaborated by ourselves, "Results obtained by the SPSS Software".

- From the provided figure, it is evident that the linear regression line has a positive slope with respect to the X-axis, with a value of a = 0.2011 This implies that a one-unit increase in the number of packages to be picked per order corresponds to a 0.20 minute or 12-second increase in the preparation time for each order.

Before moving on to my ABC ranking based on three criteria, I would like to discuss the current ranking system used by Numilog, which only considers product rotation. While rotation is indeed an important factor, this ranking system does not take into account the weight and packaging type of the prepared products. For instance, the preparer may prioritize products with high rotation but overlook the fact that they are lightweight or packaged in a way, such as using cardboard, that prevents placing other products on top of them. Therefore, it is necessary to reorganize the warehouse using the ABC ranking system that considers product rotation as the primary criterion, product weight as the second criterion, and packaging type as the third criterion.

The receiving products process and the order preparation process are critical components of the UNODIS-NOMILOG system. Identify and address anomalies and problems in those processes is crucial for ensuring the efficient and accurate delivery of goods to their final recipients.

Section 3: Attempts to improve the good receiving and the order preparation process

In this section, we will focus on optimizing the good receiving and order preparation processes within the UNODIS-NOMILOG system. Our objective is to provide proposal solutions and recommendations that can enhance the efficiency and accuracy of these crucial supply chain operations.

We are trying to optimize the product receiving process because there is a direct relationship with the order preparation process. Delays in the receiving process result in delays in the preparation process since the same individuals work in both processes. It is necessary to initiate these preparation orders before 2 p.m. in order to distribute the tasks among the logistics operators.

1. Attempts to improve the Product receiving process

To address the anomalies in this process or, at the very least, reduce the losses associated with it, we have proposed several solutions that we will discuss in this part:

- For non-planned orders, establish a direct relationship with the UNODIS administration to address the issue.
- Improve internal communication by using walkie-talkies between administrative staff and logistics team leaders.
- Provide Personal Protective Equipment (PPE) for administrative staff to avoid any ambiguity.
- Enable communication via walkie-talkies between the security guard stationed at the dock and the team leader to assign operators.
- Mention the height of trucks on the Delivery Note (BL) to determine the appropriate dock or ramp for unloading.
- Allocate more operators if the received goods are a mixture of loose and palletized items.
- Calculate the number of pallets for the next day (day J+1) and prepare them after 6:00 PM on day J.
- Verify the condition of the pallets before placing them with undamaged pallets.
- Designate a specific area (loading zone) for tools such as carts or pallet jacks.
- Charge the Personal Digital Assistants (PDAs) before the first shift at 6:00 AM.
- Place a frequency Zebra ticket at the entrance of each cell to remind employees to change the code.
- Assign a specialized agent to integrate non-integrated products into the REFLEX system.
- Merge UNO purchase orders to avoid additional charges and errors.
- Consider adding a new ramp or using a removable ramp on Mondays when ramp usage is high.
- Implement new Zebra printers (Annex X) in cell 03.
- If bundle reconciliation is computerized, it is beneficial.
- Conduct quality control checks to prevent product returns.
- Use walkies-talkies between team leaders and Operations Packaging Line (OPL) to clear the docks.
- Calculate the need for cardboard separators if the J+1 planning includes beverage suppliers.

The proposed solutions aim to address the anomalies in the product receiving process. While they do not cover the entirety of the 1,090 minutes of lost time over the next 30 receptions, they do help reduce this lost time to a certain number, as indicated in the following table.

Table 3.16: Problem number and time lost.

Problem number	Average time lost
Command out of schedule	**17**
Internal communication	**7**
ADM agents do not have personal protective equipment (PPE)	**12**
Allocation of operators to the dock Semi-trailer is not compatible with the ramp	**10** **5**
Reception of half pallets in bulk	**7**
Shortage of empty pallets	**5**
Damaged pallets	**2**
Excessive motion (tools far away)	**4**
Forgot to charge the handheld device (PDA)	**17**
Forgot to change the ZEBRA frequency	**5**
Barcode integration for products is missing	**7**
Uno does not merge additional loading dock assignments	**6**
Value in Logistics (VL) and shipping boxes (PCB) do not match the physical count	**6**
Dock ramp occupied	**21**
Missing ZEBRA device	**5**
Bundle matching for BC (Bill of Consignment) and BL (Bill of Lading)	**7**
Product returns not compatible with storage	**7**
Allocation of operators for unloading the dock	**19**
Cardboard separation missing	**4**

Source: Elaborated by ourselves, using EXCEL.

- Based on the previous table, we can save a total of 171 minutes of lost time for the 30 receptions. By extrapolating this result and considering an average of 142 receptions per month for 12 months, we can save a significant amount of time, totaling 9,073 minutes or approximately 162 hours of work. This substantial time-saving can be used to allocate resources more effectively, such as redirecting the salary of an operator or assigning them to other valuable tasks.
- Another solution I would like to propose is the automation of docks, where the opening and closing of docks are controlled by the administrative system. By indicating in REFLEX which docks are occupied and which ones are vacant, we can save a significant amount of

time. Additionally, by implementing a time calculator that measures the productivity the OPLs when the dock is open, we can further optimize efficiency.

2. Attempts to improve the order preparation process

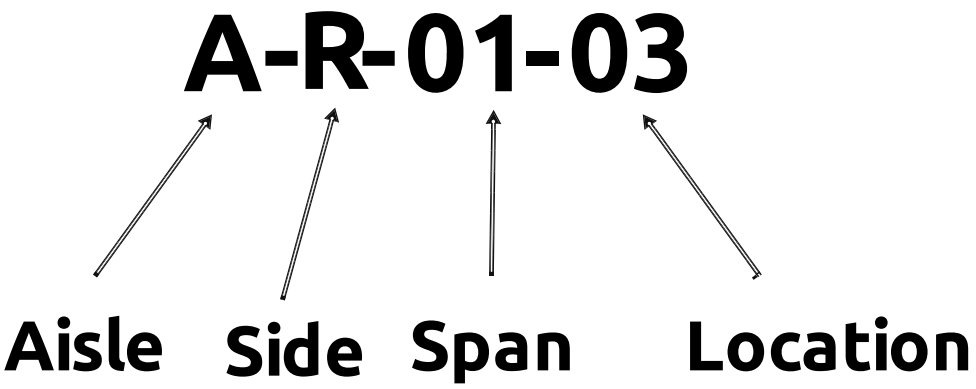
In this part, we aim to optimize the order preparation process by reorganizing the storage space using the ABC method based on three criteria. We also intend to propose a method to minimize the logistics operators' movements during order preparation.

2.1 Minimizing retrieval paths

Refers to the process of reducing the distance or number of trips required for logistics operators to retrieve items from the storage area during order preparation. By organizing the storage space efficiently and strategically placing items based on their importance or demand, to illustrate the impact of different paths on order preparation time, let's consider an example of an order with two different routes. We can analyze the difference between these routes and determine whether the choice of path can minimize the preparation time.

- Before moving on to the example, we need to measure the distances between the preparation area and the aisles of the warehouse. The following table illustrate distances between aisles and preparation area:
- Also, the codification of the storage location:

Figure 3.10: Codification of the storage location.



Source: Elaborated by ourselves.

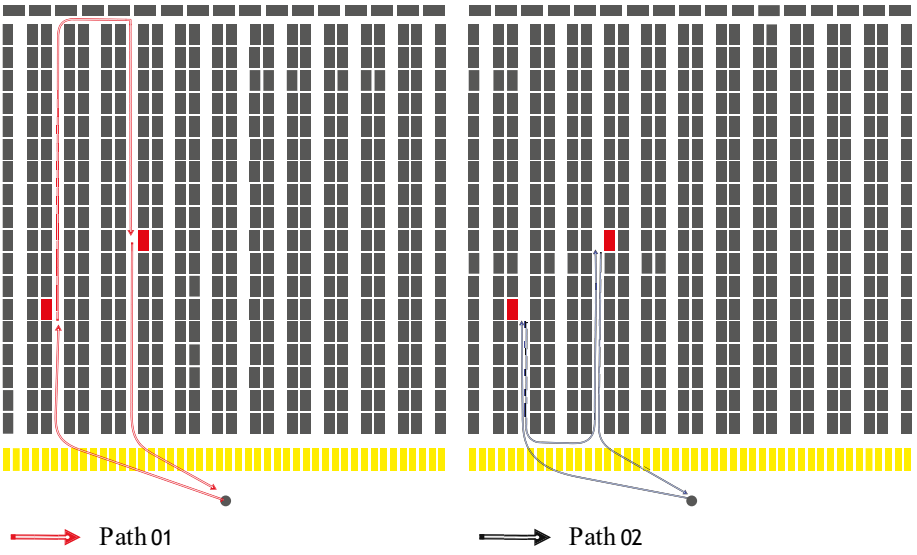
Table 3.17: Distances between different aisles and preparation area.

	Distances in Meters											
	To											
From	A	B	C	D	E	F	G	H	I	J	K	L
Preparation Area	30	25	20	15	10	8	8	10	15	20	25	30

Source: Elaborated by ourselves.

- Here are the distances between the preparation area and the beginning of each Aisle.
- The distance between each Aisle is 6 meters, and the distance between each Span is 3.30 meters.
- Each Aisle has 18 Spans.
- To track an order during its preparation and measure the distance traveled using routes 01 and 02 presented in the following diagram:

Figure 3.11: Example of an order with two different Paths.



