

Improvement Program Based on Lean Office Methodologies in a Customs Broker

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Master's Dissertation

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Mestrado Integrado em Engenharia Mecânica

2020-01-27

To my parents, for being the best role
model I could ever wish for.

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Abstract

The globalization of the economy has transformed the way businesses are developed by creating a global market. Nowadays, companies face an international demanding marketplace whose competition is fiercely technological. The emergence of new technologies at such an accelerating and ever-changing level, coupled with the current business scenario marked by budget cuts, and preeminent quarterly results. Is unreliable the compulsion that organizations adopt new methodologies, that narrow their focus on higher-value-added-tasks, in their business strategy, in order to display the most distinguished products or services, determined to differ from the competition.

Within this framework, a customs broker has started a project aimed at the digital transformation of the processes. One of the first guidelines in the project, is the application of lean tools and principles to promote a mindset of continuous improvement.

Hence, the exposed Lean Office program aspires to develop and apply measures to reduce waste in the entire chain of operations on an end to end perspective focusing on the higher efficiency improvement found. Therefore, the program presented in this document is specifically addressed for changes to improve the processes that do not conflict with the vision of major project at hand.

The result is a cumulative plan of quick actions, aimed at the elimination of idle procedures that generate waste and thus create more value to the flow of information. Key changes on the workspace organizational culture and the additional layout redesign lead to the promotion of new metrics in the organizational skills of the employees and a clearer flow for communication. A technological appeal to the daily operations procedures was made through the reinforce of the use of the excel tool. This measure would parallel support the central change on how the documentation that reach the company be treated. These efforts would climax at the reduction of the company lead time, consequently, the productivity increase, and the further elevation of a digital “footprint” of all the processes information.

It is also marked by the introduction of Daily Kaizen in the operations to promote a shift to a continuous improvement culture, which was the crucial implementation barrier in this program.

Resumo

A globalização da economia transformou a maneira como os negócios são desenvolvidos, criando um mercado global. Atualmente, as empresas enfrentam um mercado internacional exigente, cuja concorrência é ferozmente tecnológica. O surgimento de novas tecnologias a um nível tão acelerado e em constante mudança, juntamente com o atual cenário comercial marcado por cortes no orçamento e resultados trimestrais proeminentes. É indiscutível a compulsão de as organizações adotarem novas metodologias, que foquem em tarefas de maior valor agregado, na sua estratégia de negócios, para exibir os produtos ou serviços mais distintos, determinados a diferir da concorrência.

Dentro desse contexto, um despachante aduaneiro iniciou um projeto que visa a transformação digital dos processos. Uma das primeiras diretrizes do projeto é a aplicação de ferramentas e princípios Lean para promover uma mentalidade de melhoria contínua.

Portanto, o programa de Lean Office exposto aspira a desenvolver e aplicar medidas para reduzir o desperdício em toda a cadeia de operações numa perspectiva de ponta a ponta, com foco na maior melhoria de eficiência encontrada. Assim, o programa apresentado neste documento é especificamente abordado para alterações de melhoria de processos que não entram em conflito com a visão do grande projeto em questão.

O resultado é um plano cumulativo de ações rápidas, que visa a eliminação de procedimentos ociosos que geram desperdício e, assim, cria-se mais valor ao fluxo de informações. As principais mudanças na cultura organizacional do espaço de trabalho e o novo design do layout levam à promoção de novas métricas nas habilidades organizacionais dos funcionários e a um fluxo mais claro de comunicação. Um apelo tecnológico aos procedimentos operacionais diários foi feito através do reforço do uso da ferramenta excel. Essa medida apoiaria paralelamente a mudança central de como a documentação que chega à empresa seria tratada. Esses esforços culminariam na redução do lead time da empresa, conseqüentemente, no aumento da produtividade e no avanço de uma "pegada" digital de todas as informações dos processos.

Também é marcado pela introdução do Kaizen diário nas operações para promover uma mudança para uma cultura de melhoria contínua, que foi a barreira de implementação crucial neste programa.

Acknowledgments

I would like to thank my supervisor at Rangel, Marco Brito, for always being available to share his technical knowledge, his guidance and supporting me every time throughout this project.

I would also like to express my gratitude towards my other supervisor within the project being developed, Miguel Cordeiro, for his management inputs, leadership qualities and the general environment of transparency towards the pursued strategies.

To my academic supervisor, Professor Eduardo Costa, I would like to express a word of gratitude for the technical inputs, the overall support and guidance during the project.

Thank you note to Jorge Ferreira and Ana Santos in the financial administration department for all availability and the theoretical inputs. To all my colleagues in DSI for the shared knowledge and experiences. A special acknowledge to Lúcio Gomes for all the endurance along this project, without it half of the planed measures wouldn't have happened.

It has been a long path until this point, with all its highs and lows, an enriching and breathtaking experience. To my family for always being present, for the unconditional love and support throughout this academical experience.

The last but not the least to Catarina Almeida for all the love and support.

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Acronyms:

AEO – Authorized Economical Operator

AWB – Air Waybill

BI – Business Intelligence

BL – Bill of Lading

CAPEX – Capital Expenditure

CMR – Convention on the Contract for the International Carriage of Goods by Road

DW – Data Warehouse

ERDO – Eduardo Rangel Despachante Oficial

ERP – Enterprise Resource Planning

ETL – Extract Transform and Load

EU – European Union

FEFO – First to Expire First Out

FTE – Full Time Equivalent

GDP – Gross Domestic Product

INE – Instituto Nacional de Estadística

KPI – Key Performance Indicator

LTS – Long Term Strategy

OCR – Optical Character Recognition

OPEX – Operational Expenditure

OPL – One Point Lessons

ROI – Return On Investment

SLA – Service Level Agreement

SP – Stored Procedures

STS – Short Term Strategy

UDF – User-Defined Functions

VAT – Value Added Tax

WCO – World Customs Organization

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1 Introduction

In the past 25 years, service companies have become a relevant booster in the global economy, sensibly 60% of European's employees work in the services businesses, (OECD, 2019), 73.2% of the 2018 Gross Domestic Product (GDP) is contributed by services, of that 19.1 % are distributive trades, transport, accommodation and food services (Eurostat, 2019).

China is among Portugal's main trading partners and the exchange between the two countries has been increasing at a rapid pace in recent years as result, a new cycle in the relationship between Lisbon and Beijing. Importing goods from China is increasingly common among Portuguese companies. According to Instituto Nacional de Estatística (INE), in 2018, Portugal bought more than 2,350 million euros in goods from China, an increase of 14.6% over 2017 (INE, 2019). China is the largest importer of basic material in the world and the first exporter of finished goods (Gereffi, 2018). Thus, this presents a web of quite extensive and complex bilateral trade relations. This evidence has been happening proportionally over the past 15 years, which embodies a major a pole shift in global market dynamics, making a relevant impact on the trade volume of Logistics companies, such as Rangel. Conjointly, the term “Brexit” which is a crucial topic these days as the actual outcome may potentially create trade barriers and shatter innumerable supply chains, notably the transit times and fluxes.

Taken into consideration all these unfolding factors, Logistic businesses ought to lay the groundwork and anticipate measures to the upcoming events. Reassuring their operations department in an unshakable and efficacious way, to brace up to the incoming work volume intensity.

The present dissertation, developed at the Rangel Logistic Solutions, focuses on improving the performance of the operations department of Eduardo Rangel Despachante Oficial. The operational department is crucial on the operational side of the company because of its information inflow. This work represented the first push into a restructure which envisions the digitalization of its processes on an end to end basis.

1.1 Rangel Logistics Solutions

Rangel Logistics Solutions is recognized in the market as a global logistics operator, with a portfolio of integrated solutions, spanning from customs formalities, land, sea or air transportation, national and international express courier, warehousing, physical distribution, trade fairs and exhibitions, critical transport, a tailored segment disassociated in critical categories. The mote in Rangel is to be a Global Logistics Partner, mainly a business-to-business model, providing a service of One Stop Shop solution to its clients. This business model allows the company to be a reliable player in many supply chains from small to large businesses, providing its clients with the freedom to concentrate on their core field, as well as, in their value-added based activities. Such specificity in the supply is by virtue of Rangel internal structure, the whole organization is a group of companies sub-divided by each business

line, which are responsible to manage their own activities and report directly to each Chief of Operations, which accounts to the Rangel Chief Executive Officer.

Throughout the years Rangel grown towards their clients' needs and challenges, which resulted in the creation of the different companies within the organization. Those companies are described below.

Customs Broker – acts as a mediator between Traders and Customs in the clearance process, providing world trade services on behalf of both national and international companies, by executing customs formalities and procedures related to cargo clearance, while maintaining governments interests by ensuring compliance with customs and all mandatory regulations associated with collection of duties and taxes on the goods.

Road Freight – Ensures Europe's full coverage by road transport operations in all types: groupage, full and part loads, intermodal transport and local distribution. This business relies on a broad network of partners with resources to make the transport of goods until the final station.

Air and Sea Freight – Offers a freight forward service via aviation and navigation companies, banking on them to uphold the transport. The Air Freight distinguishes for the urgency and dimensions of the carried goods, concerning the Sea Freight, differentiating in the volume and type (hazardous materials).

Express – In collaboration with Correos Express, provides domestic and foreign express delivery options, with pressing matters on the products to dispatch.

Contract Logistics – Covers a spectrum of solutions, which enables the customer to transfer all the non-expertise procedures of their business, such as warehousing, stock management, order preparation, labelling, picking and packing, assembly and distribution.

FeirExpo – Conceived in 1998 in the interest of handling all affairs for the Expo 98. Since then, mature to a made-to-order business, devoted to the transportation of special packages (artworks), storage in acclimatized and protected warehouses, the carriage with highly qualified vehicles, and all-over supervision of the events.

Custom Critical – Strikes a narrow sector of the logistics, offers a tailored operation with critical and customized needs due to the characteristics of the shipment, in terms of urgency, weight, dimensions, value and unusual design.

Established in Portugal, the Rangel headquarters are in Porto and Lisbon, along with offices in Angola, Mozambique, Cape Verde and Brazil. The enterprise incorporates more than 2.000 employees (Rangel, 2019). The project is held down in Porto, in the Customs Broker company Eduardo Rangel Despachante Oficial.

1.2 Eduardo Rangel Despachante Oficial - ERDO

ERDO was the first sub-brand of the organization, had its origin in 1980. At this time, the unique and solely purpose of ERDO was to support operations of customs clearance by exclusively filing declarations for Customs release.

This company has a specific role in the supply chain on behalf of traders, such as freight forwarders, carriers/agents, warehouse operators and transporters, by bridging the clients with suppliers, through connecting all parts involved in the transaction. Moreover, the distinguished regimes (export or import) relate to a different point in the supply chain (WCO, 2016).

Furthermore, the status of Authorized Economic Operator (AEO) was granted by ERDO. This status acknowledged companies that meet a set of criteria and requirements assessed by the customs administration which realizes a privileged position in the relationship with customs at

international level (WCO, 2016). Some of the advantages of this trust status are the reduction in the number of verifications and agile release of cargo.

Customs clearance consists of checking the compliance of the data declared by the trader with the legislation in force in the country of destination according to the type of goods. This is the primary function of customs as a national authority to ensure compliance with legal requirements, such as *VAT – value-added tax* and customs duties, on goods. Goods imported from countries outside the European Union, which do not belong to the community, are subject to customs control aimed at ensuring the compliance of customs formalities necessary for the goods to be consumed or traded on the common market.

Depending on various factors, such as: the origin and value of the goods, the tariff classification, the nature of the parties involved, the nature of the business, the purpose of the goods, and so forth; the length of customs formalities to be completed in a customs clearance process may be minimal or not.

1.3 Project Objectives

ERDO is undergoing a 4.0 project which aspires to accomplish, in 3 years, a complete restructuring of the company through reengineering and digitalization of the processes.

A Roadmap was created by the project managers in order to implant the progress in line with the restructure objectives, which portrays a split venture in three different vectors. Firstly, Implement a culture of continuous improvement. Then, procurement phase of a new information system. Finally, acquisition and execution. Regarding the timeframe juncture, the first vector comprehends the Short-Term Strategy - STS, while the other two covers the Long-Term Strategy - LTS.

The present project refers to STS, and so the attempt to improve the operational inefficiencies in the Customs Broker and toward the creation of a continuous improvement mindset.

This involvement aimed to eliminate several detected *Muda* in the operations department thus increase productivity. The proposal behind this schedule, allowed the operators to be the head of the endeavor, beginning the first steps to ERDO 4.0, giving them the sense of project involvement instead of a pushover.

The project aims to:

- Improve the organization and visual management of the work area;
- Create a better flow of information;
- Design a management methodology for natural teams;
- Implement the methodologies in the natural teams.

In addition to these goals, it is also intended to achieve a higher degree of technology awareness. Therefore, the digitalization is smoothly managed and easily attainable.

1.4 Methodology

The STS was arranged in three individual stages: trace and analyzation; outlining solutions; execution and overseeing.

The first step began with the complete submersion in the business and in all relevant operations. There happened the mapping of all the current activities and the analysis of the value chain, in order to understand the existing state. Then, a survey was carried out of the processes used in production and the flow of information. During this monitoring, the different tasks had their time measured, to later create a sample base to work on, hence compose relevant productivity indicators.

In a posterior phase, using the Lean tools mentioned in the Literature Review, the different improvement opportunities were bridged with some proposed solutions to be implemented. Based on the solutions obtained, an action plan was developed to implement the desired changes and then were presented to the project managers, company's head office and employees. Consequently, all stakeholders' convictions and struggles were aligned with the project strategy.

At last, the fulfilment changes will be monitored to ensure that they grew sustainably and to later evaluate the results obtained. The applied tools have the purpose to support employees who were directly affected by the changes and to enable them to overcome the difficulties they experienced or will experience.

1.5 Document Structure

Based on the aforementioned objective presented in the introduction, this document is divided into five chapters.

Chapter 1 exposes the current business scenario where this enterprise fits and the overall service structure that Rangel presents to its customers. In this chapter, is also disclosed the subject and methodologies of this project, and its relevance towards the company's pursued strategy.

Chapter 2 presents the literature methodologies undertaken in the project. Chapter 3 uncovers the current state and the improvement opportunities. Chapter 4 discusses the collection of applied and proposed improvements, then, at chapter 5 is analysed the operational and financial impact of those improvements.

Finally, chapter six draws conclusions from the results and discussion, and presents the major implications, limitations as well as suggestions for future research.

2 Literature Review

In this chapter is addressed in a greater scope lean thinking and modern approaches to lean principles in office-related environment thus their influence in managing productivity. Further detailed applications in the office such as effects of architectural dispositions; business intelligence tools; and process modelling, will be the presented subject bellow.

2.1 Lean Thinking

In the 1940s after World War II, the Japanese economy was in decline. National companies were forced to look for new methods of controlling production and inventory in order to reduce their production costs. Picture the only manner would it be possible to outlast in bearish market, where demand was dwindling, and humongous financial problems were commonplace for various companies (Krafcik, 1988).

Competitiveness would be achieved by cost reductions through eliminating waste in the operations, but unlike American automotive companies, Toyota could not resort to economies of scale or mass production as efficiency strategies since the Japanese market was not large enough. In addition, the Japanese government had implemented stringent legislation to prevent the dismissal of workers. This context motivated Toyota to develop an increasingly flexible and efficient production system and less dependent on large production lots (Hopp & Spearman, 2001).

Matured over time, the fundamentals and tools implemented at Toyota have been consolidated into the new approach to operating departments, known today as *Lean Manufacturing* (Reinertsen, 2005). Lean Manufacturing first appeared in 1990 as a result of a comparative study on mass production of European and American companies highlighting the flexible production operation, or better known as *Toyota Production System*, of Japanese automotive companies (Womack, Jones, & Roos, 1992).

2.2 Lean Office

Once the Lean philosophy was integrated into the production support areas, Lean was extended to service companies, and the Lean Office concept emerged. This is not surprising as today more than 70% of the working population is engaged in a form of an office corporate job. This opportunity presents a huge potential in the office environment (Rüttimann, Fischer, & Stöckli, 2014).

A problem with introducing and accepting Lean Office in most companies was that “office waste concept” owes to characteristics of the business such as, intangibility, perishability, variability and lack of ownership, which precludes the ability to assess the current state and therefore, difficult to reduce and measure results (Andrés-López, González-Requena, & Sanz-Lobera, 2015). There are reduced key figures capable of measuring the efficiency of office activities and processes. Mostly due to the execution of such process is rather open to the executor discretions. As in the service sector the main cost factor is associated with the workforce, corporates throughout the market want to assess efficient new methods and management approaches (Damrath, 2012). Thereby, the methods developed for the industrial manufacturing can only be transferred to the office world in a rudimental manner. Although the same approaches cannot be precisely transferred, the same objectives are pursued in both industrial and office. This evidence clearly implies the original lean methodology, as applied in TPS, is not yet fully assimilated by the general service sector (Rüttimann et al., 2014).

The processes in office, usually cover not only the operational perspective but also the service generation view and the support operations. When analyzing an enterprise, it is required a

special awareness along these stages. The utilization of swim lanes presents an attractive solution to visualize the interfaces, where handovers happen, and even where dilemmas are faced (Chen & Cox, 2012). The performance of activities in the service sector cannot be determined in accurately quantitative measures. Since every process is unique in its own core, it is repeatable but not in its content. Also, the required information to complete a process, can too be of different origins. For example, the oral instructions given by phone call to customers, or an enterprise internal communication related to some process. This lack of repeatability leads to different working procedures, as its constraints a clear modelling of the desk job. Hence, when considering a large workforce, there is an exponential dissemination of inequalities throughout the processes, which challenges the fair interpretation of key performance indicators (Rüttimann et al., 2014).

In manufacturing the lean methodologies strive to achieve a customer defined takt, the division of labor into small repeatable elements that increase efficiency. However, in the office environment, even if a division of efforts is made, the work is not particularly defined which means several deviations can happen. Eventually, the official in charge has an increased number of tasks to perform. Not necessarily a constraint, since this improves the amount of checks, which lead to better quality. Nevertheless, the lesser number of transfers and the less information is exchanged decreases the likelihood of misinformation. As mentioned, in the office world there is frequent interaction with other stakeholders. In consequence, the collection of tasks presents a high variability of the initial input scope and the forward verification, which most likely emerged only during the execution. The variability between production of the service and forward verification of the process, is the reason the implementation of takt-pull system in office is challenging (Rüttimann et al., 2014).

One regularly emergent philosophy in the service sector, which is often misunderstood, is Kaizen. This methodology will be discussed in a later section, through the operations view. The Kaizen has a natural fit in the service sector, mostly due to the rear shift in mindset of the management for the success of the business. Surely, without the effective change management from Kaizen, lean office will most likely pitfall (Rüttimann et al., 2014).

The application of lean tools in the office environment practices is still limited to the use of value stream mapping the procedures; flagging the different value and non-added value activities; and hunting operational waste. For this reason, many Lean Manufacturing tools and methodologies had to be adapted to offices, to take into consideration the office reality (Chen & Cox, 2012).

2.2.1 Lean Principles and practices

The lean methodology for achieving improved performance in office operations was developed by shaping the types of waste to the different concept and by establishing a series of principles and techniques for services (Wijnhoven, Beckers, & Amrit, 2016). These authors also added two further principles to include frequently observed issues in office: improving communication and designing better integration with information systems.

Reduce Waste – eliminating or diminishing waste from the value chain is the key factor in lean. This reduction consists of downsizing the need for resources and maintaining the same output (Wijnhoven et al., 2016). Moreover, streamlining processes and growing process consistency accomplishes enhanced operational performance (Alsmadi, Almani, & Jerisat, 2012). Office-related wastes tend to arise as long waiting, rescheduling and postpones, and preparing unnecessary reports (Hines, Martins, & Beale, 2008).

Focus on customer value – focusing on the customer means that the customer becomes an integral part of the delivered value and that the firm needs to find greater value creation opportunities for both supplier and customer (Ashkanasy, 2011). Linked customer concerns are

usually service quality provided, customer experience and customer satisfaction which impacts crucially the success of businesses (Wijnhoven et al., 2016).

Take holistic perspective – lean principles should be applied to the entire value stream in coherent business logic, otherwise, lean changes will remain restrained. Eliminating waste along the entire organization, instead of pinpoint situations, shapes a strategy that adds more value to the businesses so that the whole is worth more than the sum of its parts. Accompanying the propensity towards improvement on processes as a whole instead of enhancing sub-parts, is relevant to service businesses considering their vertical and functional structure may inhibit communication between cross-section departments (Bortolotti, Romano, & Nicoletti, 2010).

Standardize work – standardization expresses the vessel to uniformize certain activities into the best operating cycle into a step-by-step way. Standardization enables a significant reduction on variation, which leads to improved productivity, quality and even cost reductions (Wijnhoven et al., 2016). Joining those capabilities with some degree of automation, show results in the service sector in reduced queues and data entry errors (Bortolotti et al., 2010). Also, the standardization of tasks empowers operations teams with the necessary robustness to bridge challenges like high loads, unpredicted absences (Míkva, Prajová, Yakimovich, Korshunov, & Tyurin, 2016).

Make steps flow – flow is working continuously from start to finish in the value stream without bump leaps in volume (Rahani & Al-Ashraf, 2012). Flow can be improved by placing people near, which reduces the necessary movement of people and information (Swank, 2003). One-piece flow and cell layout enables the minimization of motion, work-in-progress and batch size, which promotes the continuous flow (Bortolotti et al., 2010). Streamlining information with the use of software to enhance the interface design between automated and manual activities, allows improved flow (Bortolotti et al., 2010).

Reduce inventory – inventory covers all types of materials and information held by companies to neutralize the effects of variability in supply, processing time and demand (Shah & Ward, 2007). Work-in-progress limitation enables a refined flow by shortening work cycles and creating small batches, which culminates in reduced need of space for inventory (Wijnhoven et al., 2016).

Increase employee involvement – highlights the capability of involving employees in the process of problem solving in operations by playing on developments in reengineering, quality improvement and preventive maintenance. Further, lean methodology endorses the idea that workers should be cross-trained to promote versatility and prevent compromising the flow or even the quality in case of unexpected casualties (Shah & Ward, 2007). In service businesses, employee involvement can be notably accomplished because these firms already realized that their competitive advantage is on their main resource – human behaviour (Wijnhoven et al., 2016).

