

NOVA

IMS

Information
Management
School

MGI

Master's Degree Program in
Information Management

The Impact of Dashboard Visualizations in CISCO's Operations & Decision-Making Processes

Mariana das Neves Graça

Internship Report

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

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

Universidade Nova de Lisboa

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
Universidade Nova de Lisboa

THE IMPACT OF DASHBOARD VISUALIZATIONS IN CISCO'S OPERATIONS & DECISION-MAKING PROCESSES

By

Mariana das Neves Graça

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

Co-Supervisors: Professor Pedro Malta & Elsa Gradíssimo

June 2023

STATEMENT OF INTEGRITY

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

[Lisbon, 1 January of 2023]

ABSTRACT

Business Intelligence has been growing significantly in recent years and has been more and more used in companies that strive for innovation and to always be up to date with their competitors. With this, there's an increased need to have specialized professionals that deliver new perspectives and insights of looking at the data and allow for the companies to grow wisely and efficiently. It is crucial to understand in what ways the concept of Business Intelligence being implemented and a regular practice has an impact on the companies and how they function, that being the main subject of study of the report. This report is with regards to the one-year internship started in March of 2022 as a Business Operations Analyst at CISCO, with the aim of conducting a deep analysis and translating the data into actionable business insights and assist business functions to create value for key strategic initiatives, namely by gathering data, creating dynamic visualizations through dashboards, and analyzing/investigating their impact and importance on the firm's efficiency and how it influences its decision-making processes. With this internship I was able to not only learn but to also experience in first-hand the importance of business intelligence and have a practical example of how the outcomes changed when compared to previous solutions and practices.

KEYWORDS

Dashboards; Business Intelligence; CISCO; Data Visualization; Data-Driven Decisions; Data Analysis

Sustainable Development Goals (SGD):



INDEX

1. Introduction.....	1
2. Literature Review.....	2
2.1. Overview & Background Contextualization of CISCO	2
2.2. BI In Decision Making Processes	6
2.3. Data Visualization.....	8
2.4. Data-Driven Culture.....	10
3. Methodology	11
3.1. The Internship.....	11
3.2. The Dashboard	12
3.2.1. DATA SOURCES & TREATMENT	12
3.2.2. FINAL LOOK & METRICS.....	15
4. Results and Discussion.....	18
5. Conclusions and Future Works	21
6. References	22

LIST OF FIGURES

Figure 1 - CISCO's Timeline of Milestones.....	2
Figure 2 - CISCO's Products	3
Figure 3 - CISCO's Services.....	3
Figure 4 - CISCO's Culture	4
Figure 5 - CISCO's Conscious Culture.....	5
Figure 6 – Pyramid Of Data Abstraction.....	7
Figure 7 - Process To Choose A Chart.....	8
Figure 8 - Internship Areas of Focus.....	11
Figure 9 - Data Model (Active Tables)	13
Figure 10 - Data Model (Hidden Tables)	13
Figure 11 - Dashboard Pages.....	15
Figure 12 - EMEA Analysis	15
Figure 13 - Blue Badge Overview	16
Figure 14 - Leaders' Check-Ins.....	16
Figure 15 - Leaders' Check-Ins Trend	17
Figure 16 - Tooltip Example.....	17
Figure 17 - Metrics Usability.....	18
Figure 18 - Metrics Easy to Consume and Actionable.....	19
Figure 19 - Better Team Visibility	19
Figure 20 - Frequency of Use.....	20

LIST OF TABLES

Table 1 - Results of Effective Dashboards..... 9

LIST OF ABBREVIATIONS AND ACRONYMS

BI	Business Intelligence
IoT	Internet of Things
ISR	Integrated Services Router
AI	Artificial Intelligence
AGS	Advanced Gateway Server
EMEA	Europe, Middle East and Africa
AMER	America
APJC	Asia, Pacific, Japan and China
CLO	Commerce & Lifecycle Operations
SC	Supply Chain
PTO	Paid Time Off

1. INTRODUCTION

Business Intelligence (BI) has been growing significantly in recent years and has been more and more used in companies that strive for innovation and to always be up to date with their competitors. With this, there's an increased need to have specialized professionals that deliver new perspectives and insights of looking at the data and allow for the companies to grow wisely and efficiently.

It is crucial to understand in what ways the concept of Business Intelligence being implemented as a regular practice impacts companies and how they function, more specifically in CISCO, that being the main subject of study of the report.

The main objective of this report is to state and explain the different activities performed during the one-year internship started on the 8th of March of 2022 as a Business Operations Analyst at CISCO within the scope of the master's degree Program in Information Management, with a specialization in Knowledge Management and Business Intelligence.

The internship had the aim of conducting a deep analysis and translating the data into actionable business insights and assist business functions to create value for key strategic initiatives, namely by gathering data, creating dynamic visualizations through dashboards, and analyzing/investigating their impact and importance on the firm's efficiency and how it influences its decision-making processes.

With this internship I was able to not only learn but to also experience in first-hand the importance of business intelligence and have a practical example of how the outcomes changed when compared to previous solutions and practices.

In this perspective, this project starts with a literature review, which is going to be divided into four main topics: CISCO, BI in Decision Making Processes, Data Visualization, and Data-Driven Culture. The analysis of these components altogether will allow a better understanding of the results obtained and, consequently, provide improved conclusions and next steps for the company.

After that it will be shared one of the created dashboards, with a detailed explanation of how it was built and its objectives, as well as the importance and efficiency of it (through a survey assessment). Finally, it will be shared the results and conclusions regarding all the developed work regarding this matter.

2. LITERATURE REVIEW

This literature review has the objective of providing an overview and background contextualization of the four main topics of this report: CISCO, to better understand the company, its culture and how it operates; BI in Decision Making Processes, to comprehend the importance of having BI components and their impact while making decisions; Data Visualization, what it is and its components, more specifically, dashboards; Data-Driven Culture, which influences the impact of dashboards on the company depending on the type of culture it already has and how much data-driven it's based on.

2.1. OVERVIEW & BACKGROUND CONTEXTUALIZATION OF CISCO

CISCO is one of the world leading IT companies, founded by Leonard Bosack and Sandra Lerner in 1984 in San Francisco, USA, taking the company name from the city. Since its creation, the company has been striving to push the boundaries of technological innovation and digital transformation, by being present in the market with cutting edge products and key technologies, making the Internet the most useful and dynamic as possible in the future (Cisco, 2004). This allows them to have a competitive advantage and consolidate their influence in the industry.

Below is an image with the timeline of milestones the company has reached:

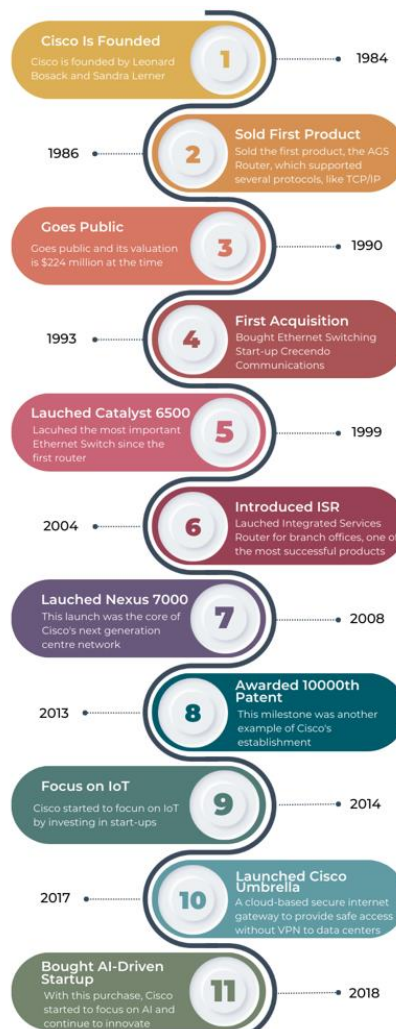


Figure 1 - CISCO's Timeline of Milestones
Source: Author's Content

With this figure, we can better understand that what started as a hardware company quickly became software focused as well, having grown into a much broader and comprehensive enterprise with several areas of service, namely, Security, Artificial Intelligence, Machine Learning and Networking. Over the years, the company has been evolving and expanding offered products and services, having the customers currently a large portfolio that they can choose from. Below there are two figures that illustrate some examples of both products and services the enterprise has:

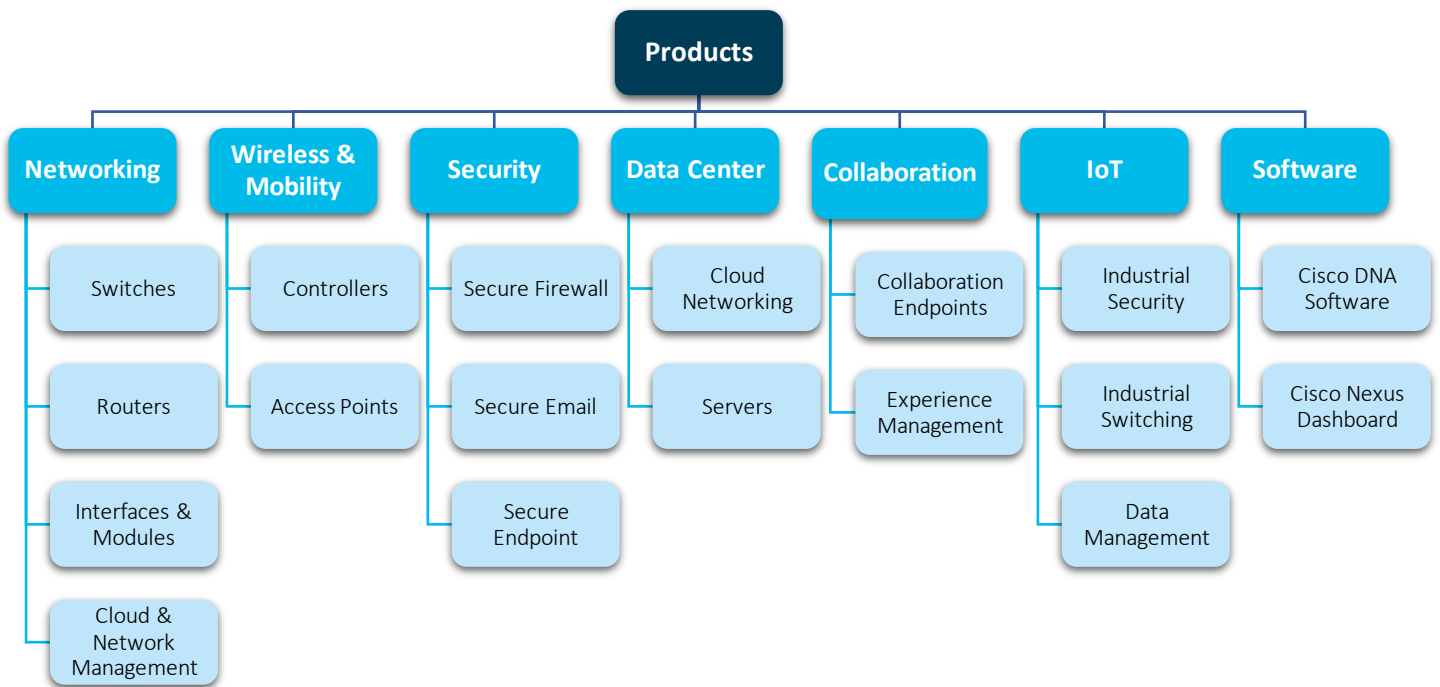


Figure 2 - CISCO's Products
Source: Author's Content

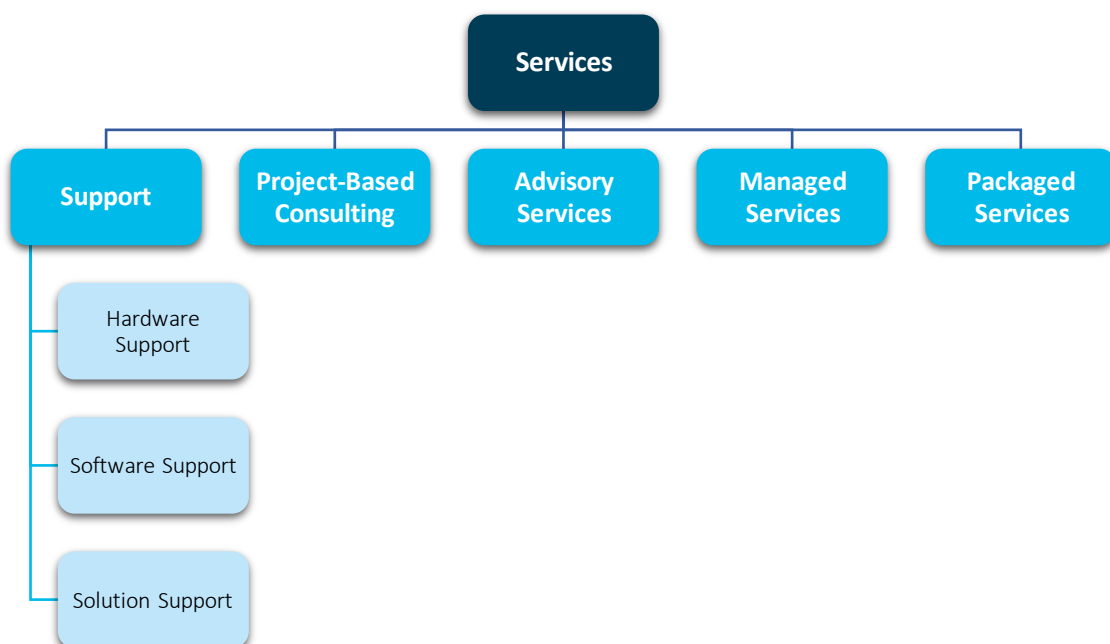


Figure 3 - CISCO's Services
Source: Author's Content

Currently, CISCO is divided into three main regions in which operates: EMEA (Europe, Middle East and Africa), AMER (America) and APJC (Asia, Pacific, Japan and China), counting with more than 200 offices around the world. As of the fiscal year 2021, the company had over 79500 employees in 95 countries, having generated around \$50 billion in revenue worldwide (Cisco, 2021). Regarding the EMEA region (the one that I worked for as the Internship took place in Oeiras, Portugal), it has offices in approximately 34 countries and contributes with about a third of the company's global sales.

One of the main reasons these results happened and why CISCO keeps being one of the leading IT companies is due to the clear mindset and vision people have and everyone being on the same page. According to Wilson, Case, and Dobni (2023), a research based on the insight from 1265 companies in 9 countries, confirms that innovation-oriented firms identify among others, design thinking, big data analytics, measuring innovation, and innovation management software as common practices. This only demonstrates the importance of having the right culture and practices within a company to be able to stand out from the competitors.

In CISCO's website there's a statement regarding what they value most, being "Our people, our technology, and changing the world". Cisco is indeed a company that has realized that the numbers and results are greatly impacted by the human factor, thus has been continuously working to create the best conditions possible to their employees to guarantee that the outcomes are the best, even being recognized as The Best Place To Work. According to the global media company Forbes, no one should be surprised CISCO got that prize as "It is a leader in corporate social responsibility and puts a major emphasis on fostering a healthy company culture within its organization" (Moorhead, 2019b). This is done by fulfilling their initiative called "Our People Deal", which is divided into three components: Connect Everything (fostering working as a team), Innovate Everywhere (being agile and open to new ideas), and Benefit Everyone (supporting employees' professional development as well as encouraging and appreciating individual contributions). By satisfying this promise, CISCO instigates people to embody the company's goals and with that, win together (Moorhead, 2019a). The following image demonstrates why CISCO's employees love their work, representing a lot of what was mentioned above:



Figure 4 - CISCO's Culture
 Source: Cisco (2023)

Having as their slogan “The Bridge to Possible”, CISCO has the objective of helping its customers to implement changes in their businesses making them better, and to do that, the company connects everything: people, processes, data, and things. This way, it is possible to be the most efficient and shape the technologies as we know them today, always keeping up to date with digital transformation. However, those would be only buzzwords without the culture that allows and is open to innovation, creativity, and even failure (Cisco, 2023). Thus, by combining unique people, talents, and personalities and making them all work together as a team, the creativity and diversity fuels the innovation and the out of the box thinking. Laker (2021) defends that a good culture is the core and the most powerful advantage to have a good company.

