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Dashboards and automation for Call Center operations

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Master (MSc) in Management of Services and Technology

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Marketing, Operations and General Management Department

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*I dedicate this work to my mother
Who never let me go hungry
The many hours in front of the screen*

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Abstract

Call Centre operations are complex and raise several multidisciplinary issues related to business management. Operations management and Human Resources management are under enormous pressure to respond to the unique characteristics of these operations: the technology used, the specific workforce and the objectives that Call Centres are set out to achieve: quality of service, sales volume and brand representation, simultaneously striving for cost reduction, standardisation and efficiency.

This project aims to increase the quality and efficiency of business support provided to the internal Call Centre of a telecommunications company. The department identified inadequacies in the existing tools and processes for monitoring, assessing performance and supporting decision-making in the areas of Human Resources, as well as difficulties in finding solutions.

Thus, it is proposed the development and design of dashboards, conducive to the transformation of reporting processes, by creating quality and efficient methods by which information is processed, maintained, and disseminated. While fostering a critical spirit from a continuous improvement perspective, identifying through collaboration with employees inefficient tasks that can be automated or redesigned with solutions implemented at a low level.

The output of the project is two dashboards, with an "Ad hoc reporting" type system, where the dashboard serves as a launch pad to complementary information, following the optic of self-service BI. The solutions found proved to be useful and easy to use, increasing the quality and efficiency of the support provided to the operations, by making new and better information available and increasing the useful working time employees.

Keywords: dashboard, Business Intelligence, Human Recourses Management, call centre, automation

JEL Rating: O15 (Human Resources); O32 (Management of Technological Innovation and R&D); M15 (IT Management)

Resumo

As operações de *Call Centers* são complexas e levantam várias questões multidisciplinares na gestão do negócio. A gestão de operações e gestão de recursos humanos estão sobre enorme pressão para responder às características particulares da tecnologia utilizada, da força de trabalho existente e dos objetivos que os *Call Centers* se propõem a atingir: Qualidade de serviço, vendas e representação da marca, em simultâneo com redução de custos, padronização e eficiência.

Este projeto visa a elevação da qualidade e eficiência do suporte ao negócio prestado a operações internas de *Call Center*, numa empresa de telecomunicações. Que identificou insuficiências nos instrumentos de controlo, avaliação de performance e apoio à decisão das áreas de Recursos Humanos e, dificuldades em alterar a situação.

Desta forma, propõe-se o desenvolvimento e design de *dashboards*, transformando os processos de *reporting*, ou seja, a forma e método como a informação é tratada, mantida e divulgada. Enquanto se procura fomentar espírito crítico na ótica de melhoria contínua, identificando em colaboração com funcionários tarefas ineficientes passíveis de automatização ou redesenho, e soluções simples que possam ser implementadas a baixo nível.

Foi possível implementar dois *dashboards*, com um painel de geração de relatórios ativos incorporado na ótica de self-service BI. As soluções encontradas revelaram-se uteis e de fácil utilização, contribuindo para o aumento da qualidade e eficiência do suporte prestado à operação, através de informação disponível e aumento de tempo útil de trabalho dos técnicos do departamento.

Palavras-Chave: *Dashboard, Business Intelligence, Gestão de Recursos Humanos, call center, automatização*

Classificação JEL: O15 (Human Resources); O32 (Management of Technological Innovation and R&D); M15 (IT Management)

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List of abbreviations and acronyms

ACD - Automatic Call Distributor

CI - Continuous Improvement

HR - Human Resources

HRIS - Humans Resources Information Systems

HRM - Human Resources Management

KPI - Key Performance Indicator

PP - Power Pivot

PQ - Power Query

SCD - Sales and Commercial Department (Sales Force Management)

SBM - Service and Business Management

VBA - Visual Basic for Applications

1 Introduction

In a competitive business environment with accelerated technological progress, the continuous improvement of performance levels, process optimisation and the ability to transform the information and data produced by companies into valuable decision-support knowledge play a fundamental role in creating competitive advantages.

Companies and managers now have a wide variety of simple and inexpensive tools at their disposal for decision support, operational control, and process optimisation. However, changing processes and working methods to take advantage of these tools is rarely an easy task in the real world. Restrictions on budget, time, resources, know-how and the cultural or organisational context can delay the modernisation of processes and limit the ability to analyse and rethink the systems set up.

This project is part of the master's Thesis in "Management of Services and Technology" and its collaborative partner is a large company operating in the field of telecommunications. Within the scope of a specific department, it is proposed firstly to develop and design operational control dashboards and secondly to automate repetitive and routine tasks with a view to continuous improvement and optimisation of working time.

1.1 Problematic

The project is assigned to the Business Support (GSN) department of the Sales Force Directorate (DCV), with a focus on the Recruitment and Human Resources processes of the company's internal call centre operations. The theme arose from the department's interest in raising the human resources processes and capabilities of business support for the telemarketing sales force, and the scope of the project was extensively moulded by the department.

Call centre operations present us with several interesting management topics and dilemmas, and mirror different work organisations and management styles. Human Resources Management plays a key role in this sector, and specifically the areas of recruitment and training face enormous challenges (Townsend, 2007). Regardless of the management strategy applied, clear and up-to-date operational information is crucial for controlling and making business decisions in a fast-paced, modern call centre operation.

There is a team in the GSN department with responsibilities for reporting and database control, with computer knowledge, but this team is focused on call centre operational matters and information provided by ACDs (Automatic Call Distribution), such as the volume of calls made, received, and rejected, average call time, etc. The responsibility for producing and publicising Human Resources control and performance reports falls to the respective HR teams. The problem begins with the processes set up to fulfil this responsibility, or the lack of them.

Current HR and recruitment inventory reports and analyses are made in an "on demand" logic, i.e. prepared when needed before meetings or announcements. They are generally presented in table or list data structures and built on a static snapshot of data at the relevant date. In other words, in most cases, for each control need, each day, the table, list or indicator required at the time is developed. The department recognises that the state of the processes and control of human resources functions is not ideal in terms of quality and efficiency, largely due to the employees' lack of know-how in this area. Therefore, at the end of 2021, training on visualisation and dashboards in Excel was carried out for the department's middle managers. The effort to improve the quality of reporting is evident, with team leaders working hard to build appealing graphic visualisations for monthly dissemination. However, the process is still inefficient, and updating takes up a lot of useful working time, with graphs being developed manually in an Excel file and copied in image format to the dashboard. In addition, other routine, and repetitive HR processes, especially in the administrative sphere, lack definition, standardisation and automation. This increases the number of inefficient tasks that take useful working time away from employees. For example, "copy/paste" updating tasks, manual construction of lists that are part of recurring processes and overlapping tasks between employees.

Finally, the department suffers from resistance to unimposed change, due to a lack of useful time and reflection, know-how and reasons related to the organisational and cultural context.

1.2 Project plan: Objective, methodology and limitations

The project benefits from a starting point external to the company at no financial cost and seeks to respond directly to the set of problems addressed above. Firstly, by transforming reporting processes, i.e. the way in which performance-related information is processed, maintained, and disseminated. Secondly, by fostering a critical spirit with a view to continuous improvement.

That said, the project's two main objectives are:

- The development and design of operational dashboards for performance control and HR processes.
- Practical automation of routine tasks (inefficiencies identified by employees)

For the project to be considered complete, the dashboards must: (1) allow automatic daily updating with the information available in the company's applications and databases without the effort of data transformation or other types of processing; (2) be visual and easy to analyse; (3) allow dissemination within the department without compromising the integrity of the data and visualisation.

The successful completion of the project is a priority for the department because:

- From the point of view of continuous improvement, efforts had already been made to improve HR reporting processes, but they had had little effect due to difficulties with technical knowledge and lack of time;
- It boosts the strategic positioning of Human Resources Management, providing a tool for management, control, support for decision-making and dissemination with other departments;
- Frees up useful working time for employees involved in transformed processes. Enables greater focus on the business and continuous improvement processes;
- It fosters a spirit of collaboration, idea-sharing and a philosophy of continuous improvement among employees, when they are exposed to new ideas and "voluntarily forced" to rethink the processes and systems they have set up.

With regard to the methodologies followed, the main tools used were MS Excel software, Power Query (PQ), Power Pivot (PP), and VBA for Excel, and the respective programming languages with their own methodologies. The general values of agile project management methodologies were applied throughout the development of the project in co-operation with the company and its employees, who were asked to take a leading role in regular and occasional meetings to define the scope, criteria and measures.

The success of the project depends on the willingness of the department's employees to participate. For this reason, careful management of these interpersonal relationships is extremely important. Initially, the main collaborators for the project were schematised (Appendix A), their role and how they should be managed, in a logic of stakeholder management in projects.

This was followed by scoping and non-scoping meetings. The project took shape with the development of the dashboards that accompanied weekly progress and functional demonstration meetings and occasional meetings with GSN employees with the aim of deconstructing inefficient processes into tasks that could be automated. It ended with the development of two files, the first containing three sheets of visualisations of indicators related to recruitment processes, and the second consisting of an HR inventory dashboard, with a built-in ad hoc reporting interface (Automatic Reporting Centre) that allows six tasks to be automated from a self-service BI perspective.

From the outset, the project was limited to the deadline for delivery within the scope of the master's thesis and the company's limitations, such as know-how and technological limitations, for example the non-existence of subscriptions to other data modelling and visualisation software (Power BI or Tableau).

Limitations were also identified in achieving the second proposed objective "automating processes and tasks", as this is an objective linked to continuous improvement, and there was some resistance to more in-depth process changes, especially in the time available for the thesis. The solution was to create an "Automatic Report Centre" where the user can update reports automatically or extract predefined lists (updated automatically) used regularly in processes, thus increasing the autonomy of processes, and reducing interdependence and unnecessary requests via email.

1.3 Structure and organisation of the project report

This company project report is made up of 6 chapters, including the current introduction, which presents the problem and the proposed objectives of the project.

The second chapter is a brief literature review of the issues surrounding the problem and the solution developed. The technical instruments used in the development of the project were considered secondary to the literature review because they were outside the scope of the master's programme in question, so the framework focuses on the theoretical and management issues related to the problem and the context of the project. The third chapter presents the organisational context of the company in which the project was carried out, drawing lines with the problems identified. The fourth chapter deals with the methodology used to develop the project and collect and process information. The tools used to create the solution are detailed. The fifth chapter reflects the implementation and analysis of the results obtained, or in this case, the final output achieved. The technical elements that enabled the project to be developed and implemented are also analysed in depth. Finally, the sixth chapter presents the project's conclusions and contributions, as well as its limitations and recommendations for further work.

2 Literature Review

2.1 Call centres and Human Resources Management (HRM)

Call centre operations offer a number of interesting topics for multidisciplinary study and management dilemmas, being varied in their work organisations and applied management styles (Townsend, 2007). Call centres were described by Taylor and Bain (1999) as follows: "a dedicated operation in which computer-utilizing employees receive inbound, or make outbound, telephone calls, with those calls processed and controlled either by an automatic call distribution (ACD) or predictive dialing system" (p.102).

Human Resource Management is considered a crucial area in the development and success of call centres (Townsend, 2007; Robinson & Morley, 2006). The literature shows that HR practices that emphasise training, commission systems and freedom of discretion are related to greater employee commitment and involvement, better service quality and improved revenue per call indicators (Batt et al., 2002; Wright, 2008).

This evidence suggests that the internal service climate (Bowen & Schneider, 1988) and service-focused HR strategies have an impact on the consumer (Wright, 2008), referring to the concept of the "service profit chain" (Heskett et al., 1997). The central argument is that the internal working environment, created mainly by the HR practices implemented, increases or decreases the satisfaction of employees, who will thus be motivated to provide a better or worse service, which in the end will impact on customer satisfaction and company performance (Batt & Moynihan, 2006).

This is a concept deeply linked to service management, due to the greater intangibility of the offer, however Gronroos (1990) notes that the experience lived by the consumer in the purchase or delivery process is central to their perception of quality, so ideally, "(production) processes are transformed to outputs in the form of services" (Gronroos & Ojasalo, 2004, p.414).

It's easy to see the parallel with call centre operations which, despite historically being a "cost centre" that generates savings through automation and economies of scale (Batt & Moynihan, 2006), have gained increasing consideration from managers in their role of attracting and retaining customers, as well as in the public representation of the company, in a context where the experiences lived can have a major impact on customer satisfaction and the company's image (Askin et al., 2007).

HRM thus faces tremendous challenges in this sector, especially in recruitment and training processes, facing two contradictory imperatives: minimising costs and high quality customer-oriented service, also referred to in the literature as the Service-Efficiency tradeoff (Townsend, 2007; Batt 2000; Robinson & Morley, 2006).

On the one hand, efficiency is achieved through the implementation and use of technology that facilitates the physical concentration of agents, the organisation and automation of work, and the high level of monitoring of work (Askin et al., 2007; Robinson & Morley, 2006). The latter was taken to the extreme by the capacity of ACD (Automatic Call Distribution) technology, which at the end of the millennium was strongly criticised by the scientific community and merited references such as Fernie and Metcalf (1997): "the tyranny of the assembly line' is but a Sunday school picnic compared with the control that management can exercise in computer telephony" (p.3). Whether these criticisms are motivated by the low morality associated with monitoring, or by the popularity of electronic domain chains and corporate surveillance at the turn of the millennium, or both, studies have made it clear that the aforementioned efficiency-seeking measures have negative impacts, such as exhaustion, stress and high turnover (Taylor & Bain, 1999; Robinson and Morley, 2006; Townsend, 2007).

On the other hand, call centres have high performance requirements in a context of simultaneous production and consumption, i.e. co-production of the service in which, even with rigid scripts and standardisation, they will always be unique and "live" interactions in which managers can hardly intervene. In addition, marketing studies show that a negative interaction between the customer and the employee has a much greater impact than a positive interaction (Batt & Moynihan, 2006; Gronroos, 1990).

The unique and challenging conditions of the sector put HRM under enormous pressure and the strategies encountered are varied. One of the strategies identified in several call centres is the "Sacrificial HR Strategy" (Wallace et al., 2000), which responds to the service-efficiency paradox by requiring agents to absorb the emotional costs associated with work. The strategy predicts a - deliberate - misalignment between the requirements of the task and the intrinsic motivation of the employee, which results in stress, burnout and turnover. In the "Sacrificial HR Strategy", this misalignment is seen as the solution and not the problem. The effectiveness and quality of the service is ensured by selecting people who are intrinsically motivated to serve the client, and by replacing resources who go into burnout or reduce their commitment. Rather than relying on expensive management practices such as development support programmes and relationship-oriented management (Wallace et al., 2000; Townsend, 2007).

In order to successfully implement this strategy, the call centre needs an efficient recruitment process capable of selecting intrinsically motivated candidates and a work structure that minimises the adaptation period. Wallace et al. (2000) concludes that these attributes, combined with a large labour force available on the market, make for a sustainable "sacrificial HR strategy" capable of providing high levels of service and efficiency. They emphasise, however, that the long-term impacts have yet to be studied.

The literature identifies other more balanced systems, such as the "Hybrid HR system" (Story & Castanheira, 2020). This strategy combines HR practices perceived as antagonistic, usually through rigorous monitoring combined with continuous training and reward systems.

Townsend's study (2007) shows that recruitment in call centres is generally in a middle ground between hiring for attitude and looking for technical skills. The ability to deal with pressure and perform emotional labour, basic computer skills and good communication are the most common requirements. In addition, the author stresses the importance of the organisational gatekeeper function of recruitment, which ensures that the wrong people don't join the company. The same study found the existing training processes to be generally rudimentary, focussing on basic knowledge of the company's products, IT systems and company policies.

HR strategies are sometimes poorly perceived and communicated by managers. The study by Robinson and Morley (2006) concludes that there is evidence of a paradox in which customer-oriented service is communicated as the main objective of most call centre managers, yet the emphasis of agent performance measurement falls on the productivity aspects of activities, recalling the ease that DCAs offer to this analysis: "There is a concern that call centre management is measuring what is easy to measure rather than what is important to measure" (p.4).

2.2 Business Intelligence for HRM

Business Intelligence (BI) is the engine that helps organisations use information and data to gain competitive advantage, combining human, technological and process skills to support strategic business decision-making (Sousa & Dias, 2002; Kapoor, 2010). Howard Dresner, an analyst at the Gartner Group, proposed the following definition in 1989: "Business Intelligence is an umbrella term to describe concepts and methods to improve business decision making by using fact-based support systems."

