TÉCNICO LISBOA

Implementation of processes to improve the operational efficiency of Company A

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ABSTRACT

Faced with the growing competition of current markets, companies have been focusing on increasing the efficiency of their operations and improving customer experience. The main objective of this dissertation is to implement improvement processes to increase the operational efficiency of service stations owned and managed by Company A, a company of the energy sector in Portugal. The developed work results from a professional project between the company and Kaizen Institute. The implementation of improvement processes involves waste reduction, elimination of critical points and improvement of customer satisfaction.

After conducting a literature review, the lean tools – *Gemba* Walks, Value Stream Mapping, Root Cause Analysis, 5S and visual management – were analyzed alongside other processes and improvement tools such as changes in stock management process, changes in customer service process and tools to improve customer satisfaction. Finally, the initial processes were studied, sources of waste were identified, and improvements were implemented.

After the implementation period, stockouts decreased about 37%, losses decreased 36%, Net Promoter Score, an indicator that assesses customer satisfaction and loyalty, increased 45%, complaints decreased about 14% and the usage rate of outdoor payment terminals increased about 12%.

Keywords: Lean, *Kaizen*, Retail, Service Station, Convenience Store, Efficiency

1. INTRODUCTION

Sectors associated with product distribution have become increasingly important in recent years. Globalization and markets characterized by a constant change in demand represent a current challenge and are continuously increasing the competitiveness environment in these sectors. To ensure their survival in the market for a longer period, modern organizations have adopted new methods and strategies of improvement and cost reduction (Jaca *et al.*, 2011; Shakoor *et al.*, 2017).

As regards Service Stations (SS), they may be located on motorways or roads close to urban areas and are understood as commercial areas with filling stations, convenience stores and, in some cases, accommodation, catering and car washing, maintenance, and repair service. In this type of service (SS), the efficiency increase can be achieved by reducing waiting time and customer service, enabling improvements in customer experience and satisfaction.

The lean concept is defined as a philosophy of long-term growth that generates value for the customer, society and economy. Thus, it is achieved by reducing costs, improving quality and eliminating waste. Although this methodology has emerged in an industrial environment, lean principles have been adopted in many organizations throughout diverse sectors. However, the way in which they are implemented varies according to the organization and the area of business (Radnor & Walley, 2008). Therefore, lean methodology helps to configure resources and processes in a customer-driven way and causes fundamental changes in the business model that lead to increased efficiency and quality of retail services (Radnor & Walley, 2008; Shakoor *et al.*, 2017).

On the other hand, Netland & Powell (2017) identified seven main sources of waste in retail: stock, transport, waiting, overproduction, over-processing, defects, and underutilized collaborators, hence, the operational efficiency of an organization can be increased by eliminating these sources of waste.

Moreover, change management is a topic often intertwined with the lean methodology. Simoes *et al*. (2014) studied a process of change management in a leading global pharmaceutical company and argued that communication and employee involvement were the key aspects to successfully lead this process.

In view of the above considerations, this work aims to implement lean tools and methodologies along

with other improvement processes in order to create a culture of continuous improvement in the SS network of a company in the energy sector. The ultimate purpose of this company is to increase the overall efficiency of its operations and improve customer experience and satisfaction.

2. STATE OF THE ART

2.1 Lean tools and methodologies

There are several lean tools and methodologies used to reduce the lack of operational performance in the service sector: Value Stream Mapping (VSM), 5S, *Kaizen*, visual management and Root Cause Analysis (RCA) (Drew *et al.*, 2004):

(i) VSM is considered one of the best tools to map a process and identify its critical points. The current state map is used to collect data and to distinguish value-added activities from non-value-added activities. It contains the representation of both the value chain graph and the information chain. VSM is based in five different stages: 1) selection of a family of products; 2) mapping the current state so that waste can be identified; 3) mapping the future state, with support of lean tools; 4) definition of a work plan; 5) obtaining the work plan (De Steur *et al.*, 2016);

(ii) 5S is a five-step process that allows the reduction of waste through a better organization of the workspace, visual communication, and general cleaning: sort, straighten, shine, standardize and sustain (Agrahari *et al*., 2017);

