

MGI

Master Degree Program in
Information Management

**Business Intelligence Solution to support data-driven decisions
in wine commercialization**

Dashboards creation for a Sales Department

Maria Teresa Melo Osório Portugal Ramos

Project Work

presented as partial requirement for obtaining the Master Degree Program in Information Management, with a
Specialization in Knowledge Management and Business Intelligence

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação

Universidade Nova de Lisboa

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BUSINESS INTELLIGENCE SOLUTION TO SUPPORT DATA-DRIVEN DECISIONS IN WINE COMMERCIALIZATION

by

Maria Teresa Melo Osório Portugal Ramos

Project Work presented as partial requirement for obtaining the Master's degree in Information Management, with a specialization in Knowledge Management and Business Intelligence.

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July 2023

STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledge the Rules of Conduct and Code of Honor from the NOVA Information Management School.

Teresa Portugal Ramos

Lisbon, 14th July 2023

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ABSTRACT

In the last decades, the use and access to data has become a valuable asset for the success of an organization and to keep ahead of the competition. It is clear that data driven companies tend to have a better performance since their decisions are data-based, which are usually supported by Business Intelligence tools.

The Commercial Department of João Portugal Ramos Wines & Spirits, a Portuguese wine company, had the need to structure and centralize the available data in valuable reports that would sustain their decisions. Therefore, the goal of this project was to build a Business Intelligence tool, namely a Power BI solution, to support the Commercial Department in the decision-making process.

As the starting point, an introduction to the problem itself, the context of the organization, the company description and a literature review related with the main topics was presented. The Design Science Research methodology was chosen to undertake this project, with its different phases applied successfully.

The results showed that the artifact produced (Power BI solution) was able to answer to the business needs identified by the Commercial Department and that such tool has benefit the team by allowing the managers to have a clearer picture of the performance of a specific market or brand, therefore permitting better informed decisions.

KEYWORDS

Business Intelligence; KPI; Data Visualization; Dashboards; Power BI; Wine Industry

INDEX

1. Introduction	1
1.1. Context	1
1.2. Research gap	1
1.3. Purpose and Objectives.....	1
1.4. Company description.....	2
1.5. Methodology	3
1.6. Contributions.....	3
2. Literature review	4
2.1. Wine Industry	4
2.1.1. Global Context	4
2.1.2. Portugal in the World	5
2.2. Business Intelligence	8
2.2.1. Business Intelligence for SME.....	9
2.3. Business Needs and Key Performance Indicators	10
2.3.1. Business Needs	10
2.3.2. Key Performance Indicators	12
2.4. Data Visualization and Dashboards.....	14
3. Methodology	18
3.1. Problem Identification and Motivation	18
3.2. Defining the objectives of the solution	18
3.3. Design and Development	19
3.3.1. Selected tool: Power BI	19
3.4. Demonstration.....	20
3.5. Evaluation	20
4. EMPRICAL STUDY.....	21
4.1. Data Sources.....	21
4.1.1. Sales.....	21
4.1.2. Budget and Forecast.....	22
4.1.3. Stocks.....	23
4.2. Designing the Dimensional Model	23
4.3. Importing Data into Power BI and Data Transformations	25
4.3.1. Dim Data	26
4.3.2. Dim Produto	26

4.3.3. Dim Cliente	27
4.3.4. Dim Série	28
4.3.5. Fact Vendas	28
4.3.6. Fact Budget / Fact Previsões	29
4.3.7. Fact Stocks	30
4.4. Dimensional Model	31
4.5. New Columns and Measures.....	32
5. Results.....	34
5.1. Business Overview	35
5.1.1. Sales Overview (“ <i>Visão Geral</i> ”)	35
5.1.2. Stocks Overview	36
5.2. Segment Overview	37
5.2.1. Dashboard “ <i>Visão Comercial</i> ”	37
5.2.2. Dashboard “ <i>Visão Mercado</i> ”	38
5.2.3. Dashboard “ <i>Snapshot Mercado</i> ” and Dashboard “ <i>Snapshot Marca</i> ”	39
5.3. Wine Tourism Overview	40
6. Conclusions, Limitations and Future Work	42
Bibliographical References	44
Appendix A: Interview with the Deputy CEO	48
Appendix B: Interview with a member of the Commercial Department.....	50

LIST OF FIGURES

Figure 1 - Existing Sales Performance Management Tool.....	2
Figure 2 - Future Sales Performance Management Solution in Power BI	2
Figure 3 - Changes in the market share by production region. ‘Old World’ is defined as western Europe; ‘New World’ as Australia, North America and South America; ‘other countries’ includes Asia (Bisson et al., 2002)	5
Figure 4 - Region Market Share - per-cent production (OIV - International Organization of Vine and Wine, 2023)	5
Figure 5 - Portugal Market share in terms of production, exports, imports and consumption (OIV - International Organization of Vine and Wine, 2023).....	6
Figure 6 - Visualization types in Power BI - adapted from Microsoft Learn (2023c)	15
Figure 7 - Direction without a Performance Dashboard vs. with a Performance Dashboard (Eckerson, 2010).....	16
Figure 8 - Design Science Research methodology – adapted from Peffers et al. (2007).....	18
Figure 9 - The Parts of Power BI - adaptation of (Microsoft Learn, 2023b).....	20
Figure 10 - Constellation Schema Architecture	25
Figure 11 - Dimensional Model	31
Figure 12 - Power BI Main Menu	34
Figure 13 - Business Overview: Sales	36
Figure 14 - Business Overview: Stocks	36
Figure 15 - L4L " <i>Visão Comercial</i> "	38
Figure 16 - L4L " <i>Visão Mercado</i> "	39
Figure 17 - L4L " <i>Snapshot Mercado</i> "	40
Figure 18 - L4L " <i>Snapshot Marca</i> "	40
Figure 19 - Wine Tourism	41

LIST OF TABLES

Table 1 - Variation over time in terms of production, export and import in Portugal (OIV - International Organization of Vine and Wine, 2023)	6
Table 2 - Portuguese Exports per Country 2021 vs. 2020 in k€ and HL (IVV - Instituto do Vinho e Da Vinha, 2022)	7
Table 3 - Portuguese Exports per Country Nov 2022 vs. Nov 2021 in k€ and HL (IVV - Instituto do Vinho e Da Vinha, 2023).....	7
Table 4 - Possible KPIs for a Commercial Department.....	13
Table 5 - Sales Data Source	21
Table 6 - Products Data Source	21
Table 7 - Clients Data Source.....	22
Table 8 - Budget / Forecast Data Source.....	23
Table 9 - Stocks Data Source	23
Table 10 - Measures	24
Table 11 - Bus Matrix.....	25
Table 12 - <i>Dim Data</i> details	26
Table 13 - <i>Dim Produto</i> details.....	27
Table 14 - <i>Dim Cliente</i> details.....	27
Table 15 - <i>Dim Série</i> details	28
Table 16 - <i>Fact Vendas</i> details.....	28
Table 17 - <i>Fact Budget</i> details	29
Table 18 - <i>Fact Previsões</i> details	29
Table 19 - <i>Fact Stocks</i> details	30
Table 20 - Hierarchies.....	31
Table 21 - New Columns.....	32
Table 22 - Created Measures	33

LIST OF ABBREVIATIONS AND ACRONYMS

BI	Business Intelligence
SME	Small and medium-sized enterprise
KPI	Key performance indicators
EU	European Union
USA	Unites States of America
ICT	Information and Technological Information
KPI	Key Performance Indicator
JPR	João Portugal Ramos Wines & Spirits
DSR	Design Science Research
DAX	Data Analysis Expressions
SK	Surrogate Key
FK	Foreign Key

1. INTRODUCTION

1.1. CONTEXT

In a constantly changing business environment, companies must adapt their processes to keep a competitive advantage. The world where companies are operating is not the same as 20 years ago, threats and opportunities are always appearing. Such complexity forces companies to be agile and proactive in making decisions, otherwise companies will not survive in such a dynamic environment. More than ever, data is becoming the most powerful instrument in organizations, therefore, to survive, organizations must understand the data that is being generated by their own business. Transforming data into information, and subsequently into knowledge, where valuable insights can be found is a significant challenge for companies, but it is also a crucial instrument if they want to succeed. In this context, technological tools, such as Business Intelligence (BI) tools, are required to transform the data in actionable information and support the decision-making process (Tavera Romero et al., 2021).

BI tools play a crucial part in the decision-making process for companies. An organization should use the right and most appropriate technical tool to answer their business needs. Currently, there are few BI solutions for SME (Small Medium-sized Enterprises), most of the providers focus on larger companies since smaller companies usually have less resources, skills, or capital to invest in such tools. However, smaller companies have the same need / motivation, as larger companies, to adopt such tools (Guarda et al., 2013). The challenge for SMEs, due to lack of knowledge in the BI field, is to choose and adopt a BI solution that is suitable for the organization (Raj et al., 2016).

1.2. RESEARCH GAP

In 2020/2021, I had the opportunity to work for João Portugal Ramos Wines & Spirits (JPR) and, one of the biggest gaps I identified at the time, was the incapability of transforming existing data in structured reports that could support decision-making, particularly within the sales team. The management software used by the company (ArtSoft) had strong limitations with regards to the centralization of data in a clear and visual way. Therefore, the team has been using simple excel dashboards but is searching for more efficient alternatives. The main stakeholders of the company have this in mind as a priority and there is full support from top-level management to search for new tools, not only for the sales team, but also for other departments in the future (e.g., production, stocks).

1.3. PURPOSE AND OBJECTIVES

A Business Intelligence tool able to transform data and create personalized dashboards could have a significant impact on the team's daily work. Therefore, the purpose of this project is to develop a BI solution, namely Power BI, that analyses the sales performance of the company. Such tool will support the decision-making process within the commercial department, saving time and enhancing job efficiency to adding more value to sales performance. The project will consist in the creation of dashboards for decision makers to support a better understanding of specific markets and by that enabling smarter and data-based decisions.

In light of the above, two objectives have been specified:

- 1) Identify which are the main KPIs and business needs of the sales department.
- 2) Understand how the dashboards should be designed to support the decision-making process.

The content displayed should be very visual and appealing. The process must be clean and transparent within the sales department, in order for the business users / decision makers to be able to modify the final dashboard and customize it if new needs and requirements arise.

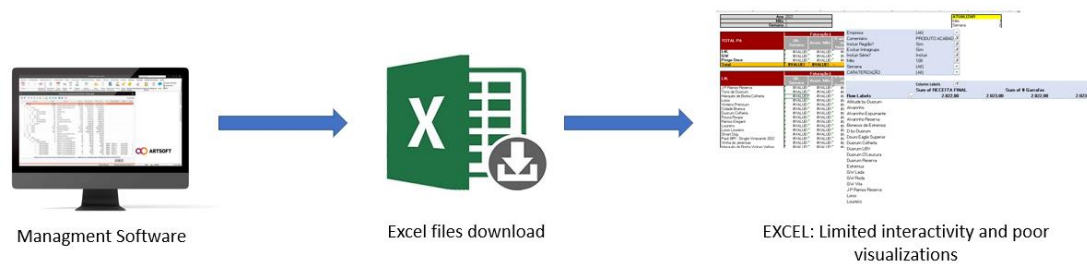


Figure 1 - Existing Sales Performance Management Tool

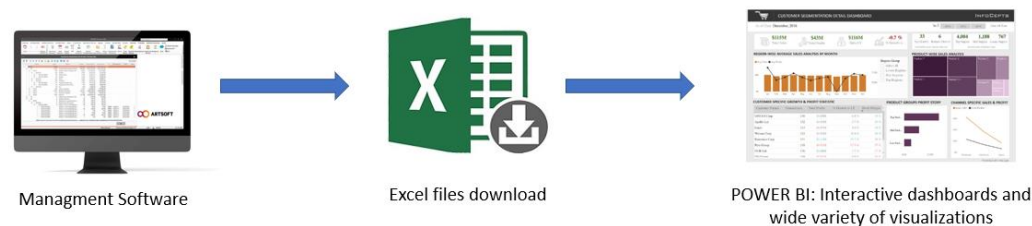


Figure 2 - Future Sales Performance Management Solution in Power BI

1.4. COMPANY DESCRIPTION

JPR is a family-owned SME operating in the wine and spirits' sector. In 2022 the company celebrated 30 years of existence. The company has over 130 employees. The Group is present in four different regions of Portugal: Douro, Vinho Verde, Beiras and Alentejo (where the headquarters are located). Before creating the company, João Portugal Ramos worked as a winemaker consultant for many Portuguese wineries, having a significant influence in the way the sector evolved, not only in terms of quality, but also in the level of recognition for Portuguese wines in the world. Today, well known Portuguese wines like *Marquês de Borba*, *Duorum* and *Pouca Roupá* are produced, bottled, and commercialized by the Group. Nowadays, JPR produces and exports more than 70% of their wines to around 40 different countries, such as Poland, Sweden, USA, Brazil, China, Angola, Belgium, Canada and so on. Since 2016, the Group has in its portfolio the leading brand of brandies in Portugal – *CR&F* – a brand with a significant presence in the national market but also in markets such as the USA, Luxemburg, Macau, South Africa, among others. The Group manages 550 hectares of vineyards (owned and rented) and with a vinification capacity of 8.880.000 liters. As the result of a significant investment made in 2017, today the bottling line has capability of bottling 10.000.000 liters of wine per year. Such investment was to provide an answer to international demand. In 2021, the Group

produced around 5.000.000 liters of wine, an increase of 28% when compared with 2020 and, besides the economic environment, the total amount of revenues increased by 11%, when compared with the previous year. The brands of the Group, as said before, are present around the world, being the sales leader of Portuguese wines in some of those countries. At the moment, in the national market, the Group works with around 15 brands of wine, represented by 40 different wines, and with the CRF and 1920 brands (in the brandies segment). JPR also offers wine tourism programs such as wine tastings, lunches, and other experiences. This business segment has been growing in the past years, even with a pandemic in the middle, allowing the creation of differentiated tourism and attracting new and different clients to the winery. As the founder of the Group once said, “our purpose is to be a reference for Portuguese wines at international level by conferring a particular identity to different wines in which consumers can rely on”, the company is focused on following this vision as a long-term strategy, always keeping a familiar identity while aiming for leadership in the production and commercialization of wines.

