Improving the Process of Equipment Control and Correction in a Telecommunications Company: Enhancing Efficiency and Effectiveness

Miguel de Figueiredo Soeiro Messias

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Orientador na FEUP: Prof. Teresa Bianchi de Aguiar

U.PORTO

FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

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Abstract

The project underlying this report was conducted in a business context at NOS, a Portuguese company with a prominent presence in the telecommunications industry.

The proportion in the industry and the nature of the telecommunications business require constant control and correction of equipment in order to ensure the quality of services provided to customers.

The objective of this thesis was to contribute to the continuous improvement of this process, identifying existing problems in different areas and proposing effective solutions. During the internship, three main problems were addressed in the equipment control and correction process: the handling of store inconsistencies, the handling of inconsistencies of the SPs, and support for partners, technicians and internal teams.

Regarding handling store inconsistencies, it was identified that the existing process was manual, complex, and susceptible to errors. By developing a single, clear, automated file with constant data monitoring, it was possible to increase effectiveness and efficiency.

Within the scope of the inconsistencies in the SAP system, the problem lay in the existing process being manual and complex, as in the previous task. An in-depth study was conducted, mapping the process flow and identifying opportunities for future standardization and optimization.

In the support to partners, technicians, and internal teams the major problem lay in the lack of knowledge of the tasks involved. The approach went through detailed process analysis, establishing performance evaluation metrics, and implementing task management tools.

The implemented interventions brought significant improvements in the process at the level of efficiency and effectiveness, in the quality of work. Standardization, effective communication, and team empowerment were key elements to achieve these results.

The implemented actions allowed the time allocated to these tasks to be reduced to 28%, simultaneously improving the performance in solving them.

Resumo

O projeto subjacente a este relatório foi realizado em contexto empresarial na NOS, uma empresa portuguesa com presença destacada no sector das telecomunicações.

A proporção do setor e a natureza do negócio das telecomunicações obrigam a um constante controlo e correção dos equipamentos, de forma a garantir a qualidade dos serviços prestados aos clientes.

O objetivo desta dissertação foi contribuir para a melhoria contínua deste processo, identificando os problemas existentes nas diferentes áreas e propondo soluções eficazes. Durante o estágio, foram abordados três problemas principais no processo de controlo e correção de equipamentos: o tratamento de inconsistências em loja, o tratamento de inconsistências dos SP e o apoio a parceiros, técnicos e equipas internas.

No que respeita ao tratamento das incoerências das lojas, verificou-se que o processo existente era manual, complexo e suscetível de erros. Ao desenvolver um ficheiro único, claro e automatizado, com monitorização constante dos dados, foi possível aumentar a eficácia e a eficiência.

No âmbito das inconsistências no sistema SAP, o problema residia no facto de o processo existente ser manual e complexo, tal como na tarefa anterior. Foi realizado um estudo aprofundado, mapeando o fluxo do processo e identificando oportunidades de padronização e otimização futuras.

No apoio a parceiros, técnicos e equipas internas, o maior problema residia na falta de conhecimento das tarefas envolvidas. A abordagem passou por uma análise pormenorizada do processo, estabelecendo métricas de avaliação do desempenho e implementando ferramentas de gestão de tarefas.

As intervenções implementadas trouxeram melhorias significativas no processo ao nível da eficiência e eficácia, na qualidade do trabalho. A padronização, a comunicação eficaz e a capacitação da equipa foram elementos-chave para alcançar esses resultados.

As medidas implementadas permitiram reduzir o tempo atribuído a estas tarefas para 28%, melhorando simultaneamente o desempenho na sua resolução.

Agradecimentos

O percurso até este momento que simboliza o culminar de cinco anos de trabalho foi longo, mas muito especial. Gostaria de expressar a minha profunda gratidão às pessoas que desempenharam um papel fundamental no meu crescimento pessoal e profissional.

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"Tenho em mim todos os sonhos do mundo."

Fernando Pessoa

Contents

Acronyms and Symbols

KPI	Key Performance Indicator
SP	Service Provider
ITSM	IT Service Manager
SLA	Service Level Agreement
BPR	Business Process Reegineering
DFSS	Design for Six Sigma
DMAIC	Define, Measure, Analyze, Improve, Control
B2C	Business to Customer
SAP	Systems Applications and Products
WO	Work Order
SN	Serial Number
ID	Identity

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Chapter 1

Introduction

As part of the Master's Dissertation in Production Management of the Mechanical Engineering course at the Faculty of Engineering of the University of Porto, this project was developed at NOS Comunicações S.A., headquartered in Lisbon and with offices in Porto, during the period of about four months, starting in February 2023 and ending in June 2023.

In this chapter, firstly, the project is introduced, along with its motivation, providing a contextual framework within the current company landscape. Subsequently, the main objectives of the project are identified, as well as the methodology employed, concluding with an overview of the structure in which this dissertation is organized.

1.1 Motivation and Project Framing

NOS Comunicações S.A. is one of the leading telecommunications companies in Portugal, with a share of around 30% of the country's telecommunications. The high percentage allows one to perceive the prominence that NOS has in the industry, reflecting consumer preference for its services and allowing inferences about the role of this company in the global market.

Over the years, NOS has played a key role in the development of the sector in Portugal. The company was established in 1994 under the name TVCabo, initially providing cable television services. After some rebrandings and several changes over time, in 2013, it underwent a significant rebranding and adopted the name "NOS Comunicações", marking a new era for the company. This evolution arose naturally in response to the constantly changing high demands of the telecommunications market. Over the years, the company has pioneered the introduction of services such as pay-TV, high-speed Internet, and advanced mobile services.

NOS has been a driver of connectivity in Portugal. The company has invested significantly in expanding its network infrastructure, enabling wide and reliable coverage across the country. It is currently facing challenges in 5G coverage of the country, a solution seen as the future. The constant investment in the quest to cover the entire Portuguese territory has contributed to the improvement of digital accessibility and connectivity of local communities, especially those more distant from large metropolises.

The figure 1.1 below shows the map of current network coverage at NOS in Portugal, with a focus on 5G deployment.

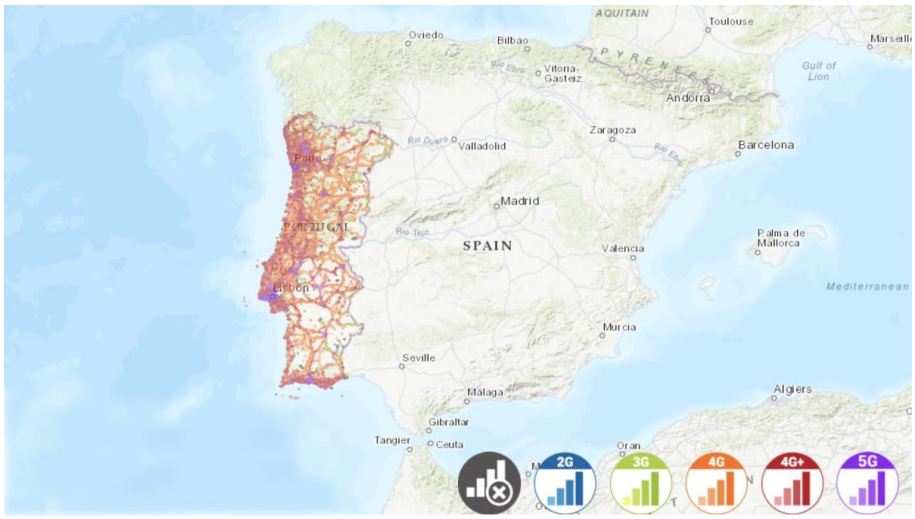


Figure 1.1: The network coverage of NOS Comunicações in Portugal Source: Martins (2022)

Logistics plays a crucial role in a telecommunications company's operations, ensuring efficiency and the delivery of high-quality services to customers. NOS relies on a well-structured logistics network to manage the distribution of equipment, such as boxes, routers, and other telecommunications devices, while also ensuring an adequate supply of components and materials for its operations.

The dissertation addresses the topic of improving the process of control and correction of equipments in the Department of Fixed Planning at NOS Comunicações S.A., a renowned telecommunications company in Portugal. Given the context of NOS, the improvement of the equipment control and correction process is essential to maintain competitiveness in the marketplace. With the continuous growth of customer demands and the need to provide reliable fixed services, improving equipment management is a strategic priority for the organization.

1.2 Improvement of the equipment control and correction process at NOS

Considering the size of the company, it is necessary to have an extensive telecommunications infrastructure network involving a large amount of equipment in different locations, not forgetting that each type of equipment may have distinct characteristics and requirements for control and correction. In the NOS Fixed Planning department, the proper management of equipment is essential to ensure the quality and availability of fixed services offered by the company.

Due to the large number of boxes and routers used by NOS customers and the numerous systems that support the business, there are internal processes to ensure the integrity/correction of stocks in the stores, warehouse and NOS installation technicians that arise from inconsistencies

and occasional unavailability of the systems. All processes are done by a single person, manually and casually, which leads to a number of challenges and negative consequences for the company.

One of the main problems is over-reliance on a single person. By concentrating all responsibilities related to the control and correction of equipment in a single source, the company is vulnerable to significant operational risks. Any absence or inability of this person can result in delays, errors, and inefficiencies in identifying and correcting problems, impairing the quality and consistency of the services provided.

On the other hand, the lack of standardization and proper documentation of processes is an additional challenge. With tasks performed casually and manually, it becomes difficult to track, analyze data, and identify opportunities for improvement. Lack of proper documentation can also make it difficult to train team members, as it can limit the ability of others on the team to be able to perform these tasks, should the need arise.

Performing tasks manually can result in significant delays due to the need to deal with each step, step by step, which is more time-consuming than if an automated system were used. In addition, without clear and consistent procedures, each task may be approached differently, leading to variations and possible errors, which may require further corrections in the future.

1.3 Project Objectives

Pursuing continuous improvement is crucial when considering the huge significance of logistics for a telecommunications organization, as is the case with NOS. In order to optimize the processes, the company has carried out routine work in the many logistics departments and in the widest range of operations, from the purchase of equipment from suppliers through its return and subsequent re-entry into the logistics flow.

The objectives of this project are focused on improving the equipment control and correction process, aiming to achieve the following results:

- Decrease in the number of process steps: identifying and eliminating the process steps that do not add significant value, i.e., activities that consume time and resources without effectively contributing to the quality or efficiency of the final result. With the process flow without excess steps, it is possible to reduce waste and increase productivity.

- Process optimization and automation: in order to make the process more efficient, fast, and accurate, the execution of the equipment control and correction process is going to be optimized. Through the automation of repetitive and standardized tasks, it is possible to reduce the dependence on manual intervention and minimize possible human errors. The use of appropriate tools and technologies will be explored to achieve this optimization.

- Visibility over the results obtained, allowing the development of continuous improvement: it is also intended to create a clear and comprehensive view of the results of the equipment control and correction process through the development of monitoring tools, such as reports or dashboards. The use of follow-up tools will allow a more precise and objective analysis of

key performance indicators, enabling the identification of areas for improvement throughout the process and the implementation of corrective and preventive actions.

By focusing on these objectives, NOS aims to achieve greater efficiency, accuracy, and productivity in its logistics operations, ultimately providing better services to its customers in the telecommunications industry.

1.4 Method followed in the project

The figure 1.2 shows the planning of the tasks aimed at achieving the objectives presented previously.

Initially, and after understanding the project's objectives, a plan of tasks for developing the project was structured.

Briefly, at a very early stage, there was the integration and familiarization with the business environment. This was followed by a follow-up of the process and a study of the subjects inherent to it, relevant to the understanding and execution of this project.

In continuity with the process monitoring, data was collected to perform an analysis of the process and its tasks, in order to find possible opportunities for improvement. Subsequently, an improvement suggestion was developed for each task, from identifying and eliminating gaps in each task to its implementation.

Until the final implementation of the suggestions, there was an iterative process in which the proposal was constantly being presented, evaluated and corrected, if necessary. In the final stage, with everything already successfully implemented, there was a formative part about what was implemented, thus ensuring the continuity of the process.

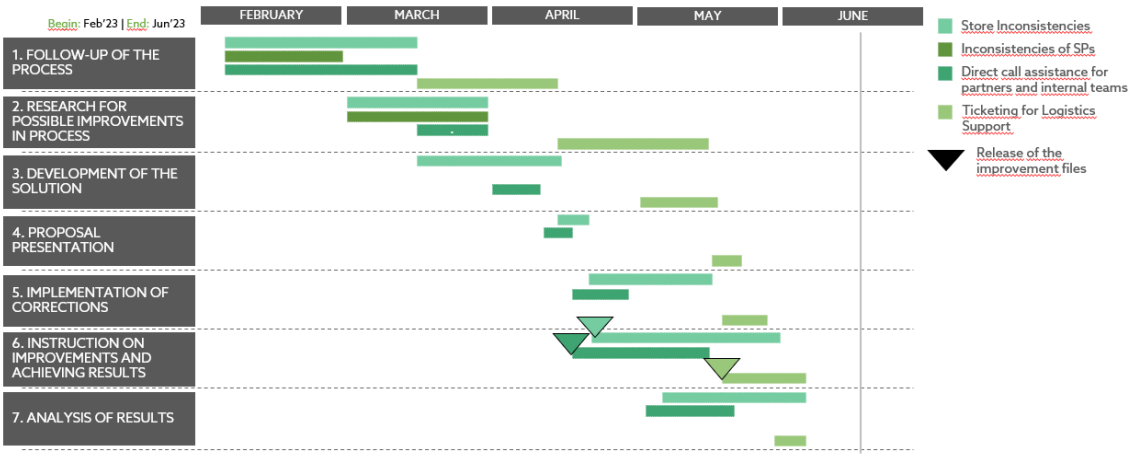


Figure 1.2: Gantt chart of the task planning

1.5 Structure of the dissertation

This dissertation is divided into five chapters, where there are subchapters in order to organize the information and deepen the topics covered.

Chapter 2, "Literature Review", provides the theoretical framework of the relevant areas addressed in the project for a better understanding of the themes of the project.

Chapter 3, "Current Description of the Problem", exposes the current situation of the company and the process that is intended to be addressed, along with an analysis of the current problems of its tasks. Initially, the area in which the project is located within NOS is presented, and then the Equipment Control and Correction process is explained in more detail. The various tasks of the process are also presented, as well as the causes that aroused interest in this internship.

In Chapter 4, "Methodologies and Implementation Proposals", the path until having the implementation proposal for the process and its tasks is presented. In this section, the method taken throughout the internship is explained until we have solutions for process improvement, as well as the obstacles encountered and how to proceed in order to proceed to process optimization in the final stage.

Finally, Chapter 5 presents a discussion of the results obtained, the main conclusions, and lessons learned during the course of the project.

Chapter 2

Literature Review

The literature review chapter addresses different topics relevant to the project. An in-depth understanding of the concepts, strategies and practices in these areas is attempted by reviewing the existing literature.

Initially, it begins by exploring the main strategies for identifying improvements in logistics, as well as its importance as a competitive advantage in the telecommunications industry.

Next, inventory management and equipment control practices are explored, analyzing the approaches used to optimize these processes and ensure adequate equipment availability. In addition, performance management is discussed, including the objectives of this practice, the indicators used to monitor organizational performance and monitoring methods.

Finally, the idea of multitasking is addressed, exploring how this practice can influence the organization and productivity of daily activities.

2.1 Logistics with continuous improvement

The efficient and successful management of corporate operations and supply chains dependends on logistics. According to Christopher (2016), logistics includes a wide range of activities, ranging from the acquisition and transportation of raw materials to the distribution of finished products to clients, with the goal of creating networks that add value and combine activities in a harmonic manner. In this context, a logistics system describes the activities that determine the flow of the materials and information among the organizations' facilities that can be in different locations. It consists of the infrastructure, equipment, means and resources (including people) required to carry out the activity (Ghiani et al., 2013).

Efficient and optimized logistics are essential for maintaining a continuous flow of goods and information in the supply chain while meeting customer needs, reducing operating costs and enhancing sales competitiveness (Bohács et al., 2013; Tamás, 2016).

2.1.1 Strategies for identifying improvement in logistics

Continuous improvement plays an essential role in optimizing logistics processes (Pereira et al., 2019). Organizations are responding to the global competition that today's world faces by reconsidering how they approach supplying goods and services to their clients. This rise in competition, combined with client demands, governmental requirements, and environmental regulations, suggests the reconstruction of the organizations in order to succeed in the future and to survive financially (Lockamy III and Smith, 1997; Van Goor, 2001). This situation motivated the development of some business process improvement theories and approaches, such as Business Process Reengineering (BPR) and Six Sigma.

Business Process Reengineering (BPR) emerged in the 1990s by Hammer (1990) as a management technique focused on redesigning the tasks necessary to achieve a particular business outcome by analyzing workflows. BPR was defined by Hammer and Champy (1993) as "fundamental rethinking and the radical remodeling of business processes in order to achieve dramatic improvements in critical and contemporary performance measures such as quality, cost, service, or velocity." This method of process reengineering aims to lower costs, reduce the length time of the process, improve the output quality, and improve the quality of life for those who are involved in the process (Davenport et al., 1990). While some companies have successfully implemented BPR, the failure rate remains high (Caron et al., 1994).

To ensure effective process reengineering, a systematic approach is required, involving the identification of flaws, radical changes to increase efficiency, and involving affected employees, clear vision, detailed planning, and measurement of progress by using technology (Hammer and Champy, 1993). Six Sigma methodology is often used to manage risks and improve process efficiency through metrics and statistical analysis. By reducing process errors to less than 3.4 per million opportunities, Six Sigma aims to achieve high-quality outcomes (Usman Tariq, 2013). In Figure 2.1 below, the necessary steps for a reengineering process are represented.

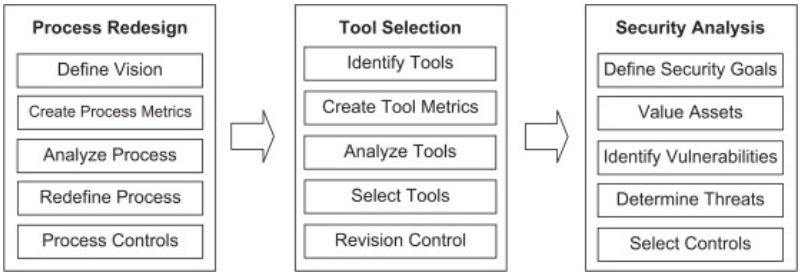


Figure 2.1: Process reengineering steps. Source: Goel and Chen (2008)

Process restructuring involves creating metrics, evaluating options, and selecting processes. The ideal procedure is chosen for each step, leading to the development of an integrated process. DFSS (Design for Six Sigma) is used to collect specifications from stakeholders and evaluate different options to create the new process. The Six Sigma methodology, specifically DMAIC (Define, Measure, Analyze, Improve, Control), is employed to measure existing processes, identify areas for improvement, and monitor and control them. By combining risk analysis with the

Six Sigma methodology, one can measure, analyze, and improve the restructured process while analyzing and controlling security risks (Goel and Chen, 2008).

In summary, logistics plays a critical role in the efficient management of operations and supply chains. Business Process Reengineering, along with continuous improvement and methodologies like Six Sigma, offers approaches for optimizing processes, improving performance, and ensuring customer satisfaction. Proper planning, tool selection, risk analysis, and employee involvement are key factors for successful process reengineering endeavors.

2.1.2 As a competitive advantage in telecommunications Industry

According to Gunasekaran et al. (2017), 20% of a company's overall costs are attributable to logistics. Due to its significant weight in an organization's cost structure, this area can have a significant impact on how competitive a company is. However, competitive advantages for organizations go beyond just low logistics operation costs.

In the view of Porter (1985), an organization gains a strategic advantage when it can control costs or when it outperforms its rivals in activities that are crucial from a strategic perspective. The first is a lower-cost strategy that lowers operating expenses in order to offer more affordable prices. The second involves using a differentiation strategy to provide customers with products that are more highly valued. Therefore, a strategic approach to logistics, aligned with the organization's competitive strategy, can drive the attainment of competitive advantage in the market.

The telecommunications industry is distinguished by its extensive global reach and high level of complexity. Companies manage complex networks and infrastructures while operating across numerous geographies and serving a variety of customer segments (Rycroft, 2007). The market is characterized by intense competition, rapid technological advancements, and increasing customer expectations (Stiller, 2009). Authors such as Christopher (2016) emphasize the significance of effective logistic practices to help telecommunication companies in overcoming these challenges by optimizing their operations, ensuring seamless coordination across multiple locations, reducing costs, optimizing inventory levels, and minimizing lead times.

Supply chain design plays a crucial role in optimizing production and service processes. It involves managing the process chain from the supplier to the final consumer, with the aim of enhancing the overall performance of the entire chain. A well-designed and efficient supply chain can result in lower operational costs, resource optimization, and improved product or service deliveries (Nagy et al., 2021). An example of a supply chain design for the telecommunications industry is shown in Figure 2.2.

In addition, establishing cross-company partnerships can help companies in the telecommunications industry maintain optimal inventory levels and achieve various benefits. By leveraging these alliances, companies can enhance information sharing, streamline processes, and achieve additional benefits like automation and elimination of unnecessary steps. Ultimately, embracing supply chain collaborations and strategic alliances enable companies to overcome inventory challenges, enhance operational efficiency, and gain a competitive advantage in delivering superior products and services (Moore, 1998).

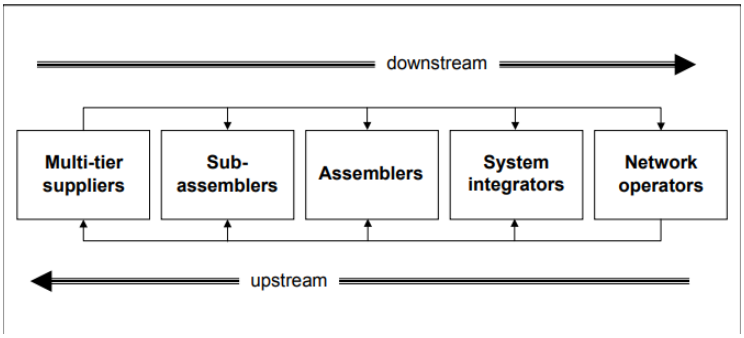


Figure 2.2: Telecommunication equipment industry supply chain. Source: Cassivi et al. (2004)

Economic competition has driven the innovation of knowledge-intensive technologies, such as automobiles, aircraft, and telecommunications equipment. Complex innovation networks, including strategic alliances and research consortia involving universities, play a vital role in this innovation. Network collaboration reduces innovation time, facilitates global knowledge diffusion, and optimizes logistics. This change acknowledges the significance of collaboration and the rapid pace of technological advancements, which ultimately boost economic growth and improve the operational efficiency of companies (Rycroft, 2007).

2.2 Stock management and equipment control

The term "stock" is used to refer to quantities of finished goods in the process of being manufactured, raw materials, or spare parts. Typically, stocks represent a sizable financial commitment to logistics systems (Gonçalves, 2000). Consequently, effective stock management can lead to significant cost savings (dos Reis, 2008).

Stocks act as regulators between deliveries and consumption or sales, which occur at different rates. The main drawbacks of stocks include the fragility of some items, which can lead to deterioration and loss of value, the invested capital that becomes immobilized, the costs associated with the space occupied, insurance, and labor (dos Reis, 2008). Therefore, although holding stocks are useful in several situations, they also involve costs that must be considered for proper management. Stock management is thus a fundamental part of the dynamics and smooth running of a company, with the principle that the benefits of holding stock should exceed its costs (Monczka et al., 2020).

Although there are several opposing ideas, such as the Just In Time philosophy, which advocates minimum stock levels and consequently the costs they represent through the capital invested in them and the investment in the logistics systems to maintain them, there are industries that require stock in high quantities, for various reasons:

- Avoid production interruptions: The main goal of maintaining inventories is to ensure the constant flow of materials to the assembly line, avoiding interruptions or problems related to lack of materials or possible supplier failures.

- Dealing with variations in demand: Demand forecasts are not always accurate, and it is necessary to have stocks to deal with the variations that occur.
- Benefit from discounts on larger purchases: Suppliers usually offer discounts on purchases of larger quantities. The ability to keep larger inventories benefits from these discounts and lower the unit costs of the materials bought, but it must take into account the costs related to inventory, such as storage space and insurance (Monczka et al., 2020).

