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MASTER'S DEGREE PROGRAMME IN DATA ANALYTICS
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FINAL THESIS

# A digital transformation process from Qlik to Power BI in a fashion firm

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# Chapter 1

# Introduction

In our super-connected world, we constantly hear about data and Big Data that companies collect about our habits, interests, orientation, and anything else they can find. We can debate the rights of taking these information, but it is undeniable that this data is essential for businesses.

In fact, in today's information-centric age, the use of data in business strategy is very common and central to decision making, and the process of collecting and using it is becoming increasingly important. Data is now considered one of the most important, if not the most important asset in modern businesses, and every company collects data for everything it needs.

But it is not enough to collect data, the most important thing is to know how to interpret it. In this situation, all the business intelligence tools come into play.

Business Intelligence (BI) is defined as a decision-making process supported by the integration and analysis of an organization's data resources. BI plays a very important role in today's world, where data is treated like gold and the time to respond to market demands is shorter than ever. The purpose of BI is to support decision making processes in all business areas of an organization such as finance, planning, operations, etc.

The first interest in BI was in the early 1990s, but since 2016 it has played a crucial role in the age of the Internet and globalization. Nowadays, information can be transmitted in real time from anywhere in the world, there are no borders between countries. This makes it possible to collect and analyze data in real

time, and companies can respond to the needs of the market very quickly. In this way, the informatics structures of companies are fundamental, there is a push for the IT department with several IT consulting companies specializing in data collection, software development, support and analysis.

Today there are a variety of BI tools available on the market, each tool has its own characteristics with strengths and weaknesses. The only thing to do is to choose the product and implement the solutions offered. Below we can see Gartner's magic quadrant, which analyzes these products based on the ability to execute on the Y axis and the completeness of the vision on the X axis. Using this image, we can divide the quadrant into four areas: Challengers, Market Leaders, Niche Vendors, and Visionaries. The market leaders are currently Microsoft and Tableau.
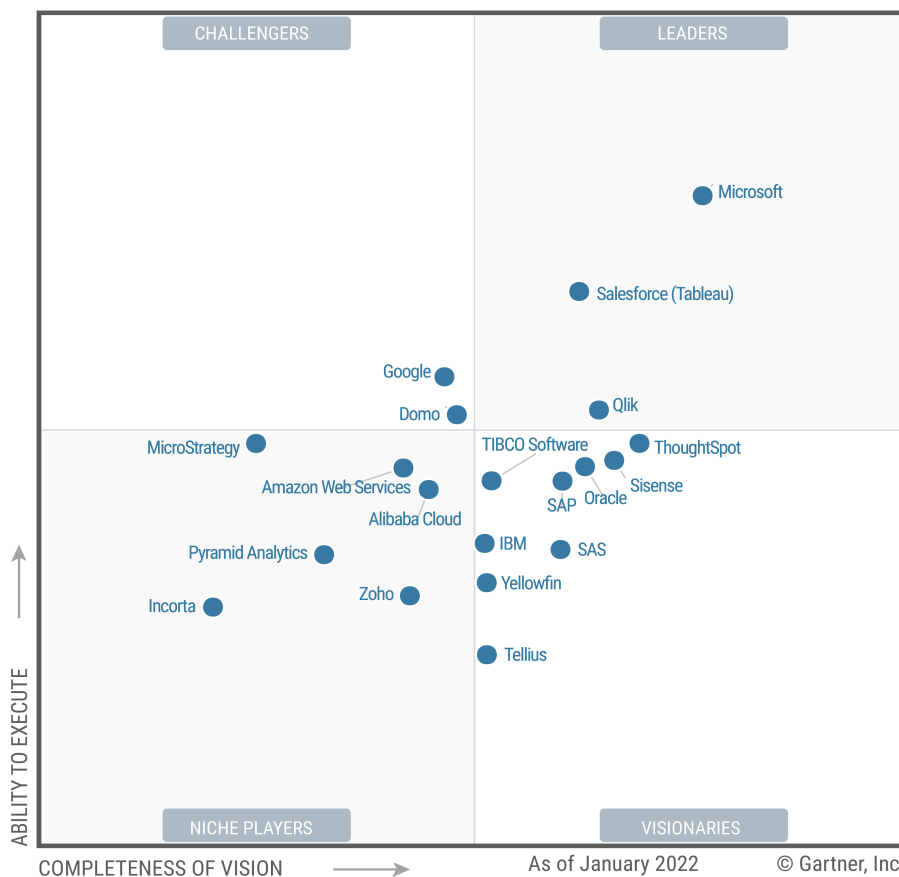


Source: Gartner (March 2022)

Figure 1.1: Magic Quadrant

The goal of this thesis is to provide a complete overview of the structure of a fashion industry. We'll also focus on the digital transformation process from a tool of business intelligence to another. We'll use this practical example to analyse the reasons for this decision and the advantages and disadvantages. We'll also report on a practical case of transferring a report from the old tool to the new one and explain how we interact with the people who will use this data as a consultancy.

# Chapter 2

# Information System

In every company we talk about information systems. There are many definitions for this topic and the most common ones refer to the components and the role of the system. To summarize, the Information System is an integrated set of components for capturing, storing, processing data and providing information, knowledge and digital products. Businesses and other organizations rely on information systems to perform and manage their operations, interact with their customers and suppliers, and compete in the marketplace. As businesses are composed of different levels and functions, they need a wide range of information to manage all business processes. We define a business process as the activity that organizations perform to achieve their business goals, including the core activities that transform inputs and produce outputs, and the supporting activities that enable the core activities to take place. We can talk about different uses of information system split by different levels of decision making. We can divide into the operational level, where we usually find repetitive activities that occur in a daily routine. The managerial level, where the focus is on monitoring and controlling the activities at the operational-level, i.e. managers have to control the efficiency and effectiveness of the operations based on KPIs (Key Performance Indicators). The executive level, where strategy is evaluated in the long term period and decisions require intense scrutiny due to the difficulties managers may have in changing it. In this case, decisions are unstructured and few or no procedures can be established in advance.

So far we have talked about the role of the information system, but what about the components? After some research, we can divide the components of the information system into 5 parts: Hardware, Software, Data, People and Processes.

**Hardware**

This is the physical part of information systems. Computers, disks, keyboards, and all the devices we can touch. Nowadays it is very difficult to keep up with the evolution of these systems, according to Moore's Law, which states that the number of transistors on a chip doubles every two years.

**Software**

Software is the intangible part of information systems that tells hardware what to do. Software is created through the process of programming and is the guide for the hardware parts. There is a wide range of software types, usually divided into two macro areas: Operating System Software and Application Software.

**Data**

Data are the pieces of information that companies need for their analyses. There are quantitative and qualitative data, the former referring to numerical data and the latter to descriptive data. Data must be transformed and processed to be useful; this is a key process to create value in the enterprise. When we talk about data, we must also mention databases, which are a collection of data, but we'll talk about them later.

**People**

In a firm is not enough to have a good information system if people do not know how to use its potential. People play a key role that should not be underestimated; they are the path to a successful company. So the education, training and skills development for employees.

**Process**

A process is a set of activities and actions to achieve a specific goal. So if we have good technology and skilled people, but an inefficient process, we will fail because we cannot optimize our resources. This means that designing a better flow for the activities to be done is as important as developing technology and skills.

## 2.1 History of Information System

### 2.1.1 First Era

Between 1960 and 1970, the inception of IS occurred following the advent of the first computers. Subsequently, MIS (Manage Information System) and IS (Information System) were incorporated into the curricula of business schools and utilized by some companies that embraced this technology. The initial users, such as banks and military organizations, were able to centralize and administer customary data operations and transactions through the use of IBM's novel generation of computers. The software provided by IBM facilitated communication between previously incompatible hardware and software. As costs declined, other enterprises eventually became interested in experimenting with this technology.

### 2.1.2 Second Era

Between 1970 and 1980, the second phase emerged with the advent of personal computers. This facilitated companies in distributing their computing and processing capability across the organization as the hardware costs for PCs were notably lower compared to mainframes. Moreover, all business units embraced IS and competed for these resources, resulting in no definitive corporate strategy. During this period, each function developed IS applications for their respective objectives.

Subsequently, in 1981, the personal computer was introduced, enabling companies to distribute computing power across the organization, leading to the

development of new strategies based on this new framework. Additionally, the introduction of PCs eliminated compatibility issues, allowing software companies to market their products to almost all companies.

### 2.1.3 Third Era

The era from 1980 to 1990 witnessed a process of decentralization wherein each business unit of enterprises attempted to procure its own hardware and software to cater to their needs. However, the challenge during this time was to align the data and its utilization across different functions to avoid misunderstandings and conflicting interpretations. This led to the creation of the CIO (Chief Information Officer) role and the IS department, which were responsible for managing the data, structure, and architecture of the enterprise system. As competition intensified, firms began to seek better IS solutions externally, while managers aimed to align corporate strategy with IS strategy.

During this period, the precursor to the Internet, ARPANET, was introduced. The military abandoned the project, and some universities, with the assistance of companies, assumed control of ARPANET. In a few years, this led to the birth of the Internet, which opened up numerous possibilities for the business world.

### 2.1.4 Fourth Era

From 1990 to 2000, a period that could be considered the most significant for IS, the arrival of the Internet created numerous opportunities for businesses. Consequently, information systems became critical, partly because of the substantial changes in the way business is conducted. Customized and individualized solutions have become essential, given the rise of technology services and products offered by various companies. Additionally, the emergence of open-source communities has transformed the development of software and other programs. Companies have had to manage multiple changes in their structure and concentrate on enhancing their infrastructure and additional connections to expand their network. With the elimination of time and space constraints, the IT and IS fields

have developed at an extremely fast pace, taking various forms.

### 2.1.5   Fifth Era

From 2000 to the present day, companies have been investing in technology to enhance their IT and IS departments. With the emergence of social media, smartphones, tablets, and other technological advancements, the world has become so interconnected that boundaries no longer exist, and everything happens in real-time.

Current trends and systems comprise outsourcing, re-engineering, transaction processing systems, relational database management systems, and non-relational database management systems. There has been a significant increase in consulting firms that specialize in the development of IT structures. This highlights the complexity of managing the new types of infrastructures. Moreover, due to the large volume of data, companies' physical tools are inadequate, and they must rely on cloud services for storage space and memory, which are distributed globally.

## 2.2 Business Intelligence

Data is a very important component in today's world. All business units use and analyze data sources to gain insight into virtually every activity inside and outside their organizations. Organizations can collect data from a variety of sources, and most organizations track and record thousands of transactions every day. This includes not only customer purchases, which can include information such as the customer's name, products/items sold, the store where the purchase was made, and the date and time of the purchase, but also warehouse activity, inventory transactions, labor hours and release time, and daily operating costs. However, most companies are drowning in data. The difficulty is extracting the right data from the amount of information available to businesses and turning it into something valuable to the company and a competitive advantage. At this stage, business intelligence plays a key role in analyzing and preparing the data.