1.5. METHODOLOGY

To achieve the purpose of this project, the Design Science Research methodology will be followed. Such approach consists in six main steps (Peppers et al., 2007): 1) Problem identification and motivation; 2) Defining the objectives of the solution; 3) Design and development; 4) Demonstration; 5) Evaluation; 6) Communication. This method will require multiple interactions with the sales team members and certain directors such as the Deputy CEO.

1.6. CONTRIBUTIONS

As an expected contribution, the Commercial Department will be provided with a powerful ready-to-use decision-making tool, which can be also used by other stakeholders. In the future, if need be, such tool can be applied to other departments/subjects (e.g., production, stocks).

2. LITERATURE REVIEW

This section provides the relevant theoretical ground behind the added value of the implementation of a Power BI tool within the sales department of JPR. In this matter, concepts like, Business Intelligence (BI), KPI (Key Performance Indicators), Data Visualization, Dashboards and other notions are also presented below.

2.1. WINE INDUSTRY

2.1.1. Global Context

According to Bisson et al. (2002), to succeed in the wine business it is key to combine two different dimensions: art and science. In the first dimension it is important to keep the traditions, since the wine sector has a lot of history, but there is also the need for creativity and innovative technologies to keep up. Regarding the second dimension, it is important to have in mind that wine production is a business like any other, thus it is important to guarantee profitability maximization in the long term. In a such competitive market, where every day new wine producers and new brands appear, the most successful wine companies are the ones who understand the market forces of demand and supply and whose products deliver high quality.

In the past, what defined the quality of wine was the wine maker behind the production, therefore if a consumer did not like a specific wine, he was considered to have a poor wine culture. Nowadays, with globalization and the easy and fast access to information, consumers have more power and knowledge to define if a product is good or not, and by that steer their purchases based on quality. Therefore, now more than ever, the perception of quality in a wine is led by the consumer, which requires wine producers to do an extensive evaluation of consumers behavior and choice of products. Besides the quality of the wine (taste and aroma), consumers also take into account in their wine preferences factors as the bottle and label design and sustainability policies (Bisson et al., 2002).

Given this, wine producers must focus not only in the wine quality but also in extrinsic factors that motivate the product choice of consumers, always combined with profitability optimization. Quality wines are produced all over the world and consumers expect specific and differentiating wine characteristics from each region, being possible for quality to be perceived by costumers in all regions (Bisson et al., 2002).

The wine business is a very competitive market, but significant changes have occurred in the last decades. In the 1980s, countries like France, Italy, Spain (known as the 'Old World'), dominated the wine industry (Castellini & Samoggia, 2018) but , in the last years, with the competition increase, emerging markets as the USA, Australia, Chile and Argentina, known as the 'New World', started gaining ground (Bisson et al., 2002). 'Old World' wine producers started to be challenged by 'New World' players, who have applied more modern and forceful international marketing approaches and have adopted innovative technologies, being able to compete with medium and quality wines (Campbell & Guibert, 2006).

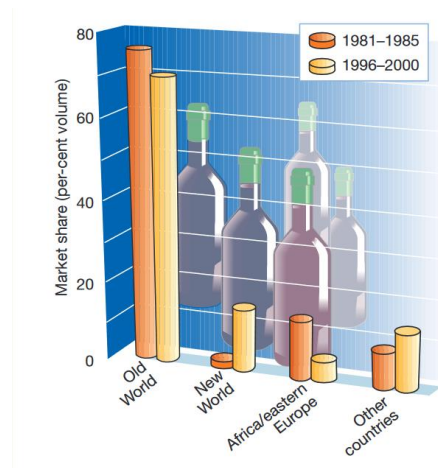


Figure 3 - Changes in the market share by production region. 'Old World' is defined as western Europe; 'New World' as Australia, North America and South America; 'other countries' includes Asia (Bisson et al., 2002)

Today, in the 21st century, the 'New World' emerging markets keep on increasing their relevance in terms of production. From 2000 to 2010, Western Europe production (Italy, France, Spain, Germany and Portugal) continued to be absorbed by 'New World' countries (USA, Australia, Chile and Argentina), Africa (South Africa) and by other countries. Western Countries still have the monopoly of the wine industry, but 'New World' countries represent a quarter of the wine industry (OIV - International Organization of Vine and Wine, 2023).

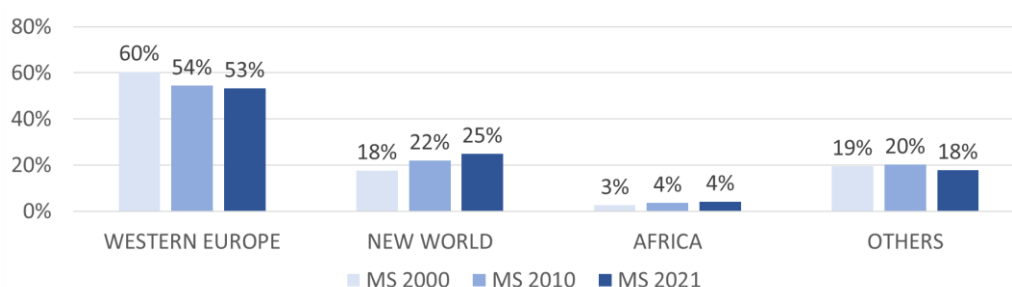


Figure 4 - Region Market Share - per-cent production (OIV - International Organization of Vine and Wine, 2023)

Keeping up in the wine business, in a competitive and successful way, is not an easy task for wine producers. Understanding the real motivation of consumer's choice, producing attractive wines and at the same time developing and keeping up with sustainability policies can be very challenging for companies. Therefore, to survive it is really important to understand and analyze the impact of each factor (intrinsic and extrinsic) that are in the foundation of consumer's preference, perception, behavior, and patterns (Bisson et al., 2002).

2.1.2. Portugal in the World

The Portuguese Wine Industry, which is included in the "Western Europe" segment, is based on a typical monopolistic market structure, composed essentially by micro-companies (74%) and SME (25%), where large-sized companies represent less than 1% of the market. Portugal is a historical wine

producing region that dates back to the Roman times, having vineyards distributed throughout the whole country (Faria et al., 2020).

In the year of 2021, vineyards occupied an area of approximately 194.000 hectares and Portugal produced around 7.359.000 hectoliters, the highest level since 2016, and ranked as the 10th world wine producer. In 2021, in terms of ranking, Portugal is the 10th Exporter (around 3.279.000 hectoliters exported) and the 11th Importer in the world (approximately 2.825.000 hectoliters). In terms of consumption Portugal achieved approximately 4.600.000 hectoliters in 2021, being the 12th wine consumer in the world. However, when talking about wine consumption per capita, Portugal takes the first place (51.9 liters per capita) (OIV - International Organization of Vine and Wine, 2023).

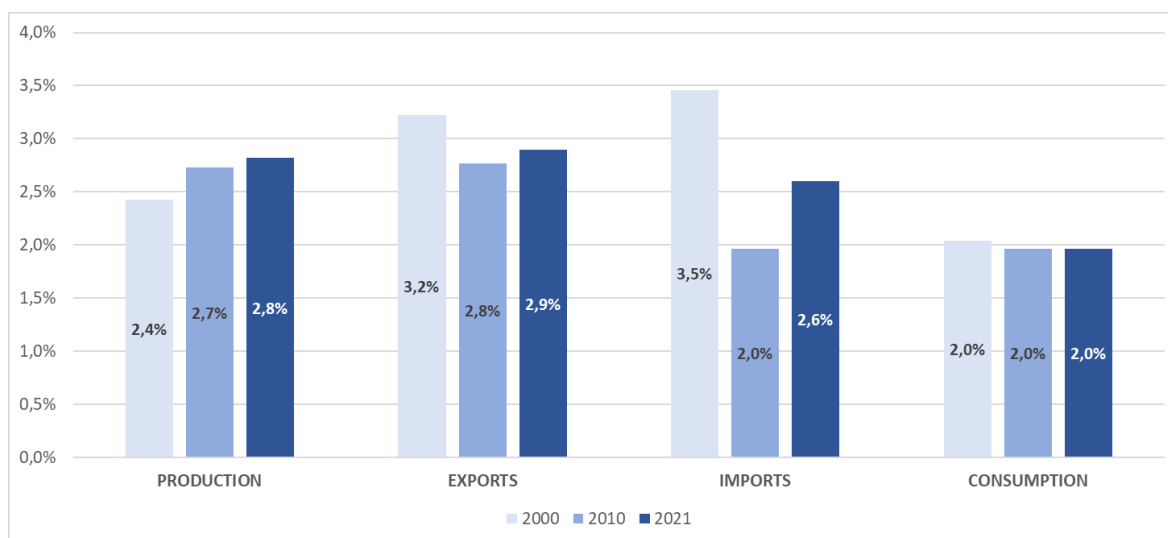


Figure 5 - Portugal Market share in terms of production, exports, imports and consumption (OIV - International Organization of Vine and Wine, 2023)

It is important to refer that, in the last decade, Portugal has slowed down its exportations, but it is importing more wine, when compared with the previous decade. Regarding consumption and production, there was also a decline in terms of production and consumption in the last decade.

Table 1 - Variation over time in terms of production, export and import in Portugal (OIV - International Organization of Vine and Wine, 2023)

	2000-2010	2010-2021
Δ Production	6.5%	3.0%
Δ Export	37.4%	23.0%
Δ Import	-8.5%	55.6%
Δ Consumption	2.8%	-2.6%

As said before, in 2021 Portugal exported around 3.279 k hectoliters, which corresponds approximately to 925.647 k €, in the table below the main international markets are presented:

Table 2 - Portuguese Exports per Country 2021 vs. 2020 in k€ and HL (IVV - Instituto do Vinho e Da Vinha, 2022)

	k €				Hectoliters				Average price (€ / l)		
	2020	2021	%	Var	2020	2021	%	Var	2020	2021	Var
FRANCE	110.831	116.203	12,6%	4,8%	405.676	424.989	13,0%	4,8%	2,73	2,73	0,1%
USA	92.250	104.317	11,3%	13,1%	257.453	274.924	8,4%	6,8%	3,58	3,79	5,9%
UK	95.304	96.190	10,4%	0,9%	290.814	269.221	8,2%	-7,4%	3,28	3,57	9,0%
BRAZIL	67.897	73.772	8,0%	8,7%	252.713	267.286	8,2%	5,8%	2,69	2,76	2,7%
GERMANY	48.188	54.672	5,9%	13,5%	193.472	225.041	6,9%	16,3%	2,49	2,43	-2,5%
NETHERLANDS	47.708	50.690	5,5%	6,3%	139.127	137.635	4,2%	-1,1%	3,43	3,68	7,4%
CANADA	49.808	50.487	5,5%	1,4%	136.933	131.530	4,0%	-3,9%	3,64	3,84	5,5%
BELGIUM	46.846	48.776	5,3%	4,1%	140.022	138.186	4,2%	-1,3%	3,35	3,53	5,5%
SWITZERLAND	34.308	35.889	3,9%	4,6%	112.125	108.329	3,3%	-3,4%	3,06	3,31	8,3%
POLAND	25.916	30.979	3,3%	19,5%	117.130	137.250	4,2%	17,2%	2,21	2,26	2,0%
SWEDEN	28.945	27.770	3,0%	-4,1%	125.394	117.931	3,6%	-6,0%	2,31	2,35	2,0%
ANGOLA	26.137	24.204	2,6%	-7,4%	219.036	202.146	6,2%	-7,7%	1,19	1,20	0,3%
DENMARK	21.530	22.969	2,5%	6,7%	39.219	40.127	1,2%	2,3%	5,49	5,72	4,3%
SPAIN	16.723	20.413	2,2%	22,1%	74.475	79.868	2,4%	7,2%	2,25	2,56	13,8%
NORWAY	14.873	14.322	1,5%	-3,7%	53.665	51.351	1,6%	-4,3%	2,77	2,79	0,6%
OTHERS	128.927	153.992	16,6%	19,4%	594.131	673.319	20,5%	13,3%	2,17	2,29	5,4%
TOTAL	856.190	925.647		8,1%	3.151.384	3.279.133		4,1%	2,72	2,82	3,9%

In 2021, the overall performance was very positive, in terms of value, the Portuguese exports increased 8.1%, which represents an increase of 4.1% in volume. The most important markets were France, the USA, UK, Brazil and Germany, together they represented 48.1% of the exports in value and 44.6% of exports in volume. In general, there was an increase in the average price per liter, being Germany an exception.