Being closely related to stock, equipment control in the telecommunications industry refers to the management and monitoring of various types of equipment used in telecommunications networks and systems. This includes devices such as switches, routers, servers, transmission equipment, antennas, and other network infrastructure components. Here are some key aspects of equipment control in the telecommunications industry:

- Asset Tracking: Telecommunications providers employ asset tracking systems to monitor the location and movement of equipment.
- Maintenance and repairs: Scheduling and managing maintenance tasks, such as regular inspections, preventive maintenance, and repairs, are part of active equipment control.
- Performance Monitoring: To spot potential problems and guarantee optimum network performance, monitoring equipment performance is crucial (Subramanian et al., 2010).

2.3 Performance management

Performance management plays a crucial role in the success and effectiveness of organizations in a competitive environment. Its proper implementation brings benefits to both employees and the organization as a whole (Armstrong and Baron, 2004). Performance Management cycle, represented in Figure 2.3, encompasses the process of assessing the differences between actual and desired outcomes, identifying and flagging those differences that are critical (thereby warranting management intervention), understanding if and why the deficiencies have taken place and, when necessary, introducing (and monitoring) corrective actions aimed at closing the significant performance gaps (Argyris, 1977).

The advantages of performance management are highlighted by Fontes (2013), who states that the implementation of a Performance Management cycle promotes the alignment of individual objectives with the collective objectives, creating a culture of competition, commitment, pressure and responsibility.

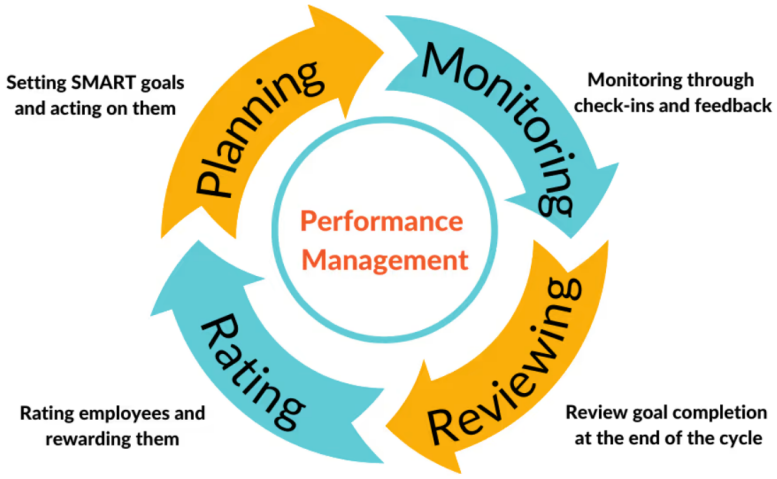


Figure 2.3: Performance Management cycle. Source: Chellappa (2023)

2.3.1 Objectives of performance management

Goldratt and Cox (2016) consider that performance evaluation serves a variety of purposes:

- Monitoring process performance over time: Performance evaluation provides a means to continuously monitor the performance of processes over time. It helps in tracking key metrics, identifying trends, and detecting any deviations from expected performance levels.

- Identifying process bottlenecks and inefficiencies: helps identifying areas within a process that are causing delays, bottlenecks, or inefficiencies. By measuring and analyzing process performance metrics, organizations can pinpoint specific areas that require improvement.

- Assessing the effectiveness of process changes: allows organizations to assess the impact of process changes or optimization efforts. By comparing performance metrics before and after the implementation of changes, organizations can determine if the desired improvements have been achieved.

- Supporting communication and accountability: provides a basis for communication and accountability within the organization. It helps in setting performance targets, communicating expectations, and holding individuals or teams accountable for their contributions to process improvement initiatives.

Through performance management, organizations can thus implement measures to monitor and improve product quality, ensuring that they meet established individual and collective standards and expectations. Together, these consequences are essential for customer satisfaction and for the company's reputation in the marketplace.

2.3.2 Performance Indicators

Performance indicators, known as KPIs (Key Performance Indicators), are metrics that measure the performance of a process and compare against established goals (Ahmad and Dhafr, 2002). KPIs are the principal component of any performance management system since they allow for the evaluation of current performance and the identification of areas for development.

As Meier et al. (2013) refers, “Many companies are working with the wrong measures, many of which are incorrectly named key performance indicators (KPIs)." Only a small number of organizations truly monitor their key performance indicators (KPIs). This is mainly because only a limited number of organizations, business leaders, writers, accountants and consultants have fully explored and understood the concept of KPIs.

To get better results, a performance management system with several indicators is not sufficient on its own. The indicators must be aligned with the environment and strategy of the firm. In order to make sure that the measurements are in line with the business strategy, the KPIs chosen should reflect what is crucial for the organization (Meier et al., 2013).

Figure 2.4 shows the path that should be followed in defining a KPI, relating it to the outcome. By going through each step, it is possible to arrive at a good KPI, detailed at a maximum level and able to indicate the actions that should be taken in the future.

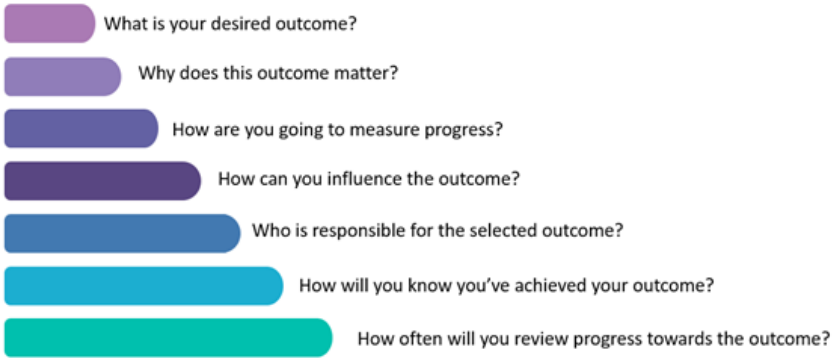


Figure 2.4: How to define a KPI? Source: Lara (2018)

According to Ahmad and Dhafr (2002), KPIs can be divided into three main types:

- Financial performance indicators: measure the financial performance of the organization, including metrics such as revenue, profit, margin of profit, or return on investment;
- Productivity indicators: evaluate the efficiency and productivity of processes, considering metrics such as production per hour, production per employee, average production time, among others;
- Efficiency indicators: Measure the efficiency of processes, considering metrics such as average cycle time, rework rate, failure rate, or resource utilization;

From the indicators presented, it is important to select according to the specific needs and goals of the organization, ensuring that they are relevant, measurable, and able to provide actionable insights to drive operational improvements.

2.3.3 Organizational Performance Monitoring and Reporting

Performance management plays an important role in the success of organizations, allowing to evaluate and monitor the performance of different areas and processes. To this end, reports and dashboards emerge as essential tools, providing valuable information for strategic decision- making.

When creating reports, KPIs serve as the foundation for tracking and evaluating performance. Reports are documents or presentations that, typically on a recurring basis, provide data and results related to various KPIs regarding how well an organization is performing. They are usually based on historical data, allowing a detailed analysis of the results achieved, and can cover several aspects, such as sales, productivity, and quality, among others (Kuniavsky, 2003).

A dashboard, as illustrated in Figure 2.5, is an example of a control system seeking to provide its user with useful information for the success of their tasks, and organizations with the assistance needed to raise their work standards. Otley (1999) defines as "a visual and interactive performance management visual and interactive tool that presents on a single screen the most important information needed to achieve one or several individual and/or organizational goals, allowing the user to identify, explore and communicate problem areas that need corrective action".

The combination of reports and dashboards provides a comprehensive view of organizational performance. While reports provide a more in-depth and detailed look into the past, dashboards provide a snapshot and easy-to-understand view.

Figure 2.5: Exemple of a Dashboard Source: Catunda (2021)

According to Rushton et al. (2022), key features that define a good dashboard or report include:

- Objectivity and relevance: The ability to provide relevant information according to the users' objectives and needs is fundamental. An effective dashboard or report should present the most important metrics and indicators for tracking and evaluating results;

- Clear and intuitive visualization: The visual presentation of data plays a crucial role in understanding and interpreting the information. Charts, tables, and other visual elements should be used clearly and intuitively to convey insights effectively;

- Interactivity and exploitability: The ability to interact with data, filter information, and explore different perspectives is essential. Features such as filters and drill-down allow users to investigate the data at different levels of detail, making it easier to identify patterns, trends, and relevant insights;

- Data accuracy and reliability: Data quality is critical to the reliability and effectiveness of a dashboard or report. It is important to ensure that data is accurate, up-to-date, and from reliable sources.

The appropriate frequency for updating reports and dashboards varies according to the needs and characteristics of each organization. In some cases, daily updates may be necessary, while in other cases, weekly or monthly updates may be ideal. The availability of data, the frequency of changes in key indicators, and the speed with which information is needed to support decisions are all factors that can change the frequency at any time (Kaplan et al., 1996).

As for focus, reports and dashboards should be aligned with the strategic objectives of the organization. The indicators selected must provide relevant insights into the key areas of the business while avoiding the inclusion of irrelevant information (Storey and Treude, 2019).

In summary, the integration of reporting and dashboard functionality provides a powerful solution for data analysis enabling users to make informed decisions and drive performance improvement in their organizations.

2.4 Multi-tasking

Multi-tasking is defined as the ability to do several tasks simultaneously. With the growing need for productivity and the increasing exposure to technologies that allow us to be available practically 24 hours a day, it is generally considered beneficial, in the belief that being able to do several things at once increases productivity and efficiency (Carrier et al., 2015). However, in reality, multi-tasking can have disadvantages.

While it may seem that performing multiple tasks at the same time is a solution, in fact, the human brain is not designed to focus on multiple complex activities at the same time (Pashler et al., 2001). Studies show that multi-tasking, which with the increasing innovation of technologies, has become present throughout people's day, can lead to errors, decreased creative and problem-solving performance, and increased stress (Stone, 2007).

Creating and restructuring fixed schedules can be seen as an effective strategy for dealing with the difficulty of multi-tasking and its disadvantages. By establishing a specific schedule for each activity, it is possible to devote the right amount of time completely to one task at a time, without interruptions or distractions (De Janasz et al., 2008). Work will be completed more effectively and with higher-quality results by maximizing attention, focus, and productivity.

Furthermore, having fixed schedules helps to establish a consistent routine. As illustrated in Figure 2.6, a predefined schedule makes it easier to plan and organize activities, which helps with better time management. By setting aside specific periods for each of the most important tasks, the idea of trying to do everything at once fades away (De Janasz et al., 2008).

However, it is important to recognize that it is not always possible to have a strict fixed schedule. While there are tasks that can be done on a regular basis, there are tasks that may arise sporadically and with a high degree of urgency, requiring them to be done on the stop, leading to a restructuring of schedules. Therefore, it is crucial to find a balance between creating fixed schedules and being able to deal with unforeseen events (Chen et al., 2018).

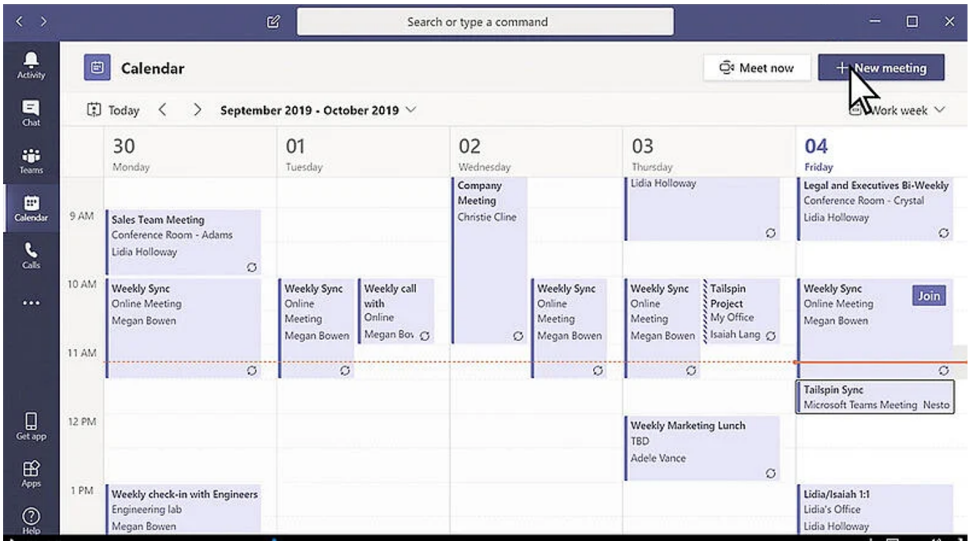


Figure 2.6: Exemple of a predefined weekly schedule Source: Riz (2020)

Chapter 3

Current Description of the Problem

3.1 Fixed planning department at NOS

Logistics plays a key role at NOS Comunicações, being responsible for the smooth running of the company. At NOS, the logistics department is divided into several sub-departments, each with its specific areas of responsibility. The organizational structure created allows better management of logistics activities and a deeper focus on each area of operation. Although each sub-department has its own tasks and challenges, cooperation and collaboration between them is a decisive factor, aiming at the greater common goal; contributing to the success of the company.

The company's Logistics department is based on the ability to plan, implement and monitor operations related to the flow of materials, information and services, addressing several aspects, including:

- Supply chain management: Logistics coordinates the supply chain, which includes suppliers, manufacturers, distributors, and resellers, ensuring that all are aligned, sharing information and collaborating to ensure an efficient flow of materials and services.
- Stock management: Logistics assists in controlling and managing the stock of equipment, components and materials required to provide telecommunications services. This involves constant monitoring of stock levels, demand forecasting, and procurement to ensure the adequate availability of resources to meet operational needs.
- Transportation and distribution: the efficient planning and execution of the transportation of equipment and materials between locations, such as warehouses, distribution centers, and points of sale is carried out by logistics. The aim is to optimize transportation routes, choosing the most appropriate modes of transport and ensuring timely delivery, ultimately resulting in service continuity and customer satisfaction.
- Planning and scheduling: Logistics is responsible for planning and scheduling operational activities. Through the use of advanced tools and technologies, it determines delivery times, defines workflows, allocates resources, and coordinates the different stages of the service delivery process.

Within the scope of this dissertation, the fixed department stands out, dealing with a variety of essential equipment, such as boxes, routers, commands and components.In this regard, it is important to initially explain the entire flow in fixed planning, illustrated in figure 3.1 below.

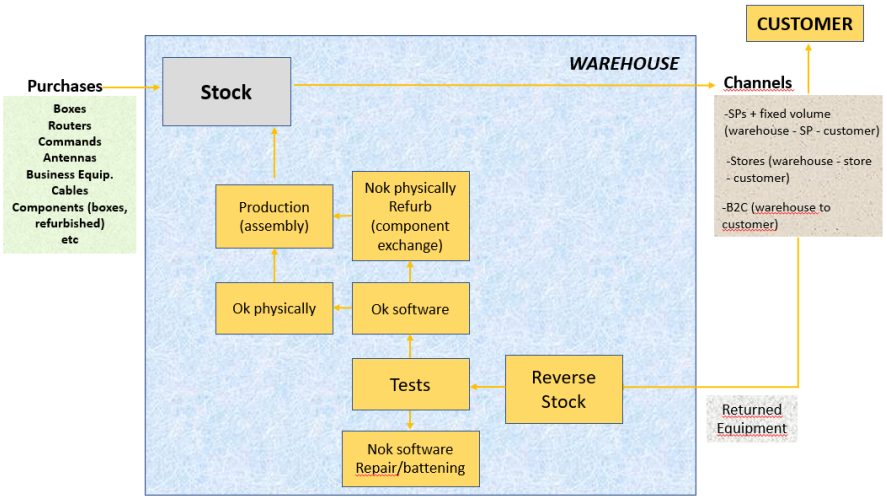


Figure 3.1: Logistics Flow of Fixed Planning at NOS.

In the fixed planning process, the first step is the purchase of equipment from suppliers. Constant communication and coordination between the team and other NOS departments are key in the equipment purchasing process. As a result, this ensures that orders are adequate in terms of technical specifications, quantities, and delivery dates. In addition, communication with departments such as Finance and Marketing helps assess the viability of purchases and ensure strategic alignment. Dealing with possible incidences, such as delivery delays or damaged products, requires efficient coordination to minimize impacts on the logistical flow.

After the purchase, it is necessary to verify the equipment's receipt and delivery dates and deal with any incidences that may arise. This verification is essential to ensure that all orders arrive in good condition at the NOS warehouse, where stock is generated and kept available for later use. It is important to emphasize the importance of strict stock control, ensuring proper management of equipment, avoiding overstocks or shortages, which can affect the ability to meet customer demands efficiently.

With stock available in the warehouse, the logistics flow follows different channels. The Service Providers (SPs) play a key role in the distribution of the equipment, acting as intermediaries between NOS and the end customers, in the distribution of the equipment, performing the installation, configuration and offering technical support to customers. It is necessary to regularly supply the equipment to the SPs to meet demands and ensure the availability of products in their operations.

In the case of the physical stores, although direct sales of fixed equipment may not be available, there is stock available to provide to customers when they sign a contract with the company for their fixed services. Once the customer signs the contract, the store team can begin the process

of delivering the equipment. This may involve coordinating with the company's logistics or fulfillment department to ensure on-time delivery or timely pickup of the equipment. Store staff can also guide the customer through any necessary configuration or installation processes.

The B2C channel, which encompasses direct-to-consumer sales, is another important route in the logistics flow. In this channel, NOS sells its products and services directly to customers through telesales or online platforms. Through this channel, the company has the opportunity to create a personalized experience for the customer, offering tailored solutions and ensuring a convenient and efficient purchasing process.

Finally, to mention reverse logistics, it allows the management of equipment and material returns. The process contributes to waste reduction and promotes environmental sustainability. The equipment returned by customers undergoes rigorous testing in terms of software and physical appearance before being reinstated in the warehouse stock. Ensuring that this equipment is in perfect condition for reuse or recycling contributes to the company's operational efficiency and environmental responsibility.

Each step in this flow has specific challenges that need to be addressed in order to be ready and available to meet customer demands.

Throughout the flow of the fixed planning, several tasks arise to be done, directly or indirectly. Since the fixed planning team is a team consisting of only five elements, as is illustrated in the Figure 3.2, there are no tasks to be done by more than one person at the same time, which implies that tasks are the sole responsibility of the person in question throughout the work week. In the fixed planning department, the tasks associated with the flow in order to guarantee its continuous operation are: dealing with purchases from suppliers, ensuring that everything that is bought is received in the warehouse, ensuring the supply of stores and SPs, checking how the reverse logistics process is done and, finally, and perhaps the task that, looking at the flow, goes unnoticed, the control and correction of equipment.

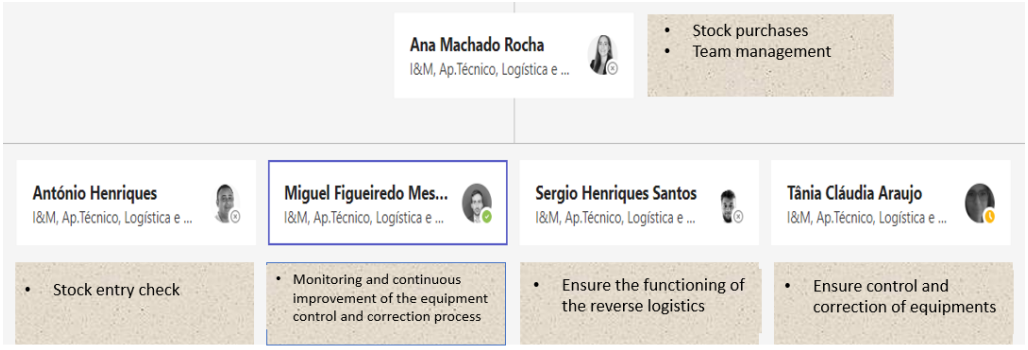


Figure 3.2: Structure of the fixed planning department at NOS.

In addition to the tasks associated with the flow, there are always new subjects to deal with. Some examples of issues that arise on a regular basis are:

- Introduction of new projects and technologies: with constant technological advancement, once the company wants to launch new products or services, a planning and execution process is required, which involves defining product specifications, introducing them into the system, updating information systems and possibly replacing older products with the new ones, managing the supply of the new products, and coordinating with the various departments involved, such as Marketing or Finance.

- Business expansion: when the company decides to expand its business, whether by opening new stores, expanding into new markets, or acquiring other companies, it is necessary to understand whether this expansion has an impact on the department and, if so, to plan carefully. This involves feasibility analysis, organization of new tasks that may arise, management of the resources needed for expansion, and constant coordination and contact with other departments.

- Crisis management: unforeseen situations such as natural disasters, supplier problems, worker strikes, or economic crises can affect the functioning of logistics, including, fixed planning. In these cases, it is important to implement contingency plans, coordinate emergency response actions, manage communication with stakeholders, and minimize the negative impacts it may trigger on the flow.

- Continuous improvement: the search for continuous improvement is a constant theme in logistics. Thus, with the contribution of new technologies, it is possible to create tools for the analysis of performance indicators that help in the identification and implementation of improvement points in the process. Subsequently, with the monitoring of the results and the evaluation of the return on investment of the improvements, iterations are made until the process, in terms of efficiency and quality, is as optimized as possible.

Indeed, the topics mentioned earlier are examples of subjects that demand continuous and heightened attention within the scope of Fixed Planning. However, it is important to note that these issues are often unforeseeable and can arise unexpectedly. As a result, they cannot be pre-allocated and included in the workers' weekly plan.

The team must be adaptable and flexible to manage unforeseen problems that may emerge in the company's logistics environment. These challenges require immediate action, coordination with various departments, and collaboration with external stakeholders. To address these issues effectively, the team maintains a proactive approach; as it is impossible to predict the exact nature or timing of these challenges, the team integrates flexibility into their weekly plans, allowing them to allocate resources and adjust priorities accordingly.

When structuring the team's schedule, it is necessary to take into consideration that there are regular tasks that must always be present throughout the week. These tasks are mostly associated with the continuous functioning of the logistics flow, which occurs without interruption. The flow must be continuous in order to ensure effectiveness and promptness in meeting consumer requests.

On the other hand, since NOS is a telecommunications company, part of a constantly evolving environment, "new" tasks can be expected to arise at any time. Over time, there has been an increase in the time spent on these unpredictable tasks.

Since the weekly schedule is limited, the solution is to give more attention to regular tasks in order to reduce the time allocated to them. In this sense, it is crucial to evaluate the current processes, search for enhancements such as automation tools, and optimize them. With regular tasks performed more efficiently, it is possible to ensure the smooth running of the flow sooner. In addition, this optimization allows a wider window of time to identify and address problems and issues that may arise.

3.2 Equipment control and correction process

Within the scope of fixed planning at NOS Comunicações, the equipment control and correction process is one of the essential tasks to be performed to ensure the consistency of stocks in stores and partners, as well as to identify and correct any discrepancies between stock records and the physical quantity of equipment available.

To identify any potential discrepancies, this process begins with routinely checking stocks, both in physical stores and with partners, to ensure that they align with internal system records.

Inconsistencies in stocks can be reported by the partners themselves through tickets, which describe the discrepancies found. In addition, periodic inventories are also performed in stores to check the amount of equipment in stock and compare it with the recorded data. The detection of any discrepancy is the starting point for its correction and resolution.

When inconsistencies occur, it is necessary to identify the reason that led to this situation. It may be due to errors in the recording of sales, thefts, unrecorded returns, or other logistical problems. Once the cause is identified, corrective actions are implemented to resolve the discrepancy.

The control and correction of equipment play a key role in the efficient management of the company's resources. By ensuring the consistency of stocks, problems such as missing products in stores or excessive accumulation of equipment in stock are avoided. In addition, this process contributes to better financial management since it allows to identify possible losses or deviations and take appropriate corrective action.

Overall, the equipment control and correction process is essential to keep the logistics operation of NOS Comunicações fluid and efficient, ensuring customer satisfaction and maximization of the company's results.

3.2.1 The main tasks within the process

Among the equipment control and correction process there are several tasks that play a key role in managing the logistics flow of fixed planning. These tasks are performed regularly to ensure the consistency and efficiency of the process. The following will describe the tasks mentioned above in more detail.

3.2.1.1 Handling of store inconsistencies

In the equipment control and correction process, it is important to be aware of inconsistencies that may arise in the stores. These inconsistencies can occur when equipment is returned by the client, being registered by the store in order to re-enter the logistics cycle but, for some reason, does not enter the warehouse as it should. In such cases, the store reports this situation, indicating that the equipment was not properly processed at the reverse.

The store has the responsibility to do its process of registering the equipment. However, if any problem occurs that prevents the equipment from entering the reverse, the store continues collecting of the equipment. However, if it is not possible to return the equipment to the inverse, it ends up being identified in the inconsistency report. This report is evaluated weekly, with the objective of regularizing the situation and ensuring that the equipment is assigned to the store's stock so that they can proceed with its return.