(iii) *Kaizen* is a lean methodology whose purpose is to create value and eliminate waste. A *Kaizen* seminar is a group activity lasting up to five days. This seminar is attended by a facilitator and a team with elements of an organization that are involved in the process. It allows the identification and implementation of significant improvements in that process (Baril *et al*., 2016);

(iv) Visual management is a tool to present information. Eaidgah *et al.* (2016) argue that the use of this tool has several advantages for organizations: it simplifies the flow of information; provides information at the time of use; gives recognition to employees; facilitates continuous feedback and communication goals and objectives; increases the transparency of processes; improves discipline; creates a sense of shared dominance; encourages management through data and facts; increases motivation and supports continuous improvement;

(v) RCA is a methodology to identify the root causes of problems in a structured way. In this approach, solutions are identified and implemented in the improvement stage.

Finally, the sustainability of the results is guaranteed in the control stage. During the analysis stage, root cause identification is usually based on tools such as the "5 whys" analysis. In this tool, the question "why" is asked several times until the cause of a problem is found (Ashok Sarkar *et al*., 2013).

2.2 Stock management

A supply chain is a system that begins in the supply of raw materials and ends with the distribution and sale of the good to the final customer. Therefore, its effective management plays a key role in the strategy of all organizations. This management is driven by demand, where the starting point is associated with the available and planned orders of the different customers (Cardoso *et al.*, 2013). In fact, effective stock control proves to be particularly important and represents one of the most difficult tasks to manage in an organization. Therefore, this work addresses the way lean methodology can reduce waste through an effective stock management process.

The ABC classification system or ABC analysis is widely used for effective stock management. ABC analysis was originally named due to its division into three groups: A, B and C. Products A are products of high value, therefore greater attention and effort is required in their management; products B are average value products and products C are low-value products (Chu *et al.*, 2008). After sorting the different products in one of the three groups presented, it is necessary to determine the stock management policy for each of those groups. Stock management policies that consider demand uncertainty are designated by stochastic models and can be classified into continuous review policies or periodic review policies (Cavalieri *et al.*, 2008).

On the one hand, in order-up-to-level policy (s,S) - a continuous review policy - an order is placed to reach the level S when the stock level reaches or falls below s. On the other hand, order-up-to-level policy (T,S) is the most common periodic review policy, in which, in each period of constant interval T, a necessary amount is ordered to reach S. Moreover, as opposed to the stock management policies mentioned before, there are situations where stock cannot be transported from one period to another due to the impossibility of accumulating perishable products (Kaya & Polat, 2017).

The conventional stock management studies in the literature related to retail stores present some limitations: it approaches the store itself as a single node in the supply chain without distinguishing the shelves from the warehouse storage, which leads

the customer to find an "empty shelf" even when there is enough stock in the store. Furthermore, there is lack of information regarding internal logistics, since all papers related to replenishment of shelves focus only on a single product (Mou *et al.*, 2018).

3. METHODOLOGY

3.1 Main approach

The tools and methodologies studied previously have been integrated to develop an implementation approach. Thus, in the first stage causes of the problems are identified, using the concepts of VSM to map the processes and identify the waste of the value chain. This tool is complemented with top management visits to the SS, *Gemba Walks*. It is also used the "5 whys" analysis of the RCA tool to identify the root causes of the problems. Afterwards, improvements are implemented through 5S and visual management tools in order to organize the workspace. Other processes and improvement tools, like new replenishment process, new shelf life check process, production support tool, operations manual, promotion of OPT, customer satisfaction dashboard and analysis of customer flow, are also implemented in order to solve the critical points identified (Figure 1).

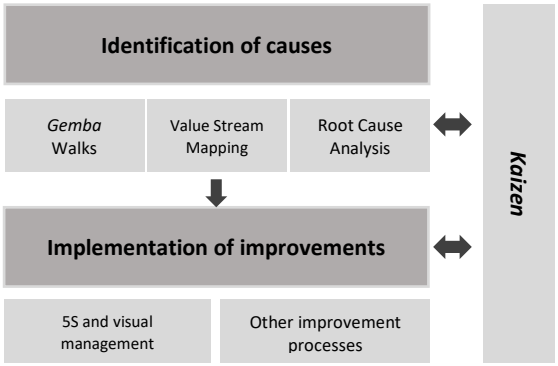

Figure 1 – Integration of the tools and methodologies studied.