Metrics for throughput time and quality – throughput time is a valuable measure, it is a metric for checking the current state of activities performed with start to end scope, in combination with statistical process control for measuring the quality of the work performed. It is a powerful system for controlling operations performance in office (Wijnhoven et al., 2016).

Visual control boards – are a resourceful tool to agilely communicate information in teams by making everyone aware of current affairs, making use of charts, graphs, signs, images, colors or even electric lights. The target is to increase operational efficiency by making steps more visual and employees aware of them. In service businesses, this tool has the purpose of shining light in the processes which in the office are slightly difficult to notice (Wijnhoven et al., 2016).

Levelling the workload – related to producing outflow at a rate that is agreeable with client demand. The workload can be evened out by dispersing into different complexity levels. This is achieved through proactive planning so that operations are conducted in continuum and in a balanced workflow. Additionally, through implementing FEFO – first to expire first out, a less stressful environment for both operations and clients can be accomplished (Wijnhoven et al., 2016).

2.2.2 Types of Waste

In (Ohno, 1988) seven types of *muda* are identified for the first time, whose minimization or even elimination is crucial to the wellbeing of a company.

An important form of waste that is not represented in the original Seven Wastes is *unused potential*. Not fully using people's mental and physical abilities leads to a variety of lost opportunities such as less drive, less creative and minor improvements. Unused potential often results in lost opportunities. The inefficient management policies and management styles often incur in unutilized employee experience.

Since then evolved in light with lean office principles applied in services companies, and, also increased to nine types as an adaptation by this author, in line with desk job specificity given the large cost basis are allocated to operators time to conclude tasks (Wijnhoven et al., 2016).

1. **Expenditure of resources that do not add value for the customer** – unnecessary expenditure of resources to complete the task, or purely executed tasks that lead to inactivity;
2. **Information overflow** – the office form of overproduction, since there is no material flow. Generating excess of information is a waste of effort;
3. **Waiting** – the prominent factor in customer satisfaction. This waste is a consequence of different problems such as wrong office layouts, data entry errors, or even poorly designed IT systems;
4. **Extra processing** – is generally a result of mistakes or missing information, manifests by the time consumption in correcting and verifying the information;
5. **Excess Inventory** – the volume office supplies are not distressing, although it happens with unfinished work. The storage of overabundant information, partly due to misunderstanding of its potential value. For example, preservation of multiple copies of documents in different repositories;
6. **Motion** – building layouts or even office layouts, have a harmful impact on the unnecessary movement of employees. Also, attending meetings that are not entirely necessary for the presence of every person. In information's systems, it is still relevant since several software's inabilities to exchange information and that forcing the need of duplication of information by the user;
7. **Defective information** – tasks or resources required to ensure the correct and accurate information. Defective information, such as data entry errors or poor quality inputs from customers;
8. **Lack of standardization** – service business tasks are considered more volatile due to customers demand, nevertheless there are multiple routines able to improve efficiency through standardization, which decrease lead times and waiting times;
9. **Under-utilization of people's talents and systems capabilities** – the unused potential of the workforce leads to less driven and less motivated employees. Additionally, can

be applied to IT systems. Some IT features are not exploited to the whole extension due to lack of training and/or inefficient communication.

This segmentation of different types of *muda* is an adaptation of different authors with intention to create their method to service companies (LEFI - Lean Evaluation and Future Improvement) which allows organizations to easily identify where waste is in each of their processes and operations, thus through their complete elimination or minimization, companies are able to reach large efficiency increases (Wijnhoven et al., 2016).

2.3 Kaizen Fundamentals

Three years before Lean emerged, in 1985, Masaaki Imai founded the Kaizen Institute Consulting Group and shortly after published the book “Kaizen: The Key to Japan's Competitive Success” (Imai, 1986). Imai describes Toyota's management system from a different perspective. Essentially, the competitive advantage of the Japanese is summarized in a concept, kaizen, whose literal translation is "change for the better". While Western management systems were geared to immediate results, Japanese management systems were process-oriented and long-term. Based on the assumption that good processes lead to good results, Imai argues that continuous improvement is a key point in business success.

Later, Imai defines Kaizen as “a strategy to win by giving all employees the ability to solve problems” (Imai, 2012). Each employee is given the opportunity to find problems in the way they work, to solve and implement improvements. This creates a system capable of following the deviations, learning from them and overcoming them. The goal is to guide improvement efforts by giving a comparative term. Because it is certain that the standards of the present will not be adequate for the requirements of the future.

The dilemma is Lean needs to grow in order to sustain the reduction of Full-Time Equivalent (FTE). Meaning, with the same number of workers, produce more and better, thus increasing efficiency. So, if the goal is to produce the same, with fewer workers, Lean is doomed to fail. Lean is primarily a growth strategy, not a cost reduction program. The focus must be on the long-term commitment needed with the employees, customers and suppliers, and not on lean tools. Otherwise, the improvement will not be sustainable, and the system sooner or later falters.

Kaizen presents itself as a way for companies to learn and understand the entire Lean system. It is a vehicle to harness the potential of all employees to make the company more efficient by creating more value (Laginha, 2019).

2.4 Daily Kaizen

The Daily Kaizen methodology strives to achieve better management of operational teams and the involvement of all employees in continuous improvement actions, belongs to an organizational transformation model called Kaizen Change Management. This tool results from the combination of some key concepts of operational team management, such as performance measurement, accountability and motivation, suggestion systems, work planning, workspace organization, standardization, improvement management and structured problem solving (Coelho, 2013).

One of the fundamental principles of a Lean management system is the daily accountability of work teams (Liker & Rother, 2010; Ökvist, 2016). This accountability should be based on frequent, brief and structured meetings, which should be held standing up and on *gemba* (Japanese word for "the place where value is created" that identifies the "shop floor" or work area) and should be a well defined schedule clear and visible to everyone.

Daily Kaizen responds to the need of holding employees accountable for their actions and aims to bring people together in work teams, where there is a distinct leader, responsible for conducting team meetings and promoting engagement. The goal is to develop various teams to be autonomous and able to maintain and improve their processes and work areas continuously. These teams should focus, beyond their work, in planning daily activities, the organization of *gemba*, meet compliance with rules and procedures, analysis of indicators and preparation of improvement proposals (Coelho, 2013).

The Daily Kaizen methodology is structured into four levels of intervention:

1. Team organization (staff meetings);
2. Workplace organization (5S);
3. Standardization (creation of work routines);
4. Process improvement (structured problem solving).

2.4.1 Team Organization

The first level concerns the organization of teams, which is symbolized by the formation of natural teams. The need to define the elements belonging to each team and their leader is imperative. Frequently the natural teams already exist in companies and belong to a certain department and to a certain team leader. Nevertheless, it is essential to state clearly their composition. Also, establish a meeting venue that has all the relevant information available to support the meetings. Team tables are usually created with the display of information visually, the goal is that this information serves as a support for a performance measurement and team accountability system, as a work planning tool and as a suggestion for improvement system (Félix, 2013).

Meetings should be set according to the needs of the teams, which can be daily, weekly or monthly. Is required a list of attendances, that compels everyone's involvement. Meetings must be quick and have a set agenda with a focus on the most important topics. The goal is to measure and discuss the team performance, through the established KPIs, which should be updated according to the frequency of the meetings, be simple and have attainable goals.

On the team board should exist an area for problem solving, the action plan, which tracks the improvement actions, this tool will manage all teams suggestions. This action plan works based on the improvement cycle, overtime will expose various problems and waste that teams face, which will lead to suggestions for improvement that can make teamwork more efficient and productive. The commonly used tool is the PDCA cycle.

2.4.2 Workplace Organization

The objective is to organize and maintain workplaces, in order to facilitate the usage of spaces. In order to be applied successfully, the involvement of all employees is essential since they are the ones who know the processes best and who will thrive with the implemented solutions. This way it is possible to come up with credible solutions and give the teams a sense of ownership so that they commit to maintaining working conditions constantly.

The tool used for this purpose is the 5S, should be done in a campaign environment, involving as much as possible the team collaborators. Although it is sometimes impossible to stop all workforce and ensure the presence of all (Félix, 2013; Santos, 2015)

The 5S tool origins from five Japanese words: *seiri*, *seiton*, *seiso*, *seiketsu*, *shitsuke*.

- *Seiri* (Sort): Separate and classify what is needed and what is not needed. Identify in the workplace what is being used or will be used soon, removing anything that is not useful;

- *Seiton* (Set): Organize what is needed in a simple and visible way. Everything should be properly identified and labelled, making it easy to spot something that is offsite. This certifies that each thing is accessible, hence reducing the movements required for its use;
- *Seiso* (Shine): Maintaining equipment and workplace conditions is the main goal of cleaning. Clean sheets will ensure the commitment to the task therefore products are always available;
- *Seiketsu* (Standardize): Employee commitment to change is a sensible thing to safeguard, so it is necessary to provide the changes made through normalization, monitoring the conditions defined in the first three steps described above;
- *Shitsuke* (Sustain): To assure standards previously created requires the involvement of everyone, where team leaders play a key role through periodic audits and objective alignment.

2.4.3 Standardization

The third level concerns the standardization of work processes. The intention is to adopt better working methods in order to increase productivity and compliance with the level of service provided to clients, as well as the support and preservation of knowledge. Thus, by setting the standards to be met, processes and their results become increasingly consistent, which allows managers to measure the performance of their teams in a more fair and consistent manner.

To normalize the work there are several tools, such as the Standardize, Do, Check, Act (SDCA) cycle, which appears as a guarantee that improvement processes are consolidated within organizations, or the creation of One Point Lessons (OPL). An OPL is a step-by-step explanation of a specific part of a task and should be written in the form of succinct sentences, similar to a checklist.

It is then necessary to define and design the working standards to comply, which should be simple, objective and accessible. Thus, it can be concluded that standardization serves as a complement to the cycle of improvement (Félix, 2013).

2.4.4 Autonomous improvement

The last level of this methodology concerns structured problem solving. Teams should be able to identify existing problems in their processes and propose improvements to their resolution, in order to simplify and optimize the workflow. Tools that help solve problems in a structured way are used here, such as the PDCA (Félix, 2013).

3C Methodology is also utilized as a structured problem solving tool. The described problems are structured in four blocks:

- **Case** - the cycle begins with the problem description by answering the questions: "what? when? where? who? how?";
- **Causes** - Secondly, the root causes are explored by use of fishbone diagram or analysis of the five whys;
- **Countermeasures** - outlined an action plan with well-defined responsibilities and deadlines;
- **Verification of results** - the results are confirmed to see if the problem was effectively resolved.

2.5 Office Layout

Employee productivity is intrinsically associated with the success and financial wellbeing of an organization. With the growth of service companies, employees are consolidated as a decisive key asset of a company, being essential to ensure their job satisfaction and productivity as a competitive tool. The influence of the work environment on satisfaction and productivity have become a common matter between researchers (Ornstein, 2011). The workplace must provide employees with a work environment that supports their activities and is aligned with the specifics and requirements of their tasks, thus supporting solid performance (Colonial Academic Alliance. Leah R. Wolfeld, 2010).

2.5.1 Implications of layout change

Changing the workplace environment as an aid to organizational change is effortful. The workplace layout can be used to increase collaboration and openness, thereby enabling improved organizational performance. The notion that the workplace should not hinder an organization's ability to respond to the changing business world has been studied with significant devotion. The authors developed the idea of workspace flexibility, which is a minimalist approach to the office design. Their thesis focuses in maintaining a clean office, free of clutter, to enhance the capability of the workforce to react according with the demands (Bradley & Hood, 2003).

Bradley and Hood (2003) created four rules to ensure the workplace improves corporate agility, those rules are described below:

1. Consistently cleaning to maintain mobility in the office;
2. Plan the design to sustain stress hours;
3. Choose relocatable components;
4. Consistently audit the need for space and technology, follow the flow of innovation.

The fourth, probably the most crucial, support office habitats should be designed and adapted, to reinforce the work procedures, with the intent of diminishing the probability of divergence between them and leading a modern and collaborative climate.

Aligning office layout and work processes

Productivity losses could be attributed to a mismatch between the office environment and the work undertaken in that environment. Regulating the design of the office's physical arrangement by the use of work patterns to settle an optimal match between work processes and office conditions. Employing measurements like face-to-face interaction in the office, the amount of flexibility and autonomy of the occupier researchers concluded office layout to be generally having a negative impact on their productivity when office environments are being designed without a detailed appreciation of the occupiers' and necessary use of space (Haynes, 2008).

Physical Proximity

Another office layout feature commonly examined refers to the physical distance between people. Physical proximity increases the frequency of interactions and the quality of communication among people. The existence of teammates nearby can develop an environment for the efficient exchange of information that is necessary for favourable collaborations.

Even though communication technologies had a relevant boost on the number of users, face-to-face communication remains more effective than virtual communication methods for completion of complex team tasks, which is why it remains critical for organizations to uphold

the effort of promoting value teamwork and collaboration (Zerella, von Treuer, & Albrecht, 2017).

Influence on employee distraction

A common concern with employee interactions is the level of distraction. The workplace together such as “local of collaboration and teamwork” is correlated with not being distracted, which means when considering job satisfaction, productivity and organizational commitment within the context of the work environment, workers stay more focused on the tasks at hand, when there is a physical rule that reminds them that they are at work (Colonial Academic Alliance. Leah R. Wolfeld, 2010). However, human behaviour is unpredictable and unreliable, so some adjustments are necessary to counteract some practices. One of them is travel time within the office correlates with accessibility and with the frequency of interactions. Which spatial configuration of an office had a direct impact on the frequency of interactions (Colonial Academic Alliance. Leah R. Wolfeld, 2010).

Architectural Privacy

Privacy is defined as a feature of the physical environment. Often, architectural privacy refers to the influences on which people are exposed to distractions and disturbances when working in the community. Office layout refers to the physical office space and the way objects within it are positioned including the boundaries that are created by physical barriers such as walls and objects. The use of walls and physical barriers increases the level of architectural privacy; while open office spaces with no physical barriers separating workstations are linked to minimal privacy, thus leading to greater opportunity for interaction, communication and collaboration, but also, unfortunately, distractions (Zerella et al., 2017).

Congestion

Congestion is caused by bottlenecks. In offices congestion derives from people’s behaviors, when a person feels in control of the situation, they can mediate approach and control personal behaviors. Congestion is a situation in which a person is generally not in control. The lack of control may have a variety of negative responses, which is why spatial layout can be an effective instrument to positively influence this situation. Affecting undoubtedly motion in office and travel times results in much less congestion such as irritation and stress (Zijlstra & Mobach, 2011).

2.5.2 Layout designs

Designing the physical arrangement must obey a few key strategies. The office layout concerns the disposition of resources like desks, equipment on the premises of operation, determining the way information flows through the operation. The office layout is a predictor of organizational culture, which can guide employee behaviour, particularly the quality of people’s interactions in work environments (Zerella et al., 2017).

Process Layout

Characterized by the grouping of all processes and similar functions in the same location. Where each employee has his distinct task. This structure achieves a better flexibility when concerning large variability in work flows. However, high intense flow leads to the work accumulation in buffer, hence increased lead times (Slack, Chambers, 2009).

Cellular layout

Cellular arrangement just like in manufacturing is a great tool to improve productivity, the mutated concept to office space relates to the same. The information upon entering the operation, are pre-selected to be routed to a specific part of the operation (cell) in which the

work needed to meet client requirements, allowing for more flexibility as the open plan arrangement, along with more efficiency. Cooperative work provides advantages when the division of labour is required as well as the resulting specialization of employees (Otterbring, Pareigis, Wästlund, Makrygiannis, & Lindström, 2018; Slack, Chambers, 2009).

“The greatest improvement in the productive powers of labour, (...) seem to have been the effects of the division of labour.”- Adam Smith, The Wealth of Nations

2.6 Process Modelling

Process modelling represents one of the core concepts enabling businesses to flexibly react to dangerous mutable business environment (Leopold, 2013). Depending on the degree of complexity of the processes, there are several methodologies that organizations can use to visually transpose the way they conduct their internal activities (Santos, 2019).

This methodology is far from perfect, there should be some careness related to its proving. Process modelling should be represented in a formal and easy language as one of the difficulties in their communication. In addition it is important to understand the most appropriate degree of detail, since too much detail can lead to bewilderment, and also the other way around, the lack of representation (Santos, 2019).

The modelling procedure consists of the graphical representation of the activities in the study, which will be the basis for the analysis phase in order to identify improvement opportunities (Braga, 2018). There are some stages structuring the modelling process:

- Getting acquainted with the business – know the core business, processes of management, support and operations. Understand the client's needs and some goals to accomplish;
- Preparation for modelling de process - the stage where the duration of the mapping process is estimated, where the elements to be delivered to the client company are defined;
- Process survey –survey meetings are conducted with employees of the organization, which aim to sequentially document the tasks performed, identifying the control documents needed in each task, the points of decision making, the periodicity of execution of tasks, the necessary information systems and know how activities and processes relate to each other;
- Design model AS IS - the AS IS model corresponds to an abstract representation of the current reality of the company;
- Identification of improvement opportunities - detection and diagnosis phase of process hotspots, duplicate tasks and areas for improvement;
- Design model TO BE – plan the graphical representation of the future state model of the organization. Based on industry best practices in which the organization is inserted, and the detected failures are eliminated or reduced.

2.6.1 Swimlane

The swimlane diagram is a well known process flow representation model. It is intuitive, from left to right, to get a sense of the process flow and the point of involvement of each participant. These types of diagrams expose clearly the tasks of each stakeholder throughout the process and are widely used in cross-organizational processes by highlighting the participation of each, so that it is more evident the responsibility to perform the process.

The involvement of different departments or even different companies in the process path is a common requirement. For that reason, swimlane diagrams distinguish for being able to highlight the relationships between various stakeholders without impairing or puzzling reading (Santos, 2019).

2.6.2 Flowchart

Picturing an exact photograph of a real situation in a step by step insight. The flowchart models are an expedient and impromptu method of representing the flow of information between the elements that make up the process. Visually decomposing a process into activities by highlighting its logical relationships and can represent in great detail the process flow with a considerable degree of complexity.

In comparison with swimlanes, flowcharts are more capable of representing the variability and complexity of the actual work. Therefore, flowcharts are most intended for higher level of detail (Braga, 2018).

2.7 Business Intelligence Systems

Over the past 40 years Information Systems have had exponential growth mostly due to the same market exponential evolution in both competition and complexity. A crucial success factor has become the willingness to develop custom computer based systems to present answers to management questions and support the process of decision making (Burstein, W. Holsapple, Adam, & Pomerol, 2008).

The concept of Business Intelligence (BI) is comprehensive, but can be understood as the set of methodologies, architectures and technologies that transform the entire data gathered into meaningful and useful information through granular refining. The processes cover extraction, analysis and presentation to provide fruitful insight about an enterprise, thus leveraging an optimized business decision (Wu, Barash, & Bartolini, 2007).

2.7.1 Business Intelligence Architecture

Business Intelligence architecture can be defined by layers, that way it helps to identify the implementation phases and technologies required to realize BI systems. This architecture consists of five layers, each corresponding to a different data stage and system requirements: data source, data movement, Data Warehouse, mid-tier servers, and the data business analysis, Figure 1.

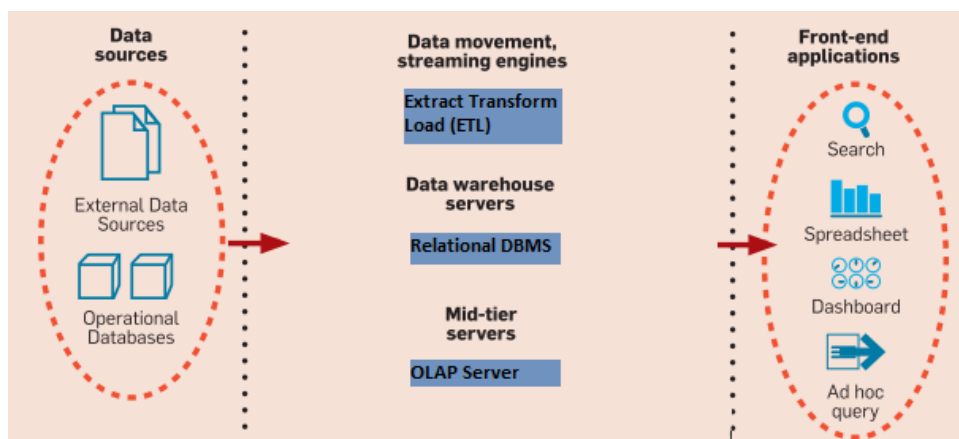


Figure 1 - BI architecture adapted from: (Chaudhuri, Dayal, & Narasayya, 2011)

Data Source

BI tasks are performed over data, that typically comes from multiple sources. Those databases can have their origin in the organization within like operational databases or come from external data source. The various sources can contain data of diverse quality, like inconsistent representations, codes and formats, which must be reconciled in order to be exploited. Thus, problems such as integrating and cleansing data in the preparation for BI tasks can be considerably troublesome. Additionally, BI tasks need to be performed regularly whenever new data is loaded in the model. For example, the loading of last month revenue data, refreshing every month. Consequently, efficient and scalable data loading is imperative for BI. That capability is achieved through a back-end technology which prepares the data for BI and is commonly referred as Extract-Transform-Load (ETL) (Chaudhuri et al., 2011).

Extract-Transform-Load (ETL)

ETL refers to a collection of tools that play a vital role in identifying and correcting data quality issues and efficiently loading large volumes of data into the warehouse. When data is loaded into the warehouse, there may be errors such as missing information in the data or even inconsistent representation of the same values. As a result, tools that can efficiently get high quality data into the Data Warehouse (DW) from multiple sources, by detecting data quality issues and restoring data integrity in the warehouse.

Load and refresh are capabilities responsible for moving data from operational databases and external sources into the DW quickly and with minimal impact on performance. The overall procedure for capturing changed data and efficient loading it into the DW can approach refresh rates of few seconds (Chaudhuri et al., 2011).

Relational Servers

Gradually there has been the need to support BI tasks in near real time. In other words, make business oriented decisions based on fresh operational data itself. Thereby, specialized engines have emerged to support such demands. The data is loaded into a repository called the Data Warehouse which can be managed by several DW servers. A widespread solution engine for storing and enable querying the DW is Relational Database Management Systems (RDBMS) (Chaudhuri et al., 2011).