BI can thus be considered a facilitator of strategic positioning and is recognised as an instrumental strategic initiative in enhancing the skills and innovation of companies or departments (Watson & Wixom, 2007). It uses processes in which essential information is systematically collected, managed, and analysed, sometimes in real time, allowing analysts and managers to conduct appropriate analyses (Skyrius et al., 2013; Sousa & Dias, 2002).

BI applications and technologies include data management methods for planning, collecting, storing, maintaining, structuring, and processing data in data warehouses and data marts, as well as analytical methods (among others) for querying, reporting, visualising and generating active reports (Sousa & Dias, 2002). In addition, the literature emphasises the role of BI in improving the performance of business processes, reinforcing the timeliness, punctuality, and quality of inputs to decision-making processes, as well as making it possible to automate tasks and increase efficiency (Elbashir et al., 2008).

BI tools, which function as integral elements of the BI system, are broadly classified in the literature as follows: data management, advanced analytics, performance management and information delivery (Sousa & Dias, 2002; Kapoor, 2010).

Data management aims to manage the development, implementation, and operations of databases, including the extraction, transformation, cleansing, architecture, loading and distribution of data from different sources, as well as security and data management, backup, and recovery (Sousa & Dias, 2002). Gartner's IT Glossary (n.d.) provides the following definition: "Data management (DM) consists of the practices, architectural techniques, and tools for achieving consistent access to and delivery of data(...) ,to meet the data consumption requirements of all applications and business processes."

Advanced analytics includes mathematical or statistical, data mining, predictive and optimisation models and functions built on the data generated (Sousa & Dias, 2002). As defined in Gartner's IT Glossary (n.d.): "(...)analytics is used to describe statistical and mathematical data analysis that clusters, segments, scores and predicts what scenarios are most likely to happen."

Performance management consists of processes for measuring performance and monitoring strategic goals, and decision-making processes for improving performance (Sousa & Dias, 2002). As presented by Gartner in the IT Glossary (n.d.): "Corporate performance management (CPM) is an umbrella term that describes the methodologies, metrics, processes and systems used to monitor and manage the business performance of an enterprise."

Finally, information delivery gives recipients the ability to access information in easy-to-understand and pre-worked formats, for continuous monitoring of the organisational, operational or strategic performance of the company and departments, through information portals, scorecards and dashboards (Sousa & Dias, 2002). Gartner's IT Glossary (n.d.) divides the concept of "information delivery" into four elements "Reporting, Dashboards, Ad hoc query, Microsoft Office integration", the definitions of which can be found in Appendix B.

In this context, BI systems and elements are fundamental for all parts of any organisation. The Human Resources department generates - and deals with - a large volume of information relating to the workers and characteristics of the company's intellectual capital. This volume of information is leveraged by the implementation of Human Resources Information Systems (HRIS), which has automated the creation of HR data and processes and introduced the concept of self-service HR, which occasionally replaces the intervention of the HR specialist (McCartney & Fu, 2021; Bondarouk & Brewster, 2016; Karmańska, 2020; Becker & Huselid, 2006).

Heuvel and Bondarouk (2017) describe the intersection of BI and HRM or "HR analytics" as the systematic identification and quantification of human factors that drive results - or in the authors' words, "people drivers of business outcomes" (p.4) - to support decision-making. In its IT Glossary (n.d.), Gartner takes an even more simplistic view of the use of the word "analytics" as a "suffix" for an area or domain, as is the case with the concept "HR analytics": "For some, it is the process of analysing information from a particular domain, such as website analytics. For others, it is applying the breadth of BI capabilities to a specific content area (for example, sales, service, supply chain)".

HR BI outputs are used not only for self-management and self-monitoring of critical processes, but also need to be made available to other departments in an efficient and consistent manner (Sousa & Dias, 2002). Since they should be inputs to strategic and operational decision-making and enrich the strategic and operational models built, creating management and decision-making interfaces between departments, and thus increasing their strategic role in the organisation (Boudreau, et al, 2003).

That said, when BI is applied to HRM, it is seen as the driving force behind the department's strategic positioning and the transformational journey that the area has undergone in recent decades. Moving away from its conventional role as an administrative specialist (Ulrich, 1997) to the evolving role of strategic partner, business-oriented and vertically integrated with other disciplines, establishing relationships with specialists from other departments, managers and executives, in which the HR professional participates directly and actively in strategic and operational planning, in implementing the organisation's mission, value and culture and in meeting the company's strategic, operational and financial objectives (Sousa & Dias, 2002; Tansley & Newell, 2007).

The applicability of BI systems depends on the quality of the data available and the know-how of HR specialists. The ability to keep up with external and internal needs with qualified employees is crucial (Hustad & Munkvold, 2005), which is sometimes not the case in HR departments, possibly because it is a historically administrative area with less strategic relevance (Ulrich, 1997). This can lead to a logic of inertia: the low level of employee know-how results in poorly developed BI systems that don't promote the strategic positioning of HR, which in turn doesn't encourage the recruitment of employees qualified in BI or the qualification of existing employees, because the need doesn't exist or isn't understood.

According to Portuguese HR managers, KPIs (Key Performance Indicators) are the main BI tool for analysing performance and strategic HRM objectives. According to Harvey (2000), KPIs are the "mirror of the business" (p.66) and should be reformulated periodically and adapted to the environment and activity, so each department should use different KPIs to control processes and assess performance.

In their book *"Business analytics for managers: Taking business intelligence beyond reporting"*, Laursen and Thorlund (2010) describe a general scenario of the alignment and role of BI in HR departments:

- BI doesn't provide information at a strategic level, but only answers questions at an operational and procedural level.
- BI represents passive support, where it only produces reports that support evaluation and control.
- BI informs HR strategy, and its outputs can change it, so they can be decisive for HRM.

However, this is sometimes an overly positive outlook, which cannot be identified in companies with little transformational capacity, and which have not made the leap to adopting competent BI tools. This is borne out by the study by Dugelova and Strenitzerova (2015), which identified the following problems with the control methods used in the HR department of a call centre company:

- There are too many HR indicators, and they are not communicated clearly enough
- HR indicators are not measured periodically;
- Indicators are only made available during meetings or when requested by the HR manager;
- There are no defined methodologies for obtaining, using, and monitoring HR indicators, nor for carrying out adjacent corrective measures.

In addition, the previous subchapter demonstrated the difficulty and rare occurrence of producing BI elements that do not come from ACDs in call centre operations (Robinson & Morley, 2006). Even considering the close relationship between operations management and cost control with HRM in the sector, and the existing literary contributions on the advantages of an "OM-HRM interface" (p.186) in the call centre industry (Boudreau, et al, 2003; Tekin et al, 2008).

2.3 Dashboards

Organisations of all types and sectors use dashboards to monitor operational processes and performance, as they offer a unique and powerful solution that responds directly to an organisation's need for information (Few, 2006).

As stated above, the dashboard is a recognised BI tool included in the elements of information delivery and performance management, however its definition is somewhat flexible as noted by Few (2006). The book *"Performance Dashboards: Measuring, Monitoring, and Managing Your Business"* by Eckerson (2010) defines this instrument as visualisation mechanisms within a performance management system that convey critical information at a glance. Few (2006) suggests a very similar definition, adding the characteristic of being displayed on a single screen.

An effective dashboard allows managers to monitor and act on events as they occur, visually transmitting the necessary information at the right time, usually on a daily or intraday basis, using graphs or tables. In this way they can improve managers' decisions, optimise processes and work proactively (Eckerson 2010).

Eckerson (2010) also contributed to the definition of the concept of dashboards by introducing what the author calls "the three threes". Cataloguing the characteristics of the various types of dashboards: "A performance dashboard is composed of the "three threes." There are three types of applications (monitoring, analysis, and management), three layers of data (graphical, dimensional, and transactional), and three types of dashboards (operational, tactical, and strategic.)"

Despite the usefulness and advantages intrinsic to their concept, many dashboards do not fulfil their potential. Few (2010) points out that most dashboards do not communicate efficiently and effectively, not because the technology used is inadequate, but because they have a poor design. Allio (2012) adds that when dashboards are used only as a reporting and control tool - rather than as an input to strategic dialogue and decision-making - they are likely to be disregarded by managers and technicians.

That said, we can already identify the design and functional and management scope of dashboards as key elements for their success. The literature also adds the importance of the indicators and targets included; ease of maintenance and updating; and the ability to evolve and adapt (Few, 2010; Allio, 2012; Batch et al., 2022).

Allio (2012) points out that, when defining indicators and targets, the best approach is the direct participation of cross-functional teams, including the managers who will analyse the dashboards and the teams on which the indicators focus. The author also considers that creating a dashboard is a process that includes implementation, testing and correction, and should always be subject to change: "Good dashboards, like good managers, stay fiercely attuned to environmental changes." (Allio, 2012, p.11).

Dashboard design has evolved over the years and, although there is a lot of information and educational content on information visualisation, dashboard design is not straightforward and offers a huge range of choices in various parameters (Batch et al., 2022). Few (2010) believes that dashboard design should endeavour to be practical and effective, with this characteristic being much more relevant than "beauty" or attractiveness.

Batch et al. (2022) offers an excellent contribution on the dashboard design process and the various choices and tradeoffs the designer faces in this process. Summarised in figure 2.1:

Dashboard Design Cheatsheet <https://dashboarddesignpatterns.github.io>

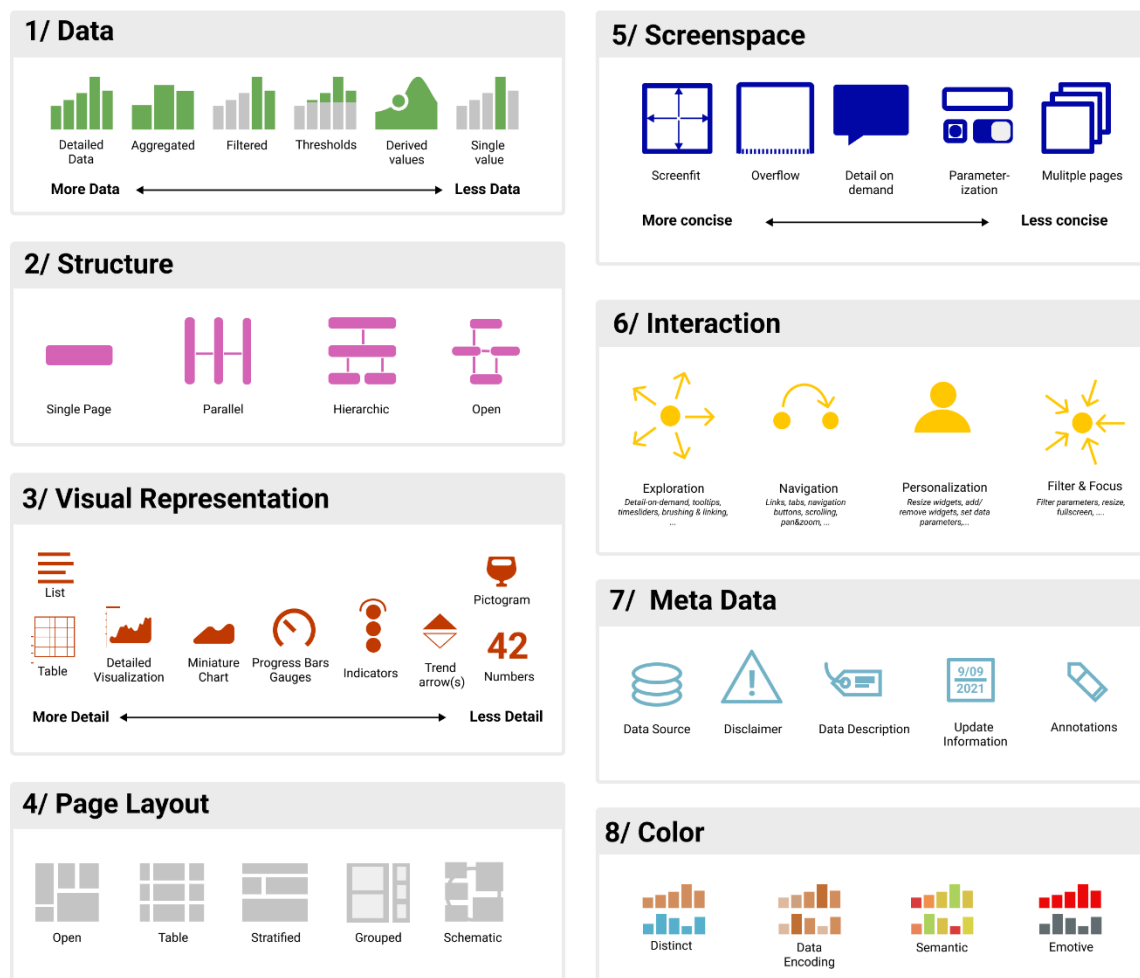


Figure 2.1 - Dashboard Design Cheatsheet
Source: Bach et al., 2022, <https://dashboarddesignpatterns.github.io/>

The colours used in dashboards have a huge impact on their perception. It is common practice to define a general colour palette for dashboard design. Bach et al. (2022) refer to this feature as a "shared colour scheme", in which colours are generally used in accordance with the brand image.

Few (2010) adds that dashboards can be an interface for other types of BI tools, for example operating as an access area for complementary information. In other words, an ad hoc query system, integrated into the Self-Service BI concept.

The self-service BI concept allows for the independence of employees and processes, as it enables access to the necessary information or tools without the intervention of IT, IS, reporting or HR departments (Imhoff & White, 2011).

2.4 Kaizen Philosophy, Innovation and Organisational Contexts

The constant quest to improve performance and results is intrinsic to the nature of business and competition. Over the years, Continuous Improvement (CI) has been widely discussed and known as a management approach whose main objective is to improve an organisation's performance and results (Aleu & Aken, 2016).

According to the literature, CI originated in Japan after the Second World War, when the reconstruction of industry also made it possible to rebuild existing management systems. Philosophical lines linked to Japanese culture and tradition created this approach, which is widely considered to be the reason for the success of Japanese industry (Singh and Singh, 2009; Prošić, 2011; Colenso, 2000; Berger 1997). The philosophy was brought to the West largely due to the success of the KAIZEN concept, set out by Masaaki Imai in his book "KAIZEN - The Key to Japan's Competitive Success" (1986), where he outlined the concept and the main values and principles (Berger, 1997).

KAIZEN is presented as a process-orientated management philosophy and approach, as opposed to a results-orientated one, as stated by Anders Berger (1997), processes need to be improved before results can improve.

In addition, KAISEN is a people-orientated theory that should involve everyone from top managers to lower-level workers. Individual commitment is a fundamental pillar in the logic of "Mandatory Volunteerism". Imai (1986) defends people's intrinsic desire for quality and value, in which managers only need to initiate the process and set an example.

The spirit of KAISEN is continuous improvement through small steps rather than rigorous and drastic changes, and the autonomy of workers to carry out these low-level improvements (Prošić, 2011; Colenso, 2000). Process innovation and improvement does not need to completely change the way work is done; small improvements in complementary or secondary tasks that increase productivity, efficiency, satisfaction or reduce costs are considered equally relevant innovations (Prošić, 2011).

The literature shows that, when applied correctly, the philosophy humanises the workplace, creating a more collaborative and supportive environment where work teams can thrive, develops the company's specific knowledge base, eliminates unnecessary and exhausting work (physically and mentally), eliminates waste in processes, and ultimately increases their efficiency across the board (Prošić, 2011; Colenso 2000).

However, the literature also suggests that the successful implementation of CI processes, and the creation of a KAISEN philosophy, is only possible in specific organisational contexts and cultures (Singh & Singh, 2009; Almainan & McLauchin, 2018). One factor that is sometimes overlooked in discussions of KAISEN is the conditions and context in which the philosophy becomes a management approach. Post-war Japan is characterised by total employment, lifetime employment contracts and the distribution of benefits for company development. This contractual context is still the backdrop to KAISEN theory, which provides the necessary security to guarantee the trust of the workforce (Brunet, 2000; Singh & Singh, 2009).

Mani (2009) suggests eight organisational characteristics that facilitate the implementation of CI processes and the dissemination of its philosophies among employees:

- Supportive leadership
- Employee empowerment (safety, training and autonomy)
- Reward system (as a motivator for individual dedication and commitment)
- Process management (control mechanisms and information systems)
- Supportive culture (openness to innovation and change, collaboration and teamwork, solid communication in all directions)
- External interactions with other entities in society
- Orientation towards the future
- Customer focus

In addition, Peter F Drucker (2007) in his publication "What can we learn from Japanese Management?" on the KEIZEN Institute emphasises the generalist vision, the concept of lifelong learning, the willingness to change, significant benefits and job and income security as essential points for KAISEN's success.

