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**BUSINESS INTELLIGENCE AND ANALYTICS FOR VALUE CREATION
IN HUMAN RESOURCES MANAGEMENT**

Marta Maria Costa Gaia

Project Work

presented as partial requirement for obtaining the Master Degree Program in Information Management

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

Universidade Nova de Lisboa

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BUSINESS INTELLIGENCE AND ANALYTICS FOR VALUE CREATION IN HUMAN RESOURCES MANAGEMENT

By

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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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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.

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Lisbon, November 2023

ABSTRACT

The Human Resources sector is one of the most strategic areas of a company. Managing talent and developing effective teams are crucial factors for organizational success. With the advancement of technology and the growing volume of data available, Human Resources Analytics has become increasingly important and relevant. The Human Resources Department from Unilever FIMA were facing a big challenge in the decision-making process due to a lack of structured and centralized data. Therefore, this work project aims to describe the development of a Business Intelligence solution through Power BI to help the Human Resources Department from Unilever FIMA becoming more data-driven decision-making and play a more strategic role in the Organization. Initially, an introduction to the problem identified was made, followed by a description of the company and finally a literature review concerning the main topics were provided. This project followed the Design Science Research methodology successfully applying all corresponding phases. The result was a BI solution made up of four dashboards that combine measures previously defined as necessary to generate relevant insights. The proposed solution improved the data driven decision-making process with real time and consistent information and answered to the business needs identified by the HR team.

KEYWORDS

Business Intelligence; Dashboard; Human Resources Analytics; Power Bi; Decision-Making

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LIST OF ABBREVIATIONS AND ACRONYMS

HRA Human Resources Analytics

HR Human Resources

BI Business Intelligence

HRM Human Resources Management

KPI Key Performance Indicators

MDT Month to date

MoM Month over month

CHRO Chief of Human Resources Operations

WL Work Level

1. INTRODUCTION

In the last decade, the digitalization process has transformed our lives and businesses in so many ways. The rate of technical advancement is continuously rising along with the exponential rise in data volume, storage efficiency, and processing speed.

All these trends are providing organizations with potential in analytics and forecasting. Therefore, business analytics is becoming more important as a strategic organizational skill, which has promoted the growth of data driven HRM. HR's progression from basic administrative tasks to more recent support for data-driven decision-making and the strategic role that goes along with it has been significantly influenced by the process of storing, processing, and utilizing data.

There is a growing belief that Human Resources Analytics can be a possible solution to ensure and improve data-driven Human Resources Management and further help to achieve its strategic role in organizations.

Within this context, the following project aims to develop a Business Intelligence (BI) solution to help the Human Resources Department from Unilever FIMA becoming more data-driven decision-making and play a more strategic role in the Organization.

1.1. BACKGROUND AND PROBLEM IDENTIFICATION

According to World Federation of People Management Associations and Boston Consulting Group Report (2021), Human Resources Analytics will be critical. To determine the organization's future needs, having accurate and thorough personnel data paired with strategic workforce planning is becoming essential, nevertheless, HR teams will need to strengthen their analytical capabilities.

Still in “Creating People Advantage 2021” report, Siri Langangen, CHRO of Statkraft, a Norwegian renewable energy company said “There are two elements to tackle for a data-driven approach to HR. One is to have good master data from various sources—whether it’s demographic information or employee pay. Second, we need to be able to analyse this to get insights and interpret the data in order to make predictions about the future.”.

Thus, Unilever FIMA, which belongs to the British multinational consumer goods company, Unilever, is currently facing a challenge related to decision making process in the Human Resources team. Most decisions are based on empirical knowledge that prevents the correct interpretation of events both in the short and long term.

The company, in Portugal, has around 900 employees divided between offices and factories. Given the size of the company, the Human Resources team must deal with a huge amount of data that comes from various sources.

The information regarding personal data, remuneration, benefits, and organizational structure is compiled on a platform called *Gesven*. From this platform it is easy to extract files to have a more complete and organized view of all the data mentioned above. However, there are other data related, for example, with performance and recruitments that are stored in different files. The analysis and

decision-making process are difficult and time-consuming due to the lack of tools and skills that facilitate the analysis of this data.

1.2. STUDY RELEVANCE AND IMPORTANCE

According to Dias and Sousa (2015) Business Intelligence is a fundamental part of any organization, and the Human Resources department is not an exception. These teams work with data related to the company's intellectual capital, and their goal is to make it accessible to the other departments in an effective and uniform manner. Analysing data to make effective decisions is a great help for organizations to achieve their strategic objectives. For the authors "BI is positively associated with HRM decision taking and that also helps to predict HRM decisions in terms of future workforce planning and management."

Considering what has been said, this subject has a very special relevance to the company where this project will be developed. With the implementation of this project the Human Resources team will see its department becoming more productive and benefit from a greater capacity for analysis and decision making, timely, effective, and efficient. By developing a BI solution, the department will have access to dashboards that will reflect the metrics and KPI's needed to make the right decisions.

1.3. MAIN GOAL AND SPECIFIC OBJECTIVES

The main goal of this project is to answer the following research question: "Can we deliver a Business Intelligence solution to support the decision-making process of Human Resources?"

To achieve the main goal, the following Research Objectives were defined:

Objective 1 - Creation of the Conceptual Model

- a) Identification of the business needs and appropriate metrics to monitor;
- b) Definition of the BI architecture to answer the business needs;
- c) Proposal for a dashboard model;

Objective 2 – Development of a proof of concept applied to Unilever FIMA

- a) Identification of the software to build the BI solution;
- b) Implementation and processing data of Unilever FIMA;
- c) Construction of the dashboards to explore and visualize the data;

Objective 3 – Analysis of the results

- a) Understand if the developed BI solution achieved the primary goal and business needs.

2. LITERATURE REVIEW

2.1. HUMAN RESOURCES ANALYTICS (HRA)

In this first chapter of the literature review, the focus is on the concept of HR Analytics and its evolution over the years. In the following sections the definition of Human Resources Analytics will be presented as well as its challenges and possibilities.

2.1.1. HR Analytics

The evolution of Human Resources Management has accelerated mainly because of technological development. The accelerated development of various software tools has created new opportunities for the growing volume of data from various sources and assisted in its analysis being done more effectively than before.

According to Bassi (2011), Jac Fitz-enz in 1978 was the first one to introduce the idea that Human Resource activities and their impact should be measured. At the time, this idea generated a lot of controversy, and now, years later, it is a topic that is getting more and more importance in organizations.

The idea of Jac Fitz-enz in 1978 is what has come to be called Human Resources Analytics. In the HR published literature, HRA first appearing in 2003 – 2004, therefore it can be considered a relatively new term (Janet H. Marler & John W. Boudreau, 2016).

In 2004 Lawler, Levenson and Boudreau wrote an article entitled “HR Metrics and Analytics: Use and Impact” published by the Human Resource Planning Society, with the purpose of distinguishing ‘HR Analytics’ from ‘HR Metrics’. For the authors, HR metrics are measures categorized as efficiency, effectiveness, or impact, that represents the key HRM outcomes. On the other side, HR Analytics uses experimental methods and statistical methods to demonstrate the effects of HR activities.

Fitz-Enz in 2010, also presented a definition of HRA stating that “it can be defined as a communication tool that combines data from different sources to describe the current situation and to predict the future.”.

A year later, another author, Bassi (2011), argued that HR Analytics can be considered as “systematically reporting on an array of HR metrics” or based on predictive models and “what-if scenarios”. Bassi concludes HR Analytics “is an evidence-based approach for making better decisions on the people side of the business; it consists of an array of tools and technologies, ranging from simple reporting of HR metrics all the way up to predictive modelling.”

There were also authors like Mondare, Douthitt, and Carson (2011), that focused the definition of HRA on the link with strategic HRM defining it “as demonstrating the direct impact of people data on important business outcomes.”.

Therefore, HR analytics can be described as the methodical identification and quantification of the human factors that influence business results with the aim of improving decision-making. (Heuvel & Bondarouk, 2017).