This weekly monitoring allows the identification of the occurrences in which the equipment did not enter the reverse process correctly and to take the necessary measures to correct the situation. It is important to resolve these inconsistencies in order to ensure that the store stock and the inverted stock are aligned, avoiding possible financial losses or detours of equipment.

In summary, when inconsistencies occur in the stores in which an equipment is registered but does not enter into reverse logistics as it should, these situations are reported. Through an error monitor, which is analyzed weekly, the necessary measures are taken to regularize the situation and ensure that the equipment is assigned to the store's stock so that it can be returned appropriately. This control and correction process is fundamental to ensure the consistency of stocks and the company's operational efficiency in one of its main success factors, the physical stores.

3.2.1.2 Handling of SPs Inconsistencies

Within the equipment control and correction process, it is also important to deal with the inconsistencies generated by partners, where the focus is on mobile serialized equipment, that is, equipment such as cable telephones or satellite devices. These inconsistencies arise when a technician makes an installation service of a certain equipment, such as a rooter or a box, and registers an equipment in the system, in the case of NOS the Click. When closing the WO (service order), Click sends a request to SAP to remove the stock from the partner's factory, but for some reason, sometimes the equipment is not correctly removed from its stock.

The detection of such inconsistencies is done by comparing what is recorded in the Click system with what was not correctly consumed in the SAP system. If a serial number (SN) is registered by the technician in the Click system, but the corresponding equipment remains in SAP stock, this is considered an inconsistency and is included in the inconsistency report.

These inconsistencies can be identified in two ways: through tickets reported by partners or during the weekly analysis of the SAP system inconsistency report. As soon as an inconsistency is detected, the stock regularization process is started, that is, the quantity registered in the system is corrected in order to match the reality of the available equipment.

Next, the team tries to investigate the cause of that specific inconsistency. One example, and one of the most recurrent, is the occurrence of registration errors in the Click system. Sometimes, technicians may commit mistakes when entering information in Click, such as incorrect serial numbers or improper selection of categories and equipment states.

Once the cause of the inconsistency is identified, appropriate action can be taken to rectify the situation. The measures may involve communicating with other teams involved or providing instructions to the technician responsible for any incorrect action.

In short, the equipment control and correction process deals with SPs inconsistencies, where the differences between the Click system records and the actual situation in the SAP system are analyzed. Regularizing the stock and investigating the causes of these inconsistencies are essential to ensure the accuracy of the data and the correct logistic flow of the equipment.

3.2.1.3 Support for Partners/Technicians and Internal Teams

One of the purposes of the equipment control and correction process is to provide support to the partners and their technicians. This support establishes a direct link between them and the logistics department, thus ensuring constant communication and efficient collaboration.

Support for partners and technicians can take many forms, adapting to the specific needs of each. For them, it is very beneficial, as it enables them to get clarifications on procedures, request assistance with ongoing tasks, or get guidance on specific processes. The intention is to ensure that partners and technicians are properly prepared to handle their responsibilities and can thus overcome any challenges that may arise during the monitoring and correction process.

Supporting the company's internal teams is also very important in the smooth running of a company. The person in charge of the task has technical expertise that enables them to identify and diagnose equipment-related problems. By sharing information, the person assists other internal teams in identifying the root cause of problems due to equipment malfunctions.

In addition, support may include training sessions or workshops for internal staff as well as external partners and technicians. These training sessions and workshops aim to improve the knowledge and skills required to deal with basic equipment problems and implement preventive maintenance measures.

In the following, the two main forms of support in the process of equipment control and correction will be presented:

Ticketing for Logistics Support

Support through the creation of tickets in the ITSM system is the most common way to provide assistance and support to partners and technicians involved in the process of checking and fixing equipment. IT service management (ITSM) is a framework that focuses on employee needs, offering planning, delivery, and support of IT services through integrated people, process, and technology. This approach allows partners to report guide-related problems, ask questions, or request clarification related to their tasks or the equipment in question.

When creating a ticket, partners have the opportunity to describe in detail the situation that caused them to create the ticket or the assistance they require. The support department can then evaluate each ticket individually, catalog them by subject, and prioritize them based on their urgency and severity.

Using the ITSM system, the support department can efficiently track and manage incoming tickets, ensuring that each one is properly logged and assigned to the responsible person in order to resolve them within the established time-frame. With this approach, direct communication between partners, technicians, and the logistics department becomes easier, ensuring that all issues are handled properly and effectively.

In addition, the ticket history in the ITSM system allows further analysis of the requests received, identifying patterns or areas for improvement in the equipment control and correction processes. By facilitating a better logistical flow and enhancing the support provided to partners and technicians, it is possible to continuously improve the operation.

In summary, the creation of tickets via the ITSM system has several advantages as a way of providing support to partners and technicians and is, therefore, the recommended way for logistics. Although phone calls can also be used in support, they are something done in an exceptionally way for very specific conditions.

Direct call assistance

In the context of NOS, the support is mainly directed to partners in the logistics area, who, in turn, are responsible for informing and guiding their technicians. In very specific situations, however, support can be provided directly to the technicians involved.

Support may be provided through direct contact, such as telephone calls, with the aim of reviewing procedures, clarifying processes and providing support during the performance of tasks.

Direct contact with the technicians is carried out proactively, with the aim of providing assistance and clarifying any doubts that may arise during their work in the field so that they can carry out their tasks properly and efficiently. The call can also be made from the logistics side for the provision of specific guidelines for activations or the performance of specific tests.

Besides the assistance provided by phone to the technicians, calls are also made to provide support to the company's internal teams. These calls aim to answer questions about existing tickets, perform equipment analysis, and provide specific guidance.

The exchange of information and knowledge is essential for the development of effective strategies, the improvement of processes, and the pursuit of operational excellence.

3.2.1.4 Tasks outside the logistics flow

Within the equipment control and correction process, there are situations outside the regular logistic flow that can arise at any time and, consequently, require special attention. These issues mainly cover topics that influence the flow, not being directly in it.

Some of the most recent cases were general issues, without much immediate impact on the flow, such as analyses related to the consumption of antennas and plooms, the introduction of alarms in the business, or even analyses that cover the logistics flow itself, in the sense of improving it.

However, these may be very specific topics with a higher degree of urgency. Problems in the Click system, such as the disappearance of a necessary button in the register, are reported immediately to the responsible team, which can take action to resolve the issue and prevent it from recurring in the future. Another example is when serial numbers (SN) disappear in the transition to the SAP system, and an effort is made to find a solution and solve the problem.

The above issues are addressed when they become recurring and begin to affect the inconsistency resolution tasks in a significant way. If a certain type of inconsistency starts to occur in large numbers, the first step to resolving them is to take some time to investigate, and it may even be necessary to interrupt regular tasks to thoroughly analyze the case and understand the root cause of the problem in order to prevent similar situations in the future.

3.2.2 Limitations in the Equipment Control and Correction Process

In the equipment control and correction process, there are a number of challenges that are impacting its efficiency, productivity, and ability to deliver consistent results. These problems are common to many tasks and may compromise the company's overall effectiveness.

One of the main problems is the reliance on a single person for the execution and handling of tasks. It creates a significant difficulty because if that person is unavailable or unable to work, the entire process is affected.

Moreover, the process is executed in an excessively manual manner, without the support of automatisms or auxiliary tools, which results in low efficiency in terms of time and effectiveness. Tasks are also performed without following a consistent method, whether concerning schedules and time allocation or the execution of the tasks themselves.

Another problematic point is the absence of analysis through reports or dashboards, which makes it impossible to track the process as well as to take advantage of the inherent advantages of data analysis. Such lack of visibility makes it difficult to identify improvement areas and implement a continuous improvement process.

All these problems fit into a larger issue: the pursuit of process optimization. For each process task, there are several opportunities for improvement, and to take advantage of them, it is a good start to address each of these issues in detail.

3.2.2.1 Limitations in handling store inconsistencies

As mentioned before, in the context of the equipment control and correction process, the management of store inconsistencies plays a crucial role in ensuring stock consistency and proper logistics flow. The process had not been performed in the company since March last year.

The fact that the process of controlling inconsistencies in stores was not carried out for many months resulted in the accumulation of several problems during that period. By not regularly monitoring inconsistencies in the stores, the company was unable to identify discrepancies between stock records and the physical quantity of equipment available in the stores. Furthermore, the lack of analysis of store inconsistencies prevented the identification of possible losses, deviations or errors in sales records, unregistered returns, thefts, or other logistic problems.

The process of controlling store inconsistencies has some limitations in terms of its execution and the tools used. One of these limitations is the reliance on multiple Excel files to resolve the inconsistencies identified. This approach pulls information from multiple documents, which requires manual intervention in constantly creating formulas and performing repetitive copy and paste actions, among other tasks that consume a lot of unnecessary time and effort. The lack of automation in this process makes it archaic and inefficient, preventing a faster and more accurate resolution of inconsistencies.

Furthermore, the lack of a standardized method to execute the process contributes to a lack of clarity in performing the tasks. With several possible ways to execute the process, there is no clear path, which makes it difficult to achieve uniformity and efficiency in the treatment of inconsistencies.

Another limitation is the absence of an overall analysis of the process. There is no consolidated view on relevant parameters such as the number of entries in the cockpit, the most frequent types of errors, or others. This lack of information preventes a comprehensive understanding of the process performance, both hindering the identification of areas for improvement and the implementation of appropriate corrective measures.

These limitations in the process of controlling store inconsistencies highlight the need for a more efficient and automated approach.

3.2.2.2 Limitations in handling SPs inconsistencies

In the case of SPs inconsistencies, there are similar limitations to the store inconsistencies. Although there is no longer the issue of the number of files used, since only one file is used in this process, there is a significant dependence on the regularization of actions in the systems, especially in SAP.

The task requires that the person in charge has detailed knowledge of the processes, procedures, and history related to the inconsistencies in question. In addition, the memory of the responsible plays a crucial role in identifying patterns, solutions, and making decisions, making it difficult to transfer this responsibility to another person if necessary.

The lack of automation and the absence of a regular method further exacerbate this dependency. The process of resolving these inconsistencies is not automated until the necessary handling is detected, requiring several filters in the Excel file to resolve the inconsistencies by type, based on previous actions taken for the same type of filter.

On the other hand, the lack of a regular method in the treatment process results in a lack of order and the possibility of skipping important steps, consequently leaving equipment without

regularization. Each execution of the process varies depending on the approach, which led to a lack of consistency and efficiency.

The manual approach is time-consuming and requires additional effort from those responsible for the process. At last, the lack of a tool to analyze the evolution of the number of partner inconsistencies, their causes, as well as the status and typification of each regularization made, is also a gap in the process, making it difficult to obtain useful insights and identify areas for improvement.

3.2.2.3 Limitations on Supporting Partners/Technicians and Internal Teams

In the support to partners and technicians, one of the main problems is the lack of monitoring of the tasks involved. There is no clear performance evaluation or established metrics to measure the efficiency and quality of the support provided. Besides limiting the ability to provide consistent support, this results in difficulties in identifying and solving problems.

In the case of tickets created by the partner, the absence of an appropriate tool to receive, interpret and present the results of tickets and interactions with partners and technicians compromises the centralization of information, resulting in data fragmentation and difficulties in tracking and following up on reported issues.

Without a visual ticket management tool, the team faces challenges in organizing and prioritizing pending tickets and analyzing data to identify patterns and trends. The lack of an integrated, intuitive view of the global tickets makes it difficult to take informed decisions and implement effective corrective actions.

In addition to the tickets, direct calls to the technicians also also has limitations. Without a formal record of interactions, information shared during support calls can easily be forgotten or lost. This hinders the team's ability to identify patterns, trends, and effective solutions to problems faced by technicians in order to resolve them and consequently decrease this type of contact. On the other hand, since the ideal in case of a partner's problem is to create a ticket, the fact that there is no database of the volume of weekly calls and their duration is a major drawback.

With a comprehensive database, it would be possible to obtain several insights. Through the technicians that are demanding more time on phone calls, one could, for example, suggest the creation of tickets in cases of recurring doubts or problems, directing them to the most formal support channel.

Chapter 4

Methodologies and Implementation Proposals

This chapter presents the methodology adopted and the implementation proposals developed to improve the equipment control and correction process. Process improvement is essential to ensure efficiency and quality in the equipment operation, seeking to minimize the negative impacts of failures.

First, the methodology used, which was planned together with the company's advisors, is presented in order to overcome the challenges already identified in the current process, ensuring a structured approach for improvements. The methodology involved several steps, from data surveys to the development of implementation proposals.

Next, the specific steps of the methodology for each task are detailed. Each stage was conducted with the maximum rigor and commitment, based on in-depth analysis, aiming at a complete understanding of the process and the identification of improvement opportunities to be targeted.

Finally, this chapter will explain the implementation proposals for each of the analyzed tasks. Each proposal will be presented in detail, highlighting the expected benefits and implementation requirements.

4.1 Applied methodology to optimize the equipment control and correction process

The methodology adopted was based on a step-by-step approach, involving process analysis, solution development, and implementation. The following Figure 4.1 illustrates the flowchart of the adopted methodology.

The first step of the methodology was data collection. This step included continuous monitoring of the process over a period of several weeks, during which we observed and recorded the steps involved, the tools used, the correction procedures, and any problems or bottlenecks identified.

During the process monitoring, it was possible to understand the dynamics and challenges faced during the execution of the tasks. To this end, a constant dialog was established with the

person in charge of the process, which contributed to a detailed knowledge of each step, providing additional insights from her own experiences and perceptions.

The most important thing was ensured by continuously monitoring the process, with explanations from the person in charge; the information collected was complete, real, and accurate. With all the information collected, together with the insights provided, it was possible to have a comprehensive view of the current process, its steps, difficulties and opportunities for improvement.

With the necessary basis, the next step was to analyze the process and develop improvement proposals. At this point, all the data collected was analyzed using techniques such as flow charts to map the current workflow. Throughout the mapping, it was possible to clearly and systematically visualize all the steps involved in the process, identifying any inefficiencies and gaps in the tasks, with the goal of establishing which areas could be improved.

From the identified opportunities, an action plan was defined for each task. This plan included the specific steps to be followed, the resources needed, and a timeline for implementing the proposals.

Each proposal was designed taking into consideration the specific challenges and needs of each task, not forgetting the technical, financial, and operational requirements necessary for the posterior implementation to be successful.

After the proposals were developed, they were presented to the company's advisors, and, after their approval, the solutions were implemented. Several tests and evaluations were conducted to verify the effectiveness of the proposed solutions in improving the process. This step allowed several corrections to be made before their final implementation.

Once the proposed solutions were implemented, continuous monitoring was carried out to ensure their correct execution and to make new adjustments, if necessary. Through performance metrics, the success of the implemented improvements was evaluated, ensuring that the objectives were met.

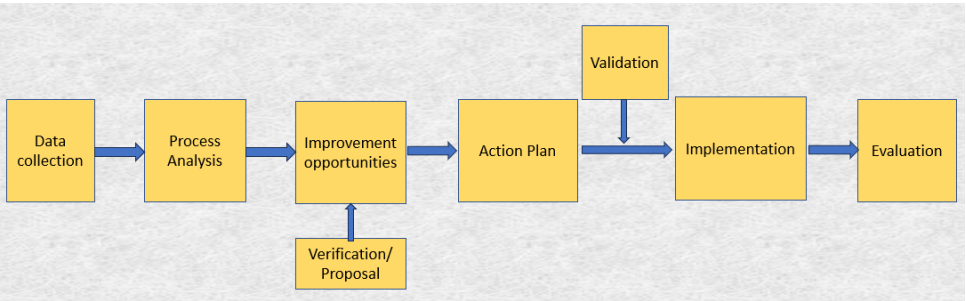


Figure 4.1: Methodology flowchart for the process

The applied methodology provided a structured and comprehensive approach to address process improvements in equipment control and correction.

4.1.1 Improving the handling of store inconsistencies

After integrating into the company and understanding the work dynamics, the collaboration with the person responsible for the execution of the process under analysis began. Following a continuous monitoring of all the tasks performed, the first task focused on the store inconsistencies. By observing its execution and conducting specific research, it was possible to acquire an in-depth knowledge about the process that allowed outlining what to do next. The task flow mapping is illustrated in the Figure 4.2.

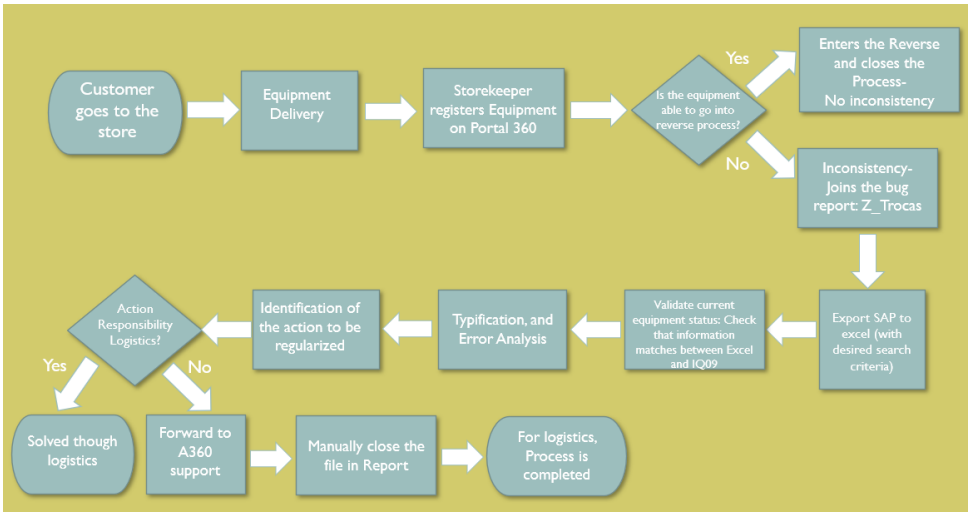


Figure 4.2: Flow of the Store Inconsistencies Task.

To start, it is important to emphasize that the logistics action starts only after checking whether or not a piece of equipment is in condition to enter the reverse process. If not, it is an inconsistency and goes into the error report Z_Trocas, in SAP.

On each monday, an extraction is made from this report, from the previous week to an Excel spreadsheet. The equipment listed in this report is then analyzed. For this, a comparative validation is performed between the report and the IQ09, SAP's gateway that provides information about the current state of the equipment, based on the registration center and the center in which the equipment is located. With the comparison done, it is possible to classify the type of error and determine the action required to correct it.

During the flow mapping, the average times for each step and the respective tools used were registered, as detailed in Table 4.1.

Using the time data and considering the necessary tools, improvement opportunities were identified, by order of relevance, not forgetting the complexity and feasibility of the solution. Based on these opportunities for improvement, action plans were proposed:

Table 4.1: Tasks, averages times and tools used during store inconsistency check

Steps Along the Task	Average time spent	Tools
Export SAP to excel	5 min	SAP and Excel
Validation IQ09	9 min	SAP and Excel
Typification and error analysis	12 min	Excel
Identification of the action to be regularized	5 min	Excel
Resolving inconsistencies	40 min	SAP and Excel
Total Task Time	1h11min	

4.1.1.1 Creating a single file to make the process more efficient and effective

The first action plan involves the creation of a single excel file for the treatment of store inconsistencies.

For this purpose, a matrix was created, depicted in Figure 4.3. The matrix suggests a typification of the error, as well as the action to take, creating a standardized method to execute the process and increasing efficiency.

ID	Centro de registo é = ao do estado do equipamento atual	Texto Breve Material	Centro	Depósito	Lote	Status Usuário	Status Sistema	Tipificação do erro	Ação para regularizar	Observações	Feedback Final	Motivo de Fecho Manual
FALSEWWDEPS	FALSE	Material Móvel-5dígitos	W#	W#			DEPS	Equipamento na direta de outra loja	Abrir RM para a loja	Validar se o centro de registo é diferente do centro do estado do equipamento atual --- Coluna AF diferente de R		
FALSETTDEPS	FALSE	Material Móvel-5dígitos	T#	T#			DEPS	Equipamento na direta de outra loja	Abrir RM para a loja	Validar se o centro de registo é diferente do centro do estado do equipamento atual --- Coluna AF diferente de R		
FALSES999SDEPS	FALSE		S999	S999			DEPS	Equipamento no Centro S999	Efetuar migração ETC para o deposito da inversa - ZLOGIN_MIGRA_STOC			
FALSE8RECODEPS ECLI	FALSE		8300		RECOLHIDOS	RECO	DEPS ECLI	Equipamento em Stock Consignado-Recolhido	Regularização através de LSMW			
FALSE8DEPS ECLI	FALSE		8300				DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			
FALSE88TNEGDEPS	FALSE		8300	83*	USADO	TNEG	DEPS	Em armazém NOS	Fechar manualmente em Z_trocas	Quando o 8306, 8307... é o depósito		Erro de registo
FALSE88DEPS	FALSE		8300	83*			DEPS	Em armazém NOS	Fechar manualmente em Z_trocas			Erro de registo
FALSE88RECODEPS	FALSE		8300	83*	RECOLHIDOS	RECO	DEPS	Em armazém NOS	Fechar manualmente em Z_trocas			Erro de registo

Figure 4.3: Extract from the matrix created for suggesting inconsistency handling.

The possibility of creating a matrix was identified after the analysis of the error typifications and the actions to regularize them, realizing that these were the result of the center's validation, talked previously, and the data from IQ09. In order to relate them, an ID was created, which aggregates the important information of each inconsistency. For this, there was an iterative process until the ideal formula for the ID was reached, covering all cases.

With the right ID, for the cases already listed in the matrix, an error typification is always given and an action to take, avoiding all the work of looking at previous cases to understand what was done, with all the problems already explained. The matrix can be updated to cover more and more cases.

Once the matrix sheet was created, it was connected to the list sheet for all equipment. This sheet shown in the Appendices A.1 and A.2 gathers data from SAP, adding extra columns, such

as the ID, that allow the connection and automatically provide the necessary information to treat inconsistencies.

Next, the possibility of implementing some improvement measurements or automation was studied in the extractions from SAP, the Z_Trocas report and IQ09. However, since this was something that required a robot for export and after talking to the company's teams specialized in creating them, it was immediately concluded that it would not be worth the cost because these tasks, added together, take only 10 minutes a week.

The information entry process can still be optimized by no longer being done manually but only requiring SAP extraction of the inconsistencies from the new week. For this purpose, two macros with visual basic code were needed, available in the appendices A.3 and A.4, one for each extraction:

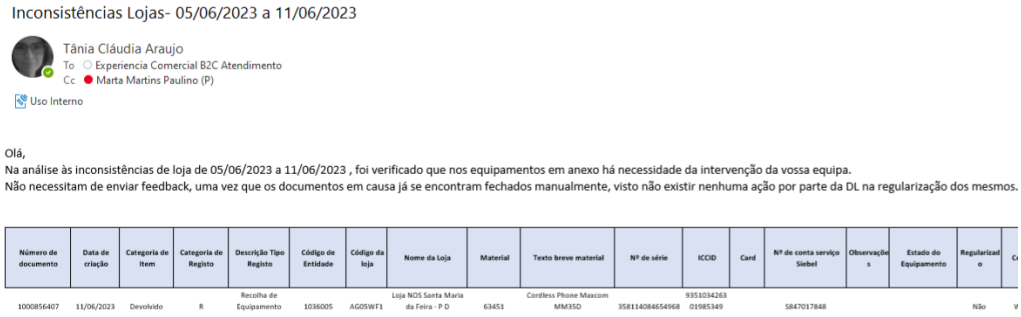
- In the case of the Z_Trocas report, a button was implemented that allows opening a window for file selection. After choosing the file, all relevant information is automatically transferred to the target sheet, which contains the list of inconsistencies.
- Regarding the IQ09 report, a button was created that deletes the previous week's data from the file and, as soon as a new extraction is performed, provides the information to the target sheet.

Once the imports have been made into the file, the treatment of inconsistencies is suggested, considering the information matrix created previously.

After optimizing the initial part of the process, a detailed study was conducted to identify possible improvements in the treatment actions. During this analysis, it was found that most of the actions involve interactions in systems such as SAP. In these cases, they cannot be automated due to the costs involved in creating robots and the need for analysis in the systems themselves.

However, one of the actions presented an opportunity for improvement: sending emails to the A360 support team, a team inside the company that manages the systems and tools used. These cases occur in equipment that, due to the type of error, are not the responsibility of the fixed planning, being necessary to forward them to the appropriate team. This communication is done by e-mail, attaching some relevant information about the equipment in question.