The definition of BI is to convert data into information and then into knowledge. The main goal of BI is to help companies make better decisions in both the short and long term. Businesses know that today's world is highly competitive, fast-paced and constantly changing, so the speed with which they respond and adapt to change is a key competitive differentiator. For these reasons, collecting, preparing and analyzing data are the most important tasks, and the data must be of excellent quality. Data is collected from numerous sources, converted, cleansed, loaded and stored in a data warehouse, then the most relevant data for a particular business area is pulled into the data warehouse. Data goes through various stages, and an organization like BI can fully leverage it at every step of the BI architecture. Raw data is created in operational environments where transactional data flows in from all areas of the business. This is the vision of a business intelligence organization: from origin to action, data flows naturally. Moreover, data is fully leveraged at every stage of the flow to ensure that the information value of the business grows. One possible approach to a continuous improvement cycle that includes BI is: 1. Obtain information 2. Make decisions and take actions based on that information 3. Measure project success against

predetermined metrics. 4. Learning lessons from one decision and applying them to the next. Every part of the organization can be involved in the process of using data to make better decisions. A team can make better decisions by using BI practices to turn raw data into relevant insights.

Organizations that use BI can have many advantages: They can respond quickly to changes in financial conditions, customer preferences, and supply chain operations by eliminating much of the guesswork within the organization and improving communication between departments while coordinating activities.

Data and information are the second most important resource for a business after people, which are the first. They accelerate decision making, as acting quickly and correctly on information before competitors can often lead to a competitive advantage. They also improve customer satisfaction by enabling prompt and appropriate responses to customer issues and priorities.

In the next sections of the chapter, we will examine the different parts of the data flow that are relevant to business intelligence functions. Typically, organizations collect data from various data sources, process it by ETL software, store it in the data warehouse, and then use it for business needs, as shown in the figure below.
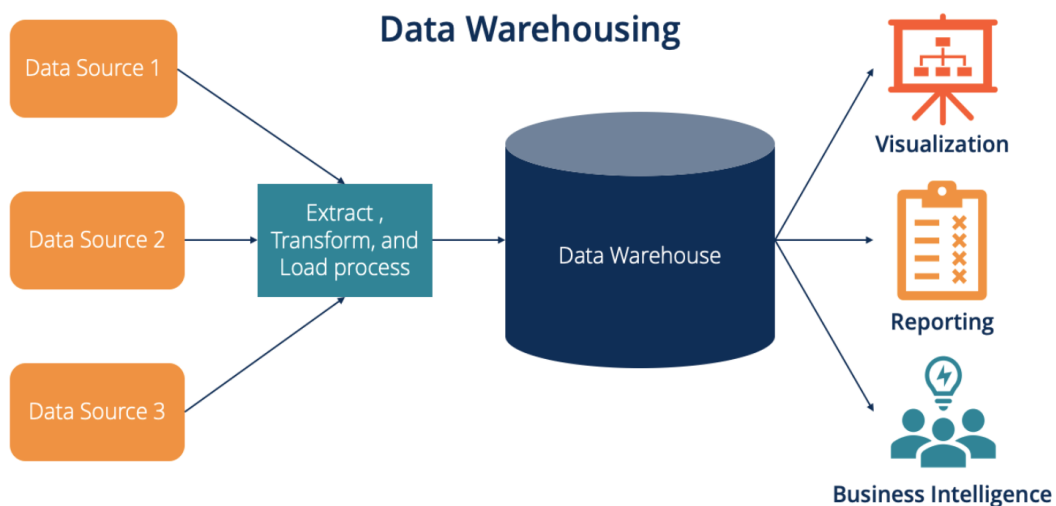


Figure 2.1: Data Warehousing

## 2.2.1 Data Sources

According to the literature, there are three main types of data that enter into a data warehouse: data can be internal data, external data, and personal data.

**Internal Data**

Companies can obtain data from internal sources in a variety of ways. Transactional data and information from POS are very useful sources because they can examine current and historical information about transactions and consumer habits, in this way they can reduce costs and stay align with the budget constraint. Another source is customer relationship management (CRM) systems, which provide a lot of information about customers and their behaviors, such as affiliations, geographic locations, and places, to get a better view of the different types of customers, also based on geographic location.

With the invention of cloud computing, internal records play an important role as they become an important source of information, especially when they come from the company's activities, regulations and procedures. We are talking about emails, Word documents, PDF, XML and all other types. Archives can also be very important, even though companies often focus on the most recent data, but looking at the past can help in decision making.

The last possible internal source is device sensors, as the Internet of Things grows every day, bringing unique data for analysis. Companies that use devices with sensors and network connectivity can also leverage this data. For example, vehicle sensors installed in a company's fleet of vehicles can provide a wealth of information about usage, mileage, fuel consumption and driving costs. Companies that sell fitness or other health monitors can also collect, anonymize and analyze this data.

**External Data**

Internal sources come from systems directly under the company's control, but are sometimes insufficient to perform accurate analyses. Whether the company wants to answer broader questions about the industry or better understand future

customers, the analytics team may need to go beyond the company's own data sources.

Social media is one of the most popular external sources; Facebook, Twitter, Instagram, etc., are a source of information that allows companies to understand their customers' needs and make better decisions. This includes how people view the company, with negative and positive feedback. For example, if a company finds that a large number of social media users are looking for a certain type of product, it can dominate the market and meet those needs. Another source of data can be governments, which can help the company gain a better understanding of the public. One example is the .gov sites, but Google also publishes some market data in real time.

**Personal Data**

In most cases, decision makers doing a business intelligence study rely on data and personal evaluations kept in workbooks or local databases on their computers. One of the goals of knowledge management systems is to retrieve such data and integrate it with structured data from both internal and external sources.

## 2.2.2 Data Warehouse

Developing a data warehouse is a way to extract relevant information from data stored in information systems into a central integrated repository and support data history needs. This type of integrated data is used for business intelligence activities, such as delivery activities that can be reviewed from different dimensions and can be set the level of detail. The data contained in the data warehouse is useful to perform various types of analysis according to specific techniques and methods. The use of data pattern discovery algorithms such as clustering, classification and mining is very common. The data in this environment is also used for application systems such as dashboards, which are intended to serve as solutions for the learning process and for monitoring performance and key performance factors that should allow making the right decisions for the company.

However, companies are finding that traditional data warehousing is no longer

able to meet the new business needs related to streaming data, real-time analytics, and large volumes of unstructured and complex datasets. For this reason, we need to distinguish between traditional and modern data warehouses.

Data warehouse is the aggregation of concepts and technologies that help organisations manage and maintain historical data originating from operational and transactional applications. It is an environment where users can find all important information and data collected according to a logical schema and separated from the operational database. Data warehouse uses a data modelling technique called dimensional modelling technique; it is a call-based model that supports high-level query access. The Star Schema is a form of this modelling that includes a fact table as the centre and dimensionality tables. Fact table contains descriptive attributes such as performance measures, operational metrics, aggregate metrics, and any other metrics needed to perform analyses. The dimensionality table, on the other hand, contains attributes that describe the data entered in the fact table.

The ETL stands for extract Extract, Transform, and Load which is a data integration process in which data is extracted from various sources, transformed according to business needs and then loaded into the data warehouse. ETL represents the base for data analytics and machine learning because by using rules set by the business, data is cleaned and organized according to the requirements of BI. Knowing how ETL works can help you better understand what we are talking about. In the first stage raw data is copied and extracted from data sources and stored in a staging area. Here, in the staging area, the second phase begins, where the data is filtered, cleaned, protected, used for some calculations, formatted into tables, and aligned with business requirements. The last stage is the transfer of data from the staging area to the data warehouse. The loading of this amount of data could be very slow and can compromise the performances of the front-end tools, for this reason ETL is often automated and and performed during off hours in companies. A well-designed ETL process can improve the quality of data, reduce maintenance, and speed up the data flow.

A data warehouse also supports the decision support system (DSS), which

is a computer-based system used to make decisions and find solutions to various problems. The DSS combines the resources of individuals with the power of computers to make better decisions. The DSS architecture consists of data, knowledge, and users. The data pertains to a state that can be simulated, and the knowledge and users work together to make informed decisions. Big data has changed the way data warehouses operate, as traditional data warehouses were unable to handle large amounts of information. This has led to the improvement of the logical and physical design of data warehouses, including the development of online analytical processing (OLAP). OLAP is a technology that organizes large business databases and performs complex analysis. It allows for the rapid multidimensional analysis of large volumes of data from a data warehouse. OLAP is more efficient at analyzing different data dimensions than a traditional relational database, which is structured in only two dimensions (rows and columns). While the traditional structure works, it can be slow when dealing with large amounts of data. The OLAP cube structure extends the single table with additional layers, where each layer represents a new dimension. While the number of layers can potentially be infinite, this can compromise performance.
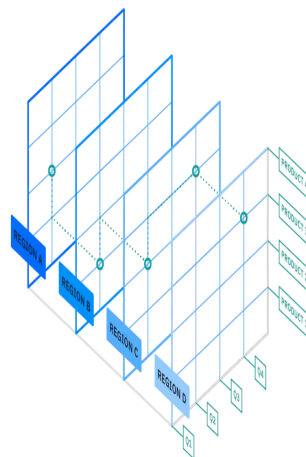


Figure 2.2: OLAP Cube

OLAP cubes offer several useful functions to users. The drill-down function

allows users to convert less detailed data into more detailed data according to a hierarchy, for example, a user can go from a monthly view to a daily view with a single click. The roll-up function is the opposite of drill-down and reduces the number of dimensions. Slice and dice allow users to select one dimension in the first case and multiple dimensions in the second. The pivot function allows users to rotate the cube to show different representations of the data, similar to the Microsoft Excel program. These functions allow users to easily manipulate and analyze data in different ways to gain insights and make informed decisions.

### 2.2.3  Enterprice Resource Planning

Enterprise resource planning (ERP) software is a type of business management system that integrates and manages all business functions within an organization. ERP systems typically include applications for human resources, financial and accounting, sales and distribution, project management, material management, supply chain management (SCM), and quality management. These applications work together to provide a comprehensive solution for managing various business processes and functions. ERP systems can help organizations streamline their operations, improve efficiency, and make better-informed decisions.

The term "ERP" was introduced by the Gartner Group in the 1990s and refers to computer and software systems that combine and integrate all related processes of an enterprise. These systems serve users by managing all functions within the enterprise. Researchers have also referred to ERP systems as enterprise systems (ES), enterprise resource management systems, and business systems. Klaus, Rosemann, and Gable conceptualized ERP systems as comprehensive packaged software solutions of information systems (IS) designed to integrate all business processes and provide a complete overview of the business from a single IT and information architecture. Davenport also described ERP as an information strategy that merges all information within an organization and creates a comprehensive information infrastructure involving all organizational units and functions.

The main purpose of ERP is to centralize information through the use of databases. ERP systems also aim to improve productivity by enhancing an or-

ganization's ability to generate accurate and timely information across the enterprise and its supply chain. ERP can lead to a variety of benefits for a company, including lower inventories, reduced product development cycle, improved customer service, increased efficiency, improved profitability, and improved effectiveness through better customer service. These benefits have led firms to invest large amounts of money and time in implementing ERP systems in their information systems, despite the complex implementation procedures and high failure rate. Another challenge in the adoption of ERP systems is the training required for their use, as people may resist change due to the disruption to their routine and processes.

### 2.2.4    BI, Reporting, Visualization

The last part of the data warehousing process is the use of data to perform analysis, display data in reports or dashboard. Here we can see the concrete results of Business Intelligence activities, in fact people from this moment can create reports, dashboards and take decisions. So the previous phases concern the data preparation and the flow according to the business needs.

