Master

Management Information Systems

Master´s Final Work

Internship Report

The Adoption of Business Intelligence Tools in Organizational Decision Making

Catarina Gonçalves Vieira

October 2024

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The Adoption of Business Intelligence Tools in Organizational Decision Making

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GLOSSARY

AI - Artificial Intelligence

BI - Business Intelligence

DL - Data Lake

DM - Data Mining

DW - Data Warehouse

ETL - Extraction, Transformation, and Loading

EU - European Union

IT - Information Technology

IoT - Internet of Things

KPI - Key Performance Indicator

ML - Machine Learning

OLAP- Online Analytical Processing

QA – Quality Assurance

ROI - Return on Investment

RPA - Robotic Process Automation

SAC - SAP Analytics Cloud

SAP - System Applications and Products

ABSTRACT

This report details the experience of curricular internship at Brighten Consulting, in the Digital department, on Business Intelligence (BI) tools. During the internship, it was possible to obtain local experience in an international consultancy, in an area of interest. In this, three dashboards were developed covering different functional areas: Sales, Logistics, and Purchasing, from the initial definition of metrics to visual implementation, constituting a relevant element for the organizational decision-making process.

The main objective of the internship was to apply the theoretical and practical knowledge acquired throughout the academic journey to create several dashboards adopting the Power BI. The experience allowed to consolidate knowledge in BI, when dealing with challenges such as obtaining complete and quality information, in addition to the risk of data manipulation, issues that align with the difficulties described in the review literature.

The Purchasing, Sales, and Logistics dashboards play complementary roles, offering a broad and integrated view of the company's performance and operations. The internship therefore allowed a strategic view of the different business areas and the importance of BI tools to optimize processes.

The report highlights the growing importance of BI as a key catalyst for driving operational efficiency in organizations by providing valuable insights from complex data. The comprehensive literature review on BI provides deeper insights, with a special focus on data visualization tools.

Keywords: Business Intelligence, Data integration, Efficiency, Visualization Tools, Dashboard

RESUMO

Este relatório detalha a experiência de estágio curricular na Brighten Consulting, no departamento Digital, em Business Intelligence (BI) tools. Durante o estágio, foi possível obter uma experiência local numa consultora internacional, numa área de interesse. Neste, foram desenvolvidos três dashboards abrangendo áreas funcionais distintas: Vendas, Logística e Compras, desde a definição inicial de métricas até a implementação visual o que constituiu um elemento relevante para o processo de tomada de decisão organizacional.

O principal objetivo do estágio foi aplicar o conhecimento teórico e prático adquirido ao longo da jornada acadêmica na criação de diversos dashboards utilizando a ferramenta Power BI. A experiência permitiu consolidar os conhecimentos em BI, ao lidar com desafios como a obtenção de informações completas e de qualidade, além do risco de manipulação de dados, questões que se alinham com as dificuldades descritas na literatura de revisão.

Os dashboards de Compras, Vendas e Logística desempenham papéis complementares, oferecendo uma visão ampla e integrada do desempenho e das operações da empresa. O estágio permitiu, portanto, uma visão estratégica das várias áreas de negócios e da importância de ferramentas de BI para otimizar processos.

O relatório destaca a crescente importância do BI como um catalisador fundamental para impulsionar a eficiência operacional nas organizações, fornecendo insights valiosos a partir de dados complexos. A revisão abrangente da literatura sobre BI fornece um conhecimento mais profundo, com foco especial em ferramentas de visualização de dados.

Palavras Chaves: Business Intelligence, Integração de Dados, Eficiência, Ferramentas de visualização, Dashboard

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1. INTRODUCTION

The growing volume of data from different sources and sectors has driven the search for tools that enable more efficient interpretation, understanding, and use of this complex information. Business Intelligence (BI) tools play a pivotal role in transforming complex datasets into insights that inform strategic decision-making. In this context, BI tools are essential for enterprises aiming to extract valuable insights from their data, insights that might be difficult to uncover initially. (Siddiqui, 2021)

The information analysis process is fundamental for business management, especially for making strategic decisions. Effective visual representation not only communicates information more clearly but also promotes deeper understanding, enabling quick decisions and the development of scenarios and simulations considering aspects external to the company. (Stefanini, 2012)

Companies adopt BI tools are supported to make their processes more transparent and intelligent. Furthermore, they make better decisions, achieve results faster, reduce costs and risks, and increase added value. (Azeroual & Theel, 2018)

Data visualization emerges as a useful tool, excelling in simplifying the complexity of data, and identifying patterns, trends, and insights. (Siddiqui, 2021)

In this context, to complete the master's degree in management information systems at the Lisbon School of Economics and Management (ISEG), an internship was carried out at Brighten Consulting, in the digital department, in the BI area. The objective was to apply the knowledge acquired throughout the master's degree in business practice. During the internship, three dashboards were developed covering the areas of Sales, Logistics, and Purchasing.

This internship report contains a literature review on the definition of BI and key concepts, BI architecture, benefits and challenges in implementation, and types of BI data visualization tools. Next, the company Brighten Consulting, where the internship was carried out, is presented. The internship plan the tasks performed in the organization and critical analysis are also presented.

It is important to note that Grammarly was used to improve the quality and accuracy of the text.

2. LITERATURE REVIEW

This chapter provides a comprehensive understanding of the theoretical foundations of BI, exploring the definition, main concepts, and BI architecture. The practical application of the BI architecture methodology, as experienced during the internship, allowed for a direct experience of the benefits and challenges of adoption tools such as Power BI. As well as a theoretical comparison of the main BI tools according to Gartner, thus enriching a broader view of the BI market.

2.1. Business Intelligence definition and main concepts

The traditional definition of BI emerged as a system of sharing information in organizations originally in the 1960s. Only in 1989 did the term BI appear with a new dimension and was used for the first time by Howard Dressner, which describes BI as concepts and methodologies intended to improve business decision-making through the utilization of fact-based support systems. (Dressner, 1989)

BI is about capturing, storing, understanding, analyzing, and transforming one of a company's most valuable assets (raw data) into actionable information to improve business performance (Azvine et al., 2005). While data consists of raw and unprocessed elements, representing isolated fragments of events, information results from the processing and relationship of this, elevating it to a more meaningful and applicable hierarchy for strategic decision-making (Baskarada & Koronios, 2013).

Evelson and Nicolson (2008) consider that BI is a set of methods, processes, architectures, applications, and technologies that gather and transform raw data into meaningful and useful information used to enable more effective, tactical, and operational strategies for decision-making to boost business performance. BI allows to make business decisions in the shortest possible time, incorporating applications and analyses of large amounts of data built on operational and analytical databases (Wang et al., 2022).

The BI process typically consists of data processing (data collection, processing, cleaning, and storage), analysis, and data presentation. The term "data presentation" describes the layer between data and humans. (Zheng, 2018)

2.2. BI architecture

BI architecture plays a crucial role in an organizations ability to extract valuable insights from data. This complex structure is made up of several interconnected layers that facilitate the collection, organization, analysis, and visualization. (Ong et al.,2011)

At the core of this architecture is firstly the Extraction, Transformation, and Loading (ETL) layer, where extraction consists of acquiring data from internal and external sources of an organization (Awiti & Zimányi, 2020). In the transformation phase, it ranges from cleaning the data, which includes correcting spelling errors or resolving conflicts, to processing missing elements or eliminating duplicate data. (Kimball, 2013). In the loading phase, data is loaded into a storage repository (Data Warehouse (DW) or Data Lake (DL)) providing a solid basis for query and analysis (Kimball, 2013).

DW is a central storage that collects and stores different data from internal and external sources from different sources in one place for querying, analysis, and decision-making. Furthermore, it also stores large amounts of historical data for long-term analysis (Li et al.,2007).

After loading the data into the DW, tools such as Online Analytical Processing (OLAP) offer a multidimensional view, allowing consultation, generation of reports, and interactive analysis. (Sen & Sinha, 2005). In addition, Data Mining (DM) can be used, a process that automatically identifies useful information, such as patterns, trends, and unusual relationships that are hidden in a large amount of data. OLAP and DM are used to process stored data, including complex queries, identifying trends, statistical analysis and applying algorithms to discover valuable insights hidden in the data. (Ong et al.,2011)

The end-user layer plays a key role in the accessibility and understanding of the insights generated. Through various presentation and visualization tools, this layer adapts information to different users and needs. Query and reporting tools allow users to quickly access data and create reports through interactive dashboards, dynamic reports, and

visualization tools. This makes information more accessible and easier to apply, enabling organizations to make informed and strategic decisions. (Ong et al.,2011)

2.3. Benefits of adoption Business Intelligence

The use of BI represents a significant milestone in organizations' ability to transform data into useful information for making strategic decisions. Through advanced data analysis and visualization techniques, BI offers a comprehensive view of both operational performance and market behavior, allowing for more informed and effective decision-making (Turban et al., 2018).

Furthermore, BI plays a crucial role in integrating information from different sources, promoting a holistic view of the business. This not only optimizes operational processes but also provides a platform for identifying trends and patterns and discovering future opportunities that guide the formulation of growth and innovation strategies (Sharda et al., 2015).

Other benefits of adoption BI are the illustration of information and problems using meaningful and realistic models; processing, evaluating, and presenting results in understandable forms, and using multimedia techniques (texts, graphics, images, and language). A study carried out on a group of start-ups (Azeroual & Theel, 2018) proved this, and these advantages can also be seen in other types of companies.

2.4. Challenges in BI Implementation

The successful implementation of BI in enterprises faces a few challenges that require careful strategies and approaches in an increasingly competitive and data-driven business environment.

In the business realm, having an ample supply of high-quality information and key performance indicators (KPIs) is crucial for decision-making (Azeroual & Theel, 2018). KPIs serve as quantifiable metrics of performance, offering objective evidence of progress toward the desired result and providing essential data for strategic decision-making (Leads 2b blog, 2022). The big challenge for companies is the difficulty in identifying KPIs, as well as having sufficient and quality information as this can lead to mistaken decisions and inappropriate actions if the information is not complete. This leads

to poor use of tools, making them inefficient. Many documents, shares, or databases are not published, nor available to others, that contain a lot of relevant information. (Azeroual & Theel, 2018).

Another big challenge is mainly the fusion of information. Most companies have their data stored in different systems and formats. Integrating this data from disparate sources into a single BI environment can be complex and requires an effective data integration strategy. Therefore, a global holistic view must be created to make more effective decisions. (Azeroual & Theel, 2018).

