Implementation of lean manufacturing in a pharmaceutical distribution center: a case study

Implementação do lean manufacturing em um centro de distribuição farmacêutica: um estudo de caso

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ABSTRACT
The present work aims to provide a brief case study of a distribution center of a major Brazilian pharmaceutical retail company. Initially, a quick literature review is presented regarding the fundamental concepts of Logistics, as well as its primary activities according to the most traditional literature, the concept of a distribution center, and the important characteristics for its proper functioning, and finally, the delimitation of the lean philosophy, elucidating key points to be used in its implementation. The study showed that, within a context of continuous improvements, lean practices implemented in production, such as VSM, are a powerful tool for diagnosing and repairing deviations. Thus, it is understood that the lean logistics philosophy is indeed key to the proper functioning of companies in general, especially for large distribution centers, whose merchandise flow depends on robust logistics at the end of the production chain.

Keywords: Lean Philosophy, Distribution Center, Continuous Improvements, Pharmaceutical Retail.

RESUMO
O presente trabalho tem como objetivo apresentar um breve estudo de caso de um centro de distribuição de uma grande empresa varejista farmacêutica brasileira. Inicialmente é apresentada uma rápida revisão de literatura a respeito dos conceitos fundamentais da Logística, bem como suas atividades primárias de acordo com a literatura mais tradicional, o conceito de centro de distribuição, e as características importantes para o seu bom funcionamento, e por fim, a delimitação de a filosofia lean, elucidando pontos-chave a serem utilizados em sua implementação. O estudo mostrou que, num contexto de melhorias contínuas, as práticas lean implementadas na produção, como o VSM, são uma ferramenta poderosa para diagnosticar e reparar desvios. Assim, entende-se que a filosofia da logística enxuta é sim fundamental para o bom funcionamento das empresas em geral, principalmente dos grandes centros de distribuição, cujo fluxo de mercadorias depende de uma logística robusta na ponta da cadeia produtiva.

Palavras-chave: Filosofia Lean, Centro de Distribuição, Melhorias Contínuas, Varejo Farmacêutico.

RESUMEN
El presente trabajo tiene como objetivo proporcionar un breve estudio de caso de un centro de distribución de una importante empresa minorista farmacéutica brasileña. Inicialmente se presenta una rápida revisión bibliográfica respecto de los conceptos fundamentales de la Logística, así como sus actividades primarias según la literatura más tradicional, el concepto de centro de distribución y las características importantes para su
correcto funcionamiento, y finalmente, la delimitación de la filosofía lean, dilucidando los puntos clave que se utilizarán en su implementación. El estudio demostró que, en un contexto de mejora continua, las prácticas lean implementadas en producción, como VSM, son una poderosa herramienta para diagnosticar y reparar desviaciones. Así, se entiende que la filosofía de logística ajustada es efectivamente clave para el buen funcionamiento de las empresas en general, especialmente para los grandes centros de distribución, cuyo flujo de mercancías depende de una logística robusta al final de la cadena de producción.

**Palabras clave:** Filosofía Lean, Centro de Distribución, Mejoras Continuas, Retail Farmacéutico.

### 1 INTRODUCTION

Every day, we experience a growing need for greater efficiency in less time, whether in everyday life, household chores, the efficiency of simple activities, or in the field of commerce, economics, and markets in general. Thus, the study of methods and techniques capable of simplifying and optimizing from such simple activities to the most complex projects becomes extremely relevant, achieving the same final quality but in less time.

The theme of this work revolves around verifying the gains proposed by Lean Logistics in a logistical support Distribution Center of a pharmaceutical retail company. As a starting point, our research problem seeks to find the answer to what gains are obtained with the application of lean methodology in the Distribution Center of a pharmaceutical company and how this can impact the company's logistical success.

This study aims to conduct a case study of the Distribution Center (DC) of a large Brazilian pharmaceutical industry, whose branch in Lauro de Freitas, Bahia, has one of the largest distribution centers in the country and serves as support for the Group's expansion to the Northeast. Additionally, it aims to demonstrate how the use of lean methodology has contributed to the logistical success of this company in a market segment marked by fierce competition.

The aim of this study is to delineate the existing linkage between the concepts of Logistics and Lean, evaluate the Lean practices implemented in the distribution center of
this pharmaceutical retail company, verify possible waste through the construction of VSM (Value Stream Mapping) in some sectors within the distribution center, and investigate potential deviations associated with the concept of the 8 wastes of Lean Manufacturing.