This is a reality that reflects a lot of the firm's principles, them being:

- Give Your Best
- Give Something of Yourself
- Give your Ego the day Off
- Take Accountability
- Take Difference to Heart
- Take a Bold Step

Having them as a basis and keeping in mind the purpose of powering an inclusive future for all, the diversity of thought and the commitment to equality, allows to move forward and to continue to excel.

Due to this, Cisco created a strategy that they call a “Conscious Culture”, which consists of being aware of each other and the environment, feeling accountable and empowered to contribute to a culture where everyone thrives and seeks out, learns, understands, and appreciates everything (Cisco, 2023). Although this is a difficult task to fulfill as generally in tech companies there are up to five different generations working together and with high demands, such as inclusivity, this strategy has become a key driver to employees’ happiness.

This Conscious Culture can be separated into three areas: the Environment (a space with values such as respect, equity, fairness) that consists of the foundation of everything; the Characteristics (the behaviors and principles) which have been evolving over the years; the Experience (how people deal with each other, which is instigated through good leadership and team buildings) (Moorhead, 2019a). According to Moorhead (2019a) the main differentiator is the emphasis on the respect and humanity between people. The following image illustrates how Moorhead (2019a) envisioned this strategy:

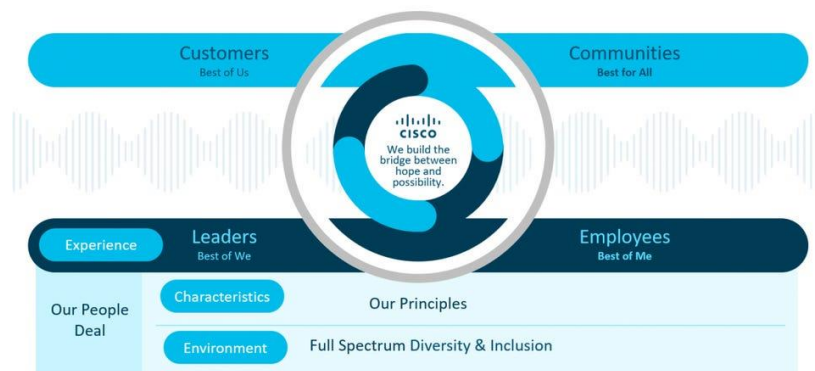


Figure 5 - CISCO's Conscious Culture
Source: Moorhead (2019a)

With this, we can better understand that, in fact, having a good culture and a few key strategies allows the company to increase its potential for success, contributing to having the best outcomes possible.

This contributes to another relevant perspective that, besides all that was previously mentioned, it is as important to keep reinventing and finding new and better ways to deliver the clients' requests and how the outcomes of the work can change for the better. With Business Intelligence becoming more significant over the years, companies have been investing in it, namely CISCO, in order to obtain that differentiation factor.

More specifically, the Portuguese office has been optimizing its processes, in which, what they initially had, for example, in an excel file, is now being created through more user friendly dashboard reports that "[...] are a new tool to track key performance indicators by displaying information [...] to help the decision-makers to move from the traditional style of production data storage to big data analytics." (Belghith, Ben Ammar, Masmoudi, & Elloumi, 2023), highlighting the importance of companies evolving their practices to keep being updated and with a competitive advantage.

One of the tasks performed during the internship was exactly regarding this matter, in which the objective was to convert and improve the resources that the company already had, underlining the use of Business Intelligence tools, and understanding how it could affect CISCO in terms of the decision-making processes.

2.2. BI IN DECISION MAKING PROCESSES

The fast-paced nature of the business environment today and the constant advancements in information technologies are generating a lot more data that, consequently, needs to be gathered and analyzed as it represents the most valuable asset of companies. This is a problem that several organizations currently face as it has become more difficult to ensure the extraction of as much relevant information as possible in order to acquire knowledge and make better decisions based on that. According to Hansoti (2010), a report generated by the Enterprise Strategy Group (1999) states that nearly 11% of large organizations gather more than 10 TB (terabyte) of data every month that comes from more than 10,000 sources so it has become critical to solve this situation.

One of the solutions that has gained significance is Business Intelligence. This concept is with regards to a set of strategies and software that gathers data and transforms it into information by presenting it in a user-friendly format, such as through reports and dashboards. This enables the users to have access to both historic and current data (also looking at an evolution trend), which can be semi-structured or unstructured, allowing them to retain actionable insights (IBM, n.d.). According to the CIO Magazine (2023), "Although business intelligence does not tell business users what to do or what will happen if they take a certain course, neither is BI only about generating reports. Rather, BI offers a way for people to examine data to understand trends and derive insights" (Olavsrud & Fruhlinger, 2023). With the help of Business Intelligence, the data companies generate (that is not cleaned so the level of abstraction and quantity are much higher) can be treated, becoming information. By using it to retrieve insights, the initial data is transformed into knowledge and intelligence, as demonstrated in the figure below (an example of a BI process).

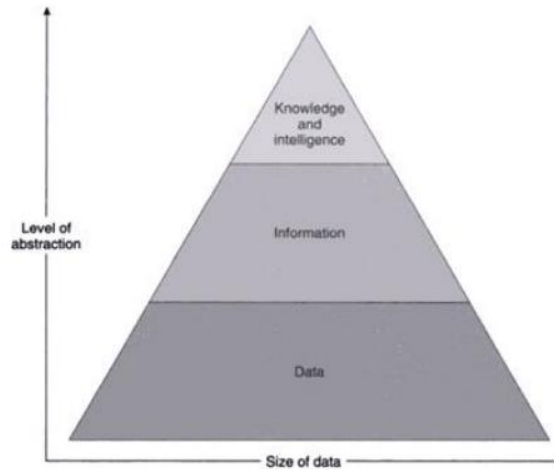


Figure 6 – Pyramid Of Data Abstraction
Source: Loshin (2003, cited in Madlener, 2009)

In his article, Remigiusz Tunowski (2015) does a good overview of the BI evolution, concluding that, as a result of Business Intelligence implementation, there's a creation of organizations based on knowledge and learning, which improves the decision-making processes as they are made based on hard data with effective measurements, as well as taking much less time to collect and process data. As for data visualization, "Its advantage lies in much greater information capacity compared to a traditional visualization" (2015).

With this, we can sum up the main advantages of BI as the following:

- Faster analysis which leads to more efficiency
- Improved employee satisfaction which also contributes to a better customer service and experience
- Competitive advantage
- Data-Driven business decisions

These characteristics make Business Intelligence as a whole a very important asset to have, and that is why a lot of companies have been investing in it. One of the ways in which BI is useful is in the decision-making processes, which consist of "making judgments regarding several investments and resources based on the quantitative and qualitative data" (Hansoti, 2010). As the decisions are made by humans and not systems, the presentation of data plays a key role in the processes, as explained further below. However, implementing a BI software or system by itself does not guarantee satisfactory results, the management team needs to make several decisions aiming to the improvement of the organizations in order for that to happen.

This presentation of data can be done through several ways, being one of the most used and common, the Dashboard, which consists of an interface that supports managers in getting gathered and consolidated data from several sources, making it more accessible and displaying it in a user-friendly manner, playing an important role in decision-making processes (Hansoti, 2010). The dashboards, by allowing the data to be easily read and understandable, consolidate the fact that data visualization plays an important part when transmitting and sharing the results and new ideas to people, especially

the ones that are not necessarily familiar with all the concepts and sources, and actually need to have a simple and high overview of the information.

2.3. DATA VISUALIZATION

Data visualization is a concept that can be applied in Business Intelligence by being part of many BI tools. Data visualization is defined as “the graphical representation of information and data. By using visual elements like charts, graphs, and maps, data visualization tools provide an accessible way to see and understand trends, outliers, and patterns in data” (Tableau, n.d.).