The reality in the West, especially regarding job security, is moving in the opposite direction, with the increasing flexibilisation of work through outsourcing, temporary contracts and autonomous service provision (Cetrulo et al., 2018). This can be an obstacle not only to the implementation of CI processes, but also to any kind of innovation and employee involvement (Kleinknecht & Naastepad, 2005; Toner, 2011).

The use of these types of contracts can limit the increase in the skills of the labour force. There is empirical evidence that, in the West, workers on these labour contracts are significantly less likely to receive employer-funded training or to invest in acquiring skills corresponding to a job with an uncertain future (Toner, 2011).

In addition, the study by Kleinknecht and Naastepad (2005) suggests that increasing levels of turnover, leveraged by temporary contracts and weak dismissal restrictions, have a negative effect on cohesion and trust, and increase moral hazard and opportunistic behaviour. Greater labour flexibility, coupled with a higher probability of dismissal, may reduce employees' propensity to share their expertise with colleagues, hindering collaboration and preventing the development of a company-specific knowledge base. At the same time, it can encourage employees to divulge company-specific knowledge to competitors. This can lead to a vicious circle in which employers exclude employees from decisions involving strategic information and employees reduce their efforts to contribute.

3 Organisational context

The project was carried out within a company belonging to a multinational telecommunications group with a long history in the domestic market, which provides sales services for branded products and services in Portugal - in order to make it easier to articulate the organisational characteristics, this company will be referred to as "SALES". More specifically, it was the "Business Support" department of the "Sales Force Department" that hosted the project.

The official organisational structure can be reviewed in Appendix C, with a brief description of the main responsibilities allocated to each area, to enable a better understanding of the hierarchy and framework of the management departments.

The project is rooted in the RFR sub-department - Recruitment, Training and Human Resources - which is organised into functional work teams with allocated team leaders: Recruitment, Training, Access and Applications, Human Resources and BackOffice teams. The manager in charge of the RFR department is the company advisor responsible for overseeing the development of the project from start to finish.

The recruitment process is carried out in conjunction with partner temporary employment agencies (TTEs), which recruit candidates and hire them if they are selected by recruitment, pass initial training and the team coordinator of the respective channel undergoes on-the-job training. The recruitment team must validate the candidates sent by the ETTs and other sources to fill the planned initial training courses, which in turn depend on the resources requested by each channel, depending on needs. Some sales teams, especially the Outbound channel, set strict performance targets, accepting higher turnover, and relying on recruitment and training to replace resources. Whether or not this is a deliberate strategy, it shows parallels with HR management strategies observed in call centres in studies cited in the literature review.

The department's labour context has some nuances that may be relevant to the problem under discussion. The department, like the company as a whole, has gone through several structural changes in its history, with privatisations, acquisitions, mergers and sales, which has resulted in a heterogeneous internal employment and contractual context. What's more, the department meets its own recruitment needs in part by using partner temporary work agencies to recruit salespeople, exacerbating contractual heterogeneity in the department, and undermining the capacity for internal development and updating of qualifications, with high turnover and short-term collaborations.

As far as the business and product are concerned, in addition to the classic offer of telecommunications products and services (mobile, fixed, internet, TV, packages and equipment), the Group has expanded the offer of complementary brand products, especially in recent years, with a view to horizontal integration and business diversification, with smart living products, intelligent solutions and equipment for the home and mobility, energy products, electricity and solar panels, among other integrated services and solutions for everyday needs. Thus, expanding the products that SALES is responsible for selling.

The strategy of diversifying offers is a response to the saturation of the telecoms market, mentioned by ANACOM over the years in the annual reports "The communications sector", and highlighted by Fitch Solutions as one of the biggest current difficulties in the national telecoms market, along with the small size of the market and the low purchasing power of consumers, in the 2022 publication "Portugal Telecommunications Report 2022".

That said, SALES, its managers, technicians, and sales force have seen their mission evolve over the years, due to market conditions and the increased variety and complexity of the products and services sold. These evolutions cut across all departments: not only did the sales force stop selling only telecoms services to a growing market, but it now sells to a saturated market, as well as telecoms services, electricity, solar panels, and even integrated insurance solutions. Managers, trainers and recruiters have also had to adapt and respond to new business characteristics.

The strategic positioning of human resources management and the development of internal processes with a view to continuous improvement are sidelined in favour of the department's constant need to respond to the high turnover of the sales force and the day-to-day running of the business. This can be interpreted as cause and effect, i.e. the lack of a continuous improvement approach results in inefficient processes, which in turn reduce the useful time for process improvement.

In short, in the last few paragraphs, the idea circulates that there is resistance to change, difficulty in procedural innovation and a lack of an intrinsic view of continuous improvement in the department's organisational context, or at least that it doesn't foster any of these attitudes, having cultural and organisational aspects that are antagonistic to those presented in the literature review as facilitating the implementation of continuous improvement processes.

4 Methodology

4.1 Project development

The project in question was carried out in a business context, so it benefited from the company's facilities and the ease of communication and participation of the company's managers and technicians. On the other hand, it dealt with the department's limitations in terms of know-how, technology and available tools.

In order to achieve the proposed objective, collaboration in the development of the project was extended to various coworkers, in addition to the supervisor assigned by the company, such as administrative technicians, recruitment technicians, IT specialists and the important contribution of the head of the recruitment team.

The project followed the general values and principles of agile methodologies, generally applied to project management in software development, and here adapted to the existing reality. Agile methodologies are characterised by collaborative work, multidisciplinary skills, flexibility, customer involvement and the continuous delivery of functional software, to enable rapid adaptation to changing contexts and needs (Madadipouy, 2015). The concept gained notoriety in 2001 with the publication of the "Manifesto for Agile Software Development", signed by seventeen authors - "The Agile Alliance" - which describes the 4 values of the Agile methodology (Beck et al., 2001):

"Individuals and interactions over processes and tools;

Working software over comprehensive documentation;

Customer collaboration over contract negotiation;

Responding to change over following a plan."

In practice, these methodological values fostered continuous collaboration in weekly meetings to demonstrate progress and adjustments to redefine the scope and needs with the head of the RFR department, the recruitment team leader, and occasional players. Agile values also fostered openness to change, self-criticism and the pursuit of excellence, as well as flexibility and autonomy in output development procedures. In addition to the regular meetings, there were also occasional meetings with administrative technicians, recruiters, and IT staff to gather information on procedures and identify problems and inefficiencies.

4.2 Dashboards: Collecting, processing and visualising data

The dashboards were developed in MS Excel, a unique choice, limited by the business context, as it was the tool provided by the department, which does not have a subscription to other visualisation software, such as Power BI. However, MS Excel was the right choice because it is compatible with the users' know-how and because it is more efficient in terms of technological requirements, making it easier to use the dashboards on the department's equipment. Although Excel doesn't have such simple and easy-to-use visualisation tools, it does have the ability to build original and highly customisable visualisations, and it also has the associated flexibility that makes it possible to integrate the project's objectives into the same output, i.e. the dashboards and the automation of tasks in the same tool and even in the same file.

The software version used was MS Office 365 with the Power Query (PQ) and Power Pivot (PP) add-ons. Visual Basic for Applications (VBA) was also used to automate tasks and procedures that complement the dashboards.

Two separate files were developed, the first will be referred to as "Recruitment Dashboards", focuses on recruitment KPIs and includes three dashboards: "General Dashboards", "Recruiters" and "Recruitment actions"; the second, which will be referred to as "HR Dashboards", refers to existing human resources and includes an HR KPI dashboard and the automation of tasks, through the creation of the "Automatic Reports Centre", which essentially originate from lists of data from the dashboard's base files. Both files follow the same methodologies for collecting, processing and visualising data and are based on the same data. The separation is due to the different scopes and end users, so access can be restricted for each.

Of the data files used, two are important to mention and characterise from the outset, since they play a central role in the data model designed, and their attributes weigh on the methodological choices for collecting and processing information.

Firstly, the "JSN" file brings together all the applications made to the internal sales channels belonging to SALES and processed by the department. It is obtained by extracting a report generated by the internal recruitment software, an application in which all candidates are entered and updated at each stage of the recruitment process manually by the recruitment technicians. The report is extracted in Excel file format, with a start and end date of your choice.

Secondly, the cadastro file gathers information on all employees who have signed contracts and worked in management, is updated manually, and serves as the information base for various administrative processes, such as contractual changes, making courses/training available, confirming eligibility for payments, resources control and reports and HR KPIs.

The figure below schematises the methodologies used in each phase of dashboard construction:

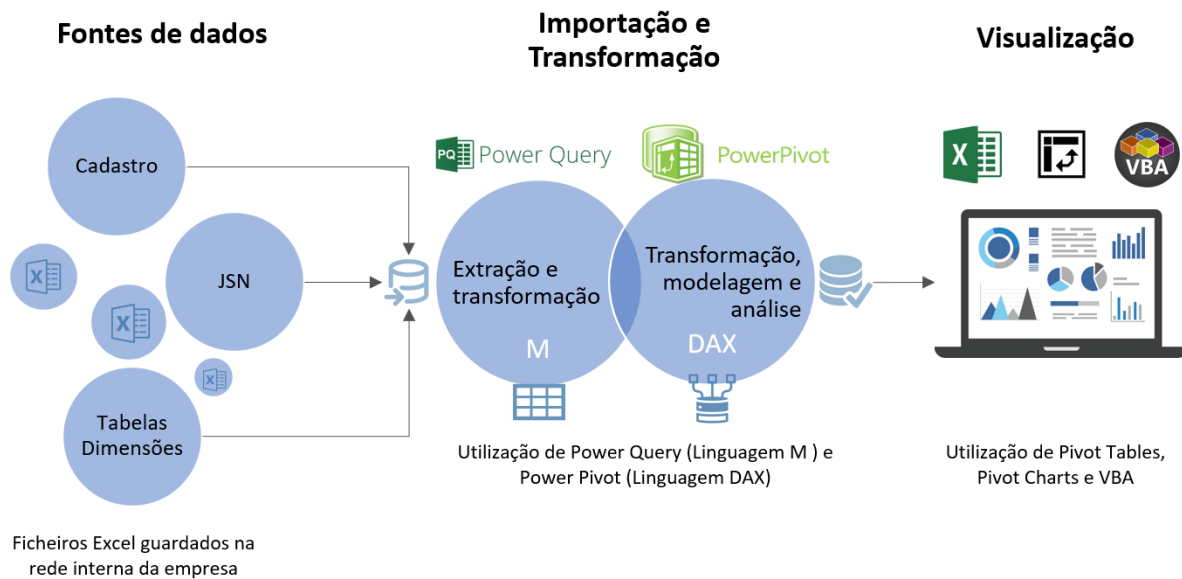


Figure 4.1 - Dashboard methodologies and tools (by phase)

Source: author

Data is collected by importing files with the Power Query Formula Language (PQ), which recognises them by name and location and transforms them into Excel queries. In this way, all the files that make up the data model must necessarily be in the defined folder with the defined name. It is also important that changes to the structure of these files are kept to a minimum and, when necessary, communicated to adapt the model.

The data is initially processed in the PQ, with commands to clean and reorganise the information, in the M script language, the functional language that runs behind the scenes of the PQ. At this stage, an efficient cleaning methodology was followed, starting by eliminating unnecessary information from the file before any data processing, so that the following code runs through fewer iterations and requires less from the machine. This methodology is presented in Microsoft's Power Query documentation in the article "Best practices when working with Power Query", where it is advised to filter tables and eliminate columns first and leave the demanding operations until last.

Subsequently, the modelling of the tables with Excel's Power Pivot (PP) tool followed the star schema methodology, using dimensional tables and active and inactive relationships with the central fact table. The star schema is defined by Microsoft in the PowerBI documentation - which uses the same data modelling as PP - in the article "Understand star schema and the importance for Power BI" (2022) as follows: "Star schema is a widely adopted modelling approach. It requires modelers to classify their model tables as either 'dimension' or 'fact'".

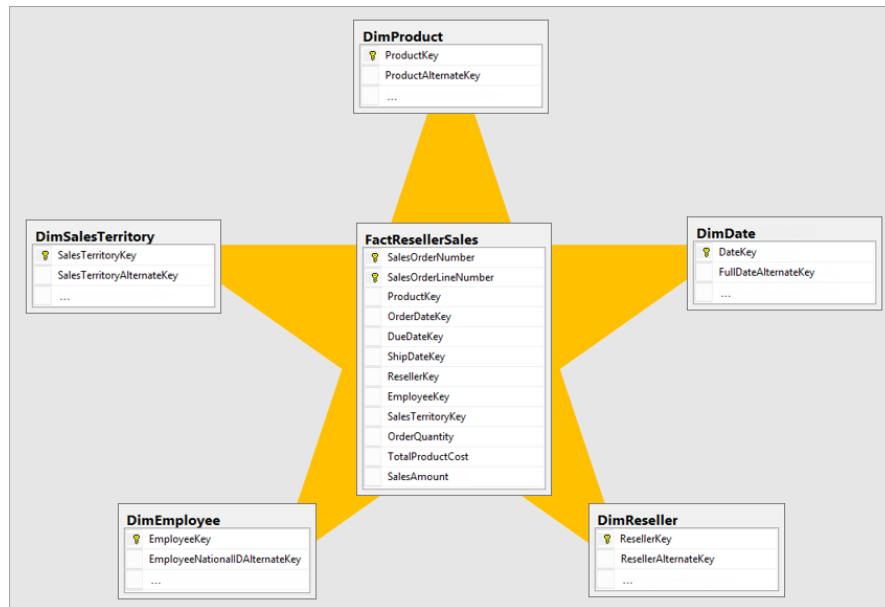


Figure 4.2 - Example star schema data model
Source: Microsoft PowerBI documentation,
<https://learn.microsoft.com/power-bi/guidance/star-schema>

Microsoft advises the use of the star schema, so that when rules and filters are applied to the dimension tables, the model's relationships are efficiently propagated to the table of facts and measures constructed. The documentation also mentions the concept of slowly changing dimensions (SCD), which adequately manages changes to dimension members over time. There are two approaches, SCD type 1 which always considers the most recent or current values; and SCD type 2 which supports history and version control.

The manual procedures for maintaining and updating the base files represent a difficulty for building the data model and a risk for the normal functioning of the outputs, since inconsistencies can be expected in manually filled databases with open fields. A star schema model alleviates this problem, and the dimensional tables make it possible to respond to changes in the databases without the need to rectify code. The type 1 SCD approach was followed, which will be further analysed in chapter 5 "Implementation and analysis of results".

Finally, the data is processed in a data analysis context with the DAX expression language, Data Analysis eXpression Language, by building expressions and measures that consider the filters and relationships of the data model, with the aim of creating the inputs (KPIs, temporal and comparable measures) for the visualisations of the final dashboard output.

The choice of KPIs and other visualisation inputs were discussed at the regular meetings mentioned above, with a review of the literature and scientific knowledge on analytics, indicators and HR performance measurements being used as a starting point for these discussions.

The graphs, tables and data boxes that make up the dashboards were built using Excel's inbuilt tools, mainly Pivot Table and Pivot Chart, with reference to the data model and measures previously developed in DAX.

The colours used in the visualisations were restricted to a palette following the "Shared colour schemes" method (Bach et. Al, 2022). Colors software was used to identify colours linked to the company's brand and to adapt them in a schematic Divergent colour logic until the nine-colour palette shown in the figure below was obtained. The Excel colour and theme software then added the Sequential colour scheme dimension to the palette.

The visualisation is carried out on a sheet in full screen mode, with a fixed scroll range and automatic zoom to the space occupied by the dashboard, all the usual tools of an Excel sheet have been hidden, such as the guidelines, headings, the formula and scroll bar and the sheet separators. In other words, the user hardly recognises that it's an Excel file, it works like a photograph that doesn't exceed the limits of a single screen and dynamically adapts to the filters provided in Slicers. These visualisation properties are set using the Office event-oriented programming language Visual Basic for Applications (VBA), via the Workbook.Open event. This MS Office programming language is also the tool used for procedures that complement dashboards, such as updating data and protecting the file.

4.3 Task automation

The aim of automating routine tasks is firstly to free up useful time for HR technicians and managers occupied by inefficient processes, secondly to reduce overlapping tasks between employees in favour of articulating them, and finally to awaken a critical sense of existing processes.

In this way, the survey of processes considered inefficient by employees and the deconstruction of these processes in the tasks that constitute them assume a crucial role. Occasional meetings were held to encourage dialogue and the sharing of ideas, in line with the principles of KAISEN's approach to continuous improvement, and a list was drawn up of tasks across various processes that could be automated.