Today beyond classic reporting with a huge amount of numbers where people lose their eyes, data visualization is a key tool for companies. It's a graphic display of data like scatterplots, histograms, heat maps and so on. The display of data is very useful to see data and statistics to gain information and take decisions. Data visualization is helpful for data cleaning, exploring data structure, detecting outliers and unusual gorups, find trends and clusters and plotting results. All these functions are part of the exploratory data analisys and mining, they can reveal patterns and features that models and simply statistics can't reveal. Of course for doing such things we have to know the flow of data, data sources, the way they are collected, the transformations that IT department use to clean data and more then anything else how to interpret and use data.

Visualizations are not sufficient to explain all the reasonings behind, for this reason the use of text is essential to describe charts to other people. For example why you use this type of graphic, how you draw it, what you can see, the pattern

that you see, the interesting things and the conclusion. Nowaday there are a lot of tools that offer hardware and software for data visualization, the performances are very high if we think of the precision, the color, the easy way of drawing. There a lot of attention on graph theory with several studies that explain the best way of plotting data according to the nature, the structure and so on.

# Chapter 3

# Digital Transformation Process

## 3.1 Technical Transformation Process

The adoption of digital technologies is causing widespread disruption across various industries, and many companies are striving to keep pace with these changes or gain a competitive edge by undergoing large-scale digital transformations. In a recent survey by McKinsey, over 80% of respondents reported that their organizations had undergone such efforts in the past five years. However, despite these efforts, success in these transformations has proven to be a challenge. Our research has shown that only a small fraction of organizational transformations achieve sustained improvement in company performance, and the success rate of digital transformations is even lower.

Fashion Industry is a high competitive and dynamic market where trends, behavior and styles can change very fast. All the work behind the study of the collection, the production, the marketing and CRM will be judge by experts, fashion pundits, blogger and celebrities that will say if products are good or not. For this reason Data Science can help firms to develop KPIs and elaborate other information to analyse historical data and try to predict which factors had determine the success of a collection in the past.Data Scientists can use concepts from predictive algorithms, visual search, capturing structured data from photographs, natural language processing and many more.

The use of big data is crucial for success in any major industry, including

fashion. According to a report, big data is increasingly being utilized in the fashion industry for "inventory management, customer behavior analysis, preferences, and emotions." In 2020, it was estimated that over 75% of fashion retailers would invest in AI, considering that nearly 1 trillion is expected to be spent on e-commerce purchases by consumers. This was reported by Business of Fashion (BoF).

In this particular moment the Covid-19 pandemic brought lots of difficulties for several industries and also the fashion world conveyed these bad effects. For this reason several firms decided to move to a data driven approach trying to survive and also implement their business. Handling this type of changes is not easy for a company, there are lot of complications. Fashion and luxury businesses that have included data in their strategies, product selection, and supply chain operations have experienced noticeable improvements. Utilizing data to make informed decisions about stock and store placement has led to a 10% boost in sales. Improved transparency across the supply chain has also streamlined inventory management, increased accuracy of returns predictions, and optimized transportation networks, resulting in a reduction of inventory costs by up to 15%. The most noteworthy impact is seen in fashion companies that have leveraged the power of data to tailor their online customer experience, resulting in a growth in digital sales by 30-50%.

**Defining Targets and Strategies**

The first phase of digital transformation is defining which strategy and direction the firm wants to have and keep in the future. The decision of a long term strategy will influence the firm choices for a long period of time and it's not easy to make modifications on the way. The executive board must have a clear vision of firm targets and define an efficient approach to make these changes in the most efficient, fast and easy way for the firm. The data journey is a team effort that involves the participation of many executives, as it touches on various aspects of the value chain. The Chief Data Officer converts the vision into a series of core business domains of high priority, which are essentially the company's "frontlines"

in data and analytics. They then outline specific applications for each priority area.

The business areas that will benefit of this transformation are:

- Direct and indirect distribution channels: we are talking about the store sales but also the sales related to the distributors, which are independent stores that buy goods to resell in their channels. Digital transformation can help the store network for omnichannel sales, allows to understand sales and stock inventory in real time and also monitoring the performances of each store and employee, in this way the time to discover and act will be minimized. All these features can influence the sales growth.

- E-commerce: nowadays e-commerce has a large influence in the fashion industry world. A strong e-commerce means that the brand has appeal and people are interested in it. The very power of e-com is the possibility to gain a large amount of data about customers behaviors and preferences. In this way data analysts can create a doc promotion, can understand and categorized customers to take better choices in collection development, pricing, promotion but also a huge help in CRM.

- Merchandising: for sure every brand had their analysis about products and collection to understand best and worst seller to figured out strengths and weaknesses of their goods. The most common tool used for this type of analyses is Excel, but with the new typology of data storage and the cloud services people can use business intelligence tools to make analyses in faster, nicer and more accurate way saving a huge amount of time.

- Supply chain: probably this business area can obtain the main advantages from this type of data flow and transformation. Supply chain can monitoring stock movements in real time, understanding warehouse needs and managing the inventory in an easy and interactive way. This type of management can prevent the situation of never out of stock, but also the opposite so overstock situation.

- Sustainability: in this year we heard a lot about this argument. Several firms put much effort on this, for the environment, human rights and also because it grants a better market position. In fact people are more aware about where and how their purchases are made. Data driven strategy allows to monitor also the manufacturing process, the selection of suppliers, the over productions and other KPIs very important in this area.

After these phases the chief data officer should take decision about the data architecture and platforms for the firm. In today's fashion industry, advanced data systems manage extensive and diverse data sets crucial to daily retail operations, including SKUs, sales, point-of-sale transactions, stock transactions, customer data, and RFID (Radio Frequency Identification). However, many fashion and luxury companies still have outdated systems based on inflexible and limited data warehouses that can't incorporate new sources of data, and are therefore costly and inefficient.

The use of data lakes has become a common solution for fashion and luxury companies facing the challenge of managing large amounts of unstructured data. These data lakes serve as a centralized repository of information and have various layers for data utilization. However, in order to effectively handle modern data needs, data architectures must be constantly evolving to incorporate newer technology such as cloud-based data platforms, serverless and containerized applications, no-SQL databases, adaptable data structures, and solutions that allow for real-time data processing.

Fashion and luxury companies that have effectively integrated data into their operations have seen tangible benefits. A leading fashion player, for example, made a substantial investment to develop a massive multi-layer data lake in the private cloud and consolidate hundreds of internal and external data sources. This was accomplished by migrating most of the company's databases and systems over the past three to four years, and by setting up a data architecture lab to continuously experiment with new data tools. The firm's efforts have resulted in the ability to process petabytes of data per hour, allowing for a quick response to market changes and early identification of trending products.

However, many companies fall into the trap of blindly investing in data solutions without first committing to delivering real value through data use cases. Successful players, on the other hand, scale data platform investments along with value delivery. This phased approach allows for investment to increase as benefits become clear, ultimately saving on upfront costs. The key to success is investing in the resources necessary to deliver the first set of use cases, and then building on that foundation in an incremental way to ensure quick time to market for each new use case.

The challenge of managing data is a persistent issue for many fashion and luxury companies. The lack of high-quality data, clear taxonomies, and common understanding around data can impede progress in data analysis. This is especially true for core data sets, such as those from point-of-sale transactions, which often contain sensitive information like credit card numbers, and SKU-product data, which requires careful management due to inconsistent formats from suppliers.

To address this, fashion companies have established a value-driven data operating model framework that covers 20 to 30 data domains, such as sales, stock, and store transactions. Each domain has a designated owner within the business who is best suited to define the necessary data and understand its impact. These owners work together to ensure a consistent definition of data and implement processes to monitor its quality. This ownership structure emphasizes that the task of obtaining accurate data is not just a technical issue, but a critical aspect of decision-making throughout the organization.

A prominent fast-fashion company that operates seamlessly across multiple channels achieved impressive results through a data governance approach. They established a framework that outlines roles, responsibilities, and processes to ensure the quality of data and establish a clear understanding of essential data sets that support informed decision making. The company created teams to design tools and use cases for the business and concurrently define and implement data governance. As a result, their data quality improved by 50 percent, as indicated by the compliance with data-quality regulations set by the business.

Fashion and luxury companies can leverage machine learning to enhance the quality of crucial data assets like customer information. For example, retailers can utilize pattern recognition algorithms to eliminate duplicates in their customer databases. Other machine learning techniques such as data imputation and natural language processing can also improve demand forecasting.

Many fashion and luxury companies are investing in developing their workforce and transforming their talent and cultural practices. They are attracting talent from academia, digital natives, and start-ups and some firms are building their own data academies to train new data professionals like data architects, data scientists, and data stewards. It is crucial to have a data-driven culture that is not only open to insights and modeling, but actively seeks them, to maximize the value of the data investment. Failing to do so can result in skepticism and resistance to change, leading to a limited impact of the data initiatives.

## 3.2 Training and Adoption

The development of talent and skills within a company is crucial to the success of a digital transformation. To start, it is essential to realign individuals' roles and responsibilities to align with the transformation goals, which can help define the necessary skills and capabilities within the organization.

Having strong internal capabilities is also dependent on engaging key roles such as integrators and technology-innovation managers. Integrators play an important role in translating and integrating new digital methods into traditional work processes, while technology-innovation managers lead digital innovation initiatives with specialized technical skills.

In addition to these critical roles, a successful digital transformation also requires a well-funded and comprehensive approach to talent development. Research shows that a significant investment in digital talent is three times more likely to result in a successful transformation.

In order to ensure success in digital transformations, companies need to adopt a wider range of recruitment methods. While traditional recruitment methods,

such as public job postings and employee referrals, do not have a significant impact, innovative campaigns, such as hosting technology conferences or hackathons, or using unique recruiting processes like gaming or source code puzzles, have been shown to increase the chances of success by two-fold or more.

Successful digital transformations also require cultural and behavioral shifts, such as a willingness to take calculated risks, increased collaboration, and a customer-centric focus. The survey results indicate two key ways to empower employees to adopt these changes.

The first approach involves reinforcing new behaviors and ways of working through formal mechanisms. Establishing new practices, such as continuous learning or open work environments, and giving employees a voice in deciding where digitization can improve the business can contribute to transformation success.

The second approach involves ensuring that key personnel play a role in reinforcing change. Encouraging employees to challenge old processes, promoting risk-taking, and fostering collaboration among units through the involvement of senior leaders and those engaged in transformation specific roles, have been shown to increase the likelihood of success.

Digitizing tools and processes play a crucial role in enabling organizations to empower their employees to work in new ways. The three main factors for success in digital transformation include making information more accessible through digital tools, providing digital self-serve technologies for employees and business partners, and incorporating new technologies into standard operating procedures. Additionally, a reliance on data-driven decision making and the visible use of interactive tools can also significantly increase the likelihood of a successful transformation.

Effective communication is essential during a digital transformation, and there are two key components to it. The first is conveying a compelling change story that clearly explains the organization's goals, reasons for change, and the significance of the changes. This practice has been shown to increase the likelihood of a successful transformation by more than three times. The second component is

senior leaders creating a sense of urgency and communicating it effectively within their units. This can be achieved through clear communication of the transformation's timeline and goals, as well as by sharing a rich and engaging change story.