Source: Elaborated by ourselves Using Adobe illustrator.

- The red squares represent the picking locations for this order, and they are located in aisle B and span 6, and aisle D and span 9, respectively.

- If we take the path 01, we have:

Preparation Area to Aisle B: 25 meters.

Aisle B to Span 06: 3.3m x 6 = 19.8 m.

Span 06 to Span 18: 3.3m x 12 = 39.6 m.

Aisle B to Aisle D: 6m x 2 = 12 m.

Span 18 to Span 09: 3.3m x 9 = 29.7 m.

Span 09 to Aisle D: 3.3m x 9= 29.7 m.

Aisle D to preparation Area: 15 meters.

Total Path 01 = 170.8 meters.

- If we take the path 02, we have:

Preparation Area to Aisle B: 25 meters.
Aisle B to Span 06: 3.3m x 6 = 19.8 m.
Span 06 to Aisle B: 3.3m x 6 = 19.8 m.
Aisle B to Aisle D: 6m x 2 = 12 m.
Aisle D to Span 09: 3.3m x 9 = 29.7 m.
Span 09 to Aisle D: 3.3m x 9 = 29.7 m.
Aisle D to Preparation Area: 15 meters.
Total Path 02 = 151 meters.

- The path 02 is better than path 01, Then the choice of path minimizes the travel distance for logistics operators and, consequently, reduces the preparation time.

2.2 Reorganizing the storage space

For the reorganization of the storage space, we have opted for an ABC classification based on three criteria: product rotation, product weight, and packaging type. All of this will be explained in the following section using the Pareto method.

The ABC method allows for classifying products into three groups (A, B, C) based on their importance. The objective is to highlight the most critical items rather than focusing on numerous less important ones. This classification of items facilitates warehouse reorganization, and the use of the ABC method is one of the solutions for optimizing order preparation.

The commonly used thresholds are as follows:

- Class "A" represents the percentage of products that account for approximately 80% of UNODIS customer orders.

- Class "B" represents the percentage of products that account for approximately 15% of UNODIS customer orders.

- Class "C" represents the percentage of products that account for approximately 5% of UNODIS customer orders.

In summary, the ABC method enables prioritizing products based on their impact on customer orders, which aids in organizing storage and optimizing order preparation.

To apply the ABC method, we have requested administrative records of shipment flows from 2022 and data from the logistics team leaders for cells 09 and 11, specifically regarding the weight and packaging type of each product. We started with the basic ABC classification, considering product rotation. Since UNODIS has a wide range of products, exceeding 7,000 items, we have taken a sample of 300 products.

Now, let's explain why we are incorporating the additional criteria of weight and packaging type. During the preparation process, it is important to consider the weight and packaging type of each product. It is not feasible to place a heavy product on top of a lighter one, as it could lead to damage or safety concerns. Similarly, products with different packaging types, such as beverages and packaged goods, need to be separated to ensure appropriate handling and storage.

By considering the weight and packaging type alongside product rotation, we aim to address this challenge of organizing the storage space. This holistic approach ensures that the classification takes into account practical considerations during order preparation, preventing issues such as product damage, inefficiencies, and safety risks. Ultimately, the integration of these criteria helps optimize the storage layout and improve the overall logistics process at UNODIS.

- We selected a sample of 220 articles due to the vast number of references. Only a small percentage of the class A items will be covered in this analysis; the remaining class B and class C items are covered in detail in the Annex 10.

Table 3.18: Part of the ABC Classification.

Article No.	Article Label	Rotation	Proportion	Cumulative Proportion	ABC (rotation)	Weight	ABC (Weight)	Packaging	ABC (Packaging)	TOTAL ABC
14006818	SUCRESKOR2	4605	5.33%	5.33%	A	8	B	plastic	A	A B A
14010081	CAFEOSCAR1	2054	2.38%	7.70%	A	5	B	plastic	A	A B A
10000348	CANNCOCACOLA	1932	2.24%	9.94%	A	1.5	C	can	C	A C C
2483	SOSEMIEFARINE	1898	2.20%	12.14%	A	9	B	plastic	A	A B A
14010816	SUCRESKOR10	1800	2.08%	14.22%	A	10	B	plastic	A	A B A
14006504	TAAMICOUSCOUS	1725	2.00%	16.22%	A	12	A	box	B	A A B
91075	VINAIGRECARRE	1546	1.79%	18.00%	A	7	B	plastic	A	A B A
14005600	THIKAFRIK500G	1076	1.24%	19.25%	A	10	B	box	B	A B B
83345	CAFECARAMELISE	974	1.13%	20.38%	A	5	B	plastic	A	A B A
14006494	TAAMIPETITCOU	965	1.12%	21.49%	A	10	B	box	B	A B B
14004608	SKORBLANCMORC	856	0.99%	22.48%	A	7.5	B	box	B	A B B
10001415	COCKTRAISINMU	750	0.87%	23.35%	A	4	C	plastic	A	A C A
10001036	MOUZAIAZESTDE	720	0.83%	24.18%	A	6	B	plastic	A	A B A
10001478	BOISSONROUIBA	713	0.82%	25.01%	A	3.76	C	plastic	A	A C A
10001300	RAISINPETROUI	709	0.82%	25.83%	A	3	C	plastic	A	A C A
14000116	THIKARIZETUVE	680	0.79%	26.62%	A	10	B	box	B	A B B
11002681	BINGOLIQ2.5ANT	648	0.75%	27.37%	A	10	B	box	B	A B B
10001309	ICETEAROUIBA	633	0.73%	28.10%	A	6	B	plastic	A	A B A
10001066	EXCELLENCENECT	632	0.73%	28.83%	A	4.5	C	plastic	A	A C A
11002296	AIGLELIQVAISS	625	0.72%	29.55%	A	7.8	B	box	B	A B B

Source: Elaborated by ourselves, using EXCEL.

- In this classification, we use article rotation as the first criterion, with 20% and 80% as the common rotation points. The primary focus is on weight, where we have set a condition based on weight ranges. Articles weighing between 10 and 15 kg are classified as Class A, those between 5 and 10 kg as Class B, and finally, those weighing less than 5 kg are classified as Class C. This formulation aims to place lighter products on top of heavier ones, thus avoiding damage.
- Regarding packaging type, Class A contains plastic products, which are the strongest and most resilient. Class B involves packaging products in cardboard, and Class C includes cans and glass articles. This classification helps prevent overloading and stacking damages.
- Taking the example of Coca-Cola cans, which are classified as ACC, they are in high demand and have a high rotation rate. They have a lightweight of 1.5 kg and come in flimsy packaging. Therefore, during the preparation of a pallet, it is advisable to place them in the last layer. This way, the heavier items can be placed below to provide stability and avoid potential damage to the lighter Coca-Cola cans.

➢ So, Numilog loses a lot of time during order preparation due to poor warehouse organization. Sometimes, lightweight products are placed first, making stacking impossible and causing significant additional time and even extra pallets.

➢ Poor warehouse organization is not the only problem; there are other issues that we will discuss in the following part.

Among them, there are other problems such as equipment issues. A lack of equipment like PDAs and forklifts leads to significant additional time and even delays during preparation. Secondly, there are preparation errors, including quantity discrepancies and identification errors, among others. Breakage is another issue that cannot be avoided as there may be damages during transportation or even during the preparation process. Additionally, inventory errors occur due to incorrect data entry or counting.

2.3 Suggestions and recommendations

We will endeavor to provide several recommendations, hoping that they prove valuable in enhancing the efficiency and effectiveness of order fulfillment operations.

- Increase the number of machines such as carts, pallet jacks, and PDAs to contribute to the smooth execution of various warehouse tasks, including replenishment and picking.
- Reorganize the picking area using the ABC method to reduce order preparation time.
- Optimize the replenishment of the picking area more effectively to avoid time loss.
- Strengthen the warehouse personnel by recruiting competent new pickers.
- Reorganize the warehouse team by identifying the tasks of each individual. The better employees know their tasks, the faster they will perform.
- Conduct training sessions for the staff to enhance their proficiency in using computer tools like WMS (Warehouse Management System) to improve efficiency.
- Invest in cutting-edge technologies such as RFID for better utilization in the logistics operations.
- Make better use of the various features of the WMS that enable automation and faster management, especially at the docks.
- Optimize the allocation of docks to reduce unnecessary travel and movements.
- Modernize storage infrastructure, for example, by investing in automated storage and retrieval systems or dynamic racks.
- Optimize picking routes and reduce the distances between operators and products.
- Train operators to minimize unnecessary steps in their processes.
- Evaluate different picking methods and choose contemporary approaches like pick-to-light or voice picking.
- Utilize exoskeletons to reduce the physical strain on logistics operators.

- Implement cross-docking techniques, allowing goods to move directly to the shipping area without intermediate storage.

In conclusion, the two processes studied in this section can be more efficient through the implementation of several solutions. However, it is worth noting that additional contributions from interns like us, who are dedicated to this project, could further enhance the overall outcome. By having more interns focused on this initiative.

Conclusion

This chapter provides a comprehensive analysis of two important processes, The analysis of these processes allows us to identify areas for improvement and optimization. By identifying challenges and barriers, we have paved the way for solutions that improve efficiency and effectiveness, all of which saving time.

In conclusion, the results presented in this chapter highlight the importance of continuous improvement and innovation in both processes. By implementing the proposed solutions and recommendations, this improvement leads the company to increased productivity, customer satisfaction and overall success.