3.2 Identification of causes

This stage begins by carrying out several *Gemba* Walks together with the director of operations of Company A. These visits were made to six SS, two in each Portuguese region. The *Gemba* Walks allowed to establish conversations with the collaborators and to identify, in advance, some sources of waste in the operational activity.

After that, the focus was to develop a simplified mapping (using the concepts of VSM) during a *Kaizen* seminar with the participation of a multidisciplinary team. This team was composed by members of the operations management, marketing and human resources teams of Company A. In fact, this tool allowed the identification of the value-added activities and of the main origins of waste in a visual and simple way.

3.3 Implementation of improvements

After identifying the necessary improvements, they must be implemented starting with the simplest tools, which contribute to a better management and organization of workspaces. Afterwards, changes are made to the stock management process and, finally, improvements must be made to the customer service process and teams' sizing through the development of a tool to analyze customer satisfaction.

According to the three stages of improvement presented, it was decided the following implementation methodology:

- Four SS pilots were chosen, with teams consisting of eight to twenty elements, depending on the size of the SS. In the same way, theoretical training was carried out with all the elements of the pilot teams;
- Implementation of the tools or processes in the selected teams;
- Development of a manual and/or a visual norm that compiles theoretical information about the tool or process, as well as practical examples of the initial implementation. Finally, training was carried out with the SS managers and the selected tool or improvement was applied to the remaining SS of the company;
- Follow-up visits were carried out to assess whether the implementation of the tool or process was taking place as planned.

4. CASE STUDY: COMPANY A

4.1 The oil and non-oil business sectors and Company A

The oil business sector concerns the retail business of liquid road fuels and is carried out through filling stations. It constitutes a highly competitive activity in Portugal, in which a small number of companies dominate a currently mature market. In August 2016, revenues from the sale of diesel and gasoline amounted to 495 million euros, corresponding to 303 million liters of single fuel and 157 million liters of fuel added. In Portugal, the liquid fuel retail distribution network comprises approximately 3018 filling stations, associated or not with SS.

The non-oil business sector includes the offer of services and sales in convenience stores of the SS, with categories of products such as tobacco, newspapers and magazines, beverages, telecommunications, food, gas, games, lubricants, and other automotive products. Store sales may also include cafeteria service offering sandwiches, cakes, and beverages. The Portuguese convenience business is part of the economic activity sector "Retail trade in other non-specialized establishments, predominantly food products, beverages or tobacco", which has a turnover that exceeds 300 thousand euros, having increased 5% from 2015 to 2016 (Banco de Portugal, 2016).

Company A is a company of the energy sector. In Portugal, there are 96 SS owned and managed by Company A, also known as Company Owned, Company Operated (CoCo) SS. These SS have convenience stores that stand out for the offer provided, with category of products varying between 25 and 35. Regarding customer service, the demand for the SS of Company A is described through the ticket concept, where each ticket represents a purchase. Therefore, a customer can represent one or more tickets which are divided into “oil ticket” (payment for the fuel supply), “non-oil ticket” (payment for a store product) and “mixed ticket” (payment for a store product and fuel supply).

In 2018, following a decision made by the management of Company A, CoCo SS were integrated into an improvement project with the aim of creating a culture of continuous improvement in the organization and, thus, increasing the overall efficiency of its operations through the implementation of lean tools along with other processes and improvement tools.

