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SEIZING BIG MARKETING OPPORTUNITIES IN EUROPE: A ROADMAP
FOR EFFICIENT BIG DATA IMPLEMENTATION IN SPANISH SMEs

Módulo:
Marketing

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ABSTRACT

This report aims to help small and medium enterprises (SMEs) to seize the potential of Big Data in their marketing strategies to leverage a competitive advantage in the raising digital marketplace and lead the post pandemic recovery.

Spanish SMEs face serious hurdles working with Big Data, like data talent shortage or poor digital infrastructures. To pose the grounds for a successful Big Data implementation, this guide follows an innovative methodology, providing SMEs with updated information on how to access the most appropriate opportunities among the historic financial stimulus mobilized by the European Union. This report is extremely relevant at date, because all the identified calls are forthcoming.

Besides generating financing opportunities for SMEs, this guide's value lies on its end-to-end approach when it comes to support SMEs' Big Data strategy, by offering the most profitable tools to analyze data, thus overcoming SME's issues with Big Data management and monetizing their marketing strategies.

Key words: Big Data, Business Intelligence, Behavioral Analytics, Small and Medium Enterprises (SMEs), Europe, Digital Spain.

RESUMEN

Este trabajo busca ayudar a las Pymes (Pequeñas Medianas Empresas) a liderar la recuperación económica a través de la implantación de los “Big Data” en sus estrategias de marketing digital.

Las Pymes españolas se enfrentan a grandes dificultades al operar con “Big Data” como su baja adopción tecnológica o la escasez de habilidades digitales avanzadas. Para garantizar su digitalización, esta guía con información actualizada sobre cómo acceder a las históricas oportunidades de financiación movilizadas desde el seno de la Unión Europea, así como las herramientas para conseguirlas y las áreas donde invertir. Actualmente, esta guía es muy relevante, ya que las convocatorias continúan abiertas.

El valor añadido e innovador del proyecto reside en su enfoque integral al acompañar a las Pymes, no solo ayuda a financiar su estrategia, sino que les ofrece las herramientas analíticas más rentables para consolidarla, asesorándoles sobre cómo utilizar los datos para monetizar sus acciones de marketing.

Palabras Clave: Big Data, Business Intelligence, Análisis del Comportamiento, Pequeñas y Medianas Empresas (Pymes), Europa, España Digital.

INDEX

1. INTRODUCTION.....	5
2. DEFINING BIG DATA.....	9
2.1. Big Data as a concept	9
2.2. Business Intelligence: How to extract value from Big Data	13
2. MARKETING APPLICATIONS FOR BIG DATA.....	17
2.1. Behavioral Analytics: a strategy to gain better insights.....	18
3.2 Big Data applications in marketing.....	20
3.3 Big Data limitations in marketing and future opportunities.....	23
3. BIG DATA MARKET.....	29
3.1. European investments in Big Data: Digital Europe, Horizon Europe and Next Generation EU.	29
3.1.1. External dependency and investments in data infrastructure.....	29
3.1.2. Data talent gap.....	34
3.1.3. Capacity building for SMEs.....	37
3.2. The Spanish Big Data market.....	38
3.2.1. The Spanish market: baseline scenario	38
3.2.2. The Spanish data market.....	45
3.2.3. Digital Marketing Opportunities for Spanish SMEs.	49
4. A PRACTICAL GUIDE FOR SPANISH SMES: HOW TO IMPLEMENT BIG DATA BY TACKLING ADVANTAGE OF PUBLIC FUNDING OPPORTUNITIES.	51
5. CONCLUSIONS.....	57
BIBLIOGRAPHY	60
APPENDIX 1: spanish big data innovation hubs.....	67

1. INTRODUCTION

In January 2020, after detecting outbreaks of SARS-CoV-2 virus outside China's borders, the World Health Organization (WHO) declared an international health emergency (World Health Organization, 2020). Twelve months later, December 2020 closed the year that changed it all. From the way humans interact, to the manner in which business operate, or the or the responses of the policy makers.

December 2020 closed a year shifted the world economy as we knew it (Lora Jones et al., 2021) but it also opened a window to hope during the Lisboa Web Summit. The second of December of 2020, European Commission President, Ursula Von der Leyen announced the Commission's ambitions for the upcoming Multiannual Financial Framework (MFF) 2021-2027 to help repair the economic and social damage caused by the coronavirus pandemic (European Commission, 2020d): *“Our recovery plan, called Next Generation EU, is an unprecedented public investment to reshape Europe's economy. It is worth €750 billion, and 20% of it will fund digital investment. Next GenerationEU will help small businesses take up the latest technologies that are already available on the market”*.

This speech will remain engraved for posterity, as it sets a turning point for the European economic recovery. The upcoming financial package represents a major scale-up in the European Union's (EU) public stimulus, since the amounts devoted to fight the pandemic crisis have reached all-time-highs. As Albert Einstein said during the post-war depression in 1919, “in the midst of any crisis, lies great opportunity” and the bigger the crisis, the bigger the opportunity. At the moment, the dimensions of the pandemic's crisis are as far-reaching as the possibilities that lie ahead.

European businesses will receive during the next Multiannual Financial Framework a historic stimulus and it is the aim of this report to help as many companies as possible to benefit from it. The words of the President of the Commission and their ambition when looking at the future have inspired these pages, which want to follow the path traced by the EU, and generate an added value for the community by supporting the most affected businesses to access these funds.

Europe has addressed digitalization as one of the necessary pillars to carry out the economic recovery. Digitalization transforms the way businesses operate and the COVID-19 crisis has only accelerated their technological adoption, which sets data at the center of this transformation. Organizations and consumers all around the globe are transitioning towards

a connected business ecosystem where large amounts of information from different sources are consistently delivered to the web.

Spain has been one of the most affected Member States by the crisis because its businesses (especially small and medium-sized enterprises, SMEs) have lacked flexibility, given their limited capacity to manage the necessary data to adapt their strategies to the market's reality. Since this report is intended to help the most vulnerable economic agents to overcome their main strategic weaknesses exposed during the pandemic, the challenge of supporting the use of Big Data across Spanish SMEs will be the ultimate goal of this work.

Big Data has undoubtedly become the new buzzword in almost every sector. However, many organizations are lacking a complete understanding of concept of Big Data and how to harness the opportunities it presents. According to a report by Forbes (Forbes Insights & Rocket Fuel, 2013), *“even those who use Big Data most strongly still are not fully aware of its benefits and the more sophisticated uses of Big Data are still not fully realized by even the heaviest of big data users”*. Businesses will be able to use this work to deepen their understanding of Big Data and how it affects their operations.

Marketing departments have been leaders in making Big Data profitable, because information has served as a catalyst to understand consumer insights (Forbes Insights and Rocket Fuel, 2013). Over the last few years, there have been many successful stories involving the use of Big Data for marketing purposes and it seems that they have not yet seen the limit for their potential, as more techniques and tools are being developed every day and the data collected is becoming richer and more insightful (Mashingaidze & Backhouse, 2017).

To date, only large companies have benefited from the use of Big Data, as the barriers to entry in the data market for SMEs were enormous. New technological advances (cloud computing, artificial intelligence...) have significantly optimized the data analysis processes, making it profitable for companies of all sizes to invest in Big Data. However, many SMEs face several issues when they try to work with Big Data due to their lack of experience in the field and the data's complexity. **This paper is presented as an essential tool for SMEs willing to unleash the potential that Big Data offers. It will not only bring Big Data closer to the reality of SMEs, but it will also offer tools and techniques to apply Big Data in their digital marketing strategies and to subsequently be able to invest profitably in them.**

The thesis' methodology will follow a series of steps to guarantee a successful Big Data implementation across Spanish SMEs. Firstly, the research will go through the current literature to extract the main insights on the Big Data concept and will explore how to use them for marketing purposes. Secondly, a market research will address the core limitations that marketing departments face while working with voluminous, varied and timely data. Additionally, in order to facilitate the Big Data adoption in companies with limited resources, this paper will present the most cost-effective and widespread analytical techniques and tools for each type of digital marketing use case and will deep into the available funding opportunities in the European programs to identify key incentives to fund the projects. Finally, an interactive guide put in a nutshell the most relevant calls to tackle the main weaknesses as addressed in the analysis.

The last step will involve the preparation of an exhaustive and updated guide with the most relevant public funding opportunities for Big Data implementation. This section of the work will put in a nutshell the most profitable upcoming funding opportunities for Spanish SMEs and where to apply for them. This methodology is an innovative approach to the development of a business strategy since the scope of the strategy is global and it will support SMEs from the beginning to the end of their Big Data implementation process. It will do so by providing information that is totally up to date and highly relevant and value for Spanish businesses.

Although the potential of Big Data has long been recognized, the pandemic has brought data to the center of the discussion and European digitalization strategy has presented strategic investments in Big Data as a pathway for the economic recovery (European Commission, 2020c). As Von der Leyen claimed at the beginning of the report, digital will be a first order priority in the European strategy for the next 6 years. The most relevant opportunities in the Big Data field will arise from the Digital Europe and the Horizon Europe programs. The Digital Europe program will support the “strengthening of digital capacities for high-performance computing, artificial intelligence and cybersecurity, along with advanced digital skills and accelerating the adoption and best use of digital technologies” (European Commission, 2021d, p. 15). The Horizon Europe program will be aimed to finance strategic investments in disruptive technologies such as Big Data (European Commission, 2021d).

In order to be able to identify the most interesting calls among the thousands opened both nationally and internationally, this study will carry out an analysis of the current situation in Spain and Europe, to determine the areas where it is most necessary to invest. Business willing to exploit the public bodies' heightened interest in the Big Data area and profit from

the upcoming public funding opportunities, will leverage a competitive advantage by making use of the information in this report, whose final part will provide an interactive roadmap where readers will be able to find the best fitting opportunities for their Big Data investment plan. **The key production of this work is that as well as the Commission, it looks to the future, and it aims to grow the seed that will help the hardest hit companies by the pandemic to scale-up. This guide will provide the most updated funding opportunities and it will centralize them in a single file, making this user manual a key asset for SMEs with limited resources to carry such analysis on their own.**

Summarizing, this paper will carry out a wholistic analysis whose outcomes are aimed to serve as a compass for Spanish SMEs willing to unleash the potential that Big Data can provide for their marketing strategies. This is a unique and innovative tool which can generate a huge impact for the Spanish economy, as Big Data has been considered be the oil of the 21st century and its analysis, the engine of the economic recovery, because it allows businesses to make adaptative and insightful decisions. Nevertheless, like oil, raw data alone have no value, they have to be refined and the infrastructure needed for such process is costly and difficult to implement, especially for SMEs. This report is extremely valuable at date, because all the identified European funding opportunities have not been opened yet or are still open. Hence, users of this guide will count with the most up-to-date information to get funded, make Big Data investment decisions, and implement them in their companies supported by all the technical assistance contained in this study.

2. DEFINING BIG DATA

2.1. Big Data as a concept

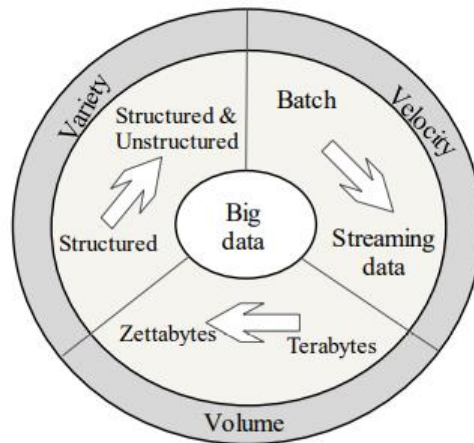
Since the early 2000s, the Internet revolution set the ground for unique data collection and analytical research and development opportunities (Chen et al, 2020). The way in which society harnesses information has shifted substantially over this period. Datasets nowadays are not only larger than before but they are also growing faster, and have allowed businesses to produce insightful, valuable information (Mayer-Schönberger & Cukier, 2013).