Transform the way you work. Empowering employees to work differently is crucial for success in digital transformation. This requires not only digital-literate leaders but also a workforce equipped with the skills and capabilities needed for the transformation. Companies must carefully consider the impact of digitization, automation, and other technological advancements on their business and workforce, both in the short and long term, and develop a clear strategy for acquiring the necessary skills and capabilities. Upgrading the organization's processes and tools, as well as adopting a more agile operating model, is crucial to support these changes. Leaders have a vital role to play in letting go of old practices and can benefit from leadership development programs to shift their mindset and behaviors. Revamp communication. Effective communication has always been a crucial factor in traditional change efforts, and it's no different in digital transformation. Companies must adopt creative communication channels that enable faster, more open dialogue and collaboration across the organization, rather than relying on one-way channels like company-wide emails. Tailored, concise messages are also more effective than lengthy communications.

# Chapter 4

# Business Intelligence Tools

## 4.1 Qlik

Qlik is a company that specializes in data visualization and business intelligence through its flagship product, QlikView. This self-service BI platform allows users to create, examine, and share data visualizations and insights, and uses an associative data model that facilitates connections between different data sets. QlikView supports various data sources such as Excel, SQL databases, and cloud data and offers collaboration and data governance features suitable for both individual analysts and large organizations.

QlikView operates similarly to the human brain, making associative connections in the processed information. The user has control and decides the questions to ask by simply clicking on the item they want to know more about. Retrieving data in traditional systems is often a complicated process, but QlikView simplifies it by allowing free selection from data displayed on the screen with a click of the mouse, in contrast to the top-down approach of conventional information search systems.

QlikView provides a unified and comprehensive view of data from various databases, whether they are central or local, and can be used with almost any database.

Qlik was founded in 1993 by three Swedish entrepreneurs, Björn Berg, Staffan Gestrelius, and Ludvig Övrén. The company's software, QlikView, aimed to

make data exploration and visualization more user-friendly and accessible. In 2000, QlikView was launched and the company primarily focused on building its customer base in the Nordic countries. In 2007, QlikTech went public through an initial public offering on the NASDAQ stock exchange.

As the company grew, it expanded globally, opening offices in Europe, Asia, and the Americas. In 2010, QlikTech was recognized as a leader in the Gartner Magic Quadrant for Business Intelligence and in 2012 they introduced QlikSense, a self-service data visualization tool that was an advancement of QlikView. In 2016, QlikTech changed its name to Qlik and announced a strategic partnership with Microsoft to bring new data visualization and analytics capabilities to Office 365.

Today, Qlik is a publicly traded company and remains a leading provider of data visualization and business intelligence software, serving customers across various industries worldwide.
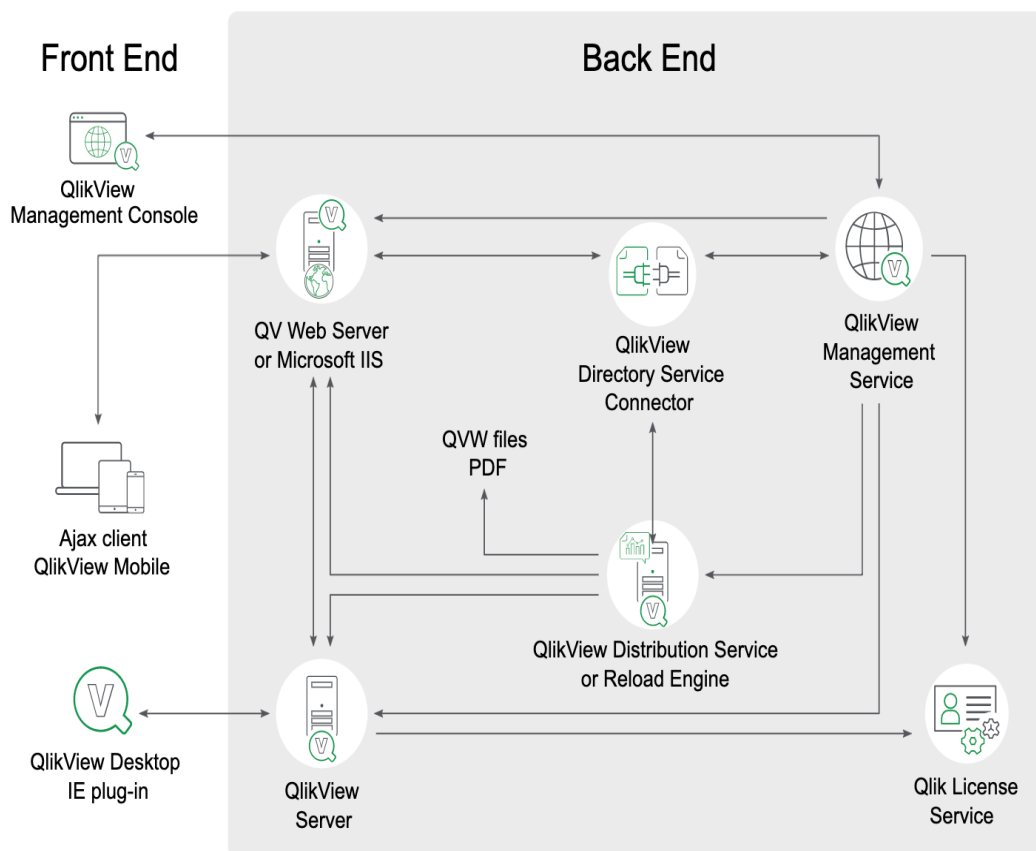


Figure 4.1: Qlik Architecture

Some potential drawbacks of using Qlik for business intelligence and performance management include:

- Self-service BI: QlikView is a self-service BI platform that allows users to create, explore, and share data visualizations and insights without the need for technical assistance

- Associative Data Model: The software uses an associative data model, which enables users to easily connect different data sets and uncover relationships between data

- Multi-Data Source Support: QlikView supports a variety of data sources, including Excel, SQL databases, and cloud-based data, making it possible to combine data from multiple sources for a more comprehensive view

- Data Visualization: QlikView provides a range of data visualization tools and features, making it easy to create interactive, visually appealing dashboards and reports

- Collaboration and Data Governance: QlikView offers collaboration and data governance features, making it suitable for use by both individual analysts and large organizations

- Ease of Use: The software is designed to be user-friendly, with an intuitive interface and drag-and-drop functionality that makes it easy for users to get started

- Scalability: QlikView is scalable and can accommodate the needs of small and large organizations

- Integration: QlikView integrates with other tools and platforms, making it possible to extend its capabilities and improve workflows

Manytimes users don't know what they need from the data so they must have the freedom of play with data and find the best way of managing them. Qlik allows users to create simply and easy view, personalized and assembled data

for their purposes. The ability of making statistical analysis is very useful, this feature allows people to explore and investigate data in depth. Qlik also permits users to make predictive and what-if analysis that can anticipate or improve the strategic conclusions that decision makers have to take.

With the adoption of Qlik organizations can implement useful reporting visualization that help decision makers in their job. Qlik is easy to connect to data sources, people can import spreadsheet and CSV files but also XML, OLAP and relational database. It has an automatic function drove by the AI that prepares, clean and analyze your data, this can save a lot of time because can underline the main patterns and features of data in few moments and allows you to focus on more detailed analyses. The possibility of make dynamic visuals could be very useful, in fact users can play and produce interactive and eye-catching dashboards through the drag and drop function. We also have the possibility of personalized our reports depending on the business unit and on the stakeholders that should see the data. There is also the opportunity of scheduling monthly and weekly reports that will be created automatically. One of the last features that IBM released were the connection between Qlik and the mobile devices, this allows users to be connected anytimes and anywhere. Everyone can pick up the phone and see all the charts that are in a specific dashboard with the relevant data but it's possible to set notification and alerts.

While Qlik offers many benefits, it also has some limitations that may be considered disadvantages by some users. Some of the potential cons of Qlik include:

- Steep learning curve: While Qlik is designed to be intuitive, its user interface can be overwhelming for some users who are not familiar with data visualization and business intelligence software

- Limited customization options: While Qlik provides a range of customization options for visualizing data, it may not be enough for some users who have specific requirements for customizing the look and feel of their dashboards.

- Performance limitations: The performance of QlikView can be affected by the size of the data sets being used, and some users may find that it slows down when dealing with large data sets

- Cost: Qlik can be an expensive solution, especially for small and medium-sized businesses that may not need all the features offered by the software

- Integration issues: Integration with other systems can be challenging, especially for users who need to integrate Qlik with legacy systems

In the end we can say that Qlik is an optimal business reporting tool that allows you to do a lot of things with visualizations, data preparation, statistical methods and so on. One thing that every one should take in consideration is the possibility that the data sources of the firm can be integrated with the tool. If this condition is not observed could be a problem because data from all these sources has to be integrated first and then stored in a centralized location. So with this attention every firm can choose the BI tool which it prefers, according to the business needs and purposes.

## 4.2 Power BI

Power BI is a business analytics service provided by Microsoft. It provides interactive visualizations and business intelligence capabilities with an interface that is simple and easy to use. With Power BI, you can easily connect to your data sources, visualize and discover insights, and share your findings with others in your organization. Power BI allows you to access your data from a variety of sources, including Excel, SQL Server, and cloud services such as Azure and Google Analytics. It also offers a range of pre-built connectors and integration with other popular business applications. Power BI is available as a cloud-based service, as well as a desktop application.

Power BI was born as a secret project in 2006, developed by Thierry D'hers and Amir Netz from Microsoft's SQL Server Reporting Services Team. In that period the project was called "Gemini". Gemini had the power of SQL Server Analysis Services (SSAS) and made it available as in-memory engine. In few years Microsoft started realising a lot of features. In 2009 Gemini was renamed "PowerPivot", a free extension of Excel. In 2010 PowerPivot obtain success with the help of Rob Collie who opened a blog to spread his knowledge about this new tool and Excel, from this moment was developed a lot of data modelling capabilities and the capacity of manage large volumes of data. For example a new feature was Data Explorer that will become "Power Query" that is a data preparation engine that helps you transform and clean your data as well as ingest different sources of data as queries. In 2015 Microsoft merged Power Pivot and Power Query to create Power BI as a new Business Intelligence tool. Even before the launch there were a lot of expectations that over 500,000 unique users signed on to test and help design the revolutionary new product.

Power BI is divided into three main parts, Desktop, Service and Mobile. Power BI Desktop is the free program that people can download in their local PC and load their data in it and play with almost all the features of the software. But Power BI Service is a paid service that is very useful for a company. In this online environment people have their own workspace where they can developed reports

and dashboards for their analysis but common workspace are working areas in which people can work together and share what they do. Another useful feature of Power BI Service is the presence of Apps. Apps are interactive collection of reports and dashboards for the final stakeholders, in fact who have the access to the app can't modify the reports inside it but they can only consult them. Now we can talk about mobile service because Microsoft developed a mobile App that is connected with Power BI Service and allows people to see dashboards, reports and so on from mobile devices in real-time.

One more helpful thing is the manage of datasets that are collection of data which you import or connect to. You can use and connect all sort of datasets which are also associated with the workspaces. A dataset can be the source of information for more than one workspace and can be create by the users. Of course this is a risky practice because organization should give some guide lines to develop certified and standardized datasets to give the same source of truth to people.