General conclusion

The main objective of this study is to optimize the order preparation process for the UNODIS customer, to do this we have chosen to rely on a data collection and calculation tool that is materialized by a documentary study and even of real data of the sample that allowed us to find that:

Order preparation is an activity that has relationships with other processes so the optimization of these processes optimizes this repair of orders among them are the process of receiving products and the process of storage or storage.

Order pickers are usually the most represented employees on logistics platforms. Their job is to manually pick up inventory items and then assemble them for shipment to the customer. therefore, this process requires a great deal of effort on the part of the body, since some operations have several physical constraints: carrying loads, moving with these loads on foot, leaning or extending the trunk with or without loads, etc. Moreover, these operations are repetitive and often carried out at a sustained rate. In our study we try to find solutions optimizes the preparation of orders but also reduces the penetrability of operators.

Our internship in NUMILOG lasts 3 months we have learned a lot, we have the chance to practice real logistics and make the difference between practice and theory,

We can see that the optimization of a process requires seeing the other functions or processes for increasing the level obtained and even for continuous improvement,

The UNODIS customer choice is among the best steps because this folder is the true logistics of detail its where a student learns how to start his professional life.

During this internship, we subtracted the problems that cause delays in the process of receiving and even the preparation of orders we must see on the distances and the paths covered by the logistic operators and even reorganize the warehouses by the method ABC to reduce these travels and minimizes time.

The traineeship we carried out within this company was in order to address the theme of optimizing the process of order preparation for a logistics provider, in order to respond to the problem posed which is **« how to optimize the order preparation process for a logistics provider? »**

Our practical training with NUMILOG/ UNODIS allowed us to collect information needed to answer our questions and thus judge our hypotheses.

So, we confirmed our first hypothesis **« H1: The product receiving process is suboptimal, and Numilog is not achieving its objective due to load disruptions »**. because Numilog does not reach their objectives of receptions this causes delays and involve delays in the process of preparations of commands these delays are caused by disruptions of load therefore it is necessary to settle to reach the result desired. we have found that Numilog loses up to 1070 minutes, and we can get back up to 171minutes if we apply the solutions and recommendations.

After the calculation of the correlation between the number of preparer packages and the preparation time we have to find a significant relationship so we have to confirm our second **« H2: There is a positive correlation between the number of packages prepared and the preparation time ».** the correlation coefficient, r = 0.978, is close to 1, indicating a strong positive correlation between the number of packages to be prepared for each order and the picking time. and we have to find that for each supplementary package there is 12 seconds more on the preparation time.

Finally, we found that Numilog is poorly organize its warehouse and there are axes of improvement among them the ABC rankings with the three criteria that we have proposed We have to overturn our last hypothesis **« H3: Numilog has a good warehouse organization facilitates picking ».** this Reorganization reduce the picking paths and reduces the Hardship of the operators.

During our work we find ourselves faced with problems such as moving to the wilaya de Bouira we also time constraint because 3 months is not enough for analysis these processes for a large company like Numilog,

Finally, it should be said that our research work remains our first experience, a work that has allowed us to deepen our theoretical knowledge and to discover the difficulties of scientific research. even we wanted the professional world.

However, we encourage future students of the next promotions to carry out further research on certain points that have not been addressed so far on this very broad and broad theme to have on the process of receptions it is necessary to DISSECT it because it can be done big changes on him.

We can also propose other lines of research that are:

- How to optimise the product reception process for a logistics provider?

- how to minimise damage in order preparation?

Students can also be encouraged to design a new type of packaging that avoids and minimizes damage.

In conclusion, we hope that this modest research work has achieved its objectives, it has enabled us to deepen our theoretical knowledge already acquired and to put them into practice, and the managers of NOMILOG will take our recommendations into consideration. during the internship several recommendations were applied thanks to your confidence.

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Annexes

List of Annexes

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02	Order of unloading
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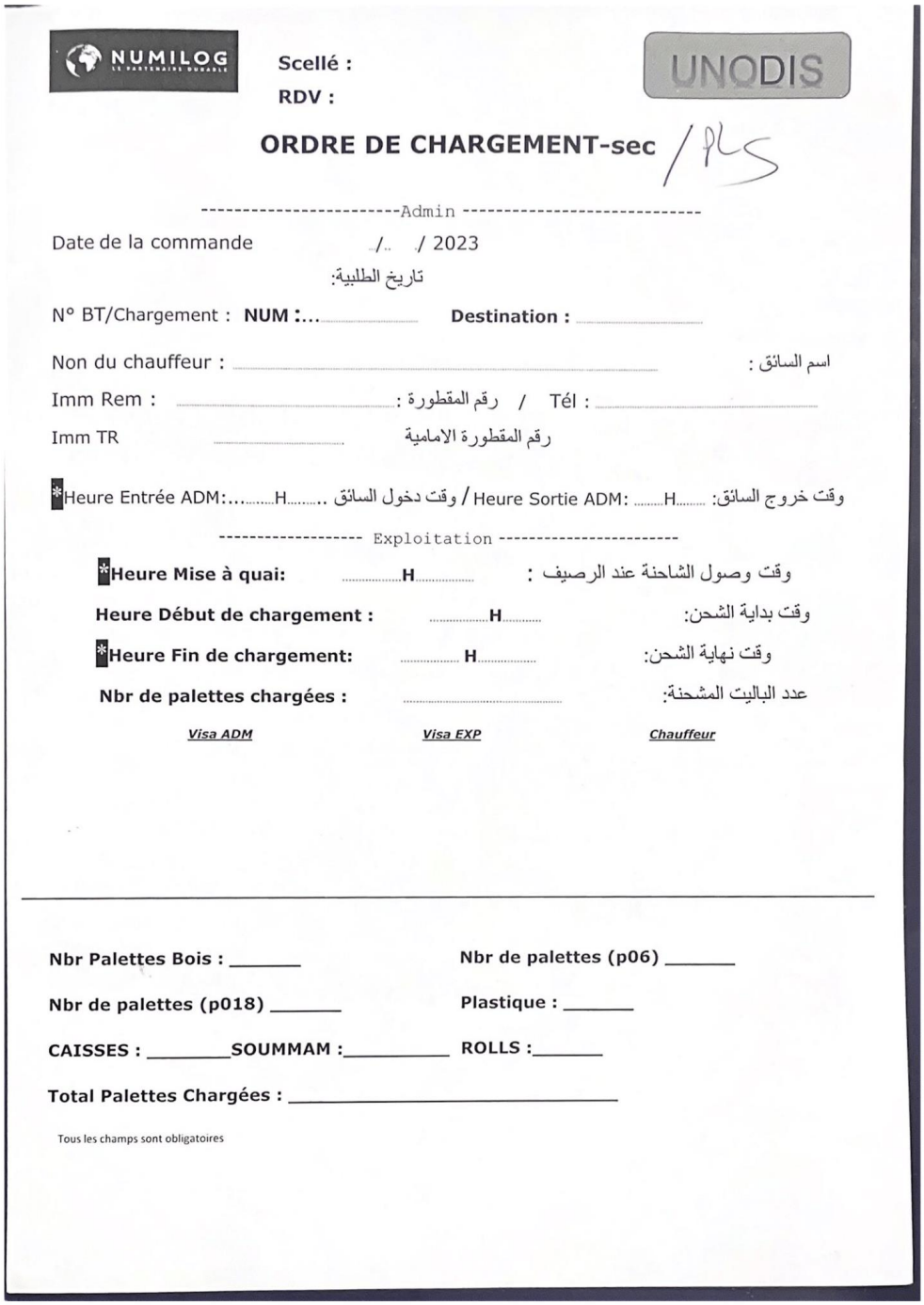
06	Return form
07	Packing list
08	PDA - Personal Digital Assistant
09	Handling equipment
10	ABC classification for 220 items

Annex 01: Order of loading



NUMILOG

Scellé :

RDV :

UNODIS

ORDRE DE CHARGEMENT-sec /PLS

----------Admin ----------

Date de la commande ../.. ./ 2023

تاريخ الطلبية:

N° BT/Chargement : **NUM :**..... **Destination :** .....

Non du chauffeur : ..... اسم السائق :

Imm Rem : ..... رقم المقطورة : / Tél : .....