4.2 Identification of waste

The six main processes in the SS of Company A were obtained after performing a simplified VSM and are as follows:

- **Reception** – it is carried out through a Personal Digital Assistant (PDA). Initially, the product is scanned by reading its delivery note. Then the counting is performed. If the number of goods received match the one indicated on the delivery note, it is validated in the PDA. Otherwise, changes are made manually in the device. Then, the PDA is connected to the computer so that the readings made are transferred to the SAP retail system, the management software used by Company A. Finally, the merchandise is restocked on the shelves of the warehouse or in the store, according to current need;
- **Replacement and shelf life period check** – the expiration dates of all products received are recorded in an agenda as the merchandise is restocked. The food shelves are cleaned weekly and complemented with a monthly deep cleaning. The shelf life period of all products is checked in a daily basis and reported in the agenda, and the products whose expiration date has ended on the same day are removed;
- **Production of bakery and cafeteria products** – in this process, it is up to the operator to decide, according to his experience and sensitivity, the quantity and frequency of products to be produced. This process begins by removing the products from the freezer and placing them in the oven to be cooked. Finally, the cooked products are displayed in the counter area;
- **Customer service and sale** – regarding “oil tickets”, the following scenarios were considered: 1) scenario 1 – pre-payment – when the customer goes to the convenience store and makes the manual payment in the counter before placing fuel in the vehicle; 2) scenario 2 – post payment – when the customer places fuel in the vehicle before paying in the counter; 3) scenario 3 – when the customer pays through OPT.
  On the other hand, regarding “non-oil tickets”, the customer always goes to the store to pay for the product.
  Finally, the ”mixed tickets” result from a blend of scenarios 1 and 2, in which the customer orders the product immediately before paying.
- **Order** – the order is placed to the supplier through the SAP retail system when a product is currently out of stock or if the employee senses a need to place an order due to the average sales. Thus, it begins by visually selecting the products to be ordered, placing the order in SAP retail, and finally sending an email to the supplier with the order details.
- **Devolution** – in contracts established with some suppliers there is the possibility to return the products at the end of their shelf life period. In this option, employees select the products that can no longer be sold and place them in a pre-defined place. When the supplier visits the SS to deliver a new order, he collects the products to be returned. Finally, the output of the products is recorded in SAP retail.

After several visits to the SS (*Gemba* Walks), and by mapping the current state of Company A, it was possible to identify and group the sources of waste,

using the seven types of waste in retail (Table 1). By analyzing this table together with the multidisciplinary team, it was immediately concluded that the topic that constitutes a major source of waste is the existence of losses and stockouts, mainly in categories such as cafeteria and bakery. Therefore, it was used the "5 why's" analysis to understand its root causes. With this exercise it was concluded that the absence of a support tool to produce bakery and cafeteria products, as well as the absence of an effective products' shelf life period check process and an order support tool were the main root causes of the problem.

Table 1 – Main types of waste in Company A.

TYPE OF WASTE	DESCRIPTION
Stock	Excessive orders of products to suppliers and existence of empty shelves and stockouts. Imbalance in the number of orders received during the different days of the week.
Transport	Employees move excessively to perform their duties due to the disorganization and ergonomics of the workspaces. Lack of identification of the products in the warehouse.
Waiting	High lead-time customer service within the convenience store. Lack of availability of operators for service.
Overproduction	Production of bakery and cafeteria products not adjusted to the demand. Existence of losses.
Over-processing	Registration of 100% of the products shelf life period upon receipt.
Defects	Incorrect customer service causing rework, complaints and customer dissatisfaction.
Underutilized collaborators	Behavioral waste and lack of training of SS employees.

Furthermore, the teams' sizing was also a topic raised during the *Gemba* Walks, since it affected customer satisfaction. This issue was confirmed after conducting a comparative analysis between the number of actual tickets and the number of theoretical tickets in the SS.

Finally, a future vision of the company's processes was mapped together with the multidisciplinary team. In the future state of the SS processes, it is intended that:

- The management of the material replenishment is carried out by using information such as the average weekly consumption; the lead time of the different suppliers, the existing stock and the orders in transit;
- The workspace is organized, using visual management; the waste resulting from verifying the expiration date of all the food products is eliminated;
- The production of bakery and cafeteria products is triggered according to sales history, due to the high percentage of loss of these categories (31.7% and 14.5%);
- Service is standardized and improved, so that customer satisfaction increases. Another opportunity for improvement related to the service process concerns the possibility of transferring pre-payment tickets for payments through OPT;
- The sizing of the teams is adjusted to the demand.