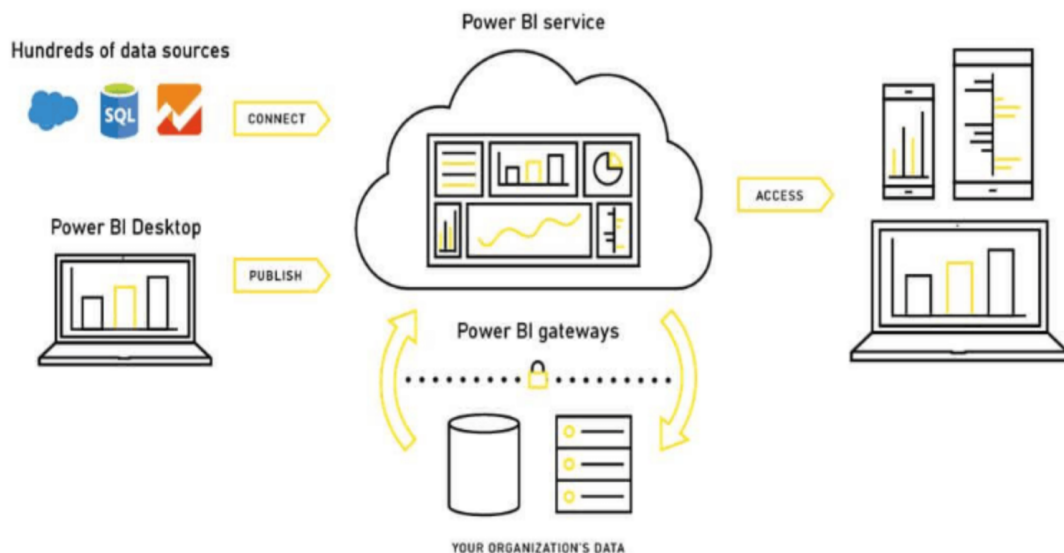As we can see in the image below the architecture of Power BI is very simple and intuitive.



Figure 4.2: Power BI Architecture

We can summarize the best features of Power BI in the following points:

- Data connectivity and integration: Power BI allows you to connect to a wide range of data sources, including Excel, SQL Server, and cloud services such as Azure and Google Analytics. It also offers a range of pre-built connectors and integrations with other popular business applications.

- Data visualization and exploration: With Power BI, you can easily create interactive visualizations and dashboards to help you explore and gain insights from your data. Power BI offers a range of built-in visualization types, as well as the ability to create custom visuals using R or Python.

- Natural language queries: Power BI allows you to use natural language queries to ask questions about your data and get answers in the form of interactive visualizations. This makes it easy for even non-technical users to explore and gain insights from their data.

- Collaboration and sharing: Power BI makes it easy to share your findings with others in your organization. You can publish your dashboards and reports to the Power BI service, where they can be accessed by others in your organization. You can also collaborate on dashboards and reports in real time, using Power BI's built-in chat and commenting features.

- Mobile access: Power BI offers native apps for iOS, Android, and Windows devices, so you can access your dashboards and reports on the go. You can also view and interact with your data on any device with a web browser.

- A huge community: Power BI has a huge community with several blogs and forum where users can ask to other users about their problems with the tool and especially about Dax code that is the part that can give more problems.

Surely Power BI is not the perfect program, it has some limitations. In fact the free version of Power BI has a limited amount of data storage, only 1 GB. Another thing that could be tricky is the language for writing formulas and codes to create measures, tables and so on.

DAX (Data Analysis Expressions) is a formula language used to create calculated columns and measures in Power BI, Power Pivot, and SSAS (SQL Server Analysis Services). It is similar to Excel formulas, but with some additional functions and syntax specifically designed for use in BI and data modeling. DAX formulas are used to perform calculations on data in a Power BI report, such as creating new columns based on existing data, calculating metrics like sum, average, and count, and creating custom measures. DAX formulas can be typed directly into the Power BI report canvas or into the formula bar in the Power Pivot data model. DAX includes a variety of functions for working with data, such as aggregation functions (e.g., SUM, AVG, MIN, MAX), logical functions (e.g., IF, AND, OR), and time intelligence functions. It also includes functions for working with relationships between tables, such as the RELATED and RE-LATEDTABLE functions. DAX is an important part of the Power BI toolset and is used to create sophisticated and dynamic reports and dashboards. It is a good language to learn for those interested in data analysis and BI.

Another critical point could be the relationships between tables that is very rigid and in some cases the join between tables could be difficult and solutions are a bit complex.

Some of the potential drawbacks of Power BI include:

- Cost: Power BI is not free. While there is a free version of Power BI available, it has limited capabilities and is best suited for personal use. If you want to use Power BI for your organization, you will need to purchase a subscription.

- Limited data storage: The free version of Power BI only allows you to store up to 1 GB of data. If you have a large amount of data, you will need to purchase a paid subscription, which offers more storage.

- Complexity: While Power BI has a simple, user-friendly interface, it can still be complex to use for users who are new to business analytics or don't have a lot of technical expertise. It may take some time to learn how to use Power BI effectively.

- Dependence on Microsoft: Power BI is a Microsoft product, so it is closely tied to other Microsoft technologies and platforms. This means that if you are not already using other Microsoft products, you may need to invest in additional software and infrastructure in order to use Power BI.

- Limited support for on-premises data: Power BI is primarily a cloud-based service, so it is not well-suited for organizations that need to analyze on-premises data. If you have on-premises data that you need to analyze, you may need to look for an alternative solution.

## 4.3 Main Features

In the previous sections we explain the structures and the main features of Cognos and Power BI. For a company is always difficult to choose which BI tool fits for its organization, because there's no right answer. Of course the Business Intelligence team of the firm can think about its requirements and try to understand which tool can be more appropriate but it's not easy.

The majority of BI solutions offered by the market are basic features like data analysis, ad-hoc reports, dashboards, data visualization, performance metrics, ad-hoc query, ad-hoc analysis, and key performance indicators. But which are the advance features that firms should be aware when selecting a BI tool?

**Data Quality Management**

Data quality management is the process of ensuring that data is accurate, consistent, and complete. It involves identifying and correcting errors or inconsistencies in data, as well as establishing processes and controls to prevent future errors. There are several steps involved in data quality management, like: defining data quality standards, identifying and correcting errors, establishing data governance, ensuring data security, monitoring and maintaining data quality. Effective data quality management is essential for businesses that rely on data to make decisions. Poor quality data can lead to incorrect conclusions and faulty decisions, which can have serious consequences for a business.

**Visualizations**

Data discovery and visualization is the process of finding, examining, and visualizing data in order to extract insights and gain a better understanding of the data. It involves using tools and techniques to explore and analyze data, and then presenting the results in a visual format that is easy to understand. Good features of data discovery and visualization allow firms to reduce pressure on their data scientist because every one can easily perform this type of analysis and taking decisions in the right way. The implementation of AI can help in this phase because there are a lot of algorithms that performs these type of analysis to simplify human's work and speed up the process without errors.

**Self Service BI**

Self-service BI refers to a type of BI tool that allows users to access, analyze, and visualize data without the need for technical expertise or support from IT staff. Self-service BI tools are designed to be easy to use, with intuitive interfaces and drag-and-drop functionality that allow users to create their own reports and dashboards.

Self-service BI tools are often used by business analysts, marketing professionals, and other non-technical users who need to make data-driven decisions but may not have the technical skills to work with raw data. With self-service BI, these users can access the data they need and create their own reports and dashboards, without having to rely on IT or data analysts to do it for them. This type of feature can improve the speed of decision making, increment flexibility, reduce reliance on IT and reduce the overall costs. Self-service BI is a valuable tool for organizations that need to make data-driven decisions but do not have the resources or technical expertise to do so. It can help businesses access and analyze data more quickly and effectively, enabling them to make better decisions and drive growth.

**Data Governance**

Data governance is the overall management of the availability, usability, integrity, and security of data used in an organization. It involves establishing a

set of policies, procedures, and standards for acquiring, storing, processing, and using data, as well as defining roles and responsibilities for data-related activities. The goal of data governance is to ensure that data is used effectively, ethically, and legally, and that it supports the needs and goals of the organization. Effective data governance is important for ensuring the integrity, accuracy, and security of an organization's data, and for building trust with customers, partners, and other stakeholders. It can also help organizations better understand and use their data to make informed decisions, improve operations, and achieve their business goals.

**Data Management**

Data management refers to the process of collecting, storing, organizing, and maintaining data in a way that ensures its availability, accuracy, and security. It involves a set of practices and processes that are designed to support the effective and efficient use of data within an organization. Effective data management is important for ensuring the availability, integrity, and security of an organization's data, and for supporting the organization's business goals and objectives. So the main purpose is to optimize the use of data and simplify the life of IT department. With the development of Cloud Services, solutions become easier, faster and more flexible speeding up a lot of processes.

**Augmented Analytics**

Augmented analytics is a type of data analytics that uses artificial intelligence (AI) and machine learning (ML) techniques to automate the process of analyzing data and generating insights. It involves the use of tools and technologies that can automatically discover patterns, trends, and insights in data, and present them in a way that is easy for users to understand and act upon. Augmented analytics can help organizations to reduce the time and effort required to analyze data, and make data analytics more accessible to a wider range of users. So a BI vendor that can offer something like this could have a great advantage.

**Mobile Business Intelligence**

Mobile business intelligence is the use of mobile devices, such as smartphones

and tablets, to access and analyze business data in real-time. It allows users to access, visualize, and interact with data and analytics on the go, enabling them to make informed decisions and take timely action based on the insights they receive. Nowadays almost all the BI providers have developed apps for reading reports, dashboards and important information in every place of the world. With these apps people can access to every kind of data for taking decisions everywhere. Mobile BI can help organizations of all sizes to better understand and use their data to make informed decisions, improve operations, and achieve their business goals. It can also help increase productivity and enable users to make data-driven decisions on the go.

**Real Time Analysis**

Real-time analysis is the process of analyzing data as it is generated, allowing organizations to quickly understand and act on the most current information. This can be particularly useful in situations where time is of the essence, such as in supply chain management, fraud detection, or customer service. Real-time analysis typically involves the use of specialized software and technologies that can process and analyze data in real-time, as well as visualize and present the results in a way that is easy for users to understand and act upon. Some features of real-time analysis are: stream processing, alerts and notifications, visualization, collaboration.

**Agile BI Development**

Agile BI development is a method of developing and implementing business intelligence solutions that is based on the Agile software development methodology. Agile BI development involves iterative and incremental development, with a focus on rapid prototyping and flexible response to change. With this features we intend the strict collaboration between IT department and the business area, improving this can bring a lot of advantages. IT can developed ad hoc processes according to business needs saving a lot of time for each team and improve the quality of data because often the two teams don't collaborate in the right way and this can bring some misunderstandings in what business really needs and

consequently some errors.

**Data Warehouse Modernization**

Data warehouse modernization refers to the process of updating and upgrading an organization's data warehouse to make it more efficient, scalable, and flexible. This can involve a range of activities, including migrating to new hardware or software platforms, improving data integration and management processes, and adopting new technologies and approaches such as cloud computing or big data analytics. Some key consideration could be: scalability, performance, flexibility and cost reduction. It can also help organizations stay competitive and adapt to changing business needs and requirements.

**Data Driven Culture**

A data-driven culture is one in which data is used to inform decision-making at all levels of an organization. This means that data is collected, analyzed, and used to guide actions and strategies, rather than relying on gut feelings or tradition. Adopting a data-driven culture can have many benefits, including: improve decision making, increase efficiency, enhance costumer experience and increase competitiveness. To establish a data-driven culture, organizations should prioritize data literacy, invest in data infrastructure and tools, and establish clear processes for collecting, analyzing, and using data. It is also important to have strong leadership and buy-in from all levels of the organization to ensure that data is used effectively.