The implementation of lean logistics has been the reason for the recovery of large companies that have begun to show declining sales, as well as general difficulties in their direct customer interface services. Based on this, it is necessary to understand the practical details and already applied aspects of this logistical "philosophy."

To scope the focus of this work, a distribution center of a large pharmaceutical company was taken as the observation target. Several data were collected from it, the values of which are not presented here in their maximum fidelity due to confidentiality reasons. In order to support the analyses made here, a brief literature review was conducted on the general concept of logistics, the basic functioning of a distribution center, as well as the implementation structure of lean logistics in any commercial environment.

Knowing the proven effectiveness of lean manufacturing philosophy by numerous companies and distribution centers worldwide, it is also expected in this brief case study to observe significant advancements with the implementation of this form of logistics in a large pharmaceutical retail distribution center in Lauro de Freitas, Bahia.

2 THEORETICAL FRAMEWORK

Here we use basic bibliography for logistics subjects, touching on points relating to distribution centers, as well as lean manufacturing.

2.1 LOGISTICS

The Council of Supply Chain Management Professionals defines logistics as follows:
Logistics is the part of Supply Chain Management that plans, implements, and controls the efficient and economical flow and storage of raw materials, semi-finished materials, and finished products, as well as the information related to them, from the point of origin to the point of consumption, with the purpose of meeting customer requirements (Carvalho, 2002).

One of the most prominent sectors of growth within large companies is logistics. This has occurred due to the need that such companies have to provide their services and products desired by customers at the exact time and location required by them. When going to a store and not finding the product they intended to purchase, customers end up opting for another brand, which is not the best option for a company aiming to expand its market. The solution to this impasse is, in fact, delivery at the planned time and location.

Ballou (1993) divided the study of Logistics into three primary activities:

a) transportation: part of Logistics responsible for determining the best way to transport goods, taking into account various means of transportation: road, rail, air, sea, or even multimodal. Additionally, consideration should also be given to the best route, considering the level of service and the lowest associated cost. When deciding on the best mode of transportation, it is necessary to observe:
   - product type: Many products have a relatively high added value. Therefore, it is preferable to opt for a safer and faster method of transportation;
   - product delivery time: Some locations have restrictions on supplier service hours. Therefore, it is important to observe this time window for product delivery;
   - delivery capacity: The quantity of merchandise that can be delivered varies greatly, especially due to the type of product to be delivered;
   - packaging;
   - material handling;
   - service level;
   - door-to-door delivery.

b) inventory management: In general, customers do not have a very large waiting time window. Therefore, it is important that when a product is requested, the company already has it in stock. Even if the merchandise cannot remain in stock
for long, as is the case with some food products, it is ideal to have a reasonable level already stocked;
c) order processing: This is the primary activity responsible for initiating the movement of goods from one point to another. It is a very sensitive part of the process, as it requires a robust information system regarding the logistics associated with the flow of products. If the order contains any errors, this oversight will generate higher costs than expected, as the merchandise will need to be returned before proceeding to the correct destination.

To narrow down the bibliographic treatment of this work, we will focus on understanding the basic structure of a Distribution Center and its entire logistics architecture.

2.1.1 Distribution Center (DC)

As the name suggests or allows inferring, Distribution Centers of companies have the main objective of storing, sorting, and delivering products to their customers. One of the most growing needs that can be noted is the delivery at the right time (or even shorter) and at the right place. For the general conception of Logistics, achieving these two objectives is to generate value for the customer (Cardoso, 2016).

Distribution centers are privileged locations where logistics operations are articulated through a series of activities that affect the culminating act of delivering the order to the customer in the right quantity, at the right place, at the right time, in the right form and content, intact and without any type of damage, constituting what we call perfect order logistics lean (Torres Jr., 2016).

To understand the logistical functioning of a distribution center, it is necessary to outline its operation, which is called value stream mapping. In it, all possible steps of the process must be outlined, as well as pertinent information regarding customer service from order to delivery.

Such maps primarily identify opportunities for improvement in the distribution center. Among the types of value stream mappings, there is the current one, in which the...
order is tracked until its delivery, in order to determine its current conditions. The future state map indicates opportunities for future improvements, identified by the current state map (Cardoso, 2016).