Imm TR ..... رقم المقطورة الامامية

*Heure Entrée ADM:.....H..... وقت دخول السائق / Heure Sortie ADM: .....H..... وقت خروج السائق:

---------- Exploitation ----------

***Heure Mise à quai:** .....H..... وقت وصول الشاحنة عند الرصيف :

Heure Début de chargement : .....H..... وقت بداية الشحن:

***Heure Fin de chargement:** .....H..... وقت نهاية الشحن:

Nbr de palettes chargées : ..... عدد الباليت المشحنة:

Visa ADM ***Visa EXP*** ***Chauffeur***

Nbr Palettes Bois : _____ **Nbr de palettes (p06)** _____

Nbr de palettes (p018) _____ **Plastique :** _____

CAISSES : _____**SOUMMAM :**_____ **ROLLS :**_____

Total Palettes Chargées : _____

Tous les champs sont obligatoires

NUMILOG

UNODIS

Vérification des camions/Cellule et de leur contenu

QUALITE & SECURITE DES ALIMENTS : Déchargement / Chargement/ des Camions / Cellule

En cas de non-conformité, pas de chargement (déchargement en zone de blocage), et prévenir les responsables opérationnels

Température :

Numéro de plombage :

- Notification du numéro de plomb du camion/ container :
- Notification du numéro de plomb noté sur le bon de Livraison :

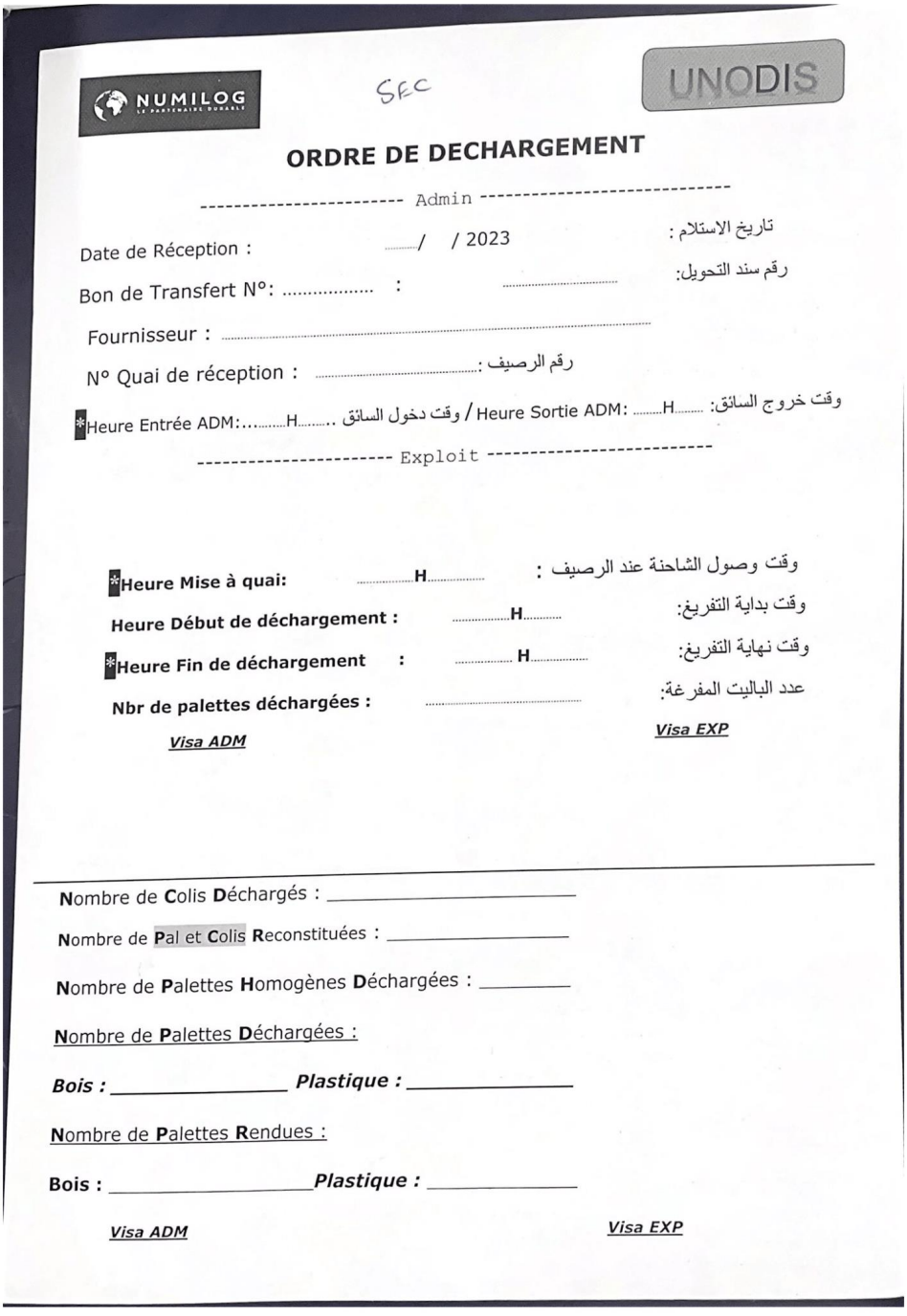
Critères		Conforme	Non Conforme
Hygiène du camion ou du container	Absence de corps étrangers, de verre, de déchets, d'insectes, odeurs…		
Etat du plancher	Bonne intégrité et pas de morceaux de bois qui sort du plancher Absence de trace d'eau, d'huile ou autres produits sur le plancher		
Etat des plafonniers	Plafonnier intègre et non cassé, pas de trace de fuite d'eau		
Etat des parois	Propreté et Absence de trace d'eau, d'huile ou autres produits sur les parois		
Conformité chargement	Absence de produits à risque dans le chargement (produits chimiques, allergènes, produits à détruire)		
Température	Std température Transport		
Câble de tire	Présence câble de tire		

QUALITE & SECURITE DES ALIMENTS : Réception des Palettes et Colis

En cas de non-conformité, pas de déchargement, et prévenir le responsable opérationnel

Critères		Conforme	Non conforme
Hygiène des palettes	Absence de corps étrangers, poussière, d'humidité, de moisissures, de salissures. Plots et traverses en bon état.		
Etat des colis	Caisses en bon état, intègre, non gondolé, non troué, non arraché, absence de moisissures et de salissures		
Traçabilité	Présence Fiches palette		
Traçabilité	Concordance des informations de la fiche palette et des étiquettes colis : DLC, SSCC		

Annex 02: Order of unloading



NUMILOG

SEC

UNODIS

ORDRE DE DECHARGEMENT

---------- Admin ----------

Date de Réception : ...../ / 2023 تاريخ الاستلام :

Bon de Transfert N°: ..... : ..... رقم سند التحويل:

Fournisseur : .....

N° Quai de réception : .....: رقم الرصيف

*Heure Entrée ADM:.....H..... وقت دخول السائق / Heure Sortie ADM: .....H..... وقت خروج السائق:

---------- Exploit ----------

*Heure Mise à quai: .....H..... وقت وصول الشاحنة عند الرصيف :

Heure Début de déchargement : .....H..... وقت بداية التفريغ:

*Heure Fin de déchargement : .....H..... وقت نهاية التفريغ:

Nbr de palettes déchargées : ..... عدد البالیت المفرغة:

Visa ADM *Visa EXP*

Nombre de Colis Déchargés : _____

Nombre de Pal et Colis Reconstituées : _____

Nombre de Palettes Homogènes Déchargées : _____

Nombre de Palettes Déchargées :

Bois : _____ *Plastique :* _____

Nombre de Palettes Rendues :

Bois : _____ *Plastique :* _____

Visa ADM *Visa EXP*

NUMILOG

UNODIS

Vérification des camions/Cellule et de leur contenu

QUALITE & SECURITE DES ALIMENTS : Déchargement / Chargement/ des Camions / Cellule

En cas de non-conformité, pas de chargement (déchargement en zone de blocage), et prévenir les responsables opérationnels

Température :

Numéro de plombage :

- Notification du numéro de plomb du camion/ container :
- Notification du numéro de plomb noté sur le bon de Livraison :

Critères		Conforme	Non Conforme
Hygiène du camion ou du container	Absence de corps étrangers, de verre, de déchets, d'insectes, odeurs…		
Etat du plancher	Bonne intégrité et pas de morceaux de bois qui sort du plancher Absence de trace d'eau, d'huile ou autres produits sur le plancher		
Etat des plafonniers	Plafonnier intègre et non cassé, pas de trace de fuite d'eau		
Etat des parois	Propreté et Absence de trace d'eau, d'huile ou autres produits sur les parois		
Conformité chargement	Absence de produits à risque dans le chargement (produits chimiques, allergènes, produits à détruire)		
Température	Std température Transport		
Câble de tire	Présence câble de tire		

QUALITE & SECURITE DES ALIMENTS : Réception des Palettes et Colis

En cas de non-conformité, pas de déchargement, et prévenir le responsable opérationnel

Critères		Conforme	Non conforme
Hygiène des palettes	Absence de corps étrangers, poussière, d'humidité, de moisissures, de salissures. Plots et traverses en bon état.		
Etat des colis	Caisses en bon état, intègre, non gondolé, non troué, non arraché, absence de moisissures et de salissures		
Traçabilité	Présence Fiches palette		
Traçabilité	Concordance des informations de la fiche palette et des étiquettes colis : DLC, SSCC		

/! \ Remarques : /!