Data have swept into almost every industry and has become major capital asset for many businesses. Information societies have contributed to the massive adoption of the smart devices, a major source for data generation, and have developed visible information technology systems everywhere in our environment. However, “information itself is less noticeable” (Mayer-Schönberger & Cukier, 2013, p.3). The intangibility feature of the data has made really challenging the process of finding an appropriate definition.

The term “Big Data” defines voluminous and ever-growing datasets coming from a wide range of sources. The this term was first coined by the US National Aeronautics and Space Administration (NASA) in the 90s, and it was aimed at describing the problem NASA scientist had with visualization due to the data’s massive size (Press, 2014). Nowadays, however, further considerations should be taken into account when considering any information set “Big Data”.

It was two decades ago when Doug Laney, stated the now-mainstream definition of Big Data (Research Data Alliance, n.d) as the **three V’s: volume, velocity and variety (Image 1)** (Erevelles et al., 2016; Lycett, 2013). These dimensions help to differentiate large rich datasets (i.e. the US census) from actual Big Data (i.e. consumer data collected by a clothing retailer), which is constantly updated, and allows data users to define consumer behavioral patterns. (Erevelles et al., 2016).

Image 1 The 3 dimensions of Big Data: Gartner's Vector model.



Source: (Ajah & Nweke, 2019)

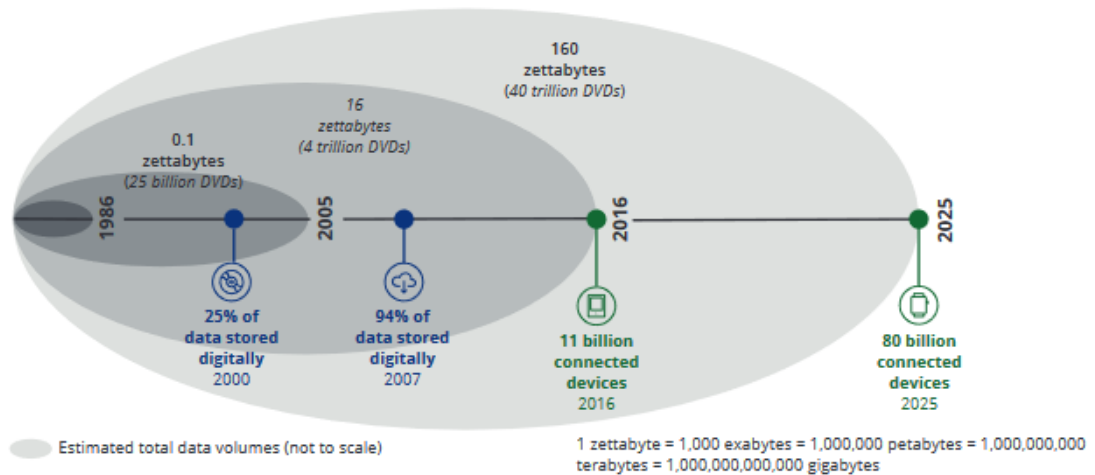
- **Volume** is the primary attribute of Big Data and represents its size's dimension (Research Data Alliance, n.d). The most common metric used to quantify data are terabytes, however, Big Data can also be measured in terms of time, counting records, transactions, tables, or files (Russom, 2011).

Over the last decades, as new technologies offered novel ways of creating, sharing and storing information, data volumes have increased exponentially. According to the International Data Corporation (2017), the total volume of the world's digital data produced are expected to grow up to 175 zettabytes in 2025, a 61% increase from its 2018 levels, with half of the data already residing in the cloud (Image 2).

Although information's size varies across organizations and industries (Ajah & Nweke, 2019), more voluminous data typically lead to higher-quality models which provide more insightful predictions (Lycett, 2013; Zhao, 2013). When analyzing Big Data, companies should consider key concepts related to the volume dimension such as scalability, data distribution, and their ability to process the data (Lycett, 2013).

In 2016, McKinsey pointed out in a corporate report that Big Data's definition cannot be static and needs to be revised, since data's worldwide size more than doubles every two years (Image 2) (ICD, 2014). Additionally, this same report addressed that volume is typically one of the biggest challenges for most organizations when it comes to working with Big Data, because *"it is beyond the ability of typical database software tools to capture, store, manage, and analyze"* (Manyika et al, 2011, p.1).

Image 2 Global data growth trends over time.



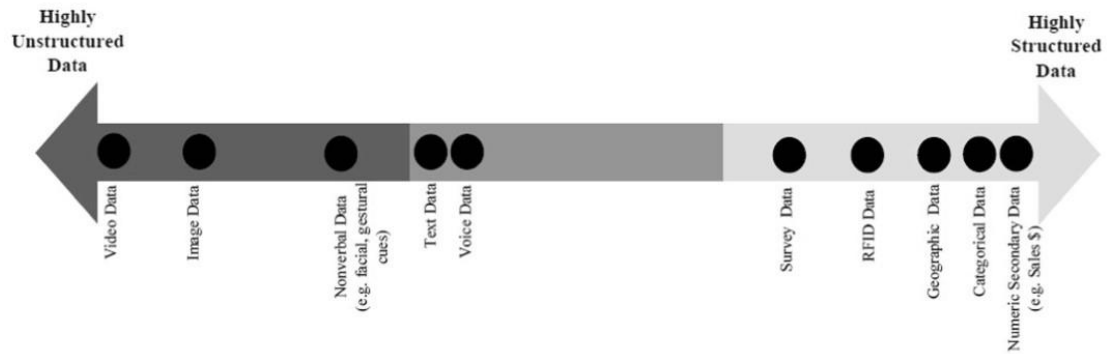
Source: (Deloitte, 2017)

One more element that has boosted data scalability is the development of cloud storage. According to the European Commission (2020c), data storage systems are currently experiencing an inflection point and “will change dramatically over the next 5 years”. Their forecasts have projected that by 2025, most of the data processed and analyzed will come from smart connected objects. The increased efficiency and lower costs on infrastructure of cloud-based storage systems, will not only allow existing Big Data users to scale up their current resources, but they will also help to drive Big Data adoption in organizations of all sizes (Research and Markets, 2020). Cloud computing services guarantee reliable and persistent large-scale data storage. Furthermore, by storing their information in digital lakes, multiple users can make continuous modifications at the same time, maintaining the information repositories continuously updated (Ajah & Nweke, 2019).

- Cloud storage has also transformed Big Data’s **velocity dimension** by allowing businesses to dynamically modify their information warehouses in a timely manner. “The term ‘**velocity**’ refers to the speed and dynamic nature of the data collection process and how to generate these data in real-time” (Ajah & Nweke, 2019, p.6). The rapid collection of timely, insightful, data allows marketers to develop an adaptive behavior that fits customers’ real-time needs at any stage of their journey.
- A key difference between traditional large datasets and contemporary Big Data is its **variety** (Erevelles et al., 2016). Nowadays, businesses use not only structured data (names, addresses, scanners...) but they have also included **unstructured datasets** (textual and non-textual data from messages, videos, or audios) to their records (Image 3). Unstructured data cannot be treated with the traditional relational database

management system (RDBMS) (Ajah & Nweke, 2019). Therefore, unstructured data proliferation requires the adoption of new data processing and collecting techniques.

Image 3 Unstructured Data in Marketing.



Source: (Balducci & Marinova, 2018, p.559)

According to Rizkallah et al. (2017) most of the firms using Big Data have shifted towards unstructured data analytics, in fact, they reported that over 80% of company data is currently unstructured. Over the last years, businesses have shown a shift in their approach to data collection, even those organizations with rich internal data, are also looking for further data in the market, mainly unstructured (Henke et al., 2016).

One of the main complexities of working with non-structured data has always been its classification, given that it is extremely challenging to group data coming from multiple sources in different formats. However, nowadays unstructured data can easily be arranged by using automated frameworks such as Hadoop, which “uses a code to read the data without knowing the structure ahead of time” (Concepta, 2021). This cloud based-analytical software, collects the information by clusters which can be transferred as needed. Companies using cloud-based analytics have been able to boost Big Data profitability by generating faster outcomes at a lower cost than with traditional storage warehouses (Ajah & Nweke, 2019).

Despite all the benefits that the use of unstructured data generates for businesses, there are two sides to the coin. Contrasting with the insights retrieved from unstructured datasets, the degree of information loss, and the data’s suitability should be considered while working with unstructured Big Data. (Lycett, 2013).

Over the the recent years, two more Vs have been added to Big Data’s definition: value and veracity. **Veracity** sheds the light on the relevance of data’s reliability. The use of an ever-

increasing amount of data from numerous sources has raised a pressing need to verify the robustness of this data, since analyzing data of dubious quality or of little relevance to the business could lead to significant losses for the organization analyzing the data (Erevelles et al., 2016; Lycett, 2013). Value and veracity have gained importance over time as dimensions of Big Data, given the increased presence of unregulated data sources.

2.2. Business Intelligence: How to extract value from Big Data

Data analysis has been increasingly incorporated into many different ways to create value across industries and geographies. In fact, according to Ajah and Nweke (2019, p. 27), *“enterprises that embarked on a Big Data project have experienced massive growth in business as they have been able to reduce costs, make faster and better decisions and even provide new offering for the customer”*. Nonetheless, Big Data value does not reside in the data itself but in the outcomes of its analysis (Zhao, 2013).

Moreover, Big Data *“is not a standalone solution”* (Becker et al., 2016, p.278), it depends on many layers such as technological architecture, connectivity, or data access, among many others. Additionally, non-technical elements such as legislation, advanced data professionals or business models are also critical for an efficient Big Data usage (Becker et al., 2016). To make strategic decisions based on Big Data, managers should understand all the elements behind Business Intelligence (Concepta, 2021).

Big Data has leveraged a competitive advantage across most business functions, however, *“no area has benefited from this Big Data more than marketing”* (Forbes Insights and Rocket Fuel, 2013, p.5).

Massive data generation is making information analysis a major challenge for marketers. To generate value for a company, a data analyst must go through the weeds of information and extract the most relevant data in order to transform the retrieved information into actionable insights and construct an educated data-driven strategy (Tableau, n.d.).

Business Intelligence (BI) transforms raw data into information by conducting a **descriptive analysis based on historical data**. Business intelligence covers data collection and storage and produces relevant metrics. Besides, it carries out the information's subsequent comprehensive analysis (Tableau, n.d.) by creating detailed and descriptive reports addressing what happens and where. The outcomes generated by BI give companies answers which are key assets in the organization's strategic, and operational business plans. (Ajah & Nweke, 2019; Tableau, n.d.).

The most common advantages extracted from the use of business intelligence are flexibility, competitive advantage and unique sales insights (Concepta, 2021). Real-time information helps companies to be aware of what is happening on a timely manner and adapt rapidly to the circumstances, allowing organizations to develop a strategic advantage with respect to their competitors. Some of the most widely used BI office suits are: Microsoft's Power BI, Pentaho, and Self-service tools such as Tableau or Qlik aimed at non-expert users (Concepta, 2017).