2.5. Data Visualization BI Tools

The BI tools for Data Visualization allow to reduce data interpretation time and perceive relevant data patterns and relationships from a large data set. The fact that information is presented through graphs and tables allows for better interpretation as humans are more receptive to images and graphs than to data in the format of text and numbers. (Pedrosa et al., 2019)

In other words, BI Data Visualization objectives are focused on supporting decision making, particularly it has two broad objectives: visualizing key metrics for easy and quick understanding, which directly facilitates decision making; provide a visual and interactive way to explore data. (Zheng, 2018)

These tools can be used by professionals or users without knowledge in the area, such as visualization tools: Power BI, Tableau, Qlick.

The next subchapter presents the Power BI in more detail, as it was the tool used throughout the internship.

2.5.1. Power BI

Power BI, a is a BI platform developed by Microsoft and launched in 2013. Renowned for its seamless integration with various Microsoft offerings like Excel and Azure, Power BI delivers a holistic and immensely effective data analysis experience, catering to organizations across diverse scales (Power BI, 2024).

Power BI provides an interface that enables users to generate interactive data visualizations, dashboards, and insightful reports. Moreover, the software simplifies the process of connecting to a diverse range of data sources, including spreadsheets, local databases, and cloud services. This versatility makes Power BI an ideal option for companies that want to consolidate information from different sources. (Power BI, 2024)

Power BI guarantees security in publishing reports carried out in the company and automatically regulates data with information updates. (Widjaja & Mauritsius, 2019)

Power BI also provides advanced analytics capabilities, such as incorporating predictive analytics and Machine Learning (ML) capabilities, allowing organizations to gain deeper insights and predict future trends based on their data. (Power BI, 2024)

2.5.2. Comparison of BI tools

There is a wide variety of tools that enable and help the construction of dashboards (Gartner, 2023). Figure 1 presents the magic quadrant of BI analysis platforms.

Figure 1: Magic Quadrant for analysis and BI platforms, prepared by Gartner | Source: Gartner 2024

Among all the available tools, three stand out: Power BI, Tableau, and Qlik. These are, according to Gartner, some of the leading tools. The comparison of these three tools can be made according to the following criteria: ease of use and interface; data analysis; data integration and connectivity; visualization capabilities; and licenses.

In terms of ease of use and interface, it was found that Power BI and Tableau are both intuitive and easy to use and can be easily used by users of different skill levels in data analysis while Qlik is intuitive, but requires a greater learning compared to the first two tools. (Pedrosa et al., 2019)

In terms of data analysis, Qlik is superior to the others, with sophisticated analyses that allow data discovery with in-memory technology, as well as relating between different sets of information dynamically. (Pedrosa et al., 2019)

In terms of data integration and connectivity, Power BI is superior, as it was developed by Microsoft, so it integrates perfectly with the various Microsoft products. (Power BI, 2024)

In terms of visualization capabilities, the four featured tools offer a wide range of data visualization options. The choice is often based on user preferences and the type of visualization desired. It can be said that Tableau demonstrates that it is the best on the market when it comes to creating dashboards, although Power BI is also very strong in this field. (Pedrosa et al., 2019)

In terms of licenses, Power BI and Qlik offers a free version, which can be an advantageous aspect for users who have a smaller volume of data as they do not need to invest in monetary terms. (Pedrosa et al., 2019)

According to Gartner research, the Qlik in terms of dynamics remains the lowest compared to the other tools. While they support existing customers in migrating to Qlik Sense, many users choose to modernize their businesses by choosing competing tools. (Richardson et al. 2021)

Another study concluded that Tableau and Power BI tools are the leaders in Data Visualization. (Pedrosa et al., 2019)

Based on these comparisons and studies carried out, it can be said that choosing the BI tool for Data Visualization that best adapts to an organization depends on many factors, and there are no better tools than others, each tool has its advantages and challenges.

3. IT INTERNACIONAL CONSULTING

In this chapter, the IT consultant is briefly introduced, along with a presentation of the digital department where the internship was conducted.

3.1. Brighten Consulting Overview

Brighten Consulting is an international IT consultancy specializing in delivering innovative technological solutions to enhance business performance. Its main objective is to help clients overcome challenges in their respective markets by appropriately using technology. The company operates with the vision "Simplify your business together". (Brighten Consulting, 2024)

The history of Brighten Consulting company began in 1998 with the establishment of the company Procensus, which was focused on offering skills and resources in SAP solutions. In 2015, it presented itself on the national and international market with a new image, as well as the launch of SAGE skills. In 2017, the Strategy & Operations department was established. In 2019, more than 50% of consulting activities expanded to European Union (EU) countries. In 2020, the Robotic Process Automation (RPA) department was created, marking the beginning of offering solutions in digital areas and Business Analytics. In 2021, Brighten Consulting emerged as the result of the merger between Procensus and OakPeak. (Brighten Consulting, 2024)

Brighten Consulting is a company that offers support in the following areas: Strategy & Operations, Enterprise Applications and Digital. It is worth mentioning that Enterprise Applications provides implementation and support of System Applications and Products and SAGE programs. Digital includes customized development and RPA solutions, through a partnership with UiPath and includes the BI area.

Brighten has more than 120 employees, 500 projects delivered, 100 customers and ends 2023 with a turnover of more than 8 million euros. It has developed specific

competencies in the areas of energy and natural resources, professional services, the consumer industry, discrete industries, financial services, and public services.

Recently, Brighten Consulting was awarded, for the second consecutive year, the status of "Best Company to Work For" in Portugal by Exam magazine, in partnership with ManpowerGroup Portugal. (Brighten Consulting, 2024)

3.2. Digital Department

Brighten Consulting's Digital department, where the internship was conducted, focuses on leveraging data analytics and BI tools to drive digital transformation for clients across various industries.

As previously stated, this department encompasses several areas to comprehensively support its customers, which are Big Data, Data Integration, Visualization, Predictive Analysis and IoTs.

The Big Data area aims to capture, store, and analyze large amounts of structured and unstructured data, to discover patterns, trends and hidden insights. This way, it allows the customers to make more informed and efficient decisions.

The Data Integration area ensures the seamless connection of different data sources providing a unified view, greater quality, and greater collaboration.

The Visualization area uses the tools Power BI, SAC and Qlick to transform complex data into easy-to-understand visual representations. This allows a greater understanding of information and a greater agility in decision-making.

The Predictive Analysis area uses the power of Artificial Intelligence (AI) and ML to anticipate trends, challenges, and future opportunities. This approach allows the customers to be ahead of competitors, which means greater competitiveness and decision-making based on concrete data.

Finally, the IoTs area consists of collecting, analyzing, and acting on real-time data from connected sensors. The integration of IoT with BI improves operational efficiency, decision-making and unlocks new growth opportunities.

4. INTERNSHIP

In this chapter, the objectives and internship plan that were defined at the beginning of the internship will be detailed. Furthermore, a detailed description of all the tasks performed during this period in the organization.

4.1. General Objectives of the Internship

The internship took place at the technology consultancy company Brighten Consulting. The internship period ran from January 9 to March 22, 2024. This was done in the Digital department to provide practical experience in using Power BI and Dax for data visualization and analysis. It is worth mentioning that throughout the internship the tasks were constantly monitored, and there was support from the team that works directly with Power BI, especially Maria Demétrio and Jorge Ferreira.

The main objectives pre-defined by the company for the intern's internship were the following:

- Acquire a comprehensive understanding of the Power BI tool and SQL language, and an introduction to the PowerQuery tool and Dax language;
- Develop the ability to efficiently integrate and transform multiple sources into Power BI;
- Acquire proficiency in creating visually appealing and interactive reports and dashboards;
- Enhance analytical skills to interpret complex data sets, identify patterns, trends, and outliers, and provide actionable insights to business stakeholders;
- Develop experience performing thorough testing of Power BI reports to ensure data accuracy, reliability, and adherence to best practices;
- Improve documentation skills by creating clear, easy-to-understand documents; and
- Enhance communication skills to effectively convey insights to non-technical stakeholders.

4.2. Timeline and tasks

The following table shows the general work planning stipulated in the internship plan for its development. The key tasks are Power BI report development, data integration, analysis and insights, documentation, and quality assurance (QA).

Tasks	**Calendar (months)**		
	January	February	March
Introduction and Initial Education	X		
Introduction to new tools	X		
BI Report Development	X	X	X
Data Integration	X	X	X
Analysis and Insights			X
Documentation			X
Quality Assurance		X	X

Figure 2: Schedule of activities prepared by Brighten Consulting in November 2023

The Power BI report development task involves collaborating with the team to understand the data requirements of internal panels, developing, and designing interactive and visually appealing reports in Power BI, and ensuring data accuracy and awareness in visual presentation.

The data integration task is related to implementing best practices for cleaning and transforming data and dealing with different data formats and structures.

Analysis and insights tasks consist of collaborating with internal stakeholders to understand business requirements and extract actionable insights from available data.

The documentation task aims to create clear documentation for the reports and panels developed, as well as create user guides for end users.

The quality assurance task aims to perform tests to ensure the accuracy and reliability of Power BI reports, as well as resolve any problems or discrepancies in the identified data or visualizations.

4.3. Description of the internship activities

During the internship, the activities developed were linked to the company's internal project, with a special focus on the "StarterPack" dashboard. "StarterPack" is the name given to the internal project aimed at creating dashboard for presentation to potential clients.

Initially, time was dedicated to exploring the different dashboards, understanding the diversity of the dashboard offered, and to familiarize with the Power BI application. These dashboards are presented to potential customers as a way of demonstrating the variety and quality of products offered by the company.

During this phase, several types of dashboards were analyzed, covering a wide range of areas. For example, the Commercial Portfolio dashboard makes it possible to analyze the company's turnover and gross margin, segmented by customer and month. Receipt Analysis dashboard provides a detailed view of credits per customer for invoices issued during a defined period. The Order Status dashboard offers an overview of orders placed and pending delivery. The Average Order dashboard provides a detailed commercial analysis, breaking down customer orders by sales representative and monthly value. The Sales dashboard offers a global view of the brand's sales. In the context of logistics, the logistics dashboard allows a comprehensive analysis of the company's stock and inventory, including a detailed analysis of each of the centers. Finally, the Purchasing dashboard offers an overview of the volume of orders from suppliers, by department, storage, and location.

After viewing the various dashboards, it was requested to enrich the Sales, Purchasing, and Logistics dashboards, aiming to provide a more complete view to potential customers, making them more comprehensive and strategic.