In view of the difficulties already mentioned, the solution developed is an interface called "Automatic Reporting Centre" in ad hoc reporting and self-service BI logic. Six tasks from different processes were selected to demonstrate their automation in this project, although it was understood that this would be a topic for continuous improvement, which needs to be followed up.

VBA and PQ for Excel are the most relevant technical tools for developing the solution found, which is capable of automatically generating specific lists that integrate frequent processes and updating regular reports that used to be updated manually.

5 Implementing and analysing results

The purpose of this chapter is to demonstrate how the outputs work and the procedures carried out to develop and implement them. Initially, the dashboards - HR and recruitment - will be discussed, following the order of the phases of their development: choice of indicators; data collection and processing; and visualisation. The last subchapter is transversal both dashboards and explains the procedures for updating data and protecting the files developed.

However, before demonstrating the output, an explanation of the databases that feed the data model incorporated into the dashboards is in order. The table in Appendix D shows all the imported files, their characteristics, location, and the context in which they were used.

The JSN and Cadastro files contain the fact tables for the Recruitment Dashboard and HR Dashboard, respectively. All the dimensional tables (DIM) are in the same Excel file and facilitate the following processes: (1) responding to inconsistencies in the data in the fact tables; (2) necessary updating due to operational changes in the fact tables; (3) and building the visualisations.

Firstly, the fact tables are updated manually with few programmed rules, so record inconsistencies are common. At an early stage, several filling errors were identified in the JSN file. For example, records were identified in the "Reason not selected" field - filled in with the reason why the candidate was not selected at interview - for candidates who were not present at the interview. In addition to these situations, filling rules can change, as was the case at the beginning of 2022, when the "Channel" field was filled in with the candidate's channel and website and is now only filled in with the channel, i.e. records before the change would be "Outbound Lisbon" and afterwards "Outbound", making it difficult to process the data, since there was no retroactive correction. Therefore, dimensional tables are a facilitator in this area, creating relationships between all the entries in the application's fields and the corresponding correct information in the desired format.

Secondly, the tables are constantly growing and changing, which should not conflict with the model, so it is necessary to implement type 1 DCS, i.e. slowly changing dimensions that reflect the most recent values. In the case of the Recruitment Dashboards, there are filters by type of action and recruitment source category, but sometimes a new recruitment action is added to the database that has never been carried out before and would not be covered by the model. The dimensional table allows adjustment with minimal effort, simply by adding this action to the table with the corresponding action type and recruitment source category, without requiring changes to the script code or data model. For example, new recruitment actions are regularly added to the JSN database: taking part in job fair XY means registering the candidates obtained in that action in the JSN application, so the filters by action or recruitment source in the model wouldn't include them. By adding the line "XY job fair / Other actions / Internal recruitment" to the "DIM Recruitment action" dimensional table, the

candidates recruited at the XY job fair are represented by the model in the "Other actions" recruitment action and in the "Internal recruitment" recruitment category, without having to change the code.

Thirdly, dimensional tables simplify the creation of filters in the construction of measures and slicers for data visualisation. These tables are generally referred to as degeneration dimensions.

Finally, a control mechanism for JSN records was also developed in the Excel QP, incorporated into the Recruitment Dashboards, which identifies errors that could impact KPIs and reports built on the database, so that they can be corrected as quickly as possible. This mechanism identifies errors in filling in the "NIF", "Workload" and "Contact" fields, recognises inconsistencies in the "Training month" field (filled in in an open field in the application) in relation to the start date of the respective training, and also checks the update status of the recruitment phases - the attendance record on the first day of training and the contract signature record at the end of the training.

5.1 Dashboards

The main objective of the HR Dashboard is to provide an up-to-date view of HR headcounts and relevant KPIs for controlling the operations of the various channels. The Recruitment Dashboard aims to provide an up-to-date view of recruitment performance and processes. This dashboard has 3 sheets, focusing on the performance of recruiters and recruitment actions.

Dashboards should offer a monthly view (for the indicators that make sense) and allow an analysis of evolution and trends throughout the year.

The development of both began with the mapping of the desired indicators and visualisation tools with the support of the head of the RFR department.

5.1.1 Choice of indicators:

5.1.1.1 HR Dashboard

The following HR indicators have been defined as the most important for regular control:

- **Monthly gross head counts (HC)**
Number of employees who were active on at least one day of the month, without reference to working hours. It can be calculated independently, by adding up, or in relation to the month's opening or closing headcounts (by adding the month's entries to the opening headcounts or subtracting the month's exits from the closing headcount). This is an indicator already used by the department and known by managers. The aim is to be able to assess progress.

- **Total active employees (Distribution, Diversity)**
A constant and up-to-date view of the active sales force by channel, site, ETT, workload, work regime (face-to-face, hybrid, teleworking) and telemarketing coordinator. And also by demographic characteristics such as gender and nationality.
- **Movements (monthly inflows and outflows)**
Number of entries and exits each month. We want to be able to break down by Outbound channel coordinator, and a visualisation that allows us to assess the trend.
- **Exit rate during trial period**
Percentage of employees who left on a trial period out of each month's starters, i.e. who left within 15 days of signing their contract, by outbound coordinator.
- **Turnover rate - (Voluntary and involuntary)**
Turnover represents employee turnover, i.e. it compares the number of people leaving with the size of the workforce. It is also important to separate voluntary turnover (employee initiative) from involuntary turnover (company initiative).

There is some debate about the correct way to calculate turnover. For the calculation, the workforce at the beginning and end of the period has been considered. This is an approach advocated by academics and professionals, such as John Lipinskim, founder of "HR Analytics 101", who explains the use of this calculation in the article "Turnover: Why DO We Divide by the Average?" (2019). The formula is as follows:

$$\frac{\text{Total leaves in the period (voluntary and involuntary)}}{\left(\frac{\text{\#workers in the beginning of the period} + \text{\#workers in the end of the period}}{2} \right)} \quad (1)$$

- **Retention rate N+1**
Percentage of employees who stayed with the company for at least one month.
- **Average seniority - of active employees and leavers**
Average seniority of active employees and employees who left during the month.
- **Ranking of reasons for leaving**
Identify the main reasons for employees leaving during the period, bearing in mind that the system implemented considers the reason "Work incompatibility" in cases where no reason is given.

- ETT fundraising driver

This is an indicator specific to the department, which identifies the number of employees who have been active for at least 3 months, and who joined the company after 2018 (not inclusive) by ETT (recruitment source) - this indicator exists due to a change in the contract with the ETTs at the end of 2018, which implied a change in the billing driver of the ETTs' recruitment associated with employees with more than 3 months "at home".

As far as the filters are concerned, it was considered relevant to filter all the indicators by channel and site and, by month, the indicators that could be filtered by time.

5.1.1.2 Recruitment Dashboard

As far as recruitment is concerned, the volume of data available is considerably higher and the aim is to describe and evaluate the processes from different angles, so there was a need to create three dashboard sheets: the first overview of the recruitment process seeks to be essentially descriptive of the information in JSN, since the volume of data uploaded to the application every day makes it difficult to make sense of what exists; the second evaluates the performance of recruiters; and the third evaluates the performance of recruitment actions and partner companies in attracting candidates.

That said, the most important recruitment indicators are shown below, divided into the three groups:

i. Overview:

- KPI of resources ordered and delivered

It compares the resources requested by the areas and the resources who went on to initial training (2) and signed an employment contract (3). The formula is simple:

$$\frac{\text{Training contracts signed in the period}}{\text{Resources asked for the período}} \times 100 \quad (2)$$

$$\frac{\text{Employment contracts signed in the period}}{\text{Resources asked for the período}} \times 100 \quad (3)$$

- Evolution of applications received

Changes in the number of applications received per month, and the respective percentage of valid applications and successful candidates.

- Type of invalid applications
Number of invalid applications of each type (invalid documents, no answer, no interest, etc.).
 - Results of interviews and reasons not selected
Percentages of each possible interview result (dropped out, absent, not selected or selected) and reasons for non-selection (No profile, no interest, no availability).
 - Recruitment funnel
The recruitment funnel is a tool that quantifies the recruitment process from receiving an application to signing a contract, going through the various phases and calculating the loss of candidates at each one.
 - Division by source of recruitment
Identify the weight (%) of each source of recruitment in applications received, valid applications, those selected, training contracts and employment contracts.
 - Division by nationality
Identify the weight (%) of the main nationalities of applicants received, valid applicants, selected applicants, training contracts and work contracts.
- ii. Recruiters' performance
- Recruiter's funnel
The recruiter's funnel, like the recruitment funnel, tracks all stages of the process, this time regarding the recruiter responsible, from the number of contacts made to the number of employees in N+1 status (contract signed and 1 full month on the job).
 - Ranking N+1
The N+1 ranking refers to the department's annual campaign. At the end of the year, the recruiter who has managed to recruit the most employees who have been in post for at least a month wins a prize. The aim is to monitor the state of the campaign.
 - Complete process KPI
KPI refers to the percentage of contracts signed by the candidates selected by each recruiter. A value above 40 per cent is considered positive and below 30 per cent negative.
 - Number of actions responsible and action averages
Control the number of actions (training courses they are responsible for "filling") allocated to each recruiter and the sales channel they belong to. In addition, the average number of recruits and trainees per course.

- **Quality of selection**
Evolution in the number of people selected and the percentage of them who have signed training and work contracts. In addition, we want to know the number of employees per recruiter who remain in the post for at least 3 months.
- **Bad Hiring**
Indicator that identifies the number of those selected who do not sign an employment contract or who do not remain in the post for at least one month. Absolute number and percentage of those selected.
- **Division by nationality**
Weight of nationalities of selected and unsuccessful candidates, by recruiter.

iii. Recruitment activities

- **Ranking Shares**
"Top 5" and "bottom 5" recruitment actions in terms of applications, valid applications, selections, training contracts and employment contracts.
- **Recruitment funnel**
Recruitment funnel for each recruitment action. With the percentage of candidates lost at each stage.
- **Weights for each action**
Contribution of each recruitment action, in percentage and absolute number, to the various stages of the recruitment process (applications, valid applications, selected, training contracts and employment contracts).
- **Evolution of fundraising for each action**
Monthly evolution throughout the year of applications, selections, and employment contracts for each recruitment action.

5.1.2 Collecting and processing information

This subchapter details the procedures for collecting and processing data in a functional way, using mainly "pseudocode" and functional explanation, the code reference cases in the body of the text have pedagogical and explanatory intentions. In addition, to avoid repetition, there will be a more detailed explanation of the implementation processes for the HR Dashboard and a more succinct explanation of those relating to the Recruitment dashboard, since these processes are largely the same.

5.1.2.1 HR Dashboard

The first step is to import the fact table, i.e. the table in the cadastro file, via Excel PQ. This is an operation that can be done didactically in the Excel tabs (Data > Get Data > From File > From Excel Workbook), which leads to the same result as writing the Script below in the PQ editor.

- Import the master data table

```
Source = Excel.Workbook(File.Contents("C:\Users\Utiliser\Desktop\Pasta\Cadastro.xlsx"), null, true),  
cadastro_Table = Source[[Item="cadastro",Kind="Table"]][Data]
```

The code command finds the cadastro file by its location and name, so the file needs to be kept in the same folder and with the same name. Next, only the data table from the file is extracted, also named "cadastro".

The same type of import is carried out for the other Dimensional tables, the HR Dashboard uses the "Site", "Channel", "Exit reasons", "coordinators" and "OTB coordinators" dimensional tables. In the example of the import script for the "OTB_Coordinators" table, it is worth noting that the name of the folder where the file is stored (folder2), the name of the Excel file (Reference tables) and the name of the table (OTB_Coordinators) have been changed.

- Import the dimension table of Outbound channel coordinators

```
Source = Excel.Workbook(File.Contents("C:\Users\Utiliser\Desktop\folder2 \ReferenceTables.xlsx"), null, true),  
OTB_Coordinators_Table = Source[[Item="OTB_Coordinators",Kind="Table"]][Data]
```

Following the idea of efficient data processing, after importing the tables, we proceeded to delete the columns that are not necessary for the development of the dashboard and are unlikely to be used in future additions or improvements. A total of 56 columns were eliminated, so the cadastro table now has 28 columns out of the 84 it originally had, which corresponds to the elimination of more than 200,000 data cells.

Even with undemanding data transformations, this reduction in data volume results in fewer iterations and considerable efficiency gains. Especially given the limitations of the department's computer equipment.

This is followed by changing the data type and renaming columns. As already mentioned, correctly defining the data type of the columns in the PQ is relevant to the efficiency of operations between columns.

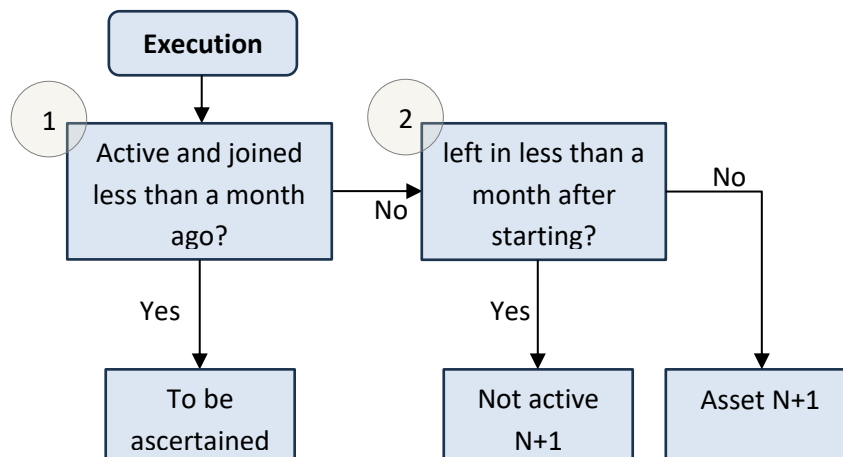
Still in the cleaning phase to reduce the volume of data, the table was filtered, discarding all records of employees who ended their contract before 2021, by selecting the rows of the table that confirm the condition: the value in the "Exit" column is empty (null) or greater than the date 31/12/2020.

Once the data has been cleaned, the process of transforming the data still in the PQ begins, with the addition of three columns: "FTEs", "Assets N+1" and "Exits in trial period".

The first - "FTEs" - is a simple calculation of the "Workload" column divided by 40, in order to obtain the FTE (Full-Time Equivalent) corresponding to each employee and will be used later to automate a report included in the CRA.

The second - "Active N+1" - indicates whether the employee has worked for the company for at least one month, and is calculated using a combination of nested IF expressions, the result of which can be one of three: "Active N+1", "Not Active N+1" or "To be determined", the last of which refers to active employees who started work less than a month ago. With regard to the logic of chained IF expressions in PQ, iteration is carried out at line level and validates the conditions in order from left to right, and is interrupted when the true condition is found, so the most efficient practice is to start from the particular to the general case and leave the most incident occurrence to the last iteration in which the previous conditions have not been met.

The figure below schematises the logic of the IF chain expression in question.



1 - Duration.Days (Date.From (DateTime.LocalNow()) - [Input]) < 30 and [Output] = null

2 - [Output] <> null and Duration.Days ([Output] - [Input]) < 30

Figure 5.1 - IF chain logic "Asset N+1" column

The third column added - "Leavers in trial period" - identifies employees who left in a trial period, i.e. within 15 days of signing their contract. The calculation is very similar to the previous one and follows the same logic, using an expression of chained IFs to return four record options: "In trial period", "Leaving in trial period", "Leaving outside trial period" and "Active".

Finally, the columns were reordered, and the queries imported into the data model, a procedure that Excel has built in by loading each existing query in the PQ into Excel, simply by selecting the "Add to data model" option. In addition, a reference query was created for the cadastro - "Active" - which is nothing more than a copy of the result of all the steps described above, to which the filter that selects only active employee records has been added. This is an auxiliary query for visualisation, which avoids the possibility of filter and slicer errors due to old records being filled in incorrectly in the base file.

The second phase of data processing is carried out in Power Pivot (PP) for Excel, which runs in the DAX language. This starts with modelling the data, then defining the DAX measures, and finally building the Pivot Tables and Pivot Charts that make up the dashboards.

The first step in all data modelling is to create the model's calendar, i.e. a time dimension table which, by relating to the date columns in the fact table, makes it possible to create correct temporal generalised filters with less effort (function performance dimension). The calendar is obtained automatically in the PP studio on the "Design > Date Table > New" tab, which creates a calendar table with a start and end date of your choice and with a set of predefined DAX operations that add the columns "Year", "Month", "Month Name", "Month Abbreviation", "MMM-YYYY", "Weekday" and "Weekday Name". The table has been named "DimCalendar" and its first record is 01/01/2020 and its last record is 31/12/2022.