Relational database servers have usually been served as the backend of very large DW. A crucial requirement for BI is the capability to execute complex SQL queries over massive volumes of data. The result is a clear and accessible data structure for performing BI front end tasks. Arising from the success of query optimization and the crucial role that Parallelism plays in processing queries over massive databases. Relational operators such as selection, projection, join, and aggregation in SQL are opportunities to leverage parallelism. That is, to apply relational operators in parallel on partitions of data and then combine the results. The effectiveness dwells on reducing the amount of data that needs to be transferred over the network during query processing (Chaudhuri et al., 2011).

As more data is of digital origin, large DW typically deploy engines so that SQL queries can be executed over large volumes of data with low latency, in seconds or even milliseconds. The desire of low cost data platforms that can support much more than that traditionally handled, is often described as the “Big Data” challenge (Varandas, 2018).

Query Processing

A set of mid-tier servers that provide specialized functionality for different BI scenarios integrate DW servers. Such as, online analytic processing (OLAP) servers. Those servers efficiently expose the multidimensional view of data and enable the common BI operations such as filtering, aggregation, drill-down and pivoting (Chaudhuri et al., 2011).

In an ordinary multidimensional data model, there is a group of numeric measures that will be analyzed. Each numeric measure is associated with a set of dimensions, which provide the context for the measure. For example, the dimensions associated with a sale amount can be the Product, City, and the Date of the sale. Each dimension is also described by a set of attributes. The attributes of a dimension may be hierarchy related via relationships. This multidimensional feature of the conceptual model puts stress on aggregation of measures by one or more dimensions. OLAP servers typically precompute these large data segments to achieve fast query response times (Chaudhuri et al., 2011).

Over the past decade, there was a growing need to review text data such as product reviews, emails and call center transcripts. The subsequent analysis of data provides the ability to build models that support the desired logical evaluation by the user. The built model remains definitive for every refresh operation. Supported by the extraction of valuable information that would otherwise require significant manual effort. In order that the required business management questions are answered anytime (Chaudhuri et al., 2011).

Front-end Applications

BI software is ultimately a decision maker enhancer. Swift visualization of data can enable dynamic exploration of patterns, outliers and help uncover relevant business matters. Users perform BI analysis by use of spreadsheets, graphs and logical tools to create visual dashboards. Where they track management applications such as key performance indicators of the business (Costa, 2012).

2.7.2 Business Intelligence Tools

Business Intelligence software addresses the decision support technologies to enable the gathering, presentation and analysis of information of data concerning all business operations that serve as a solid basis for discovering new knowledge (Burstein et al., 2008). The development of systems for decision making in organizations is increasingly being identified as essential for grading the quality of information available for strategic decision making in organizations (Chaudhuri et al., 2011).

The analyzed data provide managers the capability of defining objectives and overseeing changes in up to date performances. The software serves as support for meeting requirements and even optimizing future actions (Costa, 2012).

Business Intelligence systems are exceptional to monitor Key Performance Indicators (KPI), the use of visual dashboards, tables, graphs, and interactive multidimensional analysis tools that enable the evaluation of the situation as it stands. KPIs provide essential information to the decision-making process in organizations. Ultimately, planning the action course against organizations' strategic objectives (Costa, 2012).

Microsoft Power BI

Power BI was introduced by Microsoft in 2014, confirming a growing company bet on Business Intelligence. This tool uses the full stack of Microsoft solutions, including Microsoft SQL Server, so the tool can gather information from tables, views, User-Defined Functions (UDF) and Stored Procedures (SP) of these systems. Using two distinct import modes can load the raw data and transform it in the intended form. The two methods differ only in the amount of data

loaded in the software, one getting more particular data than other through a direct query. Then by the use of filter, aggregate, or clean the raw data, the Power BI allows to easily transform and refine data before incorporating it into the desired data model (Abreu, 2016; Microsoft, 2019).

Once the desired data model is set, the creation of the dashboard is significantly easy, without the need of SQL coding. The tool is considerably robust with all the needs from a dashboard. When it comes to filters, Power BI allows filtering both the visual widget and page, the entire report, and allows it through any of the imported columns without resorting to SQL. This low code solution from Microsoft can create scalable data models using Power Pivot, this is the core tool to create self-service BI solutions, and to easily build interactive visualizations that allow the exploration of data and the discovery of trends. In addition, the possibility of creating personal widgets, something that Microsoft allows in their online Power BI (Abreu, 2016; Microsoft, 2019).

Finally, deploy the solution, it can only be published in the Power BI Cloud. So, to view a dashboard without having Power BI installed or via mobile devices, must be hosted on the Cloud provided by Microsoft. This is against client's security policies, to keep confidential information present in foreign systems. This represent the biggest downside of Power BI (Abreu, 2016; Microsoft, 2019).

Dundas BI

Dundas BI is a “in house” solution which means the data is modelled in local sites belonging to the business.

The Dundas BI server provides a web service capable of operating on an intranet, where dashboards can be created, as well as deploying the solutions to be viewed. Dundas BI imports from SQL Server. The method to load data is a simple interrogation to the database with the necessary queries. The server uses an internal cache to store queries in order to increase the performance of the dashboards and decrease the load on the data.

Dashboard page reload or restart Browser clean does not force the server to update the dataset by interrogating the database again of data. The entire Dundas BI web interface is responsive, making it easier to use in mobile devices. However, dashboards do not adapt to screen dimensions, so that must be purposely created. The biggest example of lack of adaptation is not being able to properly display a dashboard made for a horizontal screen on a device that was oriented vertically. Dundas BI comes complete with highly customizable visualizations including interactive charts, maps, scorecards and more. Thus, allowing granular control over almost all visual design elements (Abreu, 2016; Dundas BI, 2019).

3 ERDO exposure and current situation

Firstly in this chapter, the service related to customs clearance by ERDO is described. Then, the processes carried out at the Porto office in Alfena are disclosed in detail, as this represents the department in which this project is directly concerned. The initial situation is also exposed in order to contextualize the project and progressively identify the improvement opportunities.

3.1 Customs Broker Services

ERDO day-to-day work covers a wide spectrum of tasks, which revolves around the client's needs and grievances related with the clearance of the cargo transported in and out of the European Union (EU). There is a high level of variability in the tasks and significantly large pressure associated, which is commonly present in all logistics businesses.

When filed the request for clearance, those daily activities can be summarized in:

- Customs broker prepares the document related to the release and clearance on behalf of traders;
- Provide consultancy to traders in order to meet various regulatory requirements. As representatives of the trader may perform any function on behalf of the trader, depending on what is agreed between the trader and the broker, including taking samples before the lodging of a Customs declaration;
- Responsible for the entry and accounting of goods. Brokers also liaise with other government agencies for licenses, permits and other requirements;
- The customs broker is held liable by customs to pay duties and taxes on behalf of traders and even deal with refunds and adjustments on behalf of traders;
- Assist in post clearance verifications: Documental, physical and *Control à posteriori* (CAP);
- Deliver declarations and other information to Customs when it is necessary for the resolution of disputes;
- Maintain and preserve records for a specified period for Customs inspection, 10 years, while simultaneously maintaining high professional standards, such as transparency and business ethics under the regulations.

The Customs broker, where applicable, must meet several obligations and liabilities depending on national legislation and regulations, and only under the proper authorization or agreement from the trader may act as an intermediary.

A customs broker business is intrinsically combined with customs activities, and due to customs being a public entity – the work hours are limited to 9:00 to 17:00 on the week days, so a customs broker needs to grind their work in those business hours, which is a detriment in logistical flow of goods, as carriers can work 24 hours a day, seven days a week. In other words, it appears as an obstacle in the outflow. Since after 17:00 of Friday the customs do not release any cargo. Given that, the cargo will have to wait in an authorized warehouse. Only on the next business days, the cargo will be released, meanwhile, staying on the authorized warehouse will have a daily cost. Also, in Portugal the Social Security and the Tax and Customs Authority have their data crossed. This situation means, if a trader has social security pending issues, their cargo will be arrested (or held) until a settlement is reached.

In order to be in this segment of logistics business, it is a requirement to be registered in the broker's association and have a license to practice. This license cannot be transferred or traded to another person or agent. ERDO has only the license of its owner Mr. Eduardo Rangel and all

his employees work on behalf of him, which means this person is held responsible for the acts of all doings.

ERDO is also an Authorized Economic Operator (AEO), which recognizes the company as a third-party involved in the international movement of goods, working in close cooperation with customs authorities to assure the common objective of supply chain security as complying with World Customs Organization (WCO) and are entitled to enjoy benefits in the clearance process.

Overviewing a process of customs clearance done by Rangel, ERDO only steps in the clearance and in the archive stage. To note ERDO lies within a large organization, Rangel, for that has the possibility to share resources with other companies.

By the time the clearance has happened, customs release a document through ERDO information system which informs the release of the goods. ERDO notifies the carrier to load the goods, which can be done in Rangel vehicles or client vehicles. Then, the process is sent to billing - a joint building for all organization - where the invoice is created and sent to the client. Finally, the process is filed by ERDO in the Archive room, Figure 2.



Figure 2 - ERDO processes overview

Due to the mode of operation of business where the company fits in, it requires a wide range of sites located strategically near customs and navigation companies. This spatial distribution of ERDO localizations around Portugal grants the business the flexibility to efficiently and quickly answer clients' needs, Figure 3. Also, these stations permit the immediate dislocation to last minute insurgences that need resolution.



Figure 3 - Rangel locations in Portugal

3.1.1 Documents in customs clearance

Customs brokers are required to prepare documents related to release and clearance on behalf of traders. Those documents usually are from two kinds: the documents sent by the client, such as the transport documents, the invoices and the packing lists, and the second kind, the documents created in ERDO related with clearance of cargo.

Transport Documents - Documents issued by the carrier at origin and delivered to the supplier. The supplier will make it available to the buyer after the debt has been settled (or earlier, if you have offered credit terms) and it is with this documents that the transporter can deliver the goods.

CMR - Convention on the Contract for the International Carriage of Goods by Road.

Bill of Lading (BL) - maritime way.

Air Waybill (AWB) - air way.

Commercial invoice - Where exhibits the company name and company data, the description of the goods, the price and the conditions of sale. Is the proof of sale by the seller and usually intervenes after delivery of the goods to the buyer.

Packing List - a list of the contents of the cargo, identifying volumes, units and total weight, measurements of each volume.

Customs declaration – digital file sent by ERDO to customs for clearance.

Process – the collection of all the files from a clearance process, usually internal to ERDO, unless a documental verification or CAP happens.

3.1.2 Payable fees

Customs brokers are obliged to maintain government interests by ensuring compliance with Customs and to secure duties and taxes. Thereby protecting the rights of customers, as well as the financial interests of the European Union as a whole.

Customs duties - results from the application of the specific rate of the tariff code and the origin in the goods on the customs value (sum of the amount actually paid for the product on the invoice, transport costs and insurance to the customs clearance).

Value Added Tax (VAT) - 23%, Taxable amount for VAT is the sum of Customs Value, Customs Duty and “Other Taxes”.

The “other taxes” are:

Special consumption tax - alcohol, alcoholic beverages, tobacco, petroleum and energy products.

Vehicle taxes - It is a registration tax, it is paid only once when the vehicle is first registered in Portugal, either new or used.

3.1.3 Customs Clearance

Concerning the customs clearance process, ERDO intercede when the documentation of the clients arrives by email. Nevertheless, not all documents come via email. In fact, original documents are required and for that reason, those documents are delivered by courier to the technician in charge. There are several documents that are required to fill a clearance declaration, and without them the technician cannot send it to customs. In this case, a process of customs clearance can take several days or even months to conclude.

Inside ERDO, the process starts with the reception of all compulsory information. Then the operator prints every document, received from the client related to the transport plus the emails. All the received documents are printed so that the customs broker has a legal basis to justify their actions were in accordance of the client’s requests. Afterwards, the ERDO technician analyses all the documentation in order to verify no incoherence exists between copies and originals that arrived by courier.

All those prints plus the original documents are put together inside a note of clearance to form the process. This measure of “printing everything” is the method for controlling all information related with customs in physical state – paper – which presents itself as outdate and potentially troublesome. This is due to customs brokers being obliged by law to keep for a minimum of ten years all the processes cleared. Also, in case customs order the presentation of all documentation for the necessary checks before clearance.

In 2018 ERDO cleared more than 55,000 processes, which quantify in an average of 1,100,000 printed copies, that year. To ensure the mandatory archive ERDO has a total of 400 square meters of dedicated space. As well has two people solely committed to maintaining the archive, which involves the filling and later the search for processes which were requested to CAP from the customs. This position presents itself as a no value-added task, with great opportunity for improvement bearing that not every process was demanded to customs verification, in 2018 were 11.1% of the total declarations. There is no digital storing of the overall information in processes, the operations do it so in traditional paper and boxes.

The “prepare clearance process” is the final step at ERDO, as shown in Figure 4. In fact, between Porto and Lisbon the operations happen with some opposites. Therefore, later on section 3.3, the subject discussed will focus on Porto operations, since this is where the project initially develops.

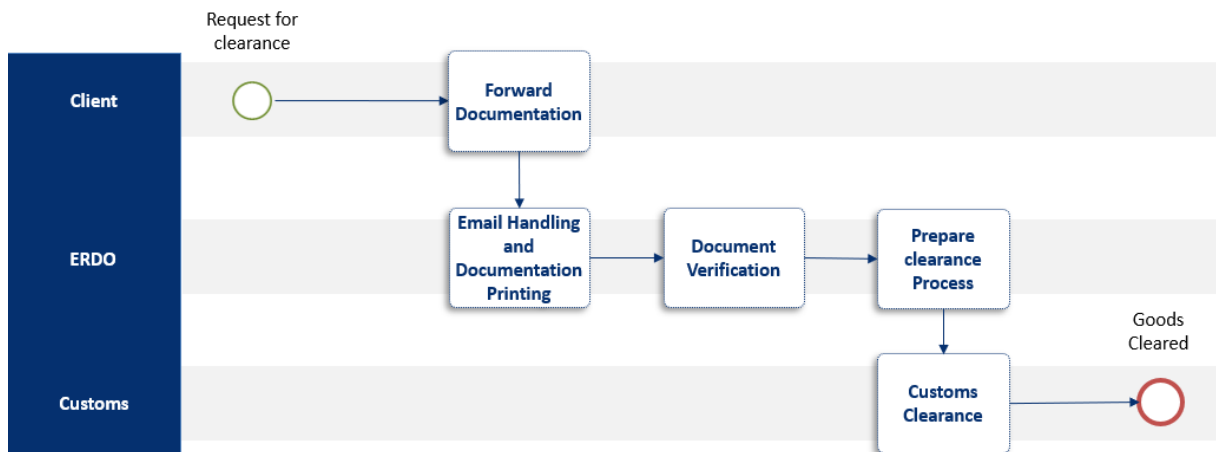


Figure 4 - Customs clearance process modelling

Export Operation

Export in a customs broker describe the act of clearing cargo sent from national environment to countries outside EU. When cargo is set to leave the EU, it must be presented in an authorized customs warehouse for clearance. Commonly, the documents reach ERDO mostly in the same day they are expected to leave Portugal. Because traders, unless they are accustomed with the volume of goods to export, never know how much the hired carrier can carry.

The customs broker file a clearance declaration stating values, descriptions and quantities of the whole cargo. And solely after the customs approval can the cargo leave the warehouse. The result of this affiliation means that most of the times clearance is done in less than 30 minutes.

Although, occasionally customs request the document or physical verification of the cargo, mostly due to some distrustfulness about the described goods. This leads to multiple delays to the transporter, usually in transit times, or the fatal cargo seized. Inevitably this pressures the relationship between broker and trader, and even further if the clearance was due to Friday.

Some documents are still produced in the old fashionable way. Which means use of chemical paper printed through needle printer, those are considered original documents. Documents like, EUR.1 or ATR, which are documents to declare the exemption of duties to the buyer, must be certified by the customs in the origin. The external employees of ERDO must regularly travel to customs to present these documents which will be certified by customs. Only after that can the technicians in office send the clearance declaration to Portuguese customs.

Import Operation

Import in a customs broker describes the act of clearing cargo that arrived from countries outside EU. When cargo arrives to the European ground is parked in an authorized customs warehouse waiting for clearance. Commonly, the documents reach ERDO with considerable days of notice, opposed to the export operation. This is due to the broker which made the export operation already certified all the documents, so the exporter only needs to forward them to the importer or directly to ERDO. Nonetheless, some processes take numerous days and even weeks, due to the control of bank guarantees. In these cases, traders ensure the cargo is paid, send the documents to an intermediary, the bank, so that only after the completion of the debt can the importer possess the documents to complete clearance.

The customs broker once again needs to file a clearance declaration stating values, descriptions and quantities of the whole cargo imported. Yet, can be done solely after the cargo is confirmed parked in European ground, never when cargo is in transit.

Before the cargo is considered stationed, ERDO must pay on behalf of his client the cargo handling fees. In case the cargo travels by navigation company (sea transport), the external ERDO employee will personally deliver the amount to the company office. This fee could be paid by wire transfer however the navigation company requires the original BL to release cargo, so the external employee uses the opportunity to do both. Strictly after that, can the clearance declaration be submitted to customs.

Once the export clearance was already done, it is reasonable to think that the customs broker which will do the import clearance could acquire some of the work, particularly, the code tariffs. Yet that information never arrives to ERDO due to the fact the code tariffs outside of EU are not equal to those established in the common market.

The import operation has to work with monetary corrections due to cambial fees between currencies. Therefore, a technician regularly maintains a close eye on the conversion rate.

The single most different aspect between both operations is the calculation of VAT and duties. The ERDO employees when appointing the different code tariffs need to regulate them on the basis of the tax authority. The duties and taxes that some commodity pays are regarding the product origin and code tariff.

3.2 Information System - Genero

In order to fulfill all customs clearance necessary steps, ERDO operatives use an information system called Genero, which is supplied by UBSystems.

This information system manages the entire customs process from the moment the information arrives to ERDO until the clearance of the goods, producing the various official documents either on paper or electronically. It also allows the management of invoicing and the possibility

of automatic integration in accounting, which is beneficial for Rangel because the organization uses SAP as Enterprise Resource Planning (ERP).

The application has different capabilities linked to the specificity of the business, of which its highlighted:

- Management of both processes (Import / Export) - issue of all documentation required for customs clearance;
- Calculation of duties and taxes related to the goods for clearance;
- Ease of elaboration of new processes using the partial or total copy of the information from existing processes;
- Alerts interface - visualization of all messages from customs, critical situations which need attention from technician;
- Send and receive electronic messages with automatic integration of relevant information in the respective processes, through *Sistema de Tratamento Automático da Declaração Aduaneira* (STADA) - (Automatic Declaration Processing System), which is the application for Portuguese customs to manage all incoming customs declarations;
- Invoicing - issuance of the Broker's account and/or invoice and its control of invoicing, debit and credit notes;
- Capable of preparing Intrastat, a statistical statement on Community transactions, by issuing listings for the client and Instituto Nacional de Estatística

On the software, users must authenticate in the platform which they belong. There are three platforms available, those are designated by the different aspects. Two of them are the locations of ERDO (Porto and Lisbon) – to identify where the technician is working. The last, is custom made operation that Rangel provides for a large client due to its volume of export and import operations. On this paper the relevance will be attributed to Porto platform since this is where the project for ERDO starts.

3.3 Porto Office

Fifteen people authenticate in Porto platform, however not all of them are working in the same place. As aforementioned, ERDO has different office locations around Portugal to accommodate the varied needs of their clients by closing in the customs relation. In Porto, technicians are divided between *Alfena* and the Airport office.

3.3.1 Shadowing Office Operations

Shadowing is an observation technique that consists of monitoring the work of a collaborator in person, not only to understand how the employee distributes his time, but also to understand the purpose of some activities, understand the different processes of the organization and identify opportunities for improvement. With face-to-face monitoring from the beginning to the end of the workday of several employees it was possible to survey several improvement opportunities and support the data collected.

The shadowing began with mapping all activities related with “Prepare Clearance Process” as above shown in Figure 4. All tasks had their time measured and were gathered in an excel spreadsheet to later analyze the time consumption of every technician by process, in Annexes D and E.

Prepare Clearance Process

Every technician has attributed distinguished clients, which they aid in clearance process of Export or Import (only one operation) from end to end. Which means every operative is the only contact point between both companies in that regimen. Each employee at ERDO is in charge of a personal computer and he is allowed to take it home. Also, on the day basis there is no one concerned with shared digital archive since everything is printed. So, the control of information is made through paper, hence, in case of employee absence and paper records cannot be found, the process must be repeated, and the client contacted.

After all documentation is in order, the technician start by filling a note of clearance, Figure 5. This note of clearance will serve as a dossier for the process, so the technician needs to write all vital information gathered from the client's email and from the transport documents, as shown in Annexe A. This method in paper continued since the beginning of the company in 1983 where the customs clearance process was exclusively done in handwritten paper.

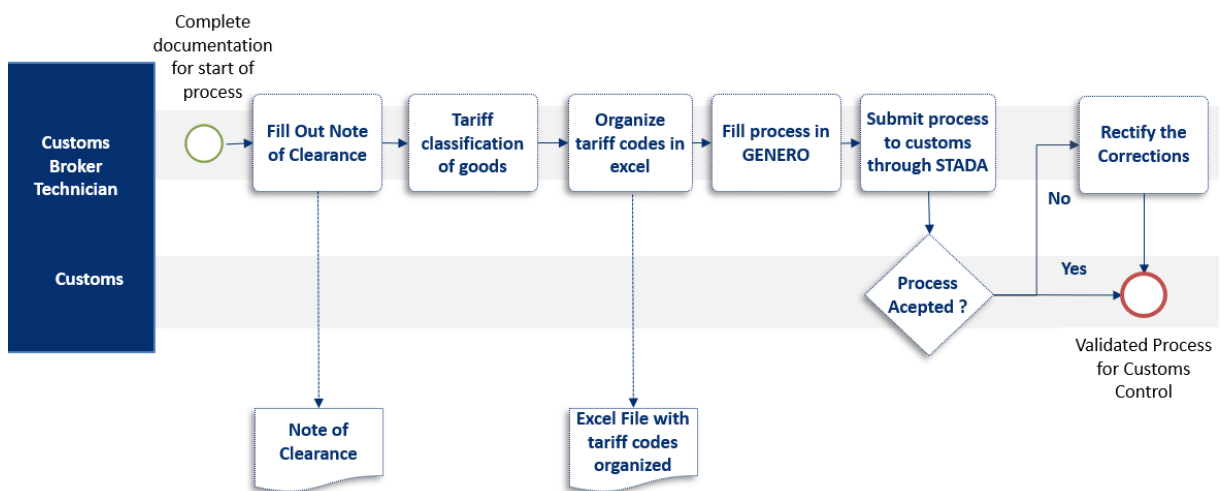


Figure 5 - Prepare Clearance Process 1/2

The tariff code, ruled by World Organization of Customs is composed by eight digits which display more than 5,000 groups of goods. Tariff Classification is the core of the business activities and where ERDO employees excel. It should be their main focus. However, this activity most of the time is prolonged because the lack of detail on descriptions of the goods. The code tariff is then written in the prints by pen, which is another duplication of information.