Having all these definitions in mind, Marler and Boudreau (2017) state “HR Analytics appears to offer more than HR Metrics through its potential to connect HR processes and decisions with organizational performance, which is an avenue to elevating HRM to having a more strategic role and joining other business functions at the strategy table.” and finally, both, defining HRA as:

“A HR practice enabled by information technology that uses descriptive, visual, and statistical analyses of data related to HR processes, human capital, organizational performance, and external economic benchmarks to establish business impact and enable data-driven decision-making.”

2.1.2.HR Analytics Challenges

Given that HRA is a relatively new term and area, it is normal that there are still some challenges that have not been identified. However, all the challenges already identified will be discussed below.

According to Cravino (2010) the first type of challenge is the data related ones. There is too much data and metrics, and this has been causing concern. Trying to measure, know and control everything is a very hard task which can result in nothing being measured properly.

The second type of challenge was presented by Castellano (Jensen-Eriksen, 2016) and is related to HR analytics processes. The author argues that HR analytics involves more than just gathering data, it also involves knowing how to apply it. It's important to strike a balance between observing what's outside and what's within while also comprehending what the measurements and parameters represent (Rasmussen & Ulrich, 2015). For this author parameters are as a reference point, it is where begins the reflection process and data and analytics do not often lead straightforward to actions. According to Castellano, HR Analytics is more a balancing between the human judgment and analytics, although sometimes seen as a replacement for human thinking. Welbourn (2015) says that the decision-making process is significantly impacted by the way data is presented. She describes this as “the data-driven storytelling”, where the focus must be directed to the presentation of the data analysis, not just the analytics itself. The author also offers a solution to this "issue", proposing that HR professionals learn how to interpret this data as insights and communicate them to the board in a more engaging manner.

The third type of challenge is related to management. McAfee and Brynjolfsson, in 2012 associated this challenge with the term “HIPPO”, which means “highest-paid person’s opinion”. With this, the authors want to show that the decision-making process of organizations often relies on these people and their intuition. Organizations must evaluate their decision-making procedures if they want to prevent this. The right question to ask should be “*What do we know...?*” instead of “*What do we think...?*”.

Castellano also raised a fourth challenge, now, related to ethics and privacy. Organization needs to be able to protect the employee’s information. As personal details of many employees are used in HRA, concerns about preserving their privacy and preventing the misuse of their sensitive personal information have grown dramatically in recent years (Jha, 2021).

Finally, according to Davenport, Harris, and Shapiro (2010) there is a fifth type of challenge, this one related with people. Organizations that use analytics for employee management sometimes tend to treat people as pure resources. There is a great need to pay special attention to the “human side” of the Human Resources Department to not “treat human beings like interchangeable widget”.

2.1.3. HR Analytics Possibilities

While there are some challenges, there are also several possibilities of using HR Analytics in Business and Upadhyay in 2021, define five of them.

The author starts by identifying the improvement in Organizational performance as the first opportunity for businesses. The author argues that HR Analytics can increase the knowledge of the company about their employees, by identifying the critical ones and finding the best talent. Moreover, by knowing its employees better, the company can better satisfy their needs and thus increase its productivity.

“Competitive Advantage” is the second possibility identified by the author. With HR Analytics, HR professionals can make “judgements” based on more solid information. Considering that it aids in understanding and promoting the organization's overall objective, this is a very useful management tool. By keeping all the information regarding employees, HR Analytics gives organizations a competitive advantage by allowing them to make more strategic decisions.

The third possibility is related to Strategic Human Resources. HR Analytics helps the HR department produce strategic information for decision-making which enables a more strategic role for HR. This shifts the organization's emphasis from forecasting to decision-making that takes both short- and long-term issues into account.

Finding the reason for attrition is the fourth possibility. Maintaining employees is one of HR's objectives, and it is in the business's best interests to give employees a secure and pleasurable work environment. Organizations can learn what causes employee turnover using HRA. If companies realize how to keep hold of its best employees, it will make more efforts to do so.

The author's final suggestion relates to prioritizing HR investments and activities. Businesses have quickly shifted from the old to the new tactical and strategic systems thanks in part to HR Analytics. As Upadhyay says “due to a lack of appropriate analytics methodologies, HR has trailed behind other divisions in the past. Therefore, HR may now leverage HR Analytics to prioritize resources and activities.”.

2.2. HUMAN RESOURCES METRICS

In organizations all core business functions use metrics and since HR also represents a core function, there is also a need for metrics. According to Dulebohn and Johnson (2013), a metric “is an accountability tool that enables the assessment of a function’s results”.

Typically, HR Metrics are categorized in three different levels, (1) Efficiency Metrics, (2) Effectiveness Metrics, and (3) Impact Metrics (Lawler et al., 2004; Boudreau & Ramstad, 2007; Fitz-enz & Mattox, 2014). However, Dulebohn and Johnson, 2013, define a fourth level of HR Metrics, Human Capital Metrics. The four levels of HR Metrics and some examples of them are listed on Table 1.

For the authors the first level of HR Metrics is efficiency metrics. This level of metrics determine how HR performs basic administrative tasks. These metrics focus mostly on productivity and cost with the purpose to maximize the operation of the HR function.

The second level is HR effectiveness or HR cost benefit metrics. These metrics aims to measure the effect of HR programs and practices in the people or talent pools that they are directed toward. With these metrics is possible to the organization measure strategic skills and core competencies in the work force. Training programs are a good illustration of this, where the emphasis is on learning outcomes achieved and new skills built as a foundation for those programs rather than assessing participation in them. (Lawler et al., 2004).

Table 1 - HR Metrics

Author	Metric Level	Examples
Boudreau and Ramsted (2007)	Efficiency Metrics	- <i>Cost per hire</i> - <i>Employer-sponsored health plan cost per employee</i> - <i>HR expense per employee</i> - <i>Yield ratios (e.g., number of applicants per recruiting source)</i> - <i>Turnover rate</i>
	Effectiveness Metrics	- <i>Firm salary / competitor salary ratio</i> - <i>Number and quality of cross-functional teams</i> - <i>Progression of employees through development plans</i> - <i>Percentage of total salary risk</i>
	Impact Metrics	- <i>These metrics involves demonstrating a relationship between a particular HR metric and other metrics in the organization.</i>
Dulebohn and Johnson (2013)	Human Capital Metrics	- <i>Absent rate</i> - <i>Labor cost fact: (compensation + benefit cost) / FTE</i>

The third and highest level of HR Metrics, according to the authors, is impact or strategic HR Metrics. These measurements assess how HR affects company results, particularly those related to finances, customers, processes, and people. These metrics involve integrating HR data with other organizational data in addition to simple ratios (Dulebohn & Johnson, 2013).

Human Capital metrics are the fourth level of HR Metrics. These metrics attempt to show in quantifiable terms how employees create value for the organization.

According to Kaplan & Norton, 2005, all these measures let assess the activities that have been in the past. However, from a strategic point of view decision makers need to use the tool that better describe how HRM strategy is performed and how HR activities influence the future objectives of the company. Therefore, managers take advantage of the *balanced scorecard* that identifies the most important parameters needed to lead the company to success. These parameters are called key performance indicators (KPIs). Same examples of KPIs in HR are:

- Key employee retention index;
- Employee stability index;
- Average profit per FTE

2.3. EXAMPLES OF HRA APPLICATIONS

In this section some examples of the application of Human Resources Analytics will be presented. Some of the examples will be case studies from real companies, others will be academic papers but all of them have the same purpose, to show the relevance of HR Analytics.

2.3.1. Google – Case Study

Google is one of the leading technology companies in the world and thanks to its innovative working environment and HR practices it has become one of the best companies to work for. Google is one of the pioneers in the field of HR analytics and has used analytics extensively in this area to get superior business outcomes. Shrivastava, Nagdev and Rajesh wrote an article named *“Redefining HR using people analytics: the case of Google”* where they talk about how Google implemented HR Analytics.

According to the article, Google first approach was related to data-driven decision making in HRM by establishing the “People & Innovation Lab”. One of the key goals of this lab was to facilitate the alignment of HR practices with academic research so that decisions could be made based on data and science.

After the Lab, and to help with less subjective hiring and retention decisions, Google created a mathematical algorithm that uses statistics. The first algorithm, related to hiring, enables the recruitment team to reconsider candidate profiles that were not previously considered, ensuring that qualified candidates are not overlooked. This algorithm maps employee’s behaviours, personality details to the Google’s skill requirements by asking applicants to fill up online surveys. In a similar way, the retention algorithm examines historical data to identify employees who are likely to remain with the company, such as remuneration, performance, and promotions.