To optimize it, a button with its code present in the Appendices A.5 and A.6 was created that filters in the sheet the list of the current week's equipment with the action type "Send to A360", copies their important data and pastes them in a new table in another sheet. Then, it attaches the table to an email, which already has the subject, recipient and content pre-selected (can be changed at any time), as illustrated in the Appendix A.7. The following figure 4.4 is an example of an email sent automatically to the A360 team.


Inconsistências Lojas- 05/06/2023 a 11/06/2023

Tânia Cláudia Araujo
To Experiencia Comercial B2C Atendimento
Cc Marta Martins Paulino (P)
Uso Interno

Olá,
Na análise às inconsistências de loja de 05/06/2023 a 11/06/2023 , foi verificado que nos equipamentos em anexo há necessidade da intervenção da vossa equipa.
Não necessitam de enviar feedback, uma vez que os documentos em causa já se encontram fechados manualmente, visto não existir nenhuma ação por parte da DL na regularização dos mesmos.

Número de documento	Data de criação	Categoria de item	Categoria de Registo	Descrição Tipo Registo	Código de Entidade	Código da loja	Nome da Loja	Material	Texto breve material	Nº de série	ICCID	Card	Nº de conta serviço Siebel	Observações	Estado do Equipamento	Regularização	C
1000856407	11/06/2023	Devolvido	R	Recolha de Equipamento	1036005	AG05WF1	Loja NOS Santa Maria da Feira - P D	63451	Cordless Phone Maxcom MM35D	358114084654968	9351034263 01985349		5847017848			Não	V

Figure 4.4: Automatic mailing to the A360 team for handling inconsistencies.

Finally, special care was taken to make the appearance of the file clearer and more intuitive. For this, an initial sheet was created called "Menu", where all the previously mentioned buttons are inserted, as well as others that allow access to all the other sheets. The menu organization follows the sequence of task steps, from data inputs to output deliveries, as shown in Figure 4.5.

This menu organization approach provides the user a more fluid and efficient experience, allowing easy access to the functionalities and information contained in the remaining files. The logical arrangement of the buttons on the menu supports navigation and workflow, contributing to a more intuitive and effective use of the developed tool.

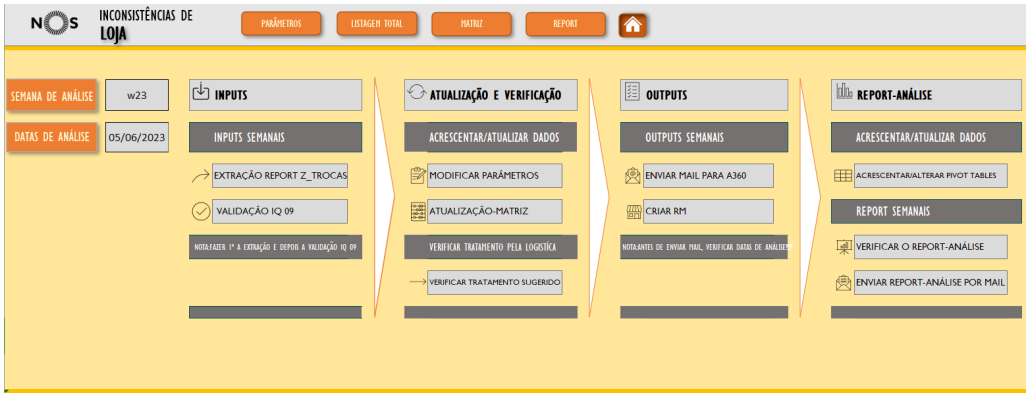


Figure 4.5: Appearance of the menu designed for the store Inconsistencies file.

4.1.1.2 Developing a report for analysis and sharing data with the team

With the file already fully operational, attention was directed to one of the opportunities for improvement previously identified: the lack of a global analysis of the process. With this goal in mind, it was decided to create a report that would provide a consolidated view of the relevant metrics through graphics, enabling a deeper understanding of the process performance.

Through the creation of pivot tables with the respective filters of interest, significant statistical data was obtained that could be incorporated into the report in graphical form. Gradually, the report was built, as illustrated in the Figure 4.6, with the most relevant graphics for the task analysis.

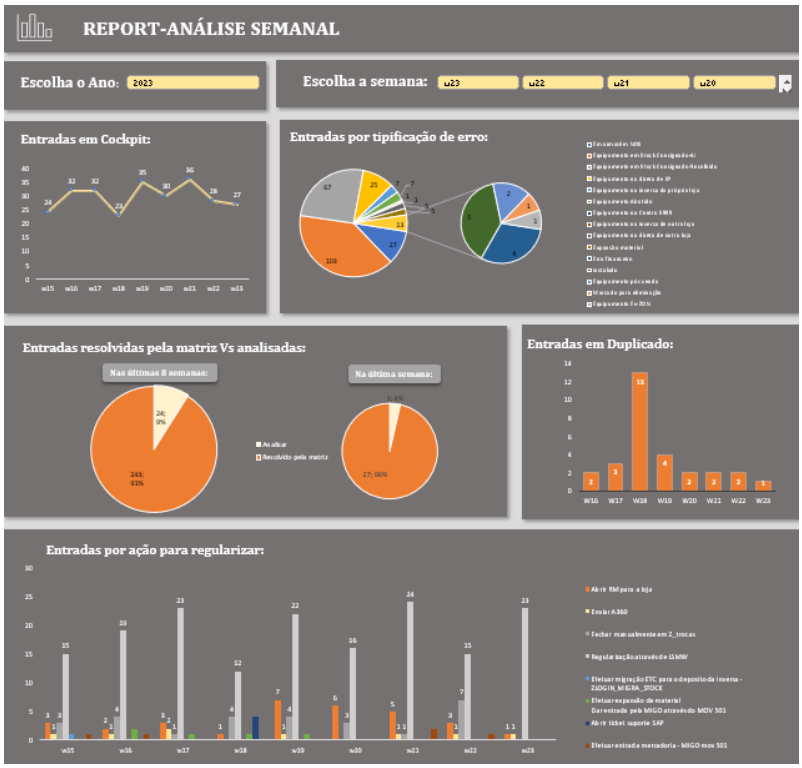


Figure 4.6: Store inconsistencies task analysis report.

In order to maintain the report up-to-date at all times, a button was implemented to automate the process of updating the data. When this button is activated after the inconsistencies of the week have been addressed, the pivot tables are refreshed, ensuring that the graphics of the report reflects the most recent information.

Once the report is up to date, it was recognized the value of sending it to the team supervisors, so they can have an immediate view that the task was completed and can also perform their analysis to verify that everything is going as expected. To send the report, a button similar to the one used to send the equipment addressed to the A360 team was also created. When pressed, the button copies the weekly report spreadsheet and attaches it to a new e-mail, with the subject and recipient pre-defined. The code for the referred button is present in the Appendices A.8 and A.9.

In this case, the content of the e-mail already provides, in summary, the most important data of the task, such as the number of entries in the cockpit and their variation, the number of store pendings, and the percentage of cases resolved with support from matrix. While it is not advisable to completely replace access to the report itself, based on the content of the email, the supervisor can already perform a preliminary analysis without having to open the full report, as illustrated in Figure 4.7.

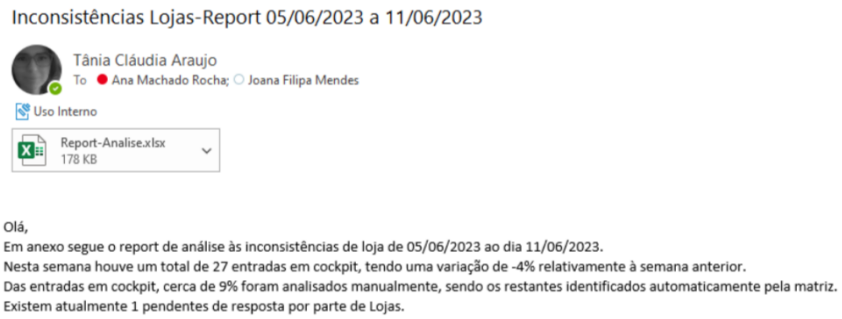


Figure 4.7: Sending an automatic mail with the task report.

4.1.1.3 Development of an instruction manual for the operation of the new file and the monitoring of the task

To ensure proper operation of the new file and efficient monitoring of the store inconsistency handling task, it is essential to develop an instruction manual. A manual serves as a guide for the users involved, providing detailed guidance on how to use the archive and perform the activities related to the task.

The instruction manual, which is included in the appendix, covers the following aspects:

- Introduction: An overview of the importance of the store inconsistency handling task and the file used.

- Navigation and Features: A detailed explanation of the structure of the file, including all relevant worksheets, tabs, and buttons. The available functionalities will be presented, such as data extraction, analysis, report generation, and sending of mails.

- Task Execution: A thorough description of each step of the store inconsistency handling process, from case identification to the actions taken to resolve it. The manual provides clear guidance on how to use the tools and resources available in the archive to execute each step efficiently.

The development of the instruction manual is essential to ensure understanding and standardization of the process of handling store inconsistencies. In addition, it provides instructions on how to perform regular future backups, which are crucial for protecting data and avoiding irreparable loss. It is also important to establish a proper process for folder pass-through. With the manual, it ensures that the necessary information and resources are available to continue the task.

By following these guidelines, the aim is to ensure efficiency and consistency in the execution of the task, as well as the security and availability of data related to the handling of store inconsistencies.

4.1.2 Improving the handling of SPs inconsistencies

Since it is a similar task to the one analyzed earlier, the next task to be addressed was SP inconsistency handling. By observing their execution, receiving guided explanations, and conducting specific research, it was possible to gain an understanding of the process that allowed the development of the task flow mapping, illustrated in the Figure 4.8.

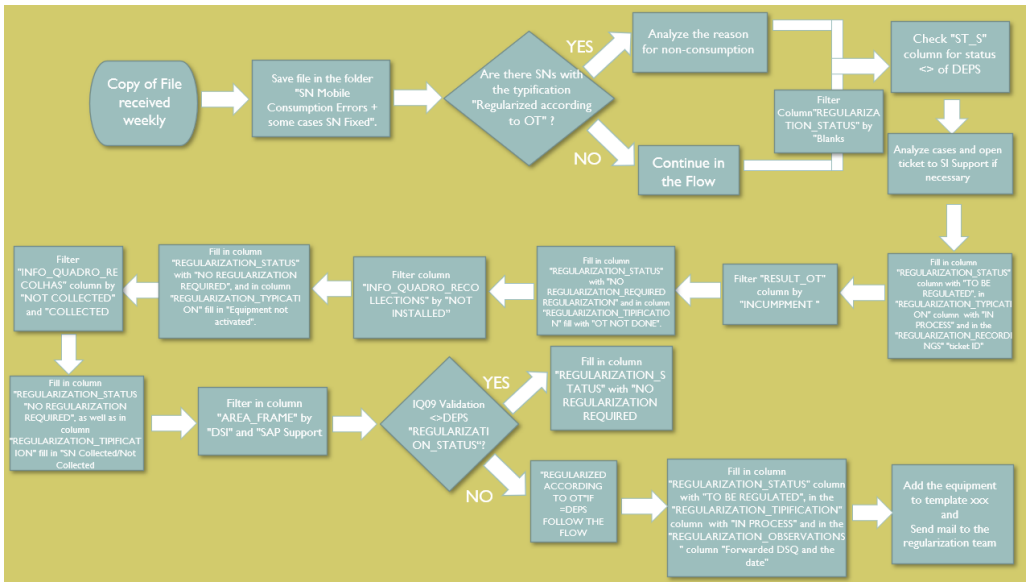


Figure 4.8: Flow of the SPs Inconsistencies Task.

The task of treating partners' inconsistencies begins weekly with the reception of a file from SAP, stored in a designated folder. The Excel file requires successive filters to fill in with information regarding the states, classifications and stock. The tasks that involve more effort are the stock regularization in the SAP system; the search for equipment, using other tracking tools; sending emails to other teams when the regularization of the stock of certain equipment is not the responsibility of the team and the analysis required in certain cases.

Despite involving several steps, the task itself has an average duration of approximately 45 minutes, demonstrating that even with manual filtering, it is done quite efficiently. Before accounting for the time required to perform this task, supervisors had a misconception that it was time-consuming, even allocating an entire day of the week for its execution. The reasons for this misperception included some lack of detailed knowledge of the process and the duration of the task time, and the existence of interruptions when performing the task.

Based on the flow mapping and task monitoring, the main problems affecting the task, already presented in the previous chapter 3.2.2.2, were identified. The action plan for improving the task was defined in order of relevance, complexity and feasibility of the solution.

To optimize the process of handling partners' inconsistencies, the action plan comprised two primary steps: adapting and optimizing the existing file to enhance efficiency and effectiveness and creating a report for analysis.

The plan was similar to the one for the store inconsistencies, so the experience in implementing it was taken into account. Based on the tasks to be improved in excel and the time they currently take, the implementation of the action plan was expected to reduce the tasks execution in 10 minutes, and would take several weeks of development.

Thus, after creating the task flow, defining the action plan and presenting them together with the task time measurements to the company supervisors, their idea was clear; the topic was not a priority, and the internship time should be focused on the remaining tasks.

4.1.3 Supporting Partners/Technicians and Internal Teams

As part of the activities related to inconsistencies, an additional task arose that consisted of providing support to partners, technicians, and internal teams.

While following the process on a weekly basis, it became clear that the task had neither a beginning nor an end and could be taken up at any time during the week, including during other activities.

Although there was no structured flow for the task, it was possible to identify the main challenges and problems by continuously monitoring the process as a whole. These challenges were discussed and detailed in the previous chapter 3.2.2.3, providing a clearer understanding of the areas that required improvement.

From this knowledge, efforts could be directed to improve the activities related to the direct call support and ticketing process in order to optimize the time, efficiency, and quality of the support provided.

4.1.3.1 Direct call assistance

Throughout the work week, it was found that the calls received in this context were frequent and interrupted other tasks, negatively affecting the overall performance. When exposing this situation to the team's supervisors, it became evident that they were not fully aware of the importance of this task. In light of this, the need arose to thoroughly investigate the support provided and better understand its rationale and objectives.

For the analysis, it was suggested by the supervisors of the company, as part of the internship, a study on the possibility of implementing a tool capable of managing the calls' data, as is used in other departments of the company. The implementation of this tool is known to require time and effort due to the many contacts involved, the need for an in-depth study, and the dependence on responses from others. Recognizing the importance of providing answers and solutions within the deadline set for the end of the internship, it was decided, in parallel with the study, to create an interim solution.

Study of the implementation of a call management tool

In order to understand the relevance of having a tool capable of managing the calls, there was a study on the tools that existed in the company in order to avoid considerable additional costs.

Within the scope of outgoing and incoming calls, several points had to be analyzed, such as the number and time of each call and its subjects. With a tool that tracks and registers all calls made, by Microsoft Teams or cell phone, with partners, technicians, or internal teams, it will be possible to make an analysis that allows to conclude their relevance.

Thus, in the several meetings held on this subject with people from teams with call management tools in place, the tool's objective and its requirements were described, seeking in this way to arrive at a solution that might be adapted to the reality of the task. However, it was concluded that the existing tools were designed to handle large volumes of calls and were not suitable for individual use. In addition, these tools were designed to handle only one form of contact (either Microsoft Teams or phone call), focusing mainly on call duration and waiting time, with no record of the issues addressed.

Considering the limitations of the tools used by the other teams, it was concluded, together with the supervisors, that the available options would not meet the intended requirements. Therefore, it was decided to wait for the results of the interim solution before making definitive decisions regarding the strategy for improving the task.

Creation of an interim call management solution

In order to achieve timely results within the scope of the thesis, various potential solutions were explored.

One of the solutions involved developing an Excel file to serve as a comprehensive database for recording all the calls made during the evaluation period. The initial step was to identify the key metrics that needed to be captured for each call. These metrics were then incorporated as columns in the Excel file, as illustrated in the Figure 4.9.

Contact Center Call Log

ID da Chamada	Data	Inicio da Chamada ?	Início da chamada	Novo Assunto ?	ID do Assunto	Origem	Tipo de Contacto	SP/ Departamento	Nome	Âmbito de contacto	Fim da Chamada ?	Fim da Chamada	Duração	Resolução	SN/OT/ Ticket	Ação Efetuada	Notas adicionais
10	22/03/2023	Sim	14:39:00	Sim	10	Efetuada	Teams	I&M/LG	Sérgio Martins	Equipamentos	Sim	14:49:58	00:10:58	Resolvido			Matriz de
11	22/03/2023	Sim	14:57:20	Sim	11	Recebida	Teams	Suporte SAP	Diogo Ferreira	Pedido esclarecimentos -	Sim	14:59:02	00:01:42	Resolvido			Ticket REQ0000021353
12	22/03/2023	Sim	15:02:26	Não	11	Recebida	Teams	Suporte SAP	Diogo Ferreira	Pedido esclarecimentos -	Sim	15:03:25	00:01:00	Resolvido			Ticket REQ0000021353
13	22/03/2023	Sim	17:48:27	Sim	12	Recebida	Externo	PROEF	Luis Vilasboas	Pedido esclarecimentos -	Sim	17:57:28	00:09:01	Resolvido			Ticket INC00013119286
14	23/03/2023	Sim	09:54:57	Sim	13	Recebida	Teams	I&M/LG	Claudia	Teste - Criação de Palete_Caixa	Sim	09:56:24	00:01:27	Pendente			
15	23/03/2023	Sim	10:22:00	Sim	14	Recebida	Teams	Suporte SAP	Célia	Erro devolução	Sim	10:29:49	00:07:49	Resolvido		Criar ticket	REQ0000021455
16	23/03/2023	Sim	10:43:39	Sim	15	Recebida	Externo	Futurcabo	Amândio Ribeiro	Esclarecimento sobre objeto em trânsito	Sim	10:46:21	00:02:42	Resolvido	VO0308561 62PT	Indicação que se trata de uma palete	
17	23/03/2023	Sim	11:52:18	Sim	16	Recebida	Técnico	Futurcabo	Marco Menchero	Validação equipamento	Sim	11:58:55	00:06:37	Resolvido	1-JLNIFOR	Ativação de equipamento	Carcaça trocada
18	23/03/2023	Sim	11:59:26	Sim	17	Recebida	Externo	Futurcabo	Amândio Ribeiro	Esclarecimento Box	Sim	12:03:24	00:03:59	Resolvido	4,101E+09	Indicado procedimento de devolução	Box não existe em SAP
19	23/03/2023	Sim	12:29:08	Sim	18	Efetuada	Externo	Futurcabo	Amândio Ribeiro	Teste - Criação de Palete_Caixa	Sim	12:36:29	00:07:21	Resolvido			
20	23/03/2023	Sim	14:14:00	Sim	19	Recebida	Técnico	PDT	Anderson	Validação equipamento	Sim	14:29:29	00:15:29	Resolvido	1-JLNHAET	Ativação de equipamento	

Figure 4.9: Created file for call management.

To streamline the manual data entry process, the Excel file was optimized using formulas, comboboxes, and buttons. The aim was to minimize the complexity and time required for registration without impeding the progress of other tasks. This approach enabled the data to be recorded during the actual call itself.

To ensure accuracy and efficiency, continuous monitoring and feedback was conducted to ensure that call data was recorded correctly and that all features of the Excel file were working properly. Regular dialogue with the person responsible for the task made it possible to update the file, including adding new metrics and continuous optimization, thus improving the analysis and contributing to process improvement.

4.1.3.2 Ticketing for Logistics Support

The last task addressed was ticket management. Partners regularly create tickets to request support. To respond to these tickets, those involved use the ITSM tool. The tickets can cover a variety of issues, from supplies to inconsistencies, and it is the responsibility of all involved to answer the tickets directed to them, prioritizing the resolution as soon as possible.

During the analysis and monitoring of this task, the main problems affecting its efficiency and effectiveness were identified. Based on the improvement opportunities identified, an action plan was developed to improve the ticketing process. From the beginning, it was possible to realize that the biggest problem was not in the task itself but in the management of what was done in it.

In this sense, the methodology adopted, encouraged by the company's supervisors, was the development of a dashboard in Power BI, a data visualization tool, with the objective of providing a comprehensive view of all tickets created by partners and those forwarded by the warehouse to Logistics Planning.

The process of creating a ticket reporting tool

During conversations with the ITSM team, it was discovered that the system already had the functionality to generate a weekly report with various metrics about the tickets created. This report shown in the Appendix B.1, contained information such as the ticket creator, the theme, and the creation date, which were essential for the creation of the dashboard. Therefore, it was only necessary to sort and manage the value metrics present in this report.

When analyzing the report, an inaccuracy was identified regarding the ticket owner. Although ITSM was directing tickets to the individuals involved, there were cases where different people were handling tickets of the same typification, which was not desired. In collaboration with the ITSM team, a new matrix exposed in the Appendix B.3, was created to define exactly who would be responsible for handling each ticket type. This change was also communicated to partners, who now had to select a ticket type from a specific set of options when creating a ticket.

In addition, it was noted that the ticket status provided by ITSM was too generic, while the reason status was too specific and not relevant to the dashboard. A supporting matrix was created to work around this issue, which combined the ticket status with the reason status to provide a more suitable typification for the project as shown in the Appendix B.2.

After creating the two supporting matrices, which were directly connected to the data as is illustrated in the Appendix B.4, and having the metrics selected and organized, the next step was to add extra columns to the data in Excel. Using formulas, these columns were designed to provide

relevant metrics for the dashboard. For example, based on the support matrix that established a 72-hour response time (SLA), a column was created that checked the date the ticket was opened, and if the 72-hour deadline was exceeded, it indicated that the ticket was outside the SLA.

With several metrics created, next task involved the dashboard's visual creation. In this phase, it was necessary to choose the graphs, tables, and data to be presented in the dashboard. The careful selection of these visual elements was made, taking into account the clarity of the information, the ease of understanding, and the ability to highlight key insights. In addition, good design practices were applied, such as the use of appropriate colors, intuitive layout, and visual hierarchy, as shown in the Figure 4.10.

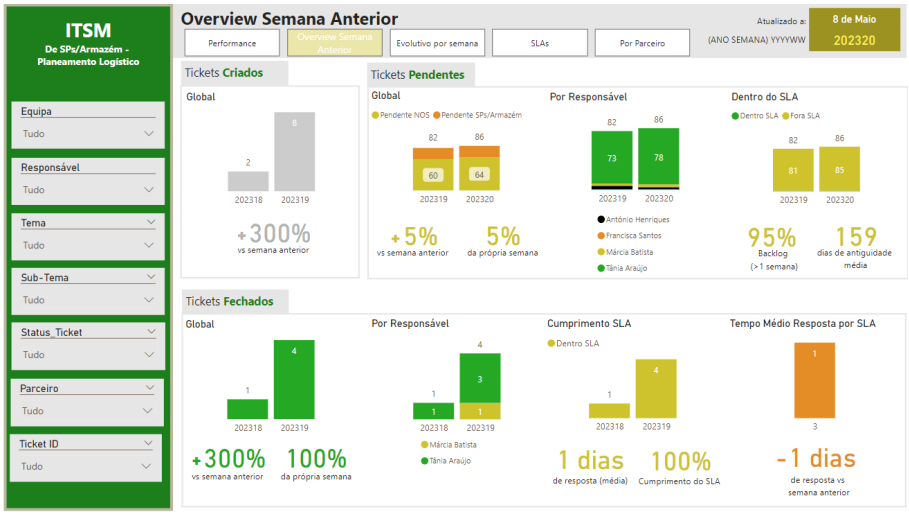


Figure 4.10: Example of one of the dashboard pages of the SPs tickets for logistical planning.

In order to facilitate the visualization and analysis of ticket-related data, the dashboard was organized into several sheets, each one addressing a subject:

- Performance: In this sheet, the closed and pending tickets for each involved party in the last week are analyzed. Metrics such as the average response time and the percentage of tickets handled are reported. This provides an idea of how well each involved individual has performed in handling the tickets.

- Previous Week Overview: A comparison is made between the current week and the previous week in terms of tickets created, pending and closed. This comparison provides insight into the overall performance in ticket handling compared to the most recent past.

- Evolution by Week: allows to see the evolution of the tickets created and closed over the last ten weeks. The data is presented by status, responsible party and partner, allowing the user to identify trends and patterns over time.