When the whole cargo is classified, the ERDO technician organizes the goods by tariff code and sums the values and weights of goods in the same tariff code. Until five codes the operator does this manually because it has table space in the note of clearance, as shown in Annexe A. In more than five codes the excel tool is used to execute calculations and sorts. Later the excel is printed to be united with the rest of the process, which is shown in Annexe C.

The information of the process will then be duplicated to the information system – GENERO. In a nutshell, the operator inputs in Genero all content already wrote on the note of clearance plus the info from the excel, if the excel was produced. When finished, the operator sends the clearance declaration through the online server to customs.

Customs has a software to detect general errors in declarations, so in less than twenty minutes the user gets a message in the system interface that will show if the process was accepted for customs control or not. In case it was not accepted the operator receives a message with errors, as shown in Annexe B, that will need to be rectified to be sent again. These errors occur quite

often on a daily basis. This could be explained by the lack of revision before sending to customs, on the operator work method.

As mentioned in section 3.1.3, in Export Operation, the customs verifications have a considerable impact on the overall service provided by ERDO. The customs can request document and/or physical verification of the cargo. This automatically requires the presence of an employee of the broker in the moment of verification – the external employee.

In the event customs denies the clearance acceptance, the products can be destroyed, and the broker incurs a fine which will need to be resolved with the client. Customs has legal right to punish all offences when in dubious reflections about the cargo. Opposed, some tariffs could be classified incorrectly by the broker or other minor error. In this case the broker should restart the process, Figure 6.

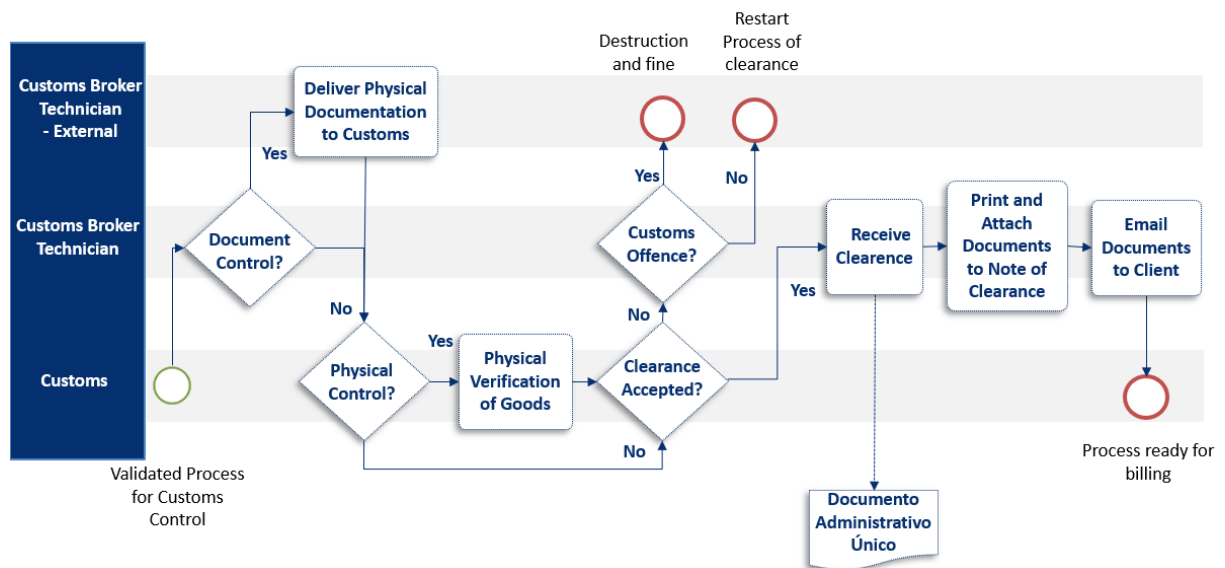


Figure 6 - Prepare clearance process 2/2

Finally, the technician receives the message for clearance by customs. This message comes as a pdf file named – *Documento Administrativo Único*. The file is printed and attached to the rest of the process. Then, the client is informed via email with the pdf file attached to testify the clearance. Lastly, the process is archived in a box which will be sent to billing in another department of Rangel.

Results from auditing task time

At Porto office in Alfena six employees are exclusively specialized to the export operation, even though one of those is partly dedicated the archive procedure. Four employees perform only import operations. The operations manager which is specialized in both operations and in customs problem resolution. Lastly, the external technician who gives assistance in the documents trail and is the link to approach communication between carriers and customs.

During this project, the staff in office was shadowed, particularly, three export employees and three in import, for a duration of 16 work hours each. It needs to be recorded that the average age group in Export and Import are 45 and 60 years. Emphasizing the fact that each technician is specialized on their personal clients, which leads to different practices in some procedures, thus uncorrelated information in task-time. It is necessary to highlight this aspect, since the mapping and the time auditing were made by aggregating general activities in tasks, with minor deviations to the reality. The audited processes were only the ones which were shadowed from beginning to end, since various processes start days before the submission to customs. The

sample size is a matter to consider since it is not large enough to withdraw precise scientific observations for statistical methods.

Throughout the process, operations were mapped by shadowing the information flow. Occurring in parallel the measure of the time consumed in every task by each of the technicians followed. The data collected was later arranged in two excel spreadsheets, one for export operations and another for import, as shown respectively in Annexe D and Annexe E.

All tasks, from the mail handling to the submission to customs were timed. On that gathered data, it was possible to calculate an average time per task; average time per process; average time per process per employee. The sample was not large enough to apply statistical methods, so the project continued with a simple “average” function in excel. Afterwards, a report was drafted about the acknowledged improvement opportunities. Operators and managers then perceived within their sensitivity that the times reported were in line with the reality. That report was then established as the work baseline.

From the information collected in excel, some conclusions are clearly attainable:

- All processes are different, and every case is a case;
- Technicians take different times for the same task;
- Processes time ranges from 12min25s to 03h41min;
- The number of code tariffs is directly related with task time;
- The average time for the process in export in this sample is 31m40s, and in import is 33m07s. The numbers are very close, however, in the same time span, Export has 48 processes and Import has 36. The explanation can have various factors such as: the export operation is overwhelmed (“Little’s law”); the age matters in the agility for performing the overall tasks.

The following sections will approach in greater detail the task times which were chosen to launch improvement measures.

Customs Declarations with more than five tariff codes

As aforementioned, when the clearance includes more than five tariff codes the process continues through the use of excel tool. The values and descriptions from the packing list are registered by the operator manually one by one. After the operator passes to the invoice, most of the times, the order of the goods are not the same as the packing list, which increases the time consumption in the task. The matching packing list values from the invoice are then inputted into Excel. Finally, the code tariff is attributed, and sums are made in order to aggregate equal goods under the same code, Figure 7. This task takes a significant amount of time as seen in Table 2, because the packing list and invoice are often sent to ERDO in pdf format.

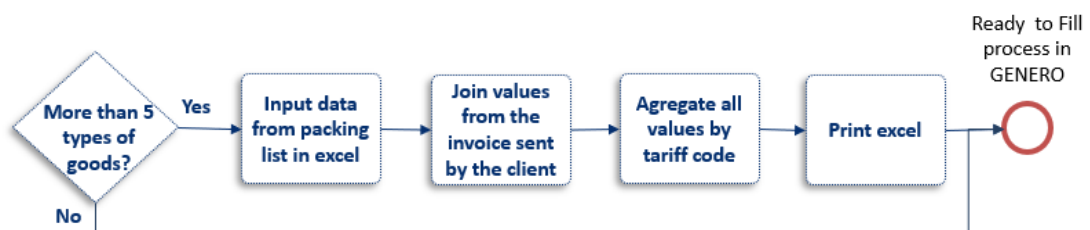


Figure 7 - Modelling “Organize Tariff Codes in Excel” AS IS

The number of customs declarations which required the utilization of the excel is summarized in Table 1. All data was withdrawn from GENERO database.

Table 1 - Summary of processes in 2018 and 2019 of Porto platform

	Export			Import		
	2018	Dif.	2019	2018	Dif.	2019
Number of Processes	11,339	21.9%	13,818	7,924	23.3%	9,768
Number of Processes with more than five codes	1,607	22.8%	1,973	119	0%	119
Percentage of processes with more than five codes (%)	14.2%		14.3%	1.5%		1.2%

From Table 1 some conclusions can be reached:

- The number of processes is increasing yearly in general, both in Export and Import;
- The number of processes cleared is larger in the Export operation;
- In the Export operation the number of processes with more than five code tariffs – implies the use of excel - is significant.

From the sample collected in Annexe D, Table 2 summarizes the task six times – use of excel. The task 6 is related with the necessary time to complete all procedures of the Figure 7, without the “Print excel” step.

Table 2 - Task 6 time summary

User	Task 6 Time (min:ss)	Samples	Task 6 Time Proportion on the Process Time (with excel need) (%)
Helio	07:12	7	17%
Ana	59:42	3	53%
Clarisse	21:28	1	48%
Weighted Average	22:49	11	37%

From the data collected in Annexes D and E, the sample from the Import operation on the task 6 time will not be integrated, because the use of excel tool was not frequently witnessed, as confirmed in Table 1.

According to the sample gathered in the mapping of time consumption in Annexe D, the “organize tariff codes in excel” can be calculated an estimated time of 22min49s. This represents a punctual observation which has major implications on the lead time of ERDO. From the Table 2 can be concluded the task 6 has an overall influence on the process time of

37% when the processes are over five code tariffs, as a result, it presents as an improvement opportunity in future developments. In Table 2, it is clear that Ana is the slowest in the task because all her clients send the packing list and invoice in pdf format. As for the other two technicians, they receive the packing list in excel format and the invoice in pdf. Helio is one exception to the stated before. This technician receives his invoices with code tariffs already, which explains the shorter time in task 6.

This section of the “Prepare Clearance Process” will be discussed later in section 4.1, with methods to counteract the large consumption of time, and also reduce the dependence of the operators of the information in paper. Leading as a good maneuver to start the digitalization through application of lean methodologies.

3.3.2 Porto’s Office Layout

The work of a customs broker technician in ERDO requires to print several documents per day and to verify their authenticity. Therefore, due to the localization of the printer in the office and being the only one present, it was estimated an average of three trips to the printer for each process, with an average time of 40 seconds, as shown under task 2 in Annexe D. The station of the printer causes congestion in the office environment since the eleven people have regularly to travel to the printer and get their copies from the mix, which has a negative impact as explained in section 2.5.1. Considering this company dominant cost is manpower, every amount of time freed has a meaningful impact on productivity. The same congestion is also provoked by the large amount of clutter and the misuse of the present furniture.

In Figure 8 can be seen an actual representation of the ERDO office layout, there is clearly seen the ERDO employees have their backs to each other, which does not allow fluid transfer of information. As the mode of the operation is currently one person does it all, there should be initiatives in dividing work and helping each other. However, the prevailing layout does not promote teamwork or even facilitate communication.

People are not distributed and seated by work teams. There was no consideration of the space utilization in this open-plan office, Figure 8. The accumulation of the above mentioned conditions supports the need for improvement and methodologies to instigate teamwork.

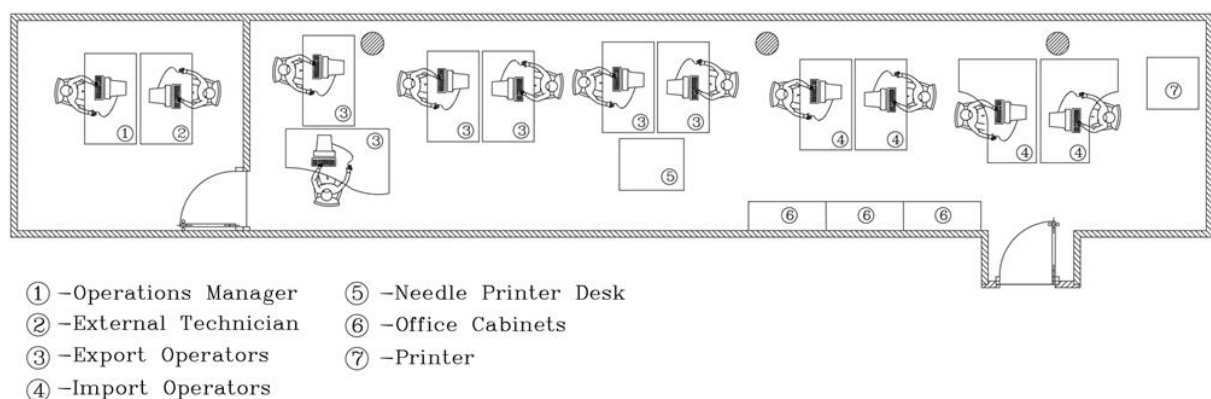


Figure 8 - Current office layout

3.4 Relationship with Billing

Upon the customs clearance of the goods, all technicians gather their processes in card boxes to ease transportation. Only after 15 days, someone is put in charge of carrying it to the other building, where it will be billed to the clients. The path travelled starts in ERDO building (the lower one in Figure 9) and ends in the second building, the Corporate Center, as demonstrated in Figure 9. The process is held in office as an insurance measure in case Customs send a CAP verification in those 15 days on the customs declaration.



Figure 9 - Path taken to deliver the processes – Source: Google Maps

The current scheme entails ERDO is giving their clients 15 days of credit without them even knowing, which is a relevant aspect within the company finances. A new mechanism must be studied in order to reduce or even eliminate the time spent by the employee whose task is carrying boxes to the other building, and even diminishing the 15 days of unwanted credit.

3.5 Archive

In terms of physical structure, the actual organization in Porto headquarters are divided into three buildings: T1, T2 and T3 as shown in Figure 10.



Figure 10 - Buildings placement in Porto Alfena – Source: Google Maps

The archive is made after the billing to clients. It is a no added value activity; however, it can't be left undone. Customs broker is required to archive at least ten years of processes. It is also compelling to archive correctly because customs often request a verification called CAP (this verification can happen three years after the clearance). To deny these obligations will result in fines by the customs. So, ERDO does the archive in three different places. The three most recent years are placed in T3 basement, Figure 11. When there is a shortage of space, the older process boxes are sent to T1 basement. Finally, the eldest are transported from T1 to Lisbon headquarters which will be their last post until they are destroyed.

The archiving procedure is accountable for one single ERDO employee, which needs monthly cataloguing and storing all the processes inboxes. Those boxes need to be labelled and put in chronological order, across all shelves. This task is deeply connected with billing and the external service because the employee must know all the time where each process is to direct it to the next priority.



Figure 11 - Archive basement in T3, Photo taken by Rangel employee

4 Action Blueprint

After knowing the state of the company, especially the operations, the raised knowledge in Chapter 2 was applied. This chapter shows all the work developed, exposing, at an early stage, the promising short triumphs in order to encourage change in critical points of the organization. Addresses the Daily Kaizen implementation and noticeably waste reduction measures. In addition, improvements are presented in organizational commitment, utilization of digital pathways and in the elaboration of work procedures, aiming at creating conditions for constant monitoring of the work. Finally, it demonstrates the obvious improvements in task time consumption with excel.

Figure 12 details the proposed project agenda. Each topic exposed a summary for the following assignments:

1. Planning Measures
 - a. Define the pilot team;
 - b. Prepare Workshops and Training;
 - c. Uncover archive current state;
 - d. Design a new layout;
2. Head office Meetings - Discuss the validity of the planned measures and reconcile implementation timetables with operation's needs;
3. Workplace Organization – General organization and cleaning with the participation of all staff in the pursued organizational culture;
4. New Layout – office layout transition to cell layout, with the same materials or less;
5. Daily Kaizen Training – the goal is to steer the operational teams into a methodology that empowers them to guide improvement efforts;
6. Daily Kaizen Board Construction and Meetings Guidance – Counsel the first meetings to promote staff overall compliance;
7. Operations Waste Reduction;
 - a. Reduce data entry;
 - b. Reduce motion;
 - c. Reduce task times in excel;
8. ERDO communication with Billing;
 - a. Standardize procedures;
 - b. Reduce Billing lead time.

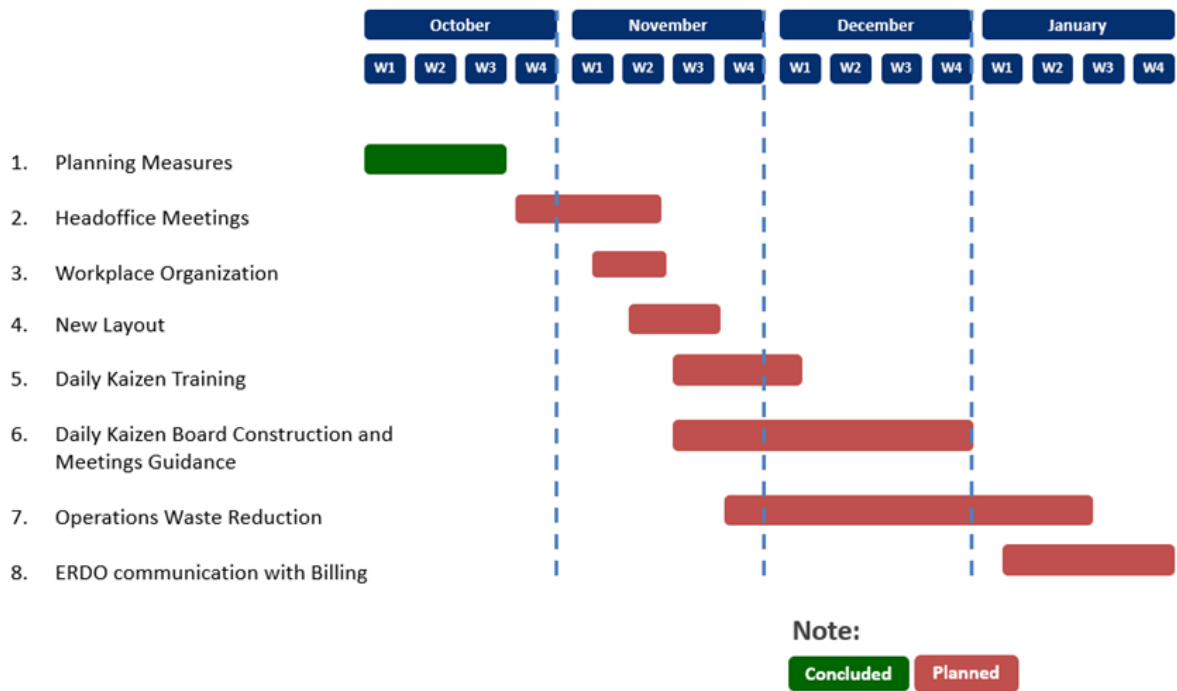


Figure 12 – Project actions schedule

4.1 Low Hanging Fruits

The metaphor - low hanging fruits - means something easily obtainable or quick fix. At the beginning of the project, the focus was on implementing a strategy to quickly produce results, with as minimal budget as possible. Since this project phase was already embedded in a Short-Term Strategy, it is important to gather a significant collection of solutions to compile an action plan rather than ambiguous loose measures.

When this project started, the strategy undertaken had a parallel purpose to shake people’s mindsets. This influenced the pursued strategy. The preferred agenda would start with the collection of smart quick wins that could raise employee involvement and uphold a commitment to the arduous forthcoming changes. These achievements will then produce countless ripples that will rebound positively along with the long term strategy. Is important to refer each and every one of the described measures in the chapter 4 required to pass a flow of approvals from the administration, which had a negative impact on following the schedule in Figure 12.

An investigation was carried out to the 2018 period to overview the flow rate of processes per day and the codes per process. Table 3 shows a summary of that analysis.

Table 3 - Porto office operations data in 2018

User	Dates	Number of processes	Proc/day	Codes	Codes/Proc
mandrade	206	1,629	7.9	2,202	1.4
augusto	222	1,112	5.0	1,593	1.4
lucio	212	1,042	4.9	1,736	1.7
casaca	219	940	4.3	1,280	1.4
elsam	206	783	3.8	1,457	1.9
Import	1,065	5,506	5.2	8,268	1.5
pamorim	221	3,680	16.7	9,082	2.5
clarisse	217	3,422	15.8	6,562	1.9
ana	227	1,756	7.7	10,054	5.7
helio	231	2,046	8.9	26,534	13.0
jneves	82	134	1.6	146	1.1
Export	978	11,038	11.3	52,278	4.7

From Table 3 the data was pooled for better insight into the possible conclusions to the chart in Figure 13.

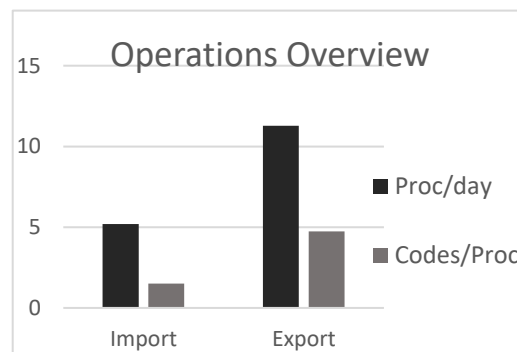


Figure 13 - Porto's office operations overview in 2018

In Figure 13 is exposed the data acquired from Genero operational database. The import chart shows what was already expected, the operations have mostly small processes with one or two code tariffs. The number of processes per day is around 5.2 per employee, when cross-referencing with average process time per team in section 3.3.1, can lead to conclude the import operation is unburdened. On the other hand, the export operation comes around with processes with an average 4.7 codes per process which appears not to be significant because of the large volume of processes with one code tariff. To notice the export employees yields an average of 11.3 processes per day, which compared to the import operation is 2.2 times more. At first sight, it indicates this operation is saturated.