Figure 5.2 shows the final diagram of the HR dashboard data model, which follows the star schema (enlarged in appendix E).

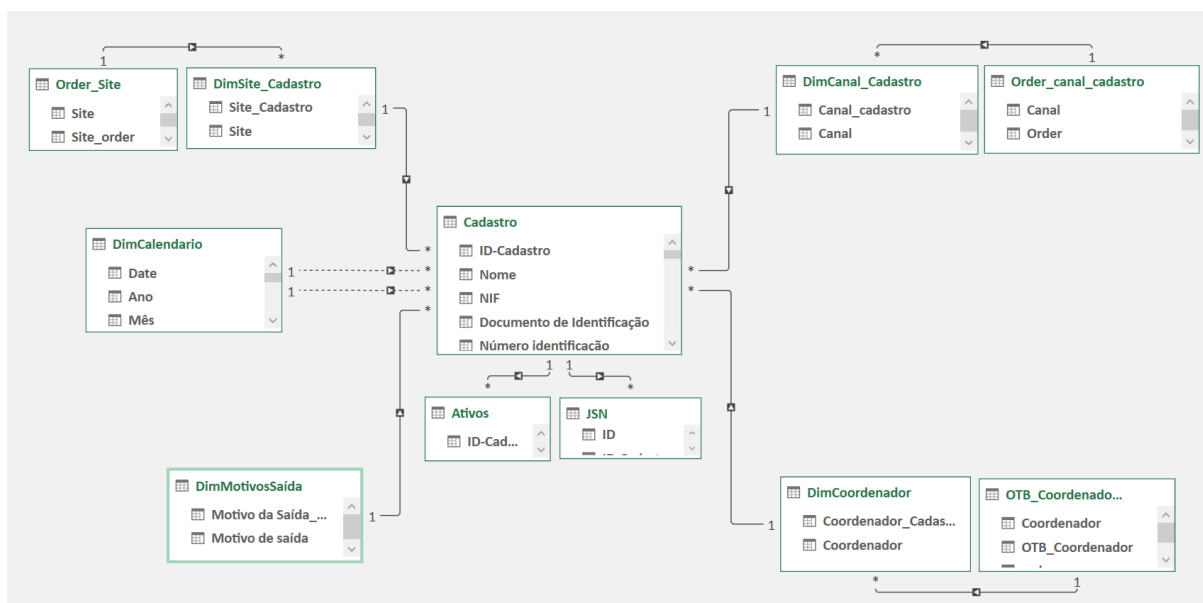


Figure 5.2 - HR Dashboard data model

The JSN table is used in the context of the Automatic Report Centre, which will be discussed later, and the "order" tables are only used to define the desired order of slicers in the dashboard view.

Having said this, it is important to differentiate between the types of relationships that exist in the model. The active relationship is labelled with a solid line and is processed automatically by operations on the model, while the inactive relationship is labelled with a dashed line and, in order to be processed, it must be referenced via the DAX function "USERRELATIONSHIP". This function does not return any value, it simply specifies the relationship to be used in a particular operation, activating it during the calculation.

All the relationships in the model are of the active type, with the exception of the relationships in the "DimCalendar" table, which is related to the exit date and entry date of the cadastro table. This allows for calculations and temporal filters using the two dates (the mechanism of inactive relationships will be explained below, along with the DAX measures).

With the data model defined in the PP, all that remains is to add the measures that will be used in the dashboard to the model. A total of 18 measures developed in DAX were incorporated into the model, 8 of which are independent and 10 of which refer to measures previously uploaded to the model. The calculations used for each measure can be found in Appendix F, accompanied by a brief description in the following format:

Table 5.1 - Example of a format for presenting measures

Name of measure	Description of the measure
<i>DAX Code</i>	

It should be noted that the time factor of the measures is related to the calendar table, and the dashboard has a monthly filter from this table that filters the measures according to the relationship chosen with the "USERRELATIONSHIP" function. For example, in the "# Entries" measure detailed below, when we choose the "January" filter, the result returned is the number of employee records that have an entry date during the month of January. The same filter for the "# Leaving" measure returns the number of records with a leaving date during the month of January.

Table 5.2 - Entries and departures

# Entries	Number of entries in the period
<code>CALCULATE (COUNTROWS ('Cadastro '); USERRELATIONSHIP ('DimCalendar' [Date] ; 'cadastro' [entradas]))</code>	
# Departures	Number of exits in the period
<code>CALCULATE (COUNTROWS ('Cadastro '); 'Cadastro ' [Output] <> BLANK(); USERRELATIONSHIP ('DimCalendar' [Date] ; 'Cadastro ' [saídas]))</code>	

If the data model is the backbone of the dashboard, the programmed measures are the brains that provide relevant analyses. Combining these measures with Excel's built-in tools, Pivot Table and Pivot Chart, starts the data visualisation.

In this way, the dynamic tables and references for the graphs and dashboard boxes were inserted into an Excel sheet, which was then hidden, using the calculated DAX measures as values.

5.1.2.2 Recruitment Dashboard

As with the HR Dashboard, the collection and processing of recruitment data begins with the import of the tables needed for the model. First the fact table (in the JSON file) and then the dimensional tables. In addition, the cadastro table containing employee departure dates is imported, which is necessary for constructing recruitment indicators. And the resource requests table.

The JSON file is an automatically generated report and the data is not in table format. However, we know that it will always have only one sheet. So to import the necessary data, we select the file by its location and then the data contained in the first sheet:

- Importing the JSON table

```
Source = Excel.Workbook(File.Contents("C:\Users\Utiliser\Desktop\Pasta\JSON.xlsx"), null, true),
JSON = Source{0}[Data],
```

The Recruitment Dashboard uses the dimensional tables "Site", "Channel", "Recruiters", "Recruitment action", "Recruitment result", "Reason not selected" and "Screening".

First, it was important to clean the data, reducing its volume, and only then carry out heavier operations. 37 columns were removed from the original 67. And a much more extensive series of data cleaning and preparation operations were carried out than in the cadastro file, such as renaming, replacing, and grouping values, partial extraction of information from columns, among others.

From the cadastro file, only 5 columns were kept, and the records of active employees or those who left after 2020 (not inclusive). The columns "Active N+1" and "Leavers on probation" were then added in exactly the same way as described above for the HR Dashboard.

After this treatment, a key column was created, which provides a link between the JSN records and the records in the cadastro table, i.e. between the candidate and the employee. A key column is necessarily made up of unique records, which was achieved by combining the values of the TIN and entry date columns (information included in both tables). This ensures that there are no repetitions since the same person (TIN) can be represented in more than one record if they have worked at different times. With the key column, it was possible to join the tables and incorporate the relevant registration ID for each record into the JSN table.

Finally, to avoid errors and visualisation problems when applying filters by active recruiter, two tables were created from the JSN table data after all the transformations. These include the ID of the candidate registered in JSN whose recruiter and case manager is one of the active recruiters. This step exists because if the measures were built on the entire data and filtered by active recruiters, the slicer in the visualisation would always show the "blank" option, i.e. records associated with recruiters who no longer perform duties.

That said, the data processing in the PP resulted in the following model (extended in Appendix E):

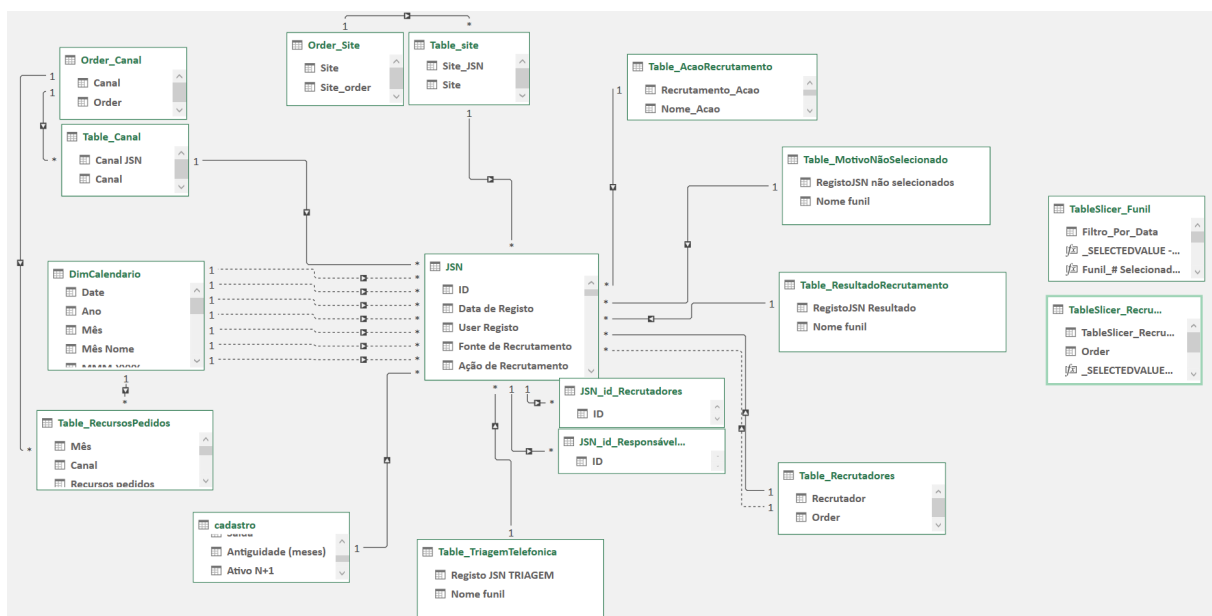


Figure 5.3 - Recruitment Dashboard data model

This is a considerably more complex data model than the previous one, with two fact tables: "JSN" and "Table_ResourcesRequests" and two dimensional tables (they can filter related facts differently): "Dim Calendar" and "Table_Recruiters".

The time dimension plays a major (and laborious) role in creating DAX measures and analysing the results, since the various stages of the recruitment process have a specific date associated with them. Thus, the measures can be calculated considering the date the application is received, the date of contact, the date of the interview, the date of training or the date of signing the contract. This raises questions and difficulties in terms of analysis.

If we want to know the number of contacts made by the recruiter in the month, we should take into account the month in which the contact is made. If we want to assess the number of candidates selected per month from "ETT A", then we should consider the month of the interview. But what about the indicators that assess behaviour between phases? How should a recruitment funnel be evaluated for a month in which the applications received, and the contracts signed in that month have no connection? Or how should the percentage of candidates attending training be calculated out of the total number of applications received?

These issues have resulted in an abundance of DAX measurements, in order to cover the various time references. The Recruitment Dashboard model has a total of 65 DAX measures incorporated into the 3 sheets, which can be reviewed in the file itself.

It's important to emphasise that the Recruitment Dashboards offer a particular interaction design component, giving the user the ability to interact with the indicators and explore the data themselves, changing the object on which some indicators focus. For example, the dashboard sheet on the performance of recruitment actions can be analysed with reference to applications received, valid applications, selected candidates, candidates attending training, or employment contracts signed. Another example of this exploratory capacity of the data is the recruitment funnel, which can display the figures for each phase referring to the respective date, or always referring to the date the application is received, using this as the starting point (the end of the funnel displays the contracts signed relating to the initial cake of applications received in the period).

This flexibility of analysis is achieved with a set of DAX expressions and auxiliary tables for creating slicers that allow the user to interact with the data. The following paragraphs explain the process of one of these operations, while the others follow the same logic.

Firstly, we created the table in PP that will be used to present the exploratory choice to the user, in the case of the recruitment actions sheet:

Table 5.3 - Slicer for exploratory interaction

Recruitment	Order
Applications	1
Valid applications	2
Selected	3
Training contracts	4
Labour contracts	5

It is then possible to create a selection panel in the dashboard, visible in the associated order, which allows the user to choose one of the options. The key is to build flexible measures capable of recognising the chosen option. To do this, an auxiliary DAX expression is used, as it doesn't exist in PP for Excel although it does exist in DAX (Power BI) under the function "SELECTEDVALUE", which is nothing more than the expression below:

- Equivalent to "SELECTEDVALUE" for PP Excel

```
IF ( HASONEVALUE ( 'TableSlicer' [Recruitment] ) ; VALUES ( 'TableSlicer' [Recruitment] ) )
```

""If there is one and only one selection in the slicer, it returns the value of the respective selection.

By entering the above auxiliary measure into the model beforehand, it is possible to create a DAX measure that references it and changes the desired output depending on the value selected, using the "SWITCH" function:

- Exploratory data interaction

```
SWITCH( TRUE();
[SELECTEDVALUE] = "Applications" ; [# Applications - registration date];
[SELECTEDVALUE] = "Valid applications" ; [# Valid applications];
[SELECTEDVALUE] = "Selected" ; [# Selected - interview date];
[SELECTEDVALUE] = "Training contracts" ; [# CF - training date];
[SELECTEDVALUE] = "Labour contracts" ; [# CT - signature date];
"Choose only one option")
```

""Evaluates the value stored in SELECTEDVALUE, and returns the corresponding measure (previously entered in the template).

5.1.3 Visualisation

It was considered a key factor for the success of the dashboards to be visually appealing and easy to read. The customisation of the Excel tools was crucial to achieving this goal. We tried to combine the various components of the dashboards to create an attractive and fluid visualisation, as Excel's default settings are insufficient in this respect. In addition, the font used was "Cascadia Code".

As already discussed in the methodology, the files are restricted to a palette of nine colours, with the sequential dimension subsequently added by Excel, resulting in a matrix palette of 54 colours. The choice of palette seeks to fit in with the colours associated with the brand, always maintaining the practicality of visualisation, i.e. a clear difference between the colours, since they will be used extensively in a categorical way. Figure 5.4 shows the evolution of the palette developed in the colors software to the Excel matrix palette.



Figure 5.4 - Dashboard colour palette
Source: author using Colors software <https://coolors.co>

The dashboards are presented in a full-screen window, without the application tools usually visible (sheet separator, separator and scroll bar, grid, headers, etc.), and with the scroll area locked, i.e. the visualisation is done on a single fixed screen. The Recruitment Dashboard has 3 data visualisation sheets that can be navigated via Excel links. The visualisation properties are defined in VBA with the Workbook.Open event. All the code for the procedure is in Appendix G.

5.1.3.1 HR Dashboard

When opening the HR Dashboard file, the user is directed to the start menu, shown in the figure below. Navigation in the file is via links that give access to the dashboard sheets.

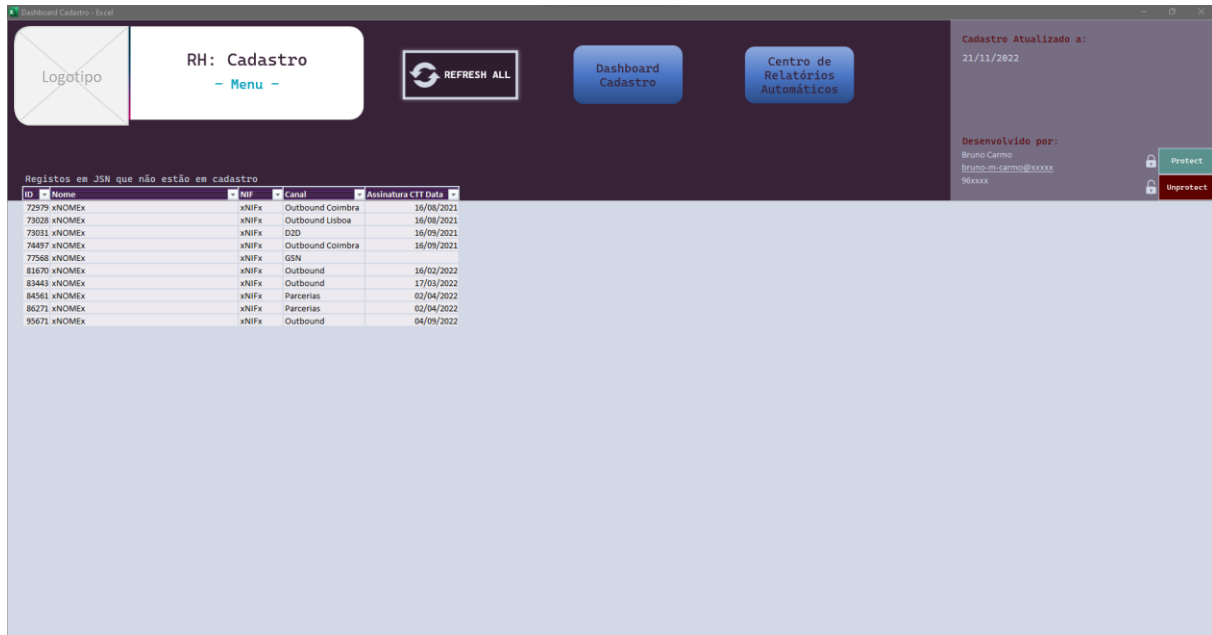


Figure 5.5 - HR Dashboard menu

1. REFRESH ALL: Button with VBA code that updates the entire file, you must enter a password for the code associated with the button to run (code in Appendix G).
2. Dashboard Cadastro: Excel link that takes you to the sheet where the dashboard is located.
3. Automatic Report Centre: Excel link that takes you to the sheet where the menu of available reports is located.
4. Protect / Unprotect: VBA commands only relevant to the editor. The "Unprotect" box asks for a password to proceed and unprotects the file, reverting to full screen presentation mode and making it editable. The "Protect" button resumes the format for visualising and interacting with dashboards (code in Appendix G).
5. Error validation: A mechanism developed in M language in the PQ, which makes it possible to validate possible inconsistencies in cadastro and JSN, since it is expected that all records in JSN with a sign contract to be in cadastro.