This concept has become paramount when investing in BI for companies, as it ensures that the users have the possibility to put all the data they have into the most appealing and user-friendly version, as the better the data is visually conveyed, the better it can be leveraged. One example in which the data needs to be correctly shown is in graphics, as there are several options that should be used according to the type of data and the intention of the user when sharing the information. The image below shows the various possibilities the user can choose from:

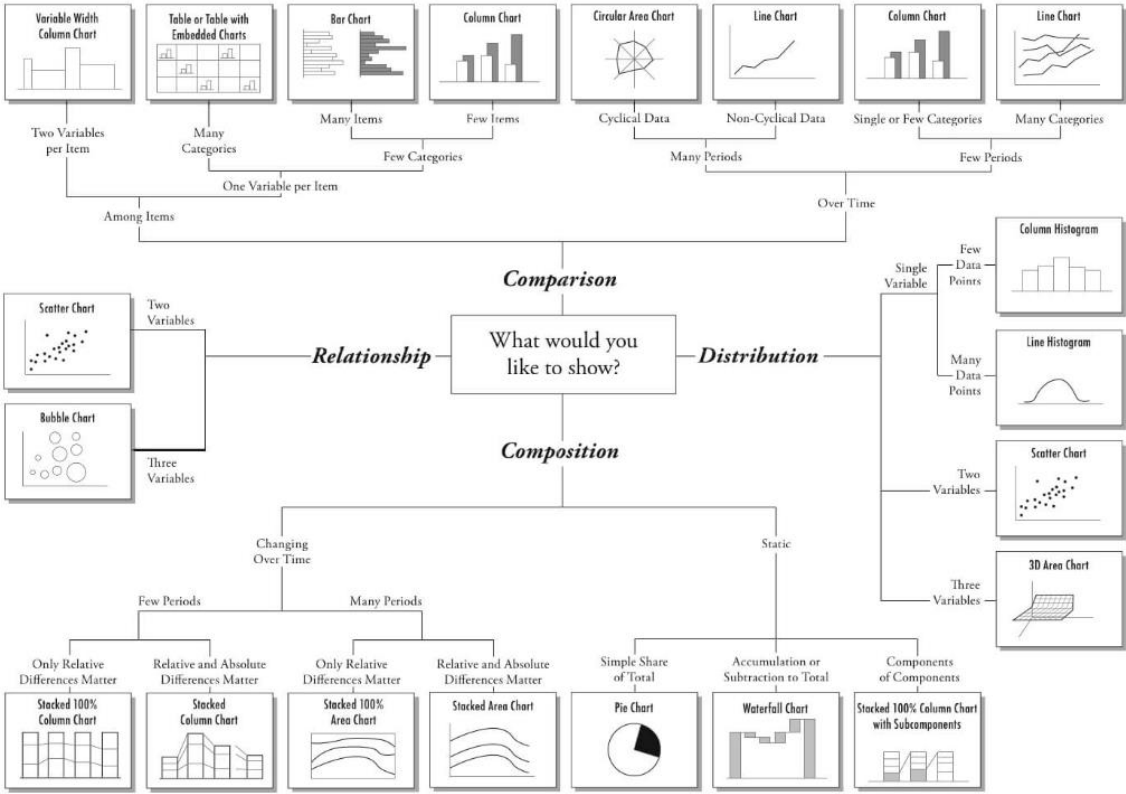


Figure 7 - Process To Choose A Chart
 Source: (Abela, 2006)

With this, is possible to understand that by having the correct type of graphic, people will be able to retrieve much more and better information, as it is displayed correctly. On the contrary, if this doesn't happen, the consequences include individuals getting the wrong intel and from that point forward, also sharing incorrect ideas.

One of the most common resources used in which Data Visualization plays a key role are Dashboards. They have become important because as stated by managers, there are at least four issues that drive the need of a dashboard (LaPointe, 2005):

- Poor organization of the possibly decision-relevant data
- Biases in information processing and decision-making
- Increasing demands for marketing accountability (there’s a dual objective of companies to grow the top-line while keeping down costs for a healthy bottom-line)
- Needing cross-departmental integration in performance reporting practices and for resource allocation

With this, Dashboards are indeed needed in enterprises as they enforce consistency in the measures across departments and business units, help monitor performance (both evaluative and developmental), can be used to plan different aspects, namely goals and strategies, and also can be used to communicate information to stakeholders (Pauwels, Ambler, Clark, LaPointe, Reibstein, Skiera, Wierenga, & Wiesel, 2009). By doing all of this, consequently, it also supports decision-making processes. Wind (2005) stated that “properly created dashboards provide the mechanism to drive effective management and resource allocation decisions” (p. 870).

To sum up, a good dashboard impacts the results and decisions in the company, and as the MIT CISR already studied and concluded, in an “analysis of over one thousand companies, those that were more effective at dashboarding were also better at most other important measures, including innovation, growth, and margin relative to industry” (Weill & Woerner, 2022) , as it allows for everyone to be on the same page with transparency, knowing their current situation in terms of metrics and what it is still missing to reach their objectives. The following table shows the results of their study:

Table 1 - Results of Effective Dashboards

Measures of Performance	Bottom Quartile Dashboard Effectiveness	Top Quartile Dashboard Effectiveness
INTERNAL		
Percent complete on transformation	39%	63%
Percent effectiveness of the future-ready drivers	40%	78%
Effectiveness of leaders in moving orientation from Command and Control to Coach and Communicate	35%	78%
Effectiveness of leaders at holding people accountable	40%	75%
Employee experience, compared to industry	51%	65%
EXTERNAL		
Net profit margin, compared to industry ¹	-9.4 pp	8.4 pp
Revenue growth, compared to industry ¹	-13.4 pp	11.0 pp
Percentage of revenues from innovations introduced in the last three years	22%	49%
Percentage of revenues from cross-selling	20%	46%
Customer experience, compared to industry	51%	66%

Source: MIT CISR 2019 TMT and Transformation Survey (N=1311).
¹ Self reported net profit margin/revenue growth correlates significantly with actual profit margin/revenue growth at the p<.01 level.

Source: Weill & Woerner (2022)

All that was stated demonstrates the importance and impact of Data visualization, that by making sure that all aspects matter, from the color palette to the order in which the graphics are displayed,

highlighting the trends and outliers, it makes a difference in the end result. This complements another concept that is as important, which is data storytelling. While “visualization” conveys information through images, graphics, among others, “storytelling” ensures the creation of a narrative with the data.

2.4. DATA-DRIVEN CULTURE

As data has become the most important asset of a company, most organizations are striving to have a data-driven culture, which consists of a collective of behaviors, beliefs and values of people who practice and encourage the use of data by embracing it in decision-making.

Some studies have been conducted regarding the impacts of companies having a data-driven culture, namely a research of a MIT professor Erik Brynjolfsson that concluded that the outputs and productivity of companies fostering this culture are 5-6% higher, and a Forrester’s senior analyst that stated that the increase of just 10% in data accessibility converts into more than 65 million dollars in net income, growing its businesses in an average of more than 30% annually (Dykes, 2019).

Although not being easy to transform companies into a data-driven culture due to previously established practices and habits, having this culture brings several benefits. According to what Vahromovs (2022) argued in Forbes magazine, some of the advantages are a sustainable improvement (as it is easier to implement best practices based on previous results), faster decisions and transparency (the time it takes to make a decision is much faster as people have access to all the data and are more accountable, making the level of risk lower as well), organizational consistency (every member of the team has knowledge on why a decision was made and what are the next steps, highlighting the best practices, which improves the consistency of service and engagement of employees), and optimized spend (making the right decisions allows for the company to know the most cost-effective strategies and actions in the long run).

As mentioned by Vachhrajani (2019), “a data-driven culture thrives when the senior leadership is engaged, middle-management is empowered, frontline employees are energized, and silos are eliminated”. This culture brings objectivity, transparency, and innovation and with it, companies are able to turn data into a differentiator in the marketplace and have competitive advantage as well as being a unifier within their businesses.

Regarding CISCO, everything that was mentioned previously about their conscious culture allows them to definitely have a data-driven culture and, consequently, experience all the benefits it brings to the company.

3. METHODOLOGY

With the literature review completed, is now necessary to better understand the internship itself, what it consisted of, the place, the role, and its objectives. Moreover, is important to share the data management in terms of the sources and what treatment was applied to the data. With this, it will be possible to comprehend the dashboards that were created and their objectives, sharing one detailed example to illustrate the content.

3.1. THE INTERNSHIP

The internship was a hybrid job, being initially mostly presencial to learn the tasks and connect with all the people and the company’s culture in the best way possible. The local was in the Portuguese headquarters in Lagoas Park, Oeiras. After a while, it became a matter of personal organization whether the job was presencial or not as the ramp-up for the tasks was completed.