Data analytics, goes a step further on the data analysis process. While business intelligence merely describes what happened with the data, data analytics makes conclusions and predictions (Frankenfield, 2020).

The literature presents 4 main models to analyze the data which are: descriptive analytics, diagnostic analytics, predictive analytics and prescriptive analytics and can be used jointly or separately in order to carry out strategic decisions. When it comes to processing the data of a company, there is not a unique way of doing it, depending on the industry and the needs of the organization, one analytical model will be much more efficient than other.

- **Descriptive analytics** is the initial step for most organizations when analyzing their data (Sisense, n.d.). This methodology is a simple statistical technique that aims at describing what has already happened. Descriptive analysis usually constructs performance indicators to assess the company's evolution. (Singh et al., 2019).
- In the same vein as in the descriptive analysis, **diagnostic analytics** interprets and analyzes historical data to find out what happened. However, diagnostic analysis takes an extra step beyond a simple representation by assessing root causes and hidden relationships of the outcomes obtained through the descriptive analysis (Ajah & Nweke, 2019; Sisense, n.d.).
- The third core analytical methodology widely used by businesses and organizations is **predictive analytics**, which forecasts trends based on statistics and predictive models. Firms use the outcomes of the predictive models to find data patterns, assess risks, and identify opportunities to generate a competitive advantage (IBM, n.d.).
- Lastly, **prescriptive analytics**, makes use of predictive analytics' results to leverage the company's competitive advantage by optimizing the business resource allocation (Ajah & Nweke, 2019). According to IBM (n.d.), "*predictive analytics' outcomes can be used in prescriptive analytics to drive actions based on predictive insights*".

Most of the of the data-driven organizations make use of business intelligence tools, and complement them with different data analysis techniques based on their needs and specific requirements.

Data analytics makes use of machine learning and mining algorithms to treat the information. However, a good analytical model does not only depend on the algorithms and procedures but also on the business context and data interpretation. Any analyst should be able to understand how the data was collected and its context, in order to choose the optimal tool to process it (Zhao, 2013). Most common machine learning algorithms and tools are grouped in 5 main categories which are regression, classification, clustering, association and correlation. (Ajah & Nweke, 2019, p.12)

- **Regression tools** are used to establish the relationship between a target, dependent variable, and a predictor or independent variable. Regression methods are typically applied in marketing to price optimization. Marketers use regression models to determine the price effect on demand and to boost profitability by aligning their offering with the market's demand (Concepta, 2021).
- **Classification** is an analytical technique which organizes data based on previously established attributes (Ajah & Nweke, 2019) and is typically used for market segmentation. Classification is a common analytical tool in marketing actions since it is essential to address the specific needs of the target group to which the actions are directed. However, the attributes to carry out such segmentation must be previously defined, and many times they are not obvious (Concepta, 2021).
- **Clustering** “allows companies to communicate with specific market segments that might not be intuitively formed” (Ajah & Nweke, 2019, p.12). This tool groups data by clusters based on common characteristics and is usually a first step in the classification method. (Concepta, 2021).
- Once segments are defined, it is essential for marketers to understand each cluster's value for the firm in order to choose the company's target market. **Association tools** look for statistical relationships between variables and provide businesses with the necessary information to address who are their more engaged customers by associating, for instance, visits to their corporate site and brand interaction with each shareholder. The outcomes generated through the use of association tools allow businesses to choose a target market, to price discriminate or to offer incentives to the most engaged client (Ajah & Nweke, 2019).

- Finally, **correlation techniques** make use of similarity-scoring algorithms to uncover relationships among different clusters (Ajah & Nweke, 2019). While clustering allows for differentiated targeting, correlation tools allow to optimize marketing efforts by using economies of scale when appealing to a larger target group. Companies using both correlation and clustering techniques will be able to leverage a competitive advantage in the market due to their ability to choose the most profitable strategy.

2. MARKETING APPLICATIONS FOR BIG DATA

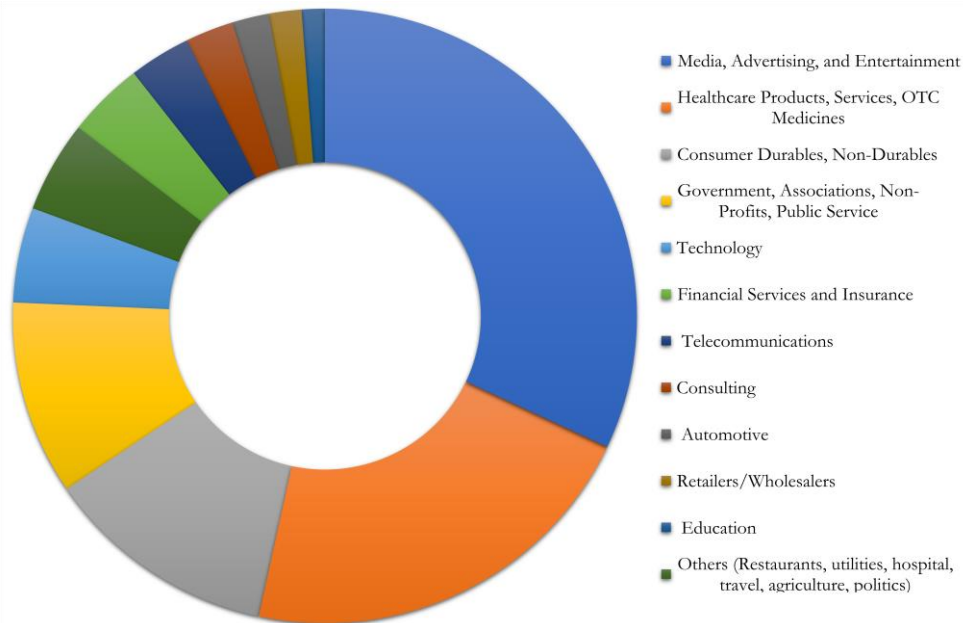
In the current digital era, where trends and preferences are continuously changing over time, companies more than ever feel the need to be continue addressing what do consumers want in order to develop a successful commercialization strategy. The increased number of digital devices has allowed companies to generate vast amounts of insightful data which allow them to send a tailored message to each target customer.

According to Castaño and Jurado (2016, p.8), **digital marketing** “aims at delivering a message to a large mass of consumers, while each of the individuals must feel unique and special, by receiving a personal treatment in a digital environment”. The core fundamentals of marketing have not changed, marketers follow a consumer-centered approach by designing a market offering tailored to consumer preferences. However, digital marketing allows to identify customer’s needs in a timely manner and to anticipate to them by the use of predictive modelling and artificial intelligence. (Chaffey & Ellis-Chadwick, 2016).

“Customer Value Analytics (CVA) based on Big Data are making possible for leading marketers to deliver consistent omnichannel customer experiences across all channels” (Colombus, 2016). According to a report published in the Forbes magazine, customer analytics represents 48% of the Big Data marketing use cases (Colombus, 2016). Big Data is transforming the way organizations approach customers by providing behavioral insights that allow marketers to make better pricing decisions, to achieve greater customer responsiveness or to expand the customer lifecycle by anticipating their future needs (Colombus, 2016).

Over the last decade, almost a third of the top business leaders (29%) have addressed “finding new customers and prospects as their biggest challenge” (Dun&Bradstreet, 2019) and two thirds of them have argued that harnessing Big Data has enable them to improve the customer service and to identify new growth opportunities (Dun&Bradstreet, 2019). Aware of the benefits of implementing Big Data in their strategies, many marketers have decided to adopt Big Data in their operations, thus becoming advertising and media communication one of the main industries benefiting from Big Data (Figure 1).

Figure 1 Top industries served by Big Data Analytics in 2020 (% of revenue per industry).



Source: Own elaboration with data from the “Research and data analytics industry report from 2020”

Over the last years, a wide variety of digital marketing techniques such as social media marketing, Search Engine Optimization (SEO), Search Engine Marketing (SEM), or Customer Relationship Management (CRM) have aroused, allowing businesses to generate faster data to meet changing customer needs, delivering greater value (Chaffey & Ellis-Chadwick, 2016). Machine learning has and online analytical platforms have eased Big Data analysis and have made its implementation cost efficient for many organizations

At a time when ecommerce is experiencing an unprecedented growth (eshopworld, 2018), marketers must take advantage from the unprecedented digital marketing resources available to engage audiences and leverage a competitive advantage in the online marketplace.

2.1. Behavioral Analytics: a strategy to gain better insights.

The state-of-the-art sets Behavioral Analytics at the core of the upcoming digital marketing strategies (Singh et al., 2019). Singh et al. (2019, p.228) defined behavioral analytics as “*an upcoming reserch area in marketing that exposes perceptions of consumer behavior on online shopping and social websites*”. This analytical approach makes use of behavioral data to monitor and predict consumers’ behaviors and and uses such information to deliver targeted marketing actions (Mogaji et al., 2020).

Behavioral Big Data are a result of customers’ engagement with a business and can be measured by site views, subscriptions, or other important user actions. Behavioral patterns can be gathered from multiple sources such as websites, mobile apps, CRM systems,

marketing automation systems, call centers, or help desks (Davidson, n.d.). Artificial intelligence has allowed analysts to aggregate the data collected from the different sources and to identify patterns that go beyond historical data on consumer behavior (Mogaji et al., 2020).

Large corporations such as Amazon have been leading the use of behavioral analytics to generate revenues by developing tailored recommendations based on previous purchases and customer attitudes (Singh et al., 2019). Behavior analysis has been proved to be key when optimizing customer acquisition, engagement and retention rates (Davidson, n.d.).

The literature presents **segmentation, funnel and cohort tools** as the as the main instruments to conduct a behavioral analysis. These tools allow digital marketers to build up key performance indicators (KPI), upon the various stages of the customer journey (Singh et al., 2019) which provide the firms with the necessary information to develop and evaluate strategies to enhance customers' conversion, engagement and retention (Davidson, n.d.).

Conversion rates, customer lifetime value, opening rate for the case of email marketing, or engagement rates are typical KPIs in marketing strategies (Oxford Dictionary, 2021). When defining its own KPIs, a business should align them with its specific objectives and according to the industry where it operates, in order to implement an effective marketing strategy (Manuel, 2013).

- The **segmentation tool** is a key instrument for behavioral analysis aimed at classifying customers based on their attitudes. Though the use of predictive analytics, data experts can identify behavioral trends and anticipate behaviors. KPIs such as subscription rates, number of clicks, or real-time in-app metrics are typically used in segmentation processes to assess customers' responses to different stimulus and classify them. (Singh et al., 2019).
- **Funnel** analysis is another type of model to analyze consumer behavior and is often used when the company seeks to attract or retain a customer. This model embarks on the each target customer's journey to understand their different needs throughout their interaction with the brand. The outcomes of the funnel analysis help marketers to determine the effectiveness of the marketing actions within the different stages of the customer lifetime and to act in consequence. Drop-off or return rates are typical KPIs in funnel analysis (Davidson, n.d.). Segmentation tools, when can be jointly used with funnel analysis to expose differences on cluster's behaviors across their journey.