- SLAs: The fulfillment of SLAs (Service Level Agreements) regarding the response time of tickets is also analyzed. It is possible to have a weekly and monthly view, verifying

if the tickets are being closed within the stipulated deadline. In addition, the antiquity of pending tickets is presented, providing information about the time that has elapsed since their creation.

- By Partner: This sheet analyzes the tickets created and pending for each partner in the last week. Metrics such as the average response time and the percentage of tickets created are covered. This analysis provides insight into the volume of tickets created by partners, as well as how they are handled.

The Appendices B.5, B.6, B.7, B.8 and B.9 present the various pages of the dashboard mentioned above.

With the dashboard-established, the final step is to incorporate the weekly ITSM reports into the system to ensure their seamless integration and functionality. By doing this, it will enable updating the data in real time and provide a comprehensive and up-to-date view of the ticketing process, enabling the final implementation of the tool.

4.2 Implemented Proposals: discussion, results and next steps

In this section, the solutions implemented to improve the tasks will be discussed, as well as the impacts achieved by these implementations. The analysis of the results will provide valuable insights into the effectiveness of the strategies adopted, demonstrating the added value and improvements achieved in the overall process.

4.2.1 Proposal for the handling of store inconsistencies:

Regarding the handling of store inconsistencies, the developed file was fully completed, presented, and validated, making it ready for implementation on April 22nd. From that date onwards, the file began to be utilized for the task. During the first three weeks, the task was performed using both the old and the new methods, ensuring that no failures occurred and that the current approach aligned with the previous one. Additionally, conducting the tasks simultaneously highlighted differences between the methods, such as simplicity, clarity, and speed.

As far as these differences are concerned, on May 1, the task took 1 hour and 15 minutes using the old method, while it was completed in 45 minutes using the new method as illustrated in the Table 4.2. In addition, the task required the use of 4 open files with constant transfers of information between them, while the new method allowed everything to be handled in a single open file. While most of the time with the old method was spent until reaching the appropriate treatment stage, with the new method, approximately 75% of the time is spent on the treatment itself.

Table 4.2: Comparison of inconsistency handling methods: measured times.

Steps Along the Task	**Time measured with the previous method**	**Time measured with the new method**
Export SAP to excel	5 min	3 min
Validation IQ09	11 min	2 min
Typification and error analysis	14 min	2 min
Identification of the action to be regularized	8 min	1 min
Resolving inconsistencies	37 min	34 min
Report: Generating and sending	Not exist	3 min
Total Task time	1h15min	45 min

In the initial phase, instruction and task guidance were necessary to ensure the utilization of all the functionalities of the new file, deviating from the natural tendency to follow the old approach. Besides contributing to change management, this phase was also crucial for necessary updates, error corrections, and file enhancements, ensuring that after the internship, no issues arise that would hinder the file's use and force a return to the old method.

After the learning phase, the file began to be exclusively used, and the task performer became increasingly familiar with it, improving her performance. The instruction manual created played a vital role in quickly resolving any doubts or questions that arose.

Moreover, every monday, a task report email was generated and shared with the supervisors, providing a systematic analysis of the identified inconsistencies and enabling the identification of areas for improvement. The review of this e-mail prompted regular discussions and clarifications about the causes of anomalies, strategy changes, and other related issues. This proactive communication approach allowed for a timely exchange of information and fostered a collaborative environment to resolve any issues or adjustments needed. The email served as a platform to share ideas, propose solutions, and align the team's efforts toward continuous improvement.

In summary, the implemented solutions have made the process more intuitive and efficient, reducing the number of steps required for data analysis. This has allowed to focus on the most important tasks: addressing inconsistencies and analyzing the evolution of cockpit entries. Regular communication through reports and clarifications from supervisors has streamlined the process, enabling faster and more accurate problem-solving and decision-making.

These improvements have created a more efficient work environment and facilitated the achievement of established goals.

4.2.2 Proposal for the handling of SPs inconsistencies:

In the context of SP inconsistencies, although the initially proposed action plan was not followed, valuable insights were gained during the process study.

These insights led to the creation of a workflow that will serve as the basis for standardizing the process, making it more consistent and effective. Although no specific new file has been developed, the improvements identified in the workflow will help optimize the way inconsistencies

in SPs are handled. The approach adopted respected the supervisors' preferences and met the company's interests, aiming to achieve more efficient and satisfactory results in other areas with greater need.

The next steps for addressing SP inconsistencies would involve taking a similar approach as to the store inconsistencies.

Therefore, the next steps involves developing a specific file to support the improved SP inconsistencies process. This file should align with the action plan and consider the requirements and needs of the task identified and presented in the previous chapter. Once developed, the file should be implemented through effective communication, training, and gradual transition, ensuring its later success.

The greatest advantage of implementing these improvements may not be easily quantifiable: it lies in the way the process is executed. While it may be challenging to measure this advantage directly, focusing on streamlining the process, reducing manual effort, and improving clarity and transparency allows the company to expect benefits such as increased efficiency, reduced errors, and improved decision-making.

4.2.3 Proposal for support to partners/technicians and internal teams:

Significant implementations have been made in support of partners/technicians and internal teams, These implementations will help strengthen the partnership with partners, improve problem resolution, and foster a collaborative and productive work environment within the organization.

4.2.3.1 Proposal for Direct call assistance:

With the implementation of the temporary call management tool created in Excel, it became possible to start recording and analyzing outgoing calls. From March 21st, the calls were registered in the tool. The file was closely monitored to ensure that the task performer filled it out correctly, allowing for subsequent analysis. Constant feedback and reporting any errors or issues during registration, helped optimize the file. Over a period of 7 weeks, all calls, made either by phone or through Teams, were recorded, allowing to derive conclusions based on the analyses made.

During this period, 103 calls were recorded, about 64 to support internal teams, 36 to support partners, and about 3 to support technicians. These calls covered a variety of subjects, some of which stand out as presented in figure 4.11 below.

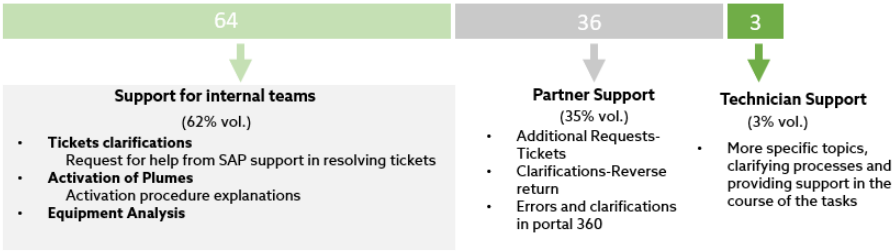


Figure 4.11: Call volume per category and subject.

The number of calls revealed an unexpected finding: the calls with technicians, which were the main reason for conducting this study, represented a rather small proportion. On the other hand, the largest number of calls were made with other teams within the company, which corroborates the idea of the call management tool being dispensable.

Based on the sample, it was also possible to analyze the evolution of the number of weekly calls and the time spent on each of them. These results have been compiled in the graphs from Figure 4.12.

Figure 4.12: Evolution of the calls over 7 weeks.

According to the sample, there were on average 17 calls per week, with an average call time of about 3 hours. These values, quite different from the held perception, contributed to the conclusion that the call management tool was unnecessary. This mistaken perception may have been caused by several factors, such as the fact that the calls occurred while other tasks were being performed, interrupting the workflow.

In terms of the type and form of contact, a balanced distribution was observed between incoming and outgoing calls, both through phone calls and the Teams platform. Regarding the subject of the calls, about 86% of them were related to a new issue, while approximately one-third required some kind of follow-up or further handling. Surprisingly, only 13% of calls could and should have been handled via a support ticket. These last two metrics were added after the implementation of the interim tool in Excel, providing valuable insights for the strategy to be adopted in the future. The discussed data is summarized in the Figure 4.13:

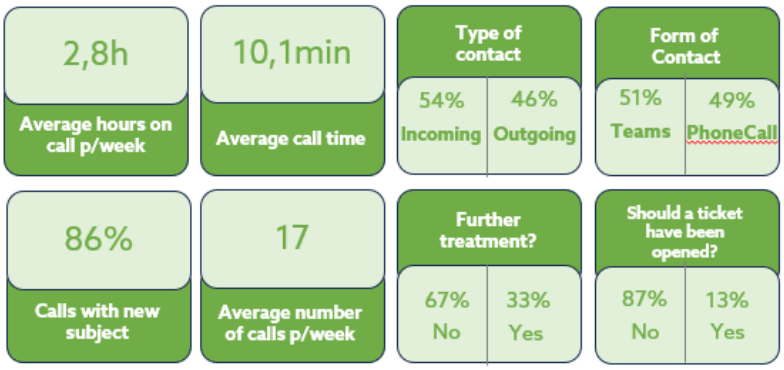


Figure 4.13: Data analysis with the dashboard: metrics and intended evolution.

In summary, considering the absence of a call management tool in the company with the desired specifications and taking into account the volume of calls and the time invested, the development of a tool is not justified at this time.

4.2.3.2 Proposal for Ticketing:

Regarding ticketing, although the Dashboard has not been fully implemented, data from a report has already been incorporated into the dashboard. The ITSM team was requested to compile all tickets created in the last 10 weeks, as well as those that are still pending. This data has provided valuable insights for analysis.

By analyzing the ticketing data, it is possible to gain a better understanding of the ticket volume, the nature of the issues reported, and the status of open tickets. This analysis can help identify recurring problems, bottlenecks in the resolution process, and areas where improvements can be made.

The analysis began by giving an idea of the percentage of tickets addressed to each involved in logistics planning and to each partner, illustrated in the graphs in Figure 4.14.

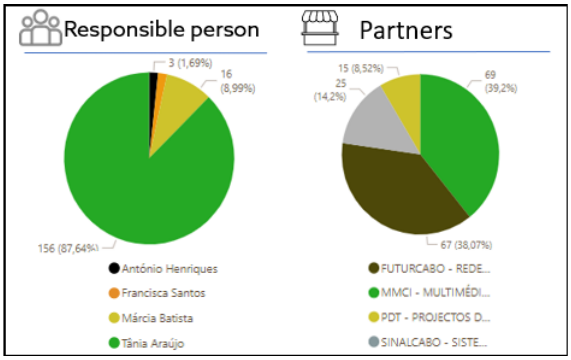


Figure 4.14: Ticket distributions per responsible and partner.

The analysis of the status of tickets over the past 10 weeks reveals some concerning findings. On average, approximately 6 tickets are created weekly, but only 4 tickets are closed. This discrepancy contributes to a higher number of tickets remaining in the system, leading to an accumulation of unresolved issues. There are currently around 86 pending tickets, with 64 awaiting a response from NOS and 22 awaiting a response from service providers (SPs). Additionally, only 52% of the tickets created have been addressed to date, indicating a significant backlog of unresolved tickets. Regarding the backlog, tickets that have been open for over 1 week account for approximately 95% of all tickets. The average antiquity of each ticket is around 159 days, indicating a considerable delay in resolving customer issues.

Furthermore, the analysis shows that the SLA (Service Level Agreement) of 3 days is only met in 23% of the cases, indicating a significant gap between the expected response time and the actual resolution time. The above data is summarized in the figure 4.15:

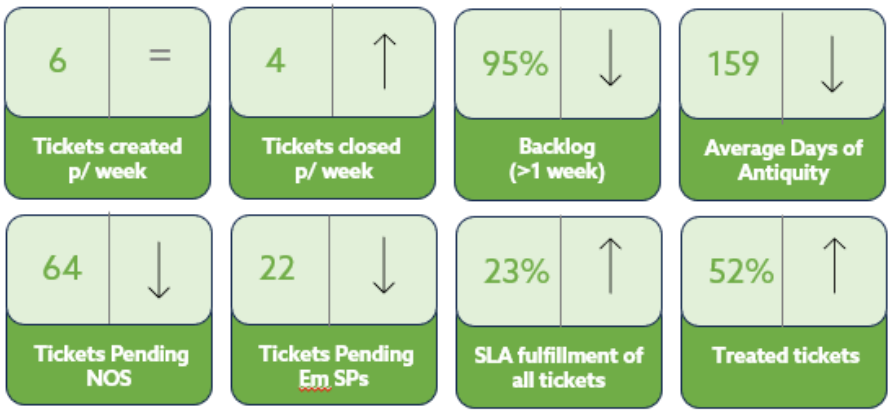


Figure 4.15: Data analysis with the dashboard: metrics and intended evolution.

Based on the analysis conducted, it was evident that the support service provided by the team was not positive. However, drawing from previous experiences in the company when implementing visual dashboards for ticket management, it was observed that once monitoring was introduced, the values showed a continuous improvement trend.

As a first step, the causes of the issues were investigated through conversations with the stakeholders involved. Based on these discussions, immediate corrective actions were taken to ensure better results in future reports. It was discovered that there were specific gaps hindering the ticket resolution process. As an example, there was a lack of alert notifications when a service provider (SP) responded to a ticket. To address this, a daily email report was requested to be generated containing all the tickets that received a response from the SP. This responsibility now lies with the teams handling the ticketing process.

The next steps involve closely monitoring the progress of the task to ensure that all previously identified metrics are improved. Additionally, ensuring that the daily report is received by all individuals involved in the process is crucial. Regular monitoring, communication, and collaboration will be essential to drive ongoing improvements in ticket management and enhance overall customer satisfaction.

4.3 Final planning proposal

To conclude the internship and with an general overview of the tasks after all the implementations were done, a weekly schedule was proposed for the person responsible for the equipment control and correction process.

The proposed schedule, represented in the following figure 4.16, was developed, taking into account the specific requirements and needs of the tasks involved. The proposed schedule aims to achieve three main goals:

- Increased productivity: By scheduling the resolution of inconsistencies on the same day, on Monday, the intention is to concentrate two similar activities into a single period, allowing the person to resolve all inconsistencies on the first day of the week.
- Creating meetings with SPs: The SPs, through their managers and technicians, typically call several times during the week, interrupting other tasks. This way, the goal is to avoid these calls by meeting once a week with each of the four partners. In this meeting, all the questions and issues from the past week will be answered.
- Ticket handling: Partner tickets are created and changed daily. By allocating daily time to the treatment of tickets, it is possible to ensure that they are tracked and treated in a timely manner, avoiding excessive accumulation of tickets and potential delays in their resolution.

DIAS DA SEMANA	SEGUNDA	TERÇA	QUARTA	QUINTA	SEXTA
	TRATAMENTO DE TICKETS-1HORA	TRATAMENTO DE TICKETS-1HORA	TRATAMENTO DE TICKETS-1HORA	TRATAMENTO DE TICKETS-1HORA	TRATAMENTO DE TICKETS-1HORA
	INCONSISTÊNCIAS DE LOJA-1 HORA	REUNIÃO SP: MMCI-1 HORA	REUNIÃO SP: FUTURCABO-1 HORA	REUNIÃO SP: PDT-1 HORA	REUNIÃO SP: SINALCABO-1 HORA
	INCONSISTÊNCIAS DE SPs-1 HORA				
TEMPO TOTAL OCUPADO	3 HORAS	2 HORAS	2 HORAS	2 HORAS	2 HORAS
TEMPO TOTAL DISPONÍVEL	5 HORAS	6 HORAS	6 HORAS	6 HORAS	6 HORAS

Figure 4.16: Weekly Schedule Proposal.

In the case of calls with internal teams, while there is no specific measure that is evidenced in the schedule, the change to ensure that tasks are not interrupted is through instruction and method. Previously, tasks were performed without changing the "Available" status in Microsoft Teams. Now, the person in question is asked to preemptively add all the fixed tasks of the week to her Microsoft Teams schedule and set the status to "Do Not Disturb" while doing them. In this way, requests may come in, but a clear signal is immediately given to other co-workers that the person is unavailable.

The schedule mentioned is only a proposal and is flexible to adjustments in the future if necessary. Moreover, with about 28% of the time occupied with recurring tasks, there is a significant time margin for solving emerging or higher priority tasks without compromising the fixed tasks.

The feedback from the team regarding the implemented measures was very positive. The fact that there was an ongoing collaboration with supervisors to develop the final measures contributed to a greater acceptance and understanding of the changes.

Placing the inconsistencies on the same day was well received. By working on the two tasks on the same day, the team is able to improve the workflow and ensure the handling of inconsistencies is done in sync, something intended from the beginning.

The creation of meetings with SPs also received positive feedback. The idea of creating a unique moment to answer the week's questions through a meeting with the person responsible for each partner was well accepted, since the team highly values communication and more direct collaboration with the SPs.

As soon as the measures were presented to the team members, there was immediate approval, and the value and relevance of the proposed changes were immediately recognized. In order to start using the proposed new schedule, it was only requested to ensure the feasibility of all the changes.

In conclusion, the proposed schedule for the person responsible for overseeing the equipment inspection and correction process represents a proactive approach to improving task management and achieving operational excellence. By providing a clear structure and dedicating specific time to each task, ensuring available time for new tasks, the company aims to promote a productive work environment and ensure the successful completion of equipment control and correction activities.

Chapter 5

Conclusion

Within the project of continuous improvement of the equipment control and correction process, great importance was given to the optimization and effectiveness of the tasks. During the internship at NOS, the main goal was to work in this direction, focusing on several areas of the process that showed room for significant improvement.

The internship at NOS provided an opportunity to understand the importance of working in a large company, especially in a sector as demanding as telecommunications. With the support of the team, it was possible to quickly integrate into the reality of the company, allowing to start working on optimizing all tasks related to the control and correction of equipment, focusing on 4 tasks.

One of the areas addressed was the resolution of inconsistencies in stores. By creating a single file capable of interpreting data and proposing resolutions, it was possible to speed up and make this task more effective. In addition, a reporting system was implemented to obtain a greater knowledge of the process performance and identify areas for improvement. During the internship, these identified areas were explored, and the report can thus ensure that the corrective measures implemented contribute to improving the results and the process as a whole. A user manual for the file was also prepared in order to ensure its correct use and facilitate the execution of the task.

Another area of intervention was the resolution of inconsistencies in the SAP system. Although the improvements proposed in the action plan are not implemented yet, the in-depth study of this task allowed us to map its flow. It will serve as a basis for its standardization, making it more consistent and effective in the future.

As far as support to partners, technicians, and internal teams is concerned, a detailed analysis of the calls made throughout the week was made in order to assess the need for a change in strategy. Based on the results obtained, it was concluded that the implementation of a call management tool was not justifiable since the volume of calls is limited and analysis already provided proposals for improvement.

In addition, a ticket management tool was developed that allowed us to verify that the tickets were not being handled properly, causing poor service level. With the guidance provided and

constant monitoring, a different reality is expected in the future, with more efficient ticket management.

Finally, in order to improve the global process, a new weekly schedule was proposed that ensures the completion of all scheduled tasks, thus allowing to address, in free time, the unplanned tasks that may arise during the week.

During the internship period, there was a significant improvement in the effectiveness and efficiency of tasks related to the control and correction of equipment. The team expressed satisfaction with the results achieved and believes that the proposed improvements will have a positive impact on the overall performance of the process.

Overall, this internship provided a comprehensive analysis of process operations, identified areas for improvement, and proposed solutions to drive positive change. By adopting a culture of continuous improvement, leveraging data and technology, and fostering collaboration among stakeholders, the company is well-positioned to achieve its goals and ensure long-term success.

5.1 Next Steps

Based on the results and conclusions obtained throughout this research, it is recommended to implement specific recommendations for the execution of the tasks definitively. These recommendations are detailed according to the knowledge gained about the process and provide practical guidance about the actions to be taken. It is crucial, then, to follow the plan in order to remain aligned with the objectives.

In addition, it is crucial to continuously follow the monitoring and continuous evaluation system set up, to track the progress of the implemented improvements. Through such constant monitoring, it will be possible to adjust actions as needed and ensure that the expected results are achieved.

A critical factor in the success of continuous process improvement is the active involvement of all relevant stakeholders. Therefore, it is important to establish effective communication channels and encourage the participation of all involved. Regular meetings, workshops, or brainstorming sessions can be held to gather ideas, obtain feedback, and ensure the continuous alignment of all stakeholders.

Finally, it is important to explore new approaches and technologies that can contribute to continuous process improvement. The research conducted in this thesis may have identified areas where these innovative approaches or emerging technologies can be applied. Next steps may involve studying best practices in other industries, investigating new technologies, or conducting pilot testing to assess the feasibility and potential benefits of these approaches.

By following these next steps, it will be possible to drive the process of continuous improvement, increasing efficiency, quality, and results achieved. The work done is just the starting point, and it is important to continue to look for opportunities for continuous improvement and refinement. Continuous improvement is an ongoing process, and these next steps will help keep the process up-to-date and aligned with evolving needs.

5.2 Final personal conclusions

On a personal level, this project was extremely rewarding.

The challenge posed was demanding, and overcoming it is a reason for personal pride.

The fact that the project was very demanding in terms of knowledge of computer programming, Power Bi, Excel, and VBA requires a note about the help that a united and collaborative team can play at the professional level. There were several moments when problems arose that were difficult to solve. Resorting to the Logistics team, there was always the necessary availability as mentors in order to overcome the difficulties encountered. On the other hand, being involved in several projects, a great capacity to manage them was necessary. For each one, it was necessary to make an extreme effort in order to fulfill the action plans on the stipulated dates.

As a first professional experience, this project was a development enhancer not only at the technical level but also at the work culture level through the soft skills acquired, including analytical skills, problem-solving, and interpersonal communication.

The project, which coincides with the end of the master's degree, was an excellent experience from which important lessons can be learned for the future.