In 2022, data until November, is possible to see a deceleration, when compared with 2021, in the Portuguese exports of wine:

Table 3 - Portuguese Exports per Country Nov 2022 vs. Nov 2021 in k€ and HL (IVV - Instituto do Vinho e Da Vinha, 2023)

	k €				Hectoliters				Average price (€ / l)		
	YTDNov2021	YTDNov2022	%	Var	YTDNov2021	YTDNov2022	%	Var	YTDNov2021	YTDNov2022	Var
FRANCE	105.025	103.389	11,8%	-1,6%	384.058	367.498	12,0%	-4,3%	2,73	2,81	2,9%
USA	97.809	99.686	11,4%	1,9%	257.689	233.666	7,6%	-9,3%	3,80	4,27	12,4%
UK	90.048	79.150	9,0%	-12,1%	253.323	221.185	7,2%	-12,7%	3,55	3,58	0,7%
BRAZIL	68.385	66.159	7,6%	-3,3%	248.284	220.725	7,2%	-11,1%	2,75	3,00	8,8%
CANADA	47.784	49.305	5,6%	3,2%	124.975	117.715	3,8%	-5,8%	3,82	4,19	9,5%
GERMANY	50.410	46.510	5,3%	-7,7%	201.685	197.510	6,4%	-2,1%	2,50	2,35	-5,8%
ANGOLA	22.083	46.384	5,3%	110,0%	187.224	322.683	10,5%	72,4%	1,18	1,44	21,9%
BELGIUM	45.558	45.218	5,2%	-0,7%	129.156	130.846	4,3%	1,3%	3,53	3,46	-2,0%
NETHERLANDS	46.272	44.441	5,1%	-4,0%	126.263	127.529	4,2%	1,0%	3,66	3,48	-4,9%
SWITZERLAND	33.043	32.031	3,7%	-3,1%	100.357	91.084	3,0%	-9,2%	3,29	3,52	6,8%
POLAND	28.047	29.951	3,4%	6,8%	123.866	133.433	4,4%	7,7%	2,26	2,24	-0,9%
SWEDEN	27.194	24.211	2,8%	-11,0%	113.751	97.985	3,2%	-13,9%	2,39	2,47	3,4%
DENMARK	21.639	21.272	2,4%	-1,7%	37.040	39.969	1,3%	7,9%	5,84	5,32	-8,9%
SPAIN	18.683	19.949	2,3%	6,8%	84.854	106.562	3,5%	25,6%	2,20	1,87	-15,0%
NORWAY	13.459	11.305	1,3%	-16,0%	48.308	36.857	1,2%	-23,7%	2,79	3,07	10,1%
OTHERS	143.881	156.592	17,9%	8,8%	627.264	618.714	20,2%	-1,4%	2,29	2,53	10,3%
TOTAL	859.320	875.554		1,9%	3.048.099	3.063.962		0,5%	2,82	2,86	1,4%

Portugal exported more 0.5% (in volume) of wine when compared with the homologous period. However, such increase was less significant when comparing the year of 2021 with 2020 (+4,1%).

It is important to highlight Angola that has increased their performance 110% in terms of sales and 72.4% in volume. In November 2022, in terms of sales ranking, Angola takes the 7th place, while in 2021

was in 12th place. In terms of volume ranking, Angola takes the 2nd place, while in 2021 was in 6th place, overtaking the USA, UK, Brazil and Germany.

In November 2022, France, the biggest market for Portuguese wines, has decreased their sales in 1.6% in value and 4.3% in volume, but is still ahead of the USA.

In terms of average price per liter, there was a general increase of 1.4%, an increase less significant when comparing the year of 2021 with 2020 (+3.9%).

2.2. BUSINESS INTELLIGENCE

According to Azvine et al. (2005), Business Intelligence (BI) “is all about how to capture, access, understand, analyze and turn one of the most valuable assets of an enterprise – raw data – into actionable information in order to improve business performance”. Therefore, BI is a set of decision support applications that enables executives, managers, and analysts in the decision-making process. Such tools enable companies to understand their business and overall performance to evaluate if their goals are being achieved or not. (Chaudhuri et al., 2011).

BI can be looked from two different perspectives: as a process and as a product. As a process is the set of techniques a firm uses to gather information that helps the business to succeed in a global environment. As a product, is the information itself that enables companies to predict the future behavior of competition, supplier companies, clients, acquired technologies, markets, products and services, and the general business environment (Vedder et al., 1999).

In the last two decades, this area has experienced enormous progression. Data is growing at a rapid rate and businesses are boosting their data asset more than ever, being able to drive their business forward and deliver products and services with more added value to customers. Today, it is difficult to find a successful company that does not use BI tools for its business, it is a requirement for companies to remain competitive (Chaudhuri et al., 2011).

Watson & Wixom (2007) explain the main benefits from implementing BI tools in companies:

- a. costs saving in acquiring data due to data consolidation;
- b. time saving in delivering the data;
- c. faster access to the data by the end-user;
- d. information with higher quality / more accurate;
- e. supporting and improving the decision-making process;
- f. support the achievement of the strategic goals

With the right approach, BI tools have a huge potential, companies that have implemented BI initiatives successfully, are able to take advantage of such tools and increase performance and profit. For example, Western Digital, a manufacturer of data storage devices, was able to reduce operating costs by 50%, Continental Airlines had a return on the BI investment of more than 1000% or, last but not least, CompUSA, an IT retailer, had a return on investment higher than \$6 million already in the first stage of the project (Williams & Williams, 2010).

Power BI is one of the most known tools available in the market, such tool not only enables the centralization of data from many sources but also allows the creation of reports and dashboards that will support the decision-making process. Therefore, in literature it was possible to find implementation projects within sales department / for analyzing sales performance, where a Power BI solution was built with the purpose of providing the right information at the right time to right person:

1) “Building A Sales Dashboard for A Sales Department by using Power BI”

A trainee of Mesko (German power industry engineering company) identified the need of transforming simple excel pivot tables (exported from SAP) into Power BI dashboards, to reflect the sales performance of the company (Huang, 2019).

2) “Utilization of Business Intelligence in Sales Information Systems”

Integrating excel tools with Power BI Desktop and building a solution for an avocado distributor company which had the need of managing and analyzing data and also the necessity of making sales and profit predictions in the future (Nurdin et al., 2022).

3) “Designing a dashboard for the sales department of Company X”

Company X (anonymous) has started using Power BI but the sales department was not applying it, therefore the project conducted had the purpose of solving two main problems: a) Missing insight about which indicators are relevant for the department; b) Difficulty on building dashboards in Power BI (Franken, 2022).

4) “Decision Support System for the Industry 4.0 Environment: Design and Development of a Business Intelligence Tool”

A project developed for Super Bock (Portuguese soft drinks company) with the purpose of improving the decision-making process, therefore a Power BI solution was built focused on supply chain processes (Marques et al., 2020).

This last project is not focused on commercialization / sales but provides insights about an efficient implementation methodology.

2.2.1. Business Intelligence for SME

A pre-conceived idea that BI tools are not applicable in small companies and that such tools are exclusive for larger companies is frequent (Guarda et al., 2013). In literature, it is more common to find studies based on larger companies, since smaller companies tend to have less resources and technologies. Typically, the available tools are more suitable for larger enterprises, that fulfill most of the requirements for the implementation of this type of solutions in order to succeed (Papachristodoulou et al., 2017). However, even small organizations, may benefit in implementing BI tools in their company, even if in a simplified way. (D’Arconte, 2018).

No matter the size of an organization, the capability to manage, access and analyze relevant data is essential for supporting business decision-making processes, such ability is fundamental to ensure the success of the company (Papachristodoulou et al., 2017; Raj et al., 2016). Like many any other companies, SME are facing problems such as large amounts of data, shortage of information and, consequently, lack of knowledge. BI tools play a crucial role and bring numerous advantages for companies, however, smaller companies, as said before, have some limitations when compared with larger companies (Papachristodoulou et al., 2017).

According to Grabova et al. (2010), the main factors for SMEs not adopting BI systems available in the market are:

- a. high cost (not only in acquiring but also in maintaining);
- b. the need of complex hardware infrastructures;
- c. complexity for users / lack of knowledge;
- d. low capacity to adapt to such a dynamic environment;
- e. limited value added;
- f. the available tools are not prepared / appropriate for SMEs reality.

Due to the complexity and high cost associated with such tools, many companies end up by using MS Excel integrated with a database, however such instrument does not include efficient analysis and visualization capabilities (Raj et al., 2016).

It is possible to find online cheaper and easier BI solutions that meet the real small business's needs. The solution implemented in a SME might be simpler / easier to implement when compared with a BI system in a larger company but might be as competitive and successful. Companies must choose the solution that better fulfills their demands (e.g., information provided, data analysis tools, visualization instruments, accessibility, decisions efficacy) and that will bring more advantages (Papachristodoulou et al., 2017).

SMEs that have implemented BI tools in their organizations, rapidly recognize that they were able to compete more successfully in the market place (Guarda et al., 2013). However, the lack of knowledge and technical know-how about which solution suits to the company is still a challenge for most of the SMEs (Raj et al., 2016).

2.3. BUSINESS NEEDS AND KEY PERFORMANCE INDICATORS

In order for a BI solution to be successful, it is important to guarantee that the deliverable tool matches the business demands and expectations. Such requirements can be found through work sessions, to understand business issues, decision-making processes, the supporting analytic needs and last but not least the business objectives, based on key performance indicators (KPIs), as well as the intrinsic data behind. Such data should be evaluated in order to understand if it exists, if it is accessible and if it is possible to extract from data sources (Ross & Kimball, 2013).

2.3.1. Business Needs

The level of competitiveness and success of a company is not measured by the quantity of information produced. On the one hand, improvements in ICTs (Information and Technological Information) have facilitated the information acquisition and diffusion but, on the other hand, there is a risk of information overload in companies, which can create barriers in the decision-making process. Therefore, a business can produce a lot of information but there is a large amount of information that does not bring any advantage to the company's decision-making process (Vuori, 2006).

BI tools have the purpose of supporting decision makers thus, in order to make accurate decisions, the right information should be provided to the right person at the right time. The company can reduce the gathering of excess information by identifying and defining the business information needs, restricting the surplus information to only information that is really needed. It is important that the BI

tool only processes the information that is essential. Such exercise has the purpose of not only avoiding the gathering of useless information, it does not make sense to invest resources in acquiring information that will not be used in the decision-making process, but also in promoting the use of suitable information. Consequently, the decision-making process is optimized, providing a competitive advantage for the company. It is important to be aware of the difference between needs and “wants”, it does not make sense to invest resources to get “nice-to-know” information that do not favor the decision-making process (Vuori, 2006).

To perform such cleaning, an action plan should be created in order to get such information needs. There are some methods to define information needs but, according to the reality and situation of the company, there are methods more suitable than others. Given this, the most typical approaches used are (Vuori, 2006):

a) Questionnaires

Easy to implement and very economic, where answers can be analyzed quantitatively. The respondents have time to think on each question, the researcher does not need to invest much time and can be answered by a considerable number of people. As any approach, there are always disadvantages associated. For instance, a questionnaire does not allow new / extra information, there is also the risk of un-answered / misinterpretation questions, people ignoring the questionnaire or even the wrong person answering the questionnaire. Lastly, producing an effective questionnaire might be a challenge since is uncertain that the accurate questions are being made.

b) Interviews

Using this approach, in contrast with questionnaires, interviewees can answer the questions in a wider and more spontaneous way, where unexpected answers may be given and where they can express their ideas more freely. An interview allows discussion which provides a better understanding of the topic and also awareness, making it possible to discover things that are not visible at first. Throughout the interview it is also possible to add and adapt questions to fit the situation. As a negative consequence, such interviews tend to be expensive (e.g., recording systems, travel, and accommodation expenses, ...) and require a lot of time from the interviewer (researcher). Last but not least, it is important to refer that the interviewer must be careful with open-ended questions to avoid broad and inaccurate answers.

c) Observation

By looking at the documents / files that an individual uses it is possible to understand which information is actually used and by that which are the information needs. This approach can be used when there is not much knowledge about the topic. Through observation it is not possible to understand past information needs or, even more important, to predict which will be the future needs. Another disadvantage is that, since the decision-making process occurs inside a person's head, it is very difficult to fully understand which information was crucial for the process. Also, as a drawback, it is important to refer that such approach is not suitable for a large group of people, it is an arduous and time-consuming task for the researcher.

Vuori (2006) presents more approaches but this three are the most common and universal to most of the business realities, such methodologies can / should be used simultaneously for better research results. For instance, a questionnaire may be a good method to prepare the questions of an interview.

2.3.2. Key Performance Indicators

Key Performance Indicators (KPIs) are quantifiable or qualitative metrics that enable companies to measure their effectiveness in accomplishing strategic and operational objectives. KPIs are crucial to evaluate business performance and understand if the company is following the strategic plan as it was supposed to. Therefore, KPIs play an important role in the decision-making process, since such measures support the company in deciding which direction should take to keep the organizational strategy on course (Bishop, 2018b).

“The right set of indicators will shine light on performance and highlight areas that need attention”. Sometimes, executives have difficulties in understanding and identify the essential management measures and instead they collect everything that is possible to quantify which will cause an overload of information (Marr, 2012).

In order to choose the right set of KPIs, the strategy of the organization should be defined and clear, then the correct indicators should be linked to those goals (Marr, 2012). There is not an exact number of KPIs a company should have to meet the business goals. The purpose is not creating as many as possible, instead the focus should be creating KPIs only related with critical organizational activities. A high number of KPIs may lead to information overload and can difficult the decision-making process (Bishop, 2018b).

KPIs should be monitored with frequency, since it is essential for a company to know if their goals are being achieved or not, enabling faster and more informed decisions to correct deviations. The company should set the frequency that better fits each KPI, depending on the measure itself. For example, there are KPIs that are more volatile and KPIs that are more stable over time, in this last scenario daily monitoring won't be effective since improvements might not be seen for weeks or even months (Bishop, 2018b).

In a company, it is recommended not only to have KPIs to analyze the overall performance of the company, but also to define KPIs at all managerial levels between different teams / areas. The performance of a company only improves if the employees' performance also improves. Therefore, individual work within teams / areas should be aligned with the organizational work, guaranteeing that everyone is working for the same purpose / strategic goal. By each area having their own KPIs it is also possible to identify possible bottlenecks that are not contributing to the overall performance of the organization, enabling faster detection of the problem and take the needed actions to solve it. Important to refer that the “lower” the level in the organization, the simpler the KPIs, nothing more than basic measures. A big challenge for managers is setting relevant and attainable targets. The target should be in line with the strategic plan / goals of the company, they should be realistic but at the same time challenging to ensure the growth of the company (Bishop, 2018b, 2018a).

The exercise of defining which KPIs are crucial for the company should not consider where the data comes from or from where it is possible to get it. To begin, the focus should be on identifying the indicators that will help the organization in the goals achievement, these data sources problem can be figured out after once the needed KPIs are identified (Bishop, 2018a).