Admini

Administration exploitation logistique -PLFBOUIRA
Dossier UNODIS
BD/REF : 2023

Déstinataire

Sce Facturation UNODIS SPA
PLF Bouira

Nous vous prions de trouver ci-joint :Liasses fournisseurs : ***21/02/2023***

Date de Réception	*Code fr*	*Fournisseur*	*N° Commande*
21/02/2023	*2987*	*CONFITA-PLUS*	*67961*
21/02/2023	*1715*	*LES MOULINS*	*67893*
21/02/2023	*2609*	*WAM FOOD*	*67964*
21/02/2023	*3064*	*BEN DIST*	*68021*
21/02/2023	*1585*	*BERIA MENAGE*	*68024*
21/02/2023	1786	*GARDEN CLEAN*	68022/68023

dministration exploitation logistique
Bouira le : 21/02/2023

NUMILOG SPA
21 FEV. 2023
EXPEDITION UNODIS

Accusé de réception
Date /signature

SPA UNODIS
Entrepôt Bouira
22 FEV. 2023
Service Comptabilité Matière et Fournisseur
Accusé de Réception

Annex 03: List of supplier bundles

Annex 04: Delivery note



SNC BISCUITERIE SAF KIFFAN
HAI EL BADR BOUDOUAOU BOUMERDES
BOUMERDES

N° RC :35/00-0974681B 07 N° Art :35025538804 N° IF...:000716097468164

DOIT :

le, 05/03/2023

SPA UNODIS

ILOT D ZONE 06 GARIDI KOUBA,KOUBA,ALGER

N° RC :16/00-1050207 B22

N.I.F :002216105020795

BON DE LIVRAISON N°00097/2023

PAGE :1

N°	REF	DESIGNATION	QTE	P.U HT	Montant HT	TVA		Montant TTC
						Taux %	Montant	
1	1018388708813	PAIN BURGER 6pièces	228	75.00	17 100.00	0	0.00	17 100.00
2	1020260058091	PAIN DE MIE 400gr	360	85.00	30 600.00	0	0.00	30 600.00
3	1019117912860	PAIN COMPLET 400gr	243	95.00	23 085.00	0	0.00	23 085.00
4	1013059581634	PAIN PANINI 4pièces	60	75.00	4 500.00	0	0.00	4 500.00
5	1000051870255	HOT DOG 2pièces	120	28.00	3 360.00	0	0.00	3 360.00
6	1020985831610	HOT DOG 5pléces	108	60.00	6 480.00	0	0.00	6 480.00
7	1000051829178	PAIN BURGER 3pièces	117	50.00	5 850.00	0	0.00	5 850.00
8	1004159952066	PAIN BURGER 1pièces	135	18.00	2 430.00	0	0.00	2 430.00
9	1019455053478	PAIN CMPLET A LA VOINE 500gr	216	125.00	27 000.00	0	0.00	27 000.00

NUMILOG SPA
06 MARS 2023
RECEPTION UNODIS

TOTAL	120 405.00
REMISE	0.00
TOTAL HT	120 405.00
TVA	0.00
TIMBRE	0.00
TOTAL TTC	120 405.00

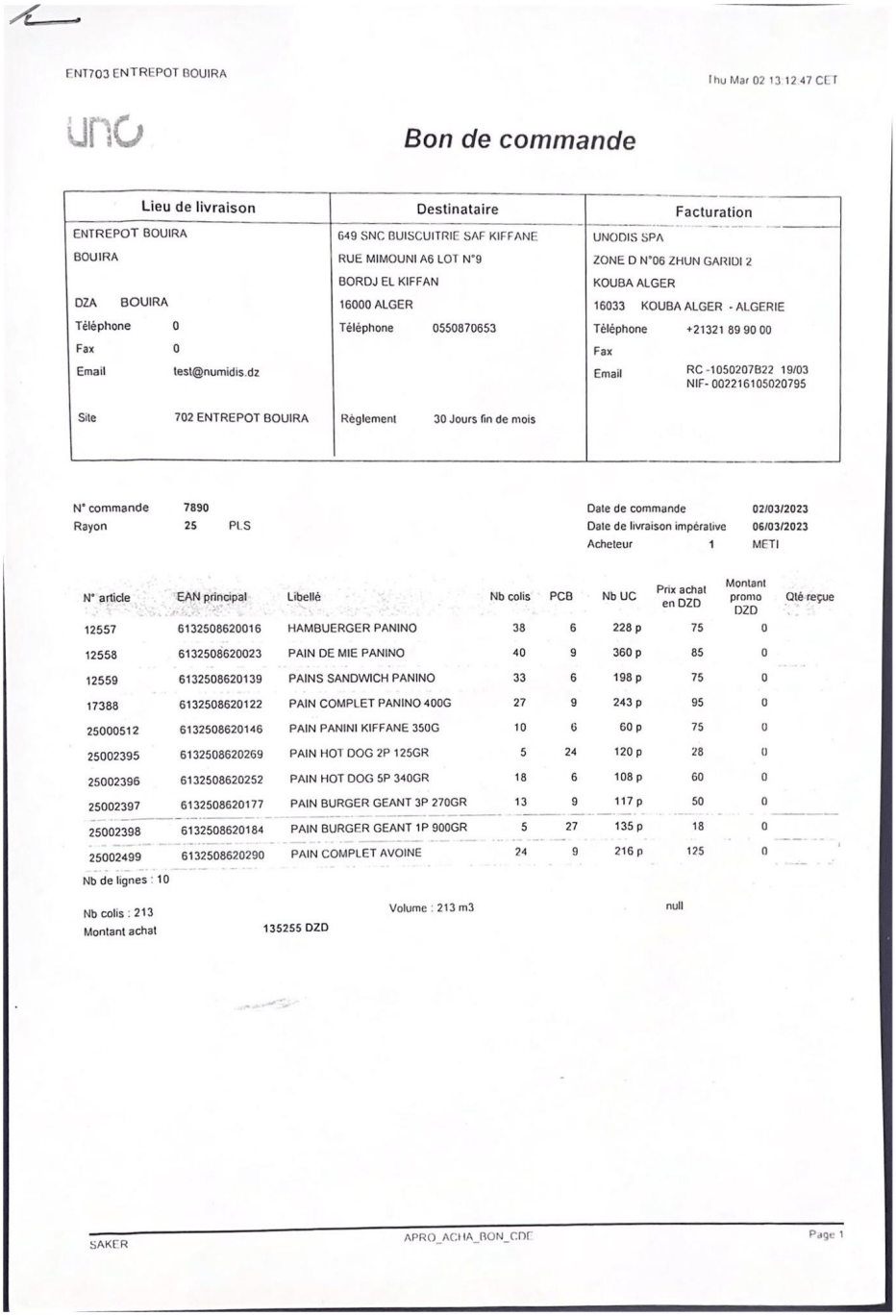
Mode de payement : ESPECE

Arrêter le présent bon de livraison à la somme de :

CENT VINGT MILLE QUATRE CENT CINQ DINARS

SNC BISCUITERIE SAF KIFFAN
Fabrication Patisserie & Produits de Boulangerie Industrielle
El Badr Boudouaou
BOUMERDES
RC 07 B 0974681 -35/00

Annex 05: Order form



ENT703 ENTREPOT BOUIRA

Thu Mar 02 13:12:47 CET

Bon de commande

Lieu de livraison	Destinataire	Facturation
ENTREPOT BOUIRA	649 SNC BUISCUITRIE SAF KIFFANE	UNODIS SPA
BOUIRA	RUE MIMOUNI A6 LOT N°9	ZONE D N°06 ZHUN GARIDI 2
	BORDJ EL KIFFAN	KOUBA ALGER
DZA BOUIRA	16000 ALGER	16033 KOUBA ALGER - ALGERIE
Téléphone 0	Téléphone 0550870653	Téléphone +21321 89 90 00
Fax 0		Fax
Email test@numidis.dz		Email RC -1050207B22 19/03 NIF- 002216105020795
Site 702 ENTREPOT BOUIRA	Règlement 30 Jours fin de mois	

N° commande **7890**
Rayon **25** PLS

Date de commande **02/03/2023**
Date de livraison impérative **06/03/2023**
Acheteur **1** METI

N° article	EAN principal	Libellé	Nb colis	PCB	Nb UC	Prix achat en DZD	Montant promo DZD	Qté reçue
12557	6132508620016	HAMBUERGER PANINO	38	6	228 p	75	0	
12558	6132508620023	PAIN DE MIE PANINO	40	9	360 p	85	0	
12559	6132508620139	PAINS SANDWICH PANINO	33	6	198 p	75	0	
17388	6132508620122	PAIN COMPLET PANINO 400G	27	9	243 p	95	0	
25000512	6132508620146	PAIN PANINI KIFFANE 350G	10	6	60 p	75	0	
25002395	6132508620269	PAIN HOT DOG 2P 125GR	5	24	120 p	28	0	
25002396	6132508620252	PAIN HOT DOG 5P 340GR	18	6	108 p	60	0	
25002397	6132508620177	PAIN BURGER GEANT 3P 270GR	13	9	117 p	50	0	
25002398	6132508620184	PAIN BURGER GEANT 1P 900GR	5	27	135 p	18	0	
25002499	6132508620290	PAIN COMPLET AVOINE	24	9	216 p	125	0	