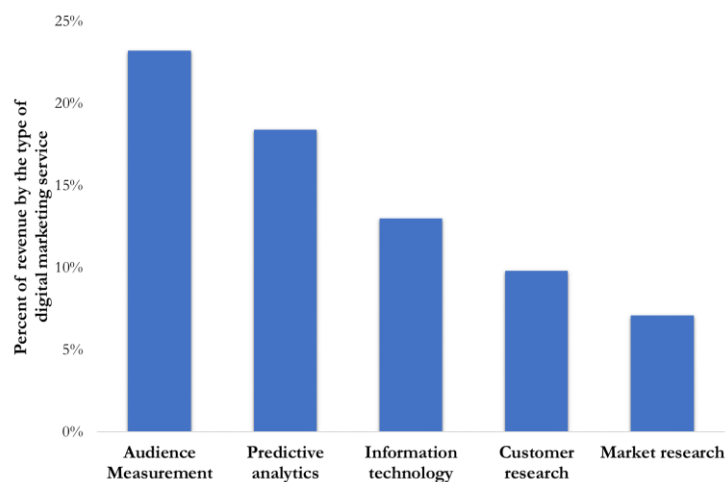
- **Cohort analysis** is a powerful instrument to determine customer engagement and retention. This tool allows companies to construct KPIs such as retention or engagement rates. Cohort analysis provides the firm with the necessary information about the customer engagement with the brand. For instance, cohort allows marketers to know who is returning to buy a specific product and who is not, enabling the company to fine-tune its targeting strategy (Davidson, n.d.).

Thanks to the insights gained through Big Data, customer behavior analysis has become one of the most interesting areas in the field of digital marketing. However, much of the data potential is yet to be exploited given that it is owned by few companies which have the necessary resources to collect it from diverse sources, centralize it, and process it.

3.2 Big Data applications in marketing

The more than 50 billion smart connected devices in the world by 2020 collecting, analyzing, and sharing data have triggered the volume, variety and velocity of data available on the market. Each day, 2,5 exabytes of data are created by consumers through multiple channels, which represents both a challenge and an opportunity for marketers seeking to implement a data-driven strategy (Whitehead, 2014). A report released during the last quarter of 2020 by the Insights association in collaboration with the Michigan State University (Bowers, 2020) revealed e services that have generated the most revenue through their use of Big Data are services used by marketing departments such as audience measurement and predictive analytics (Figure 2). In fact, according to Forbes, companies adopting a data-driven marketing are six times more likely to be profitable in the long term than their competitors (Colombus, 2016).

Figure 2 Top Big Data Analytics services by revenue 2020.

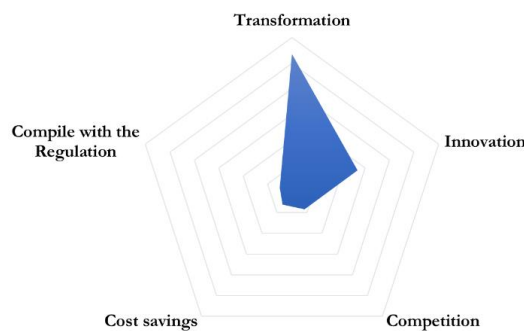


Source: Own elaboration with data from the Research and data analytics industry report from 2020

Over their initial approaches to Big Data, marketing managers typically set basic goals, nonetheless, many of them have realized that there are not exploiting information's full potential. In fact, companies that have worked with Big Data more than half of their time have observed that the outcomes of their analysis offer them possibilities that go beyond the traditional marketing goals (Forbes Insights and Rocket Fuel, 2013).

According IBM (2014) a major share of the organizations using Big Data are redesigning their structures in order to extract more value from it, indeed, Statista revealed that 57% of the Big Data investments that businesses have made over the past year are related to an structural transformation (Figure 3)(Statista Research Department, 2021).

Figure 3 Principles for Big Data investments in 2020.



Source: own elaboration with data from Statista.

Despite small and medium enterprises (SMEs) could also benefit from the use of Big Data, real-life success cases of businesses harnessing Big Data are widely linked to large corporations which are the only ones able to generate and process Big Data.

Large multinationals have set customer acquisition and retention at the center of their Big Data strategies. Coca Cola “is a clear example of a company that’s built on customer analytics and intelligence” (The Keenfolks, n.d.). As Justin De Graaf, Coca Cola’s Director of Data Strategy and Precision Marketing, revealed during the Data Day in Sydney, “Big Data *plays an essential role in every single marketing operation, from product development to consumer retention*”. Coca Cola assembles multichannel massive amounts of information from customer interaction (from social media to customer service channels, retailers...) and centralizes them to deliver a relevant message, and enhance brand engagement (The Keenfolks, n.d.). De Graaf (Coca Cola’s Director of Data Strategy), highlighted the importance that Big Data has for the multinational company, and reported that Big Data-based campaigns have skyrocketed the company’s market value.

Coca-Cola's CMO argued although the brand is worldwide known and well positioned, it is essential for them to *"spend a lot of time listening to what's changing, look at market trends for years in advance, look at market trends that are happening now and adjust."* No one can deny that the corporation currently owns one of the most competitive product portfolio in the drinks' market, yet, De Graaf argued that Millennials' preferences are shifting towards healthier options and that the company needs to be continuously investigating in product development to meet the new generations' needs.

In its quest to always be one step beyond current market demand, Coca-Cola developed the Freestyle machine in 2009 an "AI-powered soda dispenser with optical and motion sensors, Bluetooth technology and real-time cloud connectivity" (Chohan, n.d.). This machine offers customers of restaurants and other food services more than 200 drink options, when traditionally no more than 8 are offered. However, this machine does not only allow customers to obtain a customized product tailored to their specific needs, but it also allows data analysts to identify user preferences and develop products that adapt to their tastes. This is how 2017 the Sprite Cherry was launched as first national brand inspired by Coca-Cola Freestyle (Coca-Cola, 2018). The computer system within the dispenser "records all data involved in every single pour" (Coca-Cola, 2018). The machine does not only collect information about the beverage ordered but it also gathers information from motion sensors and voice recognition. Artificial intelligence allows these machines to adapt to the environment, generating offers for each specific situation and improving customer experience. "Globally, Coca Cola has installed over 50,000 machines, serving over 14 million, 8-ounce servings of drink per day, creating a gargantuan amount of actionable data" (Chohan, n.d.).

Despite Coca-Cola's huge success in collecting data from retailers or social media, their corporate Big Data strategy has room for improvement. The company claimed during the Data Day's event that they are still missing information from many relevant channels such as food services. De Graaf What argued that many customers pay by cash in restaurants or pubs, making it impossible for them to trace consumer's preferences and classify them.

Netflix is another key global player known for its success in implementing Big Data analytics in its marketing strategy. Thanks to its efficient Big Data management, Netflix has grown from a DVD rental company to a world leader in the entertainment industry saving over a billion dollars yearly by implementing a successful data-driven customer retention strategy (Petrov, 2021). Netflix collects and analyzes all kinds of consumption data, from what customers look for to where, when and how they consume each content. By using Big Data,

Netflix is able to micro-segment its customers and to offer a customized platform for each user and make recommendations based on their favorite series, the days of the week they use the platform, the unfinished programs, etc (Petrov, 2021).

Netflix's success using data analytics lies not only in the way it presents the content (which doubles the chances of the show's success) but also affects the content itself (Data Centric, 2018). In fact, Netflix used viewers' preferences to design House of Cards' plot and delivered a targeted trailer, tested in different behavioral segments, to assure the show's success (Data Centric, 2018).

3.3 Big Data limitations in marketing and future opportunities.

Throughout the paper, the multiple advantages and benefits of implementing Big Data within an organization's marketing strategy have been highlighted. However, many businesses face a myriad of obstacles when trying to include Big Data in their operations, often resulting in efficiency losses.

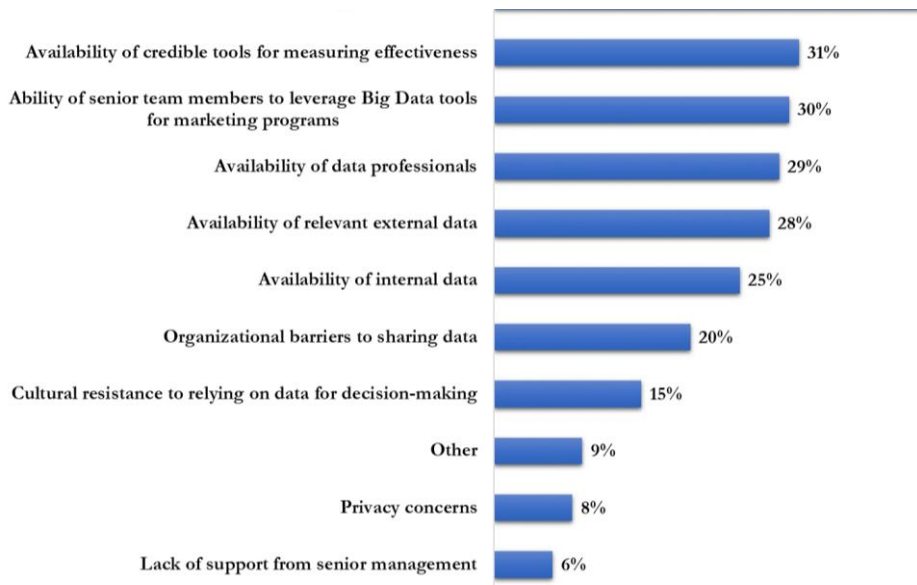
The implementation of Big Data fueled solutions for marketing purposes is still a major challenge for many companies, especially for SMEs, who do not have the sufficient infrastructure or the knowledge to handle Big Data by themselves. Dun&Breadstreet's (2019) report revealed that most businesses struggle to master data management, listing it as their current top challenge. In addition, in terms of the quality of the information analyzed, the report highlighted that SMEs are more likely to lose a customer due to the use of incomplete or inaccurate information (33% vs 25% in large companies).

The literature on Big Data analytics (Marshal et al., 2015; SpencerStuart, 2013), places organizational culture as a major obstacle for the implementation of an efficient data-driven marketing strategy. Despite the fact that almost all companies acknowledge Big Data's value, many of them are not working with it due to a lack of confidence among senior managers (McKinsey & Company, 2016; SpencerStuart, 2013). In fact, recent research (McKinsey & Company, 2016) has revealed that ensuring senior-management involvement in data and analytics activities is the most significant challenge for high-performing organizations to achieve data effectiveness (McKinsey & Company, 2016). This lack of a data culture among many businesses, often leads to a **lack** of investment in analytical data architecture and digital talent, which guarantee the efficiency of the company's use of Big Data.

Apart from the organizational culture, a survey carried out by Spencer Stuart to 171 US-based marketing executives (SpencerStuart, 2013) identified other challenges which prevented managers from harnessing the value of their Big Data investments such as lack of

technological investment, insufficient training to make an efficient use of the datasets, or lack of relevant external data (Figure 4).

Figure 4 Marketers' most significant challenge to implement Big Data in their marketing strategy.

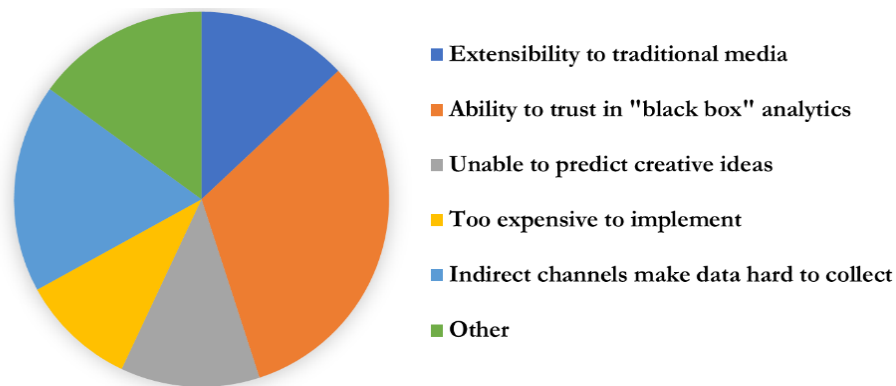


Source: Own elaboration with data retrieved from a report by Spencer Stuart after interviewing 171 U.S.-based marketing executives.