In addition to these components, the HR Dashboard Menu also shows the date of the last update and the author's name and contact details.

On the HR Dashboard sheet, the user will not be able to select any object or cell except for selecting filters (slicers).



Figure 5.6 – HR dashboard

5.1.3.2 Recruitment dashboards

Just as in the HR Dashboard, the user is directed to the initial menu of the Recruitment Dashboard and navigation is via links that give access to the dashboards.

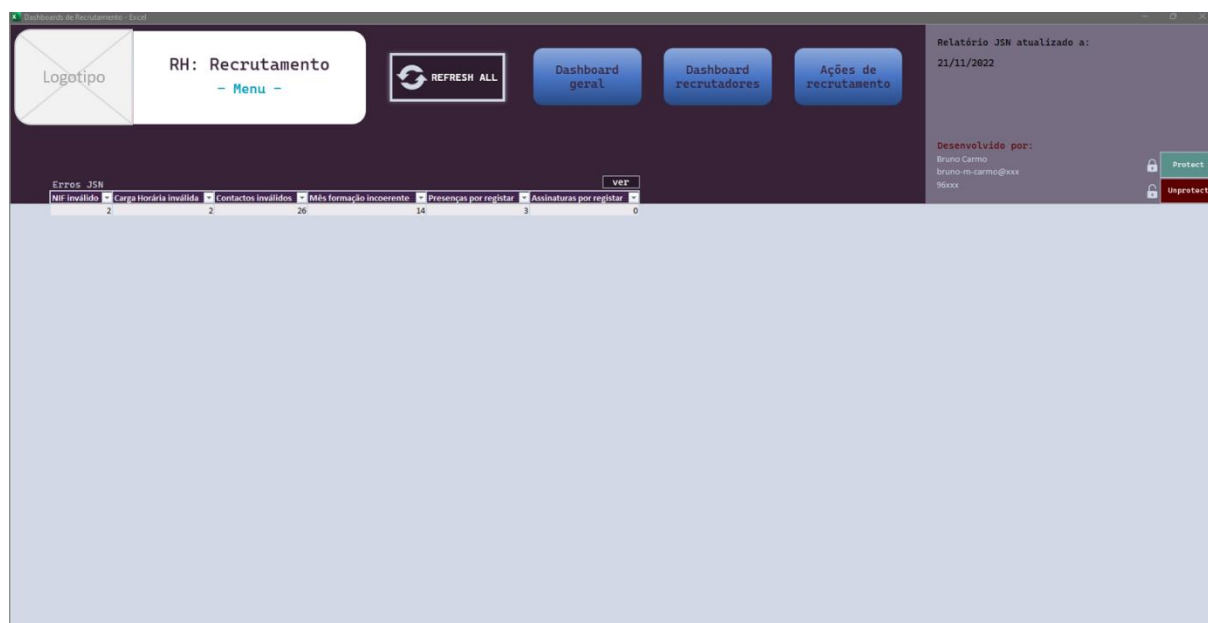


Figure 5.7 - Recruitment Dashboards menu

The "JSN errors" table comprises the sum of errors in each category. Its purpose is to immediately identify and correct errors that may exist in JSN records or in the imported file, so that no conclusions can be drawn about incorrect data. The "view" button at the top of the table opens a new Excel file with the IDs of the erroneous records and the details of the error.

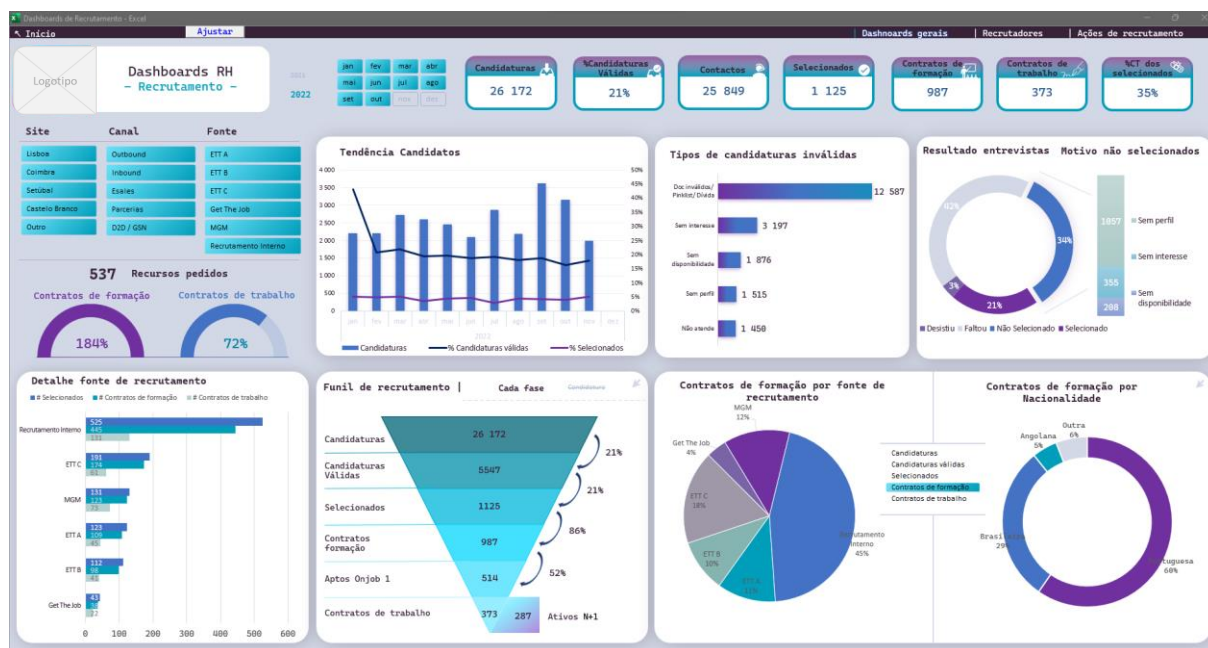


Figure 5.8 - General Recruitment Dashboard



Figure 5.9 – Recruiter's performances dashboard

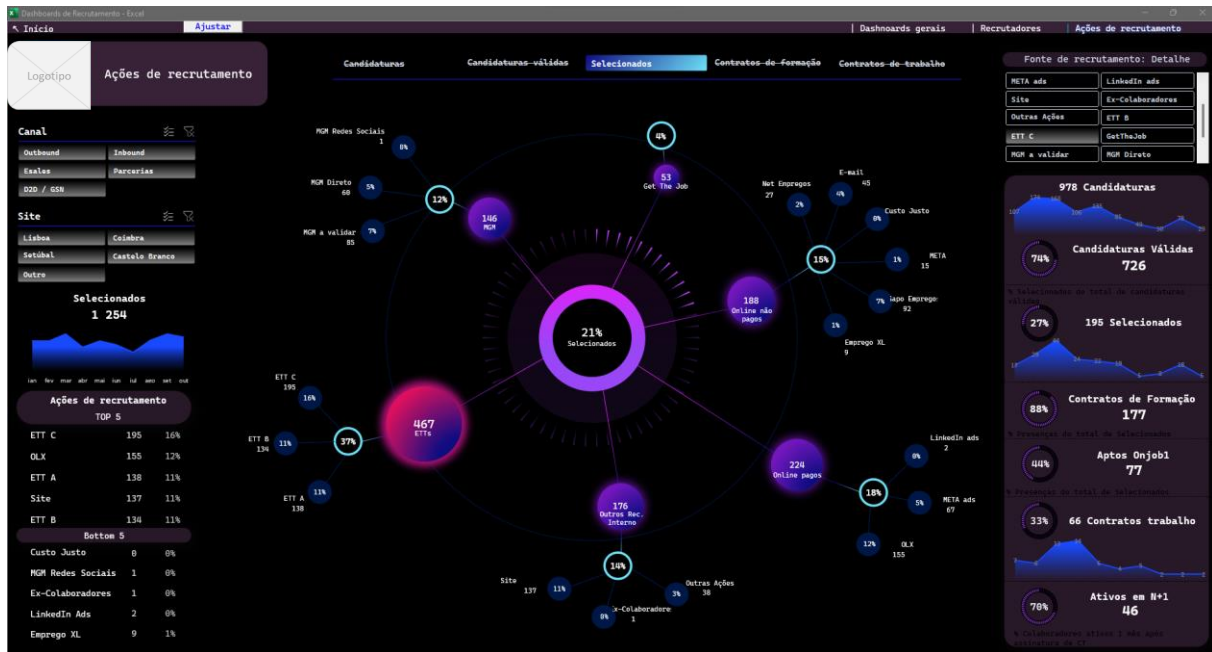


Figure 5.10 - Recruitment Actions Dashboard

5.2 Automatic Report Centre

The objective set for this topic was more ambitious at the start of the project than the output developed. Over the course of the meetings, it quickly became apparent that the managers had little interest in changing any of the processes in depth. However, the meetings also made it possible to identify six small, simple tasks that cut across several processes, take up staff time and are unpleasant for employees. It was therefore decided to explore this topic, given that there is a real interest in finding solutions to these tasks.

That said, the scope was redefined, and a solution was designed that automates small, repetitive and routine tasks by creating the so-called Automatic Reporting Centre. An ad hoc reporting interface from a self-service BI perspective that automates 6 tasks, as shown below:

1. List of those eligible for payment:
2. List of employees to be registered under GDPR
3. Listing for image declarations
4. Updating the cadastro file
5. DCV HR Report
6. ETT recruitment

The end goal remained the same: to increase the department's useful working time and foster a spirit of continuous improvement.

The first objective has been achieved, since the CRA automatically updates and makes available reports and lists that used to be updated manually and used regularly in processes. As well as freeing up useful working time, the solution increases the autonomy of processes, reduces interdependence and unnecessary requests via e-mail, and improves employee satisfaction as they are relieved of stressful tasks. The time saved by each task automation was estimated with members of the RFR team and is shown in the following table:

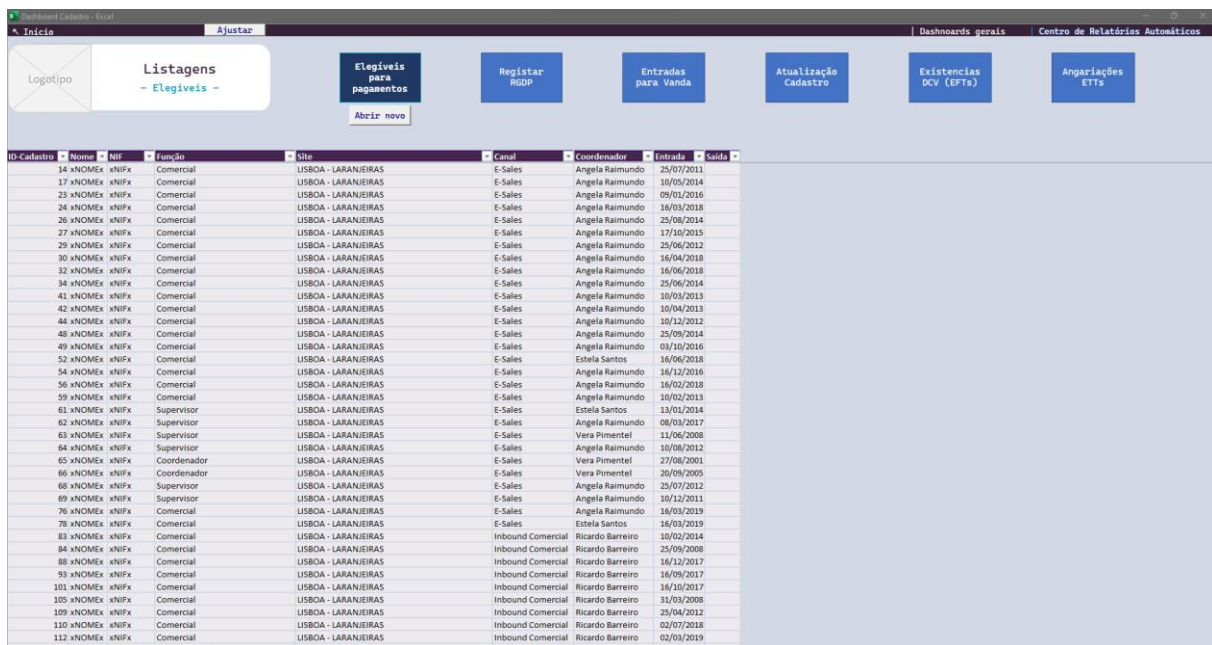
Table 5.4 - Tasks included in the CRA

Task	Previous Process	CRA process	Efficiency wins
List of those eligible for payment	- Request by general HR email 1x per month. - Compile the necessary information in an Excel file and send it by email.	Listing always available and automatically updated	- 30 minutes per month of useful HR technician time - Decrease in email <i>inflow</i>, waiting times and failures
List of employees to be registered under GDPR	- The technician must identify the need to send it (whenever a new employee joins for partnerships or D2D). - Make and send an Excel file with the employee(s)' details.	Listing always available and automatically updated	- 40 minutes per month of useful HR technician time - Decrease in email <i>inflow</i>, waiting times and failures
Listing for image declarations	- Sent after work subscriptions twice a month. - Compile the necessary information on new employees in Excel and send it by email.	Listing always available and automatically updated	- 1 hour per month of useful HR technician time - Decrease in email <i>inflow</i>, waiting times and failures
Updating the cadastro file	- Manual "copy/paste" update - based on departure dates and signed contracts	Automatic updating (entries and departures)	- 5 hours per month of useful HR technician time
DCV HR Report	- Request by general RH email to send the list. - Manual updating: 2 hours per month.	Automatic update	- 2 hours per month of useful HR technician time - Decrease in email <i>inflow</i>, waiting times and failures
ETT recruitment	- Request by general RH email to send the list. - Manual update: 30 minutes per month	Listings always available and up to date	- 30 minutes per month - Decrease in email <i>inflow</i>, waiting times and failures

The project development process made a strong contribution to the second objective. As shown in the literature review, the concept of continuous improvement (KAIZEN approach) can be considered primarily an organisational and cultural approach. The project meetings, in which employees voluntarily participate in defining problems and finding solutions, followed KAIZEN methods. Although the opposite was expected, due to the contrary organisational conditions, it was possible to create an environment of empowerment, collaboration and voluntary sharing that put the principles of KAIZEN into practice. It is believed that the fact that this was a project outside the organisation acted as an unblocker for commitment and the search for improvement, which shows that employees really do have the capacity and interest to get involved in continuous improvement processes.

From a business perspective, this is a process that doesn't end with the submission of the thesis. The company is keen to continue working on this topic. Six "reports" were chosen to be included in the Automatic Reporting Centre, but more tasks and problems were identified that need to be solved, both through this same interface, with the addition of functionalities, and through new solutions.

The solution found is included in the same file as the HR Dashboard, which may change in the future, and its visualisation can be found below, the blue rectangles are again the way to navigate in the file, they allow you to choose the report to view and the button below "open new" or "update" has the VBA command that opens the list in a new Excel file or opens and updates the file in question.



The screenshot shows a software interface titled "Dashboard Cadastro - Geral". It features a top navigation bar with "Início" and "Ajustar" tabs, and a right sidebar with "Dashboards gerais" and "Centro de Relatórios Automáticos". The main area contains several blue buttons: "Logotipo", "Listagens - Elegíveis -", "Elegíveis para pagamentos", "Registrar RGDP", "Entradas para Venda", "Atualização Cadastro", "Existências DEV (ETTs)", and "Angariações ETTs". Below these buttons is a table with the following columns: ID-Cadastro, Nome, NIF, Função, Site, Canal, Coordenador, Entrada, and Saída. The table contains 25 rows of data, including employee names, NIFs, functions, sites, channels, coordinators, and dates.