In general, when choosing a location for a Distribution Center, attention should be paid to (Farah, 2002):

a) Characteristics of the product to be delivered at this DC;
b) Basic structure for good operational functioning;
c) Dimensions of the DC area, as well as the minimum requirements for the service to be of quality and high efficiency;
d) Multiple channels of merchandise distribution.

2.2 LEAN MANUFACTURING

The term was defined by James P. Womack and Daniel T. Jones (1990) in their book "The Machine That Changed the World" (Brief, 2014). The expression also emerged to represent the Toyota Production System. It was created in the 1960s in Japan after World War II. Its prominent practical application occurred at Toyota Motor Company. The context at the time was the worst possible: Japan was devastated by war. Therefore, there were not enough resources to increase productions. This required, in a way, greater flexibility on the part of companies (Riani, 2006).

"Lean" is a philosophy that aims at eliminating non-value-added activities from the process and treats activities that do not add value to the customer's needs as waste (Bhasin and Burcher, 2006).

Contemporary literature, based on renowned authors of lean philosophy such as Ohno (1997), Shingo (1996), Lareau (2002), and Ghinato (1996), provides an overview, synthesizing the eight major manufacturing and office wastes, presented below in Table 1.
Table 1. The eight major losses of manufacturing and offices

<table>
<thead>
<tr>
<th>WASTE</th>
<th>MANUFACTURING</th>
<th>OFFICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 TRANSPORT</td>
<td>Excessive Material Transport</td>
<td>Loss in transporting physical documents or excessive use of multiple computer systems.</td>
</tr>
<tr>
<td>2 WAIT</td>
<td>Loss represented by the period in which no processing, transport, or inspection is being carried out</td>
<td>Downtime of people and information (waiting for signature approval, photocopies, phone calls, emails etc.)</td>
</tr>
<tr>
<td>3 INTELLECT</td>
<td>Failure to adequately utilize intellectual capital (knowledge, skills, attitudes, or creativity of individuals)</td>
<td></td>
</tr>
<tr>
<td>4 MOVEMENT</td>
<td>Unnecessary movements performed by operators in the execution of a task</td>
<td>Excessive movement of people and information</td>
</tr>
<tr>
<td>5 PROCESSING</td>
<td>Incorrect use of machines, tools, procedures, or systems</td>
<td>Incorrect use of procedures or inadequate systems, instead of simple and effective approaches</td>
</tr>
<tr>
<td>6 OVERPRODUCTION</td>
<td>Producing excessively or prematurely, resulting in excess inventory</td>
<td>Generating more information, in electronic media or paper, than necessary or before the correct time</td>
</tr>
<tr>
<td>7 DEFECT</td>
<td>Product or service that does not meet quality specifications and customer expectations</td>
<td>Frequent documentation errors, service quality problems, or low delivery performance</td>
</tr>
<tr>
<td>8 INVENTORY</td>
<td>Excess raw materials, work-in-progress, and finished goods inventory</td>
<td>High volume of stalled documents, pending approvals, full email inbox, etc.</td>
</tr>
</tbody>
</table>


In addition to several other pillars that support the lean philosophy, the cornerstone of lean manufacturing, according to Figueiredo (2006), is that:

(...) In fact, customers are not buying less, but rather experiencing fewer difficulties and less inconvenience when using or consuming the products and services they acquire (FIGUEIREDO, 2006, p.3).

Womack and Jones (2006) deconstruct the producer-consumer model and, based on this, innovatively present the foundations (principles) of lean consumption, whose main objective is to show companies how it is possible to eliminate inefficiency in the consumption chain (Table 2).
### Table 2. Lean Principles vs. Lean Consumption

<table>
<thead>
<tr>
<th>LEAN PRINCIPLES (PRODUCTION)</th>
<th>LEAN CONSUMPTION (CONSUMER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify and increase the value of products from the</td>
<td>Completely solve the customer's problem</td>
</tr>
<tr>
<td>customer’s perspective</td>
<td></td>
</tr>
<tr>
<td>Identify the value chain for each product and remove</td>
<td>Don't waste the customer's time</td>
</tr>
<tr>
<td>waste</td>
<td></td>
</tr>
<tr>
<td>Make value flow through the chain</td>
<td>Offer exactly what the customer wants</td>
</tr>
<tr>
<td>So that the customer can pull production</td>
<td>Offer what the customer wants exactly where they want it</td>
</tr>
<tr>
<td>Management towards perfection</td>
<td>Offer what the customer wants, where they want and exactly when</td>
</tr>
<tr>
<td></td>
<td>they want</td>
</tr>
<tr>
<td></td>
<td>Continuously add solutions to reduce customer time and hassle</td>
</tr>
</tbody>
</table>

Sources: WOMACK and JONES, 2006.