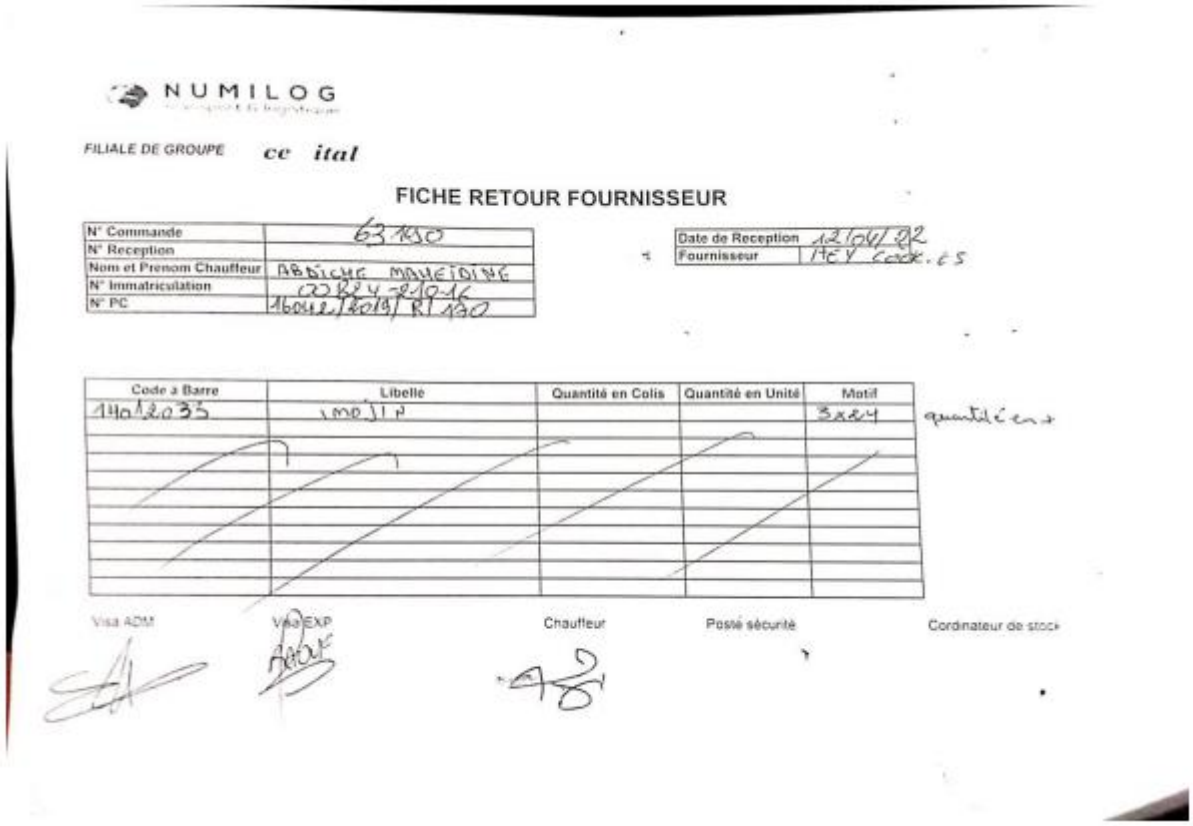
Nb de lignes : 10

Nb colis : 213 Volume : 213 m3 null

Montant achat **135255 DZD**

SAKER APRO_ACHA_BON_CDE Page 1

Annex 06: Return form



NUMILOG

FILIALE DE GROUPE ce ital

FICHE RETOUR FOURNISSEUR

N° Commande	63 1130
N° Reception	
Nom et Prenom Chauffeur	ABDICHE MAHEIDINE
N° Immatriculation	00 R 24 - 210 - 16
N° PC	16042/2019/ R/ 170

Date de Reception	12/04/22
Fournisseur	HEY Cook. ES

Code a Barre	Libelle	Quantité en Colis	Quantité en Unité	Motif	
14012033	IMOJIP			3x24	quantité en +

Visa ADM Visa EXP Chauffeur Posté sécurité Cordinateur de stock

Annex 07: Packing list



Liste de Colisage
Support N° 015120000001306928

sam. 16/04/202: 15:29:38 Page 1 sur 1
Edité par Noureddine ALIK

Expéditeur
NUMILOG BOUIRA
ROUTE DE NESSIS-OULED BOUTOULA
LOT 13 GROUPE 340
10000 BOUIRA - ALGERIE

Client
MAG UNO BAB EZZOUAR
0
ALGER

Chargement
NUM016 du 14/04/2022

Type de support : P01 - PALETTE 1000*1200
Poids brut : 0,274 Kg
Sous-Rayon : 100

Ref Cde	Ref Client	Article	VL	Libellé	Identifiant	Propriétaire	Qualité	Qté en VL de base	Lot	Date d'ordo	Numéro de serie
000002110	00000418	7034	02	E PL LALA KHEDIDJA 0 5L	6130234001161	NUM	STD	456		01/03/2023	
000002110	00000418	10001575	58	EAU MINERALE GUEDILA	6130758000121	NUM	STD	12		01/03/2023	
000002110	00000418	1148	58	EAU MINERALE GUEDILA	6130758000015	NUM	STD	12		03/03/2023	
000002110	00000418	10001574	58	EAU MINERALE GUEDILA	6130758000176	NUM	STD	12		01/03/2023	
000002110	00000418	10001573	58	EAU MINERALE GUEDILA	6130758000053	NUM	STD	12		01/02/2023	
000002110	00000418	10001576	58	EAU MINERALE GUEDILA	6130758000077	NUM	STD	6		10/11/2023	
000002110	00000434	25000636	58	SOUMY FRAISE 200ML	6130760003806	NUM	STD	960		02/06/2022	
							Total	1 470			

***** FIN DE LISTE DE COLISAGE *****

Annex 08: PDA - Personal Digital Assistant



Annex 09: Handling equipment







Annex 10: ABC classification for 220 items

Article No.	Article Label	Rotation	Proportion	Cumulative Proportion	ABC (rotation)	Weight	ABC (Weight)	Packaging	ABC (Packaging)	TOTAL ABC
14006818	SUCRESKOR2	4605	5.33%	5.33%	A	8	B	plastic	A	ABA
14010081	CAFEOSCAR1	2054	2.38%	7.70%	A	5	B	plastic	A	ABA
10000348	CANNCOCACOLA	1932	2.24%	9.94%	A	1.5	C	can	C	ACC
2483	SOSEMIEFARINE	1898	2.20%	12.14%	A	9	B	plastic	A	ABA
14010816	SUCRESKOR10	1800	2.08%	14.22%	A	10	B	plastic	A	ABA
14006504	TAAMICOUSCOUS	1725	2.00%	16.22%	A	12	A	box	B	AAB
91075	VINAIGRECARRE	1546	1.79%	18.00%	A	7	B	plastic	A	ABA
14005600	THIKAFRIK500G	1076	1.24%	19.25%	A	10	B	box	B	ABB
83345	CAFECARAMELISE	974	1.13%	20.38%	A	5	B	plastic	A	ABA
14006494	TAAMIPETITCOU	965	1.12%	21.49%	A	10	B	box	B	ABB
14004608	SKORBLANCMORC	856	0.99%	22.48%	A	7.5	B	box	B	ABB
10001415	COCKTRAISINMU	750	0.87%	23.35%	A	4	C	plastic	A	ACA
10001036	MOUZAIAZESTDE	720	0.83%	24.18%	A	6	B	plastic	A	ABA
10001478	BOISSONROUIBA	713	0.82%	25.01%	A	3.76	C	plastic	A	ACA
10001300	RAISINPETROUI	709	0.82%	25.83%	A	3	C	plastic	A	ACA
14000116	THIKARIZETUVE	680	0.79%	26.62%	A	10	B	box	B	ABB
11002681	BINGOLIQ2.5ANT	648	0.75%	27.37%	A	10	B	box	B	ABB
10001309	ICETEAROUIBA	633	0.73%	28.10%	A	6	B	plastic	A	ABA
10001066	EXCELLENCENECT	632	0.73%	28.83%	A	4.5	C	plastic	A	ACA
11002296	AIGLELIQVAISS	625	0.72%	29.55%	A	7.8	B	box	B	ABB
11002160	AMIRJAVEL130	623	0.72%	30.27%	A	12	A	box	B	AAB
96211	SODACOCACANN	610	0.71%	30.98%	A	7.92	B	can	C	ABC
10001056	BOISSTCHINAPE	610	0.71%	31.68%	A	1.44	C	can	C	ACC
14007801	CROXCHIPSCORN	609	0.70%	32.39%	A	0.84	C	box	B	ACB
10000924	BOISORANGEPE	604	0.70%	33.09%	A	3.96	C	plastic	A	ACA
14008989	VINAIGREBLANC	595	0.69%	33.78%	A	7	B	plastic	A	ABA
10001034	MOUZAIAMENTHE	589	0.68%	34.46%	A	6	B	plastic	A	ABA
10000904	SODALIMONCAN	580	0.67%	35.13%	A	1.5	C	can	C	ACC
104703	BOISSIFRUIT1L	574	0.66%	35.79%	A	6	B	plastic	A	ABA
10000972	IFRUITCITRON1	574	0.66%	36.46%	A	6	B	plastic	A	ABA
11002184	LIFELIQLINGE	561	0.65%	37.11%	A	15	A	box	B	AAB
11002619	BINGOJAVELPER	560	0.65%	37.75%	A	10.8	A	box	B	AAB
14006498	TAAMIPETITPLO	558	0.65%	38.40%	A	10	B	box	B	ABB
14010621	CHIPSTACOS145	557	0.64%	39.04%	A	1	C	box	B	ACB
10000922	BOISORANGEABR	555	0.64%	39.69%	A	3.96	C	plastic	A	ACA
11002180	LIFELIQLINGE	553	0.64%	40.33%	A	12	A	box	B	AAB
10001626	JUSNECTARCITR	550	0.64%	40.96%	A	5.4	B	plastic	A	ABA
10001483	BOISSONROUIBA	549	0.64%	41.60%	A	12	A	plastic	A	AAA
10001152	TAZEJBOISSFRUIT	548	0.63%	42.23%	A	3.99	C	plastic	A	ACA
11002430	BRILEXDEGRAISS	531	0.61%	42.85%	A	12	A	box	B	AAB
3207	MOUTARDEPMSID	530	0.61%	43.46%	A	1.56	C	plastic	A	ACA
11002185	LIFELIQLINGE	527	0.61%	44.07%	A	15	A	box	B	AAB
14009783	TABPURCHOCON	510	0.59%	44.66%	A	1.08	C	box	B	ACB
10001222	MOUZAIAMOJITO	500	0.58%	45.24%	A	4	C	plastic	A	ACA
96172	SODAPEPSI1L	498	0.58%	45.81%	A	6	B	plastic	A	ABA
1414	SIMFARINE5	496	0.57%	46.39%	A	5	B	plastic	A	ABA
11000435	AMIRL.SOLLAV	492	0.57%	46.96%	A	12	A	box	B	AAB
11002177	LIFELIQLINGE	490	0.57%	47.53%	A	12	A	box	B	AAB
10000912	BOISORANGEPE	482	0.56%	48.08%	A	6	B	plastic	A	ABA
1179	NOUARAFLANETU	470	0.54%	48.63%	A	1.2	C	box	B	ACB
10001308	ICETEAROUIBA	468	0.54%	49.17%	A	4.5	C	plastic	A	ACA
10001210	ROUIBACITRONNA	458	0.53%	49.70%	A	12	A	plastic	A	AAA
11002187	LIFELIQLINGE	458	0.53%	50.23%	A	15	A	box	B	AAB
101389	AMIRL.SOLOCEA	456	0.53%	50.76%	A	12	A	box	B	AAB