According to Bishop (2018b), there are five main characteristic that a KPI should have:

a) Relevant

A KPI should be aligned with the business information needs and by consequence with the strategic plan / goals of the company. If a KPI is not linked with a business need, we are dealing with a secondary measure and not a key performance indicator (KPI).

b) Informative

An effective KPI will tell the organization / team something that is new and even something that competitors don't know. It should gather data from different sources and create new knowledge, insights that would not be possible to get in any other way.

c) Research based

A KPI construction should be based on research assumptions to ensure foundations and precision. What's the point of having KPIs if decision-makers do not belief them or have to double check if the information is correct before making any decision?

d) Actionable

A metric that cannot be influenced, even in an indirect way, it is not important to measure. A KPI should not only be informative, instead should enable actions within the organization to correct deviations. Therefore, a KPI must measure something that the company can control.

e) Predictive

A KPI should enable decision-makers to visualize the present and also to predict the future. Here is where BI solutions play a critical role, enabling predictive analysis.

After researching specific KPIs in literature, the following set of indicators were chosen based on what could be the needs of a commercial department.

Table 4 - Possible KPIs for a Commercial Department

KPI	Source	Description
Gross sales / Total revenues	(Ishaq Bhatti et al., 2014; Kostin et al., 2021)	The total amount of revenues
Revenue growth rate	(Ishaq Bhatti et al., 2014; Marr, 2012)	Difference between the current period's revenue and the previous period's revenue, in relation to previous period's revenue (%)
Sales Volume (quantity)	(Kostin et al., 2021)	The total quantity sold
Cost of goods sold / sales	(Ishaq Bhatti et al., 2014)	Direct costs of producing the goods sold by an organization
Gross Profit Margin	(Cristea & Cristea, 2021)	The difference between revenue and cost of goods sold, in relation to revenue (%)

Budget vs. Actual sales	(Cristea & Cristea, 2021)	Difference between actual sales and budget
Average order value / Average basket value	(Peterson, 2006)	Average revenues per order
Average basket size	(Marr, 2012)	Average quantity sold per order
Incoming orders / Orders frequency	(Ishaq Bhatti et al., 2014; Kostin et al., 2021)	Total number of orders during a specific period
Customer lifetime value	(Kostin et al., 2021)	The full amount generated by a customer during the entire business relationship
Customer turnover	(Ishaq Bhatti et al., 2014; Kostin et al., 2021)	Measured as the ratio between lost customers and the total amount of customers during a specific period
Customer satisfaction	(Kostin et al., 2021)	Measured as the ratio between satisfied customers and the total number of customers

2.4. DATA VISUALIZATION AND DASHBOARDS

Data Visualization is gaining recognition as an important component of BI, being a requirement for people who work with data. Data visualization permits not only representing data in graphs but also interacting with those representations to display what is pretended, for example, through the use of filters or using the drill down capability (Few, 2007). Such tools, by effectively representing data from different sources, allow decision-makers to discover patterns, understand the information displayed, form an opinion and consequently actionable insights (Sadiku et al., 2016).

There is not a unique possibility to display a certain information, actually there are many options and the challenge is for the analyst to assess the advantages and disadvantages of each type of visual and choose the most appropriate option (Midway, 2020).

For this project, as said before, a Power BI solution will be built in order to meet the business needs of the commercial department. Therefore, the following list presents a brief summary of the most relevant visuals available on Power BI (Microsoft Learn, 2023c):

- a) Table / Matrix – a grid with rows and columns displaying different measures for each category;
- b) Bar chart / Column chart – enables the visualization of a specific value across different categories;
- c) Card – display one or more data points;
- d) Line chart – shows the evolution of a value over time;
- e) Combo chart – combines both column chart and line chart;
- f) Pie chart / Doughnut chart– shows the parts of a whole;

- g) Gauge charts / KPIs - displays a single value and measures the achievement of a specific goal;
- h) Key influence chart – displays the major contributors for a specific value / result;
- i) Map – associates information with a specific location;
- j) Scatter chart – displays points at the intersection of an x and y numerical value;
- k) Slicer – standalone chart that can be used to filter other visuals on the same page;
- l) Treemap – colored rectangles which are arranged in size from the largest to the smallest.

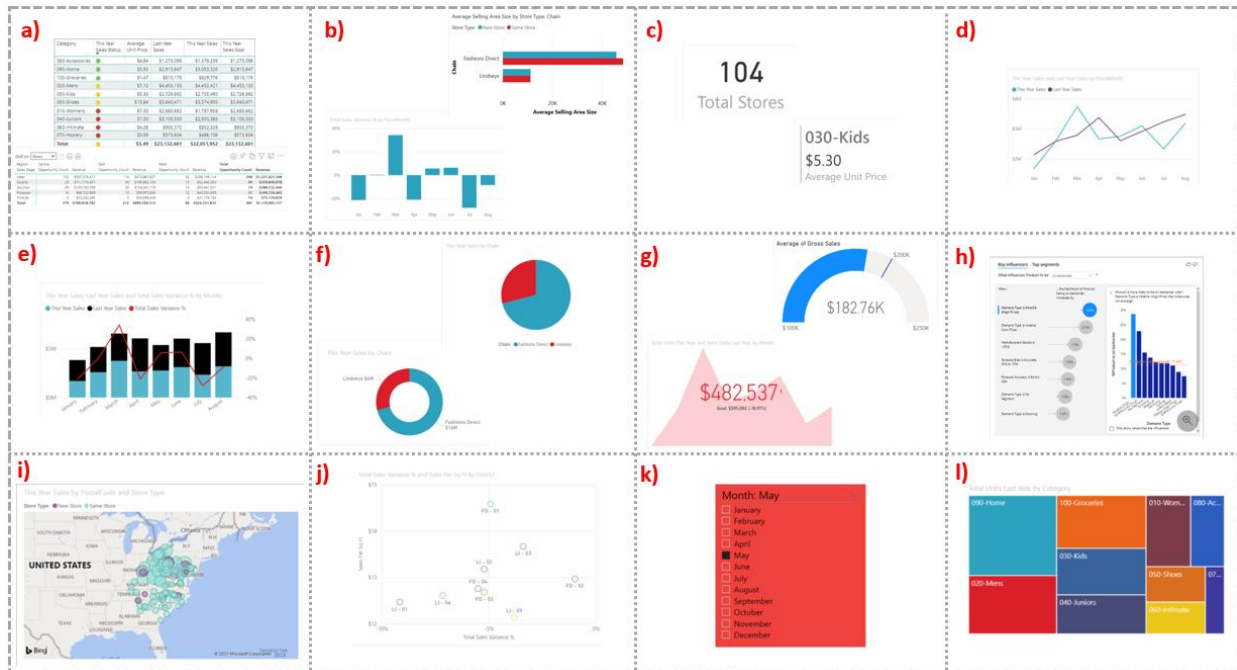


Figure 6 - Visualization types in Power BI - adapted from Microsoft Learn (2023c)

In order to choose the best visual to display specific information, the following question should be made: *“What do you need your audience to know?”*. By clarifying that, it is possible to evaluate if the chosen visual is suitable or not and make the needed changes (Knaflic, 2015).

In today’s business environment, dashboards occupy an important place in decision-makers’ mind. Such tool combines various types of visualizations in a single place, being possible to consolidate all the information that is needed to answer a specific business need on a single screen. When correctly created, dashboards enable decision-makers to have a clear picture of what is going on in their business (Few, 2007). Besides enabling decision makers to see the big picture, a dashboard should also allow to focus on a specific subject that needs attention and to quickly drill down into additional information that is needed to take actions (Few, 2005a).

Based on Eckerson (2010) view, there are 9 main benefits for adopting dashboards in a company:

- a) Communicate strategy: with a dashboard is possible to reflect and track the strategy of an organization, through metrics and targets that can be personalized to each business unit;
- b) Refine strategy: it is possible to adapt corporate decision making based on the evolution of the metrics and goals tracked on the dashboard;
- c) Increase visibility: it allows managers to access relevant data in a clear and up to date manner, allowing to flag an issue early-on and act accordingly;

- d) Increase coordination: providing access to dashboards on a company wide basis, fosters information and knowledge sharing across different areas, allowing employees to better coordinate their work;
- e) Increase motivation: dashboards are performance drivers since increase friendly competition, which will boost motivation e consequentially results;
- f) Consistent view of the business: dashboards, by consolidating and integrating corporate information, allow a single version of the truth accessed by the entire organization / department;
- g) Reduce costs and redundancy: dashboards remove the need of having different, independent and redundant reports, that can threaten having a single version of the truth;
- h) Empower users: dashboards allow users to be autonomous when accessing to information and create their own and customized reports;
- i) Deliver actionable information: dashboards provide easy access to data, which can allow users to undertake specific actions on a timely manner, instead of wasting time looking for data in order to make a decision.

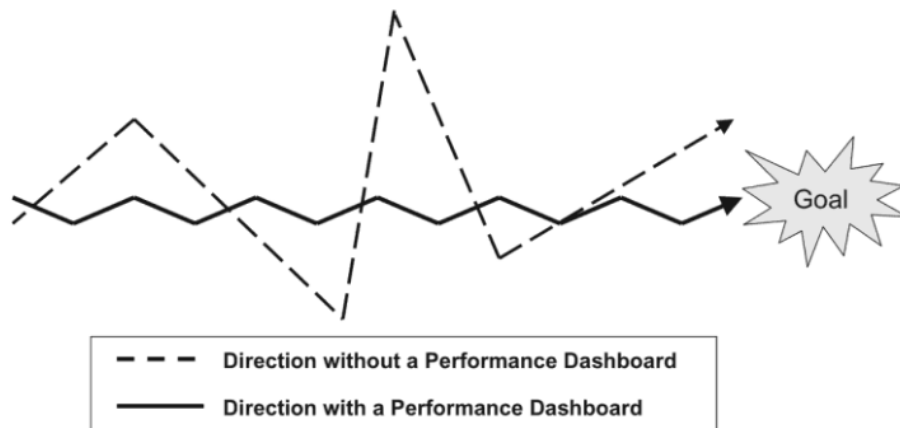


Figure 7 - Direction without a Performance Dashboard vs. with a Performance Dashboard (Eckerson, 2010)

According to Few (2005b), “the fundamental challenge of dashboard design is to display all the required information on a single screen, clearly and without distraction, in a manner that can be assimilated quickly”. In practice, such objective is not easy to reach. Building an effective dashboard requires displaying a lot of information in a single screen / page without being overwhelming. Therefore, there is a set of design principles to help in this process. The author underlines four main characteristics for an effective dashboard:

- a) well-structured and organized display;
- b) simple and concise visuals;
- c) focus on summaries and outliers;
- d) information that is clearly adapted to the subject matter.

Microsoft (2023) also refers four essential rules to create a dashboard:

- a) Use real-time data: include real-time data in the dashboards to share across the department / organization, guaranteeing that the right person has the right information at the right time;
- b) Know your audience: choose the visuals that will fit your audience best;
- c) Stay consistent: the dashboards should be easy to navigate. Consistency in filters, colors and styles should be guaranteed to help users find information easier;
- d) Group data logically: each topic / subject should be grouped with a logic to facilitate users navigation, especially when users from different areas use the same dashboard.

Furthermore Microsoft (2023), presents mistakes that should be avoided when building a dashboard, which are in line with the “13 Common Pitfalls in Dashboard Design” underlined by Few (2005a):

- a) Not having a clear purpose / goal for the dashboard. A dashboard should answer to a specific business need;
- b) Having too many KPIs / information in one dashboard;
- c) Using low-quality data (data with incoherences or even data that is not updated);
- d) Representing the with the wrong visual;
- e) Using a messy, unclear or unreachable design.

3. METHODOLOGY

The future solution was developed under the Design Science Research methodology. The main goal of the project is to build dashboards in Power BI to analyze sales performance, in order to support the decision-making process within the commercial department. This methodology consists of a six-step process (Peffer et al., 2007):



Figure 8 - Design Science Research methodology – adapted from Peffer et al. (2007)

In a nutshell, such method requires an initial contextualization of the problem, followed by the construction of the solution and testing it until the end product is suitable to solve the problem.

3.1. PROBLEM IDENTIFICATION AND MOTIVATION

As explained before, JPR has the need to build a solution that supports the decision-making process within the commercial department. Therefore, the implementation of a BI tool in this context, specifically a Power BI solution, could have a significant impact on the daily work of the company. As stated in the literature review, there are many benefits from implementing a BI tool in a company and adopting dashboards. The problem identification, potential benefits and importance of the solution proposed was presented and discussed with the Sales team and Deputy CEO.

3.2. DEFINING THE OBJECTIVES OF THE SOLUTION

Clearly define the objectives of the solution by identifying the team's business needs. As explained in the literature review, a business need is the starting point for the implementation of a BI tool. Such needs are related to information that managers need to have access in a visual and easy way in order to support their decisions. A business need should be very clear, succinct, and objective.

In the literature review, it is possible to find three main different approaches in order to identify the business needs: questionnaires, interviews and observation. For this project, the decision was to interview one member of the commercial department and the Deputy CEO in order to understand which are the main business needs / goals for the future Power BI solution (Appendix A and Appendix B).

Therefore, the following targeted business needs were defined:

- What is the company's overall sales performance?
 - by Segment (L4L, GW, PD and CR&F)
 - by Market
 - by Month and Year
 - by Brand and Macro Brand
 - by Sales Manager
- What is the company's sales budget / forecast achievement?

- by Segment (L4L, GW, PD and CR&F)
- by Market
- by Month and Year
- by Brand and Macro Brand
- by Sales Manager
- What is the monthly stock of final goods?
 - by Product
 - by Month

It is key to underline that some of these business needs require some KPIs that were identified in the Literature Review as important / essential indicators for a commercial department.

3.3. DESIGN AND DEVELOPMENT

In this step the artifact is created, by having the business needs and KPIs acknowledged it is important to identify the necessary data sources. After that, drawing the multidimensional model and building the dashboards in order to answer to the targeted business needs.

3.3.1. Selected tool: Power BI

In order to choose a BI tool that better suits the organization, it is important to understand the reality of the company (e.g., size, data sources type, systems used, business needs, key performance indicators, available resources, ...) and, with a comprehensive knowledge of the circumstances, look for a BI solution that is suitable for the company.

One of the most known BI tools available in the market is Microsoft Power BI, which has been chosen to develop this project.