ID-Cadastro	Nome	NIF	Função	Site	Canal	Coordenador	Entrada	Saída
14	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	25/07/2011	
17	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	10/09/2014	
23	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	09/03/2016	
24	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	16/03/2018	
26	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	25/08/2014	
27	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	17/10/2015	
29	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	25/04/2012	
30	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	16/04/2018	
32	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	16/06/2018	
34	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	25/06/2014	
41	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	10/03/2013	
42	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	10/04/2013	
44	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	10/12/2012	
48	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	25/09/2014	
49	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	03/10/2016	
52	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Estela Santos	16/06/2018	
54	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	16/12/2016	
56	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	16/02/2018	
59	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	10/02/2013	
61	xNOMex xNIFx		Supervisor	USBOA - LARANJEIRAS	E-Sales	Estela Santos	13/01/2014	
62	xNOMex xNIFx		Supervisor	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	08/03/2017	
63	xNOMex xNIFx		Supervisor	USBOA - LARANJEIRAS	E-Sales	Vera Pimentel	11/06/2008	
64	xNOMex xNIFx		Supervisor	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	10/08/2012	
65	xNOMex xNIFx		Coordenador	USBOA - LARANJEIRAS	E-Sales	Vera Pimentel	27/08/2001	
66	xNOMex xNIFx		Coordenador	USBOA - LARANJEIRAS	E-Sales	Vera Pimentel	20/09/2005	
68	xNOMex xNIFx		Supervisor	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	25/07/2012	
69	xNOMex xNIFx		Supervisor	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	10/12/2011	
76	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Angela Raimundo	16/03/2019	
78	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	E-Sales	Estela Santos	16/03/2019	
83	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	Inbound Comercial	Ricardo Barreiro	10/02/2014	
84	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	Inbound Comercial	Ricardo Barreiro	25/09/2008	
88	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	Inbound Comercial	Ricardo Barreiro	16/12/2017	
93	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	Inbound Comercial	Ricardo Barreiro	16/09/2017	
101	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	Inbound Comercial	Ricardo Barreiro	16/10/2017	
105	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	Inbound Comercial	Ricardo Barreiro	31/03/2008	
109	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	Inbound Comercial	Ricardo Barreiro	25/04/2012	
110	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	Inbound Comercial	Ricardo Barreiro	02/07/2018	
112	xNOMex xNIFx		Comercial	USBOA - LARANJEIRAS	Inbound Comercial	Ricardo Barreiro	02/03/2019	

Figure 5.11 - Automatic Report Centre display

VBA was essentially used in the development of each "automatic report", with PQ and PP also playing an important role in the "cadastro Update" and "HR Report" respectively. Due to its complexity and length, no code or pseudocode will be transcribed in this report. However, the VBA code for each report can be reviewed in the dashboard files.

However, reference should be made to the Excel and PP function "CUBEVALUE", which is crucial in the development of the DCV Inventories report and possibly useful for future improvements and increased functionality of the CRA and dashboards. This is a very interesting formula when working with PP data models, which allows you to select and extract unique values from the data model that fulfil a series of conditions. The syntax is as follows:

CUBEVALUE (connection, [member_expression1], [member_expression2], ...)

The function made it possible to extract the "# Monthly FTEs" DAX measurement values for each channel and ETT directly from the data model, creating tables with these values, which are then used by VBA to automatically update the DCV HR report.

The DAX Measure "# Monthly FTEs" was added to the model just for this purpose, and is detailed below:

Table 5.5 - Monthly FTEs

# Monthly FTEs	Sum of the FTEs or Full-time equivalents of the last month's gross HR stocks, i.e. of all employees who were active for at least 1 day in the month prior to the current one.
<pre> VAR end_Months = EOMONTH(TODAY() ; -1) VAR Start_Months = EOMONTH(TODAY() ; -2) + 1 RETURN IF (end_Months < TODAY() ; CALCULATE (SUM ('Cadastro'[FTEs]); 'Cadastro'[entrada] <= end_Months; OR(ISBLANK ('Cadastro'[saída]); 'Cadastro'[saída] >= Start_Months)); BLANK()) </pre>	

5.3 Updating, protecting and sharing the dashboards

The dashboard files are stored on the company's internal network in restricted access folders. They are always protected and can only be edited using the "Unprotect" VBA button in the main menu after entering the password (VBA scripts in appendix G).

The update is also done via a VBA command, since it is not possible to directly update a protected document with Excel's inbuilt "Refresh All" tool. Thus, after confirming authorisation for the procedure with the password, the script unprotects the file, updates it and protects it again. It's important to note the technical detail that for the script to run correctly, the option to refresh the queries in the background must be deactivated, otherwise the script would start the step of protecting the file before finishing the refresh and would be conflictive.

The updating process depends on the imported files, but the aim was for the dashboards to represent data updated daily. It is therefore necessary for the technician to extract a new report from the JSN application every day - this should be the first task of the day - and simply save the file in the folder labelled "JSN". The other base files, such as the cadastro file, are routinely updated daily, so it is expected that they will always have up-to-date information.

The visualisations are mainly of interest for internal control, but they can also be used for dissemination and meetings with other departments in a controlled environment. As they include information on the various sales channels, the files should not be shared in full with the departments.

6 Conclusions and recommendations

6.1 Main conclusions and contributions

The main aim of the project was to improve the quality and efficiency of the HR department's business support reporting processes.

The dashboards developed are a direct solution to the problem, and the department now has at its disposal a set of easily updated visual indicators that can be used both for internal control and for dissemination to other departments and management.

The capacity for analysis and control that dashboards offer is incomparable to what existed previously, in terms of the range of indicators and their layout. Analyses or evaluations that would have been made using lists and values in tables, built on the spot and on demand, can now be made using interactive graphics at any time.

In addition, the Automated Reporting Centre freed up useful working time and arduous tasks that generated dissatisfaction among HR employees. The collaboration that the project has created between colleagues in the department is also seen as a contribution. In addition to the tasks covered in the thesis, they have identified others that can be done more efficiently.

Finally, with the literature review carried out, it is possible to make a theoretical cross between the importance of BI for the human resources area and its deserved and due strategic role, the organisational and work context, and the ability of workers to develop innovative solutions from the perspective of KAISEN's voluntary continuous process improvement. The positive result of employee collaboration in a context that is theoretically adverse to innovation and continuous improvement may indicate that "forces" or projects perceived as external to the organisation are capable of rehabilitating collaboration, commitment and interest in continuous improvement. This could be an interesting study from the perspective of organisational psychology.

6.2 Limitations, recommendations and continuity

The project has a few technical limitations related to the, possibly unreasonable, ambition in defining the broad scope of the project and the author's introductory experience with the instruments used.

Thus, the learning curve in the tools used is felt in the project presented. As Allio (2012) rightly states about dashboard design, very few get it right first time, and the delivery deadline did not allow for the proper implementation, testing and correction process. This will be done later, with improvements needed mainly in the data modelling phase. Although the data model works correctly without any critical flaws, it could be put together more efficiently.

In addition, the dashboard was designed and structured for the 1920 x 1080 screen resolution (i.e. wide screen) and, despite having incorporated a mechanism for adjusting the zoom to the screen (Fit To Screen) in the opening event of the file, Excel has a limitation at this point. Firstly, because of the way zoom works naturally, screens of different proportions will have a slightly different presentation of the dashboard window (on narrower screens there will be some empty space left in the footer). Secondly, Excel's zoom has erratic behaviour when it comes to resizing objects. The rounding of lengths and widths does not follow a 100% constant logic, which can damage the alignment of objects and the proportion of images and shapes that, by their nature, should maintain their proportions, such as circles and squares that should never become ovals and rectangles, respectively. This is an error recognised by the community, and with several entries in Microsoft's feedback forums, and unfortunately there is no solution, zoom changes that are not double or half, i.e. 50%, 100%, 200%, etc., can cause minor damage to the proportions and alignment of objects.

The continuity of the project, from the company's point of view, is due not only to improving the dashboards, but also to continuing the work of automating small tasks and reports. Four micro-projects are already in the pipeline: the construction of a recruitment reporting tool for the Outbound department, which will be called Funnel³; the automation of the calculation of ETT invoicing (bonuses for meeting monthly employee recruitment targets); the automation of the process of preparing confidentiality statements for new employees; the automation of filling in TPLs sent to ETTs for requests for non-renewals and terminations.

In this way, it is proposed to redefine the functions of the existing position of process technician, in which this resource is no longer a crutch for the administrative department, but is responsible for keeping dashboards, reports and databases up to date and available, while correcting the inconveniences and efficiencies that lead to the excessive workload of the administrative and HR department, redefining tasks and processes.

Finally, it would be important to qualitatively evaluate the dashboards developed and the automatic reporting centre in the opinion of managers, as well as to assess whether these BI tools have managed to have an impact on the department's strategic role.

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Appendices

Appendix A - Categorisation of project *stakeholders*

Position	Role (In the project)	How to manage:
Recruitment, Training and HR Manager	<i>Extreme impact</i> Company advisor	<i>Involve constantly</i> Daily communication; Weekly structured meetings
GSN Manager	<i>A lot of power</i> Evaluates and can decide	<i>Keep satisfied</i> Involve in (re)scoping
Director DCV	<i>Extreme power</i> Approves the project	<i>Keep satisfied</i> Present the scope and output
Recruitment team leader	<i>High interest, Low power</i> Benefits from the project's output	<i>Involve constantly</i> Daily communication; Weekly structured meetings
GSN HR employees	<i>High interest, Low power</i> Benefit from the project's output	<i>Keep Informed</i> Involve on time

Appendix B - Definitions of BI instruments (Gartner Glossary)

Reporting: Reporting provides the ability to create formatted and interactive reports, with highly scalable distribution and scheduling capabilities. In addition, BI platform vendors should handle a wide array of reporting styles (for example, financial, operational and performance dashboards).

Dashboards: This subset of reporting includes the ability to publish formal, Web-based reports, with intuitive displays of information, including dials, gauges and traffic lights. These displays indicate the state of the performance metric compared with a goal or target value. Increasingly, dashboards are used to disseminate real-time data from operational applications.

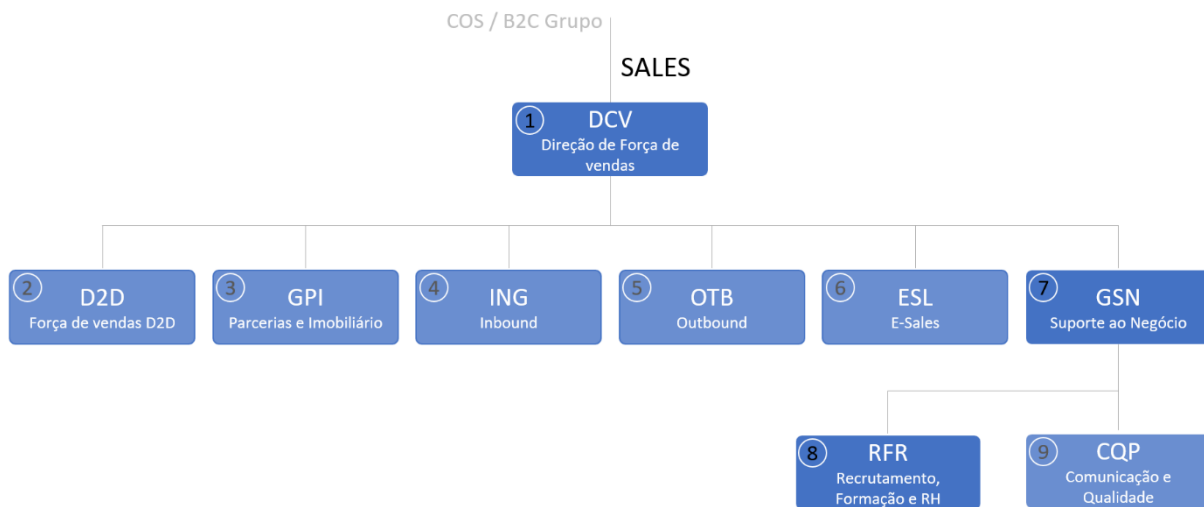
Ad hoc query: This capability, also known as self-service reporting, enables users to ask their own questions of the data, without relying on IT to create a report. In particular, the tools must have a robust semantic layer to allow users to navigate available data sources. In addition, these tools should offer query governance and auditing capabilities to ensure that queries perform well.

Microsoft Office integration: In some cases, BI platforms are used as a middle tier to manage, secure and execute BI tasks, but Microsoft Office (particularly Excel) acts as the BI client. In these cases, it is vital that the BI vendor provides integration with Microsoft Office, including support for document formats, formulas, data "refresh" and pivot tables. Advanced integration includes cell locking and write-back.

Gartner Glossary, Information Delivery,

at <https://www.gartner.com/en/information-technology/glossary/information-delivery>

Appendix C - Business organisation and departmental responsibilities



Source: author based on official company information

- DCV - Sales Force Management:
 - Ensuring the commercial effort of acquisition, up-sell and cross-sell in the consumer segment in the D2D, telemarketing and direct sales force channels.
- D2D - D2D sales force:
 - Marketing the brand's products and services to the consumer segment through the door-to-door sales channel.
 - Hiring and developing a door-to-door sales force.
 - Defining the strategy for approaching the market and evaluating the levels of services provided.
- GPI - Partnerships and Real Estate:
 - Defining and implementing the commercial strategy and developing property business processes and partnerships.
 - Define and develop communication with partners and promote the realisation of protocols with companies.
- ING - Inbound (sales intent, not technical support):
 - Developing inbound campaigns for p&s and up-selling.
 - Managing sales teams and monitoring the channel's results.
- OTB - Outbound:
 - Defining and planning objectives and needs, and monitoring and publicising commercial results.

- Defining remuneration policies for the internal sales team and external partners.
- ESL - E-sales:
 - Providing commercial support for the online shop website, developing "Click to Call" and "Click to See" campaigns for p&s and up-selling.
 - Managing the sales team and monitoring the channel's results.
- GSN - Business Support:
 - Management liaises with other areas of the company on cross-cutting projects.
 - Identify, plan and develop reporting, application and procedural solutions to meet the needs of the sales force.
- RFR - Recruitment, Training and HR:
 - Responding to the HR needs identified by the channels and planning the resources needed to realise the recruitment objectives.
 - Ensuring initial and additional training for all salespeople in the various channels and developing the practices and content to support the training.
 - Ensuring the preparation and dissemination of reports with quantitative results.
 - Ensure all communication with the ETTs.
 - Follow up sales from a back-office perspective until delivery or installation.
- CQP - Communication and Quality:
 - Ensuring quality control of sales made through management channels.
 - Defining policies and methodologies for quality assessment and control.
 - Advising sales staff on identifying points for improvement and implementing corrective measures.
 - Plan and develop communication processes for management channels.