7692	EAUDEFLEURD	450	0.52%	51.28%	A	6	B	box	B	ABB
10000925	BOISORANGEMAN	440	0.51%	51.79%	A	3.96	C	plastic	A	ACA
10001076	SLIMBOISGAZP	439	0.51%	52.29%	A	4	C	plastic	A	ACA
14008303	BIMOCOOKIESBE	430	0.50%	52.79%	A	4	C	box	B	ACB
14006497	TAAMILANGUEDO	425	0.49%	53.28%	A	10	B	box	B	ABB
10000909	BOISORANGETCH	422	0.49%	53.77%	A	6	B	plastic	A	ABA
75471	SMENMEDINA900	419	0.48%	54.26%	A	7.2	B	box	B	ABB
10000571	SODAPREMIUMOR	418	0.48%	54.74%	A	6	B	plastic	A	ABA
14010019	TABPURCHOCO	410	0.47%	55.21%	A	1.08	C	box	B	ACB
10000161	BOISSIFRUITTR	406	0.47%	55.68%	A	6	B	plastic	A	ABA
14007306	FLEURIALMAYOA	404	0.47%	56.15%	A	4.74	C	box	B	ACB
14006197	PALMARYBISCUIT	400	0.46%	56.61%	A	1.97	C	box	B	ACB
14010519	HUILEFLEURIAL	400	0.46%	57.08%	A	10.8	A	plastic	A	AAA
10001035	MOUZAIAGRENADI	399	0.46%	57.54%	A	6	B	plastic	A	ABA
10000903	SODALIMONCAN	398	0.46%	58.00%	A	1.5	C	can	C	ACC
14002218	FARINESUPERIEU	395	0.46%	58.46%	A	9	B	plastic	A	ABA
11002226	LIQ.LINGEOURSB	390	0.45%	58.91%	A	12	A	box	B	AAB
14007062	MAIMMIAMCHIPS	390	0.45%	59.36%	A	0.33	C	box	B	ACB
3209	VINAIGREAROME	385	0.45%	59.80%	A	6	B	plastic	A	ABA
10000850	CANSLIMANANAS	385	0.45%	60.25%	A	3.76	C	can	C	ACC
10001037	MOUZAIAORANGE	385	0.45%	60.69%	A	6	B	plastic	A	ABA
11002435	BRILEXLIQUIDE	385	0.45%	61.14%	A	8	B	box	B	ABB
14007447	FLEURIALMOUTAR	374	0.43%	61.57%	A	4.2	C	box	B	ACB
10000667	SODAPOMMEVERT	370	0.43%	62.00%	A	6	B	plastic	A	ABA
10001220	BIDONDE6.5LD	369	0.43%	62.43%	A	6.5	B	plastic	A	ABA
11001641	AMIRLAVESOLIA	361	0.42%	62.85%	A	12	A	box	B	AAB
14003773	PATETARTINERW	361	0.42%	63.26%	A	4.2	C	box	B	ACB
11002167	LIFELIQVAISSE	355	0.41%	63.67%	A	12	A	box	B	AAB
10001057	BOISSTCHINAPE	350	0.40%	64.08%	A	2	C	can	C	ACC
11002181	LIFELIQLINGE	345	0.40%	64.48%	A	12	A	box	B	AAB
11001949	BINGOLIQUIDEV	343	0.40%	64.88%	A	9.6	B	box	B	ABB
14006783	KINGPOPSCHOCO	341	0.39%	65.27%	A	2.4	C	box	B	ACB
5494	AIGLEVAISCITR	340	0.39%	65.66%	A	7.74	B	box	B	ABB
11000080	BRILEXLIQVAIS	340	0.39%	66.06%	A	15	A	box	B	AAB
10000146	BOISSONROUIBA	335	0.39%	66.44%	A	6	B	box	B	ABB
11002438	BRILEXLIQUIDE	335	0.39%	66.83%	A	8	B	box	B	ABB
101578	BOISSIFRI1LAU	332	0.38%	67.22%	A	6	B	plastic	A	ABA
14000893	MOUTARDEBOCAL	331	0.38%	67.60%	A	4.08	C	glass	C	ACC
10001074	HAMOUDSIROPCI	330	0.38%	67.98%	A	6	B	plastic	A	ABA
12008998	VENUSEAUMICEL	330	0.38%	68.36%	A	3	C	box	B	ACB
10001011	LIMONBOISSGA	328	0.38%	68.74%	A	6	B	plastic	A	ABA
14004326	TOMATEDCT28T	325	0.38%	69.12%	A	4.8	C	plastic	A	ACA
10000573	SODAPREMIUMOR	320	0.37%	69.49%	A	3.96	C	plastic	A	ACA
14004568	SUCRESKORROUX	319	0.37%	69.86%	A	1	C	plastic	A	ACA
14007718	CONFITUREDELIC	319	0.37%	70.23%	A	3.8	C	plastic	A	ACA
14006573	GARRIDOLENTILL	312	0.36%	70.59%	A	10	B	box	B	ABB
14008463	LAITNURSIECON	312	0.36%	70.95%	A	4.8	C	box	B	ACB
10000674	SODAANANASPRE	300	0.35%	71.30%	A	3.76	C	plastic	A	ACA
10001502	BOISSONTAZEJC	300	0.35%	71.64%	A	12	A	plastic	A	AAA
3210	VINAIGREAROME	296	0.34%	71.99%	A	6	B	plastic	A	ABA
11001344	AMIRGELJAVEL	294	0.34%	72.33%	A	12	A	box	B	AAB
14008471	LAITBLEDILAIT	291	0.34%	72.66%	A	4.2	C	box	B	ACB
101395	AMIRSANILAV1	290	0.34%	73.00%	A	12	A	box	B	AAB
10001142	TAZEJBOISSFRUIT	286	0.33%	73.33%	A	7.5	B	plastic	A	ABA
14003772	PATETARTINERW	282	0.33%	73.65%	A	4	C	box	B	ACB