According to the authors “this innovative way of talent management allows management at Google to take action before it is too late and also aids in personalizing retention solutions.”

2.3.2. “Human Resource Analytics using Power Bi Visualization Tool”

Ameer, Rahul, and Manne in 2020 wrote an article named *“Human Resource Analytics using Power Bi Visualization Tool”* with the purpose of increasing the ability of a specific company to identify employee churn using Power BI with the help of real-time data insights such as dashboards. The authors used machine learning models like Logistic Regression and Random Forest in the background.

According to the authors, the solution proposed in the article is different from other solutions because in addition to having better metrics and accuracy, it uses the Power BI data visualization tool that shows the results in the form of a dashboard for a better understanding of the underlying causes for employee attrition.

In this research paper, was possible to forecast which employees would leave the company or which employees' performance levels would decline to assess if an employee was an asset to the business. The authors concluded that as dashboards are used to track performance, this deployment can help the business grow economically.

2.3.3. “Business Intelligence Applied to Human Resources Management”

The “*Business Intelligence Applied to Human Resources Management*” is a research paper conducted by two students from a Portuguese University (Dias & Sousa, 2015).

The purpose of this paper is to demonstrate how the HRIS affects the HR decision-making process utilizing BI tools including reports, analysis, dashboards, and metrics. The writers used a quantitative methodology based on a survey given to human resources managers. The authors used SPSS software to analyse the data using the correlation coefficient and regression analysis.

In this paper was possible to conclude that analysing data to make effective decisions helps organization to reach its strategic goals and the initial investment is less significant in comparison to the long-term benefits. The main conclusions of this study were that BI is favourably related to HRM decision-making and that it also aids in the prediction of HRM decisions related to future employee planning and management.

3. METHODOLOGY

3.1. CONTEXT

The Unilever Human Resources team is responsible for managing the human resources of several companies of the group, however for the purpose of this project and in an initial stage only Unilever FIMA and Gallo Worldwide will be considered.

With the purpose of the Human Resources team to be able to do their job, it is necessary to follow a set of HR processes that refer to the fundamental strategies essential to support the employee lifecycle and a positive employee experience. The core HR processes are:

- **Recruitment:** This is the process of researching and selecting candidates to fill the opening positions.
- **Onboarding:** This is the process of integration and adaptation of new employees with the aim of instructing them about the culture, routines, and dynamics of the Organization.
- **Workforce Planning:** In this process are included the daily staff management and the strategic HR operations.
- **Talent Management:** This is the process that combines efforts and strategic incentives with the objective of attracting, hiring, and retaining outstanding professionals and talents in the Organization.
- **Performance Management:** This process helps managers to evaluate employees' work overtime through the definition of KPIs.
- **Learning & Training:** The focus here is to ensure that the Organization has the talent with the skills it needs to grow.
- **Reward:** This process includes the salary and wage decisions and fringe benefits.
- **Offboarding:** This is the process of disengaging an employee from the Organization.

All these processes generate a huge amount of data that needs to be analysed and evaluated to make the best decisions. The main objective of this project, as said before, is to help the human resources team build a business intelligence solution that makes this analysis easier and more efficient in the long term. However, and based on the data that was possible to collect, this project will represent the initial phase of the creation of the BI solution, considering the HR team's requests.

3.2. ORIGINAL DATA SOURCE

For this initial phase, three excel files were made available as data sources. Each of the following data sources offers different insights and attributes and all of them contain data for the year 2023. The data corresponds to a period between January 1st, 2023 and June 30th, 2023.

The first file is the Employee data source, containing data about all the employees of the two companies under analysis. This file corresponds to a monthly snapshot, which is extracted on the last day of each month and placed in a folder in chronological order. This data source is made up of 23 attributes, both personal and professional, of each employee.

The other two files contain data related to admissions and exits from the Organization. The Admissions data source has all the new employee's information as well as the recruitment source and the Exit data

source is a list of all the employees who left the Organization specifying the type of leaving. These data sources are made up of 15 and 14 attributes, respectively. All the attributes and their descriptions can be found in the appendix with more detail.

3.3. BUSINESS NEEDS

To help the Human Resources Department becoming more data-driven decision-making and play a more strategic role in the Organization, at an early stage some business needs were defined based on the reality of the underlying source data. Therefore, the dashboards must be able to answer effectively to the following business needs that were divided into three groups of analysis:

1. Demographic Analysis
2. People Movements
3. Diversity Analysis

Table 2 – Business Needs

Business Needs	Measures
Demographic Analysis	
1. How many people work in the Organization?	Headcount MDT; Headcount MoM; Headcount MoM%
2. How is the age distribution of the Organization?	Average Age; Headcount MDT
3. How is the tenure distribution of the Organization?	Average Tenure; Headcount MDT
4. How is the gender diversity in the Organization?	Headcount MDT; Female Average Age; %Female; Male Average Age; %Male
5. What is the distribution by structure level?	Headcount MDT
People Movements	
6. How are admissions compared to exits at the Organization?	Hires; %Hires; External Recruitment; Company Transfer; Exits; Turnover; Voluntary Exits; Involuntary Exits
7. What is the business unit with the highest turnover?	Exits
8. What are the age ranges of the exits?	Exits
9. What is the gender with the highest rotation?	Hires; Exits
10. What is the job family group with the highest rotation?	Hires; Exits
Diversity Analysis	
11. How is the WL distribution?	Headcount MDT
12. How are managers distributed within the WL's grades?	Headcount MDT
13. What is the age distribution by gender?	Headcount MDT
14. Which business unit have the lowest percentage of women?	Headcount MDT
15. Which business unit have the highest percentage of managers by gender?	Headcount MDT

3.4. SOFTWARE

The software chosen to build the BI solution that will be presented in this project was Power BI¹. This platform is a group of software services, connectors and applications that combine and transform

¹ <https://powerbi.microsoft.com/>

different sources of data into coherent, visual, and interactive insights (Microsoft Power BI, 2023a). It is all characterized as “bridge the gap between data and decision making” (Microsoft Power BI, 2023b).

By choosing Power BI, it will be possible to provide to all members of the Human Resources team with easy visualization and interpretation of the data.

3.5. DATA MODELING

In this section will be described how to materialize the designed solution. A dimensional model will be created to answer the previously defined business needs. All the tables of the model will be described and finally, the design of the dashboards will be presented.

3.5.1.Data Processing and Transformation

Before importing the data sources into Power BI, a data model draft was made with the purpose of helping to understand what dimension tables would be necessary. From this draft came the following tables:

- Fact Employee
- Fact Admissions
- Fact Terminations
- Dim Company
- Dim Employee

After the draft, the three data sources were loaded into Power BI and transformed in Power Query to become more reliable.

The first imported data sources were the data related to employees. These data have been imported from a folder containing the files for each month making it possible to consolidate information from all the months in a single table called *Fact Employee*.

Two other tables were created from the *Fact Employee* table. The first table was the *Dim Company* and it was built by removing the unnecessary columns and removing duplicates in order to only have the Company ID and Company columns. The second table was the *Dim Employee*, this table was built with the purpose of having a history of all employees and their personal information.

The file containing the admissions was the second data source imported in Power BI and was called *Fact Admissions*. In this table we can see all the information related to admissions.

The final data source imported was the Terminations file, where it is also possible to have access to information regarding the employees who have left and the reason for leaving. This table was called *Fact Terminations*.

After importing all the data sources, the *Dim Date* was created since it is best practice, according to Kimball, R., & Ross, M. (2015) to ensure that every fact table has a date dimension table associated with it.