The pillars of the lean philosophy, as well as its most important tools, are presented in diagram form in Figure 1.

Kaizen comes from Japanese and means continuous improvement. Succinctly, Jidoka is a philosophy that contributes to minimizing losses and equipment downtime. The 5S are linked to a standard of organization in various environments. Just in Time, in turn, aims to produce only what is necessary, when necessary, in the necessary quantity (Feld, 2000). The others are presented in this work in more detail.

Figure 1. Main pillars of lean manufacturing

![Figure 1. Main pillars of lean manufacturing](https://www.ejeq.com.br/conheca-o-lean-manufacturing/)
2.2.1 Lean Logistics

Lean logistics is the term commonly used to designate the principles of lean thinking embraced by logistics practice.

According to Wu (2002), lean logistics refers to the high capacity to design and manage systems to control the movement and geographical positioning of raw materials, work-in-progress, and finished inventory at the lowest cost.

Fynes and Ennis (1994) suggest that, just as there is a benefit from lean practice within manufacturing companies, notably in improving the flow of goods, this same practice can be adapted to address the flow of already manufactured goods through logistics activity, allowing for the refinement of customer service.

According to Wu,

(...) any waste elimination in firms' logistics systems can generate significant savings, with logistics cost reduction occurring through lower inventory and warehouse costs, as well as increased productivity. And to achieve these objectives, the application of lean logistics in operations is essential (WU, 2002).

2.2 VSM (VALUE STREAM MAPPING)

Value Stream Mapping (VSM) is a methodology considered a key point of what is called lean management, whose objective is to analyze the current state so that, based on it, it is possible to design a future state aimed at improving all parts ranging from product creation to its proper delivery to the customer, by eliminating waste in the current map (Figure 2).
The Japanese term for waste is "muda." This word is very common when talking about VSM. It has also been incorporated to represent the waste elimination method: muda elimination. Especially in Toyota production systems, it is extremely necessary to try to minimize waste as much as possible, whether it is time or material waste from the process.

In general, a value chain refers to all activities performed in a company. A value stream, on the other hand, specifically refers to the areas of a company where there are activities that add value to a service or product. In short, the overall objective of Value Stream Mapping is to map and, if possible, reduce (or even eliminate) the waste that can occur in value streams.

3 METHODOLOGY

The research involved a case study of the Distribution Center of a specific Brazilian pharmaceutical retail chain, located in Lauro de Freitas, Bahia. The bibliographical survey focused on the fundamental principles of Logistics, primary...
activities of a distribution center and the concepts of the Lean philosophy applied to implementation logistics.

To collect data, an immersion was carried out in the Distribution Center environment, including interviews with employees, direct observation of operations and access to materials and documents from the management team. The results obtained were analyzed in relation to the principles of Lean philosophy, aiming to identify both strengths and opportunities for improvement in the logistics efficiency of the distribution center.

The methodology used in the case study enabled the mapping of current processes, the adoption of best logistics practices aligned with the Lean approach and the identification of areas subject to optimization through the application of tools such as Value Stream Mapping. This approach aims to improve the Distribution Center's logistics, reduce waste and enhance the efficiency of logistics operations.

4 RESULTS AND DISCUSSION

For this study, the sectors, as well as the services within the Distribution Center (DC), were presented individually, and, when applicable, best practices or improvement proposals were presented.

The Distribution Center is located in the city of Lauro de Freitas, in Bahia, and has approximately 170 people directly involved in the logistics team, in addition to the Information Technology (IT) and Human Resources support teams, with an approximate workforce of 205 employees.

The DC installation occupies an area of approximately 10 thousand m² in a property rented from Mais Galpós. In addition to housing all of the CD's logistical operations, the space also has a rest area for employees, a cafeteria and changing rooms.

The Distribution Center is a client of suppliers and transport companies and its customers are the Group's stores spread across the Northeast, without direct delivery to the end consumer.