4.2 Objectives and performance indicators

In order to compare the results obtained after the implementation of the improvement processes with the company's initial situation, several performance indicators (KPIs) were defined. Table 2 shows the initial situation of those KPIs. For each tool or process was stated the main goal to achieve.

- **Losses:** this indicator is calculated from equation 1 in which L_i represents the purchase price of the lost product i, S_i is related to the selling price of the sold product and n represents the number of products in the SS under analysis.

$$Losses\ (\%) = \frac{\sum_{i=1}^{n} L_i}{\sum_{i=1}^{n} S_i} \times 100\% \qquad (1)$$

- **Stockouts:** this KPI correlates the percentage of products out of stock that belong to the products' list of a SS. Therefore, for each product i (from i=1 to i=n), St_i is equal to one if the stock of product i is zero; otherwise, St_i is equal to zero (2). Initially, the physical stock did not match the stock in SAP retail.

$$Stockouts\ (\%) = \frac{\sum_{i=1}^{n} St_i}{n} \times 100\% \qquad (2)$$

- **NPS (Net Promoter Score):** this KPI assesses the customer satisfaction and loyalty and it is based on the following question "On a scale of zero to ten, how much would you recommend Company A to a friend or relative?". The indicator is then computed by the difference between the percentage of promoters (individuals whose answer is nine or ten) and the percentage of detractors

(individuals whose answer ranges from zero to six) (3).

$$NPS\ (\%) = \%\ promoters - \%\ detractors \quad (3)$$

- **Complaints:** this KPI is calculated through equation 4, in which C_i is concerned with the complaint associated to ticket i and n represents the number of tickets. Therefore, C_i is equal to one if there is a complaint associated with ticket i; otherwise, C_i is equal to zero.

$$Complaints\ (\%)\ = \frac{\sum_{i=1}^{n} C_i}{n \times 10^{-3}} \times 100\% \quad (4)$$

- **OPT's usage rate:** this KPI is defined by equation 5, in which T_i refers to ticket i and n represents the total number of tickets of the SS. Therefore, T_i is equal to one in case the payment of ticket i is made through OPT; otherwise, T_i is equal to zero.

$$OPT's\ usage\ rate\ (\%) = \frac{\sum_{i=1}^{n} T_i}{n} \times 100\% \quad (5)$$

Table 2 – Objectives and KPIs of the activities.

ACTIVITY	KPI	INITIAL OVERALL VALUE
Changes in the stock management process	Losses	3.9%
Changes in the stock management process; 5S	Stockouts	15.1%
Customer satisfaction tools; customer service process standardization; teams sizing tool	NPS	+20%
Customer satisfaction tools; customer service process standardization; teams sizing tool	Complaints	7.3%
Customer service process	OPT' usage rate	28.8%

5. RESULTS

5.1 5S Implementation

Concerning the five phases of the 5S methodology, the following adjustments were made:

(i) Sort phase: It was defined what was needed and what could be removed from the teams' workspace. All materials that did not add value to the customer in a direct or indirect way were removed, i.e., out of date products and products that are no longer sold;

(ii) Straighten phase: it was defined a place for each material. For example, in the sweets' category, some products were stored in appropriate baskets;
(iii) Shine phase: the entire teams' workspace was cleaned, with a greater focus on the warehouse and shelves by the counter;

(iv) Standardize phase: a set of standards was created to ensure the sustainability of the previous phases. Additionally, visual management was used to define a position for each material, such as documents and records, promotional campaign gifts, reflective vests, and safety lanterns. All the products that are stored in the warehouse were also given a specific place;

(v) Sustain phase: audits were carried out to ensure the proper implementation of the tool.

After the 5S implementation, data was gathered, and the results were the following:

- Reduction of stockouts by 11.9%, from 13.5% to 11.9%;
- Positive impact on employee motivation;
- Reduction of the time spent searching for support equipment.

5.2 Changes in the stock management process

In this step the following improvements were implemented in the stock management process: a new replenishment process; a new shelf life period check process and a production support tool.