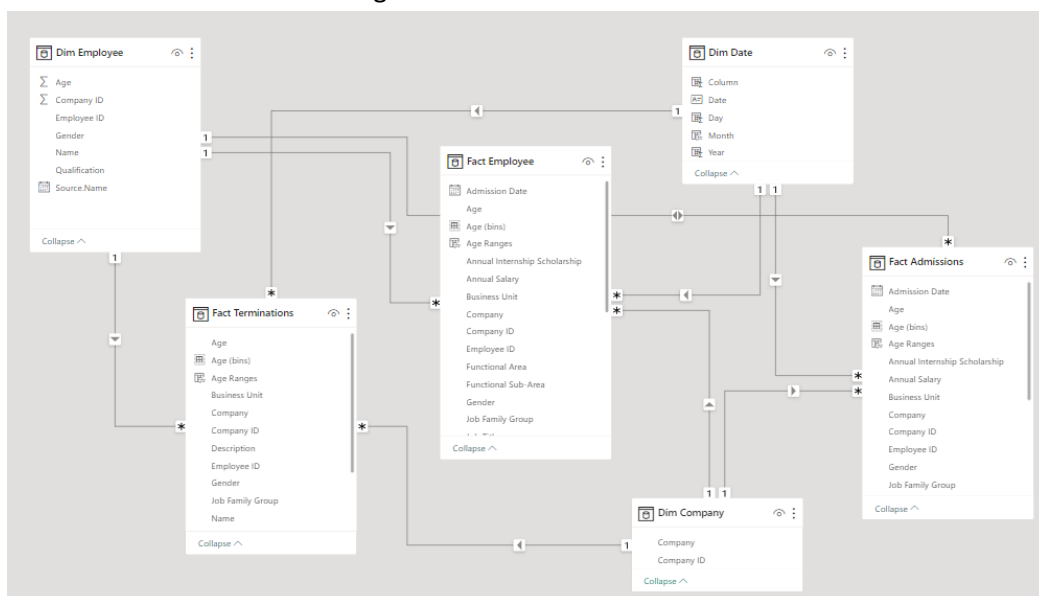
The data model entities and their respective attributes are described in table 3.

Table 3 - Data Model Entities Description

Entity	Description	Attributes
Fact Employee	Personal and professional information about all the employees of both companies.	Company ID; Employee ID; Name; Gender; Age; Company; Admission Date; Tenure; Situation; Monthly Salary; Annual Salary; Monthly Internship Scholarship; Annual Internship Scholarship; Structure Level; Professional Category; Job Title; WL; WL Grade; Job Family Group; Business Unit; Functional Area; Functional Sub-Area; Qualification
Fact Admissions	Information related to admission of all the recruitments.	Source.Name; Company ID; Employee ID; Name; Gender; Age; Company; Admission Date; Situation; Monthly Salary; Annual Salary; Monthly Internship Scholarship; Annual Internship Scholarship; Structure Level; Job Title; WL; WL Grade; Job Family Group; Business Unit; Recruitment Source
Fact Terminations	Information related to exits.	Source.Name; Company ID; Company; Employee ID; Name; Gender; Age; Tenure; Structure Level; WL Grade; Description; Termination Date; Job Family Group; Business Unit
Dim Company	Information related to the companies belonging to the Organization.	Company ID; Company
Dim Employee	Personal information of all the employees who worked in the Organization.	Source.Name; Company ID; Employee ID; Name; Gender; Age; Qualification
Dim Date	Represents the calendar year between December 31, 2022 and December 31, 2023.	Date; Year; Month; Day

The final Data Model with the relationships is shown in Figure 1.

Figure 1 - Dimensional Model



3.5.2.Metrics

To help answer the previously defined business needs, were established some metrics. These metrics were built using DAX (Data Analytics Expressions), whose definitions and calculation are presented below:

Table 4 - Metrics

Metric	Description	Formula
Headcount	Number of people working in the Organization	Headcount = COUNT('Fact Employee'[Employee ID])-[Interns]
Headcount MoM	Variation of headcount month over month	Headcount MoM = IF(ISBLANK(VAR __PREV_MONTH = CALCULATE([Headcount MTD], DATEADD('Dim Date'[Date], -1, MONTH)) RETURN DIVIDE([Headcount MTD] - __PREV_MONTH, __PREV_MONTH)*__PREV_MONTH ,0,VAR __PREV_MONTH = CALCULATE([Headcount MTD], DATEADD('Dim Date'[Date], -1, MONTH)) RETURN DIVIDE([Headcount MTD] - __PREV_MONTH, __PREV_MONTH)*__PREV_MONTH)
Headcount MoM%	Variation in percentage of headcount month over month	Headcount MoM% = IF(ISBLANK(VAR __PREV_MONTH = CALCULATE([Headcount], DATEADD('Dim Date'[Date], -1, MONTH)) RETURN DIVIDE([Headcount] - __PREV_MONTH, __PREV_MONTH) ,0,VAR __PREV_MONTH = CALCULATE([Headcount], DATEADD('Dim Date'[Date], -1, MONTH)) RETURN DIVIDE([Headcount] - __PREV_MONTH, __PREV_MONTH))
Headcount MTD	Headcount month to date	Headcount MTD = TOTALMTD([Headcount], 'Dim Date'[Date])
Average Age	Average age of the total headcount	Average Age = AVERAGE('Fact Employee'[Age])
Female Average Age	Average age based on female headcount	Female Average Age = CALCULATE([Average Age], 'Fact Employee'[Gender] IN { "Female" })
Male Average Age	Average age based on male headcount	Male Average Age = CALCULATE([Average Age], 'Fact Employee'[Gender] IN { "Male" })
Average Tenure	Average number of service years	Average Tenure = AVERAGE ('Fact Employee'[Tenure])
Female Headcount	Number of female headcount in the Organization	Female Headcount = CALCULATE([Headcount], 'Dim Employee'[Gender] IN { "Female" })
Male Headcount	Number of male headcount in the Organization	Male Headcount = CALCULATE([Headcount], 'Dim Employee'[Gender] IN { "Male" })

% Female	Percentage of female headcount	% Female = [Female Headcount]/[Headcount]
% Male	Percentage of male headcount	% Male = [Male Headcount]/[Headcount]
Hires	Number of new joiners in the Organization	Hires = [External Recruitment]+[Company Transfer]
% Hires	Percentage of hires based on total headcount	% Hires = [Hires]/[Headcount]
Exits	Number of headcount who left the Organization	Exits = [Voluntary Exits]+[Involuntary Exits]
Voluntary Exits	Number of voluntary exists based on their termination date	Voluntary Exits = IF(ISBLANK(CALCULATE(COUNTA('Fact Terminations'[Employee ID]), 'Fact Terminations'[Description] IN { "Company Transfer", "Voluntary dismissal", "Assignment of Contractual Position" }))),0,CALCULATE(COUNTA('Fact Terminations'[Employee ID]), 'Fact Terminations'[Description] IN { "Company Transfer", "Voluntary dismissal", "Assignment of Contractual Position" })))
% Voluntary Exits	Percentage of voluntary exists based on terminations	% Voluntary Exits = [Voluntary Exits]/[Exits]
Involuntary Exits	Number of involuntary exists based on their termination date	Involuntary Exits = IF(ISBLANK(CALCULATE(COUNTA('Fact Terminations'[Employee ID]), 'Fact Terminations'[Description] IN { "Termination of Fixed Term Contract", "Dismissed by mutual agreement", "End of internship" }))), 0, CALCULATE(COUNTA('Fact Terminations'[Employee ID]), 'Fact Terminations'[Description] IN { "Termination of Fixed Term Contract", "Dismissed by mutual agreement", "End of internship" })))
% Involuntary Exits	Percentage of involuntary exists based on terminations	% Involuntary Exits = [Involuntary Exits]/[Exits]

Company Transfer	Number of employees who were transferred from other Organization's companies	Company Transfer = IF(ISBLANK(CALCULATE(COUNTA('Fact Admissions'[Employee ID]), 'Fact Admissions'[Recruitment Source] IN { "Company Transfer" })),0,CALCULATE(COUNTA('Fact Admissions'[Employee ID]), 'Fact Admissions'[Recruitment Source] IN { "Company Transfer" }))
External Recruitment	Number of new joiners who were recruited externally	External Recruitment = IF(ISBLANK(CALCULATE(COUNTA('Fact Admissions'[Employee ID]), 'Fact Admissions'[Recruitment Source] IN { "External Recruitment" })),0,CALCULATE(COUNTA('Fact Admissions'[Employee ID]), 'Fact Admissions'[Recruitment Source] IN { "External Recruitment" }))
Non-Manager	Number of headcount who are not managers	Non-Manager = CALCULATE([Headcount], 'Fact Employee'[Structure Level] IN { "Non-Manager" })
Turnover	Percentage of exits based on total headcount	Turnover = [Exits]/[Headcount]

4. RESULTS AND DISCUSSION

4.1. DASHBOARDS

After the definition of the dimensional model and metrics, insightful data visualizations were created. These visualizations were compiled in four dashboards – “Demographic Analysis”, “Admission Analysis”, “Termination Analysis” and “Diversity Analysis”. This section will detail the results of the data visualization work conducted in Power BI.