As a business operations analyst and belonging to the Business Operations team, we are responsible for the strategy and planning of our organization, CLO EMEA Operations. This means that we are in charge of several different areas, which we divide among the team members. My tasks were more analytical, by providing metrics to the managers and keeping track of orders, all related to Supply Chain. Besides that, I also created and kept updated several dashboards to help the visualization and sharing of data to facilitate the managers’ decisions. Below is a scheme that better demonstrates my main area of focus:

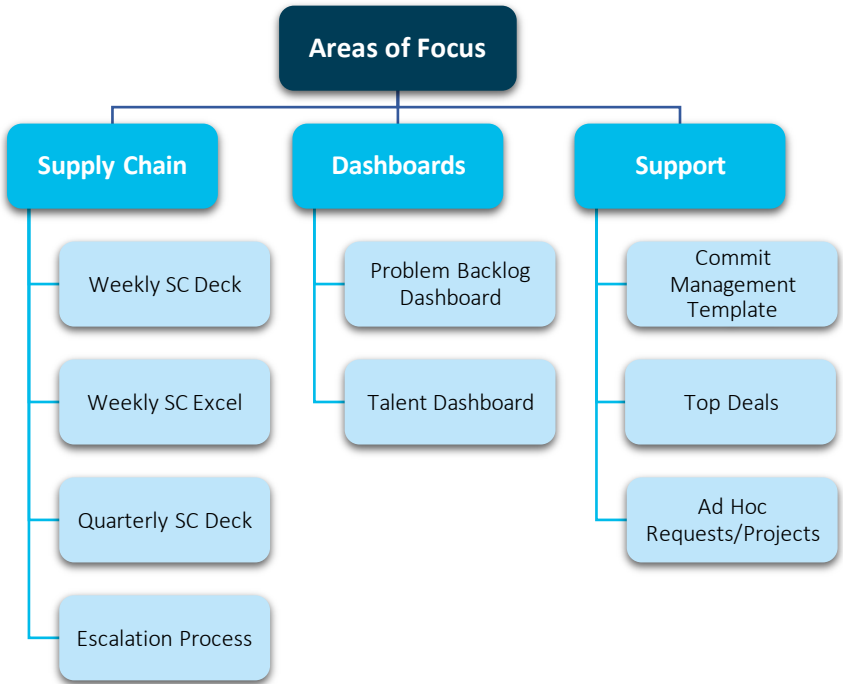


Figure 8 - Internship Areas of Focus
Source: Author's Content

The main objectives of the internship were:

- Providing innovation periodic data intelligence metrics
- Identifying data trends & patterns
- Conducting analysis of attributes from multiple cross-functional sources and communicate it synthesized
- Translate data into actual business insights and assist business functions to create value for key strategic initiatives

Having all these activities and objectives as a basis, the internship report has the intent of concluding if the conducted work has had impact on the decision-making processes of the company.

3.2. THE DASHBOARD

During the internship, in order to be able to convert raw data into actual business insights and generate value, processes of data collection and treatment were done aiming the creation of dashboard visualizations.

Depending on the objectives, different sources were used and, most of the times, the data didn't have perfect quality, being necessary to add some treatment steps along the way.

One of the created dashboards is entitled "Talent Dashboard" as it is with regards to the performance and metrics of the employees and managers in the organization. It became necessary as the leadership team wanted to have a better understanding of metrics such as new hires, attritions, teams' metrics, and check-ins response rates (weekly task in which each employee fills out a small form stating how they felt regarding the previous week and their objectives for the next one. With this, managers are able to feel the pulse of the team in a more individual way).

This dashboard has a table that is updated weekly, however, for the most part, it is updated on a monthly basis and shared only with the managers.

3.2.1. DATA SOURCES & TREATMENT

For the creation of the dashboard, there were two major data sources: Workday and Tableau.

Workday is a payroll and workforce management system that services both employees and managers. In this app is possible to review each person's current situation regarding payroll, personal time off, search in the company's directory, among others. In addition, if it is a manager, it is also possible to do tasks like approving employee requests or providing performance feedback.

As for Tableau, it is a collaborative data visualization software that supports people/organizations working with analysis of business information. With it, companies can become more data-driven, by having information displayed in a user-friendly and intuitive way, which helps to drive changes.

Of these two data sources, most information comes from Workday, as there is only one metric that is retrieved from Tableau. All exported content is put into several tabs of one excel file, which is then imported into Power BI.

Regarding data treatment, before the excel file is imported, two overview tables are created (in two of the tabs) so that all the relevant data is simplified and together. Besides that, all data treatment is done in Power BI.

The dashboard has a total of 10 active (3 dimension and 7 fact) tables and several more that are hidden as they represent each week's data (that is later merged into a centralized one, so won't be used anymore). Below are two figures that demonstrate the created data model for this dashboard:

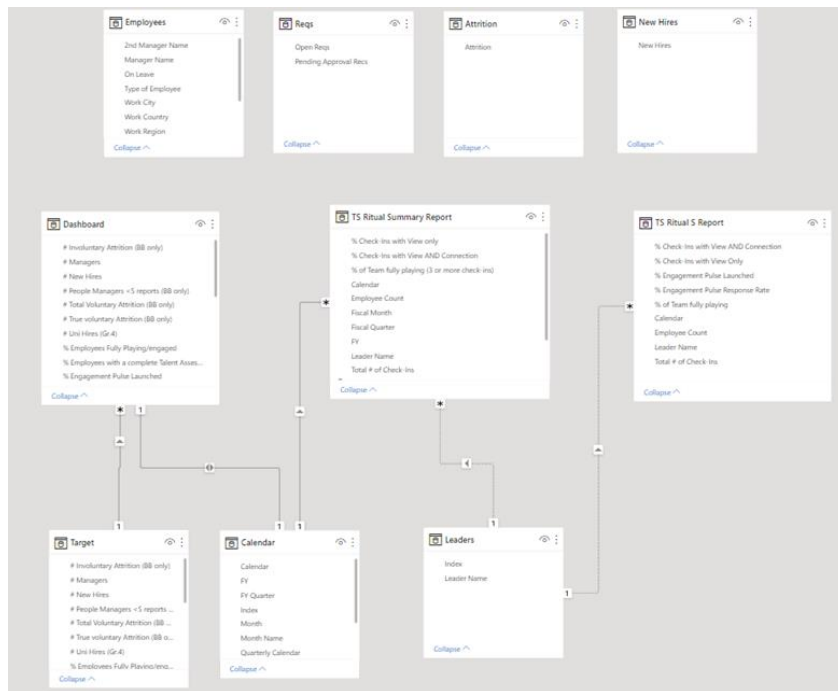


Figure 9 - Data Model (Active Tables)
Source: Power BI Author's Content

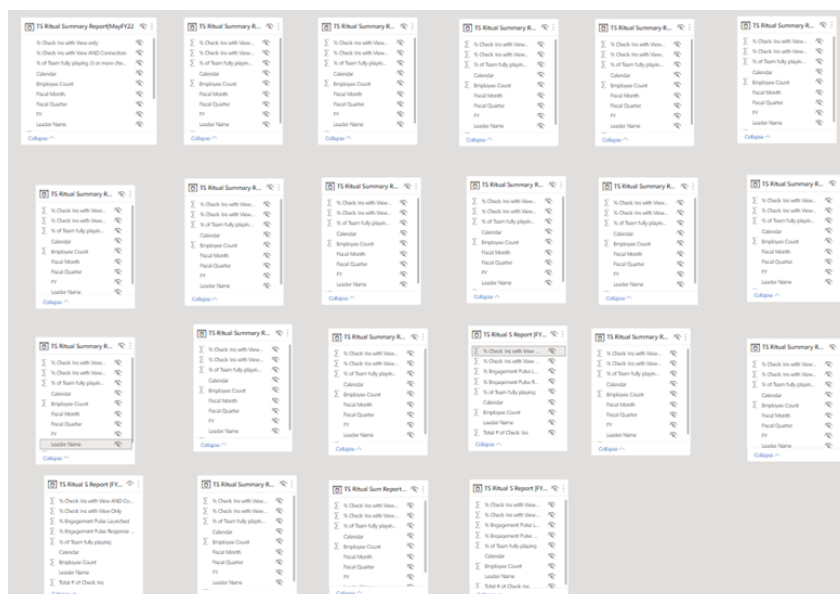


Figure 10 - Data Model (Hidden Tables)
Source: Power BI Author's Content

The 3 dimension tables are the following:

- **“Target”** – Contains information about the objectives to achieve for several metrics
- **“Calendar”** – Table with data regarding the several weeks and quarters, containing also the input in terms of the fiscal calendar
- **“Leader”** – Contains the names of all leaders of CLO EMEA

As they are dimension tables, not much data treatment was done, mostly only the deletion of columns, data types changes, and duplicates removal, as these tables were created by duplicating others and just keeping the specific column necessary.