In general, the facility is responsible for:

a) Receipt of products;
b) Storage;
c) Sorting of products for the branches;
d) Dispatch and receipt of products from the branches through reverse logistics.

4.1 PURCHASING, RECEIVING, AND INCOMING

Primordial activity that initiates the entire logistics cycle, the purchases of products to supply the DC are handled by the company's purchasing department, based at the headquarters in São Paulo. The department is responsible for analyzing the DC's inventory and, considering a consumption history as well as seasonal trends, placing orders for products considering a stock margin that allows stores to be replenished for a period of up to 25 days.

In light of lean waste, this practice avoids time wasted in waiting. Centralizing purchases in a single department also presents itself as a competitive advantage for the company, as this practice increases negotiating power. Instead of placing an order for a product for a specific branch, the purchasing department can place an order for all stores served by a DC.

The receiving department is responsible for validating the orders delivered to the DCs, generating checking reports, and issuing return notes for products that, for some reason, will not be received by the DC. Most of the counter-notes are issued for damaged products that are detected during sampling by the receiving department.

In addition, the receiving department is also responsible for ensuring that the products received at the DC comply with the company's purchasing policy, and here is where the first bottleneck appears. Since the DC is not responsible for purchasing, changes in batches of products purchased vs. received, products with short shelf life, or even discrepancies between the purchase price and the invoice value must be reported to the headquarters, which then decides whether the product will be received or not.

The time taken by the receiving department from the arrival of a carrier until its release is measured by an indicator called average unloading time (AUT). As shown in
Graph 1, this indicator has a pre-established target set by the company and has not been achieved in any month of the current year.

Given the performance exhibited by the two sectors studied, regarding the failure to achieve the AUT target, it was decided to construct their VSMs together so that the factors impacting the AUT can be highlighted. The result and discussions for the VSM are presented in Figure 3.

The VSM outlines the goods receiving process. At 1 - Access Controller, there is the initial contact between the carrier and a representative of the DC; at this point, the carrier's representative hands over the invoices of the products to be unloaded. The access controller directs them to 2 - Unloading and forwards the invoices to 3 - Receipts - NF (referring to the receiving department) for the issuance of a checking report. While waiting for the report, the received items are labeled with the company's standard in the 4 - Labeling process. Subsequently, the products are sampled in 5 - Sampling according to the Military Standard 414 (MIL-STD 414). Only then are the products checked in 6 - Report Checking with the assistance of the checking report issued by the Receiving Department, and in 7 - Movement, the products are sent to physical inventory. The Lead time - total time of the analyzed process - was 04:49:00.
The improvement opportunities identified through the VSM and associated with some lean waste were as follows:

a) **E1** - The Access Controller accumulates many invoices on their desk, delaying the sending to the Receiving Department. It is also common for the Access Controller to direct a carrier to a dock that remains closed, even after the truck is parked and waiting to unload.

**Solution:** Adjust the layout of the receiving area to make it more connected to the Receiving Department.

b) **E2** - It is not uncommon for there to be many invoices for the same order. In this scenario, there is no concern from the carrier to organize the products by invoice, resulting in products from different invoices being on the same pallet. Additionally, there is a unloading standard that must be followed by carriers: the Company does not allow more than 5 different products to be unloaded on the same pallet, which is often not respected, leading to rework.

**Solution:** Notify carriers regarding sending invoices, respecting the unloading order, and also instruct their assistants properly when Company standards are necessary.
c) **E3** - There are many discrepancies in invoices, and the waiting time for resolution is long, as these discrepancies are handled by the Headquarters. Furthermore, there is no standardization in activities in the Receiving Department.

**Solution:** Give the DC greater autonomy to decide when to accept or reject a product as a fiscal discrepancy.

d) **E4** - The labels provide product code, expiry date, and position in the inventory. Labeling errors are common: regarding expiry date when the supplier provides different expiration dates in a batch. Regarding typing, when the operator enters wrong information. Regarding employee inattention, when different products in identical or very similar boxes are arranged on the same pallet. All these situations result in rework.

**Solution:** Reinforcing employee inspection training can yield good results.

e) **E5** - The sampling plan is not strictly followed, and for some products, 100% sampling is conducted.

**Solution:** Utilize the implemented Quality Management System 2.0 in the Company and conduct sampling based on the ABNT 5426 standard - Sampling Plans and Procedures in Attribute Inspection.

f) **E6** - Excessive product movement during checking associated with poor management of physical space and lack of standardization in Checker activities.