4.1.1. Demographic Analysis

The first page of the report (Figure 2) represents the demographics of both companies under analysis. At the top of the dashboard, we can find a header with the name of the dashboard, followed by three slicers. This consistent structure is maintained throughout the remaining pages of the report, ensuring a coherent and user-friendly experience.

The slicers allow the users to select a specific year, month, and company for analysis. Except for the slicer of the year, the other two slicers allow multiple selections to have a broader view of the information. Once the slicers are selected the dashboard dynamically updates the relevant information about the demographic of the Organization.

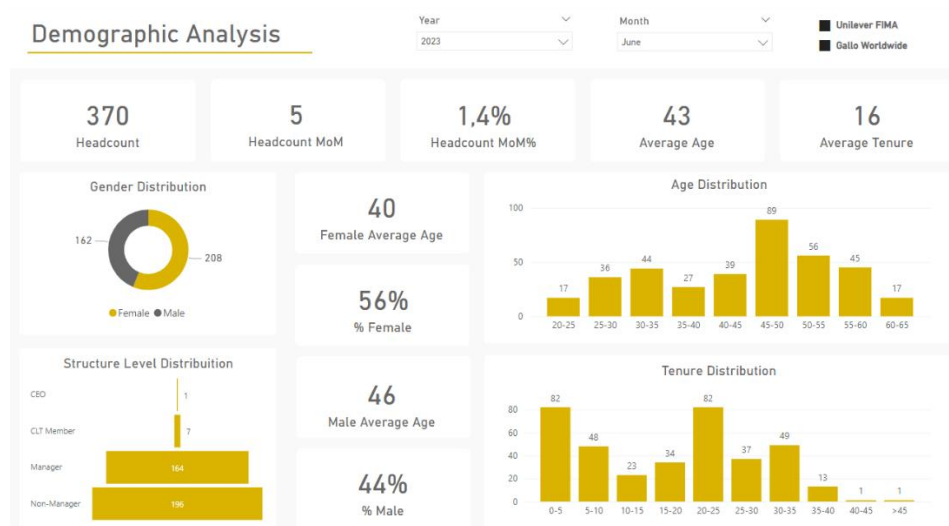
Under the header, there are five cards intended to highlight the most relevant metrics for this analysis.

Then a gender analysis is presented, starting with a donut chart that provides a clear visualization of the headcount distribution between females and males. Moving forward, in the middle of the dashboard, there are four more cards, with relevant gender metrics.

To understand the headcount distribution by structure levels, a funnel was chosen and ordered hierarchically, with the lowest level of structure at the bottom.

Finally, on the right side of the dashboard, two clustered column charts are displayed. The first chart illustrates the age distribution by age ranges and the second one illustrates the tenure distribution by year ranges.

Figure 2 - Demographic Analysis



4.1.2. People Movements

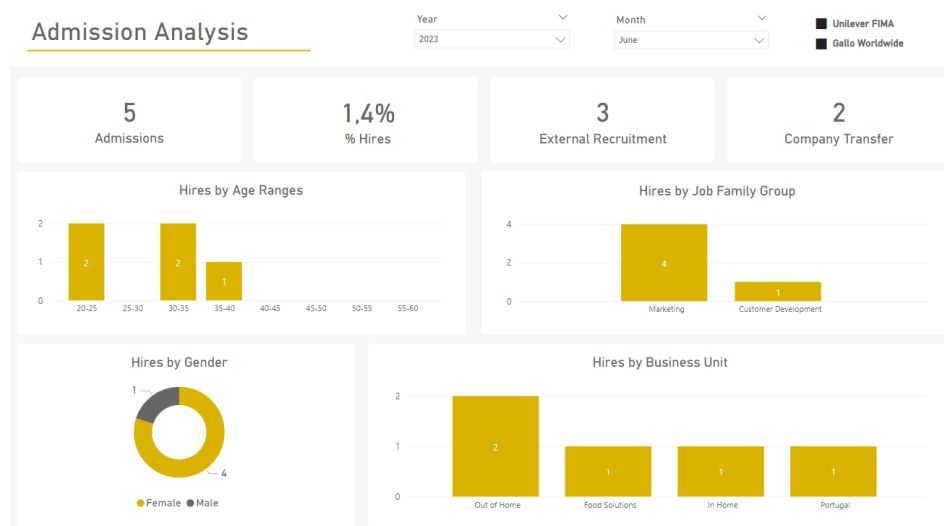
In this section, the admissions and terminations report pages will be presented. Both pages have the same structure, the main difference being the metrics used.

The Admission Analysis page, shown in Figure 3, starts with four cards that highlight the most relevant metrics for this analysis. The first one is the number of admissions, followed by the percentage of admissions based on total headcount and then another to two cards representing the two different recruitment sources.

Going down the dashboard we have a clustered column chart representing the distribution of admissions by age ranges and immediately below the admissions distribution between females and males shown again in a donut chart.

On the right side of the dashboard there are two clustered column charts. The first one represents the number of admissions by job family group and the second one represents the same but now by business unit.

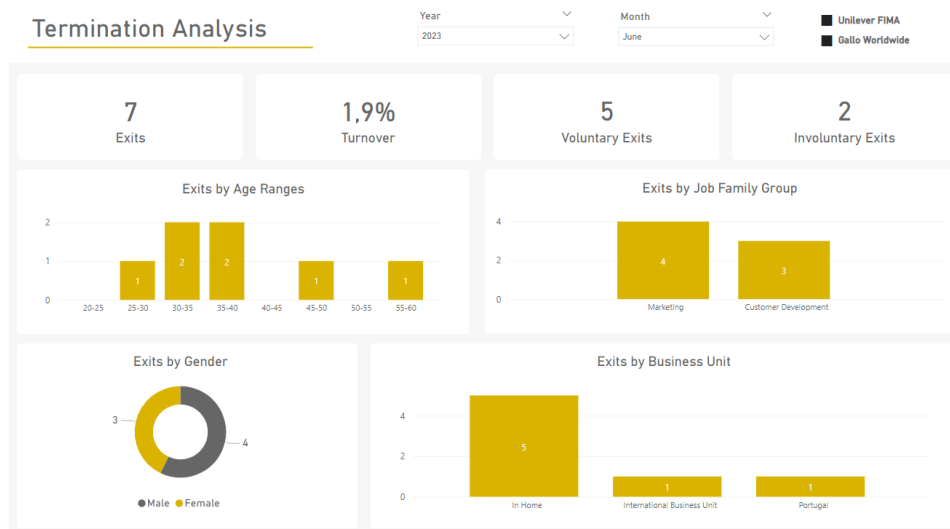
Figure 3 - Admission Analysis



Moving forward to the Termination Analysis presented in Figure 4, as previously stated, this page follows the same logic as the previous one.

Right after the header, there are also four cards. The first card represents the number of exits, chased by the turnover and finally, two cards representing the two types of termination. All charts below the cards are the same as in the previous report but now analysing the exits.