As for the 7 fact tables, they are the following:

- **“Dashboard”** – Table with metrics such as number of employees, managers, new hires, attrition, among others
- **“Employees”** – Contains detailed information regarding employees, namely their emails, managers, locations, and if they are on leave or not
- **“TS Ritual S Report”** – Is the merge of every week’s data export, containing quarter to date metrics regarding the teams (grouped by manager), for example, how engaged they are
- **“TS Ritual Summary Report”** – Is the merge of every month’s data export, containing similar metrics as the previous table but only regarding the current month, which means that the metrics shown are not taking into account previous months even if it is the same quarter
- **“Reqs”** – Table used for a tooltip, that has the number of open and pending reqs
- **“New Hires”** - Table used for a tooltip, that has the names of current month’s new hires
- **“Attrition”** – Table used for a tooltip, that has the names of current month’s attrition

For the tables only used for tooltips, no data treatment was done, however, for the remaining ones, there were several steps applied, especially for both tables that are the merge of the exported data.

For the “Dashboard” table, the treatment started by removing unnecessary columns and rows as the exported data came with more data that isn’t used for this matter. After that, it was necessary to transpose the table, as the titles of the metrics were in a row and not in the columns. To complete it, it was needed to change some of the data types and merge the three calendar related columns, from having the year, month and week separate to only one column entitled Calendar.

The steps needed for “Employees” table were all related to removing columns and rows that weren’t necessary, changing data types and renaming columns to make it more cohesive.

For “TS Ritual S Report”, after applying similar steps as for the previous tables, in the end, is also appended a new query after a quarter ends, in order to have more updated data.

“TS Ritual Summary Report” is the table that has a bit more data treatment. Besides applying all steps just like done in the other tables, it has a big part of appended queries, as instead of having new data every quarter end, it has a new table appended at the end of every month. This is only possible because the structure of the raw data remains the same.

As power BI saves the data treatment steps, every time a new table is added, they are duplicated by copying the autogenerated code of the data treatment.

3.2.2. FINAL LOOK & METRICS

After having the intended data quality, 8 dashboard pages were created (4 active and 4 that are hidden as they are tooltips).

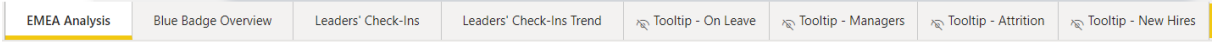


Figure 11 - Dashboard Pages
Source: Power BI Author's Content

The first one is entitled “EMEA Analysis” and has the main objective of giving a general overview of the current employee’s situation. In this page there are three cards with the total number of employees and how many of them are on leave (the latter contains a tooltip, in which, when people hover it, a detailed name list appears), as well as the number of open and pending reqs. Moreover, there are a donut chart, a column chart, and a map, which contain information with the distribution of the type of employee, the workforce type and where the employees are located geographically. In the end, there’s a table with a detailed information of all employees, namely their emails, managers, among others. For this page there are three slicers: Manager Name, Type of Employee, and Region.

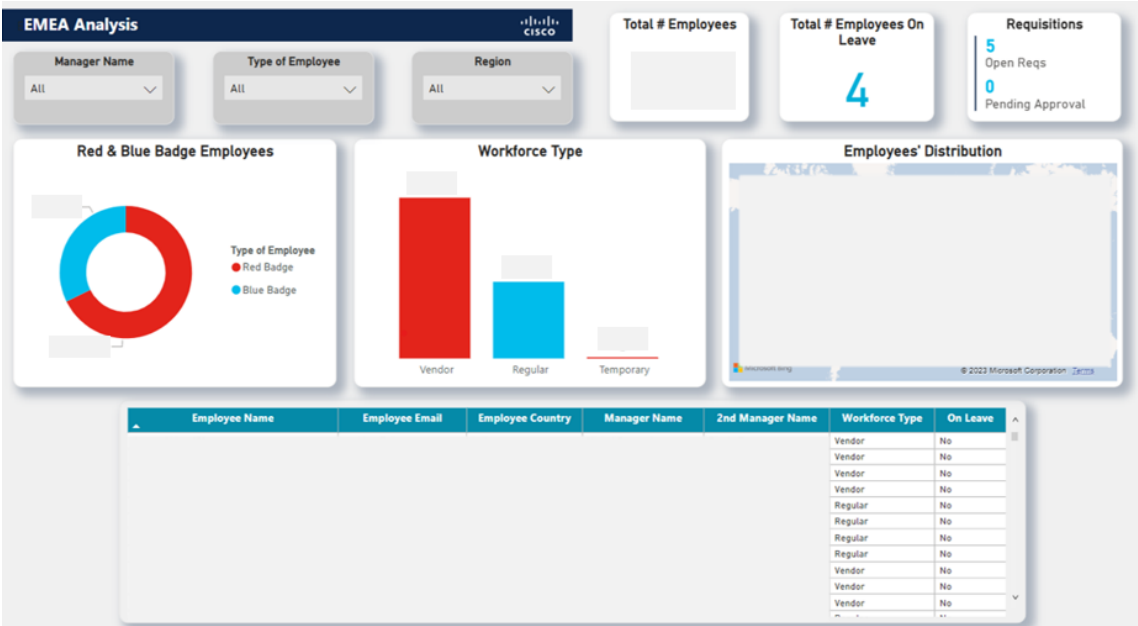


Figure 12 - EMEA Analysis
Source: Power BI Author's Content

The second page is entitled “Blue Badge Overview” and intends to do a more detailed analysis on the internal employees (blue badge). For this, there are mainly cards (some with color coding as well) with both numbers and percentages. Besides that, some of the cards also have a tooltip associated with, that when people hover it, shows a detailed name list regarding the metric. There are also four gauge visualizations, as the metrics reflected in them have objectives to reach, hence its identification and color coding. In terms of filters, there’s only one, the calendar. There’s also a direct link to an external page with a summary guide regarding the metrics in the page.



Figure 13 - Blue Badge Overview
 Source: Power BI Author's Content

The third page is “Leaders’ Check-Ins”, that has the objective of sharing in a more detailed way the metrics for each manager. For this, there are two matrix visualizations (one for monthly values and another for quarter to date values) that have the percentages and numbers for each manager representing their teams. Some of the metrics, as they also have targets, are color coded. The slicers present on this page are both calendars (monthly and quarterly) as well as the leader’s name.