5.2.1 New replenishment process

The new replenishment process is subdivided into the following tools: order support map, which provides information on when orders should be placed and received; order support solution, which helps to define the order quantity; stockouts dashboard, which allows the analysis of all the products that are out of stock.

- **Order support map**

The order support map is a tool created in excel that aims to provide information about the correct time to place and receive an order. It allows the user to set, for each supplier, the fixed days of the week in which the order should be placed. With this tool is also possible to schedule the orders received by the same distributor for the same day of the week, ensuring a proactive management of orders to optimize the stock available in the store.

- **Order support solution**

The order support solution aims to support the decision of order quantities. In order to do so, it is required to consult the stock, the orders in transit and the sales forecast available in SAP retail. The

sales forecast is given by the average consumption of the last seven weeks.

The combination of the order support map and the order support solution results in a stock management process that resembles the order-to-level periodic review policy (T,S). However, in the stock management process of Company A, there is no pre-defined target stock or safety stock, which leaves that decision to the person in charge.

- **Stockouts dashboard**

The stockouts dashboard is the third improvement implemented in the stock management process. This dashboard is sent weekly to the SS in excel format, containing a list with information on the products that are out of stock, organized by each supplier. When consulting this tool, all the products that are in the list are analyzed and the requests of these products can be made to each one of the suppliers.

5.2.2 New shelf life period check process

The new shelf life period check process allows controlling the shelf life period of the products in the store, avoiding the simultaneous registration in the agenda of all products at the time of reception. In this new process, the following products are recorded on the agenda:

- Products whose shelf life dates are lower than those defined for the category, when they are received (and replaced in the warehouse) or replaced in the store;
- Products whose shelf life period expires until the end of the month, in which the next verification will be carried out, at the time of shelf life period check.

With the implementation of the new shelf life period check process, it was possible to observe a reduction of approximately 8.5 hours/month in one of the SS of Company A. Moreover, considering that the average number of the Company A's SS receptions is 234 products/month, there is a total reduction of 816 hours/month in the Company's SS CoCo network.

5.2.3 Production support tool

The production support tool was the last implemented tool in the stock management process, whose main purpose is to help to decide the amount of cafeteria and bakery products to be produced. This tool is based on the following steps (Figure 2):

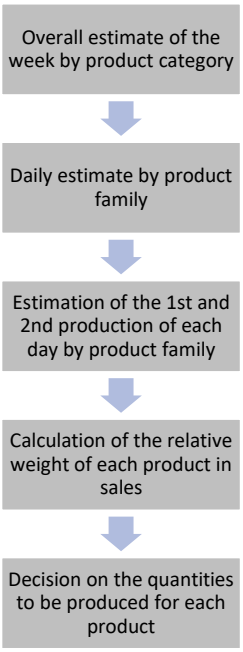

Figure 2 – Different stages of estimation of the production support tool.

- Overall estimate of the week by product family

The production support tool begins with the calculation of overall estimate for the week under analysis, by product family (S_j)(6): bread, sweet and salted products. This estimate is obtained from the sales of each product $(from\ i = 1\ to\ i = t)$ on each day $(from\ k = 1\ to\ k = 7)$ from the previous week V_{j-1}. In equation 6, j refers to the week under analysis.

To the total sales of week $j-1$ of each product family a pre-established objective loss (x) is added for each SS group, since, according to Company A's retail strategy, it is preferable to have a reduced percentage of losses than losing potential sales.

Finally, to the above estimate, a unit of each product i is added for each day k of week $j-1$ without any sales. As an example, if no unit of the "integral bread 80gr" and the "220gr bread" was sold on days $k = 1$ and $k = 3$ of week $j-1$, at the estimate of week j, it is added four units. Thus, $C_{i,j-1,k}$ equals one if there are no sales of product i on day k of week $j-1$. Otherwise, $C_{i,j-1,k}$ equals zero.

$$S_j = (1+x)\sum_{i=1}^{i=t}\sum_{k=1}^{k=7} V_{i,j-1,k} + \sum_{i=1}^{i=t}\sum_{k=1}^{k=7} C_{i,j-1,k}, \quad (6)$$

$$where\ C_{i,j-1,k} = \begin{cases} 1, if\ V_{i,j-1,k} = 0 \\ 0, if\ V_{i,j-1,k} \neq 0 \end{cases}$$