According to McKinsey & Company (2016) designing an appropriate organizational structure to support Big Data analytics activities is the biggest difficulty faced by low-performing organizations (McKinsey & Company, 2016). High performers, on the other hand, have been able to answer faster to market's needs by designing a dynamic structure with engaged leaders.

Most of the companies surveyed by McKinsey (2016) pointed to trust in the usefulness of data analysis is their main boundary for using data-driven decision tools (McKinsey & Company, 2016) . Complementarily, Spencer Stuart's report addressed that Big Data interpretation represents one of the main challenges of data analytics when it comes to its impact on marketing, given the complex "black box" nature of the information. (SpencerStuart, 2013) (Figure 5).

Figure 5 Primary limitation of Big Data and analytics when it comes to its impact on marketing



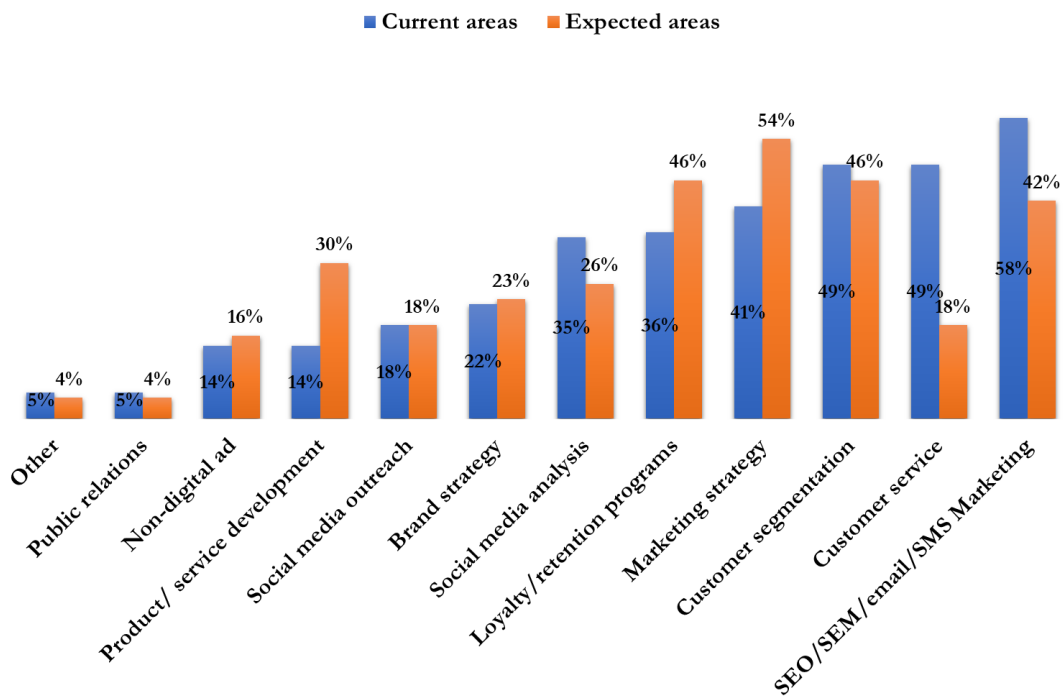
Source: Own elaboration with data retrieved from a report by Spencer Stuart after interviewing 171 U.S.-based marketing executives.

The outcomes of the analysis were revealing and announced a turning point in the Big Data adoption among businesses. According to senior executives' responses, they do not distrust the information per se, but they consider that the results of its analysis are not sufficiently solid to base their company's strategic decisions on them.

Since securing the buy-in of senior management is essential to build a Big Data strategy, changes in the data analysis process are needed (Forbes Insights and Rocket Fuel, 2013). Better skills in this field, as well as further investments in Big Data analysis technologies will tackle this problem at its root by shifting the organizational data distrust and technological barriers for Big Data adoption will disappear over time due to the widespread and cost-efficient automation of analytical processes.

Despite the lack of trust and understanding of Big Data analytics (McKinsey & Company, 2016), many senior marketers have acknowledged that Big Data analytics can become a potential tool to address their key strategic issues (Figure 6), such as increasing customer retention or building up a long term strategy with customers (Figure 7). By pointing out that Big Data is expected to have a largest impact in the areas they have considered as main priorities (Figure 7), a closer approach of senior teams to Big Data analytics can be observed.

Figure 6 Areas where Big Data analytics have the largest impact on the way marketing is executed.

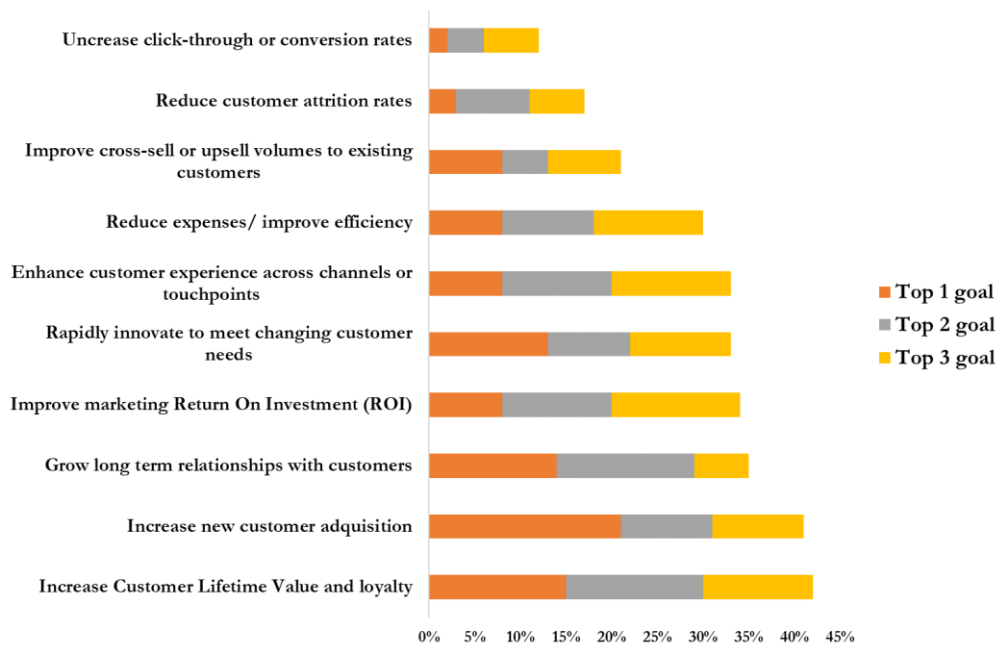


Own elaboration with data retrieved from a report by Spencer Stuart after interviewing 171 U.S.-based marketing executives about their Big Data usage.

Most of the marketers expect that Big Data is going to increase its impact in their marketing strategies (Figure 6). One of the main reasons for this strategic shift in most organizations is the development of behavioral analytics. As argued in previous sections, the use of predictive behavioral modeling for marketing purposes has boosted data's value. Behavioral analytics enables companies to deliver targeted marketing strategies for each stage of the customer journey through the use of various tools such as funnel and cohort analysis which, in turn, positively affects customer loyalty and long-term customer relationships. According to the survey, these two are marketing executives' top organizational goals (Figure 7).

However, on the other side of the coin, marketers have recalled that although cost efficiency is often mentioned as a major advantage of using Big Data, the costs of implementing it and operating with it should not be forgotten. Although cost-cutting actions are not considered the main priority in most marketing plans, it has been included among marketers' top three priorities (Figure 7).

Figure 7 Top three marketing goals.



Source: Own elaboration with data retrieved from a report by Spencer Stuart after interviewing 171 U.S.-based marketing executives about their Big Data usage.

Moreover, marketing executives have also pointed out “managing customer data quality” (as one of their top challenges (SpencerStuart, 2013). According to Ovum research (Goldfein, 2019), data quality is estimated to cost firms 30% of their annual revenue, nevertheless, Spencer Stuart’s results highlighted the potential role of Big Data in dealing with this issue. Automated analytical systems and more accurate algorithms are making easier to process real-time large-scale data, allowing Chief Marketing Officers (CMOs) to obtain a quality output that saves costs and optimizes resources.

The prospects made by Dun&Bradstreet (2019) foresee that “*advances in data management (...) and data quality (...) will present a whole host of new opportunities for businesses*”, as well as new challenges, such as the ethical use of data or vulnerability to foreign attacks.

For the next 10 years, effective data management will lead the list of Big Data challenges, especially due to the unavailability of skilled professionals. According to Dun&Bradstreet (2019) less than a quarter of the top business leaders have acknowledged to have the right people to implement an effective data strategy. To carry out an efficient data management in the future, organizations will need to count with skilled employees that know not only how to analyze the large amounts of data available now, but also to keep up with future technological developments in this area (Dun&Bradstreet, 2019).

Over this section the main limitations that marketing departments face when working with Big Data have been addressed. Although the main boundaries for Big Data implementation are currently linked to the lack of confidence of senior marketing managers in the outcome of their Big Data analysis, it has already reached a point of no return.

As technical advances in the analysis of large databases develop and quality issues have been fading away, CMOs have increased their trust in Big Data. Nevertheless, as Big Data driven solutions have become widely adopted among organizations, other relevant issues have emerged (lack of data skills, ethical and legal concerns, strategy design...).

The next sections will present a picture of how these challenges are affecting Europe and Spain and how their future political agendas are expected to address them. Moreover, a practical roadmap to help smaller businesses in Spain who want to adopt Big Data-driven marketing strategies will be produced. This guide will serve as a compass for Spanish SMEs when applying for the most relevant future funding opportunities in the field of Big Data.

3. BIG DATA MARKET

3.1. European investments in Big Data: Digital Europe, Horizon Europe and Next Generation EU.

The European Union (EU), in the midst of the social and economic crisis, must decide its pathway for the next 6 years. Over the next Financial Framework (2021-2027) Europe will make a historic financial effort to address the weaknesses exposed by the current crisis. The Multiannual Financial Framework (MFF) joined to a temporary financial instrument (Next Generation Europe, NGEU) will constitute the largest stimulus ever financed through the EU budget (La Moncloa, 2021).

The funds will be distributed mostly through the Member States and the Horizon Europe program, where Cluster 4, aimed at promoting a European digital transformation, is a key priority. In general, investments in digital technologies have been considered as one of the pillars for the European economic recovery. The Commission has established that at least 20% of each Member State's recovery plan's budget must be spent on digitalization (European Commission, 2020d).

Moreover, the EU has pointed Big Data as a key enabling technology for the digital revolution. The Commission considers data to be *"the lifeblood of economic development"* (European Commission, 2020c) and will deliver to the market a number of opportunities for businesses of all sizes through the European Data Strategy in the form of investment, training, or support.

Despite the large size of the European budget, funding will not reach everyone. Organizations, both large and small, will need to align their objectives with the EU recovery plan's priorities in order to access public grants and loans. To build up a successful proposal and receive public funding, businesses must assess first their most significant challenges and investment opportunities.