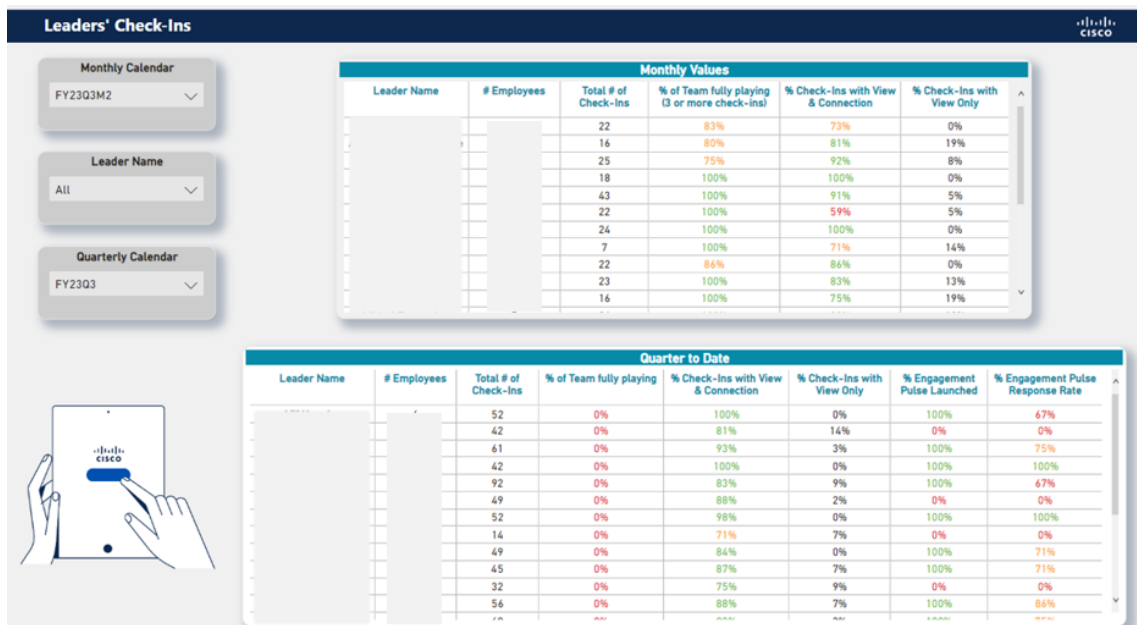


Figure 14 - Leaders' Check-Ins
 Source: Power BI Author's Content

The fourth page is “Leaders’ Check-Ins Trend”, which also contains similar information as the previous page, but with a different perspective, as it is possible to easily compare the evolution of the metrics along the months. For this, there are three line charts (one for each metric), in which is possible to see the trend for each manager, by using the filter Leader Name.



Figure 15 - Leaders' Check-Ins Trend
Source: Power BI Author's Content

The other four pages are hidden as they are tooltips but are very similar to the one shared below. Their main objective is to give more relevant and detailed information to the managers regarding some specific metrics that are important to have visibility into: People on Leave, Managers, Attrition, and New Hires.



Figure 16 - Tooltip Example
Source: Power BI Author's Content

4. RESULTS AND DISCUSSION

With the dashboard completed and shared with the managers, after a few quarters, a satisfaction survey was conducted (via SmartSheet) in order to better understand into which extent it was actually useful and worthy of continuing investing time and resources for its updates and, at the same time, have better insights on what can be improved.

This survey had a total population of 19 managers, however, 2 of them weren't able to fill out the form due to being on PTO, so the responses are according to 17 managers.

The metrics usability was one of the areas explored in this survey, by having 2 questions regarding how useful and user-friendly the managers believe the dashboard is. The results are the following:

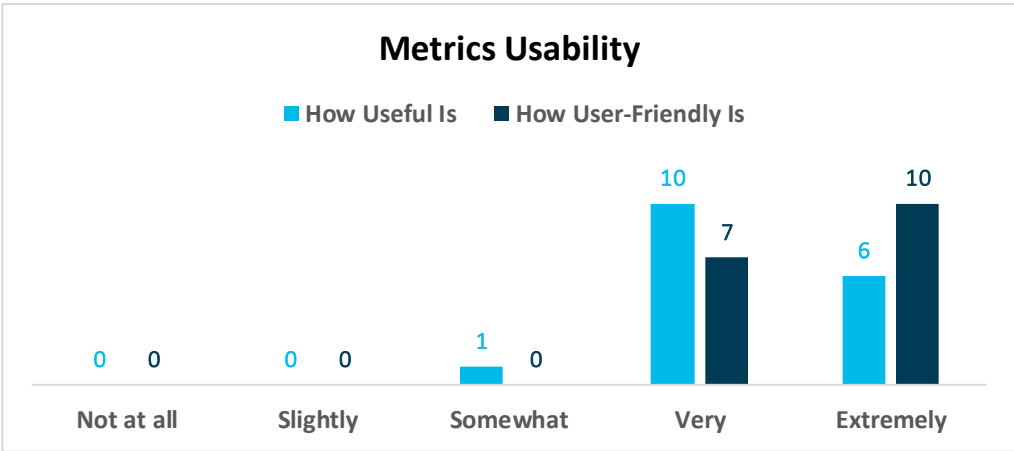


Figure 17 - Metrics Usability
Source: Author's Content

According to these scores, it is clear that the feedback was very positive, being the majority of responses on the right side of the graphic, symbolizing the highest values for usability. Between the 2 questions, being user-friendly had the highest responses values, with most of the managers agreeing that it is "extremely" user-friendly. Although only 35% of the managers said it is "extremely" useful, the majority (59%) stated it is "very", which still represents a good response score.

Complementing the usability focus, it was important to also understand if, due to the positive feedback, it translated into actions from the managers. Thus, one question was regarding the easiness of the metrics being consumed and actionable.

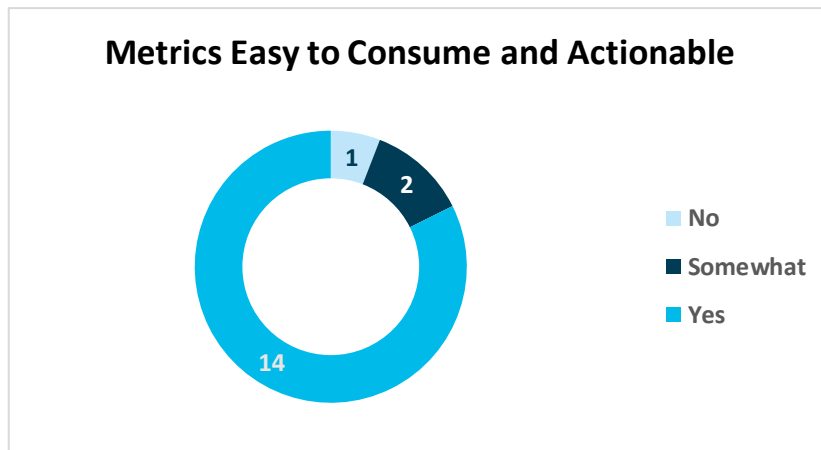


Figure 18 - Metrics Easy to Consume and Actionable
Source: Author's Content

With this graphic, it is possible to conclude that, in fact, the dashboard improves the way the managers are able to consume the metrics, understand them and, with it, take some actions that can further improve the team's performance metrics. Having around 82% of the managers with a positive response, represents the importance of having data shared in a clear and simple way, with straightforward values that allow to grasp the team's performance levels.

This reality is backed up by the following question asked regarding the impact of the dashboard on the teams' visibility.

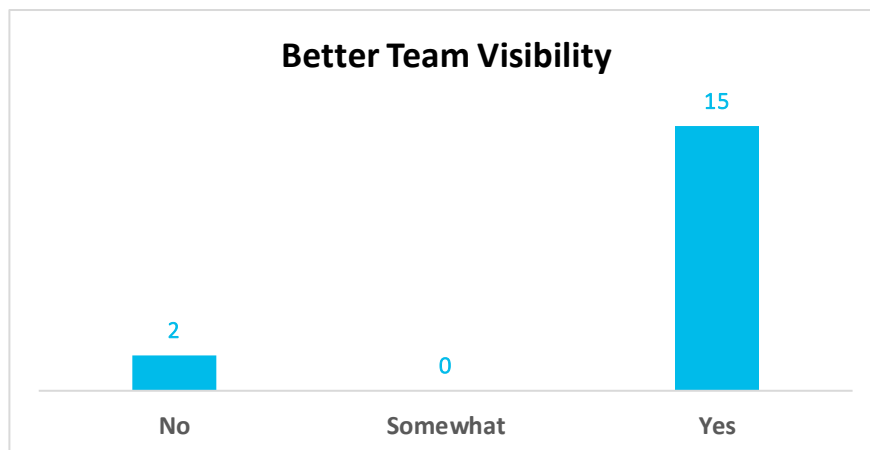


Figure 19 - Better Team Visibility
Source: Author's Content

Just like represented by the previous results, the dashboard further impacts the metrics and overall visibility the managers have regarding their teams. Around 88% agree that with the use of the dashboard they can improve their visibility.

The final question was regarding the frequency of use of the dashboard. This is an important statistic to understand how regularly it should be updated and how frequently the data needs to be up to date in order to have a positive impact on the managers and their teams.