Figure 4 - Termination Analysis



4.1.3.Diversity Analysis

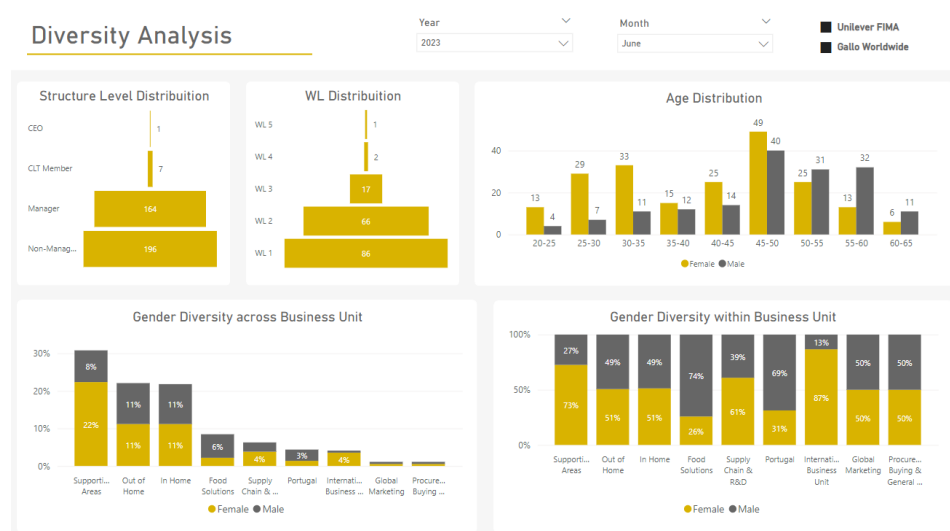
The Diversity Analysis report aims to show the diversity of the Organization regarding structure and gender across ages and business units (Figure 5).

The report starts with two funnels that aim to show the distribution by structure level and consequently by work level, in the second funnel it is also possible to drill down by work level grade. All the other charts on the page react to the levels selected in the WL Distribution funnel.

Right after the funnels there is a clustered column chart showing the gender diversity across the different age ranges.

At the bottom of the report are two stacked column charts showing the gender diversity, first one (left side) across business units and the second one (right side) within business units.

Figure 5 - Diversity Analysis



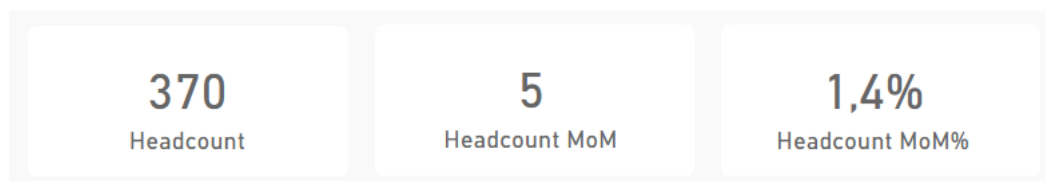
4.2. BUSINESS NEEDS ANALYSIS

This chapter aims to answer to the business questions that were previously identified as business needs. The results were obtained from the available data from the first semester of the 2023 year. The selected date for this analysis is 30/06/2023.

4.2.1. How many people work in the Organization and how does it vary?

The answer to this question is represented in the first three cards in the Demographic Analysis dashboard (Figure 6), which is 370 headcounts, with a variation of 5 employees compared to the previous month (May) representing 1,4% of the total headcount.

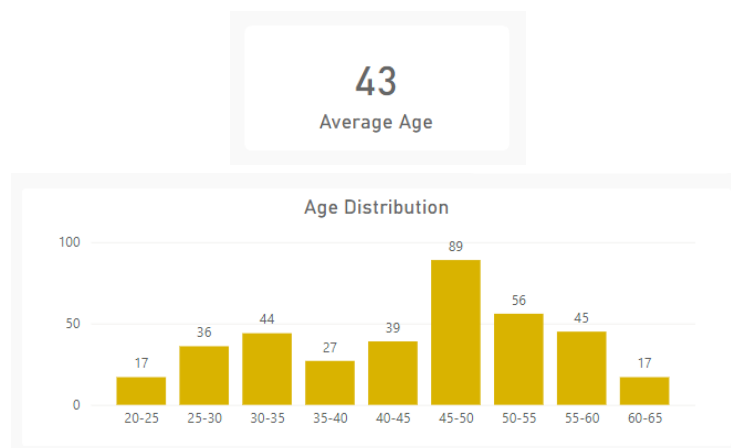
Figure 6 - Demographic Analysis | Headcount



4.2.2. How is the age distribution of the Organization?

When analysing the age distribution of the Organization (Figure 7), it is possible to realize that it is a slightly aged Organization, with a high number of employees aged between 45 and 50 years old. The average age of the Organization confirms this distribution, being 43 years old.

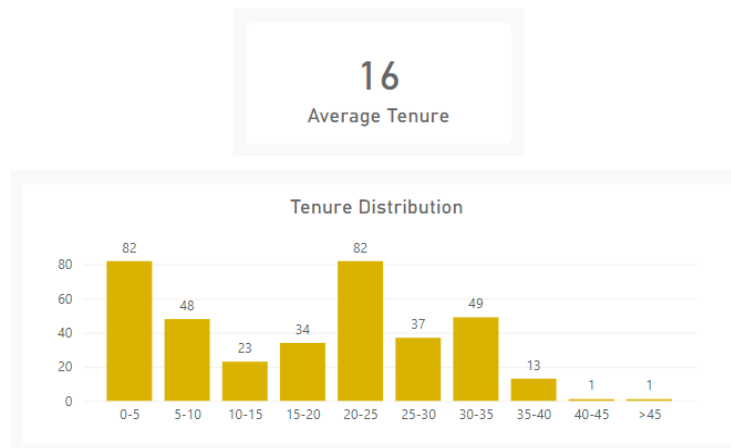
Figure 7 - Demographic Analysis | Age Distribution



4.2.3.How is the tenure distribution of the Organization?

In the card presented in Figure 8, users can observe that the Organization's average years of service are 16 years. When analysing the tenure distribution, it shows that there are the same number of employees with years of service falling between two different ranges. The first range is between 0 and 5, which means that there are a lot of recruitments recently and the second range is between 20 and 25 years.

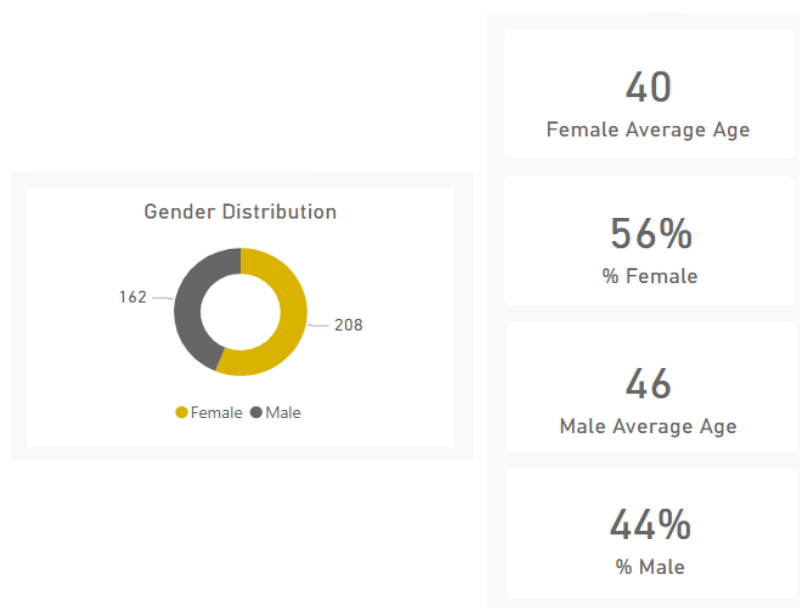
Figure 8 - Demographic Analysis | Tenure Distribution



4.2.4.How is the gender diversity in the Organization?

In the first page of the report there are some metrics that summarize the gender diversity in the Organization. As can be seen in Figure 9, there are more women than men in the Organization, however, men are on average older than women.

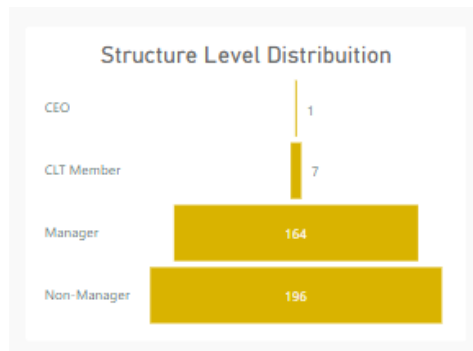
Figure 9 - Demographic Analysis | Gender Diversity



4.2.5.What is the distribution by structure level?

The Organization has four different levels of structure – CEO, CLT Member, Manager, Non-Manager. According to the funnel presented in Figure 10, the Organization is well structured, having on the bottom the lowest level of structure with the largest number of employees and as you move up in the structure the number of employees decreases.