3.1.1. External dependency and investments in data infrastructure.

The coronavirus crisis has unveiled the serious problems of external dependency that Europe faces in the digital landscape. In October of 2020, during the Special European Council, President Michel stated: *"we're setting our ambition high: digital sovereignty"*. In his speech Michel addressed the need for establishing a truly **digital single market** under the frame of the European legislation in which the EU can make its own technological choices.

The European data strategy's ambition is *"to enable the EU to become the most attractive, most secure and most dynamic data-agile economy in the world"* (European Commission, 2020c, p.25). According

to a European Commission's communication, the EU has to be able to take the lead in the data economy in order to guarantee and secure its digital future built upon the European values. To achieve this goal, the strategy set up a "Digital Compass" to underline the four main cardinal challenges that the EU must be address within the "European Digital Decade": "digital skills, secure and sustainable digital infrastructure, digital transformation of businesses and digitalization of public services" (Jorge-Ricart, 2021)

The Commission's current President, Ursula Von der Leyen, has set the establishment of the European Union as the leader of new digital world as a main priority among her political guidelines, to empower European businesses through the use of data. (European Commission, 2020c).

To achieve the ambitious objective of setting Europe at the top the world data market, the Commission has established the "European data strategy" program which will mobilize large investments from both the EU and the Member States to promote a European data-driven economy. Moreover, the EU has planned to adapt the current data legislation (Open Data Directive) to contribute to develop a more favorable ecosystem for the Open Data infrastructures that will help to address the data accessibility issues for SMEs.

But before meeting the challenge of becoming independent in the data ecosystem, and building up a strategy, the European Commission conducted an internal assessment to address its core weaknesses in the Big Data industry.

Data access was pointed out as one of the biggest European challenges in the sector. According to European experts (European Commission, 2020c), the value of data lies in its reuse and currently, there are not enough quality datasets available in the European marketplace for original reuse because Big Data are usually privately-held by large corporations which own copyrights or do not give consent to use their data.

In addition to the general issue with data accessibility, the analysis pointed out that the European Big Data market presents serious imbalances in market power, especially when it comes to compare data accessibility in large corporations to accessibility in SMEs. This 'data advantage' often results in monopolies or oligopolies given that businesses with access to Big Data are the ones profiting from them.

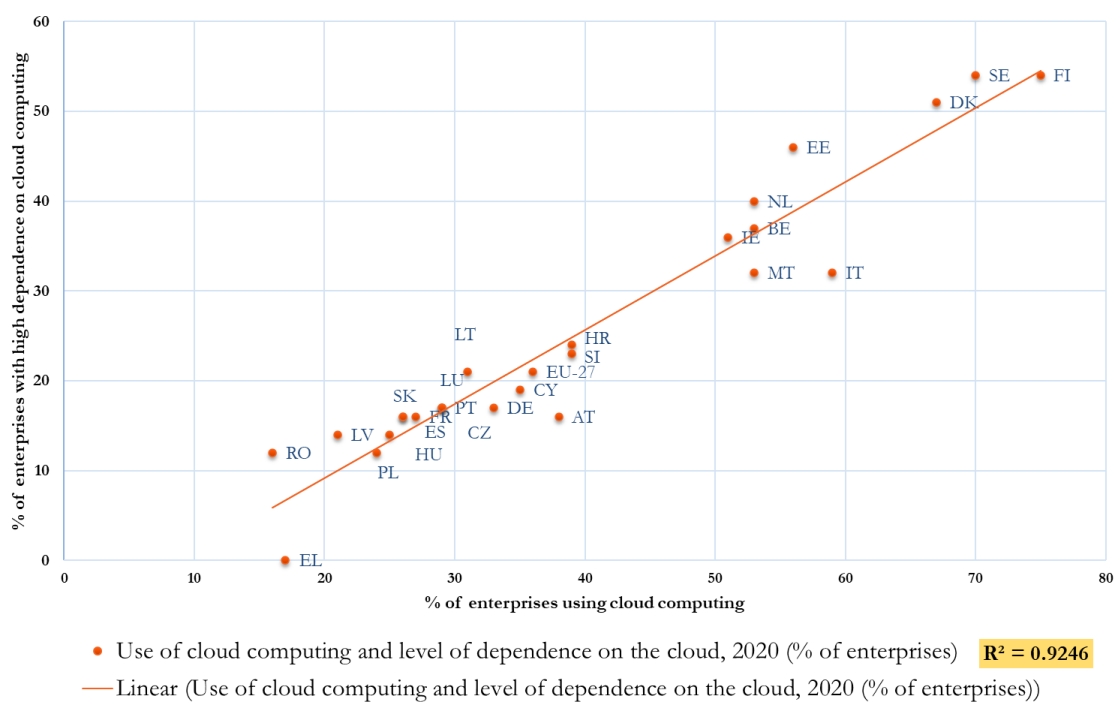
The European public bodies have already established a commitment to increase the availability of high-quality public open data to be reused by European organizations, especially by SMEs (European Commission, 2020c). The Commission's ambition is to release the full potential of the public data by publishing it in a single public repository (EU

Open Data Portal) and benefit European companies. However, they have faced various problems with data portability, since Public Administrations usually store their data in diverse cloud spaces where datasets are labeled and structured differently.

With the aim of addressing these issues and promoting the data transferability across businesses and sectors, the Commission has developed the European Interoperability Framework, to standardize the current data formats and protocols for the whole Union. Furthermore, the Commission also intends to improve the data governance across Europe by transforming the current legislative framework.

European’s cloud supply, which currently represents a small share of the world’s market, has been unable to meet Europe’s data processing demand, leading to “*technological dependencies on foreign strategic infrastructures, at the center of the data economy*” (European Commission, 2020c). Eurostat reported in 2020 that among the enterprises employing cloud computing services, “59 % were ‘highly dependent’, while 38 % were classified in the ‘upper-medium’ level” (Eurostat, 2020). This external dependence has made the EU extremely vulnerable, because the external cloud service providers such as China, do not share the European view on data protection.

Figure 8 Use of cloud computing and level of dependence on the cloud in Europe (% of enterprises)



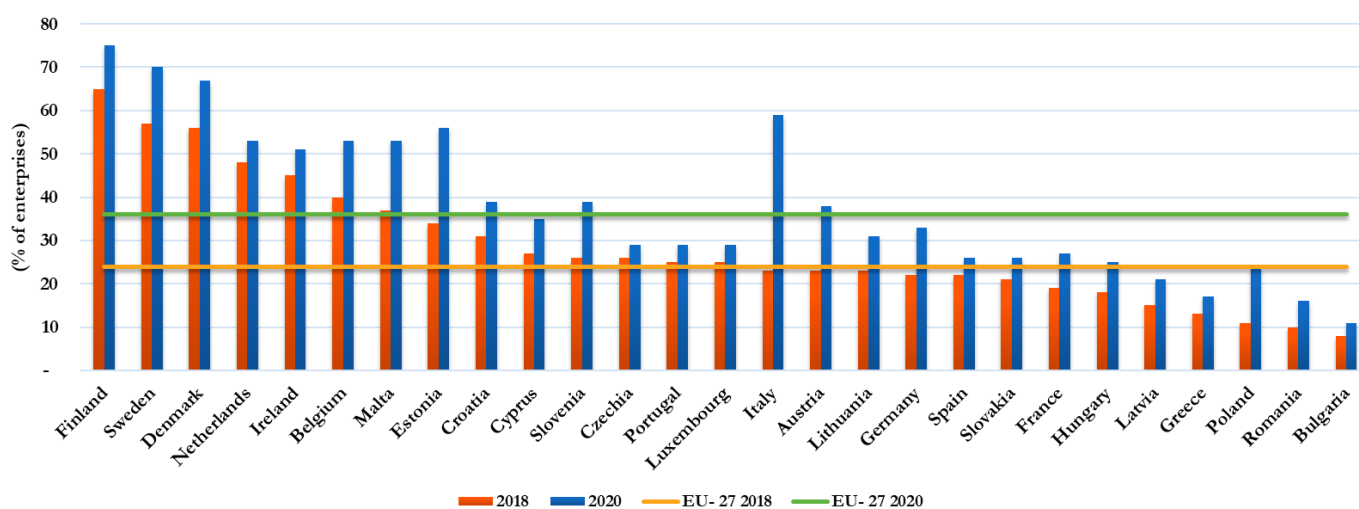
Own elaboration with data retrieved from Eurostat.

As illustrated by Figure 8, European Member states with an intensive use of cloud services are highly dependent on them. The linear regression model plotted in Figure 8 presents a R-squared of 92.46%, meaning that most of the data fits the model that relates the European external dependency on cloud computing services with cloud usage. Not even the most cloud intensive and resourceful companies are able to find cloud suppliers in the European market.

A recent study published by the Commission, revealed that SMEs are the most affected agents by the use of external cloud service providers, as they not have the sufficient power to impose the EU data protection standards in their contractual agreements (European Commission, 2020c). Hence, developing an interoperable European Cloud space based on EU values for marketers across all Member States, is a priority in the European digital strategy tackle the foreign subservience.

Over the last years, European cloud supply has lag behind demand (Figure 9). Cloud demand has been boosted by an increasing adoption of cloud services among the European companies with 25% of its businesses (20% of the SMEs) embracing these technologies. However, this process diverges significantly across Member States (Figure 9). While countries such as Italy or Estonia have doubled their share of enterprises using cloud computing services, other countries have not been able to follow this increased adoption and are and they are lagging behind other European countries. This is the case of countries like Spain, Portugal or Czechia.

Figure 9 Demand for cloud computing services by MS 2018 vs 2020.



Own elaboration with data from Eurostat.

Even though businesses in every Member State have increased their demand for cloud services, implementation rates within the European economy are still low in comparison to other developed economies. The lack of cloud services that fit the European values has disincentivized cloud adoption within the EU. Despite the fact that some innovative cloud solutions have been developed by European SMEs in the recent years, these providers have lacked visibility in the Single Market (European Commission, 2020c).

The construction of an integrated European network of data hubs aims at promoting European cloud providers while helping them to scale up. Moreover, these meeting points for cloud agents will tackle the interoperability challenge by establishing common harmonized procedures for data portability (D'Elia, 2021).

The Commission will carry out during the next six years a “High impact project on European data spaces and federated cloud infrastructures” to dynamize a secure and interconnected cloud ecosystem in the EU, without external dependencies (European Commission, 2020c). Both the Commission, Member States, and private agents will finance this initiative with €6 billion during the next period 2021-2027. The public-private initiative will bring all the stakeholders to the table in order to address the challenges within the data industry.

Businesses willing to benefit from the implementation of cloud services to manage their data must pay attention to the funding opportunities that will arise from the Commission during the following months. Although most of the digitalization investments will be administered by the states, cloud initiatives will be carried out at a supranational level, as the final goal is the construction of a pan-European secure cloud space.

Not only market adopters will benefit from the European high impact project on data spaces, innovators from any size or nation will have the chance apply for European funding by presenting a proposal to any of the Horizon Europe’s topics related to Big Data (Table 1). The deadline to deliver a proposal is September 2021 and almost €350 million will be devoted to find innovative Big Data solutions from European organizations (European Commission, 2021a).