Power BI allows the centralization of data from different sources and enables the creation of interactive dashboards and reports, which provide actionable insights about the company's performance. Such tool will not only support the decision-making process but will also improve the sharing and communication process of information among the members of the organization / team. Power BI includes 3 different elements (Marques et al., 2020):

a) Power BI Desktop, a Windows application desktop, enables the centralization of data from different data sources, the creation of different reports and a complete data analysis. It includes the Query Editor, which allows to clean and transform the data from different data sources and combine them into a data model. Once the data model is built, it is possible to create reports to answer the business needs. A report is an aggregation of many visuals (graphs and charts).

b) Power BI Service, an online SaaS (Software as a Service), which is a cloud service that allows to publish and share the reports created in the Power BI Desktop with other team members. The users are able to view and interact with the reports.

c) Mobile Power BI, which allows access through mobile devices.

The three elements combined allow users to create, share and take business insights that will help them their position in the organization in a more efficient way (Microsoft Learn, 2023b).

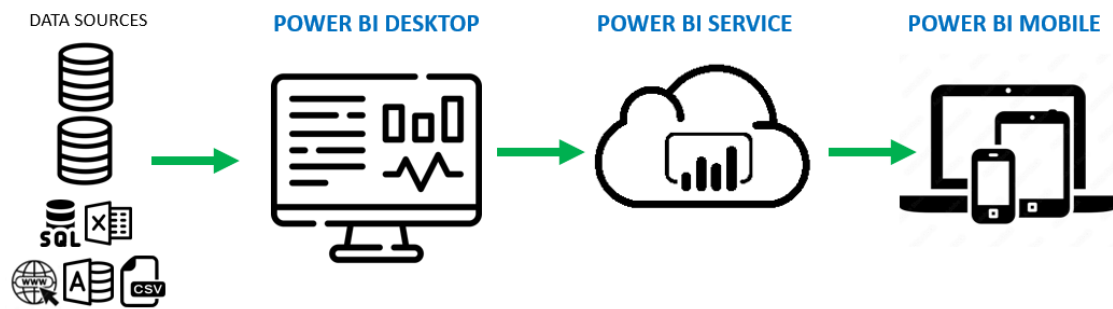


Figure 9 - The Parts of Power BI - adaptation of (Microsoft Learn, 2023b)

The construction of the artifact, the Power BI solution, which will be done in the Power BI Desktop, will be detailed in the Empirical Study chapter.

3.4. DEMONSTRATION

In this step it is important to validate the artifact, by analyzing the capability of the solution to answer to the business needs. This step requires a deep knowledge of how the dashboards should be designed in order to meet business needs. Therefore, the commercial department will play a crucial role in this step by undertaking a detailed analysis of the dashboards and providing feedback on potential adjustments.

Each dashboard will be built with the purpose of answering one or more business needs. The dashboards will be organized by business segments (L4L, GW, PD and CR&F) and in each segment will be possible to analyze revenues by sales manager, markets performance and brands performance over time. Besides this, it will also be possible to have an overview of the performance of the business as a whole (revenues and stocks) and also to evaluate the performance of the wine tourism segment (wine sales and programs). This will be developed in the Results chapter.

3.5. EVALUATION

In this step of the methodology, the final model (Power BI dashboards) will be tested with the team, comparing the initial objectives with the observed results, in other words evaluating if the created dashboards are able to answer to the business needs identified. This will be discussed in the Conclusions, Limitations and Future Work chapter.

4. EMPIRICAL STUDY

4.1. DATA SOURCES

As explained before, one of the main goals of a BI solution is to combine different data sources into a single model allowing data consolidation and having the necessary information in a single screen, supporting decisions makers. To do so the necessary data sources were provided by the company, through excel files extracted from the management software or information prepared by the commercial team. Each of these sources will be explained below.

4.1.1. Sales

As a data source, a list of sales from 2019 until today was extracted from the system used by the company (Artsoft). Such list contains the following columns:

Table 5 - Sales Data Source

Column	Description
<i>"Código Produto"</i>	Identification of the sold product
<i>"Quantidade"</i>	Quantity Sold (number of bottles / wine tourism programs)
<i>"Valores"</i>	Revenue (€)
<i>"A&P"</i>	Sale amount adjustment, if applicable (€)
<i>"Data"</i>	Transaction date
<i>"Cliente"</i>	Client's identification
<i>"Série"</i>	Sale document type
<i>"Tipologia"</i>	Type of product sold (final good or wine tourism program)

For each item of the portfolio (*"Código Produto"*) there is a list with the details of the product, with the following columns:

Table 6 - Products Data Source

Column	Description
<i>"Designação"</i>	Product Name
<i>"Tipo"</i>	Type of product (e.g., bottled wine, bag in box wine, wine tourism program, wine packs...)
<i>"Marca"</i>	Product Brand

<i>"Visão Marca"</i>	Product Macro Brand
<i>"Região"</i>	Wine Region (if not a wine tourism program)
<i>"Cor"</i>	Wine Type: red, white, rose, ... (if not a wine tourism program)
<i>"Colheita"</i>	Harvest Year (if not a wine tourism program)
<i>"Capacidade"</i>	Wine capacity in liters (if not a wine tourism program)
<i>"Negócio"</i>	Business Segment: L4L (national and international wine market), CR&F (brandy business), GW (European wine client) or PD (private label for a Portuguese Distributor)

For each client ("Cliente") there is a detailed set of information with the following columns:

Table 7 - Clients Data Source

Column	Description
<i>"Mercado Destino"</i>	Target Market
<i>"Zona 2"</i>	Market Type (<i>"Distribuidora PT"</i> , <i>"Exportação"</i> , <i>"Intragrupo"</i> , <i>"Portugal"</i>)
<i>"Região Macro"</i>	Target Continent
<i>"Gestor Comercial"</i>	Lead Sales Manager

For each sale document ("Série") there is also an elementary list with details about each document type and which ones should be included as sales revenues.

4.1.2. Budget and Forecast

Every year, in November / December, there is a meeting where the commercial department presents to the Administration the budget (expected sales) for the next year. Throughout the next year, such budget may suffer some adjustments, therefore, at the end of each month, the sales department does a 3M forecast to have a more accurate value for the expected sales. Such lists (Budget and Forecast) contain the following columns:

Table 8 - Budget / Forecast Data Source

Column	Description
<i>"Código Produto"</i>	Identification of the product
<i>"Quantidade"</i>	Expected quantity to be sold (number of bottles / wine tourism programs)
<i>"Valores"</i>	Expected Revenue
<i>"Data"</i>	Date (month)
<i>"Cliente"</i>	Client's identification

4.1.3. Stocks

It was also extracted from the system the stock of each product at the end of each month. Such list contains the following columns:

Table 9 - Stocks Data Source

Column	Description
<i>"Data"</i>	Date (month)
<i>"Código Produto"</i>	Identification of the product
<i>"Categoria"</i>	Stock Type (<i>"Produto Acabado"</i> , <i>"Produto Semi-acabado"</i> , <i>"Secos"</i> , <i>"Granel"</i> , ...)
<i>"Armazém"</i>	Storage Name / Location
<i>"Saldo"</i>	Stored Quantity
<i>"Custo Médio"</i>	Average Unit Cost (€)
<i>"Total"</i>	Stored Amount (€)

4.2. DESIGNING THE DIMENSIONAL MODEL

After having the data sources identified it is possible to build the dimensional model that will be based on relationships between fact and dimension tables. The goal of building a dimensional model is to enable end-users to make their analyses and maximize the efficiency and velocity of information retrieval. To develop a proper and useful dimensional model, according to Ross & Kimball (2013), there are four key steps to design a dimensional model:

1) Select the business process:

A business process is a low-level activity performed by an organization. In this project, the main goal is to better understand sales performance. Therefore, it is important to have the business requirements / needs well defined in order to understand which data is required.

Based on the available data, it is possible to analyze which products / brands / macro brands are sold and in which location (country / continent).

2) Declare the grain:

It is important to understand and clarify what an individual row represents, providing an answer to the question "How do you describe a single row in the fact table?"

In this project, four fact tables will be considered: "*Vendas*", "*Stocks*", "*Budget*" and "*Previsões*".

- "*Vendas*" – a single row represents a customer's sale transaction.
- "*Stocks*" – a single row represents the monthly snapshot of the inventory levels.
- "*Budget*" – a single row represents a product sales budget for a specific market.
- "*Previsões*" – a single row represents, by product, the sales forecast for a specific market.

3) Identify the dimensions:

Each fact table should be decorated with a collection of dimensions, supporting the business process by providing context.

The dimensions identified are:

- "*Produto*" – based on this data it is possible to understand which products and brands / macro brands are sold. The characteristics that describe each product were detailed above.
- "*Cliente*" – with this dimension it is possible to see which are the main customers / markets. The information contained in this dimension was explained above.
- "*Data*" – this dimension is not included in the original data sources, but it is very useful since it provides a temporal context for the organization. With this dimension it is possible to measure the evolution over time.
- "*Série*" – it is a very simple dimension as it includes only two columns but it is very important since it provides information about which sales document types should be considered as sales revenues.

4) Identify the facts

The fact tables are the numeric measures of a business process. For this project, as said before, four fact tables were identified.

Table 10 - Measures

Fact Table	Measures
Vendas	Quantity Sold; Revenues (€)
Stocks	Stored Quantity; Average Unit Price (€); Stored Amount (€)
Budget	Budget Quantity, Budget Sales Amount (€)
Previsões	Forecast Quantity, Forecast Sales Amount (€)

To understand the relationships between the dimension and fact tables, a bus matrix is illustrated in the following table:

Table 11 - Bus Matrix

	Dim Produto	Dim Cliente	Dim Data	Dim Série
Fact Vendas	X	X	X	X
Fact Budget	X	X	X	
Fact Previsões	X	X	X	
Fact Stocks	X		X	

By having the four steps clarified, it is possible to design the database structure/schema, that consists of the arrangement of the tables mentioned above. For this project a constellation schema architecture was chosen. In this architecture, the dimensions are shared by many fact tables.

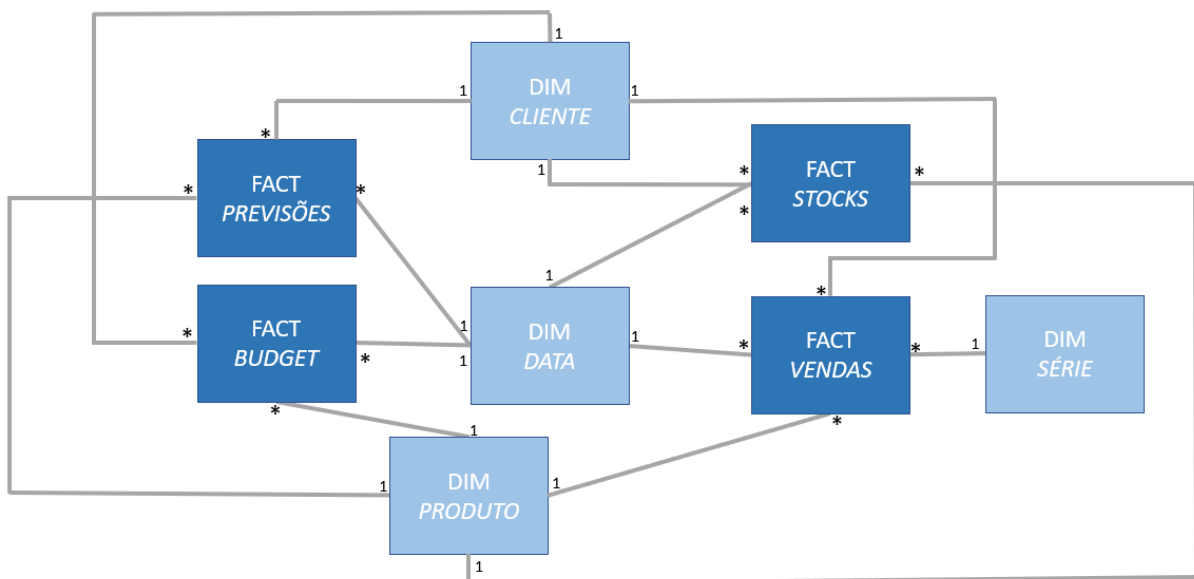


Figure 10 - Constellation Schema Architecture

4.3. IMPORTING DATA INTO POWER BI AND DATA TRANSFORMATIONS

The sales data, from 2019 until today, the Budget and Forecast for the current year and the monthly stocks were loaded into Power BI Desktop. The necessary data transformations were performed in the Power Query Editor (e.g., surrogate key creation for each dimension, removal of unnecessary columns, columns merge, tables join to create the foreign key in the fact tables, values replacement, ...).

4.3.1. Dim Data

Such dimension was not created directly from a data source but is crucial to provide a temporal context for the commercial department. As said before, with this dimension is possible to measure the sales performance over time.

Using the Power Query M language, in a blank query, the following expression was defined to create a list of dates from 2019 to 2029:

```
=List.Dates(#date(2019,1,1),Number.From(#date(2029,1,1)) -  
Number.From(#date(2019,1,1)),#duration(1,0,0,0))
```

Then, such list was converted into a table and the following columns were created based on each single date: “Ano”, “Trimestre”, “Mês”, “Semana”, “Mês_número”. It was also needed to create the SK (surrogate key) using the “Custom Column” option based on the date, for example, for the 01-01-2019, the following SK was set 20190101.

Table 12 - Dim Data details

Column	Description	Data Type
<i>SK_data</i>	Date unique identifier	Whole Number
<i>Data</i>	Date	Date
<i>Ano</i>	Year	Whole Number
<i>Trimestre</i>	Trimester identification	Text
<i>Mês</i>	Month name	Text
<i>Semana</i>	Week of the year	Whole Number
<i>Mês_número</i>	Month number	Whole Number

4.3.2. Dim Produto

For this table, the data was imported directly from the source and a few transformations were needed. First, there was the need to create the SK using the “Index Column” option (starting from 1), then the “Código_Designação” column was created merging two existing columns (“Código” + “Descrição”). In the “Capacidade” columns, the empty cells related to wine tourism programs were replaced with 0. For some columns there was the need to change the data type.