This task was subdivided into three phases, starting with enriching the sales, followed by the purchasing, and, finally, the logistics dashboard.

It is important to highlight that all data contained in the dashboards is fictitious.

4.4. Dashboard creation process

The dashboard creation process follows four steps, which are the examination of data, selection of metrics, development of the dashboards and documentation.

In the first step, all available information was examined to obtain a comprehensive understanding of the data and begin the process of creating and improving the dashboards. The information was available in several Excel sheets, which were uploaded to the respective Microsoft Teams area, thus ensuring that all team members have access to the data.

After loading the data, modifications were made to ensure the quality and accuracy of the information to be presented on the dashboards. This included applying filters, removing columns and rows that were blank, and linking all tables to ensure that all data was correlated. The integration of this data was carried out through the application of ETL techniques, including data collection, cleaning, and storage.

During this stage, the relevance of collaboration and data sharing within the team was highlighted, promoting an environment where all members are aligned and working together. Furthermore, the importance of data preparation techniques was also highlighted, such as filtering, removing blank values, and table linking. These techniques were key to ensuring data integrity and accuracy, ensuring it was ready for meaningful analysis and relevant insights. These preparation processes not only ensured data quality but also provided a solid foundation for data-informed decision-making.

In the second stage, the essential metrics to ensure customer satisfaction were identified and developed. During the metrics identification and development phase, the importance of selecting metrics relevant to business objectives was recognized. It was essential to formulate and calculate complex metrics effectively, adapting them to different functional area contexts and types of data. For each type of dashboard (sales, purchasing, and logistics), it was necessary to prioritize specific metrics, such as accumulated sales value, average delivery time, and efficiency of delivery routes, ensuring that the insights were relevant and useful for each area of the company's operation. This personalized approach contributed to the success of the dashboards, providing valuable information for making strategic decisions.

In the third stage, the dashboards were developed based on the identified metrics, adoption visualization tools to present the data in an accessible way for different stakeholders.

At this stage, it was crucial to understand the importance of presenting the data in an accessible way to different stakeholders. From selecting appropriate graphics to choosing colors and text style, every detail has been carefully considered to ensure an effective understanding of the information presented. Prioritizing clarity and accessibility, by providing useful insights concisely and understandably, benefiting the entire organization.

Lastly, at four stages, a detailed document was created where each dashboard was described, providing users with a comprehensive understanding of what each one offers. Each dashboard is accompanied by a brief text that highlights the types of charts available, the information contained in each chart, and the filters available for a more personalized experience. This document aims to improve the utility and efficiency of each dashboard, enabling users to derive valuable insights and facilitate informed decision-making with greater efficacy.

These dashboards present complex data in insights, enhancing the decision-making process.

4.4.1. Sales Dashboard

The following 14 sales metrics are selected based on sales data available in five Excel sheets:

1. Cumulative Sales Value:
    - Description: Measures the total accumulated sales value up to the current period, considering the current year.
    - Formula:
```
YTD Sales = IF(ISBLANK(TOTALYTD(SUM(Sales[Montante Linha]), 'Calendar'[Date])), "-", TOTALYTD(SUM(Sales[Montante Linha]), 'Calendar'[Date]))
```

2. Sales Previous Year:
    - Description: Calculates the total sales for the previous year for the same period.
    - Formula:
```
Sales (Previous Year) = IF(ISBLANK(CALCULATE(SUM(Sales[Montante Linha]),FILTER(ALL('Calendar'),'Calendar'[Year] = MAX('Calendar'[Year]) - 1 &&'Calendar'[Quarter.1] IN VALUES('Calendar'[Quarter.1]) &&'Calendar'[Month] IN VALUES('Calendar'[Month])))), "-", CALCULATE(SUM(Sales[Montante Linha]),FILTER(ALL('Calendar'),'Calendar'[Year] = MAX('Calendar'[Year]) - 1 &&'Calendar'[Quarter.1] IN VALUES('Calendar'[Quarter.1]) &&'Calendar'[Month] IN VALUES('Calendar'[Month]))))
```

3. Sales per Store Type (e.g., Shopping Center) (% Nº Sales Per Store):
    - Description: Percentage of sales made in a specific type of store relative to total sales.
    - Formula:
```
% Nº Sales Per Store (Shopping Center) = IF(ISBLANK(CALCULATE(COUNT(Sales[Montante Linha]), FILTER('Location Stores', 'Location Stores'[Store Type] = "Centro Comercial")) / COUNT(Sales[Montante Linha])),"-",CALCULATE(COUNT(Sales[Montante Linha]), FILTER('Location Stores', 'Location Stores'[Store Type] = "Centro Comercial") ) / COUNT(Sales[Montante Linha]))
```

4. Previous Year Sales by Store Type (e.g., Shopping Center):
    - Description: Total sales for the previous year for a specific store type.
    - Formula:
```
Sales Shopping center (Previous Year) = IF(ISBLANK(CALCULATE(SUM(Sales[Montante Linha]), FILTER( ALL('Calendar'), 'Calendar'[Year] = MAX('Calendar'[Year]) - 1 && 'Calendar'[Quarter.1] IN VALUES('Calendar'[Quarter.1]) && 'Calendar'[Month] IN VALUES('Calendar'[Month])), FILTER('Location Stores', 'Location Stores'[Store Type] = "centro comercial"))), "-", CALCULATE(SUM(Sales[Montante Linha]), FILTER( ALL('Calendar'), 'Calendar'[Year] = MAX('Calendar'[Year]) - 1 && 'Calendar'[Quarter.1] IN VALUES('Calendar'[Quarter.1]) && 'Calendar'[Month] IN VALUES('Calendar'[Month])), FILTER('Location Stores', 'Location Stores'[Store Type] = "centro comercial")))
```

5. Current Year Sales by Store Type (e.g., Shopping Center):
    - Description: Total sales for the current year for a specific store type.
    - Formula:
```
Current Year Nº Sales Per Store (Centro Comercial) = IF(ISBLANK(CALCULATE( SUM(Sales[Montante Linha]), FILTER( 'Location Stores', 'Location Stores'[Store Type] = "Centro Comercial") )),"-",CALCULATE(SUM(Sales[Montante Linha]), FILTER('Location Stores', 'Location Stores'[Store Type] = "Centro Comercial" )))
```

6. Top 5 Sales by Store Type (e.g., Shopping Center):
    - Description: The top five sales in a specific store type.
    - Formula:
```
Top 5 Sales Per Store (Centro Comercial) = VAR StoreRank =RANKX(ALL(Sales[Store]),CALCULATE(sum(Sales[MontanteLinha]),FILTER('Location Stores','Location Stores'[Store Type] = "Centro Comercial")),,DESC) Return IF(StoreRank <= 5, CALCULATE(sum(Sales[Montante Linha]),FILTER('Location Stores','Location Stores'[Store Type] = "Centro Comercial")), BLANK())
```

7. Top 5 Products by Store Type (e.g., Online):
    - Description: The top five product sales in a specific store type.
    - Formula:
```
Top 5 Sales Per Store (Online) = VAR StoreRank = RANKX(ALL(Sales[Store]),CALCULATE(sum(Sales[MontanteLinha]),FILTER('Location Stores','Location Stores'[Store Type] = "Loja Online")),,DESC) Return IF(StoreRank <= 5, CALCULATE(sum(Sales[Montante Linha]),FILTER('Location Stores','Location Stores'[Store Type] = "Loja Online")), BLANK())
```

8. Items Sold by Store Type (e.g. Shopping Center):
    - Description: Total number of items sold in a specific store type.
    - Formula:
```
Nº Sales Per Store (Centro Comercial) = if(CALCULATE(SUM(Sales[Quantity Invoiced]),FILTER('Location Stores','Location Stores'[Store Type] = "Centro Comercial")), CALCULATE(SUM(Sales[Quantity Invoiced]),FILTER('Location Stores','Location Stores'[Store Type] = "Centro Comercial")), "-")
```

9. Growth Rate (e.g. Shopping Center):
    - Description: Measures the percentage growth rate of sales in shopping centers compared to the previous year.
    - Formula:
```
Growth Rate (Shopping Center)= VAR Sales_CurrentYear = CALCULATE( SUM(Sales[Montante Linha]), FILTER('Location Stores', 'Location Stores'[Store Type] = "Centro Comercial")) VAR Sales_PriorYear = CALCULATE( SUM(Sales[Montante Linha]), FILTER('Location Stores', 'Location Stores'[Store Type] = "Centro Comercial"), SAMEPERIODLASTYEAR('Calendar'[Date])) VAR Growth_Rate = DIVIDE(Sales_CurrentYear - Sales_PriorYear, Sales_PriorYear) RETURN IF(ISBLANK(Growth_Rate), "-", IF(Growth_Rate > 0, UNICHAR(128314), UNICHAR(128315)) )
```

10. Conversion Rate:

- Description: Percentage of visitors converted into customers.
- Formulas:
```
Sum of Visitors = SUM('Number of Visitors'[Number of visitors])
Total Number of sales = COUNTROWS('sales')
Conversion Rate = DIVIDE([Total Number of sales], [Sum of Visitors], 0)
```

11. Abandonment Rate:

- Description: Percentage of users who add products to the cart but do not complete the purchasing.
- Formulas:
```
Sum of Visitors = SUM('Number of Visitors'[Number of visitors])
Sum_ Multiplications = SUMX('Number of Visitors','Number of Visitors'[Number of visitors]* RELATED('Abandonment Rate'[Abandonment]))
Abandonment of Rate = DIVIDE([Sum_ Multiplications],'Number of Visitors'[Sum of Visitors],0)
```

12. Number of Orders Returned:

- Description: Total number of orders returned.
- Formula:
```
Number of Orders Returned = CALCULATE(SUMX(Sales, IF(Sales[Qtd. Faturada] = -1, 1, 0)))
```

13. Value of Orders Returned:

- Description: Total value of orders returned.
- Formula:
```
Value Returns = CALCULATE(SUMX(Sales, IF(Sales[Qtd. Faturada] = -1, -Sales[Montante Linha], 0)))
```

14. Return Rate:

- Description: Percentage of orders returned.
- Formula:
```
Return Rate = DIVIDE([Value Returns], [Total Sales], 0)
```

15. Average Ticket:

- Description: Average transaction amount.
- Formula:
```
Total Sales quantity = SUM('Sales'[Qtd. Faturada])
Total Sales = sum(Sales[Montante Linha])
Average Ticket = DIVIDE([Total Sales],[Total Sales quantity],0 )
```

16. Best Seller by Average Ticket:

- Description: The best-performing seller based on average ticket amount.
- Formulas:
```
Best Seller (Seller Name) = TOPN(1,FILTER( VALUES(Sales[Seller]), [Average Ticket per Seller] = MAXX(VALUES(Sales[Seller]), [Average Ticket per Seller]) ), [Average Ticket per Seller], DESC)
Better Seller (Value) = CALCULATE(MAXX(VALUES(Sales[Seller]), [Average Ticket per Seller]))
```

17. Worst Seller by Average Ticket:

- Description The lowest-performing salesperson based on average ticket amount.
- Formulas:
```
WorstSeller(SellerName)=TOPN(1,FILTER(VALUES(Sales[Seller]),[ Average Ticket per Seller] = MINX(VALUES(Sales[Seller]), [Average Ticket per Seller]) ), [Average Ticket per Seller],ASC)
WorstSeller(Value)= CALCULATE(MINX(VALUES(Sales[Seller]), [Average Ticket per Seller]))
```

The Sales dashboard (figure 3) was created containing an overview of the metrics, where general sales information is presented, including the accumulated value, total sales per year, and by type of store, as well as the percentage distribution of each type of store. In addition, the top 5 shopping centers and the top five products are displayed, among other relevant information.