Table 1 Funding by topics. "Horizon Europe" Program

HORIZON EUROPE CLUSTER 4 DESTINATION 3: DATA	TOTAL		2021		2022	
	Topics	BUDGET (million €)	Topics	BUDGET (million €)	Topics	BUDGET (million €)
Data sharing in the common European data spaces	3	135	2	83	1	52
From Cloud to Edge to IoT for European Data	5	149	3	59	2	90
Strengthening Europe's data analytics capacity	2	64.5	1	30	1	34.5
Total, DESTINATION 3 DATA	10	348.5	6	172	4	176.5

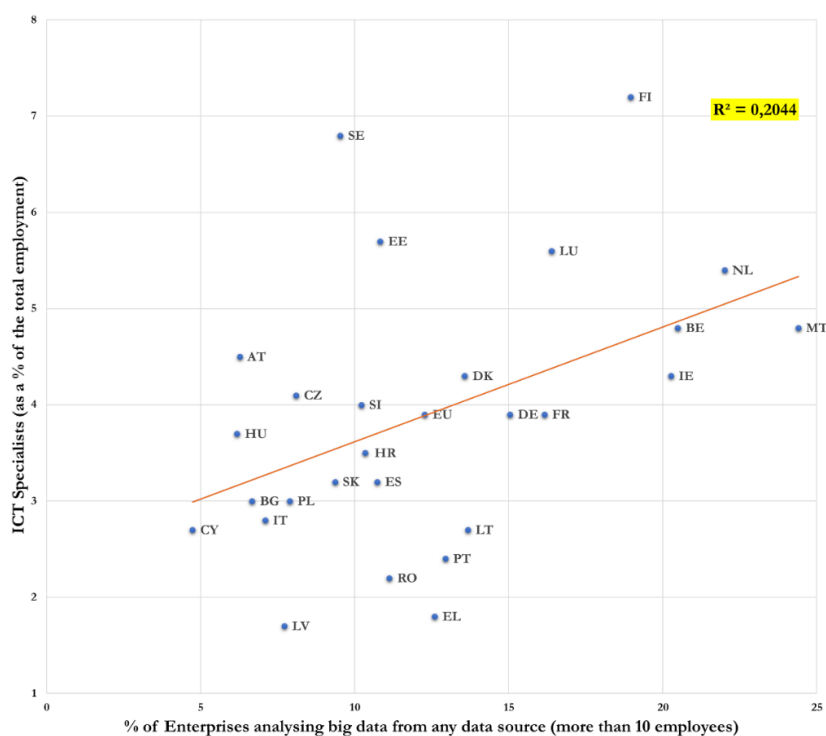
Source: own elaboration with data from the European Commission

3.1.2. Data talent gap

Europe has also highlighted a supply shortage for data specialists. The Commission reported Big Data and analytics to be at the top of the list of critical skills shortages. Figure 10 shows the inelastic ITC talent supply because European countries with a more intensive Big Data usage in 2020 do not count with larger shares of professionals in the field. Only a 20% of the increases of data professionals in a country is explained by a more intense use of Big Data within the same economy.

Thus, the European Union will open a number of funding opportunities to promote digital and data training across European organizations (European Commission, 2020d).

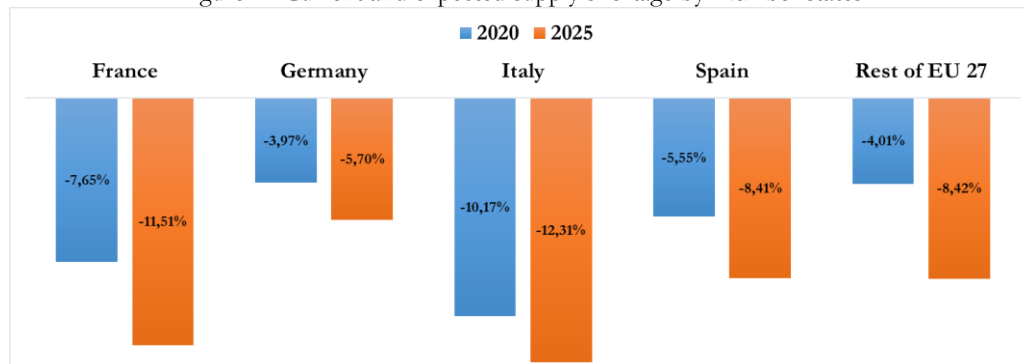
Figure 10 Big Data usage and ICT Specialists by Member State, 2020.



Own elaboration with data from Eurostat

The International Data Corporation (2020) foresees larger skills gaps as the demand for these professionals continues to increase. The forecasts depict a larger gap on data talent (Figure 11) for every European region, especially for the eastern and southern Member States, who are currently introducing Big Data analysis within their organizations. According to the IDC's (International Data Corporation, 2020), the European Union will see its shortage of data professionals doubled in 5 years (Figure 11).

Figure 11 Current and expected supply shortage by Member states.



Source: own elaboration with data from the International Data Corporation

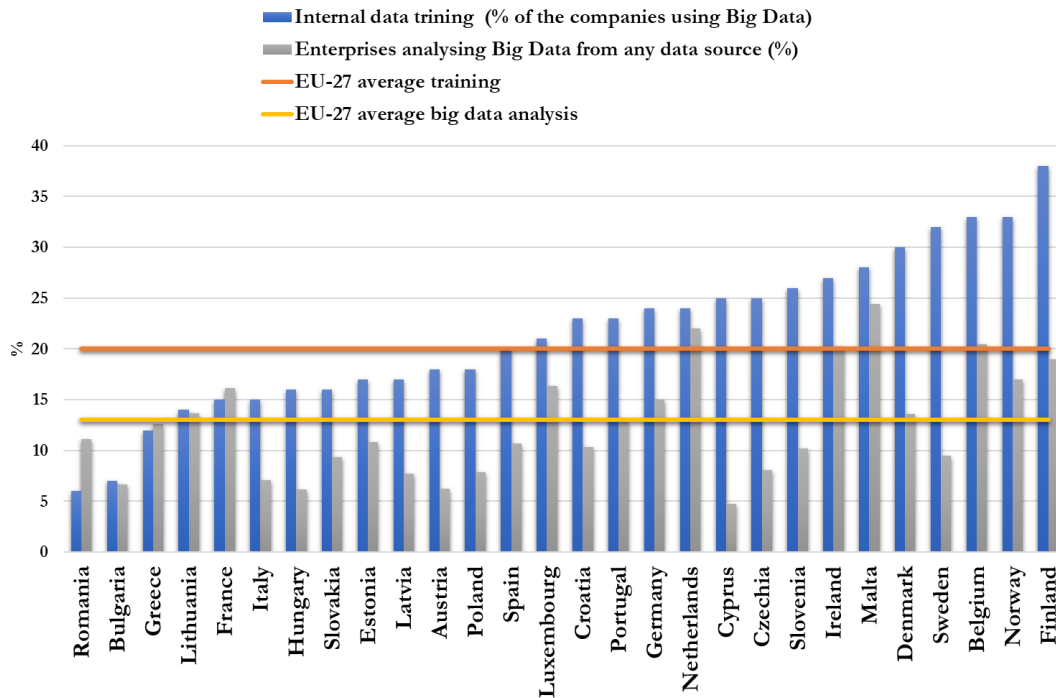
Insufficient internal training in European organizations is one of the main drivers for the data talent gap, on average, only 20% of the European companies using Big Data in their organizations are delivering specific programs to train or upgrade their employee's skills (Figure 12). Taking into account the dynamic nature of the data industry, employees' abilities should be under in constant training.

It is also worth to point out that some of the countries with higher data skills needs, such as Italy or France (Figure 11), are not addressing these issues by providing further training (Figure 12). In fact, there does not exist a strong relationship between the use of Big Data and its training within companies (Figure 12). Most of the corporate training on Big Data seems to be related to culture (Figure 12), as twice as many companies in Nordic countries (Finland, Sweden or Norway) than in Eastern (Romania) or Southern countries (Greece, France, Italy) have implemented data-related training campaigns.

The data strategy, aimed at bridging information asymmetries in the Single Market, will target those economies with lower training rates to homogenize the level of preparedness in every EU's companies to scale up in the data industry (European Commission, 2020c). Thus, Member States with higher training deficiencies will receive a larger share of the European budget to be spent in up-skilling and re-skilling their data professionals (European Commission, 2020d). Businesses operating in the most vulnerable regions as exposed in

Figure 11, should keep updated of the training funding opportunities that may arise for their regions.

Figure 12 Comparing internal training on Big Data with Big Data usage by European country (2020).

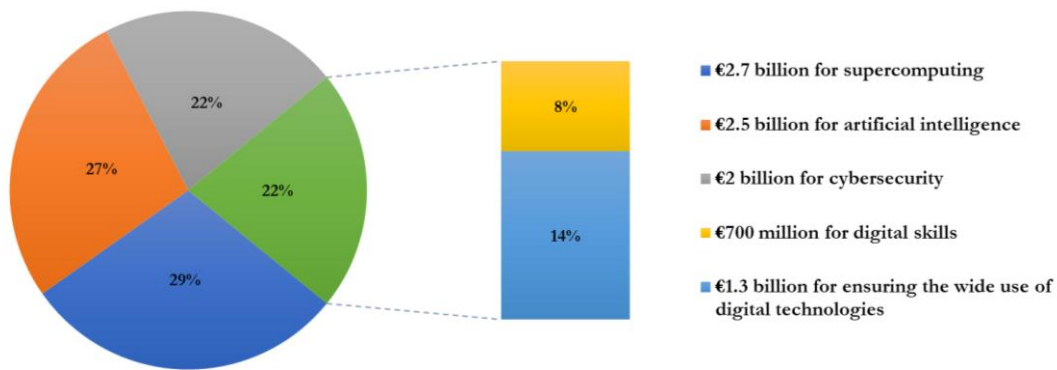


Source: own elaboration with data from the International Data Corporation and Eurostat.

Besides the specific data training, the “Digital Europe” agenda will seek to address the talent shortage in the field of Big Data and analytics by establishing basic training through its "Reinforced Skills" agenda and will seek to increase the number of Big Data specialists by at least 250,000 by 2025 (European Commission, 2020c).

Furthermore, the more than 240 data innovation hubs across Europe will act as a one-stop-shop for data specialists in order to share knowledge and experiences among different actors in the industry and up-skill current data professionals (European Commission, 2021c). In total, almost a quarter (€ 2 billion) of the EU funding for key digital technologies is devoted to enhance digital skills in the European labor force (Figure 13).

Figure 13 EU funding for key digital technologies



Source: own elaboration with data from the European Commission

From the total investment devoted to the promotion of digital skills (Figure 13), the major share of the financial stimulus will be managed by national Governments. Hence, businesses aiming at upgrading their digital and data skills to master Big Data management, should pay attention to national calls in this area.

3.1.3. Capacity building for SMEs

Capacity building is defined by the European Commission at the process where companies acquire “knowledge, skills and resources to make use of opportunities” (D’Elia, 2021).

The European data strategy’s main objective is to create a single data market to address its core issues, paying special attention to the more than 25 million small and medium enterprises that operate in the European economy (European Commission, 2020d). The SME strategy will be devoted to tackle the main obstacles that smaller organizations face when trying to scale up their data management (European Commission, 2020c).