Table 13 - *Dim Produto* details

Column	Description	Data Type
<i>SK_product</i>	Product unique identifier	Whole Number
<i>Código_Designação</i>	Product Name	Text
<i>Tipo</i>	Type of product	Text
<i>Marca</i>	Brand	Text
<i>Visão Marca</i>	Macro Brand	Text
<i>Região</i>	Wine region (if not a wine tourism program)	Text
<i>Cor</i>	Wine type	Text
<i>Colheita</i>	Harvest year (if not a wine tourism product)	Text
<i>Capacidade</i>	Wine capacity (if not a wine tourism product)	Decimal Number
<i>Negócio</i>	Business segment	Text

4.3.3. Dim Cliente

In this dimension, also imported directly from the source, there was the need to create the SK using the “Index Column” option (starting from 1) and to standardize the text in the “*Cliente*” column to uppercase.

Table 14 - *Dim Cliente* details

Column	Description	Data Type
<i>SK_cliente</i>	Client unique identifier	Whole Number
<i>Cliente</i>	Client’s name	Text
<i>Mercado_Destino</i>	Target market	Text
<i>Zona 2</i>	Market type	Text
<i>Região Macro</i>	Target continent	Text
<i>Gestor Comercial</i>	Lead sales manager	Text

4.3.4. Dim Série

This dimension contains only two original columns, but it is a very important dimension since it allows to distinguish which document types should be considered as revenues. Therefore, in this dimension the only transformation needed was to create the SK using the “Index Column” option (starting from 1).

Table 15 - *Dim Série* details

Column	Description	Data Type
<i>SK_serie</i>	Document type unique identifier	Whole Number
<i>Série</i>	Document type description	Text
<i>Incluir_Excluir</i>	Considering or not considering for sales revenues	Text

4.3.5. Fact Vendas

For this fact table the main transformations performed were merging queries in order to get the SK from each dimension table. First to merge with the “*Dim Cliente*” query, it was needed to standardize the text in the “*Cliente*” column to uppercase, then after performing the merging it was possible to extract the SK for each client. The merging with the other queries, “*Dim Data*” (through the “*Data*” column), “*Dim Série*” (“*Série*” column) and “*Dim Produto*” (“*Código*” column), were also performed and we were able to get the SK from each dimension table. After having the FKs (foreign keys), which correspond to the SK in each dimension table, we were able to delete the following columns “*Código*”, “*Data*”, “*Série*” and “*Cliente*”. Lastly, in the “*A&P*” column, there was the need to replace the empty cells with 0.

Table 16 - *Fact Vendas* details

Column	Description	Data Type
<i>FK_produto</i>	Product unique identifier	Whole Number
<i>FK_data</i>	Date unique identifier	Whole Number
<i>FK_cliente</i>	Client unique identifier	Whole Number
<i>FK_serie</i>	Document type unique identifier	Whole Number
<i>Quantidades</i>	Quantity sold	Whole Number
<i>Valores</i>	Revenue	Decimal number

<i>A&P</i>	Sales amount adjustment (if applicable)	Decimal number
Tipologia	Type of product sold (wine or wine tourism program)	Text

4.3.6. Fact Budget / Fact Previsões

These fact tables ("*Fact Budget*" and "*Fact Previsões*") have the same structure. For these tables it was needed to merge queries with "*Dim Cliente*" (after standardizing the column "*Cliente*" to uppercase), "*Dim Date*" and "*Dim Produto*". After performing the mergers and having the FKs it was possible to delete the following columns "*Código*", "*Data*" and "*Cliente*".

Table 17 - *Fact Budget* details

Column	Description	Data Type
<i>FK_produto</i>	Product unique identifier	Whole Number
<i>FK_data</i>	Date unique identifier	Whole Number
<i>FK_cliente</i>	Client unique identifier	Whole Number
<i>Budget Vendas</i>	Budget value	Decimal number
<i>Budget Quantidades</i>	Budget quantity	Decimal number

Table 18 - *Fact Previsões* details

Column	Description	Data Type
<i>FK_produto</i>	Product unique identifier	Whole Number
<i>FK_data</i>	Date unique identifier	Whole Number
<i>FK_cliente</i>	Client unique identifier	Whole Number
<i>Previsões Vendas</i>	Expected value to be sold	Decimal number
<i>Previsões Quantidades</i>	Expected quantity to be sold	Decimal number

4.3.7. Fact Stocks

For these tables it was needed to merge queries with “*Dim Date*” and “*Dim Produto*”. After performing the mergers and having the FKs it was possible to delete the following columns “*Código*” and “*Data*”. Lastly, in the “*Saldo*” and “*Custo Médio*” columns, there was the need to replace the empty cells with 0.

Table 19 - Fact Stocks details

Column	Description	Data Type
<i>FK_produto</i>	Product unique identifier	Whole Number
<i>FK_data</i>	Date unique identifier	Whole Number
<i>Saldo</i>	Stored quantity	Decimal number
<i>Custo Médio</i>	Average unit cost	Decimal number
<i>Total</i>	Stored amount	Decimal number
<i>Armazém</i>	Storage name	Text
<i>Categoria</i>	Stock type	Text

4.4. DIMENSIONAL MODEL

After having all the transformations done in the Power Query Editor and developing our dimensions and fact tables, in the Model view the tables were mapped through surrogate key and foreign key relationships. Such connections created the following dimensional model:

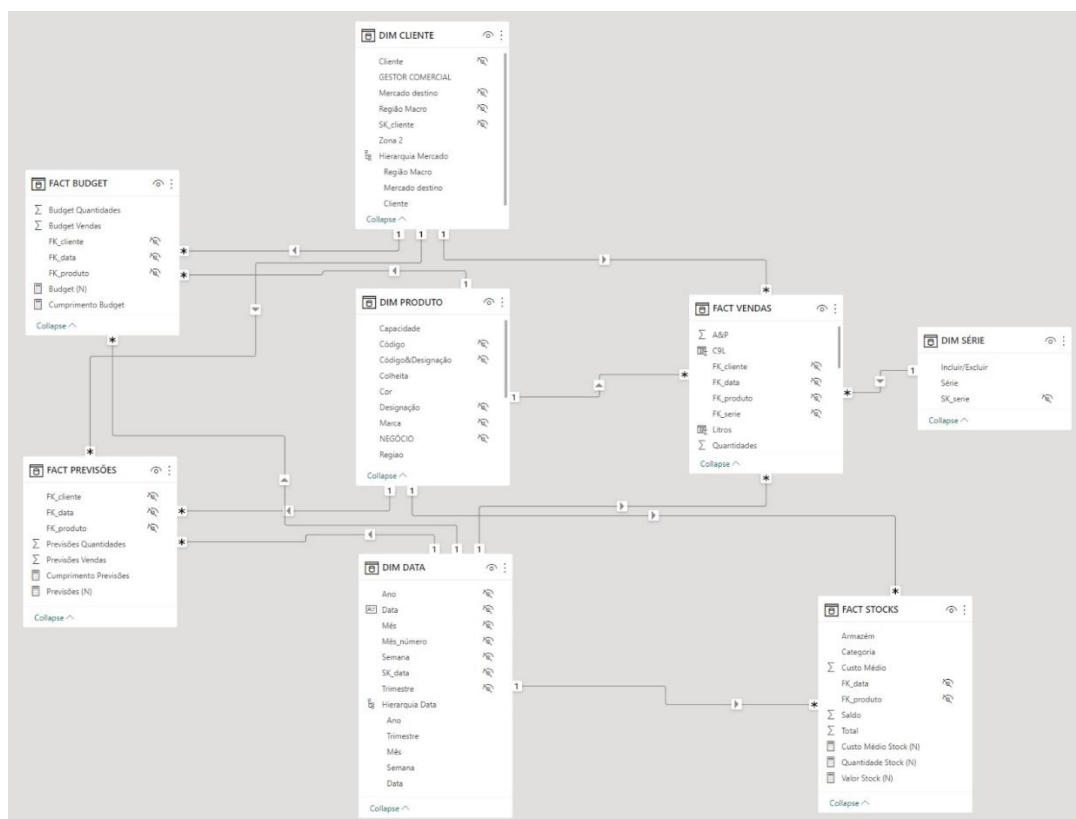


Figure 11 - Dimensional Model

The following hierarchies were defined, where each level corresponds to a many-to-one relationship between the different attributes of the same hierarchy:

Table 20 - Hierarchies

	Dim Produto	Dim Cliente	Dim Data
Level 1	Negócio	Região Macro	Ano
Level 2	Visão Marca	Mercado Destino	Trimestre
Level 3	Marca	Mercado	Mês
Level 4	Código&Designação		Semana
Level 5			Dia

In the Data view some alterations were made:

- Setting the column summarization option to sum or average when applicable;
- Changing column names;
- Changing the number of decimal places in some columns;
- Changing the data type to currency in euros (€);
- In the “Dim Data” the “Data” column data type was changed to short date and the column was sorted ascendent;
- In the “Dim Data”, there was the need to sort the column “Mês” according to the “Mês_número” (“Sort by Column” option);
- In the “Dim Data” there was also the need to set the “Data” column to “Mark as data table”;
- Hiding columns no longer needed for the dashboards design (e.g., SKs, FKs, “Mês_número”, etc.)
- Creating new columns and measures.

4.5. NEW COLUMNS AND MEASURES

In the Data view, new columns and measures are created from an expression formula using Data Analysis Expressions (DAX) formula language. Most DAX formulas are the same as Microsoft Excel, but they are essentially meant to work with relational data like we have in Power BI Desktop (Microsoft Learn, 2023a).

There was the need to create new columns that were not created in the data transformation phase (Power Query Editor). Such columns were created from existing columns in that same table or from columns from other tables, using the “related” formula (“Litros” column).

Table 21 - New Columns

Column	Table	DAX formula
C9L	Fact Vendas	=‘FACT VENDAS’ [Litros]/9
Receita Final	Fact Vendas	=‘FACT VENDAS’[Valores]-‘FACT VENDAS’[A&P]
Litros	Fact Vendas	=RELATED(‘DIM PRODUTO’[Capacidade])*‘FACT VENDAS’[Quantidades]

For this project, the creation of additional measures to achieve a better and more complete analysis was considered relevant. Each measure is associated with the table where it was created, using the existing columns from that same table.

Such measures can be considered as the main KPIs for the commercial department, which will be used to answer the business needs.

Table 22 - Created Measures

Measure	Table	DAX formula
Receitas (N)	Fact Vendas	=SUM('FACT VENDAS' [Receita Final])
Receitas (N-1)	Fact Vendas	=CALCULATE(SUM('FACT VENDAS' [Receita Final]),SAMEPERIODLASTYEAR('DIM DATA' [Data]))
RH Receitas	Fact Vendas	=DIVIDE([Receitas (N)], [Receitas (N-1)], "NA")
C9L (N)	Fact Vendas	=SUM('FACT VENDAS'[C9L])
C9L (N-1)	Fact Vendas	=CALCULATE(SUM('FACT VENDAS'[C9L]),SAMEPERIODLASTYEAR('DIM DATA'[Data]))
RH C9L	Fact Vendas	=DIVIDE([C9L (N)], [C9L (N-1)], "NA")
Litros (N)	Fact Vendas	=SUM('FACT VENDAS'[Litros])
Litros (N-1)	Fact Vendas	=CALCULATE(SUM('FACT VENDAS'[Litros]),SAMEPERIODLASTYEAR('DIM DATA'[Data]))
Preço / Litro (N)	Fact Vendas	=DIVIDE([Receitas (N)], [Litros (N)], "NA")
Preço / Litro (N-1)	Fact Vendas	=DIVIDE([Receitas (N-1)], [Litros (N-1)], "NA")
RH Preço por Litro	Fact Vendas	=DIVIDE([Preço por Litro (N)], [Preço por Litro (N-1)], "NA")
Budget (N)	Fact Budget	=SUM('FACT BUDGET'[BUDGET VENDAS])
Cumprimento Budget	Fact Budget	=DIVIDE('FACT VENDAS'[Receitas (N)], 'FACT BUDGET'[Budget (N)], "NA")
Previsões (N)	Fact Previsões	=SUM('FACT PREVISÕES'[PREVISÕES VENDAS])
Cumprimento Previsões	Fact Previsões	= DIVIDE('FACT VENDAS'[Receitas (N)], 'FACT PREVISÕES'[Previsões (N)], "NA")
Valor Stock (N)	Fact Stocks	=SUM('FACT STOCKS'[Total])
Quantidade Stock (N)	Fact Stocks	=SUM('FACT STOCKS'[Saldo])
Custo Médio Stock (N)	Fact Stocks	=DIVIDE([Valor Stock (N)], [Quantidade Stock (N)], "NA")

5. RESULTS

After having the relational model built and the new columns and measures created, it was possible to build a report with insightful data visualizations which were organized in different dashboards.

In the Power BI solution, each page represents a different dashboard, which is focused on a specific theme to be analyzed. Important to refer that each dashboard should answer to a business need identified by the organization.

The process of construction of each dashboard was done side by side with the commercial department, to guarantee that the business needs identified were answered in the right way.

The report is organized by each of the business segments: L4L, CR&F and GW+PD.

Each segment includes four different dashboards:

- “*Visão Comercial*” – Overall sales performance by sales manager
- “*Visão Mercado*” – Overall sales performance by market
- “*Snapshot Mercado*” – Historical sales performance by market
- “*Snapshot Marca*” – Historical sales performance by macro brand / brand

In the report, besides the dashboards explained above it is also possible to have an overview of the business as a whole (“*Visão Geral*”) as well as a summary of the wine tourism segment (wine sales + wine programs).

To make the report more interactive, organized, and structured, a main menu was created. With the support of the buttons created, it is possible to navigate between each page. This was done by linking each button to a bookmark.