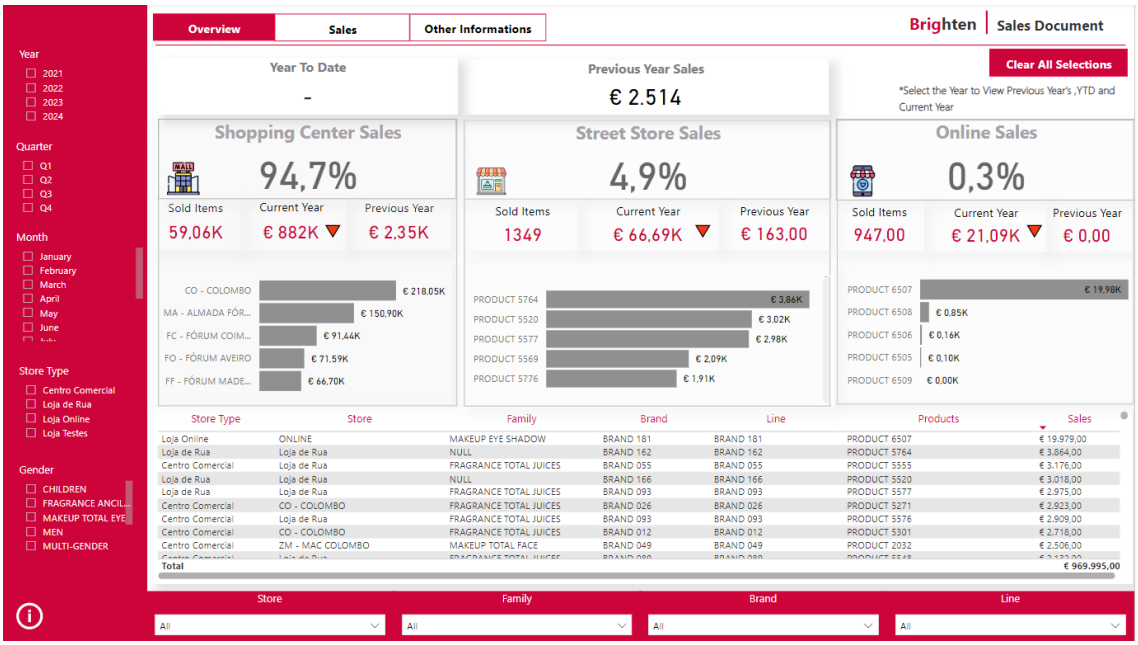

Figure 3: Dashboard Overview - Sales

On the Sales page, the total sales across different dimensions is shown, with the possibility of viewing in terms of amount (figure 4) or quantity (figure 5).

Figure 4: Dashboard Sales (terms of Amount) - Sales

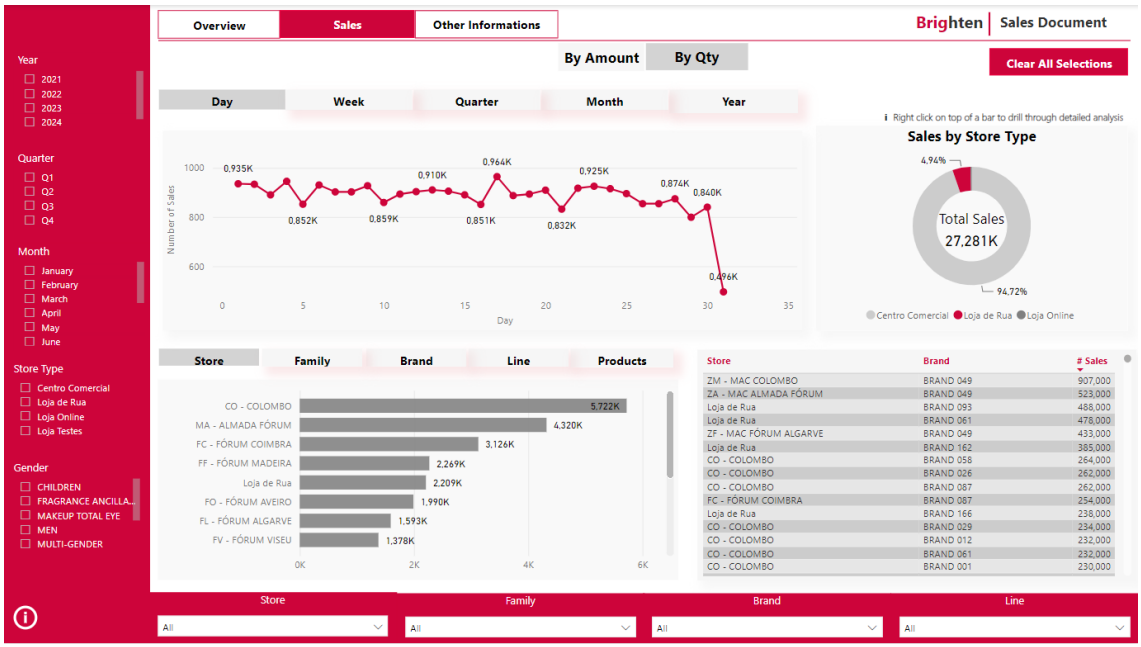

Figure 5: Dashboard Sales (terms of Quantity) - Sales

The Store Details page (figure 6) displays specific information for each store from total sales, total sales quantity, and the top of products using the Drill Through functionality concerning the stores.

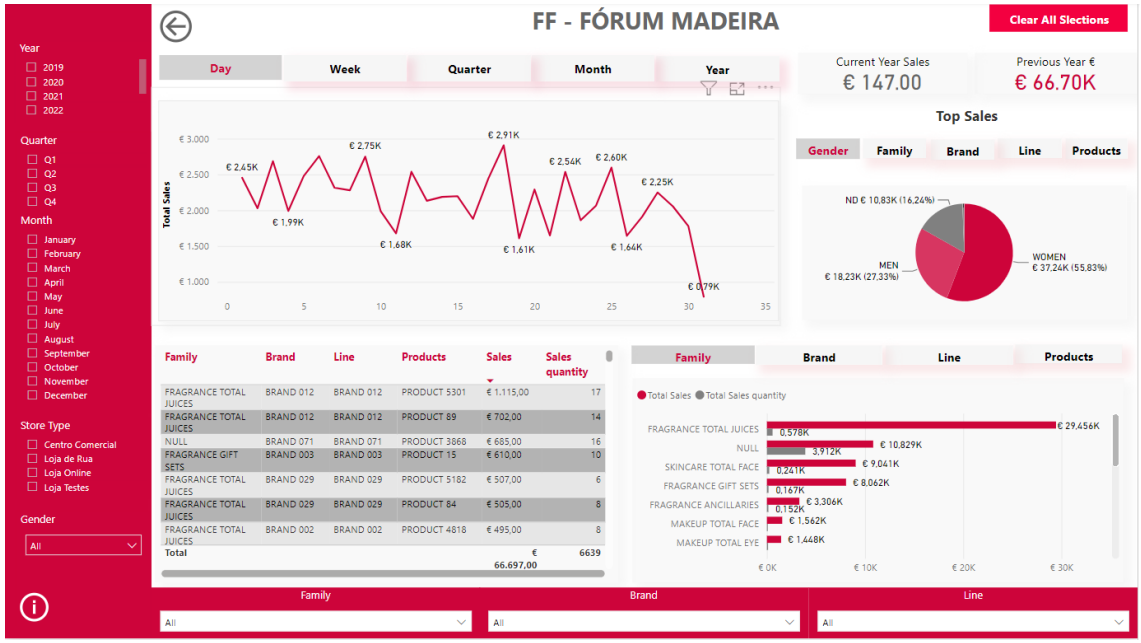

Figure 6: Dashboard Store Detail Page (e.g. Fórum Madeira) - Sales

On the Other Information page (figure 7), several additional metrics are displayed, such as conversion rate, abandonment rate, quantity and value returned, among others.

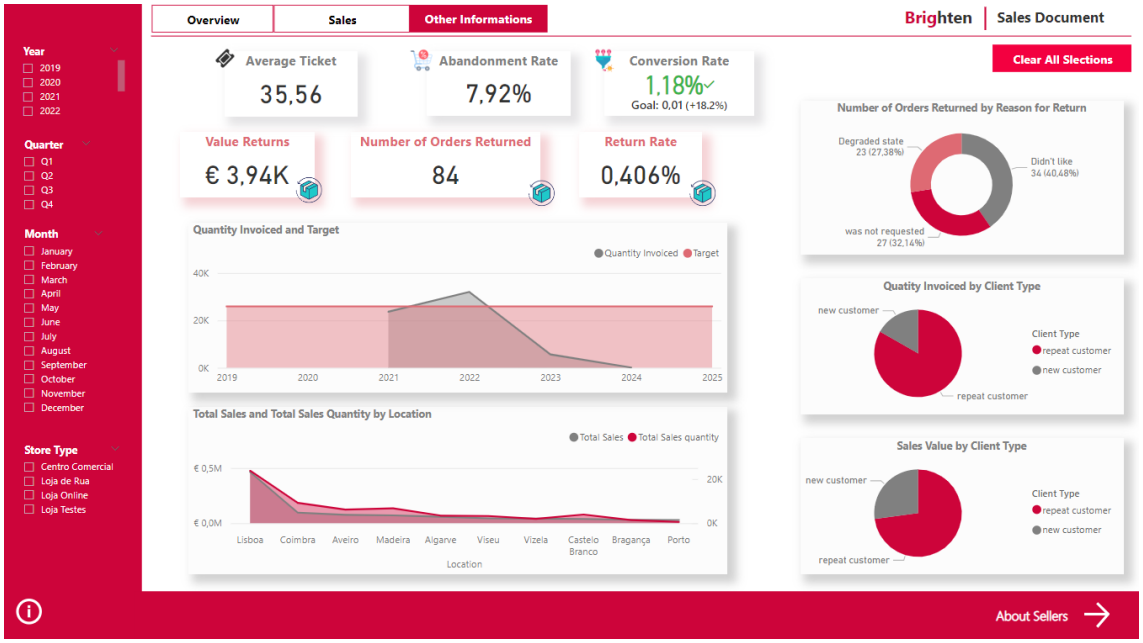

Figure 7: Dashboard Other Information - Sales

On the Seller page (figure 8), all information related to sellers is displayed, including the average sales for each seller, and the best and worst sellers.