- Daily estimate by product family

After indicating the overall estimate of the week by product family, the tool suggests an estimate of production for each day of the current week, per product family. This estimate is calculated according to equation 7, in which hd is the homologous day of the previous week.

$$Estimate\ of\ the\ day = \left(\frac{sales\ on\ the\ hd\ of\ the\ previous\ week}{total\ sales\ of\ the\ previous\ week}\right) \times overall\ estimate\ of\ the\ week \quad (7)$$

- Estimation of the 1st and 2nd production of each day by product family

The daily estimate by product family is subdivided into the estimate of the 1st and 2nd production of each day by product family. The first production of each day occurs in the morning and can be complemented at mid-morning if necessary, by reinforcement production (rp) (8). The daily stock equals the number of units of products that are not sold in the morning and transit through the afternoon of the same day. On the other hand, the estimate of the 2nd production is calculated based on the difference between the production estimate of the day and the estimate of the 1st production of the day (9).

$$Estimate\ of\ the\ 1st\ production = \left(\frac{1st\ production\ hd + rp\ hd - stock\ hd}{sales\ on\ the\ hd\ of\ the\ previous\ week}\right) \times estimate\ of\ the\ day \quad (8)$$

$$Estimate\ of\ the\ 2nd\ production = \left(1 - \frac{1st\ production\ hd + rp\ hd - stock\ hd}{sales\ on\ the\ hd\ of\ the\ previous\ week}\right) \times estimate\ of\ the\ day \quad (9)$$

- Calculation of the relative weight of each product in sales

For each day, the relative weight of each product in sales is calculated according to equation 10. These weights are used to obtain the production estimate of each product each day.

$$Relative\ weight\ of\ each\ product = \frac{product\ sales\ on\ the\ hd\ of\ the\ previous\ week}{sales\ on\ the\ hd\ of\ the\ previous\ week} \times 100\% \quad (10)$$

- Decision on the quantities to be produced for each product

The operator responsible for the cafeteria and bakery production process makes the decision based on several factors. First, it obtains a production estimate of each product in each day, by multiplying the relative weight of the product in the sales by the estimate of production of the moment of the day (1st or 2nd production). Then, in order to decide the quantities to be produced, the operator considers events that occur during the year and that may trigger changes in demand, positively or negatively influencing production on the day under review. Furthermore, it is important to ensure the production of at least one unit of each SS product. Based on these factors, the operator decides and records the quantities to be produced and the number of loss products that can be carried over to the next day. Products that transit are those with a shelf life of more than 24 hours or that were produced in the late afternoon and can still be sold until the end of the morning of the following day. In the end, it is possible to get the daily sales of each product. Finally, the tool also allows the operator to add and remove products from the products' list, containing a global history with production data, losses, and weekly sales for an accurate tracking and analysis.

After the implementation of changes in the stock management process, data was gathered, and the results are the following (Table 3):

Table 3 – Results derived by the changes in the stock management process.

KPI and other gains	Description
Overall losses	Decreased 36.0%, from 3.9% to 2,5%
Losses of bakery products	Decreased 11.4%, from 31,7% to 28.1%
Losses of cafeteria products	Decreased 56.6%, from 14.5% to 6.3%
Stockouts	Decreased 37.0%, from 13.5% to 8.5%
Time reduction	Reduction of the time to carry out the processes
Standardization	Standardization of production flow throughout the day

5.3 Introduction of other improvements

This stage presents other improvements implemented in the customer service process, such as the operations manual, the promotion of OPT and the customer satisfaction dashboard. Finally, a customer flow analysis tool was developed to support managers in the sizing of SS teams.

5.3.1 Operations manual

This manual aims to establish customer service standards and improve customer experience at the different points of contact and interaction between customers and the SS. This manual is divided into seven points of contact – box, cafeteria, shop, supply, air and water, WC and bottles of gas – and is composed of several assistance techniques such as pre-payment and post-payment scripts. It includes techniques for the management of complaints and requests for information. Its development was based on the study and observation of the techniques previously used by the team members.