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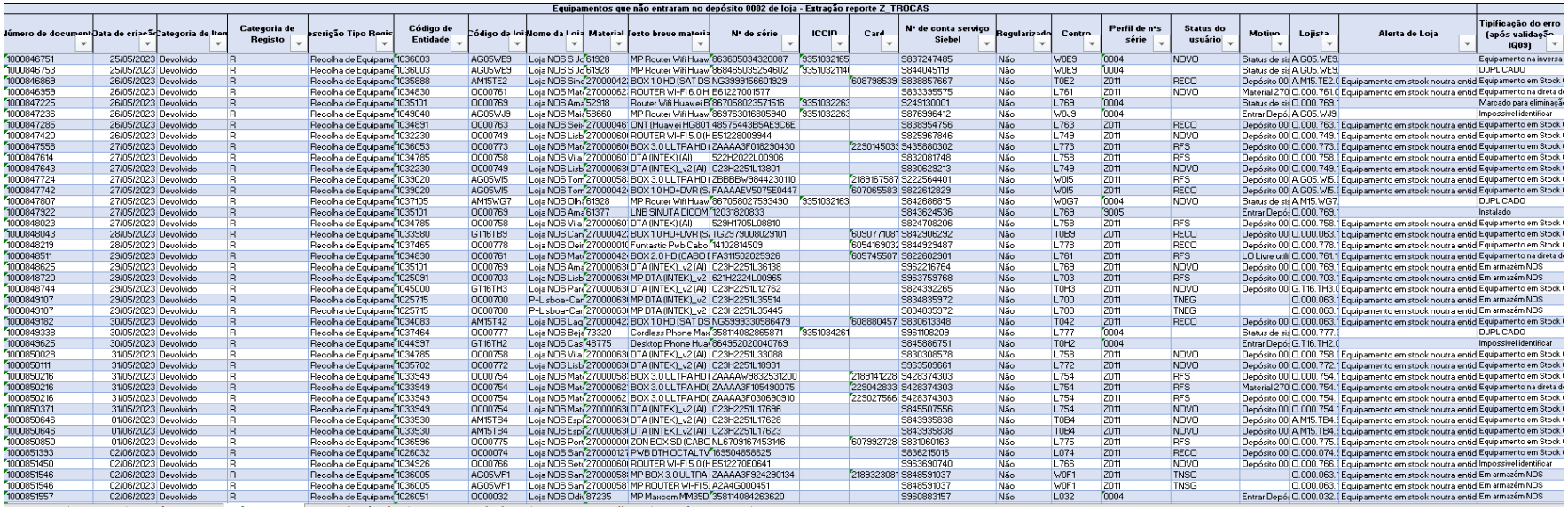
Appendix A

Handling Store Inconsistencies



Equipamentos que não entraram no depósito 0002 de loja - Extração reporte Z_TROCAS

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1000847614	27/05/2023	Devolvido	R	Recolha de Equipame	1034785	O000758	Loja NOS Vila	27000060	DTA (INTEK) (AI)	522H2022L00906			S832081748	Não	L758	2011	RFS	Depósito 00	O.000.758.(	Equipamento em stock noutra entid	Equipamento em Stock
1000847643	27/05/2023	Devolvido	R	Recolha de Equipame	1032230	O000749	Loja NOS Lisb	27000063	DTA (INTEK)_v2 (AI)	C23H2251L13801			S830629213	Não	L749	2011	NOVO	Depósito 00	O.000.749.1	Equipamento em stock noutra entid	Equipamento em Stock
1000847724	27/05/2023	Devolvido	R	Recolha de Equipame	1039020	AG05WI5	Loja NOS Tom	27000058	BOX 3.0 ULTRA HD (I	ZBBBBW3844230110		2189167587	S222564401	Não	W0I5	2011	RFS	Depósito 00	A G05.WI5.(	Equipamento em stock noutra entid	Equipamento em Stock
1000847742	27/05/2023	Devolvido	R	Recolha de Equipame	1039020	AG05WI5	Loja NOS Tom	27000042	BOX 1.0 HD+DVR (S	FAAAAEV5075E0447		6070655831	S822612829	Não	W0I5	2011	RECO	Depósito 00	A G05.WI5.(	Equipamento em stock noutra entid	Equipamento em Stock
1000847807	27/05/2023	Devolvido	R	Recolha de Equipame	1037105	AM15WG7	Loja NOS Olh	61928	MP Router Wifi Huaw	867058027533490	3351032163		S842686815	Não	W0G7	0004	NOVO	Status de sis	A M15.WG7.		DUPLICADO
1000847922	27/05/2023	Devolvido	R	Recolha de Equipame	1035101	O000769	Loja NOS Ama	61377	LNB SINUTA DICOM	12031820833			S843624536	Não	L769	9005		Entrar Depós	O.000.769.1		Instalado
1000848023	27/05/2023	Devolvido	R	Recolha de Equipame	1034785	O000758	Loja NOS Vila	27000060	DTA (INTEK) (AI)	529H1705L06810			S824708206	Não	L758	2011	RFS	Depósito 00	O.000.758.1	Equipamento em stock noutra entid	Equipamento em Stock
1000848043	28/05/2023	Devolvido	R	Recolha de Equipame	1033980	GT16TB9	Loja NOS Can	27000042	BOX 1.0 HD+DVR (S	TG2379098029101		6090771081	S842906292	Não	T0B9	2011	RECO	Depósito 00	O.000.063.1	Equipamento em stock noutra entid	Equipamento em Stock
1000848219	28/05/2023	Devolvido	R	Recolha de Equipame	1037465	O000778	Loja NOS Oei	27000001	Funtastic Pvb Cabo	14102814509		6054163032	S844329487	Não	L778	2011	RECO	Depósito 00	O.000.778.1	Equipamento em stock noutra entid	Equipamento em Stock
1000848511	29/05/2023	Devolvido	R	Recolha de Equipame	1034830	O000761	Loja NOS Mat	27000042	BOX 2.0 HD (CABO (I	FA311502025926		6057455071	S822602901	Não	L761	2011	RFS	LCI Livre utili	O.000.761.1	Equipamento em stock noutra entid	Equipamento na direta d
1000848625	29/05/2023	Devolvido	R	Recolha de Equipame	1035101	O000769	Loja NOS Ama	27000063	DTA (INTEK)_v2 (AI)	C23H2251L36138			S962216764	Não	L769	2011	NOVO	Depósito 00	O.000.769.1	Equipamento em stock noutra entid	Em armazém NOS
1000848720	29/05/2023	Devolvido	R	Recolha de Equipame	1025091	O000703	Loja NOS Lisb	27000063	MP DTA (INTEK)_v2	621H2224L00965			S963759768	Não	L703	2011	RFS	Depósito 00	O.000.703.1	Equipamento em stock noutra entid	Em armazém NOS
1000848744	29/05/2023	Devolvido	R	Recolha de Equipame	1045000	GT16TH3	Loja NOS Par	27000063	DTA (INTEK)_v2 (AI)	C23H2251L12762			S824392265	Não	T0H3	2011	NOVO	Depósito 00	G.T16.TH3.(	Equipamento em stock noutra entid	Equipamento em Stock
1000849107	29/05/2023	Devolvido	R	Recolha de Equipame	1025715	O000700	P-Lisboa-Car	27000063	MP DTA (INTEK)_v2	C23H2251L35514			S834835972	Não	L700	2011	TNEG		O.000.063.1	Equipamento em stock noutra entid	Em armazém NOS
1000849107	29/05/2023	Devolvido	R	Recolha de Equipame	1025715	O000700	P-Lisboa-Car	27000063	MP DTA (INTEK)_v2	C23H2251L35445			S834835972	Não	L700	2011	TNEG		O.000.063.1	Equipamento em stock noutra entid	Em armazém NOS
1000849162	30/05/2023	Devolvido	R	Recolha de Equipame	1034083	AM15T42	Loja NOS Lag	27000042	BOX 1.0 HD (SAT DS	NG5939330586479		6088804573	S830613348	Não	T042	2011	RECO	Depósito 00	O.000.063.1	Equipamento em stock noutra entid	Equipamento em Stock
1000849338	30/05/2023	Devolvido	R	Recolha de Equipame	1037464	O000777	Loja NOS Bej	73320	Cordless Phone Mav	358194082865871	3351034261		S961108209	Não	L777	0004		Status de sis	O.000.777.(		DUPLICADO
1000849625	30/05/2023	Devolvido	R	Recolha de Equipame	1044397	GT16TH2	Loja NOS Cas	48775	Desktop Phone Hua	864952020040769			S845866751	Não	T0H2	0004		Entrar Depós	G.T16.TH2.(		Impossível identificar
1000850028	31/05/2023	Devolvido	R	Recolha de Equipame	1034785	O000758	Loja NOS Vila	27000063	DTA (INTEK)_v2 (AI)	C23H2251L33088			S830308578	Não	L758	2011	NOVO	Depósito 00	O.000.758.(	Equipamento em stock noutra entid	Equipamento em Stock
1000850111	31/05/2023	Devolvido	R	Recolha de Equipame	1035702	O000772	Loja NOS Lisb	27000063	DTA (INTEK)_v2 (AI)	C23H2251L18931			S963509661	Não	L772	2011	NOVO	Depósito 00	O.000.772.1	Equipamento em stock noutra entid	Equipamento em Stock
1000850216	31/05/2023	Devolvido	R	Recolha de Equipame	1033949	O000754	Loja NOS Mat	27000058	BOX 3.0 ULTRA HD (I	ZAAAAW9832531200		2189141228	S428374303	Não	L754	2011	RFS	Depósito 00	O.000.754.1	Equipamento em stock noutra entid	Equipamento em Stock
1000850216	31/05/2023	Devolvido	R	Recolha de Equipame	1033949	O000754	Loja NOS Mat	27000062	BOX 3.0 ULTRA HD (I	ZAAAA3F105490075		2290428331	S428374303	Não	L754	2011	RFS	Material 270	O.000.754.1	Equipamento em stock noutra entid	Equipamento na direta d
1000850216	31/05/2023	Devolvido	R	Recolha de Equipame	1033949	O000754	Loja NOS Mat	27000062	BOX 3.0 ULTRA HD (I	ZAAAA3F030690910		2290275666	S428374303	Não	L754	2011	RFS	Depósito 00	O.000.754.1	Equipamento em stock noutra entid	Equipamento em Stock
1000850371	31/05/2023	Devolvido	R	Recolha de Equipame	1033949	O000754	Loja NOS Mat	27000063	DTA (INTEK)_v2 (AI)	C23H2251L17696			S845507556	Não	L754	2011	NOVO	Depósito 00	O.000.754.1	Equipamento em stock noutra entid	Equipamento em Stock
1000850646	01/06/2023	Devolvido	R	Recolha de Equipame	1033530	AM15TB4	Loja NOS Esp	27000063	DTA (INTEK)_v2 (AI)	C23H2251L17628			S843935838	Não	T0B4	2011	NOVO	Depósito 00	A M15.TB4.1	Equipamento em stock noutra entid	Equipamento em Stock
1000850646	01/06/2023	Devolvido	R	Recolha de Equipame	1033530	AM15TB4	Loja NOS Esp	27000063	DTA (INTEK)_v2 (AI)	C23H2251L17623			S843935838	Não	T0B4	2011	NOVO	Depósito 00	A M15.TB4.1	Equipamento em stock noutra entid	Equipamento em Stock
1000850850	01/06/2023	Devolvido	R	Recolha de Equipame	1036596	O000775	Loja NOS Por	27000000	ZON BOX SD (CABO	NL6709167453146		6079327286	S831060163	Não	L775	2011	RFS	Depósito 00	O.000.775.(	Equipamento em stock noutra entid	Equipamento em Stock
1000851393	02/06/2023	Devolvido	R	Recolha de Equipame	1026032	O000074	Loja NOS San	27000012	PWB DTH OCTALTV	169504858625			S836215016	Não	L074	2011	RECO	Depósito 00	O.000.074.1	Equipamento em stock noutra entid	Equipamento em Stock
1000851450	02/06/2023	Devolvido	R	Recolha de Equipame	1034926	O000766	Loja NOS Set	27000060	ROUTER WI-FI 5.0 (H	B512270E0641			S963690740	Não	L766	2011	NOVO	Depósito 00	O.000.766.(	Equipamento em stock noutra entid	Impossível identificar
1000851546	02/06/2023	Devolvido	R	Recolha de Equipame	1036005	AG05WF1	Loja NOS San	27000058	MP BOX 3.0 ULTRA	ZAAAA3F924290134		2189323081	S848531037	Não	W0F1	2011	TNSG		O.000.063.1	Equipamento em stock noutra entid	Em armazém NOS
1000851546	02/06/2023	Devolvido	R	Recolha de Equipame	1036005	AG05WF1	Loja NOS San	27000058	MP ROUTER WI-FI 5.	A2A4G000451			S848531037	Não	W0F1	2011	TNSG		O.000.063.1	Equipamento em stock noutra entid	Em armazém NOS
1000851557	02/06/2023	Devolvido	R	Recolha de Equipame	1026051	O000032	Loja NOS Odi	87235	MP Marcom MM35D	358140842636 20			S960883157	Não	L032	0004		Entrar Depós	O.000.032.(	Equipamento em stock noutra entid	Em armazém NOS

Figure A.1: ZTrocas data on the Equipment List Sheet.

Estado atual equipamento (Validação IQ09)											Tratamento da inconsistênci						
SNs	alidação Duplicad	ID	idação Adicional do Cant	Material2	exto breve material	Centro	Depósito	Lote	Status Usuário	Status Sistem	Tipificação do erro	Ação para regularizar	RM	Data RM	Feedback final	Motivo fecho manu	Week
ZAAAA3F208793233		FALSE8DEPS ECLI	FALSE	2700006213	BOX 3.0 ULTRA HD(CA	8300		USADO	RFS	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w21
C23H2251L19366		FALSE8DEPS ECLI	FALSE	2700006302	DTA (INTEK)_v2 (AI)	8300		NOVO	NOVO	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w21
ZAAAA3F012790106		FALSE8DEPS ECLI	FALSE	2700006213	BOX 3.0 ULTRA HD(CA	8300		USADO	RFS	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w21
C23H2251L19131		FALSE8DEPS ECLI	FALSE	2700006302	DTA (INTEK)_v2 (AI)	8300		NOVO	NOVO	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w21
158A7007C5		FALSESSDEPS	FALSE	2700005903	EXTENDER MESH WIF	S600	S600	NOVO	NOVO	DEPS	Equipamento na direta de SP	Abrir RM para a loja	247854	30/05/2023	Resolvido		w21
158A700834		FALSESSDEPS	FALSE	2700005903	EXTENDER MESH WIF	S600	S600	NOVO	NOVO	DEPS	Equipamento na direta de SP	Abrir RM para a loja	247854	30/05/2023	Resolvido		w21
351032165082517 22		TRUEW2DEPS	TRUE	54318	Pack Router Internet Hu	W0E9	2			DEPS	Equipamento na inversa da própria loja	Enviar A360			Fechado Manualmente	Fora de âmbito	w21
351032114085803 61	DUPLICADO	TRUEW2DEPS	TRUE	61929	Pack Router Internet Hu	W0E9	2			DEPS	DUPLICADO				Fechado Manualmente	Duplicado	w21
NG3999156601823		FALSE8RECODEPS EC	FALSE	2700004226	BOX 1.0 HD (SAT DST 7	8300		RECOLHIDO	RECO	DEPS ECLI	Equipamento em Stock Consignado-Recolhi	Regularização através de LSMW			Resolvido		w21
B61227001577		FALSELLDEPS	FALSE	2700006230	ROUTER Vl-F16.0 HFC	L773		NOVO	NOVO	DEPS	Equipamento na direta de outra loja	Abrir RM para a loja	247855	30/05/2023	Resolvido		w21
351032226308688890		FALSELIDI MREL	FALSE	54794	Pack Internet Fibra RV Huawei B310					LIDI MREL	Marcado para eliminação	Remover marcado para eliminaçãoEfetuar entrada mercadoria - MIGO mov 5			Resolvido		w21
351032226342457062		FALSELIDI	FALSE	59071	Pack Router Internet Huawei E5172_V2 C					LIDI	Impossível identificar	Efetuar entrada mercadoria - MIGO mov 501			Resolvido		w21
48575443B5AE9C6E		FALSE8RECODEPS EC	FALSE	2700004611	ONT (Huawei HG8012H	8300		RECOLHIDO	RECO	DEPS ECLI	Equipamento em Stock Consignado-Recolhi	Regularização através de LSMW			Resolvido		w21
B51228003944		FALSE8DEPS ECLI	FALSE	2700006068	ROUTER VI-FI5.0 (HITI	8300		NOVO	NOVO	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w21
ZAAAA3F018230430		FALSE8DEPS ECLI	FALSE	2700006062	BOX 3.0 ULTRA HD (C/	8300		NOVO	RFS	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w21
522H2022L00906		FALSE8DEPS ECLI	FALSE	2700006073	DTA (INTEK) (AI)	8300		USADO	RFS	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w21
C23H2251L13801		FALSE8DEPS ECLI	FALSE	2700006302	DTA (INTEK)_v2 (AI)	8300		NOVO	NOVO	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w21
ZBB6BVJ9844230110		FALSE8DEPS ECLI	FALSE	2700005830	BOX 3.0 ULTRA HD (AI	8300		USADO	RFS	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w21
FAAAAEV50750447		FALSE8RECODEPS EC	FALSE	2700004249	BOX 1.0 HD+DVR (SATI	8300		RECOLHIDO	RECO	DEPS ECLI	Equipamento em Stock Consignado-Recolhi	Regularização através de LSMW			Resolvido		w21
351032216329741 74	DUPLICADO	TRUEW2DEPS	TRUE	55168	Pack Internet Fibra Huaw	W0G7	2			DEPS	DUPLICADO				Fechado Manualmente	Duplicado	w21
1203182083 3		FALSELIDI	FALSE	61377	LNB SINUTA DICOM NEW					LIDI	Instalado	Efetuar entrada mercadoria - MIGO mov 501			Resolvido		w21
529H1705L08810		FALSE8DEPS ECLI	FALSE	2700006073	DTA (INTEK) (AI)	8300		USADO	RFS	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w21
TG2979008029101		FALSE8RECODEPS EC	FALSE	2700004227	BOX 1.0 HD+DVR (SAT	8300		RECOLHIDO	RECO	DEPS ECLI	Equipamento em Stock Consignado-Recolhi	Regularização através de LSMW			Resolvido		w21
14102814509		FALSE8RECODEPS EC	FALSE	2700000106	Funtastic Pwb Cabo Oo	8300		RECOLHIDO	RECO	DEPS ECLI	Equipamento em Stock Consignado-Recolhi	Regularização através de LSMW			Resolvido		w21
FA311502025926		FALSELLDEPS	FALSE	2700004246	BOX 2.0 HD (CABO DC	L754	L754	USADO	RFS	DEPS	Equipamento na direta de outra loja	Abrir RM para a loja	248682	09/06/2023	Resolvido		w22
C23H2251L36138		FALSE88TNEGDEPS	FALSE	2700006304	MP DTA (INTEK)_v2	8300	8306	NOVO	TNEG	DEPS	Em armazém NOS	Fechar manualmente em Z_trocas			Fechado Manualmente	Erro de registo	w22
621H2224L00965		FALSE88DEPS	FALSE	2700006304	MP DTA (INTEK)_v2	8300	8301	USADO	RFS	DEPS	Em armazém NOS	Fechar manualmente em Z_trocas			Fechado Manualmente	Erro de registo	w22
C23H2251L12762		FALSE8DEPS ECLI	FALSE	2700006302	DTA (INTEK)_v2 (AI)	8300		NOVO	NOVO	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w22
C23H2251L35514		FALSE88TNEGDEPS	FALSE	2700006304	MP DTA (INTEK)_v2	8300	8306	USADO	TNEG	DEPS	Em armazém NOS	Fechar manualmente em Z_trocas			Fechado Manualmente	Erro de registo	w22
C23H2251L35445		FALSE88TNEGDEPS	FALSE	2700006304	MP DTA (INTEK)_v2	8300	8306	USADO	TNEG	DEPS	Em armazém NOS	Fechar manualmente em Z_trocas			Fechado Manualmente	Erro de registo	w22
NG5999330586473		FALSE8RECODEPS EC	FALSE	2700004226	BOX 1.0 HD (SAT DST 7	8300		RECOLHIDO	RECO	DEPS ECLI	Equipamento em Stock Consignado-Recolhi	Regularização através de LSMW			Resolvido		w22
351030426101820241	DUPLICADO	TRUEL2DEPS	TRUE	47561	Pack H7 N	L777	2			DEPS	DUPLICADO				Fechado Manualmente	Duplicado	w22
864952020040769		FALSELIDI	FALSE	48775	Desktop Phone Huawei F317 preto					LIDI	Impossível identificar	Efetuar entrada mercadoria - MIGO mov 501			Resolvido		w22
C23H2251L33088		FALSE8DEPS ECLI	FALSE	2700006302	DTA (INTEK)_v2 (AI)	8300		NOVO	NOVO	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w22
C23H2251L18931		FALSE8DEPS ECLI	FALSE	2700006302	DTA (INTEK)_v2 (AI)	8300		NOVO	NOVO	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w22
ZAAAAW3832531200		FALSE8DEPS ECLI	FALSE	2700005830	BOX 3.0 ULTRA HD (AI	8300		USADO	RFS	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w22
ZAAAA3F105430075		FALSELLDEPS	FALSE	2700006213	BOX 3.0 ULTRA HD(CA	L773	L773	USADO	RFS	DEPS	Equipamento na direta de outra loja	Abrir RM para a loja	248683	09/06/2023	Resolvido		w22
ZAAAA3F030630910		FALSE8DEPS ECLI	FALSE	2700006213	BOX 3.0 ULTRA HD(CA	8300		USADO	RFS	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w22
C23H2251L17696		FALSE8DEPS ECLI	FALSE	2700006302	DTA (INTEK)_v2 (AI)	8300		NOVO	NOVO	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w22
C23H2251L17628		FALSE8DEPS ECLI	FALSE	2700006302	DTA (INTEK)_v2 (AI)	8300		NOVO	NOVO	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w22
C23H2251L17623		FALSE8DEPS ECLI	FALSE	2700006302	DTA (INTEK)_v2 (AI)	8300		NOVO	NOVO	DEPS ECLI	Equipamento em Stock Consignado-AI	Regularização através de LSMW			Resolvido		w22

Figure A.2: IQ 09 Data on the Equipment List Sheet.

```
Sub Export()
' Export Macro
    Dim wbOrigem As Workbook
    Dim wbDestino As Workbook
    Dim wsOrigem As Worksheet
    Dim wsDestino As Worksheet
    Dim ultimaLinhaOrigem As Long
    Dim ultimaLinhaDestino As Long
    'Mostra uma janela de diálogo para solicitar a data de início
    Dim dataInicial As Date
    dataInicial = InputBox("Escreva a data de início no formato DD/MM/AAAA:", "Definir Data Inicial")
    'Verifica se a data digitada é válida
    If IsDate(dataInicial) Then
        'Define a célula D6 para a data digitada
        Range("D6").Value = dataInicial
    Else
        'Exibe uma mensagem de erro se a data digitada não for válida
        MsgBox "A data digitada é inválida. Por favor, tente novamente."
    End If
     'Permite que o usuário escolha o arquivo de origem
    Dim fileDialog As fileDialog
    Set fileDialog = Application.fileDialog(msoFileDialogFilePicker)
    fileDialog.Title = "Selecione o arquivo de origem"
    fileDialog.Show
    'Define o arquivo de origem como o arquivo selecionado pelo usuário
    Dim selectedFile As String
    selectedFile = fileDialog.SelectedItems(1)
    Set wbOrigem = Workbooks.Open(selectedFile)
    'Define a planilha de origem
    Set wsOrigem = wbOrigem.Sheets(1)
    'Encontra a última linha com conteúdo na coluna AB da planilha de origem
    ultimaLinhaOrigem = wsOrigem.Cells(wsOrigem.Rows.Count, "AB").End(xlUp).Row
    'Copia as colunas A até AB da planilha de origem para a planilha de destino
    Set wsDestino = ThisWorkbook.Sheets("Listagem")
    ultimaLinhaDestino = wsDestino.Range("B:B").Find(What:="*", LookIn:=xlValues, SearchDirection:=xlPrevious).Row
    'Cola as colunas A até AB da planilha de origem na planilha de destino a partir da linha seguinte à última preenchida
    wsOrigem.Range("A2:AB" & ultimaLinhaOrigem).Copy
    wsDestino.Range("B" & ultimaLinhaDestino + 1).PasteSpecial xlPasteValues
    'Atualiza a última linha da planilha de destino após a colagem dos dados
ultimaLinhaDestino = wsDestino.Range("B:B").Find(What:="*", LookIn:=xlValues, SearchDirection:=xlPrevious).Row
     'Redimensiona a tabela para incluir os novos dados
    Dim tbl As ListObject
    Set tbl = wsDestino.ListObjects("Table1")
```

Figure A.3: Code for automatic Z_trocas import.

```
Sub LimparArquivoIQ_09()

    Dim arquivo As Variant

    'Abre o diálogo de seleção de arquivo
    arquivo = Application.GetOpenFilename("Excel Files (*.xls*), *.xls*", , "Selecione o arquivo para limpar")

    'Verifica se o usuário selecionou um arquivo
    If arquivo = False Then
        Exit Sub
    End If

    'Abre o arquivo selecionado
    Workbooks.Open Filename:=arquivo

    'Limpa as linhas 2 até a última da planilha
    With ActiveWorkbook.ActiveSheet
        .Range("A2", .Cells(.Rows.Count, "A").End(xlUp)).EntireRow.Delete
    End With

    'Informa ao usuário que é necessário extrair do IQ09 e colar no arquivo vazio
    MsgBox "O arquivo foi limpo e agora está pronto para receber os dados do IQ09. Por favor, extraia os dados do IQ09 e cole na planilha vazia.", vbInformation, "Ins

End Sub
```

Figure A.4: Code for automatic IQ09 import.

```
Sub EnviarEmail()

    Dim planilhaOrigem As Worksheet, planilhaDestino As Worksheet
    Dim ultimaLinha As Long, i As Long, j As Long
    ' Define as planilhas de origem e destino
    Set planilhaOrigem = ThisWorkbook.Worksheets("Listagem")
    Set planilhaDestino = ThisWorkbook.Worksheets("Enviar A360")
' Apaga o conteúdo da planilha de destino, exceto o cabeçalho
planilhaDestino.Range("A5:AC" & Rows.Count).ClearContents
' Encontra a última linha na coluna B com algum valor diferente de vazio da planilha de origem
ultimaLinha = planilhaOrigem.Range("B:B").Find("*", SearchDirection:=xlPrevious).Row
' Percorre todas as linhas da coluna AL
For i = 6 To ultimaLinha
    ' Verifica se a célula na coluna AL é igual a "0002"
    If planilhaOrigem.Range("AL" & i).Value = "0002" Then
        ' Formata a célula para "0000"
        planilhaOrigem.Range("AL" & i).NumberFormat = "0000"
    End If
Next i
 ' Percorre todas as linhas da coluna AI até AO
    For i = 6 To ultimaLinha
            planilhaOrigem.Range("AI" & i & ":AO" & i).Value = planilhaOrigem.Range("AI" & i & ":AO" & i).Value
    Next i

' Loop pelas linhas da coluna AQ e copia as colunas B a AD se a condição for satisfeita
j = 5 ' contador para a linha de destino
For i = 1 To ultimaLinha
    If planilhaOrigem.Cells(i, "AQ").Value = "Enviar A360" And _
   planilhaOrigem.Cells(i, "AX").Value = planilhaOrigem.Cells(5, "BH").Value And _
   planilhaOrigem.Cells(i, "AY").Value = planilhaOrigem.Cells(5, "BI").Value Then

        ' Copia as colunas B a AD da linha atual
        planilhaOrigem.Range("B" & i & ":AD" & i).Copy
        ' Cola as colunas na linha correspondente na planilha de destino
        planilhaDestino.Range("A" & j).PasteSpecial xlPasteValues
        j = j + 1 ' incrementa a linha de destino
    End If
Next i
     ' Configuração do objeto Outlook
    Dim OutlookApp As Object
    Dim OutlookMail As Object
    Dim planilhaParametros As Worksheet
    Set OutlookApp = CreateObject("Outlook.Application")
```

Figure A.5: Code for automatic mail sending to A360.

```
Set OutlookMail = OutlookApp.CreateItem(0)

' Configuração das variáveis para os dados do e-mail
Dim Destino As String
Dim CC As String
Dim Assunto As String
Dim Conteudo As String
Dim Assinatura As String

Set planilhaParametros = ThisWorkbook.Worksheets("Parâmetros")

' Leitura dos dados das células do Excel
Destino = planilhaParametros.Range("C4").Value
CC = planilhaParametros.Range("C5").Value
Assunto = planilhaParametros.Range("C8").Value
Assinatura = planilhaParametros.Range("C7").Value
Conteudo = planilhaParametros.Range("C6").Value

' Obter a última linha da coluna A
Dim LastRowA As Long
LastRowA = planilhaDestino.Range("A" & planilhaDestino.Rows.Count).End(xlUp).Row

ThisWorkbook.Sheets("Enviar A360").Activate
Range("A4", "AC" & LastRowA).Select
Range("A4", "AC" & LastRowA).Copy
' Configuração do e-mail
With OutlookMail
    .To = Destino
    .CC = CC
    .Subject = Assunto
    ' Configurar o corpo do e-mail
    .Display
    Set xInspect = .GetInspector
    Set pageEditor = xInspect.WordEditor
    pageEditor.Application.Selection.EndKey Unit:=6
    pageEditor.Application.Selection.TypeParagraph
    pageEditor.Application.Selection.TypeText Conteudo
    pageEditor.Application.Selection.TypeParagraph
    pageEditor.Application.Selection.TypeText Assinatura
    pageEditor.Application.Selection.TypeParagraph
    pageEditor.Application.Selection.TypeParagraph
    pageEditor.Application.Selection.Paste
```

Figure A.6: Code for sending automatic mail to A360(continuation).