**Data Preparation for Business User**

Data preparation is the process of cleaning, organizing, and transforming raw data into a form that is suitable for analysis and decision-making. It is an important step in the data analytics process, as it ensures that the data is accurate, complete, and usable. We talk about: data cleaning, data integration, data transformation and data enrichment. Effective data preparation is important for business users because it ensures that the data they are working with is reliable and accurate. It can also save time and effort by automating certain tasks and

streamlining the data analytics process.

**Data Storytelling**

Data storytelling is the process of using data and visualization to communicate information and insights in a clear, engaging, and compelling way. It involves presenting data in a way that tells a story, rather than just presenting raw numbers or statistics. Effective data storytelling can help business users understand complex data sets and make informed decisions. It can also be used to communicate the results of data analysis to stakeholders or the general public. To create a good data story, it is important to start by identifying the key points and insights that you want to communicate, and then choose the appropriate data and visualizations to support those points. It can also be helpful to have a clear audience in mind and tailor the data story to their needs and interests. The key element that people should have take in mind are: transmit a clear and concise message, engaging visualizations, follow a narrative structure, communicate emotions.

**Using Open Data**

Open data refers to data that is freely available for anyone to access, use, and distribute. It is often published by governments, research organizations, or other public bodies, and can include data on a wide range of topics, such as health, education, transportation, and the environment. To use open data effectively, it is important to carefully evaluate the data to ensure its quality and relevance, and to be aware of any terms of use or licensing restrictions that may apply. It is also important to follow best practices for data privacy and security, as open data may contain sensitive or personal information.

**Data Labs**

Data labs, also known as data science labs or data innovation labs, are organizations or departments within organizations that are focused on using data and data-driven technologies to drive innovation and solve business problems. Data labs often have a multidisciplinary team of data scientists, engineers, and other professionals who work together to collect, analyze, and utilize data to improve

decision-making and drive business value. Data labs can be used to: explore new data sources and technologies, develop data-driven products and services, enhance existing products and services, solve business problems. To be effective, data labs often require robust data infrastructure and tools, as well as a culture that values data and encourages data-driven decision-making.

**Visual Design Standards**

Visual design standards are guidelines that outline the principles and best practices for designing visual elements, such as graphics, typography, color, and layout. These standards can help ensure that a company's visual branding is consistent across all its communications and materials, and that the designs are effective and professional. Visual design standards may include guidelines on: typography, color, graphics, layout. Visual design standards can help ensure that a company's visual branding is consistent and professional, and that its communications are effective at conveying the desired message. It is important to regularly review and update visual design standards to ensure that they are relevant and effective.

**IoT Analytics**

IoT analytics refers to the process of collecting, analyzing, and utilizing data from Internet of Things devices and systems. IoT devices are connected devices that are embedded with sensors and other technologies that allow them to collect and transmit data over the internet. These devices can be found in a variety of settings, including homes, factories, and cities, and can generate large amounts of data. IoT analytics involves using data from IoT devices to gain insights and make informed decisions. This can involve analyzing the data in real-time to identify patterns and trends, or using machine learning algorithms to identify patterns that may not be immediately apparent. To effectively perform IoT analytics, organizations typically need robust data infrastructure and tools, as well as a strong data science team. It is also important to carefully consider data privacy and security when working with IoT data.

**Big Data Analytics**

Big data analytics involves using advanced tools and techniques, such as machine learning algorithms and distributed computing, to analyze and extract value from large data sets. It can be used to solve a wide range of business problems, such as improving customer segmentation, optimizing supply chain management, and identifying fraudulent activity. To effectively perform big data analytics, organizations typically need robust data infrastructure and tools, as well as a strong data science team. It is also important to carefully consider data privacy and security when working with big data. Some key challenges in big data analytics include: data volume, data variety, data veracity and data velocity.

**Data Lake**

A data lake is a centralized repository that allows an organization to store all its structured and unstructured data at any scale. Data lakes are designed to handle large volumes of data from a variety of sources, including transactional databases, log files, sensor data, social media, and more. The data in a data lake can be stored in its raw, unprocessed form, making it easier to analyze and extract value from the data. Data lakes are often used in conjunction with big data analytics, as they provide a scalable and flexible way to store and process large volumes of data. They can be accessed by a variety of tools and technologies, including SQL, machine learning algorithms, and data visualization tools. There are some benefits from using a data lake: scalability, flexibility, integration, cost-effectiveness. To effectively use a data lake, organizations should have a clear understanding of their data needs and a robust data governance strategy in place. It is also important to carefully consider data privacy and security when working with a data lake.

**Edge Computing and NLP**

Edge computing refers to the use of computing resources at the edge of a network, rather than in a centralized data center or cloud. This can involve deploying small, distributed computing systems, such as edge servers or gateways, to process data closer to the source. Edge computing is often used in situations where

low latency or real-time processing is required, such as in the Internet of Things, or in situations where connectivity is unreliable or bandwidth is limited. Natural language processing (NLP) is a field of artificial intelligence that focuses on the development of algorithms and technologies that allow computers to understand and process human language. NLP can be used to extract meaning and insights from text and spoken language data, and can be applied in a variety of areas, such as language translation, chatbots, and text classification. To effectively use edge computing and NLP together, organizations may need to invest in specialized hardware and software, and have a strong data science team in place.

## 4.4    Comparison

The features in the previous section are the most present in the BI solutions that organizations offers. In this way firms that need these solutions can have a comparison between the best features. Of course we have to take in consideration a lot of factors because every organization is unique with its particular requirments.

For this reason we collect some tips for comparing BI tools:

- Determine your needs: Before you start comparing BI tools, it's important to understand what you need the tool to do. Make a list of your business objectives and the specific features and capabilities that you require from a BI tool.

- Consider your budget: BI tools can vary significantly in price, so it's important to consider your budget when comparing options. Determine how much you are willing to spend and look for tools that fit within your budget.

- Evaluate the user interface: The user interface (UI) of a BI tool is important because it determines how easy it is for users to navigate and interact with the tool. Look for a tool with a user-friendly and intuitive UI.

- Check for integration capabilities: If you already have other business applications in place, it's important to ensure that the BI tool you choose

can integrate with these systems. Look for tools that offer a wide range of integration options.

- Look for scalability: If your business is growing or has the potential to grow, you'll want a BI tool that can scale with your needs. Look for a tool that can handle a large volume of data and users.

- Review the vendor's reputation: It's important to choose a reputable vendor for your BI tool. Look for vendors with a track record of delivering high-quality products and good customer support.

- Consider the learning curve: Some BI tools can be more difficult to learn than others. If you have a limited amount of time or resources to devote to training, you may want to look for a tool with a shorter learning curve.

- Try before you buy: Many BI vendors offer free trials or demos of their products. Take advantage of these opportunities to try out the tool and see if it meets your needs before making a purchase.

With these advises a company can understand what is the best solution and implement it. In the end we can say that every business tool has his pro and cons and some tool are better in something and other in something else so every firm must choose the one that fits better for its business with the features in which it is more interested in.

# Chapter 5

# Practical Example

## 5.1 How to Replicate a Report

A digital transformation is not easy to face for people. Things that people were used to do completely changed and now they have to learn something new to do old tasks. One difficult challenge is to replicate old reports and analysis with the new tool and trying to improve them. Usually who works in the business ask to replicate the version of their reports with the new tool, in our case Power BI. So a report example is given to data analyst or IT department to create a new version in Power BI. The first difficult is understand metrics meanings and acronyms that for someone who doesn't know the business can be very tricky. At this point we have to decide how to proceed. We can explain 3 methods to manage this problem.

**Lift and Shift**

Usually business is not patient and when it ask something it wants it immediately, so a common approach is to simply replicate the old report that is quite always a big table with several metrics and fields to import in Power BI. In this way the only thing to do is copying the old report and transfer it into a dashboard with the same layout with matrices and tables.

The result obtain is a new version equal to the old one, with correct numbers and good performances. At first, the business is happy, because the report no

longer needs to be made manually. While it does address some immediate, basic needs, after some time, another Excel version of the report starts being distributed again. Often the usage of the report in Power BI will be very slow because people prefer using the old tools like Excel and distributing it in this format. Of course this isn't the optimal result, because the report is copied and it works, but it's clearly not helping the business be more effective or answer their questions with insights on data. Lift and shift can lead to miss opportunity to leverage the advantages of the tool being used, it might create a sub-optimal solution to fill functionalities and other tools and in the end it avoids changes and improvement. When using a lift and shift approach, we miss the chance to enhance existing reports by utilizing the features of Power BI to benefit the business. This method is sometimes chosen because it is thought to be quicker or more efficient in terms of resources, as no new features or redesigns are required. However, this is often not the case as the negative impact on the end-product quality can outweigh any resource savings, leading to additional time and resource expenditure for post-implementation changes and redesigns.

With this approach, the new report retains all the problems from the original, which was designed for a different tool. Instead of taking advantage of the visualization capabilities of Power BI, we have treated it like Excel by only using table and matrix visuals. However, Power BI is not like Excel as users cannot modify cells or perform additional calculations, leading to adoption and export issues. Our attempt to automate has resulted in a solution that does not meet the needs of users, causing additional steps and downstream export reports.

When creating reports in Power BI, it is crucial to align the tool capabilities with the design to fully leverage its value. The table in this report is lengthy and complex, making it difficult to quickly obtain insights. Power BI's visualization capabilities can help users access information more efficiently and effectively compared to navigating the table.

**Needs and Expectations**

Management has tasked a small consulting team with revamping the report.

To kick off the Power BI project, the consultants send a "requirements template" in the form of a well-structured Excel file to the users. The template includes questions and information requests, as well as sections for technical and functional requirements.

After showcasing sample reports to stakeholders, the requirements file is reviewed, approved, and finalized in a series of meetings. The build is then estimated and the project can finally commence. Although it took some time, the report was eventually developed based on the finalized business requirements document.

The consultants put their expertise in creating Power BI reports to work and aim to create something visually stunning. While a few requirements had to be modified, they managed to meet all the requirements. They believe the final report is not only in line with best practices but also more professional and aesthetically pleasing compared to the previous version.

The delivery presentation and demonstrations of the report receive positive feedback from management and impress stakeholders, leading to its launch. However, despite initial high usage, usage of the report drops significantly over time. Surprisingly, it's even used less than the previous "lift and shift" version at one point.

Although there are many requests for modifications and additions to the report, some users continue to rely on Excel reports connected to outdated systems, citing a lack of detail or the perceived "fancy" nature of the reports. Eventually, the report is primarily utilized by executive leadership while the majority of the user base turns to alternative tools and data sources for their information needs.

Requirements document has many assumptions to satisfy, this makes things difficult. In fact it's not easy to represent the entire group of stakeholders, maybe people is not able explain their needs in a complete and efficient way.

Requirements documents are sometimes used as a way to simply determine when a report is considered "complete" once all the necessary elements have been included. However, this approach can lead to avoiding meaningful engagement with business users and can result in stakeholders taking on the responsibility for

report scope and design without proper support.

While it may seem fair for Power BI experts to not dictate the content of the report, it's important to remember that business users may need assistance in translating their questions and needs into technical and functional requirements, especially if they are unfamiliar with Power BI reports. The process of defining the requirements should ideally be a collaborative effort.