As cited above, to undergo the process improvements a Pilot Team is essential. The export operation staff was chosen to test the ground. For these two causes:

1. Most critical workload sector;
 - Faster to find improvements opportunities;
 - The changes would be desired by the staff instead of being forced;
2. Younger operators – People with fewer years of work, more susceptible to change.

In due course, the import operation also underwent the same training and changes, but with some mutations to the group requirements.

This chapter section is used to expose every measure completed during the stay in the company, along the project period.

4.1.1 Office Organization

In the first contact with the shop floor, it was evident that there was a lack of organization. The inexistence of teams, the lack of job arrangement and workplace neatness. As this scarcity of organization and cleanliness was so evident, it gave rise to different types of waste. The first focus of the project was to clean and reorganize the office environment.

The first step was the elimination of all materials that were no longer needed and therefore should not be in the office. All operators made that screening and were left with only the necessary material. This resulted in the elimination of large amounts of common waste, and archive that was not yet stored that has accumulated over three years. In addition, two office cabinets were withdrawn from the office, since their space was blocking people's motion. The materials in those cabinets were put into the place where originally was some archive boxes, as seen in the photos in Annexe F.

After sorting the necessary materials, it was needed the organization of the surrounded materials. It was defined which work tools technicians needed regularly and therefore should be at the closest possible. As well as the proper place for storage within the work area of the less frequent materials.

Visual standards have been created, in order to ensure the maintenance of the organization of the workplace. The overall change ERDO accomplished in this chapter resembles the 5S methodology in daily kaizen, however the technicians were not trained in that methodology nor were created measures to sustain this practice, which explains the name of this section being "office organization". Nevertheless, the 5S methodology is a successful application that achieves better usage of spaces and improves process productivity. Instead, the operations managers wanted to concentrate the focus on eliminating other wastes such as the described in sections 4.1.6 and 4.1.7.

4.1.2 Layout Redesign

The proper use of spaces improves the quality of the work performed, thus adding value to the organizational performance. The effectiveness depends on the alignment between all aspects, as abovementioned in section 2.5.1, to drive management plans. That stimulates the desired organizational culture and creates the right atmosphere to enhance teamwork. Aiming at favourable working conditions and the promotion of global productivity.

Holding this ideology, it was proposed a new office layout so that the technicians would sit as close as possible to their team and also technicians that had similar clients would sit side by side. In doing so, the technicians would be compelled to communicate more frequently to exchange thoughts and doubts and would be able to efficiently share work in case of work overload or even a projected absence.

The first draft of the new layout was two islands of desks, the export and import operations. Additionally, the printer localization was planned to be in the middle of the room, Figure 14. This relocation of the printer was to balance the travels to the printer within the office. Though, had the hidden objective of reducing the distance to the export technicians, which is the alarmingly work strangulated operation.

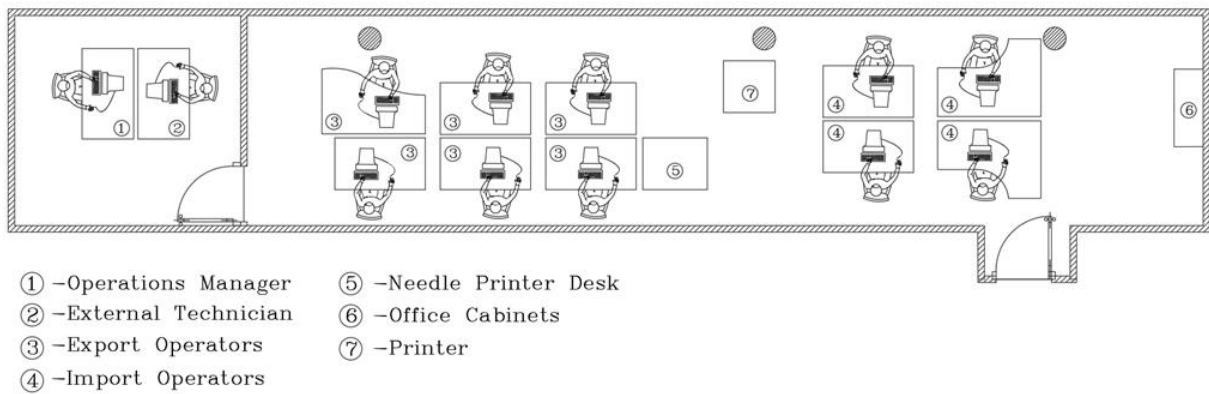


Figure 14 - First office layout redesign

However, the first version was not carried out because of the room width. It would create congestion in many passage points. The only way the first draft would be possible was by a significant remodelling of the office, and that implied a budget greater than initially planned.

A new sketch was made to at least change the environment in the export operation. The export employees were put together on two different islands. The distribution between the two islands was made considering the clients each employee had, the employee work procedures and even the employee specialization in the customs tariff, Figure 15. Strengthening employee bonds to promote teamwork.

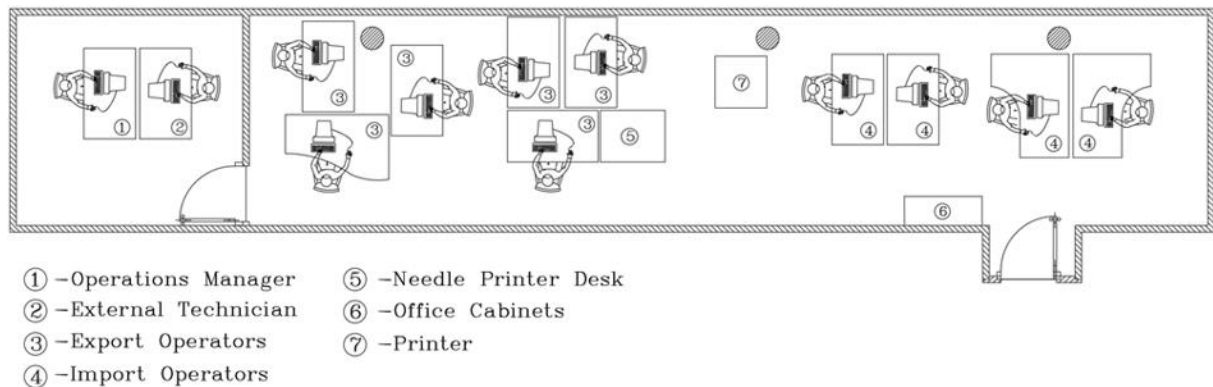


Figure 15 - Selected office layout

The office layout was changed to the final draft, the one in Figure 15, on 26/11/2019 – which is slightly behind the schedule exposed in the beginning of section 4. The resulted layout can be seen in the photos in Annexe G.

4.1.3 Reduce data entry (Y's)

During the operations shadowing, an opportunity was encountered to reduce the amount of data input in Genero. When the operator is filling the process in Genero, he needs to register the Y's related with the code tariff chosen previously. Y's are a restriction correlated with the goods that the code tariff symbolizes and geographic area to where the cargo will be transported, in export operation, or, from where the cargo comes, if it is an import operation. Technicians search on the customs authority website as shown in Annexe H.

The task of filling the Y's lies at the last step before submitting the declaration to customs, as shown in Figure 16.

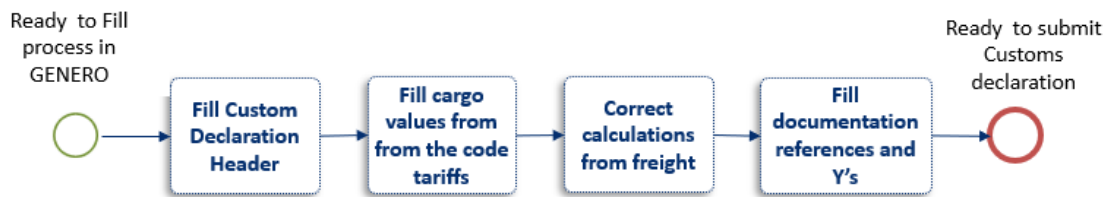


Figure 16 - Tasks that compose "Fill Process in Genero"

From the auditing task time, it is also foreseen the significant influence of inputting Y's has in the overall process time, the results are shown on Annexe D and Annexe E. The average process time which required inputting Y's is 35min49s. The Table 4 draws conclusions from these mentioned task times, particularly the influence of this effect on the overall process time.

Table 4 - Evaluation of the Y's effect on processes

User	Sample's	Task 11.1 Time (min: ss)	Proportion on the Process Time (which had time consumed) (%)
Helio	18	01:45	6%
Ana	13	02:01	5%
Clarisse	0	00:00	0%
Export	31	01:52	5%
Elsa	13	00:40	2%
Andrade	3	00:15	1%
Casaca	4	00:23	1%
Import	20	00:33	2%
Weighted Total	51	01:21	4%

About Table 4 some conclusions can be extrapolated:

- Clarisse does not have the job of inputting Y's, because every declaration that she does is copied from previous declarations. So, that step does not exist;
- Andrade and Casaca also copy some of the previous declarations, to speed up the clearance process;
- Y's input time is directly related to the number of code tariffs in the process. That explains the greater time in Export compared to Import operation.

In Annexe I, the process that every technician goes through to input the Y's is outlined. It can also be noted the fact that Genero already had the data related to that code tariff, representing a duplicate input in the information system. This describes an above operation waste, as in section 2.2.2, which can be eliminated by enhancing the Information System so that the Y's are filled automatically.

Unfortunately, Genero is not integrated with the customs authority's database. The technicians must check the customs authority's website, to record the Y's in Genero database tables, as shown in Annexe J. A potential estimate for this measure is 90% improvement in the task 11.1 time. The remaining 10% is devoted to record the Y's in Genero database.

This measure was successfully implemented in 18/11/2019. It marked the beginning of the waste reduction operations.

4.1.4 Daily Kaizen Training

In order to ensure that existing teams become more autonomous, accountable and that there is a correct flow of information throughout the office, the first level of the Daily Kaizen methodology was pursued with the creation of team boards, team meetings, strategic performance indicators and problem solving tool to follow inconsistencies.

Initially, it was necessary to acknowledge all technicians and managers affected by the project with the Daily Kaizen methodology by conducting two sessions of training. The training was conducted in a meeting room through the use of PowerPoint. A particular concern about this training was the duration and the age group, the training needed to be shocking to insure a high level of engagement. In those sessions were addressed both the lean methodologies and the initiation for the daily kaizen, although the technicians did not see the relevance of this training, they paid attention when their work and their need to change was put for debate in the presented slides, examples in Annexe K. The training always ended with the examination of each employee work procedure and writing possible improvements on post-it notes. Those post-it notes from everyone were later attributed to a PDCA cycle in a cork board and placed in visible spot in the office to show the staff these training had major relevance in their work, the first PDCA cycle is shown in Annexe L.

Later, a white board was bought and installed in the wall where before were the two cabinets, it is possible to notice in the second page of Annexe F. The positioning had the necessary exposure for everyone to consult the posted information, and space for people gather for the meetings. All templates used in the new board are in Annexe M, for close observation.

Natural Teams

Given the company operation's structure, it was defined that the team meetings will be carried out at two different times. One for each team and the Kaizen Leader would be the same. The meeting was set to occur weekly, always on Monday morning, to reduce the impact on the work.

Agenda

This area presents an agenda of topics for the meeting to follow. The duration of twenty minutes and the rules are to be met by the participants. Each of the following subjects has five minutes: Examine indicators; Discuss previous week; Discuss next week; PDCA suggestions, in Figure 17 is in display the Kaizen Board.



Figure 17 - Daily Kaizen Board

KPI's – Key Performance Indicators

The creation of indicators relevant to the performance of a company is essential to identify deviations or improvements in productivity and thus set goals and define improvement actions. Key Performance Indicators can have two types of natures:

- Time based nature;
 - Leading - an indicator of operational performance that might predict future success;
 - Lagging - an indicator of previous performance that measures the accomplished work.
- Performance based nature.
 - Efficiency - measures related to the rate of speed, and availability;
 - Effectiveness - measures how well the work is helping the organization achieve its outcomes.

The encouragement of the continuous improvement in the company is largely due to the chosen indicators. These indicators are an attempt to measure the productive capacity of each team and try to detect opportunities to improve the company's overall performance, these also must reflect the reality of the company.

The KPI's target the work teams so these should only cover operational performances and not financials. Since there were the creation of two teams, the indicators must acknowledge the values for the different teams. The chosen indicators bellow mentioned (1 and 2) surged by the need to control the number of processes done by each team and the related average number of code tariffs in those, as a measure to understand the current throughput rate and related average size of the processes. Therefore, allow the managers to really appreciate the performance of the teams and project future objectives. One of the various problems stated in section 3.3.1 was the number of times a technician corrects a declaration, this can be measured through a KPI to later evaluate and apply corrections in teams. Given that the indicators will be pulled from the Genero database, is important to collect information about the time consumed by the technicians on interacting with Genero, and the Customs response time, so that is possible to pursue an relevant indicator in the kaizen meetings, such as the reduction of these indicators.

The chosen KPI's for ERDO operations analysis are:

1. The number of processes per team – it's a lagging and efficiency indicator which states the current number of processes throughput rate;
2. The average number of code tariffs in those processes – it is also a lagging and efficiency indicator that directly relates to the processes size;
3. The number of corrections in processes – it is a leading and effectiveness indicator which shows the number of times the customs declaration sent by the ERDO technician is returned due to errors;
4. Lead time ERDO – the time between opening a process in Genero and submitting to customs, it is a lagging and efficiency indicator, that should be actively pursued by teams to reduce;
5. Lead Time Customs – the time between the submitting of the declaration by ERDO and the clearance of the cargo, it is an indicator that is indirectly related with the ERDO operations effectiveness because when technicians commit errors the customs take more time to clear the cargo as discussed in section 3.3.1.

The above-mentioned KPI's will be updated as regularly as the meetings happen – weekly.

Acronym of Fact, Cause and Action, the FCA methodology consists in analyzing the root of the problems and quickly reacting to overcome the problems (FCA, 2020).

Along with the ERDO meetings it was observed that frequently the teams would exceed the time limit, because of the number of verifications and disputes there were with clients and customs. The agenda was then altered so that in meetings, it started with examining the indicators and then quickly exploring what could be implemented in the PDCA cycle to rectify deviations.

4.1.5 ERDO KPI´s Dashboard

The indicators serve to evaluate the team's performance and to identify clearly and objectively if something did not go as planned. Upon the requirements stated above in section 4.1.4, there was the need to utilize a technology that could fulfil all expectations. The BI tool was chosen to help in the process of decision making and performance tracking. Since the company already had the Microsoft office license, the tool selected to gather all information from Genero database was Power BI.

The design of the solution began with querying the Genero database for the needed data. First, all data related to the processes like date of clearance; date of the process; the number of codes; process number; the platform; the user; the messages from customs. That became the base to construct the dashboard for the first three KPI's, mentioned before.

For the two last KPI's, the data needed were the date/times for the process creation, the process submitting, the message of clearance. The holidays were also needed, those came from a *sapo* webserver. For achieving an accurate value in those indicators, the calculations for the lead times were made through a function. This considered the work hours of 9:00 to 17:00 and even acknowledging the public holidays.

All queries used for getting the data from the operational databases and the lead times function are present in Annexe N.

Afterwards, the challenge was to create a visual, intuitive and user-friendly dashboard to the operations manager, which is the kaizen leader. The final result, in Figure 18, turns out to be a broader dashboard than initially planned. The dashboard was proficient enough to analyze all related data from processes of both operations, both ERDO headquarters (Porto and Lisbon), all comments on process messages, and keep six months of data.

To track the discussed indicators and cross-checking with previous data, the user of the dashboard would need to filter the data regularly. To do that, the multidimensional model in Power BI, needed to be linked via relationship so that, for example, when selecting week 50, the lead times would update to that particular timeframe. The relationships model is shown in Annexe O.

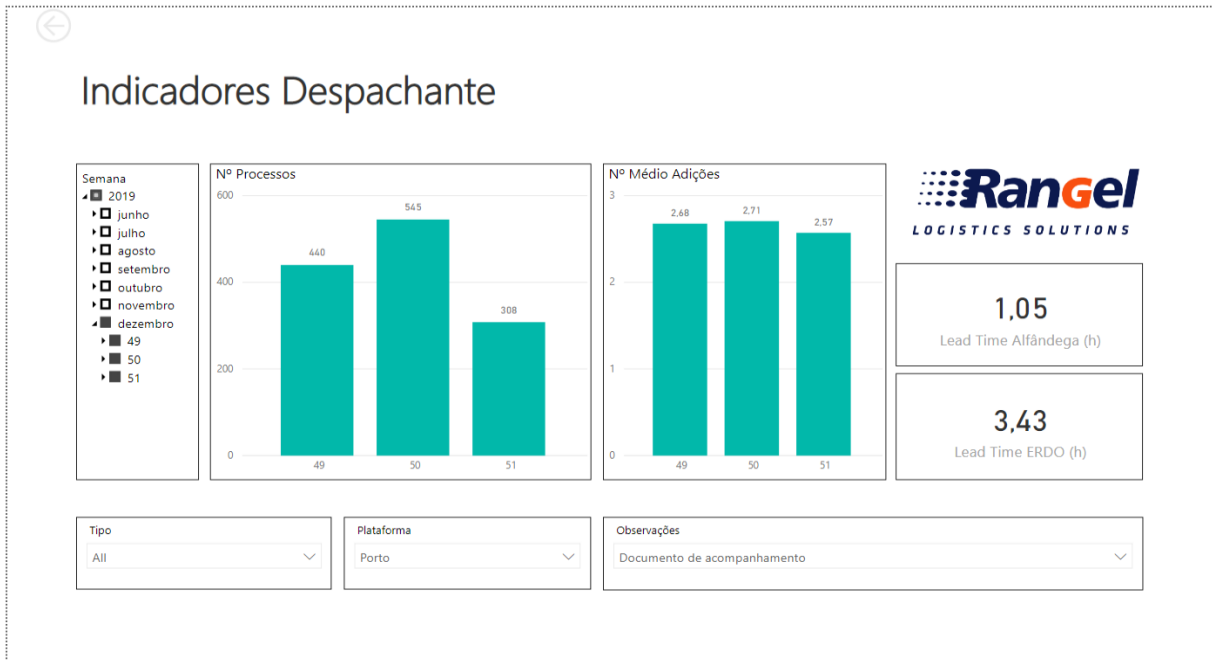


Figure 18 - ERDO KPI's in Power BI

4.1.6 Excel workshop and template

Along with the mapping, the ERDO current situation and work procedures were regularly identified as poor use of the excel tool. The use of excel was seen as arduous and complex, so the technicians would resort to manual calculating machines.

To disrupt that traditional mindset, all doubts and misuses of the excel tool were recorded. Then, a workshop was prepared to combine all the heterogeneous doubts and requests. Those opportunities were bridge through a workshop to all staff in sessions of two to three people of each team. The intention of the workshop was to homogenize the ERDO staff knowledge and promote the use of the excel in the daily operations. Photos from one of those workshops are shown in Annexe P.

The training covered some functions and tools like: sum(); count(); if(); sumif(); countif(); sumifs(); countifs(); vlookup() and Pivot tables. The training in vlookup was integrated goal to be covered in section 4.1.742. Most of the training focused on the use of pivot tables because this was the easiest tool to use, and most of the employees needed the skill on the task above mentioned as “Organize Tariff Codes in Excel” in Figure 7.

The training ended with sharing with the staff an excel template which had embodied a pivot table and two VBA buttons, shown in Annexe Q. As an expected result, the use of this template would reduce significantly the task time in aggregating values in excel. The technicians would only need to input all values under the correspondent headers, click *refresh* to aggregate the data and on the second page click *copiar* to transfer to a page already formatted and ready to print. By applying this excel template to all processes, it resulted in a measure to cut the operational working methods in the paper “addiction”, and creation of digital traces of the code tariff naming.

Considering, the use of this template by the technicians, in long run it stands for a measure of standard work. This way, the technicians are pushed into a more technological procedure to engage the required tasks of the work. The constant use of templates will help support the variability of work in times of absence and even hold a customized digital trace to the process.

4.1.7 Convert to Excel

In section 3.3.1, task 6 time was addressed as one of the reasons the customs declarations with more than five code tariffs take longer to submit to customs. Additionally, the meaningful proportion of processes with more than five code tariffs, as seen in Table 1.

This inefficiency was chosen to be tackled through the use of software capable of converting the pdf format into excel. In doing so, the time used to input manually the values in excel would be totally eliminated. All information necessary to the customs clearance will then be displayed in excel format. The software is even able to define the correct tables which are desired to convert, as seen in Figure 19.

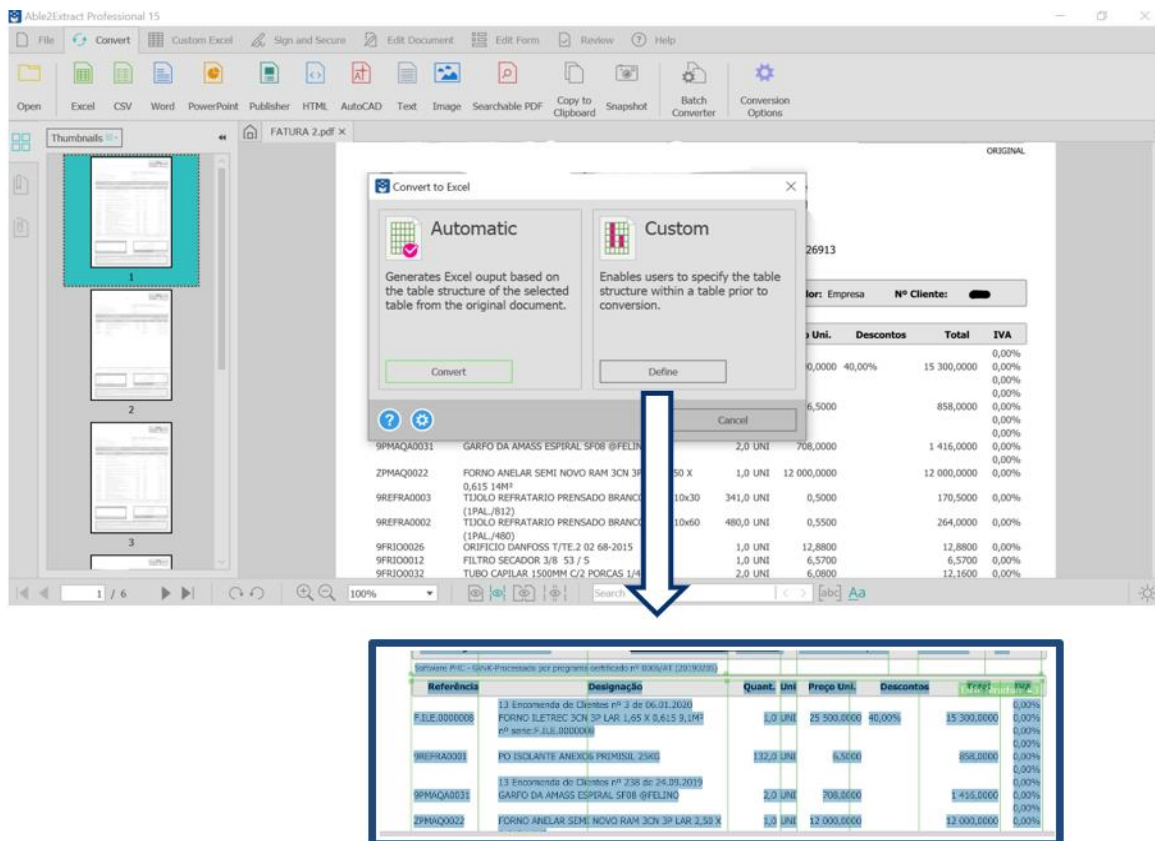


Figure 19 - Print from Able2Extract professional 15

Afterwards, all information necessary to the customs clearance began to display in excel format. This is where the excel workshop integrates, the technician have the necessary tools to work the information via vlookups and pivot tables to summarize all in tables. The ERDO technician can from this point narrow his focus in the core expertise which is code tariff naming.