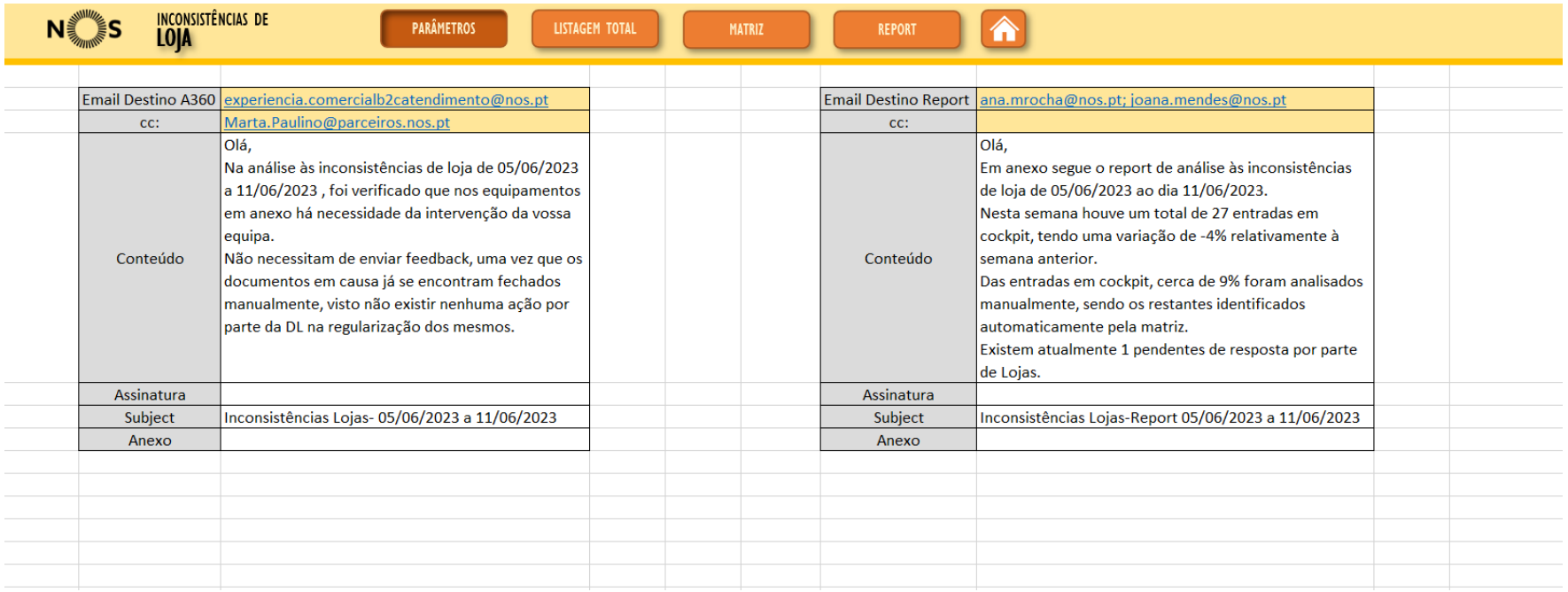


Figure A.7: Pre-set parameters for automatic mail sending.

```
Sub EnviarEmailReport()

    ' Copiar a planilha
    Dim planilhaOrigem As Worksheet
    Dim planilhaCopia As Worksheet
    Set planilhaOrigem1 = ThisWorkbook.Worksheets("Report-Analise")
    Set planilhaOrigem2 = ThisWorkbook.Worksheets("Report-Tabelas")
    Set planilhaCopia1 = ThisWorkbook.Worksheets.Add
    Set planilhaCopia2 = ThisWorkbook.Worksheets.Add
    planilhaOrigem1.Cells.Copy Destination:=planilhaCopia1.Cells(1, 1)
    planilhaOrigem2.Cells.Copy Destination:=planilhaCopia2.Cells(1, 1)
    Dim novoArquivo As Workbook
    Dim novoArquivoNome As String
    novoArquivoNome = "Z:\LogisticaDireta\08_Processos e Controlo de Equipamentos\O_Inconsistências de Loja\Report-Analise.xlsx"

    ' Abrir o arquivo existente
    Set novoArquivo = Application.Workbooks.Open(novoArquivoNome)

    ' Mover a planilha copiada para o novo arquivo
    planilhaCopia1.Move Before:=novoArquivo.Sheets(1)
    planilhaCopia2.Move Before:=novoArquivo.Sheets(1)
    Application.DisplayAlerts = False
    ' Apagar todas as planilhas do novo arquivo, exceto a primeira
    Dim i As Integer
    For i = novoArquivo.Sheets.Count To 3 Step -1
    novoArquivo.Sheets(i).Delete
    Next i
    Application.DisplayAlerts = True

     ' Desativar as gridlines na primeira planilha do novo arquivo
     novoArquivo.Sheets(2).Activate
    ActiveWindow.DisplayGridlines = False
    novoArquivo.Save

    ' Configurar o objeto Outlook
    Dim OutlookApp As Object
    Dim OutlookMail As Object
    Dim planilhaParametros As Worksheet
    Set OutlookApp = CreateObject("Outlook.Application")
    Set OutlookMail = OutlookApp.CreateItem(0)
```

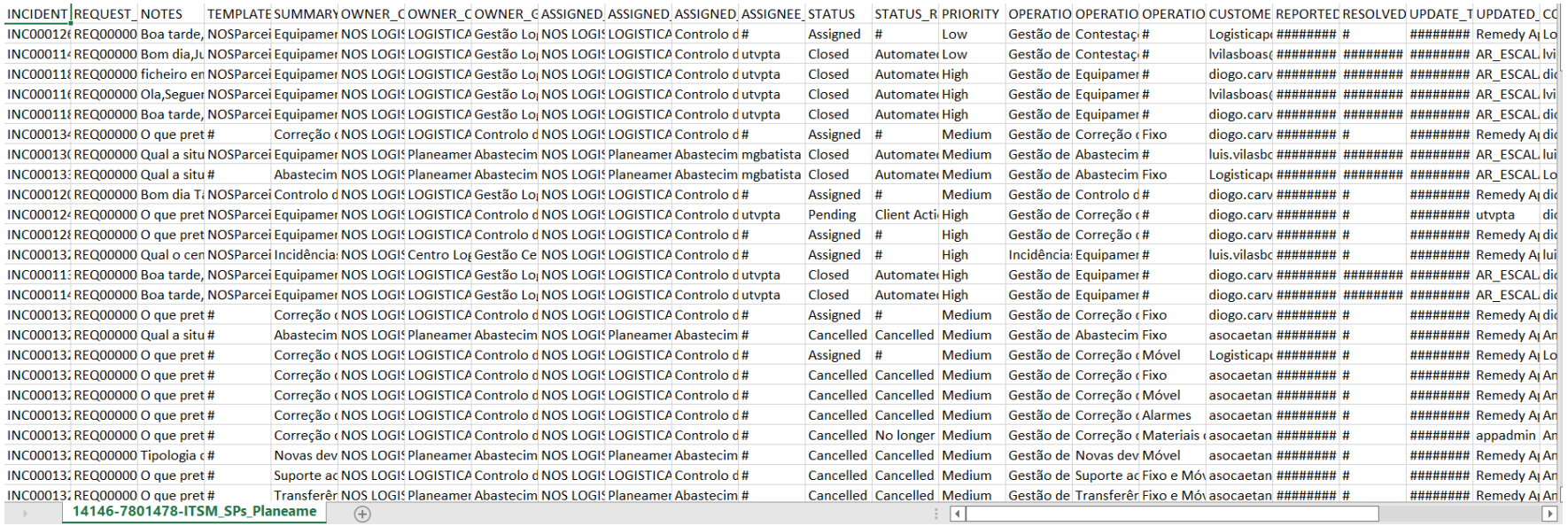
Figure A.8: Code for automatically sending the mail with the week's report.

```
    Set OutlookApp = CreateObject( Outlook.Application )
    Set OutlookMail = OutlookApp.CreateItem(0)
    ' Configurar as variáveis para os dados do e-mail
    Dim Destino As String
    Dim CC As String
    Dim Assunto As String
    Dim Conteudo As String
    Dim Assinatura As String
    Set planilhaParametros = ThisWorkbook.Worksheets("Parâmetros")
    Destino = planilhaParametros.Range("H4").Value
    CC = planilhaParametros.Range("H5").Value
    Assunto = planilhaParametros.Range("H8").Value
    Assinatura = planilhaParametros.Range("H7").Value
    Conteudo = planilhaParametros.Range("H6").Value
    ' Configurar o e-mail
    With OutlookMail
        .To = Destino
        .CC = CC
        .Subject = Assunto
        .Attachments.Add novoArquivoNome ' Anexar o novo arquivo

         ' Configurar o corpo do e-mail
        .Display
        Set xInspect = .GetInspector
        Set pageEditor = xInspect.WordEditor

        pageEditor.Application.Selection.EndKey Unit:=6
        pageEditor.Application.Selection.TypeParagraph
        pageEditor.Application.Selection.TypeText Conteudo
        pageEditor.Application.Selection.TypeParagraph
        pageEditor.Application.Selection.TypeText Assinatura

        .Display ' Mostrar e-mail para revisão antes de enviar
    End With

      ' Fechar o novo arquivo sem salvar alterações
     novoArquivo.Close False

    ' Limpar o objeto do Outlook
    Set OutlookMail = Nothing
    Set OutlookApp = Nothing

End Sub
```

Figure A.9: Code for automatically sending the mail with the week’s report(continuation).

Appendix B

Ticketing for Logistics Support



INCIDENT	REQUEST_	NOTES	TEMPLATE	SUMMARY	OWNER_C	OWNER_C	OWNER_G	ASSIGNED	ASSIGNED	ASSIGNED	ASSIGNEE_	STATUS	STATUS_R	PRIORITY	OPERATIO	OPERATIO	OPERATIO	CUSTOME	REPORTED	RESOLVED	UPDATE_T	UPDATED_	CC
INC00012	REQ00000	Boa tarde,	NOSParcei	Equipamer	NOS LOGI	LOGISTICA	Gestão Lo	NOS LOGI	LOGISTICA	Controlo d	#	Assigned	#	Low	Gestão de	Contestaç	#	Logisticap	########	#	########	Remedy Ap	Lo
INC00011	REQ00000	Bom dia,Ju	NOSParcei	Equipamer	NOS LOGI	LOGISTICA	Gestão Lo	NOS LOGI	LOGISTICA	Controlo d	utvpta	Closed	Automate	Low	Gestão de	Contestaç	#	lvilasboas	########	########	########	AR_ESCAL	lvi
INC00011	REQ00000	ficheiro en	NOSParcei	Equipamer	NOS LOGI	LOGISTICA	Gestão Lo	NOS LOGI	LOGISTICA	Controlo d	utvpta	Closed	Automate	High	Gestão de	Equipamer	#	diogo.carv	########	########	########	AR_ESCAL	dio
INC00011	REQ00000	Ola,Seguer	NOSParcei	Equipamer	NOS LOGI	LOGISTICA	Gestão Lo	NOS LOGI	LOGISTICA	Controlo d	utvpta	Closed	Automate	High	Gestão de	Equipamer	#	lvilasboas	########	########	########	AR_ESCAL	lvi
INC00011	REQ00000	Boa tarde,	NOSParcei	Equipamer	NOS LOGI	LOGISTICA	Gestão Lo	NOS LOGI	LOGISTICA	Controlo d	utvpta	Closed	Automate	High	Gestão de	Equipamer	#	diogo.carv	########	########	########	AR_ESCAL	dio
INC00013	REQ00000	O que pret	#	Correção (	NOS LOGI	LOGISTICA	Controlo d	NOS LOGI	LOGISTICA	Controlo d	#	Assigned	#	Medium	Gestão de	Correção (	Fixo	diogo.carv	########	#	########	Remedy Ap	dio
INC00013	REQ00000	Qual a situ	NOSParcei	Equipamer	NOS LOGI	Planeamer	Abastecim	NOS LOGI	Planeamer	Abastecim	mgbatista	Closed	Automate	Medium	Gestão de	Abastecim	#	luis.vilasbo	########	########	########	AR_ESCAL	lui
INC00013	REQ00000	Qual a situ	#	Abastecim	NOS LOGI	Planeamer	Abastecim	NOS LOGI	Planeamer	Abastecim	mgbatista	Closed	Automate	Medium	Gestão de	Abastecim	Fixo	Logisticap	########	########	########	AR_ESCAL	Lo
INC00012	REQ00000	Bom dia T	NOSParcei	Controlo d	NOS LOGI	LOGISTICA	Gestão Lo	NOS LOGI	LOGISTICA	Controlo d	#	Assigned	#	Medium	Gestão de	Controlo d	#	diogo.carv	########	#	########	Remedy Ap	dio
INC00012	REQ00000	O que pret	NOSParcei	Equipamer	NOS LOGI	LOGISTICA	Controlo d	NOS LOGI	LOGISTICA	Controlo d	utvpta	Pending	Client Acti	High	Gestão de	Correção (	#	diogo.carv	########	#	########	utvpta	dio
INC00012	REQ00000	O que pret	NOSParcei	Equipamer	NOS LOGI	LOGISTICA	Controlo d	NOS LOGI	LOGISTICA	Controlo d	#	Assigned	#	High	Gestão de	Correção (	#	diogo.carv	########	#	########	Remedy Ap	dio
INC00013	REQ00000	Qual o cen	NOSParcei	Incidência	NOS LOGI	Centro Lo	Gestão Ce	NOS LOGI	LOGISTICA	Controlo d	#	Assigned	#	High	Incidência	Equipamer	#	luis.vilasbo	########	#	########	Remedy Ap	lui
INC00011	REQ00000	Boa tarde,	NOSParcei	Equipamer	NOS LOGI	LOGISTICA	Gestão Lo	NOS LOGI	LOGISTICA	Controlo d	utvpta	Closed	Automate	High	Gestão de	Equipamer	#	diogo.carv	########	########	########	AR_ESCAL	dio
INC00011	REQ00000	Boa tarde,	NOSParcei	Equipamer	NOS LOGI	LOGISTICA	Gestão Lo	NOS LOGI	LOGISTICA	Controlo d	utvpta	Closed	Automate	High	Gestão de	Equipamer	#	diogo.carv	########	########	########	AR_ESCAL	dio
INC00013	REQ00000	O que pret	#	Correção (	NOS LOGI	LOGISTICA	Controlo d	NOS LOGI	LOGISTICA	Controlo d	#	Assigned	#	Medium	Gestão de	Correção (	Fixo	diogo.carv	########	#	########	Remedy Ap	dio
INC00013	REQ00000	Qual a situ	#	Abastecim	NOS LOGI	Planeamer	Abastecim	NOS LOGI	Planeamer	Abastecim	#	Cancelled	Cancelled	Medium	Gestão de	Abastecim	Fixo	asocaetan	########	#	########	Remedy Ap	An
INC00013	REQ00000	O que pret	#	Correção (	NOS LOGI	LOGISTICA	Controlo d	NOS LOGI	LOGISTICA	Controlo d	#	Assigned	#	Medium	Gestão de	Correção (	Móvel	Logisticap	########	#	########	Remedy Ap	Lo
INC00013	REQ00000	O que pret	#	Correção (	NOS LOGI	LOGISTICA	Controlo d	NOS LOGI	LOGISTICA	Controlo d	#	Cancelled	Cancelled	Medium	Gestão de	Correção (	Fixo	asocaetan	########	#	########	Remedy Ap	An
INC00013	REQ00000	O que pret	#	Correção (	NOS LOGI	LOGISTICA	Controlo d	NOS LOGI	LOGISTICA	Controlo d	#	Cancelled	Cancelled	Medium	Gestão de	Correção (	Móvel	asocaetan	########	#	########	Remedy Ap	An
INC00013	REQ00000	O que pret	#	Correção (	NOS LOGI	LOGISTICA	Controlo d	NOS LOGI	LOGISTICA	Controlo d	#	Cancelled	Cancelled	Medium	Gestão de	Correção (	Alarmes	asocaetan	########	#	########	Remedy Ap	An
INC00013	REQ00000	O que pret	#	Correção (	NOS LOGI	LOGISTICA	Controlo d	NOS LOGI	LOGISTICA	Controlo d	#	Cancelled	No longer	Medium	Gestão de	Correção (	Materiais (	asocaetan	########	#	########	appadmin	An
INC00013	REQ00000	Tipologia (	#	Novas dev	NOS LOGI	Planeamer	Abastecim	NOS LOGI	Planeamer	Abastecim	#	Cancelled	Cancelled	Medium	Gestão de	Novas dev	Móvel	asocaetan	########	#	########	Remedy Ap	An
INC00013	REQ00000	O que pret	#	Suporte ac	NOS LOGI	LOGISTICA	Controlo d	NOS LOGI	LOGISTICA	Controlo d	#	Cancelled	Cancelled	Medium	Gestão de	Suporte ac	Fixo e Móv	asocaetan	########	#	########	Remedy Ap	An
INC00013	REQ00000	O que pret	#	Transferên	NOS LOGI	Planeamer	Abastecim	NOS LOGI	Planeamer	Abastecim	#	Cancelled	Cancelled	Medium	Gestão de	Transferên	Fixo e Móv	asocaetan	########	#	########	Remedy Ap	An

14146-7801478-ITSM_SPs_Planeame

Figure B.1: Report that serves as the database for the dashboard.

STATUS_ITSM	STATUS_REASON	Status Nível 1	Status Nível 2	Chave Status
Assigned	#	Pendente NOS		Assigned#
Cancelled	#	Fechado		Cancelled#
Cancelled	Cancelled by Client	Fechado		CancelledCancelled by Client
Cancelled	Cancelled by Requester	Fechado		CancelledCancelled by Requester
Cancelled	Cancelled by Support	Fechado		CancelledCancelled by Support
Cancelled	No longer a Causal CI	Fechado		CancelledNo longer a Causal CI
Closed	#	Fechado		Closed#
Closed	Automated Resolution Reported	Fechado		ClosedAutomated Resolution Reported
Closed	Customer Close	Fechado		ClosedCustomer Close
Closed	Successful	Fechado		ClosedSuccessful
Closed	Successful with Issues	Fechado		ClosedSuccessful with Issues
Closed	System Close	Fechado		ClosedSystem Close
Closed	System Close with Issues	Fechado		ClosedSystem Close with Issues
Completed	#	Fechado		Completed#
Completed	Successful	Fechado	Fechado OK	CompletedSuccessful
Completed	Successful with Issues	Fechado	Fechado NOK	CompletedSuccessful with Issues
In Progress	#	Pendente NOS		In Progress#
Pending	#	Pendente SPs/Armazém		Pending#
Pending	Client Additional Information Requested	Pendente SPs/Armazém		PendingClient Additional Information Requested
Pending	Supplier Delivery	Pendente SPs/Armazém		PendingSupplier Delivery
Pending	Third Party Vendor Action Required	Pendente SPs/Armazém		PendingThird Party Vendor Action Required
Pending	Cliente Hold	Pendente SPs/Armazém		PendingCliente Hold
Pending	Client Action Required	Pendente SPs/Armazém		PendingClient Action Required
Pending	Support Contact Hold	Pendente SPs/Armazém		PendingSupport Contact Hold
Pending	Local Site Action Required	Pendente SPs/Armazém		PendingLocal Site Action Required
Pending	Purchase Order Approval	Pendente SPs/Armazém		PendingPurchase Order Approval
Pending	Infrastructure Change	Pendente SPs/Armazém		PendingInfrastructure Change

Figure B.2: Support Matrix for Ticket Status Assignment.

Categoria	Tipificação	M/F	User	Responsável	Tipo de Ocorrência (Incidente/Pedido)	Subgrupo ITSM
Equipamentos/Stock	Abastecimento	Fixo	mgbatista	Márcia Batista	Incidente	Abastecimento SPs
Equipamentos/Stock	Abastecimento	Fixo	mgbatista	Márcia Batista	Incidente	Abastecimento SPs
Equipamentos/Stock	Abastecimento	Materiais de rede	fdsantos	Francisca Santos	Incidente	Materiais de Rede
Equipamentos/Stock	Abastecimento	Materiais de rede	fdsantos	Francisca Santos	Incidente	Materiais de Rede
Equipamentos/Stock	Acreditações	Fixo	antonio.j.henriques	António Henriques	Incidente	Processamento e contr
Equipamentos/Stock	Contestações Inventários	Fixo	utvpta	Tânia Araújo	Incidente	Controlo de Equipamer
Equipamentos/Stock	Controlo de Prazos- Direta	Fixo	mgbatista	Márcia Batista	Incidente	Abastecimento SPs
Equipamentos/Stock	Controlo de Prazos- Inversa	Fixo	utvpta	Tânia Araújo	Incidente	Controlo de Equipamer
Equipamentos/Stock	Correção de Stocks	Fixo	utvpta	Tânia Araújo	Incidente	Controlo de Equipamer
Equipamentos/Stock	Correção de Stocks	Fixo	utvpta	Tânia Araújo	Incidente	Controlo de Equipamer
Equipamentos/Stock	Correção de Stocks	Fixo	utvpta	Tânia Araújo	Incidente	Controlo de Equipamer
Equipamentos/Stock	Correção de Stocks	Materiais de rede	fdsantos	Francisca Santos	Incidente	Materiais de Rede
Equipamentos/Stock	Devoluções V+I	Fixo	antonio.j.henriques	António Henriques	Incidente	Processamento e contr
Equipamentos/Stock	Mudança de Tecnologia	Fixo	mgbatista	Márcia Batista	Incidente	Abastecimento SPs
Equipamentos/Stock	Novas devoluções - Stock Direta SPs	Fixo	mgbatista	Márcia Batista	Incidente	Abastecimento SPs
Equipamentos/Stock	Novas devoluções - Stock Direta SPs	Fixo	mgbatista	Márcia Batista	Incidente	Abastecimento SPs
Equipamentos/Stock	Novas devoluções - Stock Direta SPs	Materiais de rede	fdsantos	Francisca Santos	Incidente	Materiais de Rede
Equipamentos/Stock	Novas devoluções - Stock Direta SPs	Materiais de rede	fdsantos	Francisca Santos	Incidente	Materiais de Rede
Equipamentos/Stock	Suporte Portal	Fixo	utvpta	Tânia Araújo	Incidente	Controlo de Equipamer
Equipamentos/Stock	Suporte Portal	Fixo	utvpta	Tânia Araújo	Incidente	Controlo de Equipamer
Equipamentos/Stock	Suporte Portal	Materiais de rede	fdsantos	Francisca Santos	Incidente	Materiais de Rede
Equipamentos/Stock	Transferência entre Armazéns	Fixo	utvpta	Tânia Araújo	Incidente	Controlo de Equipamer
Equipamentos/Stock	Transferência entre Armazéns	Materiais de rede	fdsantos	Francisca Santos	Incidente	Materiais de Rede
Equipamentos/Stock	Abastecimento	Fixo	mgbatista	Márcia Batista	Incidente	Abastecimento SPs
Equipamentos/Stock	Acreditações	Fixo	antonio.j.henriques	António Henriques	Incidente	Processamento e contr
Equipamentos/Stock	Contestações Inventários	Fixo	utvpta	Tânia Araújo	Incidente	Controlo de Equipamer
Equipamentos/Stock	Correção de Stocks	Fixo	utvpta	Tânia Araújo	Incidente	Controlo de Equipamer

Figure B.3: Support matrix for assigning a responsible person for tickets.