Figure 12 - Power BI Main Menu

5.1. BUSINESS OVERVIEW

5.1.1. Sales Overview (“Visão Geral”)

In this dashboard it is possible to have an overview of the business as a whole, selecting all or just one of the four segments: L4L, CR&F, GW, and PD. It is also possible to select a specific month of the current year or all months to have a year-to-date perspective.

The first visualization is a matrix where it is possible to analyze some measures by continent / country / client / macro brand / brand / product (drill down option). It is possible to measure the total amount sold of the current period and compare with the same period in the previous year, analyzing the budget achievement, the quantity sold (unit = 9L boxes) of the current period and compare with the same period in the last year and, last but not least, it is also possible to see the performance in terms of price per liter sold. As we can see in the figure below, until the 30th of June of 2023 (last refresh date), the L4L segments has achieved 112,3% of the total amount sold in the same period of the previous year and 95.7% of the budget until June. In terms of quantity sold, the segment has reached 107,6% of the quantity sold in the same period of the previous year and the price per liter sold has increased 4,3%.

The second visualization is a line chart where it is possible to compare the total amount sold in the current period (in green) with the total amount sold in the same period of the previous year (in grey), the budget for the current period (in blue) and the forecast for each month (in light blue). As we can see, in January the total amount sold was less than the previous year, but in terms of budget achievement the segment had a good performance. It is important to point out that the forecast amount is the same as the budget amount until March, since the commercial department will start making the adjustments of the expected sales (3 months forecast) only from April until December. From February until June the total amount sold of the current year is always higher than the previous year, except for the month of May.

On this dashboard there are also cards, one for the budget achievement and the other for the forecast achievement.

In each dashboard, the red area is used to apply the needed filters for the analysis and there is also a button to go back to the main menu.



Figure 13 - Business Overview: Sales

5.1.2. Stocks Overview

Still in the Business Overview, there was also the need to create a dashboard to assess the inventory level of final goods, organized by macro brand / brand /product. Such information helps the commercial department with planning future sales and to align the strategy with the production department. In this dashboard it is possible to select all or just one of the four segments: L4L, CR&F, GW, and PD.

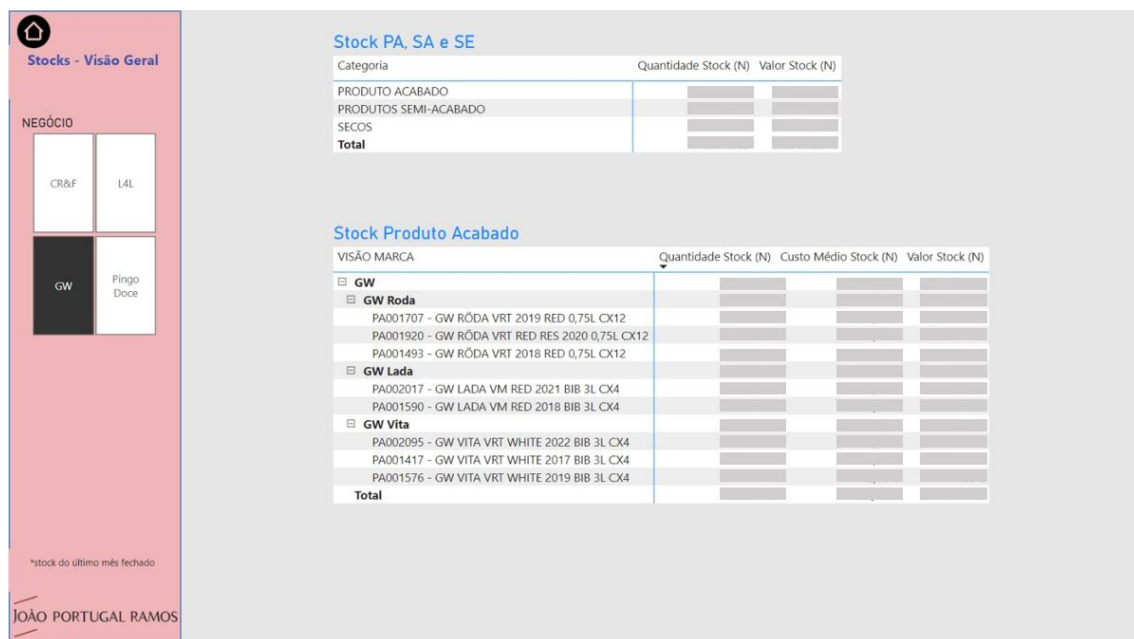


Figure 14 - Business Overview: Stocks

5.2. SEGMENT OVERVIEW

As explained above, the report is organized by business segments, each one includes four different dashboards, therefore each of those dashboards will be explained in detail using the L4L segment as an example.

5.2.1. Dashboard “*Visão Comercial*”

In this dashboard it is possible to have an overview of the market’s performance by sales manager. For the analysis, it is also possible to select a specific month of the current year or all months to have a year-to-date perspective.

The first visualization (on the top left) is a clustered column chart where it is possible to observe, by market, the total amount sold, comparing with the same period of the previous year and the budget for the current period. It is possible to see, on the figure above, for the selected commercial (BRS), the number one market is Venezuela (which had no sales in the same period of the previous year), followed by Canada, Switzerland and so on.

The second visualization (on the top right) is a sunburst, which allows to understand the weight of each macro brand (in terms of total amount sold). As we can see, the TOP 3 macro brands are *Marquês de Borba*, *Loios* and *Duorum*.

The third visualization (on the bottom left) is a clustered bar chart that shows us the total quantity sold (unit=9L boxes) by market, comparing with the same period of the previous year and the budget for the current period. The number one market, in terms of quantity, is Canada followed by Angola, Venezuela and so on.

Last but not least, on the bottom right, there are several multi-row cards where it is possible to have an overview of some measures to analyze the commercial’s performance. The first multi-row card is related to sales, where it is possible to analyze the total amount sold in their markets and compare it with the same period of the previous year and the budget for the current period. The second one allows to compare the quantities sold with the same period of the previous year. The third and last multi-row card allows to have an overview of the price per liter performance in order to understand if there is an increase or decrease in the market’s valorization.

Important to refer that the dashboards created are interactive, therefore, in this dashboard, by selecting a specific market or macro brand all the other visuals will change according to the selection.

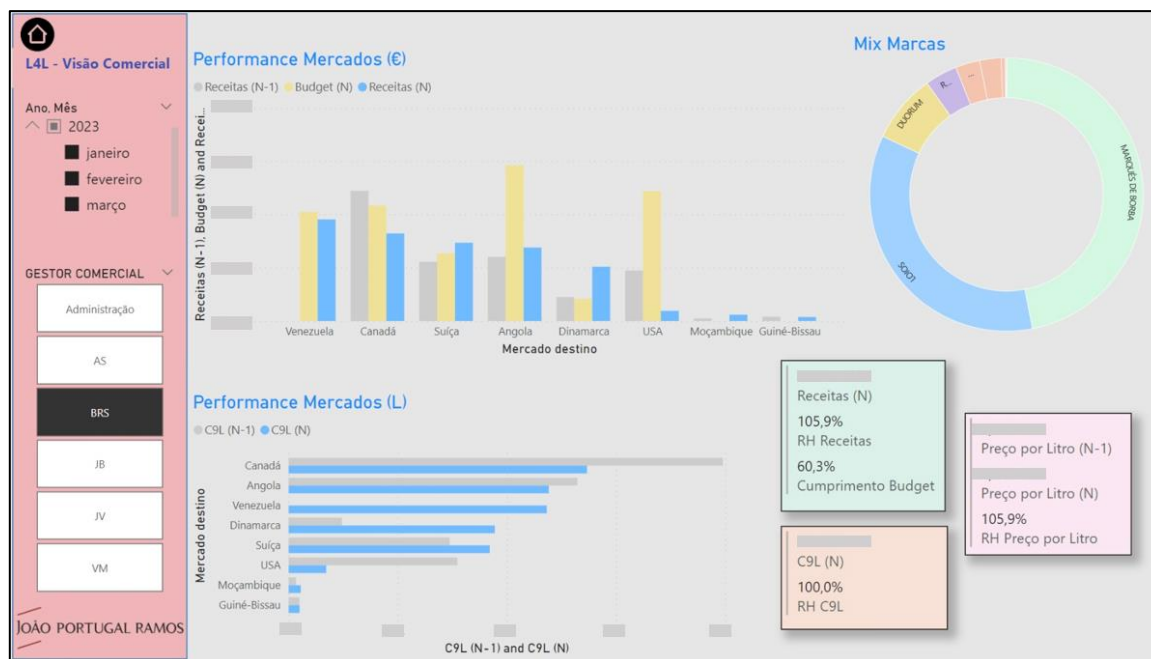


Figure 15 - L4L "Visão Comercial"

5.2.2. Dashboard "Visão Mercado"

This dashboard enables the analysis of a specific market's performance. For the analysis, it is also possible to select a specific month of the current year or all months to have a year-to-date perspective.

The first visualization is a matrix where it is possible to analyze some measures by client. It is also possible to measure the total amount sold of the current period and compare with the same period in the previous year, analyzing the budget achievement and the quantity sold (unit = 9L boxes) of the current period and compare with the same period in the last year.

The second visualization shows us the weight of each brand (in terms of total amount sold), compared with the same period of the previous year. As we can see in the figure above, in the USA more than 80% of the sales are represented by *J P Ramos Reserva*.

The third visual, on the bottom left, is a matrix where it is possible to see by brand / product (drill down option), the total amount sold, the quantity sold and also the available stock (data regarding the last completed month) which allows the sales manager to plan future sales.

Last but not least, on the bottom right, there is a multi-row card which provides information about the price per liter performance.

Once again, by selecting a specific client or brand all the other visuals will change according to the selection.

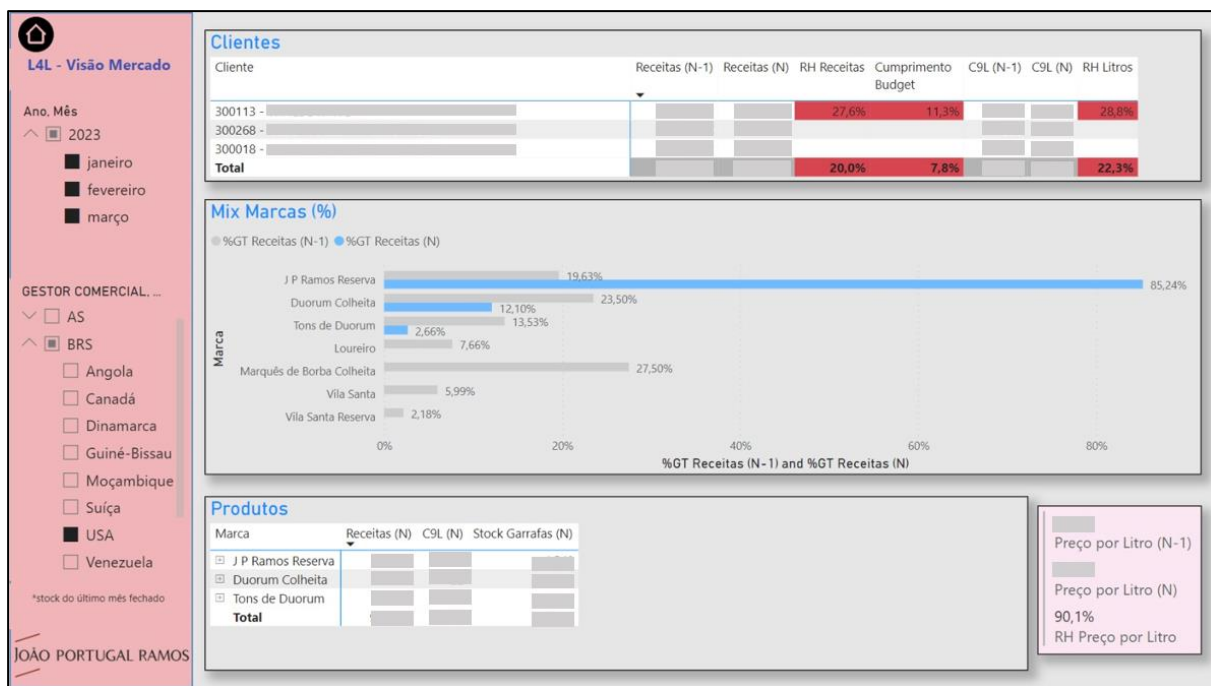


Figure 16 - L4L "Visão Mercado"

5.2.3. Dashboard "Snapshot Mercado" and Dashboard "Snapshot Marca"

When building the first dashboards, and validating with the commercial department, one member of the team identified the need to have a historical overview of the performance over time of each market and brand.

In the "Snapshot Mercado", there are three different matrixes, each one regarding a specific measure: total amount sold, quantity sold. This dashboard enables the selection of a specific market and analyze its performance by macro brand / brand / product (drill down option).

Regarding the "Snapshot Marca", there also the three different matrixes but the dashboard allows to select a specific macro brand / brand and analyze its performance by market / client.