Involving business users requires additional time and effort, but in my experience, it leads to better outcomes and higher adoption. Discussions with business users can provide valuable insight into their perspectives, challenges, and pain points, giving a clearer understanding of their reporting needs than if they were to document it themselves. Data experts can observe users as they interact with existing reports, gather information on their actions and the data they use, and identify the key business questions and problems they are trying to address. With the help of business experts, data experts can then define ways to effectively answer those challenges in a report. These become the foundation of the report and, when documented, form the basis for the reporting requirements.

**Understand Business Needs**

Another approach could be investing more time with the future users of the reports trying to understand the real needs and requests. The project team should be able to answer to who will use the report? which questions and business problems are they facing? How the report will bring values to the company?

A workshop can be a right solution to face these questions. The team begins by determining the report's intended audience in collaboration with the users. They identify multiple user groups, each with distinct needs and perspectives, ranging from managers who require a quick overview of the top line to analysts who need to delve into the details. The project team documents these insights and moves on to review existing reports and data. Working together, they define the business questions and problems the users aim to address by asking questions based on their own research and listening as users describe how they use the reports, what information they are searching for, and what actions they take

with the data.

The ultimate prototype was distinct from the initial report, but it efficiently addressed many of the same questions, allowing users to quickly access the information they needed and gain a clearer understanding of their situation. As the developer had a better understanding of the business needs, she made improved design choices such as choosing the appropriate chart types and highlighting the relevant metrics.

Upon release, the report received significantly greater usage and adoption compared to prior reports. Although there were still occasional feedback and requests, they were now made with the aim of fostering ongoing collaboration rather than trying to cram everything into a single report.

Having discussions with users, if possible, can be the most beneficial step in a reporting project. However, for the discussion to be productive, it must be guided by posing the appropriate questions, examining existing reports and data, and observing how users interact with their information. When done effectively, these discussions can enable report creators and business users to jointly determine the critical questions the report needs to address, leading to the clear formulation of requirements.

Involving users in the reporting project process can enhance report adoption and usage after implementation. This is because users will have a better understanding of what to expect from the report and will have had a hand in its design and creation. This collaboration can lead to a more positive experience for both parties, as users will feel heard and valued in the process.

Additionally, any prototypes or mock-ups produced during the project can serve as a model for future, larger projects. This provides clarity for both users, who know what they can expect from the report, and report creators, who understand what they need to produce. The prototypes can also help data engineers comprehend how the data will be consumed and displayed. Emphasizing the co-creation approach by addressing business questions and problems can also be beneficial in self-service scenarios. This often involves the formation of a community of practitioners who share knowledge and resources, and where co-creation

can bring value. In this sense, effective co-creation is a hallmark of a strong and thriving community of practitioners, where the focus is on answering questions instead of just gathering data. This collaborative approach between consumers and creators can be applied to various usage scenarios, ranging from enterprise-level to managed self-service.

Conducting such workshops and prototypes is not a simple task. It demands a considerable amount of effort and planning to run these workshops effectively, and requires a unique set of interpersonal skills to execute successfully. Simply showing up in a call and expecting users to reveal their needs and wants is not enough; it's not much different from relying solely on a requirements document.

However, if communication and change management issues exist, the workshops may become challenging. If the users are either unavailable or unwilling to change, it becomes challenging to have a productive collaboration. But, if both the developer and user are open to collaborating and remain solution-focused, these discussions can bring tremendous value to a reporting project and be an enriching experience for all involved.

Obtaining the right requirements for a report is a critical but complex task. Without an in-depth understanding of business requirements, the report will fall short in providing relevant answers and insights. A report may be visually appealing and speedy, but if it's not being utilized, it's not adding any value.

The most effective way to gain this understanding is to establish a connection with users and see things from their perspective. Engaging in conversations with them can help build empathy. Even if workshops are not always possible, striving for a collaborative, iterative process can lead to the creation of more valuable reports for your organization.

## 5.2   Dashboard Examples

### 5.2.1   Fashion Firm Dashboards Example

We can focus now on a practical case, in which a fashion company must duplicate a report. The report is composed by 3 different pages, the first one is about the "Versato di produzione", it deals with topics that revolve around comparing the quantities delivered by suppliers (specifying if they meet the predetermined deadlines or if there are any accumulated delays), as well as the invoicing for the well-versed in production. Another important aspect is the average time it takes to take orders, along with the average resource procurement for final products. Then, an emphasis is placed on the percentage of quantities delivered by the supplier to understand the punctuality and efficiency of the supplier. Finally, it is important to analyze the reliability of the supplier regarding the planning and delivery of the produced quantities.

The dashboard below has filters at the top and KPIs that show the sum of the delivered pieces, the total invoice, the total of the moved hours, the average of the delivered pieces for the last 4 weeks, and finally, the average of the moved hours in the last 4 weeks. The three containers we see have the goal of first showing the situation by year-month, then weekly with a different focus for each chart: the one at the top left analyzes the delivered pieces, the bar chart on the right shows it for the moved hours, while the last one indicates the total invoice for year-month or weekly. Finally, we can see an indicator that calculates the average of the order taking-in-charge days (calculated by subtracting the competency date of the payment from the supplier's DDT date) and a pie chart that shows the sum of the pieces moved by commodity class (Small leather goods, bags, and belts).

The "Acquisti LG" application focuses on the direct component purchases of bags. This tool is used by the purchasing office to summarize what is being done in terms of ordering: for example, it allows to monitor the quantity received and still pending by commodity class, to verify the punctuality of suppliers.

In this dashboard, we can find the filters at the top that allow us to select the year of an order or the month or season. There are then tables or graphs
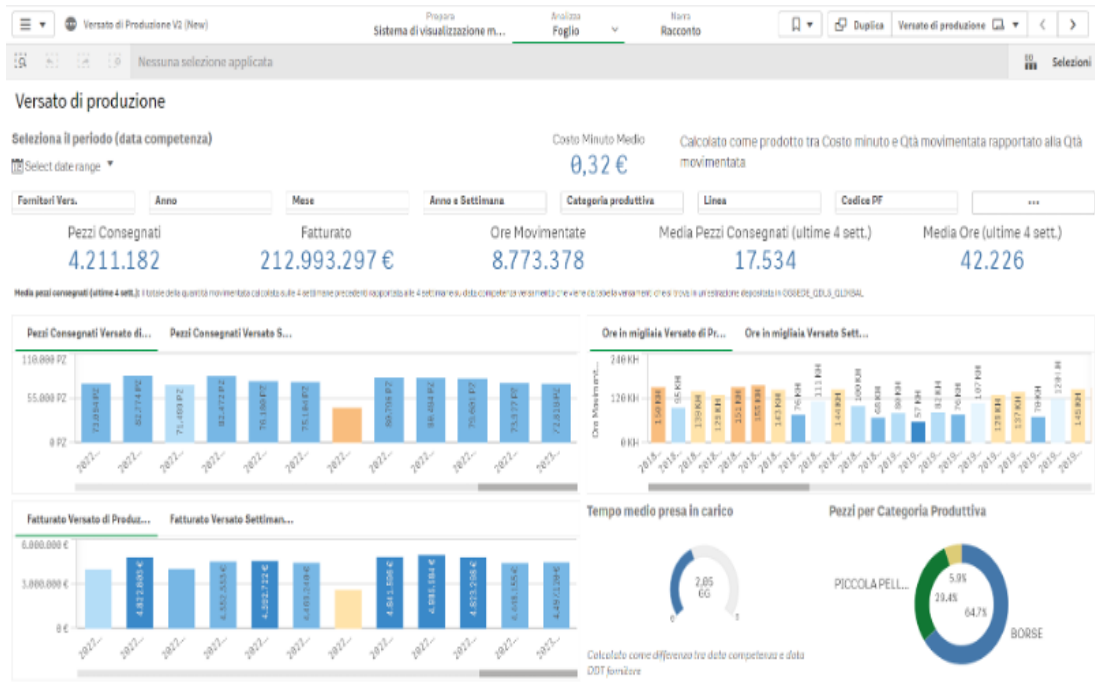
Figure 5.1: Production Payment

that indicate the total value of the orders and their composition in terms of supplier, style or color. The first table on the left indicates the value of Actual and that of all commodity classes or for some in particular (Leathers, fabrics, or metallic accessories). The bar graph on the right shows the composition of the products for the seasons. The graphs in the bottom container keep track of the cumulative orders, the orders according to the commodity class, and finally the ordered amount by season.

The "Centro di taglio" application compares the actual production with what is expected according to the standard bill of materials, calculating both material consumption savings and economic savings. These are obtained by modifying the bill of materials with a new standard or any extra consumption compared to the standard. The application compares the actual production to what is expected according to the standard in the bill of materials, calculating both the savings in terms of materials consumption and the economic savings. These are obtained by modifying the bill of materials with a new standard or any extra consumption compared to the standard. In this dashboard, we find filters on the right that allow us to select the month or year of reference, the type of product (Leather
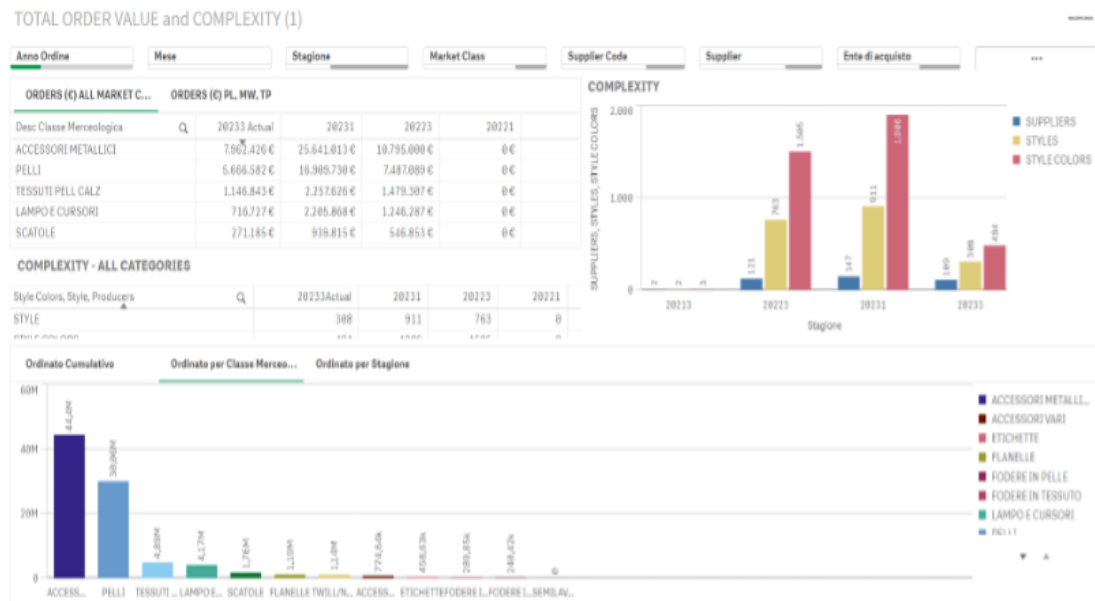
Figure 5.2: LG Purchases

goods, belts or leather goods), or the line. The table on the left shows the monetary and SQ cut consumption and the number of pieces cut for the product category. The table on the right, on the other hand, indicates the turnover, the hours worked, the number of pieces cut, and the value per piece (Turnover / Pieces). The "Saving/extra cost of Materials" chart shows the value of savings and extra costs of the materials used by year-month. The line graph indicates the trend of turnover for the type of cut, in this case Internalized (blue line), and the trend of the number of pieces cut (red line) for various years. The chart on the bottom left stacks the type of product (leather goods or small leather goods) by year-month and calculates the sum of the pieces. Finally, at the bottom right, we find a summary table that adds up the number of pieces cut of various items, divided into three types of product (Leather goods, Small Leather goods, and Belts).