**Solution:** Implement a layout that allows linearity in receiving activities associated with the acquisition of a Warehouse Management System (WMS).

g) **E7** - The movers are responsible for moving the products to physical inventory after checking. Despite performing a relatively simple activity, their tasks are not standardized.

**Solution:** Prioritize the movement of pallets with checked products to the warehouse and eliminate communication between movers and checkers.

In addition to the practices mentioned here, the DC has the possibility of Anticipation of XML Matching, which would be the advancement of invoices up to two days before the receipt of the product. Of all the practices mentioned, this is the one with the greatest potential to have a significant impact on reducing the AUT, as discrepancies
in invoices would be addressed over a much longer period. Since this methodology has not yet been implemented, it is not possible to measure its impact on the AUT.

4.2 ORDER PROCESSING, PICKING, AND SHIPPING

The processes discussed here encompass everything from generating the list of products to be sent to the stores, through picking the precise quantities, to shipping these items to the branches.

All products sold in the stores on a given day are picked and resent the following day by the DC, without the store needing to send any requests. In the context of lean practices, this stands out as a significant company advantage, as it enables a considerable time gain and reduces the need for large stocks in the stores.

The DC has a department called CRC (Replenishment Department), which is responsible for generating lists of products sold by the branches, as well as generating lists of products to be resent to the stores, dividing them by department within the DC, such as pharmaceuticals, perfumery, temperature-sensitive items (drugs requiring refrigeration), among others. These lists are loaded onto a handheld device called a scanner that reads the product barcodes, compares them with the order list, and ensures the correct product is picked in the right quantity.

All products from the same list are packed in a PVC box by the picker and then proceed to conveyors for a second checking process called checkout. At checkout, the boxes are scanned, and their contents are checked once again using a scanner. It was observed that, despite the rigorous checking process, products different from the lists still occasionally arrive at the stores, although this happens rarely.

After passing through checkout, the packages are sent to the shipping department, which receives a map containing all the boxes to be sent to a group of stores covered on the same route. The company owns 90% of its fleet and uses a third-party carrier to deliver to stores further away from the metropolitan area of Salvador, where using the company's own fleet is not economically advantageous. This is a strategic decision of the Company based on the cost per kilometer versus the freight price charged by these carriers.
4.3 REVERSE LOGISTICS

Reverse Logistics is responsible for supporting the return of products from the Branches to the DC, closing the logistics cycle. These products are returned for various reasons, among them:

a) Expired products - Products that have expired or are very close to the expiration date are collected, and it is the responsibility of Reverse Logistics to return them to the manufacturers through commercial agreements or to send them for incineration.

b) Recall - A request for the return of a batch or line of products made by the manufacturer itself. This is a very common practice in the pharmaceutical industry and usually occurs due to the discovery of product safety issues.

c) Commercial strategy - The company's commercial department is constantly monitoring product turnover in the branches. Products that take too long to sell in one store are transferred to others, in a process called Rebalancing.

5 CONCLUSION

The application of Lean Logistics is a successful reality wherever it is implemented. In the case of a Distribution Center, especially those in the pharmaceutical retail sector, where demands call for shorter delivery times — directly impacting the health of the pharmacies' customers — it is fundamental to implement logistics methodologies capable of satisfying delivery at the appropriate location and time.

Lean logistics has indeed proven to be the essential component for the smooth operation of the Distribution Center studied here. The main aspect of the methodology is the elimination of waste, and for this, it encompasses powerful analysis tools, which in the case of this specific study, enabled the mapping of the current state of the DC, as well as highlighted what needs to be improved for a future state with less waste, based on scenarios of continuous improvement.
Ultimately, the recommendation of lean naturally applies not only to pharmaceutical retail businesses but to any type of company, as the benefits extend beyond large corporations. Commercial inputs and outputs (such as raw materials and products) require a minimum level of organization to ensure that quality and deadlines are met, which is the foundational proposition and effectiveness of the lean philosophy.
REFERENCES


FARAH Jr., M. Os desafios da logística e os centros de distribuição física. FAE Business. 2 44-46, 2022.


FIGUEIREDO, K. A Logística Enxuta. 2006. Disponível em:


LAREAU, W. Office Kaizen: transforming office operations into a strategic competitive advantage. ASQ Quality Press, USA 2002.