5.3.2 Promotion of OPT

The second initiative implemented to increase customer satisfaction concerns the promotion of OPT's usage in all SS. This promotion consists in operators communicating the advantages of OPT's usage to the customer - greater speed and ease of payment, and no need to move and wait in line at the convenience store.

5.3.3 Customer satisfaction dashboard

Customer satisfaction dashboard has been developed to monitor the operational performance of each SS and enable teams to be aware of the SS performance assessed by customers. It is composed of four parts that contain frequent evaluation metrics – NPS, classification, speed and complaints. The NPS presented is calculated through the assessments made by customers, collected by telephone, digitally or in person. Regarding the classification metrics, it refers to the evaluation of SS, from zero to five, performed by customers on Google. The third part shows the SS speed, which can be monitored through: 1) average supply in liters; 2) flow rate, in liters/minute; 3) average daily number of fuel transactions. Finally, in the fourth part, the complaints of each SS are presented.

With the implementation of this dashboard, the team members were able to jointly analyze the indicated metrics and become more proactive through the development of actions to improve the results.

5.3.4 Customer flow analysis tool

In order to support the sizing of the teams according to daily demand, a tool for weekly analysis of customer flow was created (Figure 3).

To size the team in a selected week of the current year, the SS manager should analyze the supply against demand in the homologous week of the previous year. This tool is made up of daily graphs that reflect the behavior of four different variables throughout the day: 1) available FTEs (full-time equivalent); 2) operators in service; 3) period of the day in which the manager is in the SS; and 4) percentage dedicated to direct customer service.

Firstly, FTEs are added manually by the SS manager. Regarding operators in service, this variable illustrates the quotient between the number of tickets received each hour and the number of tickets that an operator can meet per hour. Finally, the percentage dedicated to customer service in each hour is computed through the ratio between operators in service and the number of FTEs present in the SS at that time.

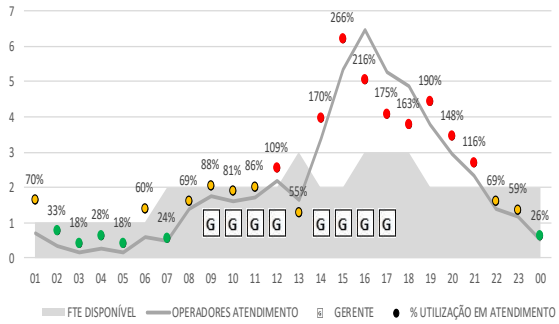

Figure 3 – Customer flow analysis tool.

After the introduction of these improvements, data was gathered, and the results are the following (Table 4):

Table 4 – Results of the introduction of other improvements

KPI and other gains	Description
NPS	Increased 45.0%, from +20% to +29%
Complaints	Decreased 13.7%, from 7.3% to 6.3%
OPT usage rate	Increased 12.2%, from 28.8% to 32.3%

6. CONCLUSIONS AND FUTURE WORK

The case study described in this paper was undertaken in Company A, with the main goal of increasing the overall efficiency of its Company Owned, Company Operated service stations and customer satisfaction.

With the implementation of lean methodologies *Kaizen*, *Gemba* Walks, Value Stream Mapping, Root Cause Analysis, 5S and visual management, and with the improvement processes in stock management and customer service, it was possible to decrease stockouts by 37.0%, losses by 35.9% and complaints by 13.7%. Furthermore, Net Promoter Score (NPS) increased 45.0% and the usage rate of outdoor payment terminals (OPT)

increased 12.2%.

Finally, regarding future fields of study in Company A, it is possible to identify the need for further work in the following four main topics:

- Improvements in stock management – study the possibility of implementing a material requirement planning to manage centralized stock;
- Improvements in team sizing – through the creation of a transversal team with resources and availability to move in certain areas of the country;
- Improvements in customer satisfaction – test the effects of placing promoters near the fuel pumps and launching online campaigns through social networks to communicate the advantages of OPT's usage;
- Improvement in the company's culture – develop the leadership of top management within the company through the practice of periodic *Gemba* Walks.

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