The bought tool was Able2Extract Professional 15. This tool can convert pdf files to all major formats including Excel, Word, PowerPoint. Also, it supports scanned pdf content using OCR (Optical Character Recognition) in several languages, which is a real requirement for this company. Process hundreds of files in one go with batch conversion and batch creation. This feature facilitates the technician by converting sometimes the multiple invoices and packing lists that arrive for clearance. The main reason this software was bought was because it is a single buy, full use for lifetime, single-user license. Only, to use in key technicians.

This measure implies only the export operation since the majority of those processes are only met there, as seen in Table 1, 14% of all export processes.

Facing this opportunity when confronted with the software the technicians resisted the change. Yet, through persistent work and support via workshops, it is possible to reengineer this task into the sequential job, in Figure 20. A potential estimate is to reach in 12 months, a 90% improvement in the task 6 time. The remaining 10% is devoted to convert the excel and work the information via excel functions.

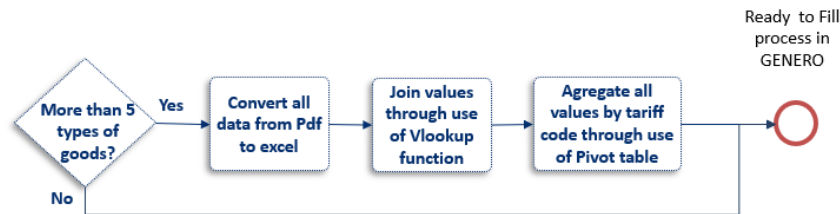


Figure 20 - Modelling “Organize Tariff Codes in Excel” TO BE

In the near future these processes will be the first ones the technicians will do without printing any document. This measure will consequently challenge the staff into the dematerialization of the processes, i.e. the technicians will do a process end to end with use of two monitors opposed to write the information in paper.

4.2 Improvement Proposals

Still in scope of continuous improvement, through use of lean practices, some measures take longer to achieve. Conjointly, as the initial proposed project agenda fell behind the schedule, in chapter 4. The subjects below mentioned in section 4.2 were put in progress during the project period. Still, there was not enough time to be accomplished before the delivery of this academic paper.

4.2.1 Negotiating Terms with Clients

Negotiating is a part of everyday business, being absolutely critical to success. When doing so correctly, it can lead to a win-win situation. Given that, this company has intrinsic interaction with customs authorities, regulations and fines are something to bear in mind. Along with being a logistics company, which by tradition are companies with strict working timeframes. The act of negotiating can display the necessary openness to achieve faster and better service to the clients, which is in their best interest.

One attempt in those terms, is arranging with clients the commitment of sending the documents in excel format instead of pdf. Nowadays, most ERP's are able to export the same invoice to excel format. This would be a measure that allows the ERDO employees skip the convert excel task. Or even the creation of an excel template to be widespread through the inquired clients, to clearly identify and standardize the information needed for customs clearance.

A second attempt is creating a Service Level Agreement (SLA) with critical clients. This is a contract between the service provider and its internal or external client that states, what services will the first provide and the service standards is obligated to meet. This maneuver leads the ERDO employees working in FEFO - First to expire first out. For example, ERDO receives documents to conduct customs clearance at 16h30m when customs close at 17h00m. The effect of an SLA assessment, quantifies the minimum and maximum required time each employee has to execute a process, considering the amount of goods. Also, establishing a minimum deadline for document delivery at ERDO, for the realization of the processes.

4.2.2 Billing Engagement

Considering billing is implicated in scheme and consequently the overall process quality and throughput rate, as shown in the Figure 2. In section 3.4, was exposed the current state and the obvious wastefulness', that lead to the search for improvement opportunities. Currently, the administration provided scope to engage in different types of solutions to reshape this circumstance.

Harmonization between ERDO and Billing

During the first meetings with the billing department the surveyed employees disclosed much of the information, the ERDO employees pass on the processes, was unnecessary for invoicing. From this revealing, surge the need to standardize the information that travels amongst the two offices. This measure would implicate both departments, since ERDO is generating excessive information which, according to the section 2.2.2, is a waste of effort. The billing would benefit by wasting less time in document verification.

Billing Relocation

To really conquer the whole fifteen days of shared unwanted credit with the clients, the proposal of relocating the billing employees concerning the ERDO operation to T3 building emerged. This way the effect on the billing lead time would suffer a sizable reduction.

The goal is to reduce fifteen days to the average collection period. The average collection period is a metric that measures the average time for a business to receive payments owed by its clients in terms of accounts receivable, this estimate can be calculated with the equation (1). Consecutively, by reducing the average collection period the net working capital will reduce.

$$\text{Average collection period} = \frac{\text{accounts receivable}}{(\text{sales} \times (1 + \text{Vat}))} \times 365 \quad (1)$$

The values from the company' profit & losses cannot be disclosed in the paper, however the estimate of average collection period resulted in 201 days. With fifteen days of reduction, results 7.1% of reduction in that period of collection.

Net Working capital is a measure of a company's liquidity, operational efficiency and its financial wellbeing. It is the difference between a company's current assets and its current liabilities, as in Equation (2). In ERDO case, these calculations are the same and are derived from company accounts receivable, less accounts payable, since there is no inventory.

$$\text{Net working capital} = \text{Accounts receivable} + \text{inventories} - \text{accounts payable} \quad (2)$$

From a short term financial perspective, the focus should be on having a near-zero client account and the supplier account as large as possible. If ERDO leverages a substantial positive working capital with these fifteen days, then it should have the potential to invest in growth opportunities.

The net working capital multiplied by the 7.1% of reduction results in 164,435.00€. This amount can be leveraged into a potential investment opportunity.

This relocation initiative would also impact the logistics related to the archive. The archiving procedure would be simplified since the processes stay in the same building all the time, and even if a CAP surges after the process is sent to billing, the interaction between both departments would be straightforward.

On account of the short duration of the project there has not been enough time to pursue an accurate estimation of the time saved with these two measures.

5 Project Assessment

The final project assessment is a way to evaluate the path undertaken in the project or even the future work. It captures the reasoning behind a project and determines whether or not its profitable for the overall strategy. The logic behind the further analysis is, whenever resources or effort are consumed, they should be in support of a specific objective like a project. Thus, the financial outcome is outlined by the assumptions in accomplishing the operational improvements. In this case, the gain is in increased productivity, by reducing the workload of the technicians, and so redirecting it to perform tasks with higher added value.

5.1 Operational improvement Results

The previous discussed measures will be further examined in this aftermath, to extract quantitative savings from the operational improvements. Is important to understand the profitability of the improvements, principally the ones which required investment, such as the data entry of the Y's and the acquisition of the able2extract licenses.

Concerning the measure in section 4.1.3, the reduction of process time related with elimination data entry in Genero – the Y's. A likely estimate can be calculated with the equation (3), by multiplying the percentage of improvement of this new method, with the amount of time related with task 11.1 (as shown in Table 4), with number of processes of the current year and the expected increase between years, resulting 584.8 hours of time eliminated in inputting data by the Porto staff in one year time span.

$$T_1 = 90\% \times \text{Average task 11.1 time} \times N_{2019} \times \left(\frac{N_{2019}}{N_{2018}}\right) \quad (3)$$

Where:

T_1 – Y's input saving (hours)

N_{2019} – the sum of both export and import processes from 2019, shown in Table 1

N_{2018} – the sum of both export and import processes from 2018, shown in Table 1

Regarding the measure in section 4.1.7, the reduction of process time by transforming a traditionally manual procedure into more technological and excel based. The saving can be estimated through the use of the equation (4), by multiplying the percentage of success of this new method, with the amount of time related with task 6 (as shown in Table 2), with the number of processes of the recent year and the expected increase between years. The result of the time saved is 829.3 hours, in using the excel tool in one year of time span. This measure in a near future will require the acquisition of two monitors for the export technicians which work with able2extract. To allow them to navigate all information in wide range through excel spreadsheets.

$$T_2 = 90\% \times \text{Average task 6 time} \times \text{Exp}_{2019} \times \frac{\text{Exp}_{2019}}{\text{Exp}_{2018}} \quad (4)$$

Where:

T_2 – use o excel saving (hours)

Exp_{2019} – number of export processes from 2019, shown in Table 1

Exp_{2018} - number of export processes from 2018, shown in Table 1

The Equation (5) evaluates the operational saving, dividing the sum of time each improvement saved by the number of work days in a year (220 days) and the daily work hours (7 hours). The sum up of the two savings result in 1414.1 hours in one year's work, which is 92% of one year's time worked by one technician.

$$\text{Operational Saving (\%)} = \frac{\sum_{i=1}^n T_i}{200 \times 7} \quad (5)$$

Where:

n – number of improvements

T_i – time saved for each improvement saving (hours)

These mentioned operational improvement opportunities will be explained below in section 5.2, as the financial impact they possess.

5.2 Financial Breakdown

Lean is primarily a growth strategy, not an employee reduction program. The focus must be on the long term commitment needed with the employees, customers and suppliers. The dismissal of workers will lead lean programs into decline. The concern should be on scraping the wastes from employee activities. For that reason, the benefits assessed for each one of the scenarios were based on the productivity improvements studied in the section 5.1. The analyses of the free time to conduct other tasks, the accomplished gains are in the reduction of costs:

- Overtime costs;
- Customs Fines;
- Travel costs related to the resolution of disputes.

The above mentioned costs were drawn from SAP, where it was possible to scrutinize the allocation to both export and import operations, as confirmed in the Table 5.

Table 5 - Assessed costs from 2018

	Export		Import		Total	
Overtime Costs	9,807.26€	78%	5,824.80€	39%	15,632.84€	56%
Travel Costs	2,078.96€	16%	4,915.00€	33%	6,994.12€	25%
Customs Fines	750.00€	6%	4,378.00€	29%	5,128.06€	18%
Total	12,636.22€	100%	15,117.80€	100%	27,755.02€	100%

The following topics were considered regarding the financial analysis of the performance of the actual implementations and ongoing proposals:

- Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) analysis for both scenarios;
- Accumulated Cost/Benefits analysis through 12 months' time period (n=month of implementation) for each one of the scenarios. Since the project revolves around the collection of quick fixes plus the initiation of daily kaizen to promote a continuous

improvement culture. It suited a short time frame (one year) to analyze this lean program effect;

- Payback period and Return on investment (ROI) analysis for each one of the scenarios. ROI is a performance measure to evaluate the efficiency of the investment. Usually, it is the difference between the benefits and the costs, divided by the cost of investment. ROI value plays a minor role in service companies since there are no large assets, unless it is projected a software acquisition;
- The downsize of travel costs and customs fines are directly correspondent. Since they are linked, because the costs are related with resolution of disputes in customs;
- To maintain correctness on the analysis was included the cost of the person dedicated to the project, which is 78% of the costs;
- The savings from the billing relocation were not considered, because this measure did not had the approval yet;
- The savings estimates are projected since the beginning of the project, in September of 2019.

The whole detail from the analysis of the project is shown in Annexes R and S.

Based on the assumptions listed above, the two different estimates were designed considering different scenarios, one moderate and another best case scenario. The difference between both scenarios regards the learning curve accrued the acceptance of the measures by the ERDO technicians. For the chosen 12-month period, the results are presented in Table 6, considering the above stated costs have average economies of 20% for the moderate scenario and 46% for the best case.

Table 6 - Project results

	Moderate Scenario	Best Case Scenario
Benefits	8,087€	12,859€
Costs	-4,921€	-4,921€
Payback Period	6 months	6 months
ROI	64%	161%

6 Conclusion

The present project aimed to apply lean office methodologies to the operations department of a customs broker company with an end-to-end focus, bearing in mind this project was embedded in a larger intention held by the company, i.e. the digitalization of the processes.

The importance of this project within the company increased during the course of the project. The identification of the current situation exposed obvious improvement opportunities in the procedures of the operations. The actual inefficiencies in the work procedures, the disregard for organizational commitment, and the lack of technological awareness in the company, marked the need to shift towards a continuous improvement culture.

6.1 Main Results

An expected outcome of this program was the improvement in the organizational environment. Each technician was working separately on their processes with its particular culture and routines. The implementation of lean office resulted in creating a culture of sharing and teamwork in intra-team and inter-team. The layout redesign helped to support this transformation, since joining the technicians by their expertise in the customs tariff knowledge and in client requirement similarities, will in the long run be fruitful. The staff will feel more comfortable to interact regarding doubts and work volume sharing. Additionally, the relocation of the only printer in the room to a middle point in the office will enable the use of the two sides of the printer to get the copies. This measure is expected to reduce the congestion significantly of the motions within office.

Eliminating or diminishing waste from the value chain is the key factor in lean office. The reduction consists of reducing efforts and maintaining the same output. During this project cases of excessive information were discovered, such as the duplication of information, which is waste of effort. Those were tackled via alteration of the Information System so that those inputs were automatically filled. After this measure has one year of modification it is predicted to save 584.8 hours only in the Porto office.

The workshops developed allowed all stakeholders to discuss the problems felt with the actual procedures and even debate possible alterations. Thus, creating a mindset for problem solving and continuous improvement. In addition, the adherent predicament to convince people of the benefits from implementing this methodology, owes to mainly the gains in lean cases are only achieved in the medium and long term.

Daily Kaizen stands as a successful methodology in making problems visible and guiding teams into finding solutions. The implementation of this methodology in ERDO operations hopes to achieve a better degree of process quality and promotes everyone's participation in the management process. The constant performance measurement promotes an environment of cultural transformation and employee motivation. When the entire organizational structure is aligned in the pursuit of gradual continuous improvement, is capable of fulfilling one of the up most lean principles – creating value to customer. The importance of the involvement of all employees also comes from empowerment and the necessary accountability. In ERDO, the ultimate goal in saving these operations hours, is to reduce overtime costs and even devote the freed time into creating quality work to reduce the amount of customs fines and related travel costs.

In the midst of this organization, the innovation in information technology was enough to generate a digital path for accurate extraction of the KPI's. This digital visual management ensures close contact between people and their own results. For teams wishing to achieve a high level of excellence the visual management is critical. One distinguished indicator is the ERDO

lead time, which tracks the average required time to submit a declaration to customs. This one is critical into pushing the staff for better performance.

The need to lead in a more technological environment in this company, the excel workshop had its intention of reducing the dependency of using paper and calculator to conduct the needed work. The later bought software was used to face one of the most time consuming activities, the aggregation of code tariffs in excel for the largest processes. The recently acquired skills in excel, taught in the workshop, plus the use of the tool for converting the pdfs to excel spreadsheet, accelerates the overall task in as much as 90% of the time consumed. From this process transformation it is projected to achieve 829.3 hours saved, only from the export operation, since the import operation does not have a sizable proportion of large processes.

The billing is an important step in the process chain of ERDO. As result, the separate location from the customs broker has its implications. By engaging in a different perspective it is possible to reduce some wastes from this interaction. The possible relocation of the billing staff to ERDO building ensures a notable decrease in both average collection period and logistics entropy. The reduction of the average collection period directly involves the net working capital. The freed working capital would be a source for minor investments in the company.

The financial analysis performed to predict the benefits for the implementation of this project, showed the level of rewards for both scenarios. However small gains, the continuous improvement mindset has no physical value to even evaluate. Those expected reductions in customs fines and travel costs come from redirection of staff the freed time to better working ethics. The reduction of employee overtime came from the sum of the overall savings stated, 1414.1 hours in one year, which represents 92% of an FTE work hours. This conclusion could even lead to a dismissal of one employee, however, this analysis does not aim for that, since this is not in the nature of lean philosophy.

Considering the company vision on the LTS, this project accomplished the necessary steps towards the needed mindset, to later help support the subsequently changes, carrying out a less resistant adoption of digital operations technologies.

6.2 Future Opportunities

At the end of this master's paper became clear, that even though this paper addresses a short-term strategy, different opportunities were handled in that time frame. The lean office methodologies just like lean methodologies is an endless pursuit for improvement opportunities. This project resulted in a set of actions that are not yet fully implemented. To cement these measures, it is necessary to continue monitoring them.

One major opportunity identified for future work was the implementation of new working methods regarding the archive procedure. Currently, ERDO has no digital archive for all documents in customs clearance, from both clients and customs. The ERDO information system - Genero - already has a mechanism to store files in their database, however it came to a consensus the technicians were not using it. The reason why concerns to two circumstances, the employees did not know this feature of the software, or some employees who knew, never used it since there was not a previous requirement from the administration to do this job. This feature can be seen in Annexe B, spotlighted by the red box. Genero has the capability to store all client's documents by clicking in that button. The solution will embark through establishing a work procedure each employee must perform. This requires a complete exposure of the new method to technicians and following of the implementation.

However, this archive feature in Genero does not allow to search through words. Therefore, since the long term strategy where the project is embodied, will address a significant

technological venture which covers a digital archive. This future work will require a study of the profitable solutions and further parallel implementation.

The other future work regarding this project is the extension of the daily kaizen methods. The daily kaizen covers a total of four levels, the last three were not yet attended. As the shift to continuous improvement mindset happens in the ERDO operations department, it must continue its course towards the completion of all daily kaizen four levels. The teams experienced firsthand the effective capability daily kaizen brings to the operational teams. In addition to the processes, it is also necessary to ensure that employees apply the 5S methodology, so that the organizational culture improves continuously and up holds the highest levels. So that, the effort on cleaning and organizing the workplace was not as much as before during the project. The application of daily kaizen level three and four, the standardization and autonomous teamwork will generate the consciousness for persistently improving procedures.

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Annexe B: Declaration status field

The screenshot displays a software interface for managing declarations. At the top, there is a table with columns: Est., Lida, Proc., Ano, IE, Regi., Afandega, DAA, Proc. Preced., Tipo, Utiliz., Plataf., Observações, Acção, Data limite, and Ficheiro. The table contains two rows of data, with the second row highlighted in red. Below the table is a toolbar with buttons: OK, Cancelar, Procurar, Anterior, Seguinte, Consultar, Inserir, Modificar, Eliminar, Listagem, and Fim. Below the toolbar is a form titled 'Genérico' with various fields. The 'Estado Envio' field is set to 'Recusado'. A red box highlights the 'Recusado' status in the form, and another red box highlights the 'Recusado' status in the table. Blue arrows point from the table to the form and from the form to the table. On the right side, there is a sidebar with buttons: Adições, Cálculos, Emissão Documentos, Guia de emolumentos, Duplicar processos, and Documentos cliente. The 'Documentos cliente' button is highlighted with a red box.