Figure 10 - Demographic Analysis | Structure Level Distribution



4.2.6.How are admissions compared to exits at the Organization?

To answer this business need, it is necessary to use two different reports. As shown in Figure 11 in June five employees were hired, three of them were recruited externally and the other two were transferred from other companies of the Organization. On the other hand, in Figure 12 is shown that seven employees left the Organization, whereby two of them left involuntarily.

Figure 11 - Admissions Analysis | Hired Employees



Figure 12 - Terminations Analysis - Terminated Employees



4.2.7. What is the business unit with the highest turnover?

As shown in the previous business need, seven employees left the Organization. These exits were distributed between different business units and according to Figure 13, the one that suffered the biggest number of exits was the *In Home* business unit.

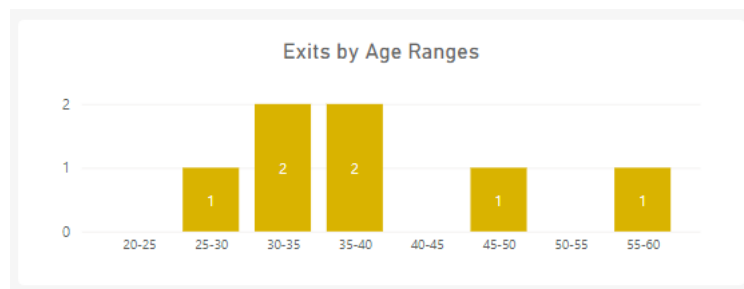
Figure 13 - Termination Analysis | Exits by Business Unit



4.2.8. What are the age ranges of the exits?

Figure 14 shows that the employees who left the Organization belonged to different age groups. The ages range from 25 and 60 years old, with a higher incidence between 30 and 40 years old.

Figure 14 - Termination Analysis | Exits by Age Ranges



4.2.9. What is the gender with the highest rotation?

During the month of June there were more exits than admissions. However, as can be seen in the figures below (Figure 15 and Figure 16) the Organization recruited more women than men, but there were also more women leaving than men. Having said that, the gender with higher rotation is the female one.

Figure 15 - Admission Analysis | Hires by Gender

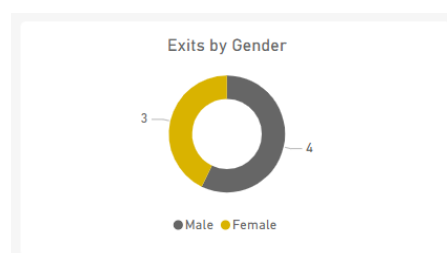
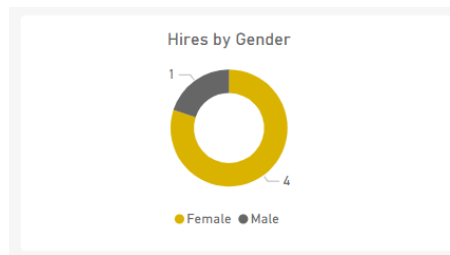


Figure 16 - Termination Analysis | Exits by Gender



4.2.10. What is the job family group with the highest rotation?

When analysing the charts below (Figure 17 and Figure 18) it is easy to conclude that the exits and the admissions took place in the same job family groups. Marketing and Customer Development were the job family groups with the highest rotation during June.

Figure 17 - Admission Analysis | Hires by Job Family Group

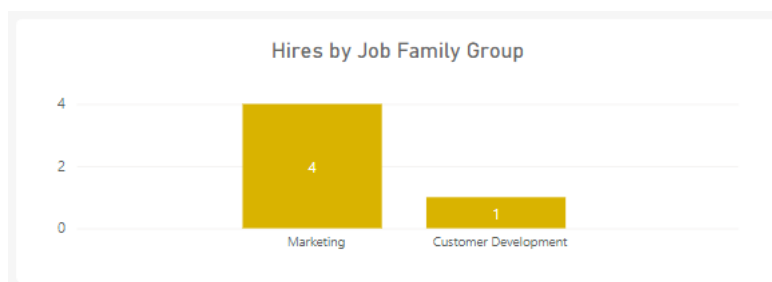


Figure 18 - Termination Analysis | Exits by Job Family Group

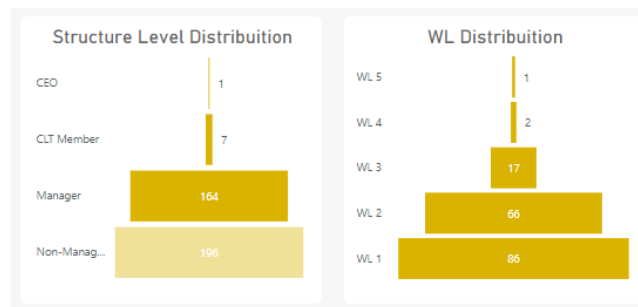


4.2.11. How is the WL distribution?

Work Levels (WL's) are an internal job classification framework which are only attributed to managers, therefore, it is necessary to exclude the non-managers from this analysis (Figure 19). In the Organization there were 172 headcounts spread across the different WL's and in order to have progression it is necessary that the distribution form a pyramid as shown in Figure 19. The first level of

WL's is on the bottom with the highest number of employees with a decrease of employees as we move up the levels.

Figure 19 - Diversity Analysis | WL Distribution

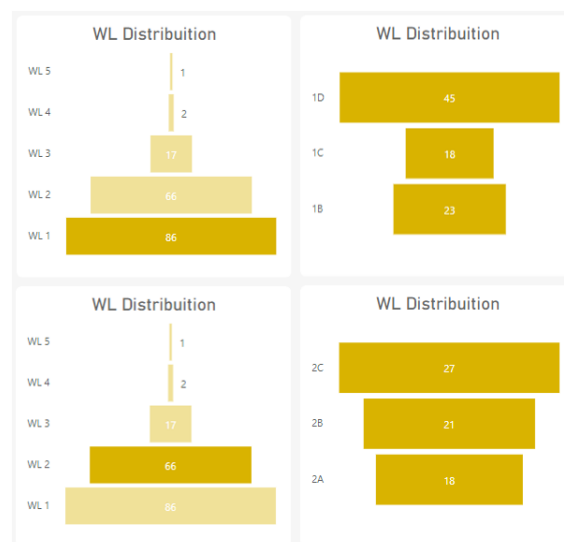


4.2.12. How are headcount distributed within the WL's grades?

Within each WL there are different grades, Figure 20 shows the distribution of WL's 1 and 2 across the different grades. The distribution of headcount by grades should follow the same logic mentioned in the previous business need, which means it should also form a pyramid. Unfortunately, in both WL's (more in WL 2 than in WL 1) there is an inverted pyramid which can mean no progression to the lowest grades of WL's and stagnation to the highest grades.

Regarding the highest levels (WL 3, 4 and 5), these do not have different grades so there is no distribution.

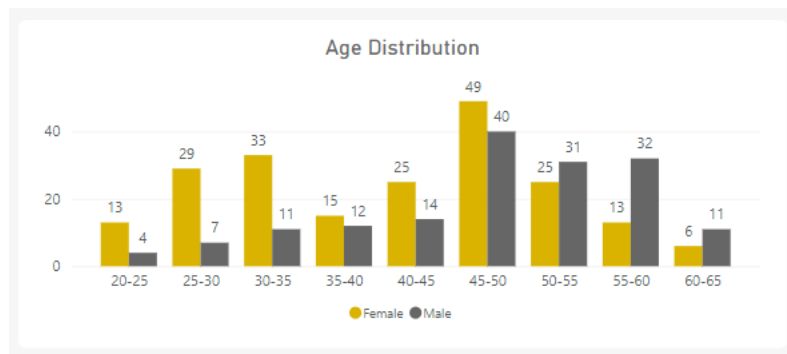
Figure 20 - Diversity Analysis | WL Distribution by grades



4.2.13. What is the age distribution by gender?

Figure 20 proves what was answered in the business need 4. Up to a certain age, there are more women than men within the age ranges, but from the age of 50 onwards there are more men than women, which proves that on average men are older than women.