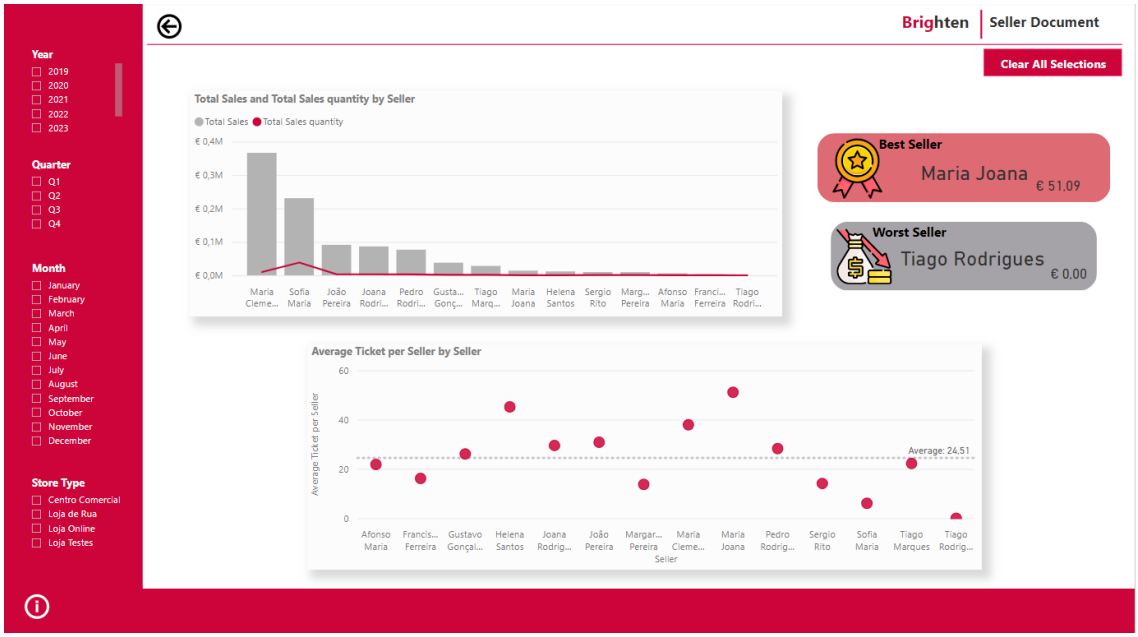

Figure 8: Dashboard Seller- Sales

The sales dashboard presented in this chapter makes predominant use of dynamic metrics, offering a real-time view of sales performance. This approach allows for agile adaptation to market changes and business needs, providing valuable insights for strategic decision-making.

4.4.2. Logistic Dashboard

The following 10 key metrics are identified to ensure the effectiveness and high performance of the supply chain. The metrics were developed based on information relevant to the logistics contained in 14 Excel sheets. These metrics are:

1. OTIF (On Time in Full):
    - Description: Measures the percentage of orders that were delivered on time and without problems relative to the total number of orders.
    - Formula:
```
Orders_In Time_Without_Problems = CALCULATE(COUNTROWS(Purchases), Purchases[Sem problemas] = "1")
Total Orders = COUNTROWS(Purchases)
OTIF = DIVIDE([Orders_In Time_Without_Problems], [Total Orders])*100
```

2. Total Supply Orders (unit):
    - Description: Total number of supply orders.
    - Formula: `Total Orders = COUNTROWS(Purchases)`

3. Done Deliveries (%):
    - Description: Percentage of deliveries that are marked as 'Done' in relation to the total number of orders.
    - Formula:
```
Done Deliviers (%) = DIVIDE(CALCULATE(COUNTROWS(Purchases), Purchases [Feitas/processo]= "Done"), COUNTROWS(Purchases))
```

4. Done Deliveries (unit):
    - Description: Total number of deliveries marked as 'Done'.
    - Formula: `Done Deliviers_Quantity = COUNTROWS(FILTER(Purchases, Purchases[Feitas/processo]="Done")`

5. On Time Deliveries (%):
    - Description: Percentage of deliveries made on time in relation to the total number of orders.
    - Formula:
```
ON TIME (%) = DIVIDE(CALCULATE(COUNTROWS(Purchases), Purchases[Feitas no prazo] = "sim" ), COUNTROWS(Purchases))
```

6. On Time Deliveries (unit):
    - Description: Total number of deliveries made on time.
    - Formula:
```
On TIME_Quantity = COUNTROWS(FILTER(Purchases, Purchases[Feitas no prazo] = "sim")
```

7. Canceled Deliveries (%):
    - Description: Percentage of deliveries that are marked as 'Canceled' in relation to the total number of orders.
    - Formula:
```
Canceled Deliviers (%) = DIVIDE(CALCULATE(COUNTROWS(Purchases), Purchases[Feitas/processo]= "Canceled"), COUNTROWS(Purchases))
```

8. Canceled Deliveries (unit):
    - Description: Total number of deliveries marked as 'Canceled'.
    - Formula:
```
Canceled Delivery_Quantity = COUNTROWS(FILTER(Purchases, Purchases[Feitas/processo] = "Canceled"))
```

9. Orders in Process (%):
    - Description: Percentage of orders that are currently in the process of delivery.
    - Formula:
```
In Process Deliviers (%) = DIVIDE(CALCULATE(COUNTROWS(Purchases), Purchases[Feitas/processo]= "In Process"), COUNTROWS(Purchases))
```

10. Average Total Days per Delivery:
    - Description: Average number of days taken for delivery across all orders.
    - Formula: `Average_Days_per_Delivery = AVERAGE(Purchases[Difference of Days])`

This dashboard was carefully designed to provide a clear and simplified visual representation of the identified metrics, enabling an accurate and agile analysis of the performance of logistics operations.

An overview page was created (Figure 9 and Figure 10), which presents a comprehensive overview of logistics operations. This page contains detailed information, such as inventory by storage location and plant, allowing comparisons with purchasing records. In addition, information from the supplier to orders and stores is provided. Also noteworthy is the inclusion of the ranking of the top 10 inventory items by material, as well as the top 10 suppliers based on purchasing made. The overview page is designed to present information in terms of both value (figure 9) and quantity (figure 10).

Below are the figures 9 and 10, respectively:

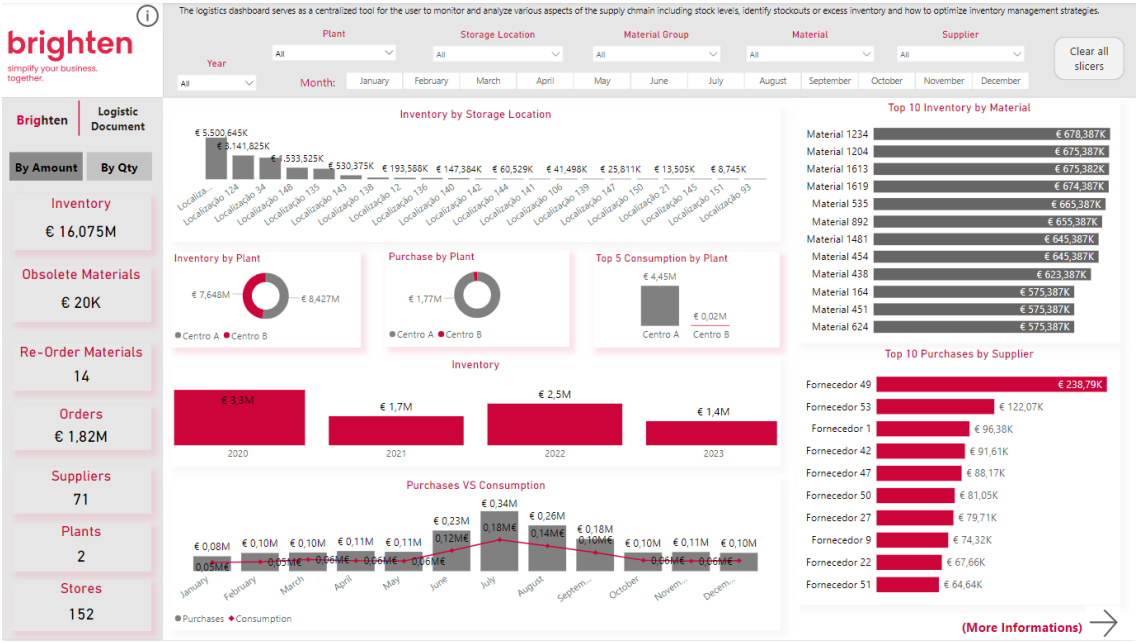

Figure 9: Dashboard Overview Logistic (terms of value) - Logistics

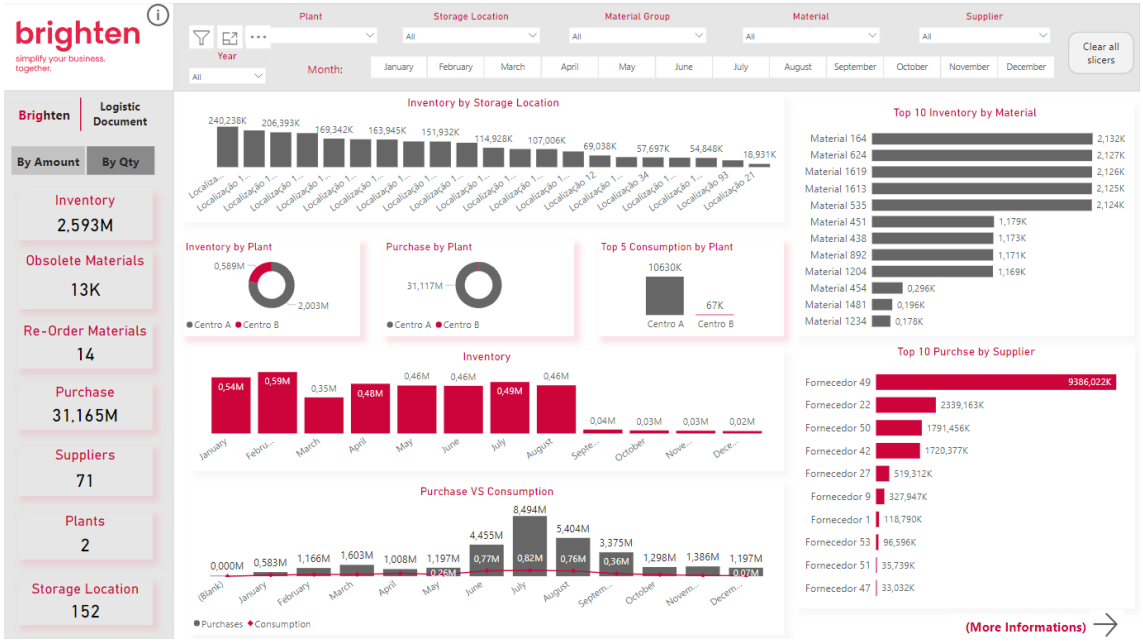

Figure 10: Dashboard Overview Logistic (terms of quantity) - Logistics

A detailed page was then created for each plant (figure 11), which offers a variety of information, covering data from purchasing to inventory information specific to each plant. This filtering is carried out using the drill-through functionality, providing an effective way to explore the details of each plant in more depth.

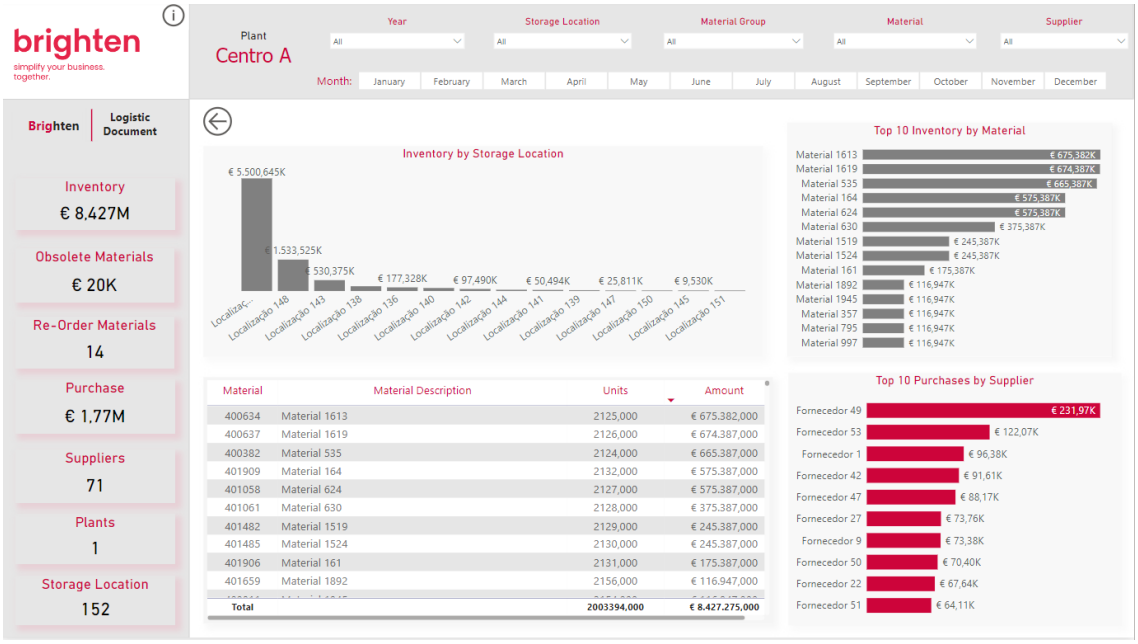

Figure 11: Dashboard Plant Detail – Logistics

Finally, an additional page was created, illustrated in Figure 12, presenting various information about the status of orders. This data includes updates on orders cancelled,

completed on time, and in process of fulfilment, as well as metrics such as On-Time In-Full (OTIF) and average days to delivery.

Figure 12: Dashboard Other Information - Logistics

The logistics dashboard plays a fundamental role for companies, serving as an essential quality control tool. By offering a comprehensive view of logistics operations, it allows for the identification and prevention of errors and failures throughout the supply chain. With a series of metrics and indicators, the panel simplifies operations management, promoting competitiveness by reducing costs and increasing profits. Centralizing stock data helps identify stockouts and optimize stock management strategies. In short, it is an essential tool for efficiency and excellence in business logistics.

4.4.3. Purchasing Dashboard

The process of developing the purchasing dashboard followed a similar method to what was outlined earlier for the other dashboards. Initially, data extraction was performed from two Excel spreadsheets, followed by an analysis to gain a holistic insight into the data. It is important to highlight that, in addition to purchasing data, sales and logistics data were also used to correlate the information.

The essential metrics for creating a purchasing dashboard were identified. The 14 selected metrics are:

1. Purchasing Approved:
    - Description: Total value of purchasing approved.
    - Formula:
```
PurchasesApproved = CALCULATE(SUM(Suppliers[FinalQuote]), FILTER(Suppliers, Suppliers[Status]="Approved"))
```

2. Number of Approved Purchasing Orders:
    - Description: Total number of purchase orders approved.
    - Formula:
```
NumberApprovedPurchaseOrders = CALCULATE(COUNT(Suppliers[PO]),FILTER(Suppliers,Suppliers[POStatus]="Approved"))
```

3. Purchasing Rejected:
    - Description: Total value of purchasing rejected.
    - Formula:
```
PurchasesRejected = CALCULATE(SUM(Suppliers[FinalQuote]), FILTER(Suppliers, Suppliers[Status]="Rejected"))
```

4. Lead Time:
    - Description: Measures the time between placing an order with the supplier and receiving the product.
    - Column:
```
Difference of date = DATEDIFF(Orders[Order from Supplier],Orders[ShippingDate],DAY)
```
    - Formula:
```
Average_LeadTime = AVERAGE(Orders[Lead_Time])
```

5. Number of Orders Returned:
    - Description: Total number of orders returned due to various reasons.
    - Formula:
```
Number of Orders Returned = CALCULATE(SUMX(Orders, IF(Orders[Quantity Sent] = -1, 1, 0)))
```

6. Value of Orders Returned:
    - Description: Total value of orders returned.
    - Formula:
```
Return in Value = CALCULATE(SUMX(Orders, IF(Orders[Quantity Sent] = -1, Orders[Final Price], 0)))
```

7. Return Rate:
    - Description: Percentage of orders returned relative to total orders.
    - Formulas:
```
Total Orders = sum(Orders[Final Price])
Return in Value = CALCULATE(SUMX(Orders, IF(Orders[Quantity Sent] = -1, -Orders[Final Price], 0)))
Return Rate = DIVIDE([Return in Value], [Total Orders],0)
```

8. Final Stock:
    - Description: Total stock available after considering consumption, orders, and sales.
    - Formula:
```
Stock Final = SUM('Material Consumption'[ Estoque final])+SUM(Orders[Quantity Sent])-SUM(Vendas[Qtd. Faturada])
```

9. Top 4 Materials with Highest Stock:
    - Description: Top 4 materials with the highest stock levels.
    - Formula:
```
Top_4_Stock_Per_Material = VAR StockRank = RANKX(ALL('Material Consumption'[Material]), [Stock Final], , DESC) RETURN IF(StockRank <= 4, [Stock Final], BLANK())
```

10. Average Duration Days (for tooltips):
    - Description: Average duration of procurement process days for approved purchasing.
    - Formula:
```
AverageDurationDays =CALCULATE(AVERAGE(Suppliers[DurationDays]),FILTER(Suppliers,Suppliers[Status]="Approved"))
```

11. Material Cost:
    - Description: Total cost of materials procured.
    - Formula:
```
MaterialCost = CALCULATE(SUM(Orders[Price])*SUM(Orders[Quantity Ordered]), FILTER(Suppliers,Suppliers[Status]="Approved"))
```

12. Number of Unique Requestors for Approved Suppliers:
    - Description: Total number of unique requestors associated with approved suppliers.
    - Formula:
```
CountRequestors = CALCULATE(DISTINCTCOUNT(Suppliers[Requestors]), FILTER(Suppliers, Suppliers[Status] = "Approved"))
```

13. Optimal Point in terms of quantity:
    - Description: Optimal point that the company should buy based on demand and safety stock. In terms of quantity.
    - Formula:
```
Stock Securit (quantity)= VAR AverageDemand = AVERAGE('Vendas'[Qtd. Faturada]) VAR StandardDeviation = STDEV.P(Vendas[Qtd. Faturada]) VAR LeadTime = [Lead_Time]VAR ZScore = 1.65 RETURN AverageDemand * LeadTime + ZScore * StandardDeviation * SQRT(LeadTime)
Days of the period = COUNTROWS('Calendário')
Average Daily Demand (quantity) = SUM('Vendas'[Qtd. Faturada]) / [Days of the period]
Lead_Time = AVERAGE(Orders[Difference of date])
Optimal Point = [Average Daily Demand]*[Lead_Time]+[Stock Security (quantity)]
```

14. Optimal Point in terms of quantity:
    - Description: Optimal point that the company should buy based on demand and safety stock. In terms of value.
    - Formula:
```
Optimal Point (value) = [Optimal Point] * SUM('Vendas'[Preço Liquido Unit.])
```

The Purchasing dashboard is designed to provide a clear and concise visualization of identified metrics, enabling effective analysis of purchasing operations performance. It is noteworthy that all the Purchase dashboards were developed in light and dark versions, providing users with varied visual options.

An overview page was developed, as illustrated in figure 13 (light version) and figure 14 (dark version), which encompasses comprehensive information related to the purchasing area. This includes the number of approved and rejected purchasing, distribution of purchasing by department, and number of suppliers and departments, among other relevant data. Furthermore, a consolidated table was created based on data from the three excel sheets (sales, purchasing, and logistics), which presents the initial stock, purchasing made, sales made, and final stock. The top 4 products with the largest available stock were also highlighted.