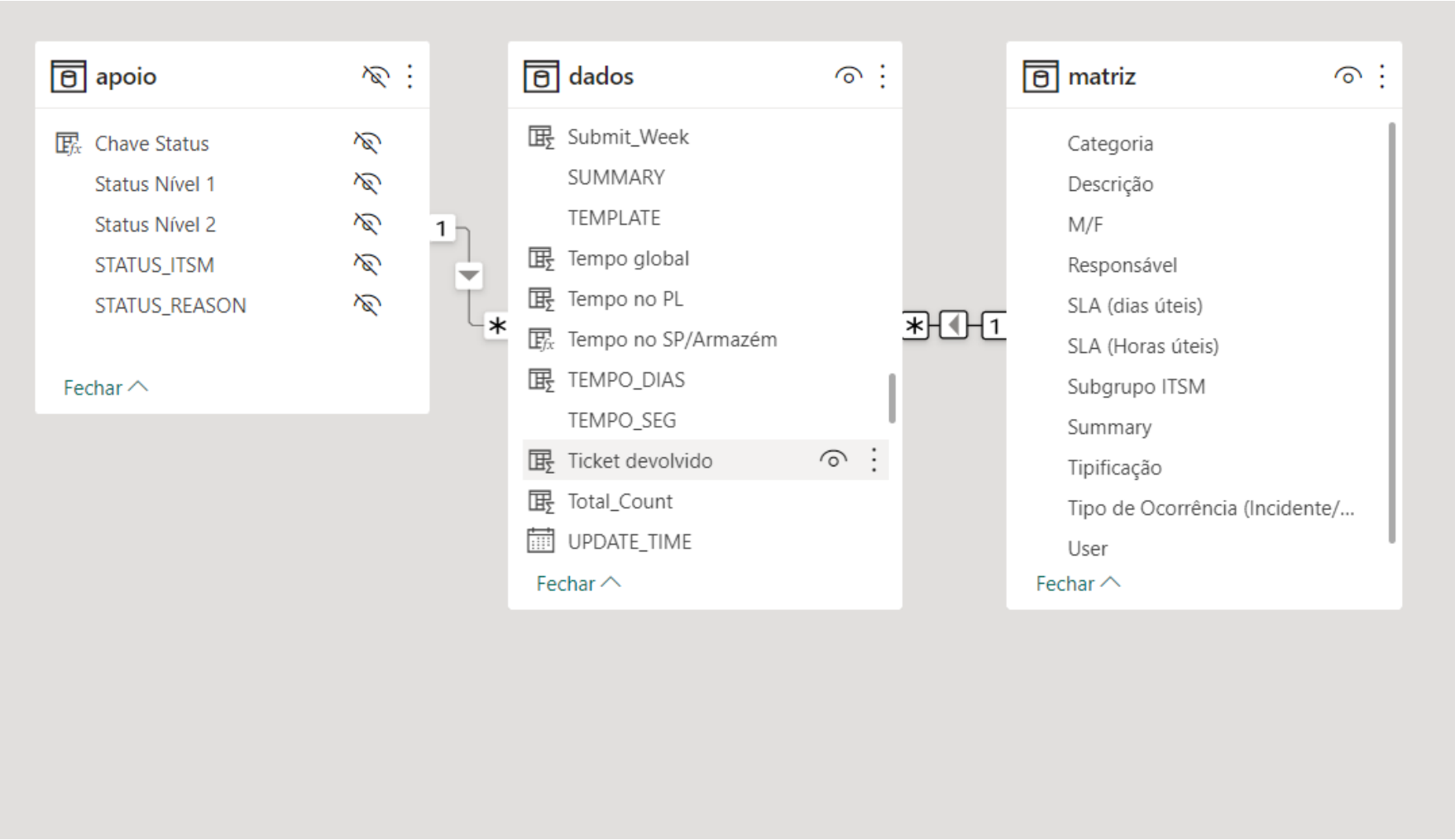


Figure B.4: Relationships Between Data models.

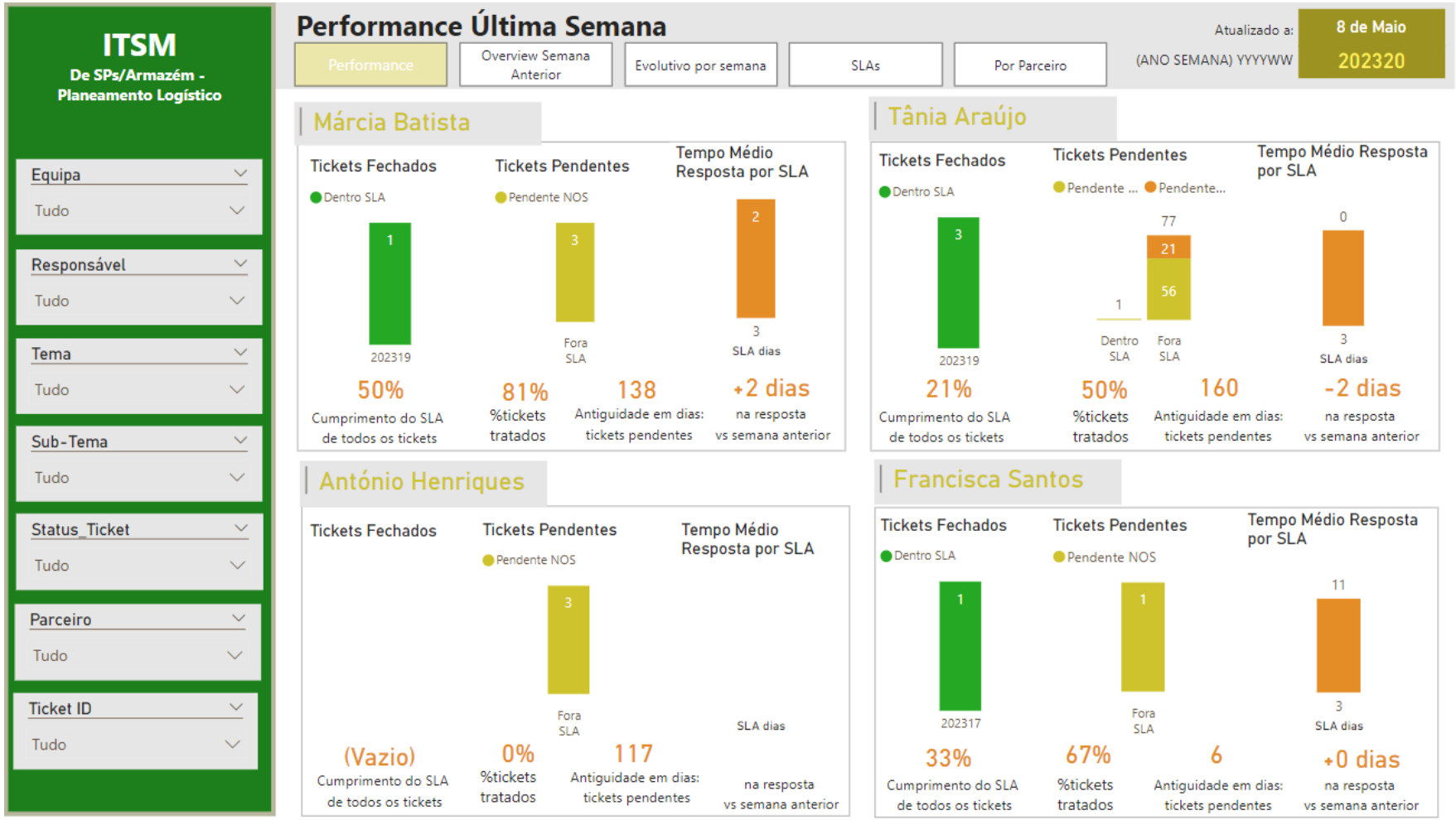


Figure B.5: Dashboard Page: Performance Last Week.

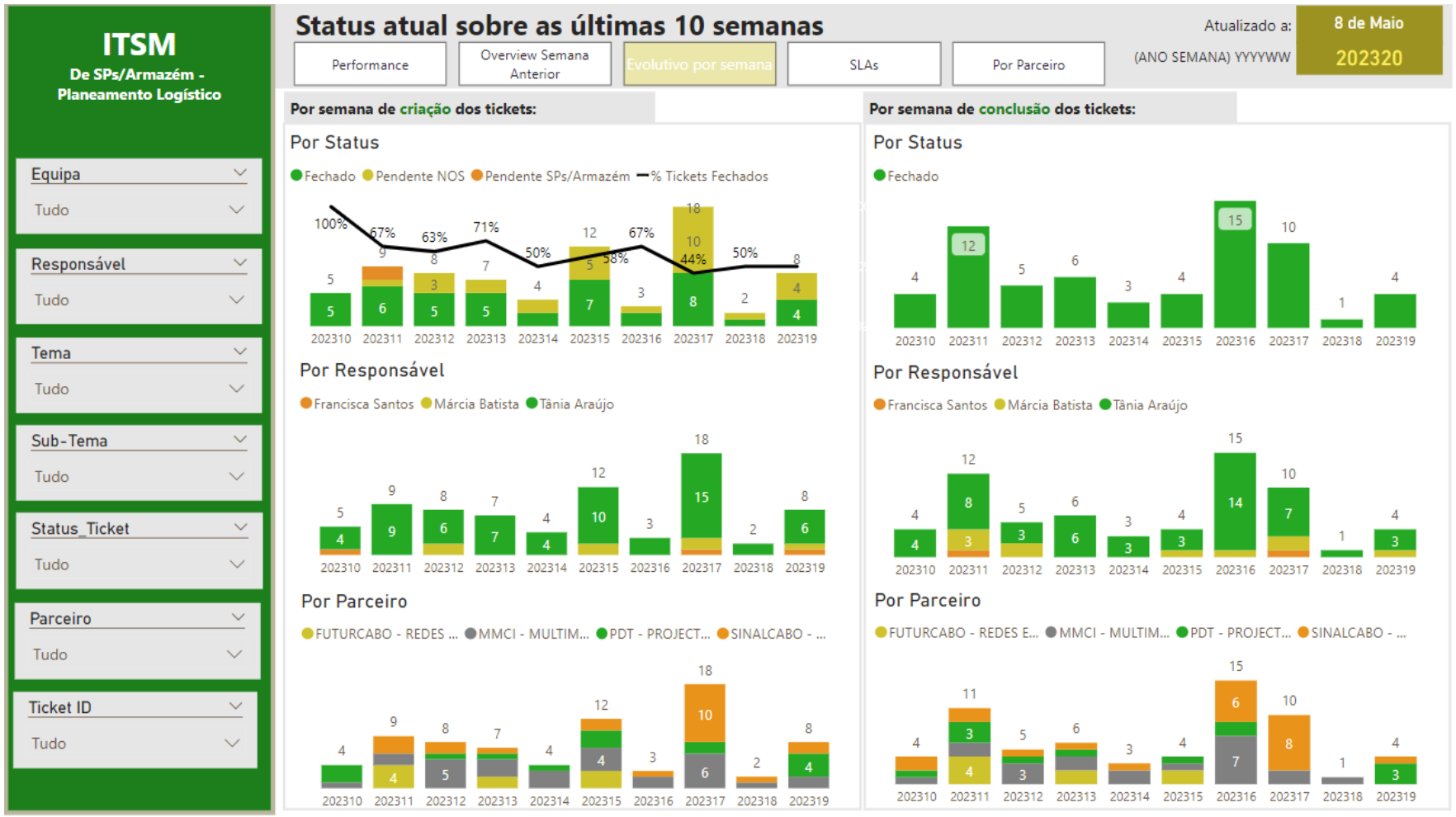


Figure B.6: Dashboard Page: Evolution by Week.

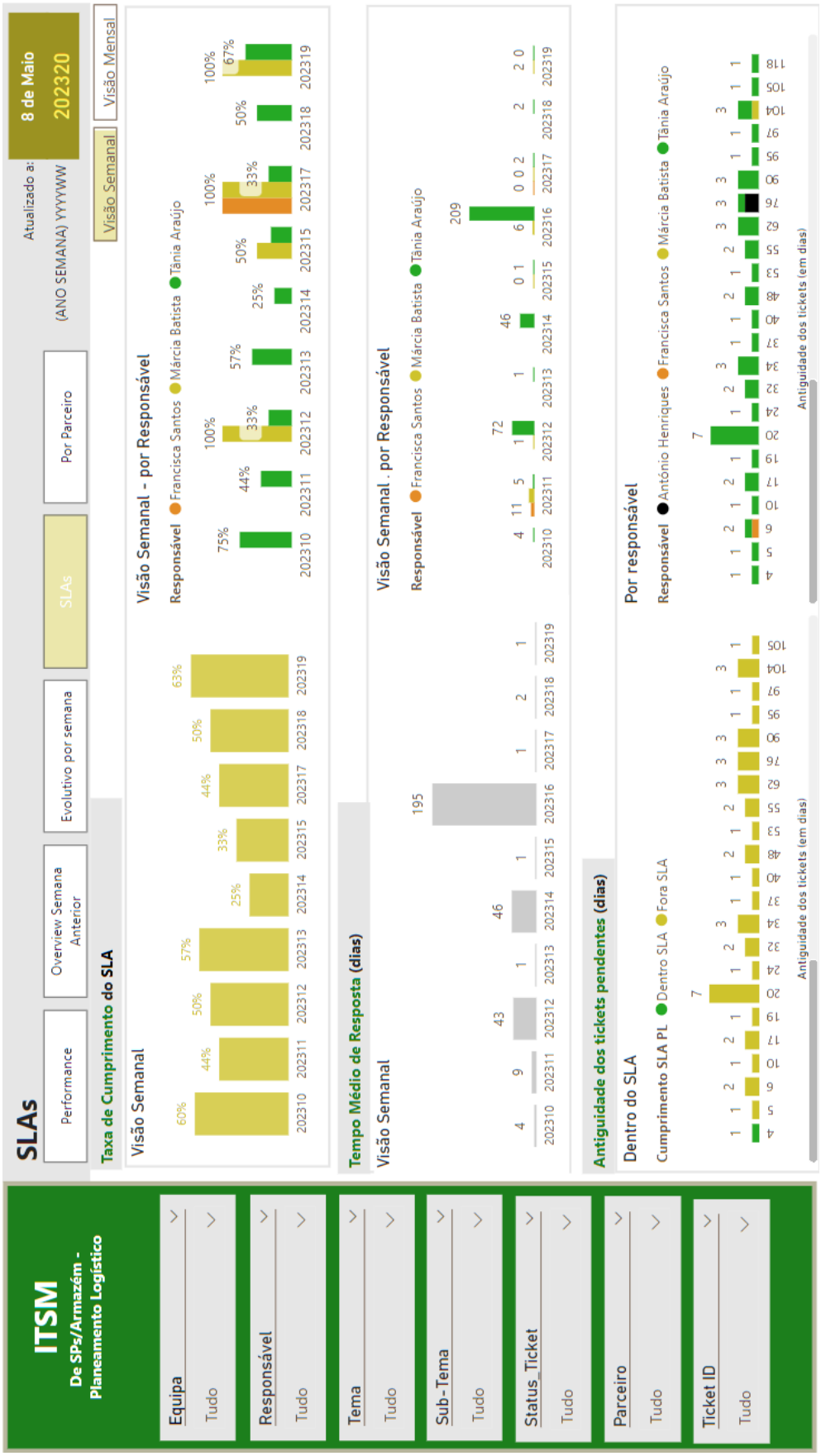


Figure B.7: Dashboard Page: SLAs.

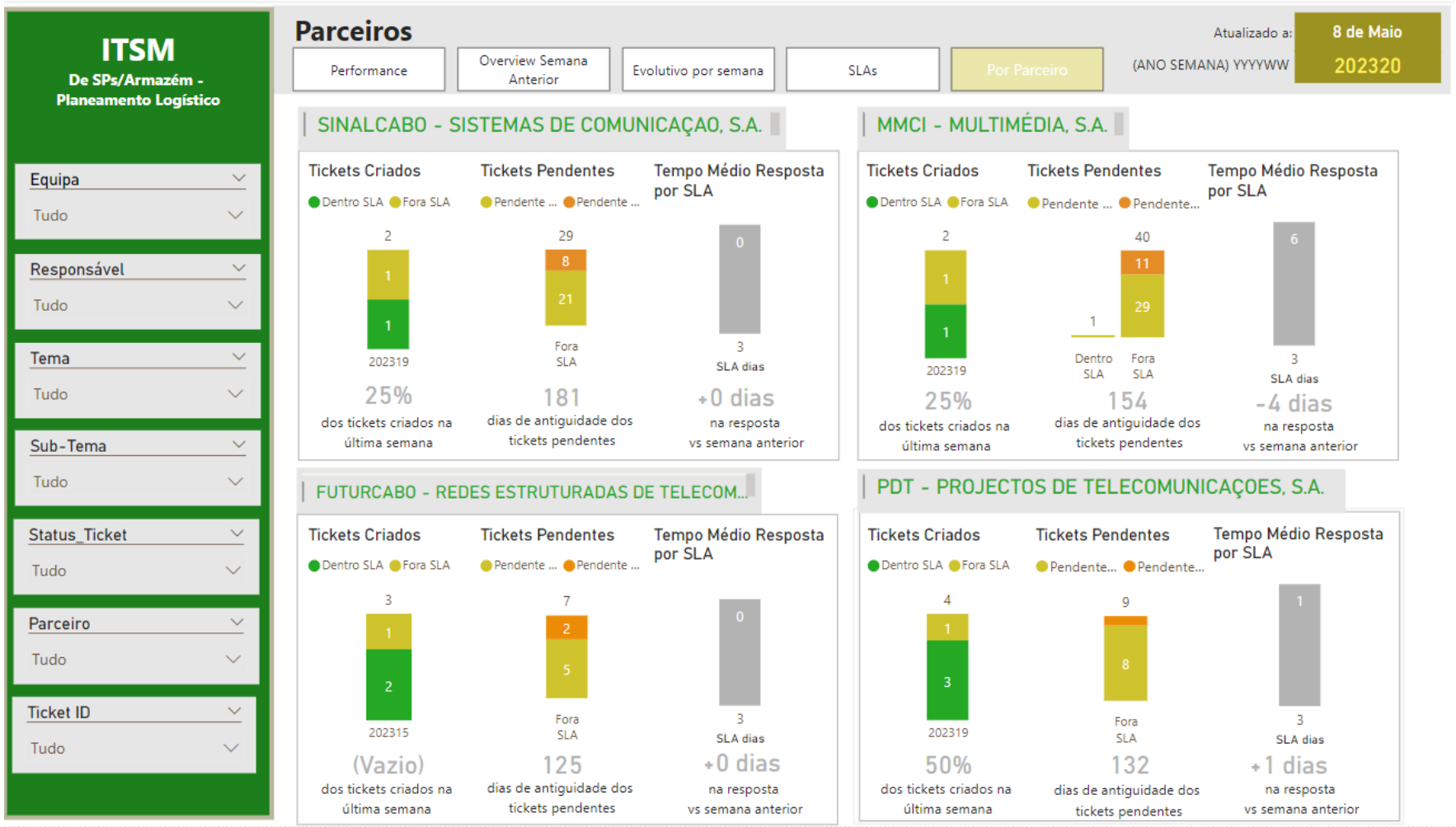


Figure B.8: Dashboard Page: Partners.

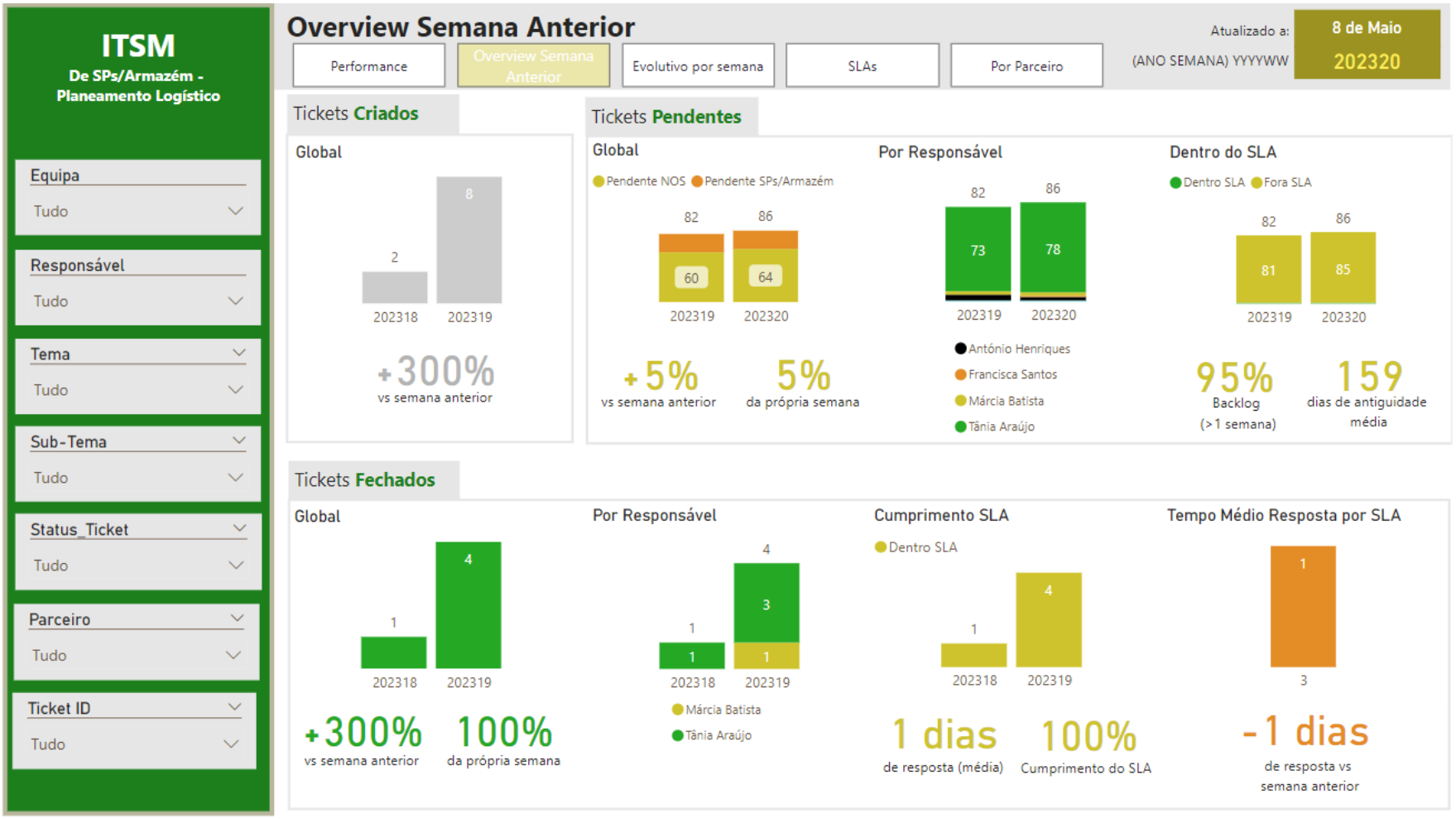


Figure B.9: Dashboard Page: Overview last week.