Est.	Lida	Proc.	Ano	IE	Regi.	Afandega	DAA	Proc. Preced.	Tipo	Utiliz.	Plataf.	Observações	Acção	Data limite	Ficheiro
		276467	20	Imp.	400	PT000020				lucio	Porto	Despacho recusado com erros		R. 141721200 202	
		276466	20	Imp.	400	PT000020				lucio	Porto	Despacho recusado com erros		R. 141721200 202	

Genérico

Processo: 276467, Ano: 20, Versão: 1, Revisão: 0, Estado Envio: Recusado

Data: 20/01/14, Operação: Criação, Procedimento: A-Normal

Utilizador: lucio, IVA/Exp.Mail: , Modalidade: , Tipo/Cálculo: , N°Provisorio: , Data desalf: 1/1/14

Plataforma: 1, Porto, Nº adições: 1, Leilões: Sem Leilões, Dt. alteracao: 1/1/14, Dt. Aceitação: 1/1/14

Motivo alter.:

Adições, Cálculos, Emissão Documentos, Guia de emolumentos, Duplicar processos, Documentos cliente

Annexe C: Print of an attached excel

PP	GUATEMALA VALOR	VAL FCA	PL	UNID	VOL
Taric code	Sum of (USD)	Sum of VAL FC	Sum of Net weight	Sum of Qty	VOL
3926200000	133,38	129,38	1,989	22	1
3926909790	64,89	62,94	0,498	22	1
4202121900	210,15	203,85	13,6	10	2
4202125000	39,13	37,96	2,474	1	1
4202129190	765,9	742,92	34,369	38	4
4202199090	273,91	265,69	23,318	7	7
4202221000	4941,74	4793,49	188,292	383	33
4202229090	323	313,31	8,768	28	3
4202290000	95,07	92,22	2,867	8	2
4202321000	2655,76	2576,09	90,748	351	9
4202329090	214,77	208,33	6,584	23	2
4202921100	1368,94	1327,87	64,959	107	6
4202929190	57,03	55,32	2,573	4	1
4602110090	21,83	21,18	0,145	4	1
6102301000	968,2	939,15	25,473	50	14P
6109902000	190	184,30	3,694	21	14P
6204430000	122,2	118,53	2,601	8	14P
6204440090	127,33	123,51	1,531	8	14P
6211439000	30,55	29,63	0,453	2	14P
6214300090	578,68	561,32	10,919	83	14P
6214400090	379,94	368,54	5,613	45	14P
6402999800	293,4	284,60	11,067	25	3
6404199000	36,48	35,39	1,62	2	1
6601999000	87,83	85,20	2,776	15	1
7113110000	216,06	209,58	0,037	18	14P
7116208000	400,92	388,89	3,154	167	14P
7117190090	5502,6	5337,52	31,385	1837	14P
7326909890	26,19	25,40	0,33	3	14P

Annexe D: Task Time Export Sample

Export

	Employee																		Total	%
	helio	helio	helio	helio	helio	helio	helio	helio	helio	helio	helio	helio	helio	helio	helio	helio	helio	helio		
Client ID	5758	1037	1588	348	7621	6976	7845	348	348	348	3177	3177	3177	2294	2294	7915	7915	7915		
Reception	mail	mai	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail		
Docs. Ok?	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes		
Tariff code ?	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes	no	no	no	no		
N°Codes	10	5	2	2	12	1	5	33	26	42	10	4	1	1	1	2	2	1		
1 Mail Handling and Printing mail, Packing List, Invoice	25	35	10	49	60	52	91	26	31	21	85	93	32	50	20	10	42	14		
2 Get the prints from printer	30	45	40	49	50	87	42	60	98	50	40	10	22	95	20	26	25	40		
3 Document Verification	98	105	70	192	60	25	40	89	50	45	32	63	12	20	53	98	78	20		
4 Fill Out Note of Clearance	143	203	165	200	288	321	96	130	120	105	97	246	184	140	92	190	50	99		
5 Tariff Classification of Goods	520	105	238		133	60	60								180	200	130	100		
6 Organize tariff codes in excel	471	350			478			611	281	641	195									
7 Print Excel + travel + archive in process	78	110			42			48	67	98										
8 Fill Custom Declaration Header	288	240	193	150	142	79.5	140	129	55	265	169	99	88	130	120	81	130	113		
9 Fill cargo values from from the code tariffs	98	195	75	96	332	75	210	751	698	985	409	100	45	47	52	81	69	45		
10 Correct calculations from freight	20	80	30	95	20	30	190	62	80	40	151	20	36	47	120	30	30	130		
10.1 Verifies all data input																				
11 Fill documentation references and Y's	242	190	91	375	72	103.5	154	727	631	1035	357	75	61	88	82	216	128	171		
11.1 Only y's	142	30	20	15	32	24	64	420	254	535	100	35	25	41	32	36	38	41		
12 Submit process to customs	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
13 Check process state	117	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90		
14 Receive Clearance + print + travel to print + attach docs + sen	425	260	475	410	421	345	370	260	280	465	260	403	345	290	280	260	430	260		
Total (s)	2560	2013	1482	1711	2193	1273	1488	2988	2486	3845	1890	1204	920	1003	1114	1286	1207	1087		
Total (min)	42:40	33:33	24:42	28:31	36:33	21:13	24:48	49:48	41:26	01:04:05	31:30	20:04	15:20	16:43	18:34	21:26	20:07	18:07		

Export

	Employee														TOTAL	%
	Ana	Ana	Ana	Ana	Ana	Ana	Ana	Ana	Ana	Ana	Ana	Ana	Ana	Ana		
Client ID	241	4983	5241	7298	2371	6553	351	160	8675	5241	413	7915	296			
Reception	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail		
Docs. Ok?	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes		
Tariff code ?	no	no	no	no	no	no	yes	no	no	no	no	no	no	no		
N°Codes	36	1	3	1	1	1	19	1	1	3	1	1	1	1		
1 Mail Handling and Printing mail, Packing List, Invoice	60	25	65	42	99	32	200	138	138	138	50	60	60	00:01:25	3%	
2 Get the prints from printer	36	35	85	39	25	12	91	26	46	36	35	17	35	00:00:40	2%	
3 Document Verification	1090	200	140	120	310	58	150	114	275	371	210	130	572	00:04:52	11%	
4 Fill Out Note of Clearance	136	210	90	160	211	121	113	337	129	158	270	732	383	00:03:53	9%	
5 Tariff Classification of Goods	160	160	160	160	160	40	60	60	60	60	60	60	624	00:02:20	5%	
6 Organize tariff codes in excel	8161							2400					186	00:59:42	53%	
7 Print Excel + travel + archive in process	30							15					65	00:00:37		
8 Fill Custom Declaration Header	365	21	180	129	33	200	304	65	293	255	47	63	138	00:02:41	6%	
9 Fill cargo values from from the code tariffs	1614	21	369	18	33	180	748	65	19	162	47	63	54	00:04:21	10%	
10 Correct calculations from freight	26	21		18	33		56		19	3	47		5	00:00:25		
10.1 Verifies all data input																
11 Fill documentation references and Y's	985	67	457	39	88	72	577	99	68	310	68	86	95	00:03:52	9%	
11.1 Only y's	698	46	188	21	55	42	314	37	49	47	21	32	28	00:02:01	5%	
12 Submit process to customs	5	5	5	5	5	5	5	5	5	5	5	5	5	00:00:05	0%	
13 Check process state	120	120	120	120	120	120	120	120	120	120	120	120	120	00:02:00	5%	
14 Receive Clearance + print + travel to print + attach docs	144	144	144	144	144	144	144	144	144	144	144	144	144	00:02:24	5%	
Total (s)	13262	1299	2085	993	1259	984	4983	1173	1316	2013	1103	1540	2235	00:43:54		
Total (min)	03:41:02	21:39	34:45	16:33	20:59	16:24	01:23:03	19:33	21:56	33:33	18:23	25:40	37:15			

Export

	Employee																TOTAL	%	Team	Weighted Average
	Clarisse	Clarisse	Clarisse	Clarisse	Clarisse	Clarisse	Clarisse	Clarisse	Clarisse	Clarisse	Clarisse	Clarisse	Clarisse	Clarisse	Clarisse	Clarisse				
Client ID	1247	6198	8748	421	2450	424	425	8798	8798	424	424	424	2450	2450	2450	2450	2450			
Reception	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail			
Docs. Ok?	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes			
Tariff code ?	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no			
N°Codes	1	1	1	1	1	12	1	1	1	1	1	1	1	1	1	1	1			
1 Mail Handling and Printing mail, Packing List, Invoice	55	110	55	96	25	39	30	31	31	30	20	63	60	60	162	63	00:56	4%		
2 Get the prints from printer	15	89	15	23	26	25	45	69	25	21	25	37	37	96	36	39	19	00:38	3%	
3 Document Verification	163	218	369	145	258	301	167	149	123	114	117	101	11	241	159	156	93	02:50	13%	
4 Fill Out Note of Clearance	294	273	458	138	58	73	95	968	555	251	444	206	102	241	127	146	236	04:34	21%	
5 Tariff Classification of Goods	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	00:30	2%	
6 Organize tariff codes in excel								1288										21:28	48%	
7 Print Excel + travel + archive in process								63										01:09		
8 Fill Custom Declaration Header	44	486	123	27	81	161	101	121	58	77	86	201	163	241	77	160	329	02:30	11%	
9 Fill cargo values from from the code tariffs	70	126	27	39	53	91	51	185	58	87	196	109	125	80	33	60	80	01:27	7%	
10 Correct calculations from freight	10	10	10	5	5	5	5	5	3	4	54	11	11	11	11	11	11	00:11	1%	
10.1 Verifies all data input																				
11 Fill documentation references and Y's	40	175	100	39	30	360	29	165	58	87	196	109	125	81	20	42	74	01:44	8%	
11.1 Only y's																				
12 Submit process to customs	14	16	12	13	13	13	9	15	15	15	15	15	15	15	12	12	12	00:14	1%	
13 Check process state	180	125	161	161	161	120	96	96	96	96	96	96	96	60	60	60	60	01:47	8%	
14 Receive Clearance + print + travel to print + attach docs	190	398	161	161	161	90	210	210	210	210	210	210	210	120	120	120	120	03:03	14%	
Total (s)	1111	2056	1522	878	908	2685	868	2062	1262	1022	1498	1145	994	1276	745	998	1127	21:43		
Total (min)	18:31	34:16	25:22	14:37	15:08	44:45	14:28	34:22	21:02	17:02	24:58	19:05	16:34	21:16	12:25	16:38	18:47		31:40	5%

Annexe E: Task Time Import Sample

Import

36

	Employee														Total	%
	Elsa	Elsa	Elsa	Elsa	Elsa	Elsa	Elsa	Elsa	Elsa	Elsa	Elsa	Elsa	Elsa	Elsa		
Client ID	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail		
Reception	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes		
Docs. Ok?	no	no	no	no	no	no	no	no	no	no	no	no	no	no		
Tariff code ?	1	1	1	1	1	1	1	1	10	1	1	1	1	1		
N*Codes																
1 Mail Handling and Printing mail, Packing List, Invoice	22	63	159	55	36	21	10	32	81	29	45	63	90	00:54	2%	
2 Get the prints from printer	45	50	26	45	89	63	23	20	23	69	37	46	98	00:49	2%	
3 Document Verification	302	289	41	240	146	127	39	138	25	169	323	125	140	02:42	7%	
4 Fill Out Note of Clearance	598	461	124	576	478	201	256	368	524	587	847	430	360	07:27	19%	
4.1 New client creation					163									03:03		
5 Tariff Classification of Goods	35	165	531	120	217	120	95	3229	552	23	89	290	600	07:47	20%	
5.1 Search customs duties					68			430						04:09		
6 Organize tariff codes in excel								2760						46:00		
7 Print Excel + travel + archive in process								45						00:45		
8 Fill Custom Declaration Header	320	225	231	60	255	138	171	120	256	302	147	200	60	03:11	8%	
9 Fill cargo values from from the code tariffs	100	200	69	97	120	118	152	63	120	87	88	105	113	01:50	5%	
10 Correct calculations from freight	2	2	2	2	2	2	2	2	2	2	2	2	2	00:02	0%	
10.1 Verifies all data input														00:00		
11 Fill documentation references and Y's	210	200	147	136	120	146	78	337	118	99	111	230	120	02:38	7%	
11.1 Only y's	25	24	30	5	17	28	49	257	29	20	14	16	10	00:40	2%	
12 Confirm at the companies or at the Port of Leizões, if the container is cleared	600	155	65	458	122	330	254	90	125	360	211	300	258	04:16	11%	
13 Submit process to customs	35	40	41	42	41	25	28	40	40	35	36	34	39	00:37	2%	
14 Check process state	98	147	159	211	165	135	178	223	96	47	58	91	112	02:12	6%	
15 Receive Clearance + print + travel to print + attach docs + send to client	311	278	89	147	150	169	178	78	125	147	156	354	478	03:25	9%	
	1005	2275	1684	2189	1941	1595	1464	7545	2087	1956	2150	2270	2470	16:45	37:55	
			28:04	36:29	32:21	26:35	24:24	02:05:45	34:47	32:36	35:50	37:50	41:10	39:16		

Import

Employee
Client ID
Reception
Docs. Ok?
Tariff code ?
N*Codes

	Andrad														Total	%
	Andrad	Andrad	Andrad	Andrad	Andrad	Andrad	Andrad	Andrad	Andrad	Andrad	Andrad	Andrad	Andrad	Andrad		
Client ID	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail		
Reception	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes		
Docs. Ok?	no	yes	yes	no	no	no	no	no	no	no	no	no	no	no		
Tariff code ?	1	1	1	1	1	1	3	2	2	2	2	1	1			
N*Codes																
1 Mail Handling and Printing mail, Packing List, Invoice	90	125	90	90	168	90	100	200	100	156	100	258	100	02:08	7%	
2 Get the prints from printer	60	52	70	89	30	58	70	69	20	53	20	42	40	00:52	3%	
3 Document Verification	300	90	400	500	60	75	60	800	400	200	100	250	600	04:55	17%	
4 Fill Out Note of Clearance	274,8	220,4	414	50	100	162	659	65	145	93	189	200	85	03:24	12%	
4.1 New client creation														00:00		
5 Tariff Classification of Goods														00:00		
5.1 Search customs duties														00:00		
6 Organize tariff codes in excel														00:00		
7 Print Excel + travel + archive in process														00:00		
8 Fill Custom Declaration Header	87	65	279	304	206	230	186	250	195	103	124	255	289	03:18	11%	
9 Fill cargo values from from the code tariffs	256	300	85	60	61	200	196	58	172	62	200	201	189	02:35	9%	
10 Correct calculations from freight	2	2	2	2	2	2	2	2	2	2	2	2	2	00:02	0%	
10.1 Verifies all data input				44	79			42			29	31		00:45		
11 Fill documentation references and Y's	589	43	211	105	228	600	660	373	332	291	208	511	458	05:55	20%	
11.1 Only y's							16		12		18			00:15	1%	
12 Confirm at the companies or at the Port of Leizões, if the container is cleared	40	41	41	41	50	45	35	15	20	65	22	20	15	00:35	2%	
13 Submit process to customs	9	10	10	12	15	20	12	14	10	15	10	9	7	00:12	1%	
14 Check process state	90	85	70	60	35	27	24	61	28	41	50	36	40	00:50	3%	
15 Receive Clearance + print + travel to print + attach docs + send to client	1031	120	120	120	120	120	467	140	140	140	140	506	200	04:19	15%	
	2829	1153	1772	1433	1075	1629	2471	2047	1564	1221	1165	2290	2025	47:09	19:13	
			29:32	23:53	17:55	27:09	41:11	34:07	26:04	20:21	19:25	38:10	33:45	29:04		

Import

Employee
Client ID
Reception
Docs. Ok?
Tariff code ?
N*Codes

	Casaca											Total	%	Equip	Média	ERDO	%					
	Casaca	Casaca	Casaca	Casaca	Casaca	Casaca	Casaca	Casaca	Casaca	Casaca	Casaca											
Client ID	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail	mail											
Reception	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes											
Docs. Ok?	no	no	no	no	no	no	no	no	no	no	no											
Tariff code ?	1	1	2	2	1	2	1	1	1	1	1											
N*Codes																						
1 Mail Handling and Printing mail, Packing List, Invoice	71	71	71	71	71	71	71	71	71	71	71	01:11	4%									
2 Get the prints from printer	45	45	45	45	45	45	45	45	45	45	45	00:45	2%									
3 Document Verification	95	45	37	45	56	98	47	67	62	55	01:01	3%										
4 Fill Out Note of Clearance	827	614	757	425	201	925	560	473	489	660	09:53	32%										
4.1 New client creation											00:00											
5 Tariff Classification of Goods	157	247	332	289	158	378	147	159	123	100	03:29	11%										
5.1 Search customs duties											00:00											
6 Organize tariff codes in excel											00:00											
7 Print Excel + travel + archive in process											00:00											
8 Fill Custom Declaration Header	65	104	106	68	85	119	108	174	100	145	01:47	6%										
9 Fill cargo values from from the code tariffs	124	165	75	190	250	57	58	54	65	55	01:49	6%										
10 Correct calculations from freight	2	2	2	2	2	2	2	2	2	2	00:02	0%										
10.1 Verifies all data input											00:00											
11 Fill documentation references and Y's	63	117	78	50	260	145	158	144	240	198	02:25	8%										
11.1 Only y's			12	17	20	45					00:23	1%	00:33	2%	00:01:21	4%						
12 Confirm at the companies or at the Port of Leizões, if the container is cleared	211	125	187	265	100	154	200	211	187	185	03:03	10%										
13 Submit process to customs	69	90	134	90	90	90	48	90	120	90	01:31	5%										
14 Check process state	45	78	95	60	54	35	25	41	64	70	00:57	3%										
15 Receive Clearance + print + travel to print + attach docs + send to client	180	180	182	191	201	190	190	190	190	190	03:08	10%										
	1954	1883	2101	1791	1573	2309	1659	1721	1758	1866	32:34	31:23	35:01	29:51	26:13	38:29	27:39	28:41	29:18	31:06	31:02	33:07

Annexe F: Organization of ERDO Office

Before:



After:



Annexe G: New Office Layout



Annexe H: Search for the Y

In the tributary and customs authority website, ERDO technicians can search for the desired code tariff.

CRITÉRIOS DE PESQUISA

Restrições e Restituições

Código Pautal:

Cód.Rest.:

Destino:

Data: (AAAA-MM-DD)

Voltar
 Pesquisar
 Limpar

Data: 2020-01-07 - 62052000

Descrição: De algodão

Restrições Restituições

Medida	Área Geográfica	Adicional	Condições	Notas	Base Legal
MILEX	BY		±	(CD 563) (CD 994) (TM 629) (TM 637)	R 765/06
MILEX	IR		±	(CD 983) (CD 995) (TM 629) (TM 637)	R 264/12
MILEX	LY		±	(CD 563) (CD 994) (TM 629) (TM 637)	R 2016/44
MILEX	MM		±	(CD 563) (CD 994) (TM 629) (TM 637)	R 401/13
MILEX	RU		±	(CD 563) (CD 994) (TM 679)	D 512/14
MILEX	SD		±	(CD 563) (CD 994) (TM 679)	R 747/14
MILEX	SS		±	(CD 563) (CD 994) (TM 679)	R 2015/735
MILEX	SY		±	(CD 563) (CD 994) (TM 629) (TM 637)	R 36/12
MILEX	VE		±	(CD 563) (CD 800) (CD 994) (TM 629) (TM 637)	R 2017/2063
MILEX	ZW		±	(CD 563) (CD 994) (TM 629) (TM 637)	R 2017/284
LUXEX	KP		±	(CD 223) (CD 995) (TM 684)	R 2017/2062
LUXEX	SY		±	(CD 634) (CD 995) (TM 797)	R 509/12
UNSUP			p/st		R 2658/87

Then, depending on the geographic area the restrictions are detailed.

← Voltar Pesquisar

Data: 2020-01-07 - 62052
 Descrição: De algodão

Restrições Restituição

Medida	Área C	Base Legal
MILEX	BY	R 765/06
MILEX	IR	R 264/12
MILEX	LY	R 2016/44
MILEX	MM	R 401/13
MILEX	RU	D 512/14
MILEX	SD	R 747/14
MILEX	SS	R 2015/735
MILEX	SY	R 36/12
MILEX	VE	(TM 637.) R 2017/2063
MILEX	ZW	R 2017/284
LUXEX	KP	± (CD 223.) (CD 995.) (TM 684.) R 2017/2062
LUXEX	SY	± (CD 634.) (CD 995.) (TM 797.) R 509/12
UNSUP	p/st	R 2658/87

Condição	Acção
Se apresentar as referências Y920 ou Y921 ou C052	Importação / exportação permitida após controlo
Senão	Importação/exportação não autorizada após controlo

C052 **Autorização de exportação para mercadorias e tecnologias objecto de restrições**
Y921 **Bens isentos da proibição**
Y920 **Mercadorias que não as descritas nas notas de rodapé associadas à medida**

Annexe I: Reduce Data Entry Overview (Y's)

... Exportação

OK Cancelar Procurar Anterior Seguinte Consultar Inserir Modificar Eliminar Listagem Fim

Mercadorias

Processo 274191 Ano 19

NºAdição 3

Código interno 443 Classificação Pautal 3926909790 A

Designação Out. obras de plastico, outras

Inf.Complementar Y901, Y904, Y906

Genérico

Processo 274191 Ano 19

Data 19/12/26

Linha	Código	Número	Emissão	Validade	Ti	Entidade emissora	Moeda	Valor	Quantidade	Unidade
1	Y901	S/N	19/12/26							
2	Y904	S/N	19/12/26							
3	Y906	S/N	19/12/26							

AS – IS

- The technician need to fill manually the *inf.complementar* that appears in blue, on the table below for every code tariff.

TO-BE

- The *inf.complementar* should be automatically filed. This (Y's) are info related with the code tariff.
 - Código = *Inf. Complementar* (Ex. 'Y900')
 - Numero = SN
 - Emissão = Date in format yy/mm/dd

Annexe J: Input Procedure *Inf. Complementar* by Technician

... Tabelas

OK Cancelar Procurar Anterior Seguinte Consultar Inserir Modificar Eliminar Listagem Fim

Pauta Aduaneira

Código Interno 443

Classificação Pautal 3926909790 A

Designação Out. obras de plastico, outras

Artigo sujeito a IEC

Tipo de produto Industrial

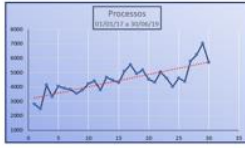
Isenção Iva na Garantia

+ Adicionar
- Remover

Preferênc	Descrição	Pais	Descrição	Tp.Taxa	Taxa
300		CE	COMUNIDADE EUROPEIA	Ad Valorem	0.00
300		CH	SUICA	Ad Valorem	0.00
300		IL	ISRAEL	Ad Valorem	0.00
300		NO	NORUEGA	Ad Valorem	0.00
300		SY	SIRIA	Ad Valorem	0.00
400		TR	TURQUIA	Ad Valorem	0.00

Annexe K: Daily Kaizen Training

Crescimento de 20% ao Ano



Descontentamento no local de trabalho

Volume sufocante



Ran-et

Insatisfação do Cliente



Hasta La Vista Baby

Ran-et

Arquivo



"Casa a arder"

"Faço o que posso"

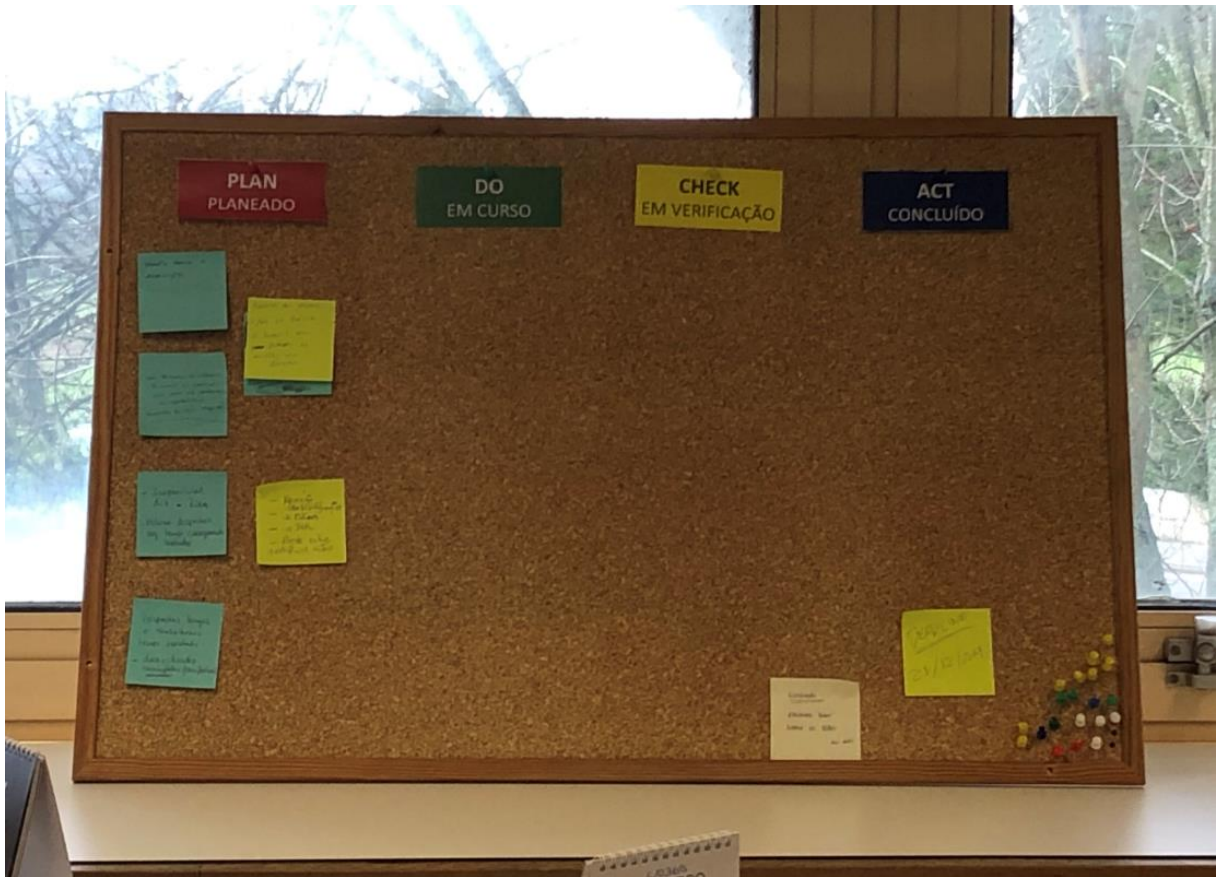
"Não dá"

O que Fazer?