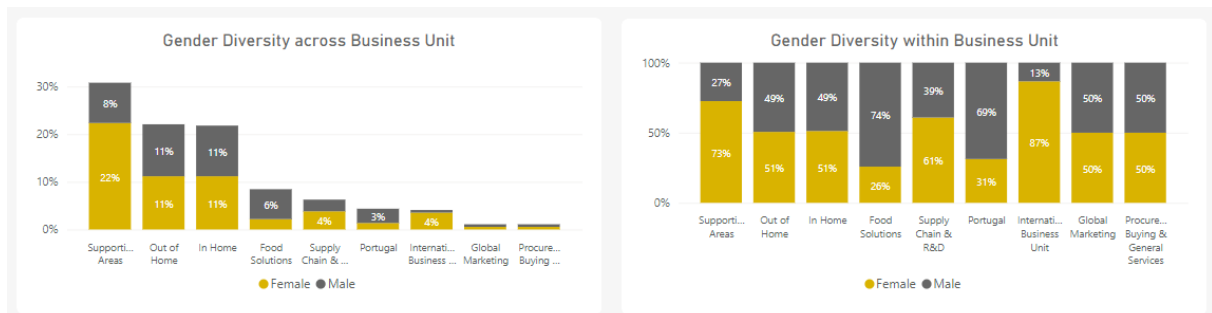
Figure 21 - Diversity Analysis | Age Distribution by gender



4.2.14. Which business unit have the lowest percentage of women?

To answer this business need, the following two charts were created (Figure 21). The first one represents the gender diversity across business unit i.e., in the total headcount of the Organization how many are women and how many are men across business units. The second chart follows the same logic but now having in consideration just the headcount within the business unit. When analysing the charts, the business units with the lowest percentage of women are Portugal and Food Solutions, where Portugal is when comparing with the total headcount of the Organization and Food Solutions when comparing the headcount within business units.

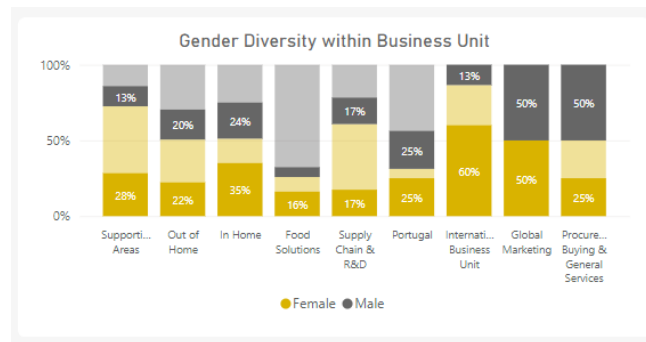
Figure 22 - Diversity Analysis | Gender Distribution by Business Unit



4.2.15. Which business unit have the highest percentage of managers by gender?

Figure 22 shows the percentage of managers by gender in each business unit. By looking to the chart, the first conclusion to be drawn is that there are more women managers than men, apart from just two business units where this is not the case. In this way, the business unit that stands out is the International Business Unit.

Figure 23 - Diversity Analysis | Managers by Business Unit



5. CONCLUSION

In this project was developed a Business Intelligence (BI) solution with the aim of helping the Human Resources Department from Unilever FIMA becoming more data-driven decision-making and play a more strategic role in the Organization.

Initially, the data sources were analysed with the aim of defining the business needs that the Human Resources team would like to see answered. Fifteen business needs were identified and divided into three groups of analysis. After choosing the software that would be used (Power BI) a draft of the data model was made, the data was imported into Power BI and some transformations were performed.

Before the development of the dashboards, some metrics were created to facilitate the analysis of the data and having a clear view of the data. Then, four dashboards were created to respond to the business needs of the three groups of analysis.

Each dashboard represents one of three areas of analysis and conveys relevant insights. The first dashboard, Demographic Analysis, gives an overview of the Organization, allowing the users to have a perception of its structure and composition. The second and third dashboard, People Movements, help to understand the people movements in terms of admissions and exits. And the last dashboard, Diversity Analysis, describes a little of the Organization's diversity.

Despite facing constraints that hindered the implementation of the developed dashboards within the Organization, the achieved results are highly satisfactory. They effectively demonstrate to the HR team of Unilever FIMA what goals to strive for. The utilization of this modern technological display empowers efficient analysis of daily data collection.

In conclusion, the three developed dashboards answered the main goal of this project by delivering a Business Intelligence solution to support the decision-making process of Human Resources. Even though this project is the first step towards achieving the final goal, I believe it is a great starting point.

6. LIMITATION AND RECOMMENDATIONS FOR FUTURE WORKS

During the development of this project, some limitations were identified that may have impacted the quality and depth of the analysis.

On a more practical side, some limitations were found. The first one was related with the needs of the Human Resources team, they wanted to analyse everything at once and were not aware of the data that would be required. Therefore, it was necessary to spend some time defining priorities and trying to understand what would be realistic to do at this point.

Another limitation found was related with the quality of the data and, also with the lack of it. There is in fact a robust data source with information about employees, organizational structure, and remuneration, however this information is not 100% accurate, leading to a lot of human intervention to avoid inconsistencies in the analysis. On the other hand, there were very interesting topics to analyse related for example to People Movement that due to lack of data it was not possible to do so.

Taking these limitations into account there are some recommendations for future works.

It is suggested to create more consistent and complete databases to satisfy all business needs and promote more comprehensive and in-depth analysis. This way it will be possible to add more pages and visuals to the dashboard to generate more insights and comprehensive analysis.

It would also be important to divide the implementation of dashboards in the Organization into phases, defining the focus area of each phase. At the moment, the Organization already has a general vision of three areas of interest but in the next phase it should focus on one area and deepen them, combining this with the collection of necessary data and construction of consistent databases in order to have more robust dashboards which add more and more value to the team.

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APPENDIX

Employee Data Source	
Attribute	Description
Company ID	Numerical number that identifies the company
Employee ID	Numerical number that identifies the employee
Name	Full name of the employee
Gender	Gender of the employee (female/male)
Age	Age in years of the employee
Company	Name of the company
Admission Date	Date on which the employee was hired
Tenure	Number of service years
Situation	Employee situation in the company
Monthly Salary	Gross monthly salary
Annual Salary	Gross annual salary
Monthly Internship Scholarship	Monthly Internship scholarship value
Annual Internship Scholarship	Annual Internship scholarship value
Structure Level	Hierarchical structure of the company
Professional Category	The profession carried out
Job Title	Name of the position in the company
WL	Employee's position within the company
WL Grade	The grade of an employee's position within the company
Job Family Group	Group of positions that involve work in the same functional area and have related core knowledge and background requirements
Business Unit	Identifies the different businesses within the company
Functional Area	Area which carries out business functions within a business unit
Functional Sub-Area	Sub-Area which carries out business functions within a Functional Area
Qualification	Literary qualifications

WL	Grade
WL 1	1B
	1C
	1D
WL 2	2A
	2B
	2C
WL 3	3X
WL 4	4X
WL 5	5X

Admissions Data Source	
Attribute	Description
Company ID	Numerical number that identifies the company
Employee ID	Numerical number that identifies the employee
Name	Full name of the employee
Gender	Gender of the employee (female/male)
Age	Age in years of the employee
Company	Name of the company
Admission Date	Date on which the employee was hired
Situation	Employee situation in the company
Monthly Salary	Gross monthly salary
Annual Salary	Gross annual salary
Monthly Internship Scholarship	Monthly Internship scholarship value
Annual Internship Scholarship	Annual Internship scholarship value
Structure Level	Hierarchical structure of the company
Job Title	Name of the position in the company
Job Family Group	Group of positions that involve work in the same functional area and have related core knowledge and background requirements
Business Unit	Identifies the different businesses within the company
Recruitment Source	Identifies how the candidate was hired

Terminations Data Source	
Attribute	Description
Company ID	Numerical number that identifies the company
Employee ID	Numerical number that identifies the employee
Name	Full name of the employee
Gender	Gender of the employee (female/male)
Age	Age in years of the employee
Company	Name of the company
Tenure	Number of service years
WL Grade	The grade of a employee's position within the company
Termination Date	Last day of work
Structure Level	Hierarchical structure of the company
Job Family Group	Group of positions that involve work in the same functional area and have related core knowledge and background requirements
Business Unit	Identifies the different businesses within the company
Description	Reason for leaving the company