### 5.2.2 Table Structure

In this section we can go deeply in the table structure of the dashboards. Usually for business intelligence tool we see a star schema structure, it is a data modeling technique designed to simplify querying and analysis of large, complex datasets
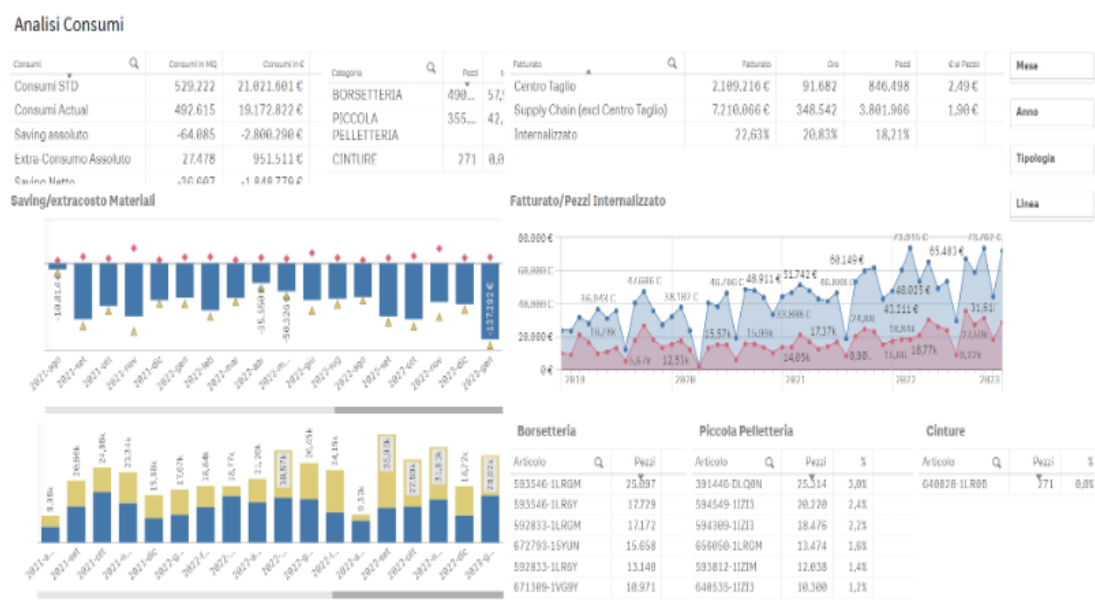
Figure 5.3: Cutter Center

by organizing the data into a central fact table and several dimension tables.

The central fact table contains the measures or facts of interest, such as sales, quantities, and amounts, while the dimension tables provide context and descriptive information about the facts. Each dimension table has a one-to-many relationship with the fact table, and the relationships are represented by the lines connecting the tables.

The star schema structure is called a "star" because the diagram resembles a star, with the fact table in the center and the dimension tables radiating outwards. The use of star schema structure helps in improving query performance and simplifying data analysis by reducing the amount of redundant data and improving data access paths.

In our case we have a look on the "Versato di produzione" table, that is quite complex instead of the others that are easier. In this structure all the tables are linked with the fact of "Versamenti", with some keys that are already inside the model but some of them are calculated ad hoc to allows specific analysis.

- K art: 'Modello'-'Parte'-'Colore'-'Stagione

- K commessa: "Ente CP"'-'"Secolo/Anno CP"'-'"Numero CP"'-'"Indice CP"

- K scad: "Ubicazione Magazzino"  upper("Classe produttiva")

- key template lanc: replace(ltrim(replace("CODICE FORNITORE"0',' ')), ' ', 0)trim("CLASSE PRODUTTIVA")

- K delivery: replace(ltrim(replace("Ubicazione Magazzino",'0',' ')), ' ', 0)/*"Descriz. Ubicazione Magazzino"*/-'ModelloParteColore'-'num(date(Year("Data competenza Versamento"),'YYYY'),'00')'-'num(date(week("Data competenza Versamento")),'00')

- key template sat: replace(ltrim(replace("CODICE FORNITORE",'0',' ')), ' ', 0)trim("CLASSE PRODUTTIVA")

- key cons plan: replace(ltrim(replace("Ubicazione Magazzino",'0',' ')), ' ', 0)/*"Descriz. Ubicazione Magazzino"*/-'ModelloParteColore'-'num(date(Year("Data competenza Versamento"),'YYYY'),'00')'-'num(date(week("Data competenza Versamento")),'00')

- key template: replace(ltrim(replace("Ubicazione Magazzino",'0',' ')), ' ', 0) "Classe produttiva"

- k lt std: year( DATE(date("Data competenza Versamento",'DD/MM/YYYY')))'-'num(date(Month("Data competenza Versamento")),'MM'),'00')'-'"Descriz. Ubicazione Magazzino"'-'"Classe produttiva"

- k lt: year( DATE(date("Data competenza Versamento",'DD/MM/YYYY')))'-'num(date(Month("Data competenza Versamento")),'MM'),'00')'-'"Descriz. Ubicazione Magazzino"'-'"Classe produttiva"

All this code in Qlik are creating a new expression that combines various elements of data to create a unique identifier. The expressions often concatenate only string text adding spaces, underscore or other text value to create ad unique key. There are also some complex codes that create a unique date with the location and also the production class to give the highest detail in the tables. Below we can see the result of this work.

After connecting all the keys between each table, we can now create visuals and obtain the first dashboard images. A huge part of the work is to understand
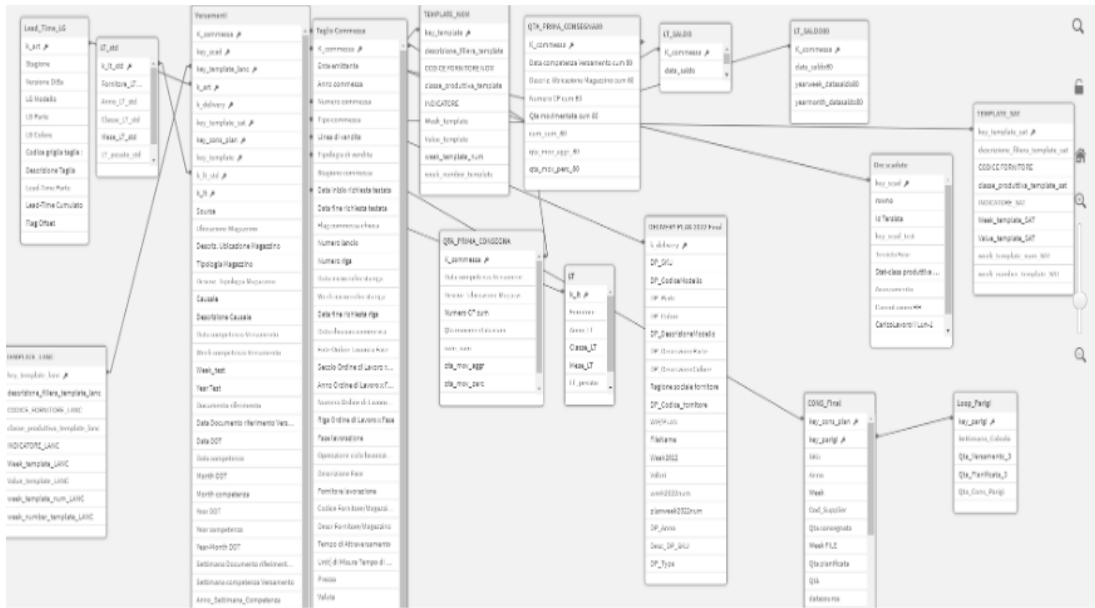
Figure 5.4: Table Structure

what the client wants to see and also what is the purpose of the analysis. So from this point of view we can recreate the model using Power BI and following the same schema as before. Probably the most difficult and time consuming part is the data modelling and preparation. All things must be in the right way and the use of a new tool could be tricky or more complex, but after that the creation of a new dashboard should be easier keeping in mind all the tips and advices cited before.

# Chapter 6

# Conclusions

The main purpose of this thesis is to give an overview of how complex a digital transformation could be in a firm.

In the first information system is defined as an integrated set of components that capture, store, process, and provide data and digital products. It is used to manage business operations, interact with customers and suppliers, and compete in the marketplace. The components of an information system include hardware, software, data, people, and processes. We mention also the importance of skilled people, efficient processes, and alignment of the IS strategy with the corporate strategy.

Data is a crucial component in today's business world as all units use and analyze data to gain insight into activities within and outside their organizations. Companies collect data from various sources and must extract the relevant information from the vast amount of data available. The main goal of BI is to help companies make better decisions in the short and long term and respond quickly to changes in the market. BI requires collecting, preparing, and analyzing data to ensure quality information is used to make decisions. The process of BI involves a continuous improvement cycle of obtaining information, making decisions, measuring success, and learning lessons.

The fashion industry is highly competitive and constantly changing, making it difficult for companies to stay ahead. Adoption of digital technologies, including data science and big data, has become a way for companies to gain a competitive

edge. The COVID-19 pandemic has further pushed companies to adopt a data-driven approach.

The success of a digital transformation in a company is highly dependent on the development of talent and skills within the organization. To start, realigning individuals' roles and responsibilities is important to align with the transformation goals and to define the necessary skills. A well-funded and comprehensive approach to talent development, along with a wider range of recruitment methods, is also necessary for success. Cultural and behavioral shifts, such as a willingness to take risks, increased collaboration, and a customer-centric focus can determine the success or the failure of this change. Empowering employees to adopt these changes can be achieved through reinforcing new behaviors and ways of working and involving key personnel in reinforcing change. Effective communication, with a compelling change story and urgency from senior leaders, is essential for success. Companies should adopt creative communication channels, and leaders should benefit from leadership development programs to shift their mindset and behaviors. The fashion industry can benefit from a data-driven approach, including increased sales and improved inventory management, by first defining a strategy, involving various executives and the Chief Data Officer, and making data-related decisions.

The two tools in question are Qlik and Power BI which are two popular data visualization and business intelligence tools that help organizations make data-driven decisions. However, there are some key differences between the two that make them suitable for different types of organizations and use cases.

In terms of data visualization, both Qlik and Power BI offer a range of chart types, including bar charts, line charts, scatter plots, and more. However, Qlik is often considered to have a more flexible and customizable visualization engine, while Power BI is considered to have a more user-friendly and intuitive interface for creating visualizations.

Overall, both Qlik and Power BI are powerful tools for data visualization and business intelligence, and the choice between them will depend on the specific needs and requirements of an organization. It is recommended to assess the

organization's data complexity, user skill levels, integration requirements, and budget before making a decision.

The thesis provides an overview of digital transformation and its importance in companies. It highlights the various components of an information system, such as hardware, software, data, people, and processes, and the role of business intelligence (BI) in making data-driven decisions. The fashion industry is mentioned as an example of an industry that can benefit from a data-driven approach, but success is dependent on talent development and cultural and behavioral shifts.

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