Now follows figures 13 (light version) and 14 (dark version):

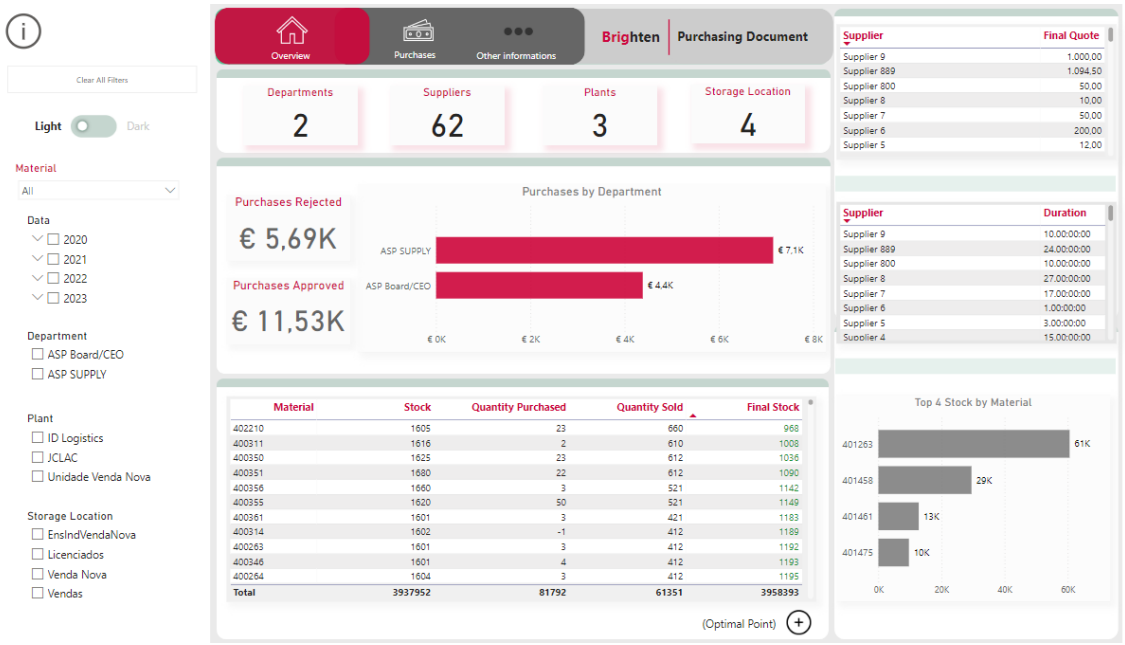

Figure 13: Dashboard Overview (Light version) - Purchasing

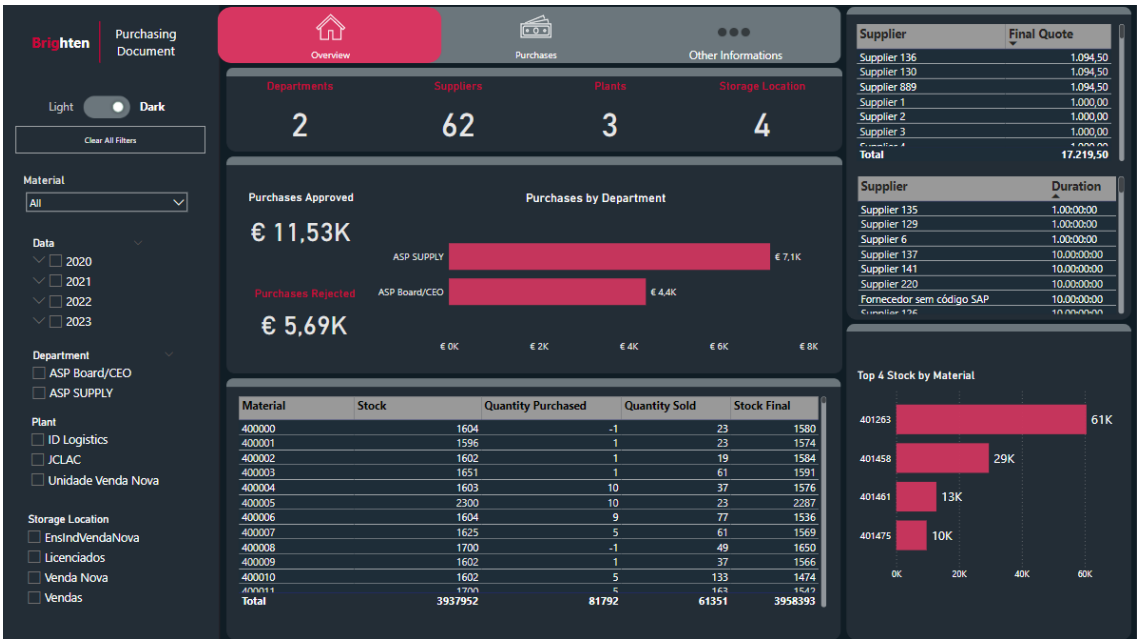

Figure 14: Dashboard Overview (Dark version) - Purchasing

Furthermore, a tooltip related to the average number of days for approval was implemented, as illustrated in (figure 15 and 16), in the graph of approved purchasing by the department.

Figure 16:Tooltip Average days to approval (Light version) - Purchasing

Figure 15: Tooltip Average days to approval (Dark version) - Purchasing

An additional page, titled "Purchasing" (Figure 17, light version and Figure 18, dark version), was created to display detailed information about approved and rejected purchasing, with different dimensions, as well as an analysis of the cost of the material from various perspectives.

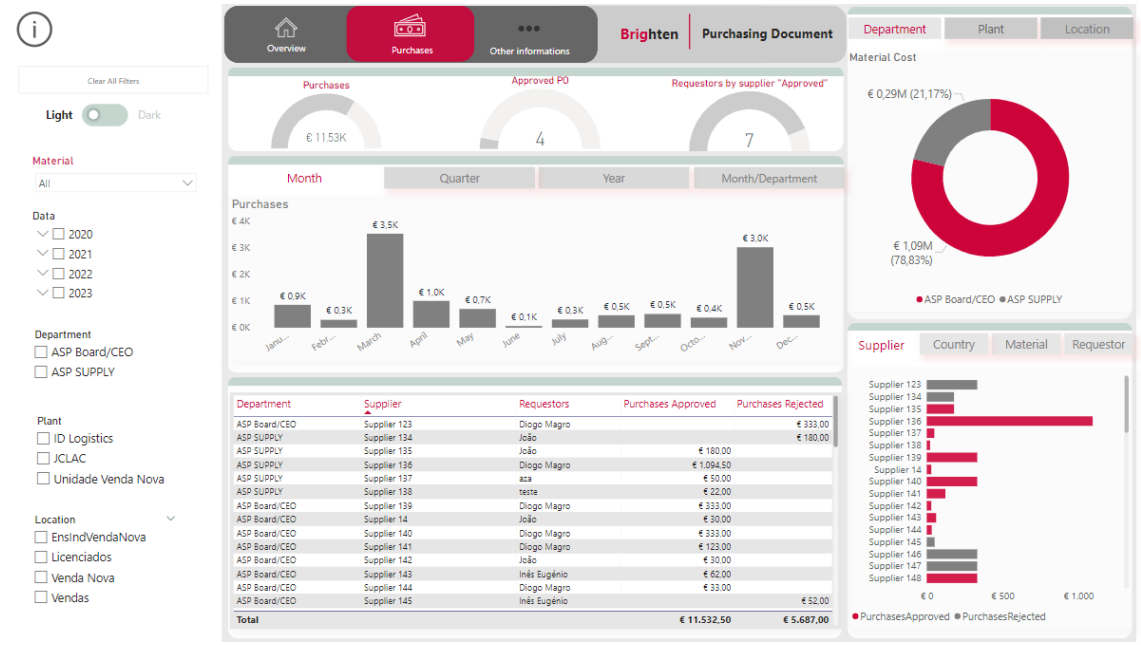

Figure 17: Dashboard Purchasing (Light version) - Purchasing

Figure 18: Dashboard Purchasing (Dark version) - Purchasing

Additionally, a page called "Other information" was developed (Figure 19 and 20), which presents data on returns, lead time, price, and quantity analysis for each group of materials, as well as an analysis of payment conditions and quantity ordered and received.

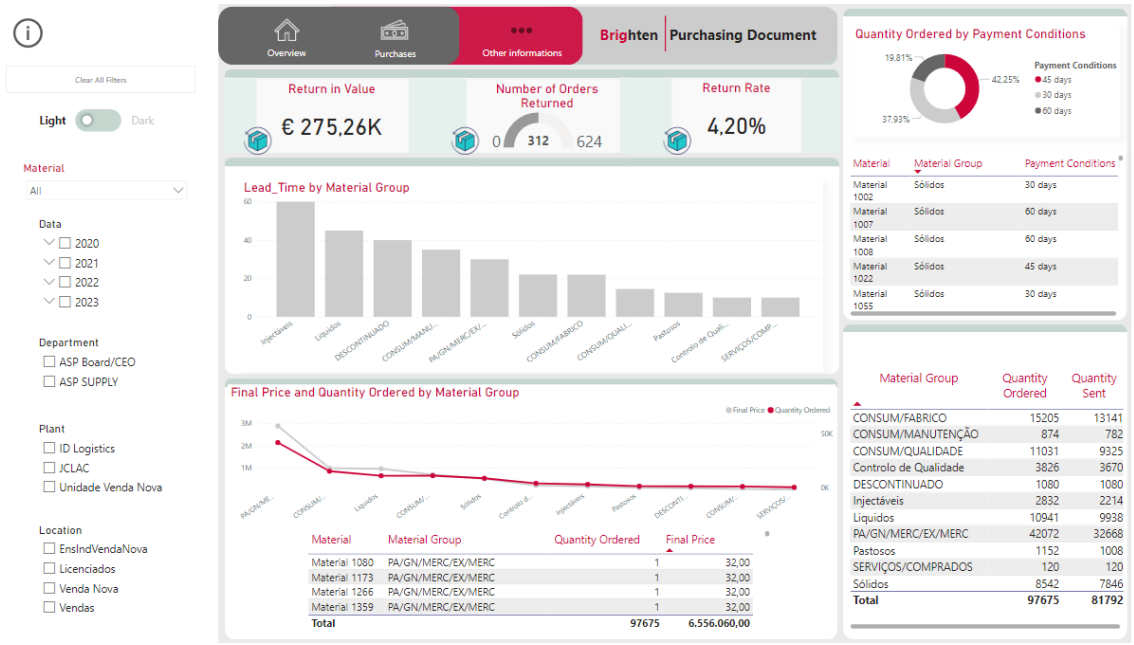

Figure 19: Dashboard Other Information (Light version) - Purchasing

Figure 20: Dashboard Other Information (Dark version) - Purchasing

A page called "Optimal Point" was also developed, as shown in Figure 21 and 22. On this page, the ideal purchase point is presented, both in terms of quantity and value. The optimal purchasing point was determined based on different variables, including quantity invoiced, average daily demand, lead time, and safety stock. These variables

were analyzed and used to calculate the ideal purchasing point, offering a reasoned and strategic approach to inventory management.