60681	BOISSRAMYORG.	281	0.33%	75.98%	A	12	A	plastic	A	AAA
96369	BISCUITSSECCR	280	0.32%	74.30%	A	1	C	box	B	ACB
10001387	SIROPDELICIAS	280	0.32%	74.63%	A	6	B	box	B	ABB
90910	CONFITUREDABR	279	0.32%	74.95%	A	9.6	B	box	B	ABB
14006799	RIZTHAIETUVE	278	0.32%	75.27%	A	10	B	box	B	ABB
14006797	THIKASEL900G	277	0.32%	75.59%	A	10	B	plastic	A	ABA
11002182	LIFELIQLINGE	272	0.31%	75.91%	A	12	A	box	B	AAB
11002176	LIFELINGENOIR	270	0.31%	76.22%	A	12	A	box	B	AAB
70979	AIGLEDECAPFOU	267	0.31%	76.53%	A	6	B	box	B	ABB
14000053	thikaseliode	264	0.31%	76.83%	A	10	B	plastic	A	ABA
10000572	SODAPREMIUMAG	260	0.30%	77.14%	A	6	B	plastic	A	ABA
10001081	BOISSTCHINAPE	260	0.30%	77.44%	A	1.5	C	can	C	ACC
10001629	JUSNECTARFRAI	260	0.30%	77.74%	A	5.4	B	plastic	A	ABA
11001952	DORILFLORAUSA	259	0.30%	78.04%	A	13.2	A	box	B	AAB
11002675	SWIFJAVEL1.8L	255	0.30%	78.33%	A	10.8	A	box	B	AAB
11002313	AIGLEDAPEFOU	252	0.29%	78.62%	A	11.4	A	box	B	AAB
99854	CONCENTREDETO	250	0.29%	78.91%	A	4.8	C	box	B	ACB
10000670	SODAFRAMBOISE	250	0.29%	79.20%	A	6	B	plastic	A	ABA
10001523	JUSDERAISINI	250	0.29%	79.49%	A	3	C	plastic	A	ACA
11000079	BRILEXLIQVAIS	250	0.29%	79.78%	A	7.8	B	box	B	ABB
11002429	BRILEXANTICALC	250	0.29%	80.07%	B	12	A	box	B	BAB
14004095	TOMATEDCT28C	250	0.29%	80.36%	B	9.6	B	box	B	BBB
14005288	TOMATEDCTRACH	250	0.29%	80.65%	B	9.6	B	box	B	BBB
10001144	TAZEJBOISSFRUIT	244	0.28%	80.93%	B	7.5	B	plastic	A	BBA
10000574	SODAPREMIUMAG	242	0.28%	81.21%	B	3.96	C	plastic	A	BCA
4104	POISCHICHE125	240	0.28%	81.49%	B	10	B	box	B	BBB
10001396	WATERFRUITSRA	240	0.28%	81.77%	B	6	B	plastic	A	BBA
11002408	BRILEXJAVELMO	240	0.28%	82.04%	B	10.8	A	box	B	BAB
14000015	NEWBELWAFI	238	0.28%	82.32%	B	2.4	C	box	B	BCB
10000669	SODACITRONPRE	235	0.27%	82.59%	B	6	B	plastic	A	BBA
14006541	CROXCHIPSPOTA	235	0.27%	82.86%	B	0.84	C	box	B	BCB
11002437	BRILEXLIQUIDE	233	0.27%	83.13%	B	8	B	box	B	BBB
12010514	LIFELAVEMAIN	232	0.27%	83.40%	B	12	A	box	B	BAB
96208	SODAFANTAFRAI	230	0.27%	83.67%	B	8	B	can	C	BBC
11002178	LIFELIQLINGE	229	0.26%	83.93%	B	12	A	box	B	BAB
11002227	LIQ.LINGEOURSB	228	0.26%	84.20%	B	12	A	box	B	BAB
11001426	AMIRLAVESOLP	227	0.26%	84.46%	B	12	A	box	B	BAB
11001343	AMIRJAVELCALS	226	0.26%	84.72%	B	12	A	box	B	BAB
1171	NOUARAFLANETU	225	0.26%	84.98%	B	1.2	C	plastic	A	BCA
50878	AIGLETOPSOLL	225	0.26%	85.24%	B	12	A	box	B	BAB
10001613	EAUBENHAROUNE	225	0.26%	85.50%	B	6	B	plastic	A	BBA
14000018	GRANDEVIE125G	225	0.26%	85.76%	B	2.4	C	box	B	BCB
10001574	EAUMINERALEGU	224	0.26%	86.02%	B	3.76	C	plastic	A	BCA
14004849	MAXONPATETART	222	0.26%	86.28%	B	2.4	C	box	B	BCB
10000354	EXCELLEGRENADE	220	0.25%	86.53%	B	4.5	C	plastic	A	BCA
14002802	RISOTTO1	220	0.25%	86.79%	B	10	B	box	B	BBB
60689	BOISSRAMYANAN	219	0.25%	87.04%	B	5.76	B	can	C	BBC
99887	DORIFLORDETERG	216	0.25%	87.29%	B	10	B	box	B	BBB
11002406	BINGOLESSIVEC	216	0.25%	87.54%	B	10.8	A	box	B	BAB
10000671	SODACITRONPRE	215	0.25%	87.79%	B	4	C	plastic	A	BCA
90906	TOMATE0.22SIM	210	0.24%	88.03%	B	9.36	B	box	B	BBB
10001178	SIROPDELICIAS	208	0.24%	88.27%	B	6	B	box	B	BBB
10001287	WATERFRUITS33	205	0.24%	88.51%	B	3.9	C	plastic	A	BCA
10001397	WATERFRUITSRA	205	0.24%	88.75%	B	6	B	plastic	A	BBA
96233	NECTROUIBAMAN	203	0.23%	88.98%	B	6	B	box	B	BBB
11002684	BINGOAMAIN75	203	0.23%	89.22%	B	9	B	box	B	BBB

10001388	SIROPDELICIAS	202	0.23%	89.45%	B	6	B	box	B	BBB
11002597	DORILFLORLIQL	201	0.23%	89.68%	B	10	B	box	B	BBB
11841	NOARASACHETFL	200	0.23%	89.91%	B	7	B	box	B	BBB
10000798	SODAPOMMECARA	200	0.23%	90.15%	B	3.76	C	plastic	A	BCA
10001524	JUSDEMANDACA	200	0.23%	90.38%	B	3	C	plastic	A	BCA
11002617	BINGOLIQVAIS	200	0.23%	90.61%	B	14.44	A	box	B	BAB
76127	BOISSRAMY1LPE	198	0.23%	90.84%	B	6	B	box	B	BBB
12008649	DOREXPACKSAV	194	0.22%	91.06%	B	6	B	box	B	BBB
11001974	BINGOMATIC2.5	193	0.22%	91.29%	B	10	B	box	B	BBB
10001096	BONASODAORANG	190	0.22%	91.50%	B	6	B	plastic	A	BBA
11002228	LIQ.LINGEOURS	190	0.22%	91.72%	B	12	A	box	B	BAB
11002139	TOPSOLPASSION	188	0.22%	91.94%	B	12	A	box	B	BAB
96234	BOISSROUIBACO	187	0.22%	92.16%	B	6	B	box	B	BBB
96232	PURJROUIBAORA	186	0.22%	92.37%	B	6	B	box	B	BBB
5498	AIGLESANITOPL	185	0.21%	92.59%	B	10.2	A	box	B	BAB
90911	CONFITUREDABR	185	0.21%	92.80%	B	9.6	B	box	B	BBB
11002658	LIFELIQUIDEVA	185	0.21%	93.02%	B	7.8	B	box	B	BBB
12007181	PACKSAVONLIQ	182	0.21%	93.23%	B	6	B	box	B	BBB
78770	VINAIGRESIDNA	180	0.21%	93.43%	B	8	B	plastic	A	BBA
11000876	AMIRLAVESOL1	179	0.21%	93.64%	B	12	A	box	B	BAB
11001922	LIQUIDEVAISSEL	178	0.21%	93.85%	B	7.32	B	box	B	BBB
96235	BOISSROUIBAOR	176	0.20%	94.05%	B	12	A	box	B	BAB
11002141	TOPSOLAZUR1L	175	0.20%	94.25%	B	12	A	box	B	BAB
12008651	DOREXPACKSAV	174	0.20%	94.46%	B	6	B	box	B	BBB
1527	SODASLIMORANG	170	0.20%	94.65%	B	6	B	plastic	A	BBA
50879	AIGLETOPSOLR	170	0.20%	94.85%	B	12	A	box	B	BAB
10000797	SODAPOMMECARA	170	0.20%	95.05%	C	6	B	plastic	A	CBA
2069	BISCUITFOURRE	165	0.19%	95.24%	C	3.5	C	box	B	CCB
6988	EXCELENCEVEGEC	165	0.19%	95.43%	C	5	B	box	B	CBB
8000	BOISSRAMYORAN	165	0.19%	95.62%	C	7.5	B	plastic	A	CBA
101398	AMIRSANIBONRO	165	0.19%	95.81%	C	12	A	box	B	CAB
11001392	AIGLEJAVEL2LPRO	165	0.19%	96.00%	C	12	A	box	B	CAB
11002442	BRILEXDEGRAISS	165	0.19%	96.19%	C	9.75	B	box	B	CBB
49919	VINAIGRLEBLED	160	0.19%	96.38%	C	7	B	plastic	A	CBA
10000321	EXCELLENCEPUR	160	0.19%	96.56%	C	4.5	C	plastic	A	CCA
11002138	TOPSOLVIOLET	160	0.19%	96.75%	C	12	A	box	B	CAB
10000676	SODAFRAMBOISE	159	0.18%	96.93%	C	3.96	C	plastic	A	CCA
2107	LAHCOUSDEBIO	157	0.18%	97.11%	C	10	B	plastic	A	CBA
101390	AMIRSANIOCEAN	157	0.18%	97.29%	C	12	A	box	B	CAB
11000161	COPHYDSTOPINS	155	0.18%	97.47%	C	4.5	C	box	B	CCB
11000429	AIGLEGELDETAR	155	0.18%	97.65%	C	8.4	B	box	B	CBB
12460	TESTJAVELREGU	152	0.18%	97.83%	C	10.8	A	box	B	CAB
90914	DCTOMATESIM4	150	0.17%	98.00%	C	9.6	B	box	B	CBB
10000673	SODAPOMMEVERT	150	0.17%	98.18%	C	3.96	C	plastic	A	CCA
101391	AMIRSANIRSE1	149	0.17%	98.35%	C	12	A	box	B	CAB
11001345	AMIRGELJAVEL	149	0.17%	98.52%	C	11.04	A	box	B	CAB
1644	SELDECUISINE	147	0.17%	98.69%	C	15	A	box	B	CAB
1551	ISSERDELICECA	146	0.17%	98.86%	C	4.44	C	box	B	CCB
11000174	DORIFLORDLING	146	0.17%	99.03%	C	12	A	box	B	CAB
11000918	E.JAVELDOZ0.	144	0.17%	99.19%	C	10.8	A	box	B	CAB
103285	BOISSRAMY240ML	140	0.16%	99.36%	C	6	B	can	C	CBC
10000251	BOISSONPECHE	140	0.16%	99.52%	C	6	B	plastic	A	CBA
10001383	BOISSONRAMYCAN	140	0.16%	99.68%	C	7	B	can	C	CBC
10001384	BOISSRAMYCANC	139	0.16%	99.84%	C	6	B	can	C	CBC
63880	BOISSRAMYMAND	137	0.16%	100.00%	C	6	B	box	B	CBB

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