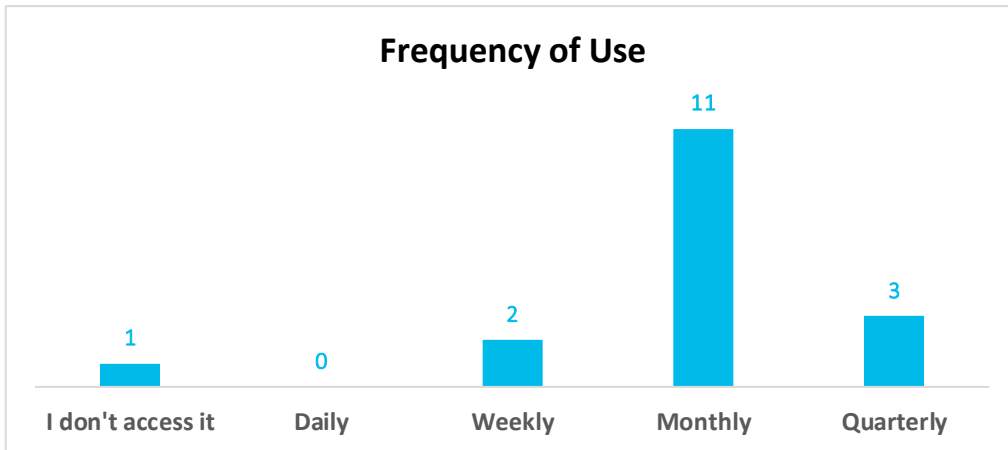


Figure 20 - Frequency of Use
Source: Author's Content

With this, we can conclude the majority access it on a monthly basis (around 69%), which makes sense due to the existing metrics in the dashboard, that are mostly analyzed every month and, furthermore, looked at aggregated by quarter.

5. CONCLUSIONS AND FUTURE WORKS

Based on the entire work presented so far, from the literature review to the results and discussions, it is possible to conclude that, in fact, dashboards do have an impact on the way data is shared and perceived.

Since the literature review that was possible to identify the importance and value of dashboards in general, as a good and correct method of showing the data can make a difference between people not clearly understanding the information and having a good and complete understanding of the reality and a strong mindset for the future of the companies. The question was if for Cisco's reality and culture, that would still apply and into which extent.

For Cisco in specific, the objective was to conclude if dashboard visualizations impacted the company's operations and decision-making processes. This was studied through an example created during the internship, the "Talent Dashboard", from which a satisfaction survey was created and results were drawn. Based on it, and although there were some limitations due to the privacy of data, it is clear the managers have an improved notion of their teams with an easy, useful and user-friendly dashboard that quickly presents the data in a way that allows them to have better ideas of what to change/invest in the team. This has positive implications for the team's performance as there is a better pulse of the status and, with this, it is possible to further drive better outcomes and positive results for the company's operations. All of this is going to provide an overall satisfaction because, on one hand, the company has good results, and on another hand, each person feels they are contributing positively.

The positive response to the introduction of the dashboard was in part due to the company's culture. The way people are data driven and focused on teamwork helped to easily integrate the new method and use it recurrently.

Regarding further works, it is expected that Cisco will continue to take advantage of the dashboards in several different areas and occasions. Having this analysis work as a basis, a good opportunity to improve would be by deep diving into the satisfaction survey results, namely:

- The reason why 1 manager stated that the dashboard is "somewhat useful" – Conclude what needs to change for it to be more useful
- The reason why 1 manager stated that the metrics aren't easy to consume nor actionable
- The reason why 2 managers believe they don't have better team visibility with the dashboard
- The reason why 1 manager doesn't access the dashboard at all – Inquire if he/she pulls the data from another source

By having these questions answered, it will be possible to improve the dashboard in general and also acquire more knowledge regarding how people in the company use dashboards in their day-to-day life, so to adapt as much as possible the tool to them.

To conclude, the internship was a great opportunity to learn and experience a company as a whole, how it works, the culture, the people, etc, and have a subject to analyze for Cisco in specific, allowed to have personalized and detailed results that became much more actionable to the company.

6. REFERENCES

- Abela, A. (2006). *Choosing a Good Chart - The Extreme Presentation Method*.
https://extremepresentation.typepad.com/blog/2006/09/choosing_a_good.html
- Belghith, M., ben Ammar, H., Masmoudi, F., & Elloumi, A. (2023). *Data Visualization for Industry 4.0: Developing Dashboards with Power BI – A Case Study in a Pharmaceutical Company* (pp. 402–408). https://doi.org/10.1007/978-3-031-14615-2_45
- Cisco. (2004). *Cisco in Europe*. www.cisco.com/go/offices.
- Cisco. (2021). *Our Purpose, Our Progress*.
- Cisco. (2023). *Conscious Culture*. <https://www.cisco.com/c/en/us/about/careers/we-are-cisco/conscious-culture.html>
- Dykes, B. (2019). *The Four Key Pillars To Fostering A Data-Driven Culture*. Forbes.
<https://www.forbes.com/sites/brentdykes/2019/03/28/the-four-key-pillars-to-fostering-a-data-driven-culture/?sh=295812cf7d90>
- Hansoti, B. (2010). *Business Intelligence Dashboard in Decision Making*. College of Technology Directed Project.
- IBM. (n.d.). *What is Business Intelligence and How Does it Work?* Retrieved 12 February 2023, from <https://www.ibm.com/topics/business-intelligence>
- Laker, B. (2021). *Culture Is A Company's Single Most Powerful Advantage. Here's Why*. Forbes.
<https://www.forbes.com/sites/benjaminlaker/2021/04/23/culture-is-a-companys-single-most-powerful-advantage-heres-why/?sh=14246963679e>
- LaPointe, P. (2005). *Marketing by the Dashboard Light*. MarketingNPV.
<https://books.google.pt/books?id=oHkyu0gXPL8C&printsec=frontcover&hl=pt-PT#v=onepage&q&f=false>
- Madlener, J. (2009). *The Implications of Integrating Governance, Risk and Compliance in Business Intelligence Systems on Corporate Performance Management*. Faculty of Economics, Erasmus University of Rotterdam.
- Moorhead, P. (2019a). *How Cisco Fosters A 'Conscious Culture' Within The Company*. Forbes.
<https://www.forbes.com/sites/patrickmoorhead/2019/03/19/how-cisco-fosters-a-conscious-culture-within-the-company/?sh=1de74b1750b7>
- Moorhead, P. (2019b). *Why No One Should Be Surprised Cisco Named 'World's Best Workplace' For 2019*. Forbes. <https://www.forbes.com/sites/moorinsights/2019/11/01/why-no-one-should-be-surprised-cisco-named-worlds-best-workplace-for-2019/?sh=77ae41123886>
- Olavsrud, T., & Fruhlinger, J. (2023). *What is business intelligence? Turning data into business insights / CIO*. <https://www.cio.com/article/272364/business-intelligence-definition-and-solutions.html>

- Pauwels, K., Ambler, T., Clark, B. H., LaPointe, P., Reibstein, D., Skiera, B., Wierenga, B., & Wiesel, T. (2009). Dashboards as a service: Why, what, how, and what research is needed? *Journal of Service Research*, 12(2), 175–189. <https://doi.org/10.1177/1094670509344213>
- Tableau. (n.d.). *What Is Data Visualization? Definition & Examples*. Retrieved 12 February 2023, from <https://www.tableau.com/learn/articles/data-visualization#definition>
- Tunowski, R. (2015). Business Intelligence in Organization. Benefits, Risks and Developments. *Przedsiębiorczość i Zarządzanie*, 16(2), 133–144. <https://doi.org/10.1515/eam-2015-0022>
- Vachhrajani, I. (2019). How to Create a Data-Driven Culture. *AWS Cloud Enterprise Strategy Blog*.
- Vahromovs, V. (2022). *How Businesses Can Benefit From A Data-Driven Culture*. Forbes. <https://www.forbes.com/sites/forbesbusinesscouncil/2022/06/22/how-businesses-can-benefit-from-a-data-driven-culture/?sh=442352095fe0>
- Weill, P., & Woerner, S. L. (2022). *Dashboarding Pays Off* (Issue 1).
- Wilson, G. A., Case, T., & Dobni, C. B. (2023). A global study of innovation-oriented firms: Dimensions, practices, and performance. *Technological Forecasting and Social Change*, 187, 122257. <https://doi.org/10.1016/j.techfore.2022.122257>
- Wind, Y. J. (2005). Marketing as an engine of business growth: a cross-functional perspective. *Journal of Business Research*, 58(7), 863–873. <https://doi.org/10.1016/j.jbusres.2004.01.002>