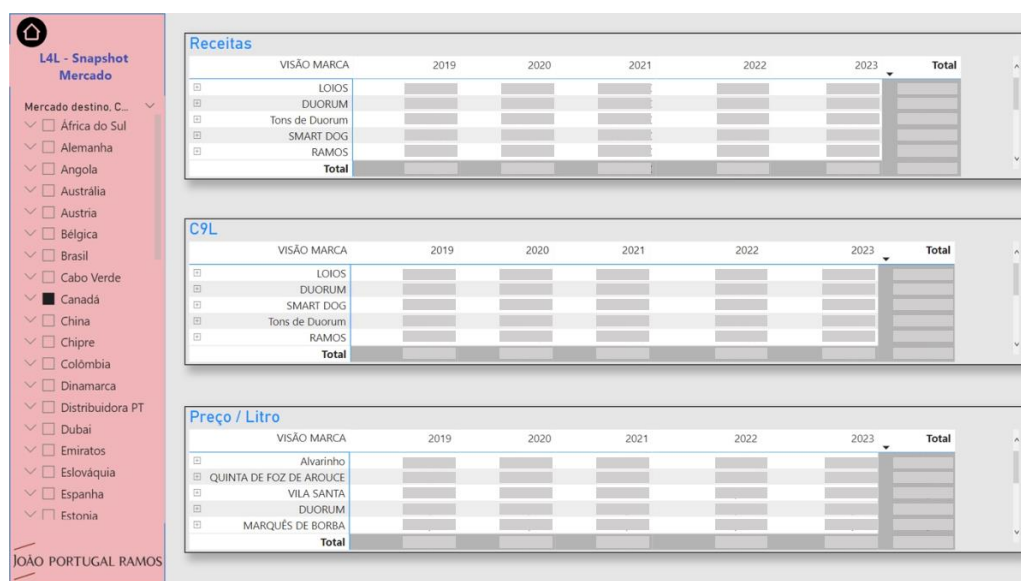


Figure 17 - L4L "Snapshot Mercado"

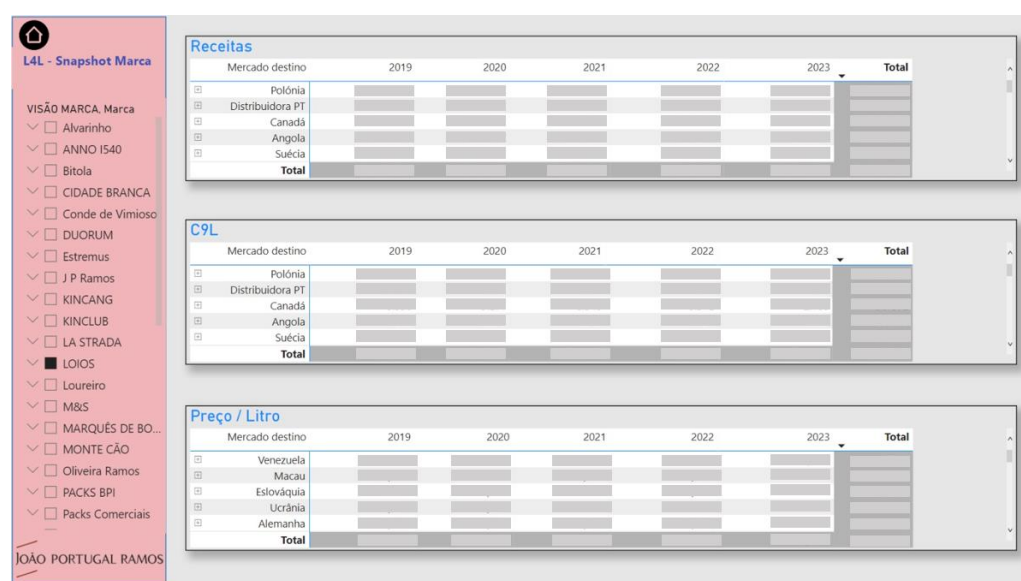


Figure 18 - L4L "Snapshot Marca"

5.3. WINE TOURISM OVERVIEW

There was the need to create a dashboard focused on the wine tourism business (sales of final goods and wine tourism programs). For the analysis, it is possible to select a specific month of the current year or all months to have a year-to-date perspective.

The two matrixes on this dashboard (on the left) allow to analyze some measures by macro brand / brand / product (drill down option). It is possible to measure the total amount sold of the current period and compare with the same period in the previous year and analyzing the budget achievement. As we can see in the figure below, until the 30th of June of 2023 (last refresh date), the amount sold of final goods in the wine tourism has achieved 154,1% of the total amount sold in the same period of

the previous year and 106,6% of the budget until June. Regarding revenues within the wine tourism programs the total achieved 141,1% of the total revenues in the same period of the previous year and 114.5% of the budget until March.

On the right there are two clustered bar charts that allows to understand the weight of each macro brand and the weight of each wine tourism product (in terms of revenues). As we can see, *Marquês de Borba* represents around 40% of the total amount sold of final goods, and the *“Programa V Santa”*, represents around 50% of the wine tourism programs revenues.

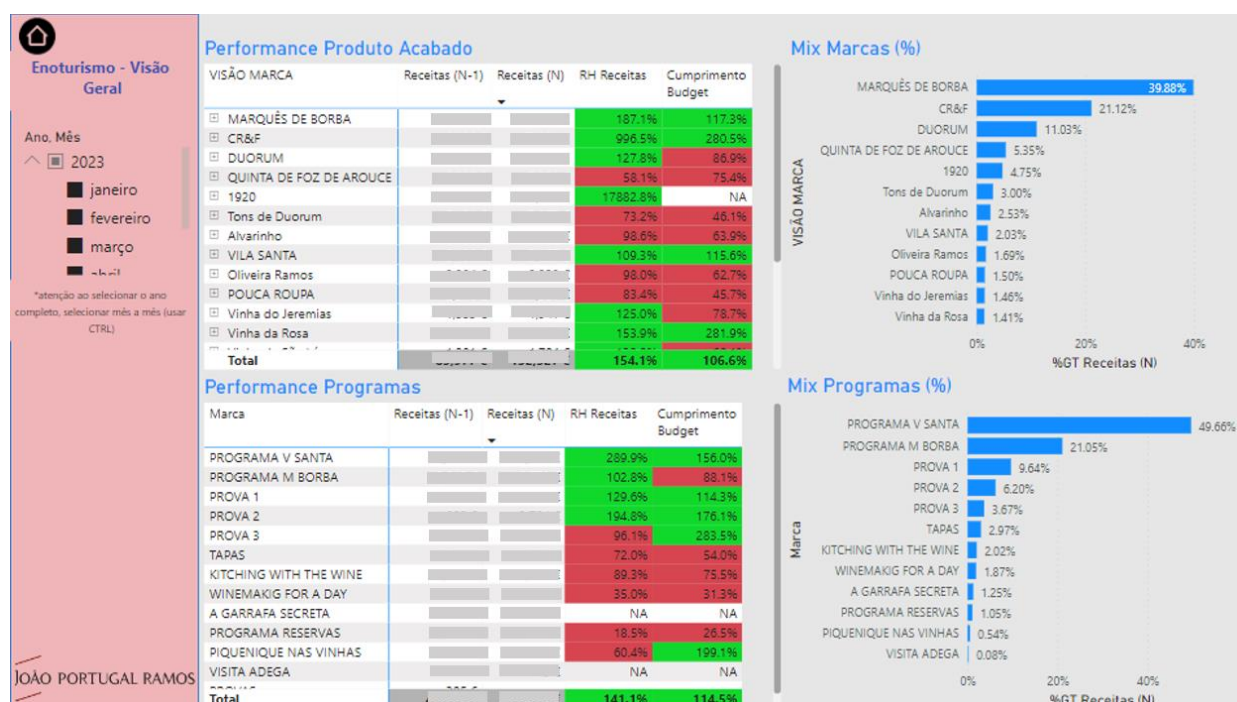


Figure 19 - Wine Tourism

6. CONCLUSIONS, LIMITATIONS AND FUTURE WORK

The purpose of this project was to create a Business Intelligence tool, specifically a Power BI solution, that could be applied in a sales department of a wine company, providing meaningful insights about a specific market / brand and supporting the sales managers in the decision-making process.

It is clear that the use of Business Intelligence tools, in this case Power BI, can be very beneficial for a commercial department, as they allow the construction of dynamic dashboards, contributing for a better and informed decision-making process.

Data-driven companies tend to have better performance and results. The implementation of such tool in JPR's commercial department will satisfy the need, felt for a long time, to organize, structure and summarize sales data within the commercial department enabling the team to make better and data-based decisions and achieve their business goals.

Having followed the design science research (DSR) methodology, the stated steps were met throughout the project in a successful way. First, by identifying the problem as the need of building a tool, specifically a Power BI solution, that could be applied in a sales department of a wine company, providing meaningful insights about a specific market / brand and supporting the sales managers in the decision-making process. Also, having clarity on the motivation as the significant impact that such tool could have on the daily work of this team and all the other benefits presented in the Literature Review. Second, the definition of the business needs with the collaboration of the Deputy CEO and a member of the commercial team (Appendix A + Appendix B). Such needs were the base and the guidelines to develop the solution. As a third phase of the DSR methodology the Design and Development of the solution, by using the Power BI Desktop to import the data from the data sources, identifying the fact tables and dimensions, designing the relational model, and creating new measures and columns. The fourth step is the demonstration and validation of the artifact, which required a deep knowledge of how each dashboard should be designed in order to answer the business needs identified.

As the last step, there was the need to validate the final model with the initial objectives (business needs). Since the process of constructing each dashboard was based on several iterations with the commercial team, with the main objective to answer to their requirements, it was possible to build dashboards that satisfy the department needs and make the decision-making process easier.

The team, by using the developed tool, is able to save a lot of time, since the information is centralized in a unique place, and invest their time in making more accurate decisions and improving markets / brands' performance. Such tool will also play a crucial role in meetings between the Commercial Department and the Board of Directors and Deputy CEO, since the dashboards display the data in a more simple and effective way, allowing a better data analysis and discussion.

This was the first step of JPR in the BI world therefore there are some recommendations / improvements that can be made to help in this transition:

- Invest in BI tools such as Power BI. This project was built under the free version, which has its limitations. The commercial team is already using this tool in their weekly meetings and in the monthly meetings with the board of directors but, by only having the Power BI Desktop

version, access is limited to one user. In the future, by investing in the Power BI Pro version, it will be possible to access and edit the dashboards by more than one user at any time.

- Invest in a connector between the management software (Artsoft) and Power BI, permitting the interface between both systems and allowing a real-time solution with up-to-date data, as pointed out by Luís Lemos Castro (Appendix A). Such investment will also save a lot of time in downloading the data from the system and upload it on Power BI. Once the company acquires the connector, some changes will be needed to adjust the model, mainly in the data transformation step in the Power Query Editor.

JPR is now beginning to use BI tools, like mentioned above, since the development of this solution for the commercial department was the first step taken by the company. As future work, the goal is to extend such tools to other departments in the company to satisfy other needs, such as margins per market / brand / SKU, viticulture measures, enology and bottling indicators.

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APPENDIX A: INTERVIEW WITH THE DEPUTY CEO

Interviewee	Luís Lemos Castro
Interviewer	Teresa Ramos
Date	20/01/2023
List of acronyms	LLC = Luís Lemos Castro; IN = Interviewer

IN: My first question aims to understand what led to the creation of this project, what were the needs that you identified that would like to see tackled by this model?

LLC: Currently, the management reporting model in the company is not supported by a proper tool, meaning that all the reports are produced manually in Excel, which implies inefficiencies in the reporting process and might lead to some errors. In addition, there is not a real-time solution, which means that the information is not always up to date.

Therefore, the Power BI solution was identified as the proper business intelligence tool for the company, due to its characteristics and potential to be developed within the company.

With this solution, the company expects to improve the management reporting model, not only in terms of the reporting process (more efficient and in real-time after the development of interfaces with the company management software), but also in terms of the quality of information and availability to the internal customers, such as the Board of Directors, commercial department, financial department, amongst others.

Additionally, this tool will guarantee the standardization of information between departments (one single version of the truth) allowing, at the same time, to develop specific reports to tackle specific needs of a user.

IN: As the pilot project, the commercial department was chosen, what was the reason behind that decision?

LLC: The choice to improve the decision-making process within the commercial department was because this pain has been felt for a long time by the sales team. Since the core business of the company is the commercialization of wine, in my opinion it should exist an instrument that allows the company to analyze sales performance over time. Besides that, the Administration also has in their best interest a tool which allows to understand the sales performance (by segment, brand and market) and to access to that information at any time.

IN: What are the impacts that you think this solution can have on the commercial department?

This solution will provide the commercial department with information in a more user-friendly way and up to date (after the development of interfaces with the company management software). In addition, this tool will allow to develop specific reports for the commercial department and will guarantee the standardization of information as explained before. In the future, after acquiring the

Power BI Pro version, any user will be able to access and interact with the dashboards since the tool will be available online. Also, the level of dependence from the controlling / financial department, who is responsible at the moment to prepare the excel dashboards will reduce, since the commercial department will have access to the information directly from the tool.

IN: Who are the potential users of this model?

LLC: The potential users of this model are the Commercial Department and the Board of Directors / Administration.

IN: What are the potentialities of the model?

LLC: Initially, this model will tackle the company needs in terms of sales and stocks information to support the commercial department. In the future, such tool can be extended to satisfy other needs, such as margins per market / brand / SKU, enology and bottling indicators and viticulture indicators.

APPENDIX B: INTERVIEW WITH A MEMBER OF THE COMMERCIAL DEPARTMENT

Interviewee	Bruno Rebelo de Sousa
Interviewer	Teresa Ramos
Date	20/01/2023
List of acronyms	BRS = Bruno Rebelo de Sousa; IN = Interviewer

IN: My first question aims to understand what led to the creation of this project, what were the needs that you identified that would like to see tackled by this model?

BRS: The need to have information ready to analyze, reducing the time spent on building pivot tables or dashboards on excel. Today, to get an overview of the markets where we sell our brands, each manager has to produce his own reports (excel dashboards and pivot tables).

IN: What are the impacts that you think this solution can have on the commercial department?

BRS: Such a tool will enable the centralization of data in a faster and more efficient, saving time to the sales team by not having to build their own reports. The team will capitalize their time in making more informed and data driven decisions.

IN: Who are the potential users of this model?

BRS: The potential users of this model are the Commercial team members, D-Level and C-Level.

IN: What are the potentialities of the model?

BRS: The model will allow better management of each market and of each brand, designing more efficient route-to-market solutions. It will also be possible to focus on implementing strategies aligned with the long-term goals of the company and to be more prepared to draw alternative scenarios as well.

IN: Which are the main business needs that you would like to answer through the help of the dashboards?

BRS: The focus should be on evaluating the sales performance over time, by each business segment and market. The tool should also allow to evaluate the performance of the macro brands / brands over time. As a sales manager, it would be useful to have an overview of the markets which I am responsible for. The board of directors and the administration consider it very important to compare the total revenues with the budget, for each business segment, market, brand and so on. Last but not least, in order to plan future sales, it would be very interesting to have an overview of the stock available by product / brand.