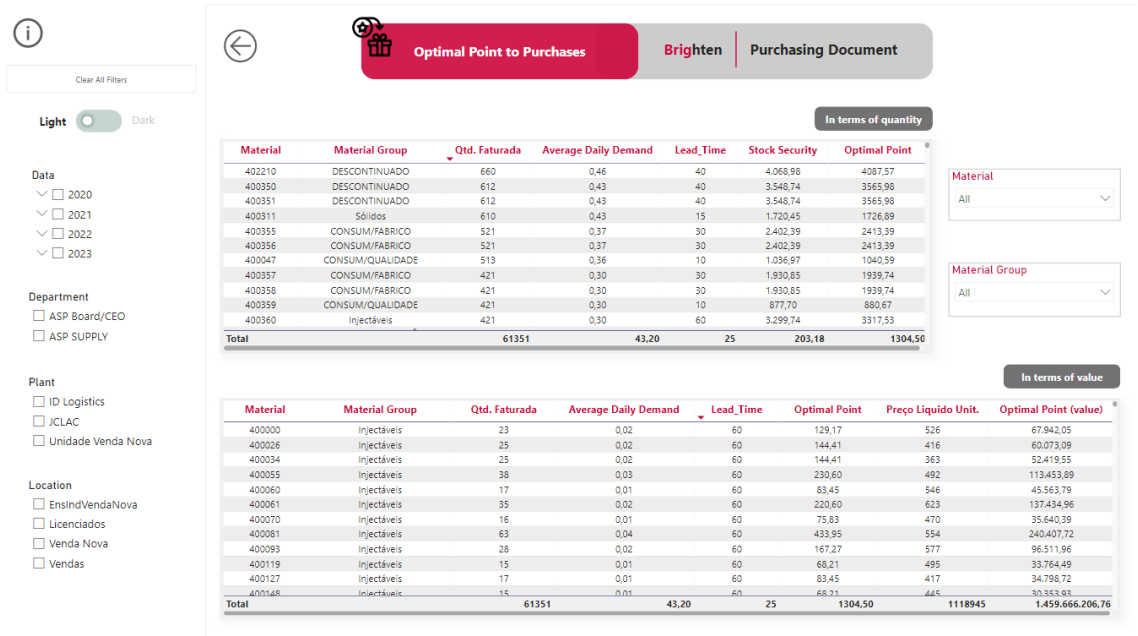

Figure 21: Dashboard Optimal Point (Light version) - Purchasing

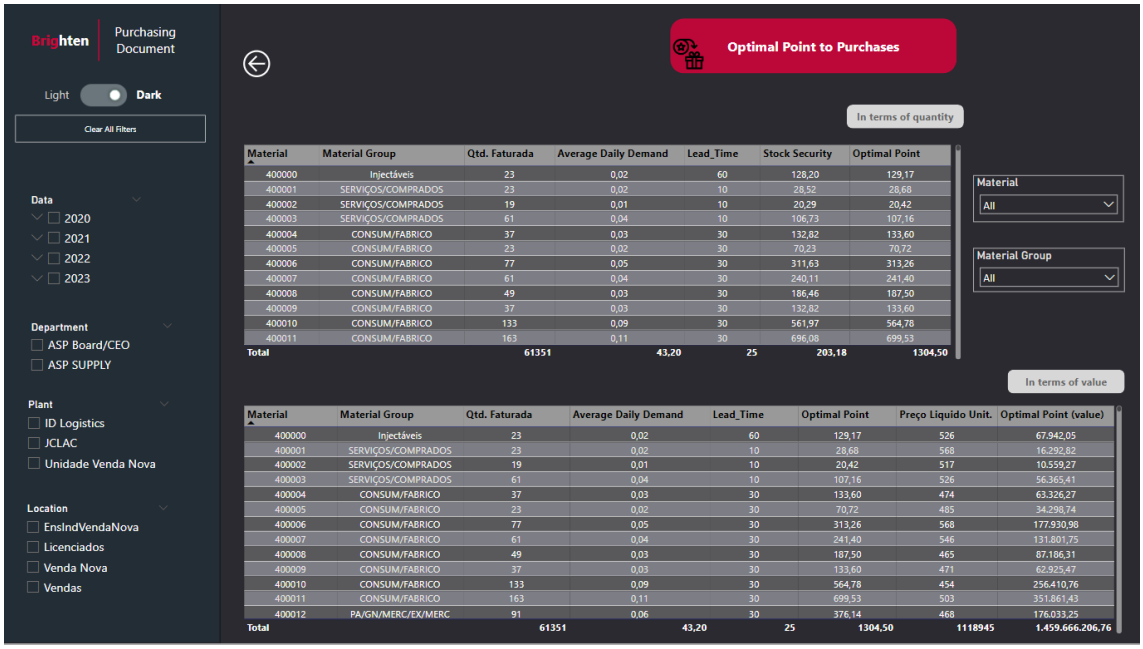

Figure 22: Dashboard Optimal Point (Dark Version) - Purchasing

The purchasing dashboard plays a crucial role in optimizing procurement processes and improving companies' operational performance. By offering a comprehensive view of approved and rejected purchasing, as well as supplier

performance, it allows a quickly identify any problems or inefficiencies in the purchasing process. Furthermore, the dashboard helps to determine the optimal purchasing points, considering demand forecasts, delivery times, and current stock levels. This information empowers decision-makers to take strategic actions that promote efficiency operational across the supply chain.

5. CRITICAL ANALYSIS

It is possible to establish a comparison between the topics covered during the internship and the literature review.

First, the importance of analyzing information for business management became evident, especially for decision-making.

Second, during the internship challenges similar to those described in the BI literature review arise, which are the risk of manipulation and generation of data and the challenges to obtain complete information.

According to Azeroual and Theel (2018), one of the main difficulties faced by companies is obtaining sufficient quality information, which can result in erroneous decisions and inappropriate actions if the information is not complete. This can lead to the inappropriate use of BI tools, making them ineffective.

During the process of preparing the dashboards, the risk of manipulation and generation of data was observed, which could compromise the veracity of the information presented. Furthermore, it was challenging to obtain complete information. Despite these challenges, it was possible to transform large sets of data into organized and attractive information, leading to more efficient decisions and reinforcing the importance of BI for companies.Third, BI plays a fundamental role in integrating information from different sources, promoting a holistic view of the business. This was observed after creating the three types of dashboards (sales, logistics, and purchasing). It was possible to observe important similarities in their metrics and dynamics.

About metrics, each dashboard features a distinct set of metrics, aligned with the specific objectives and challenges of its respective functional area, which complement each other and provide a holistic view.

For example, while the sales dashboard may contain metrics such as accumulated revenue and conversion rate, the purchasing dashboard may focus on metrics such as average delivery time and average acquisition cost, while the logistics dashboard focuses on completed, canceled, or ongoing deliveries. These metrics reflect the specific analysis needs of each department.

Furthermore, the dynamics of the dashboards vary according to the frequency of data updating and the interactivity of the resources. Sales dashboards can be more dynamic, with real-time updates to monitor sales performance throughout the day, while purchasing and logistics dashboards can have less frequent updates, depending on the company's operations cycle.

Despite these differences, all dashboards share a common analytical approach, seeking to provide actionable insights to support informed decision-making. They aim to identify trends, patterns, and opportunities for improvement in their respective functional areas, contributing to the company's operational and strategic performance.

Consequently, purchasing, sales, and logistics dashboards play distinct but complementary roles in the company's analytical landscape, providing an integrated and comprehensive view of its performance and operations.

Lastly, it is worth mention that the internship at Brighten Consulting allowed me to develop essential BI skills, from identifying metrics to creating dashboards using the Dax tool and Power BI. Despite the challenges encountered, such as autonomy at work and time management due to the advisor's restricted schedule, this experience was extremely enriching and contributed significantly to my future professional journey.

6. CONCLUSION

This internship report demonstrates a solid understanding of Business Intelligence and its practical application in organizational decision-making, as well as present a detailed description of the internship activities carried out over the 2.5 months at Brighten Consulting

After completing the internship, it was possible to experience the relevance of BI in business management, especially in decision-making. The development of the "Starterpack" dashboards revealed challenges similar to those described in the literature, such as obtaining complete and quality information, in addition to the risk of data manipulation. However, even in the face of these obstacles, the transformation of large data sets into organized information has reinforced the effectiveness of BI in driving more efficient decisions.

In addition, the Purchasing, Sales, and Logistics dashboards play complementary roles in corporate decisions, providing a comprehensive view of performance and operations. This overall perspective is fundamental for making informed decisions.

In terms of personal experience, the integration and welcoming of the digital team were also highlighted aspects, providing enriching learning with experienced professionals, and contributing to a rewarding experience.

In summary, this internship at Brighten Consulting allowed to develop a combination of technical skills in the use of Power BI and soft skills (teamwork and problem-solving) but also highlighted the growing importance of BI technologies for business success. Despite the challenges faced, such as managing the advisor’s time and working autonomy, this experience was extremely valuable. Overall, most of the objectives previously defined before the internship were achieved.

Thus, the internship not only contributed to the practical understanding of the concepts studied but also represented an important step in the professional journey, preparing for future challenges and opportunities in the area.

7. FUTURE WORK

After this analysis, two ideas for future work are suggested. It would be relevant to carry out a comprehensive comparison between visualization tools, such as Power BI and Qlik. This comparison would allow a detailed view of the differences and similarities between these two leading applications in the BI market. By examining aspects such as usability, flexibility, visualization capabilities, data integration, performance, and licensing, it would be possible to provide valuable insights for organizations looking to select the tool best suited to their specific needs.

Another relevant path for future research would be to investigate emerging trends in BI, especially in the context of the increasing adoption of technologies such as AI and ML. As these technologies advance, their significance in analyzing and interpreting extensive datasets grows substantially. Explore how organizations are integrating AI and ML technologies into their BI strategies, as well as the impacts of these technologies on decisions.

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