Ran-et

Annexe L: First PDCA



Annexe M: Kaizen Board Templates

Agenda da Reunião



Participantes:

#	Tópico	Duração
0		
1		
2		
3		
4		
5		
6		
7		

Horário:

Frequência:

Duração:

Mapa de Férias



Nome	Jan	Fev	Mar	Abril	Mai	Jun	Julh.	Agos	Set	Out	Nov	Dez
Lúcio Gomes												
Sara Bonito												
Paulo Amorim												
Clarisse Moura												
Ana Ribeiro												
Hélio Aleixo												
José Neves												
Elsa Moreira												
Manuel Andrade												
António Casaca												
Augusto Amorim												
Serafim Lopes												

Mapa de Presenças



Mês	_____				_____				_____			
NOME	1	2	3	4	1	2	3	4	1	2	3	4
Lúcio Gomes												
Sara Bonito												
Paulo Amorim												
Clarisse Moura												
Ana Ribeiro												
Hélio Aleixo												
José Neves												
Elsa Moreira												
Manuel Andrade												
António Casaca												
Augusto Amorim												

CARTÃO MELHORIA

Oportunidade/Problema:

Responsável:

Data Início:

Data Fecho:

Annexe N: Dashboard Queries and Function

Processos Query

```
select 'Exportacao' as tipo, ge_n_proc, ge_plataforma, ge_d_proc, ge_n_merc, ge_d_ordem, ge_d_desalf, ge_utilizador, pat_tipo_fich, pat_obs, pat_hora from fgexport
inner join adprocalert
on fgexport.ge_n_proc=adprocalert.pat_processo
Where ge_plataforma<3 and ge_d_proc > (date(today)-180)
union all
select 'Importacao', gi_n_proc, gi_plataforma, gi_d_proc, gi_n_merc, gi_d_ordem, gi_d_desalf, gi_utilizador, pat_tipo_fich, pat_obs, pat_hora from fgimport
inner join adprocalert
on fgimport.gi_n_proc=adprocalert.pat_processo
Where gi_d_proc > (date(today)-180) and gi_plataforma <> 3
```

Mensagens Query

```
(select fgexport.ge_plataforma, stada_hist.er_num_proc, stada_hist.er_tipo_msg, stada_hist.er_data_cri, stMsg6.* from stada_hist
inner join fgexport on fgexport.ge_n_proc=stada_hist.er_num_proc and fgexport.ge_ano = er_ano
LEFT join (SELECT er_num_proc, er_i_e, MAX(er_data_cri) from stada_hist
where er_ano = 19 and er_tipo_msg in ('EX006A', 'DAE')
group by er_num_proc, er_i_e) stMsg6 on stMsg6.er_num_proc = stada_hist.er_num_proc
where ge_d_proc > (date(today)-180)
and ge_plataforma <> 3 and er_tipo_msg="EX001A")
union all
(select fgimport.gi_plataforma, stada_hist.er_num_proc, stada_hist.er_tipo_msg, stada_hist.er_data_cri, stMsg6.* from stada_hist
inner join fgimport on fgimport.gi_n_proc=stada_hist.er_num_proc and fgimport.gi_ano = er_ano
LEFT join (SELECT er_num_proc, er_i_e, MAX(er_data_cri) from stada_hist
where er_ano = 19 and er_tipo_msg in ('IM006A', 'DAI')
group by er_num_proc, er_i_e) stMsg6 on stMsg6.er_num_proc = stada_hist.er_num_proc
where gi_d_proc > (date(today)-180)
and gi_plataforma <> 3 and er_tipo_msg="IM001A")
```

Criação Query

```
select proc, tipo, datam, MAX(stada_hist.er_data_cri) from web_processos
inner join stada_hist on web_processos.proc=stada_hist.er_num_proc
where accao="I" and datam> (date(today)-180) and tipo <> "O" and (er_tipo_msg="EX001A" or er_tipo_msg="IM001A")
group by proc, tipo, datam
```

Sapo Webser Feriados

```
Table.FromRows(Json.Document(Binary.Decompress(Binary.FromText("i45WMjIwtFSK1QExjAyUYmMB", BinaryEncoding.Base64),
Compression.Deflate)), let _t = ((type text) meta [Serialized.Text = true]) in type table [Ano = _t])
```

Lead Times Function

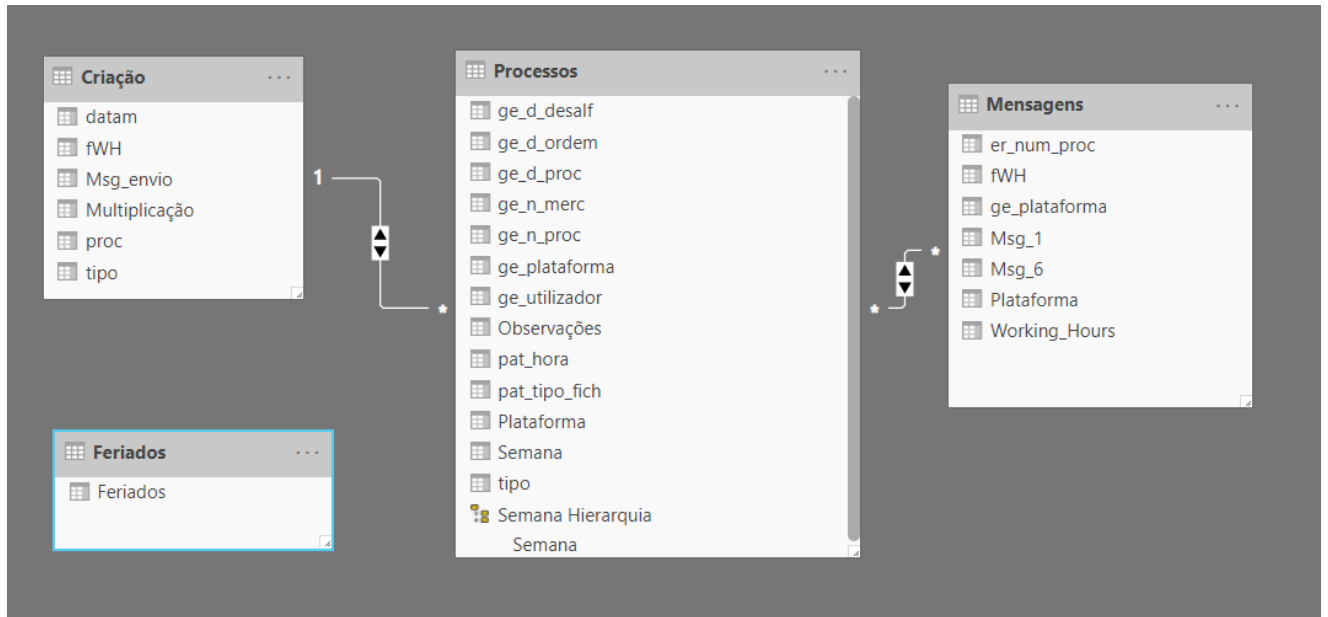
The screenshot shows the 'Advanced Editor' window for a function named 'fWH'. The code is as follows:

```

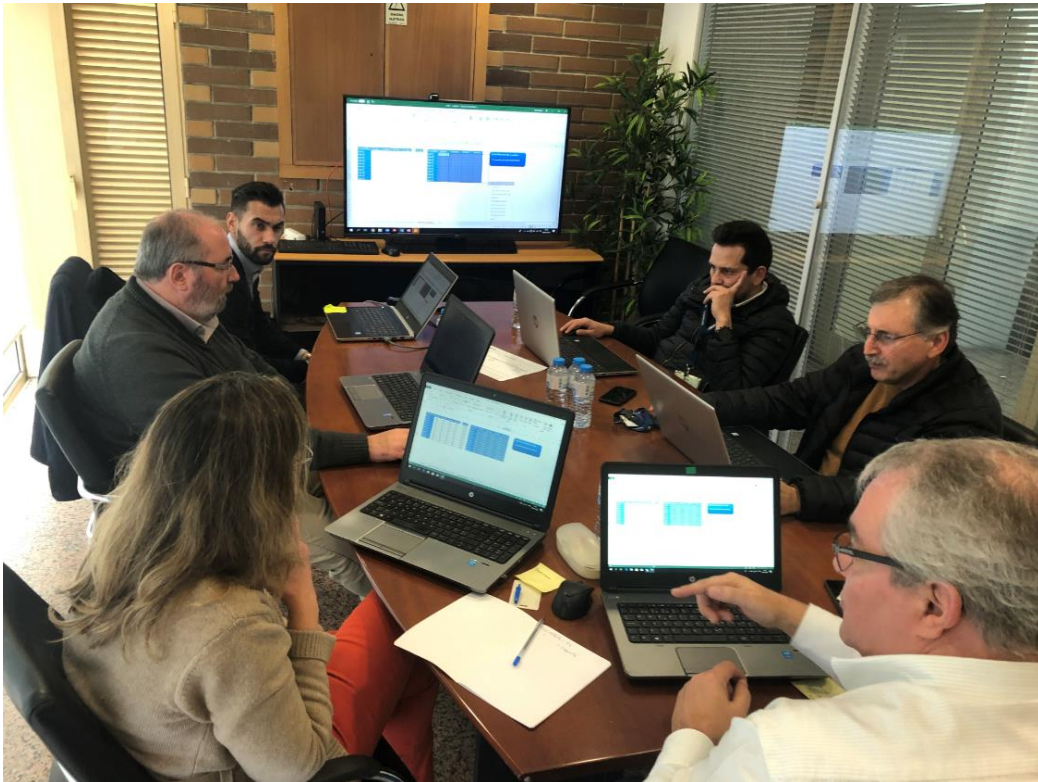
let
    DStart = Number.From(DateTime.Date(Start)), // start day
    TStart = Number.From(DateTime.Time(Start)), // start time
    DEnd = Number.From(DateTime.Date(End)), // end day
    TEnd = Number.From(DateTime.Time(End)), // end time
    // List of days without Saturdays and Sundays
    ListOfNumbers = List.Select({DStart..DEnd}, each Number.Mod(_,7)>1),
    // List of dates without holidays, Saturdays and Sundays
    ListOfWorkingDays = List.Difference(ListOfNumbers,ListOfHolidays),
    SumOfWorkingHours = if DStart = DEnd then //checking if the start day is the same as the final day
        if DStart = List.First(ListOfWorkingDays) then // checking if the start day is not a holiday (start day = end day)
            List.Median({WHStart,WHEnd,TEnd}) - List.Median({WHStart,WHEnd,TStart}) // working hours if the start day = end day
        else
            0
        else
        (
            if DStart = List.First(ListOfWorkingDays) then // checking if start day is working day (start day <> end day)
                WHEnd - List.Median({WHStart,WHEnd,TStart}) // working hours (for start day)
            else
                0
        )
        +
        (
            if DEnd = List.Last(ListOfWorkingDays) then // checking if end day is working day (start day <> end day)
                List.Median({WHStart,WHEnd,TEnd})- WHStart // working hours (for end day)
            else
                0
        )
        +
        // sum of full-time working hours (start day, end day, holidays, Saturdays and Sundays excluded)
        List.Count(List.Difference(ListOfWorkingDays,{DStart,DEnd}))*(WHEnd - WHStart)
    in
        SumOfWorkingHours
    
```

At the bottom of the editor, a status bar indicates: ✔ No syntax errors have been detected.

Annexe O: Multidimensional Model in Power BI



Annexe P: Excel Workshop Photos



Annexe Q: Excel Template

First Page

Row Labels	Soma_Valor	SOMA_FCA	Soma_PB	Soma_PL	Soma_UNID	Soma_VOL	PP	VALOR	VALOR_FCA	PB	PL	UNID	VOL
2	2,00	2,00	22,00	22,00	2	2	1	8	8,00	8,00	8,00	8	8
3	15,00	15,00	15,00	15,00	15	15	2	2	2,00	2,00	22,00	2	2
4	(blank)						3	8	7,00	7,00	7,00	7,00	7
Grand Total	17,00	17,00	37,00	37,00	17	17							

Refresh

Second Page

Row Labels	Soma_Valor	SOMA_FCA	Soma_PB	Soma_PL	Soma_UNID	Soma_VOL
2	2,00	2,00	22,00	22,00	2	2
3	15,00	15,00	15,00	15,00	15	15
4	(blank)					
Grand Total	17,00	17,00	37,00	37,00	17	17

Copiar

Annexe R: Moderate Scenario

Benefício	Descritivo Benefício	Custo unitário	Benefício estimado (bimensal)	Benefício a estimado (ano c/adesão a 100%)	N	N+2	N+4	N+6	N+8	N+10	N+12	Média	Total	N (% adesão considerada)	N+2 (% adesão considerada)	N+4 (% adesão considerada)	N+6 (% adesão considerada)	N+8 (% adesão considerada)	N+10 (% adesão considerada)	N+12 (% adesão considerada)	Poupança Projetada do Ano %
1	Redução de Custos Operacionais			5 429	N.A	301	703	1 467	1 545	1 723	2 349	1 348	8 087								20%
	Redução horas extra	15 632,06		2 605	N.A	261	587	1 272	1 272	1 272	1 696	1 060	6 360								41%
1.3	Redução horas extra EXP	9 807,26	1635	1635	N.A	163	490	981	981	981	1 308	817	4 904	N.A	10%	30%	60%	60%	60%	60%	50%
1.4	Redução horas extra IMP	5 824,80	971	971	N.A	97	97	231	231	231	388	243	1 456		10%	10%	30%	30%	30%	40%	25%
	Redução Coimas	5 128,00		855	N.A	17	46	77	104	183	269	116	697								14%
1.5	Redução Coimas EXP	750,00	125	125	N.A	3	10	19	31	38	50	25	150		2%	8%	15%	25%	30%	40%	20%
1.6	Redução Coimas IMP	4 378,00	730	730	N.A	15	36	58	73	146	219	91	547	N.A	2%	5%	8%	10%	20%	30%	13%
	Redução KMS	6 993,96		1 166	N.A	23	69	118	169	268	384	172	1 030								15%
1.7	Redução KMS EXP	2 078,96	346	346	N.A	7	28	52	87	104	139	69	416		2%	8%	15%	25%	30%	40%	20%
1.8	Redução KMS IMP	4 915,00	819	819	N.A	16	41	66	82	164	246	102	614	N.A	2%	5%	8%	10%	20%	30%	13%
		39 875,38		TOTAL Benefici	5 429	0	301	703	1 467	1 545	1 723	2 349	1 348	8 087							

	Descritivo Custo	Custo unitário	Custo estimado (bimensal)	Custo a estimado (c/adesão a 100%)	N	N+2	N+4	N+6	N+8	N+10	N+12	Média Anual	Total	N (% adesão considerada)	N+2 (% adesão considerada)	N+4 (% adesão considerada)	N+6 (% adesão considerada)	N+8 (% adesão considerada)	N+10 (% adesão considerada)	N+12 (% adesão considerada)	
1	Capex			-779	0	-320	-459	-280	0	0	0	-151	-1 059								
1.1	Automatização Y's	150	-150 UBS	-150	0	-150	0	0	0	0	0	-21	-150								
1.2	Able2Extract	115	-459 Compra II	-459	0	0	-459	0	0	0	0	-66	-459								
1.3	Implementação Melhoria Contínua	310	-170	-170	0	-170	0	0	0	0	0	-24	-170								
1.3.1	Quadro	150	-150 Compra II	-150	0	-150	0	0	0	0	0	-21	-150								
1.3.2	Consumíveis	20	-20 Compra II	-20	0	-20	0	0	0	0	0	-3	-20								
1.4	Compra de Monitores	140	0	0	0	0	0	-280	0	0	0	-40	-280								
2	Opex			0	0	-1 300	-1 300	-421	-421	-210	-210	-552	-3 862								
2.1	RH dedicado	650	850 -1300	-2 104		-1 300	-1 300	-421	-421	-210	-210	-644	-3 862		100%	100%	20%	20%	10%	10%	

TOTAL Custos	N.A.	0	-1 620	-1 759	-701	-421	-210	-210	-703	-4 921
TOTAL Benefici	5 429	0	301	703	1 467	1 545	1 723	2 349	1 155	8 087
TOTAL Cash-Flu = TOTAL Cu		0	-1 319	-1 056	766	1 124	1 513	2 139	452	3 166

ROI	64%
PBP	6 meses

Annexe S: Best Case Scenario

Benefício	Descritivo Benefício	Custo unitário	Benefício estimado (bimensal)	Benefício a estimado (ano c/adesão a 100%)	N	N+2	N+4	N+6	N+8	N+10	N+12	Média	Total	N (% adesão considerada)	N+2 (% adesão considerada)	N+4 (% adesão considerada)	N+6 (% adesão considerada)	N+8 (% adesão considerada)	N+10 (% adesão considerada)	N+12 (% adesão considerada)	Poupança Projetada do Ano %
1	Redução de Custos Operacionais			5 429	N.A	533	1 231	2 019	2 458	3 158	3 461	2 143	12 859								46%
	Redução horas extra	15 632,06		2 605	N.A	473	1 060	1 793	2 084	2 605	2 605	1 770	10 620								68%
1.3	Redução horas extra EXP	3 807,26	1635	1635	N.A	327	817	1 308	1 308	1 635	1 635	1 171	7 029	N.A	20%	50%	80%	80%	100%	100%	72%
1.4	Redução horas extra IMP	5 824,80	971	971	N.A	146	243	485	777	971	971	599	3 532		15%	25%	50%	80%	100%	100%	62%
	Redução Coimas	5 128,00		855	N.A	26	71	92	147	226	354	153	916								18%
1.5	Redução Coimas EXP	750,00	125	125	N.A	4	13	19	38	44	63	30	179		3%	10%	15%	30%	35%	50%	24%
1.6	Redução Coimas IMP	4 378,00	730	730	N.A	22	58	73	109	182	292	123	737	N.A	3%	8%	10%	15%	25%	40%	19%
	Redução KMS	6 993,96		1 166	N.A	35	100	134	227	326	501	220	1 323								19%
1.7	Redução KMS EXP	2 078,96	346	346	N.A	10	35	52	104	121	173	83	495		3%	10%	15%	30%	35%	50%	24%
1.8	Redução KMS IMP	4 915,00	819	819	N.A	25	66	82	123	205	328	138	827	N.A	3%	8%	10%	15%	25%	40%	17%
		27 754,02		TOTAL Benefício	5 429	0	533	1 231	2 019	2 458	3 158	3 461	2 143	12 859							

Custos	Descritivo Custo	Custo unitário	Custo estimado (bimensal)	Custo a estimado (c/adesão a 100%)	N	N+2	N+4	N+6	N+8	N+10	N+12	Média Anual	Total	N (% adesão considerada)	N+2 (% adesão considerada)	N+4 (% adesão considerada)	N+6 (% adesão considerada)	N+8 (% adesão considerada)	N+10 (% adesão considerada)	N+12 (% adesão considerada)	
1	Capex			-779	0	-320	-459	-280	0	0	0	-151	-1 059								
1.1	Automatização Y's	150	-150 UBS	-150	0	-150	0	0	0	0	0	-21	-150								
1.2	Able2Extract	115	-459 Compra (I)	-459	0	0	-459	0	0	0	0	-66	-459								
1.3	Implementação Melhoria Contínua	310	-170	-170	0	-170	0	0	0	0	0	-24	-170								
1.3.1	Quadro	150	-150 Compra (I)	-150	0	-150	0	0	0	0	0	-21	-150								
1.3.2	Consumíveis	20	-20 Compra (I)	-20	0	-20	0	0	0	0	0	-3	-20								
1.4	Compra de Monitores	140		0	0	0	0	-280	0	0	0	-40	-280								
2	Opex			0	0	-1 300	-1 300	-421	-421	-210	-210	-552	-3 862								
2.1	RH dedicado	650	850 -1300	-2 104		-1 300	-1 300	-421	-421	-210	-210	-644	-3 862		100%	100%	20%	20%	10%	10%	

TOTAL Custos	N.A.	0	-1 620	-1 759	-701	-421	-210	-210	-703	-4 921
TOTAL Benefício	5 429	0	533	1 231	2 019	2 458	3 158	3 461	1 837	12 859
TOTAL Cash-Flq = TOTAL Cj		0	-1 087	-528	1 318	2 037	2 947	3 250	1 134	7 938

ROI	161%
PBP	6 meses