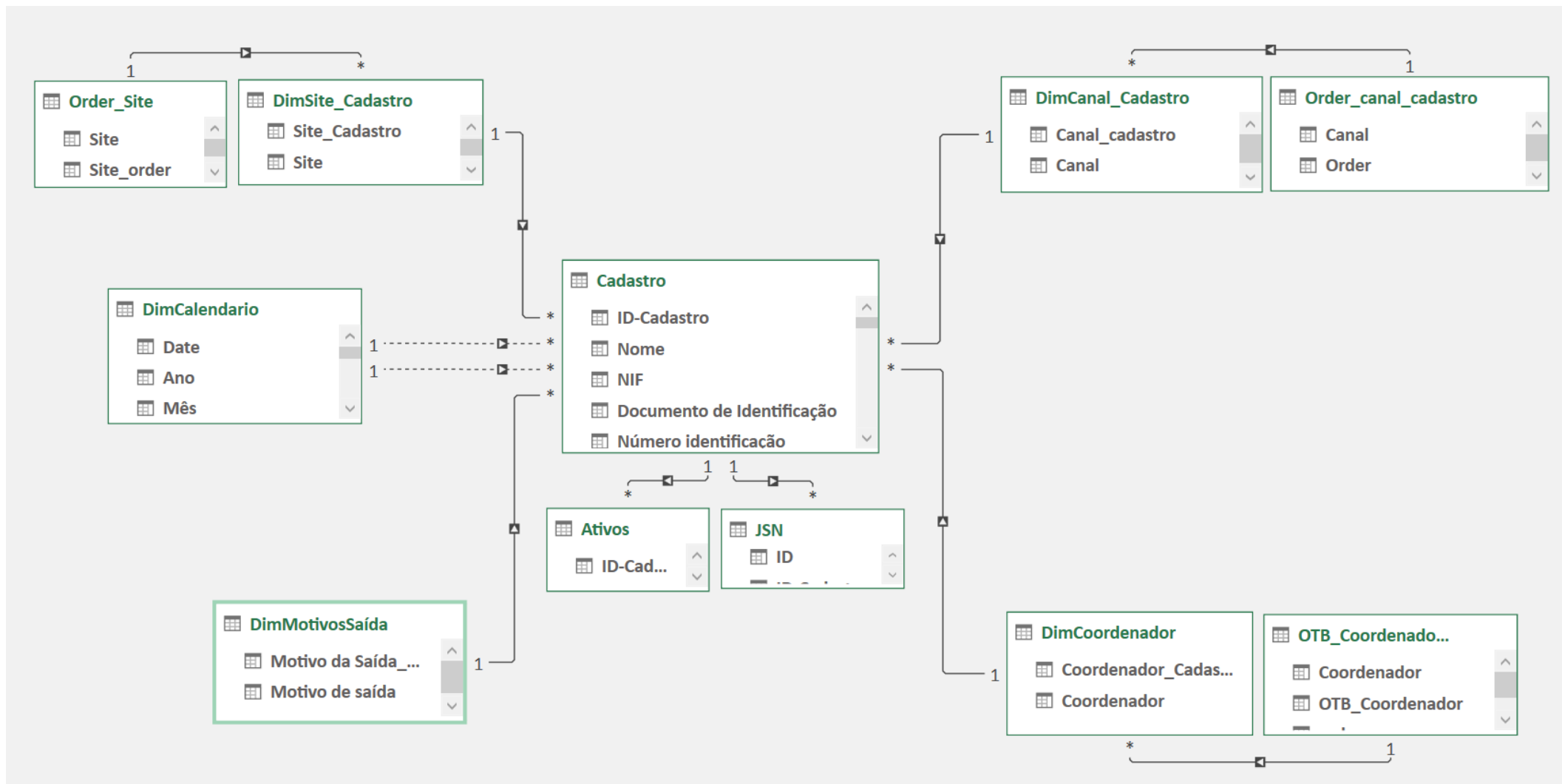
Appendix D - Data tables used in the model

File	Location	Features	Utilisation
JSN	Report extracted from the internal application "JSN"	Excel file with information on all candidates	- Table of facts from the Recruitment Dashboard - Automatic Report Centre
Cadastro	The company's internal network	- Excel file with information on all employees. - Manual update	- HR Dashboard fact table - Secondary table of the Recruitment dashboard - Automatic Report Centre
Appeal requests	The company's internal network	Excel file with information on terminations and non-renewals	Secondary table of Recruitment Dashboards
Terminations/Non-renewals	The company's internal network	Excel file with information on terminations and non-renewals	Automatic Report Centre
DIM Triage	The company's internal network	Excel table with renames of telephone screening results	Recruitment Dashboard Dimensional Table
DIM Action recruitment	The company's internal network	Excel table with recruitment action renames (source)	Recruitment Dashboard Dimensional Table
DIM Result Recruitment	The company's internal network	Excel table with Recruitment result renames	Recruitment Dashboard Dimensional Table
DIM Reason not selected	The company's internal network	Excel table with non-selection reason renames	Recruitment Dashboard Dimensional Table
DIM Channel (2)	The company's internal network	Excel table with channel motif renames	Dimensional Tables for the Recruitment and HR Dashboard

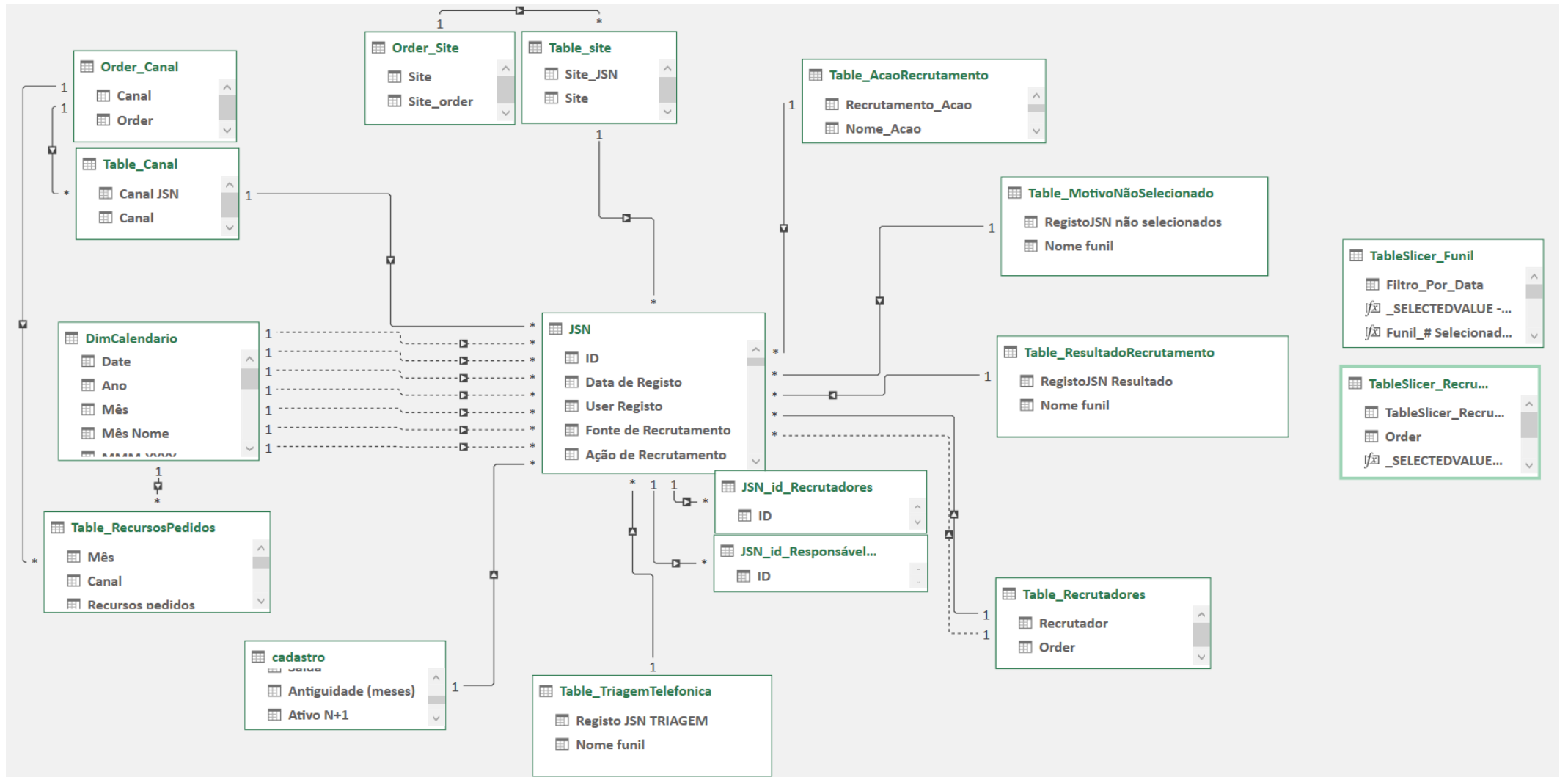
DIM Site (2)	The company's internal network	Excel table with site renames (Workplaces)	Dimensional Tables for the Recruitment and HR Dashboard
DIM Recruiters	The company's internal network	Excel table with currently active recruiters	Recruitment Dashboard Dimensional Table
DIM Reason for leaving	The company's internal network	Excel table with renames of exit reasons	Dimensional Table of the HR Dashboard
DIM Coordinators	The company's internal network	Excel table with current call centre coordinators	Dimensional Table of the HR Dashboard
DIM OTB Coordinators	The company's internal network	Excel table with current Outbound coordinators	Dimensional Table of the HR Dashboard

Appendix E - Data model

- HR Dashboard



- Recruitment Dashboard



Appendix F - Measures and calculations (DAX) from the RH dashboard

# Current headcounts	Number of active employees on the update date
<i>COUNTROWS(Ativos)</i>	

# Monthly Gross headcounts	Number of employees who were active for at least one day during the period.
<pre> VAR end_Months = MAX ('DimCalendar'[Date]) VAR Start_Months =MIN('DimCalendar'[Date]) RETURN IF (end_Months < TODAY(); CALCULATE (COUNTROWS ('Cadastro'); ' Cadastro '[Entry] <= end_Months; OR (ISBLANK (' Cadastro '[saída]); ' Cadastro '[Output] >= Start_Months)); BLANK()) </pre>	

# Entries	Number of entries in the period
<pre> CALCULATE (COUNTROWS (' Cadastro '); USERELATIONSHIP ('DimCalendar' [Date]; 'Cadastro' [entrada])) </pre>	

# Departures	Number of exits in the period
<pre> CALCULATE (COUNTROWS (' Cadastro '); ' Cadastro ' [saída] <> BLANK(); USERELATIONSHIP ('DimCalendar' [Date]; ' Cadastro ' [saída])) </pre>	

# headcounts at the beginning of the month	Number of active employees at the start of the period.
<i>[# Gross headcounts per month] - [#Entries]</i>	

# Month-end headcounts	Number of active employees at the end of the period.
<i>[# Gross headcounts per month] - [#Departures]</i>	

# Departures - Employee	Number of employee-initiated departures
<i>CALCULATE ([#Departures]; ' Cadastro ' [saída initiative] = "EMPLOYEE")</i>	

# Departures - Company	Number of company-initiated departures
<i>CALCULATE ([#Departures]; ' Cadastro '[saída initiative] = "COMPANY")</i>	

% Turnover	Turnover rate
$\frac{DIVIDE ([\#Departures] ; CALCULATE (([\# headcounts at the beginning of the month] + [\#Month-end headcounts]) / 2) ; 0)}{1}$	
% Turnover - Employee	Turnover rate related to the employee's initiative to leave
$\frac{DIVIDE ([\#Departures - Employee] ; CALCULATE (([\# headcounts at the beginning of the month] + [\#Month-end headcounts]) / 2) ; 0)}{1}$	
% Turnover - Company	Turnover rate related to the initiative to leave the company
$\frac{DIVIDE ([\#Departures - Company] ; CALCULATE (([\# headcounts at the beginning of the month] + [\#Month-end headcounts]) / 2) ; 0)}{1}$	
# Trial period	Number of exits in trial period
$CALCULATE (COUNTROWS (' Cadastro '); ' Cadastro '[Trial period exits] = "Trial period exit" ; USERELATIONSHIP ('DimCalendar'[Date]; 'Cadastro'[entrada]))$	
% Experimental period	Percentage of incoming employees who left during their probationary period less than 15 days after signing.
$DIVIDE ([\# Trial period] ; [\# Entries] ; 0)$	
# Entries (N+1)	Number of new employees who remained in post for at least 1 month.
$CALCULATE ([\# Entries] ; ' Cadastro ' [Active N+1] = "Active in N+1")$	
% Retention rate (N+1)	Percentage of new employees who remained in post for at least 1 month.
$DIVIDE ([\# Entry N+1] ; [\# Entries];0)$	
x Antiques Assets	Average length of service of active employees
$AVERAGE ('Active'[Seniority (months)])$	

x Antiques Exits	Average seniority of employees who left during the period
<i>CALCULATE (AVERAGE (' Cadastro '[Seniority (months) (saída)]) ; ' Cadastro '[saída] <> BLANK() ; USERRELATIONSHIP ('DimCalendar' [Date] ; ' Cadastro '[saída]))</i>	
# Assets - Driver fundraising	Number of active employees who have been in post for at least 3 months and joined after 2018 (not inclusive)
<i>VAR reference_date = DATEVALUE("01/01/2019") RETURN CALCULATE (COUNTROWS ('Active') ; 'Active'[Seniority (months)] >= 3; ' Active '[entrada] >= reference_date)</i>	

Appendix G - VBA scripts

- Dashboard formatting script with "workbook open" event

```
Private Sub Workbook_Open()

Application.ScreenUpdating = False
Application.DisplayFullScreen = True
Application.DisplayFormulaBar = False
ActiveWindow.DisplayWorkbookTabs = False
ActiveWindow.DisplayHeadings = False
ActiveWindow.DisplayGridlines = False

Dim wb As Workbook
Dim ws As Worksheet
Set wb = ThisWorkbook

wb.Sheets("General dashboards").Activate
[SelectLengh].Select
'Range("A1:AD49").Select
ActiveWindow.Zoom = True
z = ActiveWindow.Zoom

For Each ws In wb.Sheets
    If ws.Name Like "pivots" = False Then
        ws.Protect Password:="1234", _
            UserInterfaceOnly:=True, _
            AllowFiltering:=True, _
            AllowUsingPivotTables:=True
        ws.Activate
        ActiveWindow.Zoom = z
        Range("A1").Select
        ws.ScrollArea = ws.UsedRange.Address
    End If
Next ws

wb.Worksheets("Recruitment Menu").Activate
Application.ScreenUpdating = True

End Sub
```

- *Protect* button script

```
Public Sub UnprotectAllSheets()  
  
Dim pword As String  
pword = InputBox("Enter Password:", "Password entry")  
  
If pword = "1234" Then  
    Application.ScreenUpdating = False  
    ActiveWindow.DisplayWorkbookTabs = True  
    Application.DisplayFullScreen = False  
    Application.DisplayFormulaBar = True  
    Dim wb As Workbook  
    Dim ws As Worksheet  
    Set wb = ThisWorkbook  
  
    For Each ws In wb.Sheets  
        ws.Unprotect Password:="1234"  
        ws.ScrollArea = ""  
    Next ws  
    wb.Sheets("Recruitment Menu").Activate  
    Application.ScreenUpdating = True  
Else  
    MsgBox "Wrong password (1234)"  
End If  
  
End Sub
```

- *Unprotect*" button script

```
Public Sub ProtectAllSheets()  
  
Application.ScreenUpdating = False  
  
Dim wb As Workbook  
Dim ws As Worksheet  
Set wb = ThisWorkbook  
  
For Each ws In wb.Sheets  
    If ws.Name Like "pivots" = False Then  
        ws.Protect Password:="1234", _  
            UserInterfaceOnly:=True, _  
            AllowFiltering:=True, _  
            AllowUsingPivotTables:=True  
        ws.ScrollArea = ws.UsedRange.Address  
    End If  
Next ws  
  
ActiveWindow.DisplayWorkbookTabs = False  
Application.DisplayFullScreen = True  
Application.DisplayFormulaBar = False  
  
wb.Sheets("Recruitment Menu").Activate  
  
Application.ScreenUpdating = True  
  
End Sub
```

- Refresh all" button script

```
Public Sub Refresh_All()

Dim pword As String
pword = InputBox("Enter Password:", "Password entry")

If pword = "1234" Then
    Application.ScreenUpdating = False

    Dim wb As Workbook
    Dim ws As Worksheet
    Set wb = ThisWorkbook

    For Each ws In wb.Sheets
        If ws.Name Like "pivots" = False Then
            ws.Unprotect Password:="1234"
            ws.ScrollArea = ""
        End If
    Next ws

    wb.RefreshAll

    For Each ws In wb.Sheets
        If ws.Name Like "pivots" = False Then
            ws.Protect Password:="1234", _
                UserInterfaceOnly:=True, _
                AllowFiltering:=True, _
                AllowUsingPivotTables:=True
            ws.ScrollArea = ws.UsedRange.Address
        End If
    Next ws

    ActiveWindow.DisplayWorkbookTabs = False
    Application.DisplayFullScreen = True
    Application.DisplayFormulaBar = False

    wb.Sheets("Recruitment Menu").Activate
    Application.ScreenUpdating = True

    MsgBox "Update Complete"
Else
    MsgBox "Wrong password (1234)"
End If

End Sub
```

- Adjust button script

```
Public Sub FitToScreen_All()  
  
    Application.ScreenUpdating = False  
  
    Dim wb As Workbook  
    Set wb = ThisWorkbook  
  
    Dim thisws As Worksheet  
    Set thisws = ActiveSheet  
  
    Dim z As Integer  
  
    wb.Sheets("General dashboards").Activate  
    [SelectLengh].Select  
    'Range("A1:AD49").Select  
    ActiveWindow.Zoom = True  
    z = ActiveWindow.Zoom  
  
    Dim ws As Worksheet  
  
    For Each ws In wb.Sheets  
        ws.Activate  
        ActiveWindow.Zoom = z  
        Range("A1").Select  
    Next ws  
  
    thisws.Select  
  
    Application.ScreenUpdating = True  
  
End Sub
```