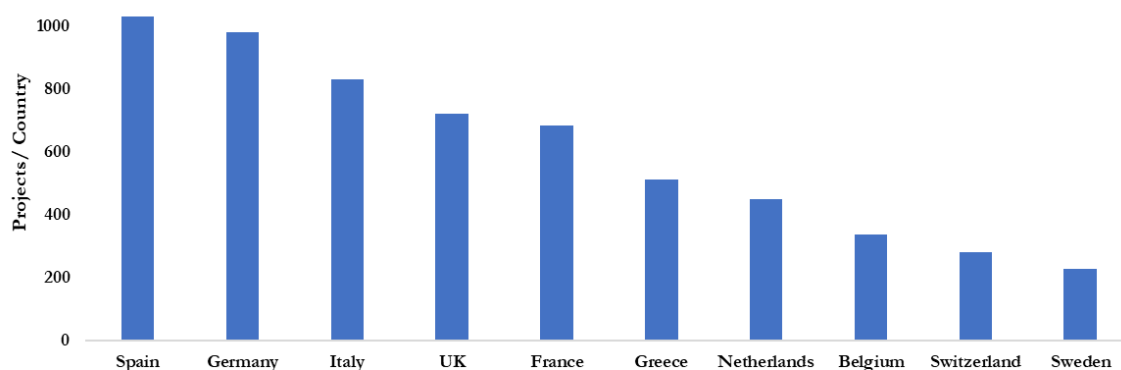
According to the survey on the access to finance of enterprises (SAFE) (European Commission, 2020e), “European SMEs believe the depressed economic outlook has reduced their access to finance by 40%”. To enhance their economic resources and support their Big Data adoption, the Commission will provide financial support through Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME) program and the Loan Guarantee Facility (LGF). Any type of organization may be eligible to access loans, credits, guarantee or venture capital by applying through the European Investment Fund portal or by filling the COSME questionnaire (European Commission, 2020d).

To reach the targeted objectives, the SME Strategy will partner with regional public bodies to monitor and support companies. Moreover, more than 600 organizations of the Enterprise Europe Network (EEN) will provide expertise, advice and support services for SMEs (European Commission, 2021b).

As has been pointed out throughout this report, European businesses face numerous opportunities in terms of access to public funding, knowledge, infrastructures and finance. The Commission seeks to ensure that these opportunities reach all players within the European data market, and it is for this reason that a large share of the budget dedicated to the promotion and development of Big Data in Europe will be managed at national and local level. After having presented the European Data Plan and which financing options may be more interesting for companies seeking to implement Big Data, the Spanish specific situation will be analyzed in detail.

The Commission has identified a potential competitive advantage in Spain for the development of a Big Data market. In fact, according to the platform Kaila, Spain has been the country where more innovative Big Data projects have been financed under the Horizon2020 program (Figure 14). Spain, determined to take advantage from the resources received from the European Community, has designed an ambitious digitization strategy to position itself as a global referent in the data market.

Figure 14 Horizon 2020 budgeted Big Data projects.



Source: own elaboration with data from Kaila

3.2. The Spanish Big Data market

3.2.1. *The Spanish market: baseline scenario*

Since the outbreak of COVID-19, many experts have highlighted the need for a Spanish digital transformation. Spain has been the second largest beneficiary from the Next Generation EU funds, an extraordinary mechanism aimed at dealing with the pandemic effects. The Spanish recovery plan will address digital transformation as one of its four fundamental pillars, along with the environmental transition, education and research and development (Gobierno de España, 2021a).

In 2020, the Spanish Government presented its national digitalization strategy for the next 5 years (Image 4) aiming at tackling the delay issues related to the Spanish Digital

Transformation (Ministerio de Asuntos Económicos y Transformación Digital, 2020). The Government seeks to achieve this goal by performing a “structural reform with a view to the future” in the form of 50 specific measures, which would mobilize a significant amount of public and private investment, amounting 70 billion euros for the next 2 years (Ministerio de Asuntos Económicos y Transformación Digital, 2020).

Image 4 Digital Spain 2025's goals.

GOAL		2020	2025
1	Coverage for the population of more than 100 Mbps	89%	100%
2	Spectrum ready for 5G	30%	100%
3	People with basic digital skills ⁹	57%	80%
4	More specialists in cybersecurity, AI and data	-	20.000
5	Public services available on mobile apps	<10%	50%
6	Contribution of e-commerce to SMEs	<10%	25%
7	Reduction in CO2 emission due to digitalisation	<10%	10%
8	Increase in audiovisual production in Spain	-	30%
9	Companies using AI and big data	<15%	25%
10	National charter of digital rights	NO	YES

Source: (Ministerio de Asuntos Económicos y Transformación Digital, 2020)

To construct an efficient digital strategy, Spain must first identify its main opportunities and challenges in order to carry out a digital transformation agenda to unleash its full digital potential.

Accenture and Oxford Economics (2017) have defined digital transformation as the ability of incorporating Information and Communication Technologies (ICT) to all the processes of the economy, to generate more efficient business ecosystem. According to the Digital Economic and Society Index, DESI, (European Commission, 2020a), Spain has a significant room for improvement in its digitalization. This indicator underlines the need for a digital acceleration within Spain in order to bridge the gap with the leading digital countries such as the United States (US), the United Kingdom (UK) or Sweden.

While the DESI measures the current levels of digitalization in an economy, the “Digital Economic Opportunity Index” (DEO) aims at measuring the level of digital transformation

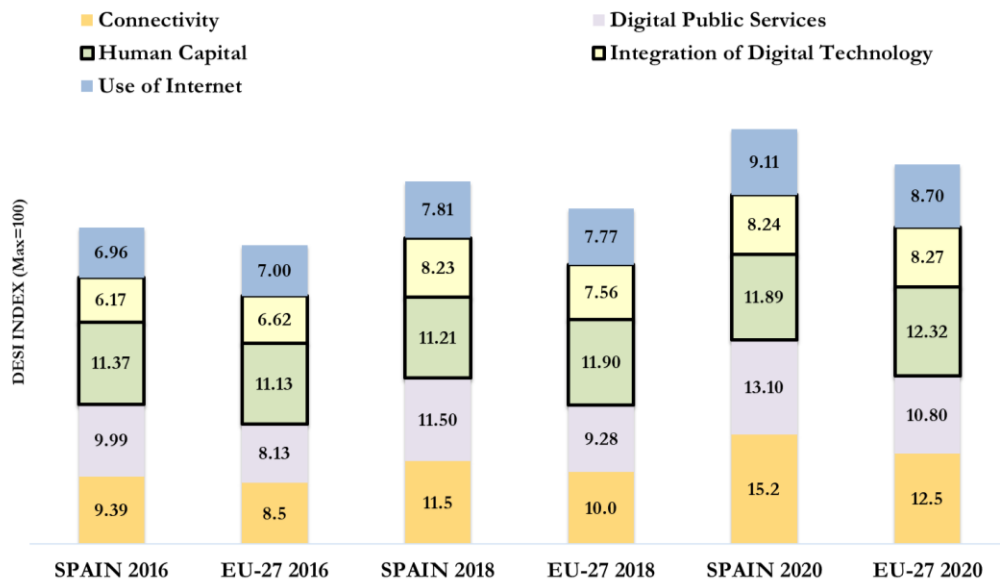
opportunities in an economy based in 3 main pillars: digital skills, digital technologies, and digital accelerators (Accenture & Oxford Economics, 2017).

In 2017, Spain was below the European average in every digital dimension. According to the DEO constructed by Accenture and Oxford Economics (2017), it ranked 15th out of the 27 Member States and the UK. One of the main reasons for the Spanish poor digital opportunities was the nation's slow economic recovery over the post-crisis years. Since the DEO is a relative index, Spain's position in the ranking was eroded because most EU countries were able to recover faster, and invested in digitizing their economies. Digital skills and digital technology have been the indicators driving this negative performance. Because digital economies are knowledge and technology intensive, a high density of these resources is needed in the Spanish economy to succeed in the digital transformation.

Over the last years, the Spanish digital transition has improved its performance (Figure 15), through an improved connectivity and its efficient digital public services. However, Spain is still below the EU average in terms of digital talent and the integration of digital technologies by private organizations (European Commission, 2020a). Despite connectivity and technological infrastructures are remarkable digital strengths within the Spanish economy (Ministerio de Asuntos Económicos y Transformación Digital, 2020) (Figure 15), the Spanish technological investment decisions and its talent management have not been able to carry out an efficient integration of digital technologies within companies.

To evaluate Spain's competitive position in the Big Data market and develop its data strategy, the Ministry of Digital Transformation (Ministerio de Asuntos Económicos y Transformación Digital, 2020) carried out Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis. The outcome of the analysis was the development of a competitive framework which identified data skills, digital transformation in SMEs, and the Spanish external digital dependency (and its related security issues) as Spain's core digital weaknesses. In addition, according to the Spanish Statistics Institute, SMEs have found more challenges in coping with these issues (Instituto Nacional de Estadística, 2020a). Given the weight of SMEs in the Spanish economy, the challenge of boosting their digitalization has been underlined as one of the main priorities of the Spain Digital Agenda 2025.

Figure 15 Spanish DESI evolution compared to EU-27 average (2016-2021).



Source: own creation with data retrieved from the European Commission.

To achieve a digital transformation within a data-driven economy, companies of all sizes must take advantage of the opportunities of digital technologies. According to the Spanish Digitalization Plan for SMEs (Table 2), the digital transformation appeals companies of all sizes, and it stresses the fact that specially SMEs should “*adopt new processes, invest in new technologies, apply digital technologies to the transformation of their business and thus achieve an increase in productivity, competitiveness and future profitability*” (Gobierno de España, 2021b). For this purpose, the Digital Agenda has established a scalable digitalization toolkit program, designed to promote digital training and cooperative actions for SMEs (Table 2).

As it can be induced from Table 2, basic digitalization will be the main destination of the public funding. However, small sized companies willing to implement disruptive technologies like Big Data may also find great opportunities from this program.

To begin with, organizational culture has been outlined in previous sections as one of marketers’ main boundaries for working with Big Data. Funding destinations aimed to tackle directives’ need for digital training will receive the second largest budget from the SMEs Digitalization Plan. In addition, the promotion of disruptive technologies across Spanish businesses will also receive certain relevance within this plan. Despite there are not many initiatives directly addressing Big Data specific challenges within the Spanish digitalization plan, barriers to Big Data implementation can be overcome through horizontal tools.

As analyzed previously, data skills, digital security and legal compliance have become major issues in the recent years for firms working with Big Data, and can be addressed through any transversal programs such as the Digital Toolkit or the “Acelera PYME program” (Table 2).

The Digital Toolkit will be the most relevant funding mechanism of the Spanish Digitalization plan for SMEs (Table 2), and will be devoted support Spanish SME’s training, digital strategies, or their implementation of digital business tools such as Customer Relationship management systems, Enterprise Resource Planning systems...

Table 2 Spanish Digitalization plan for SMEs (2021-2025)

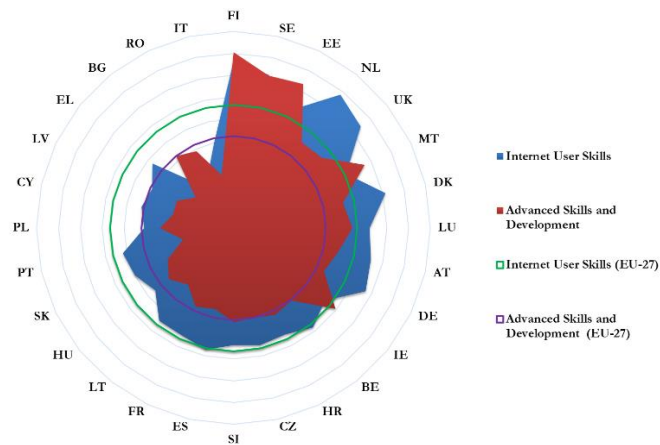
Main target	Measures
Basic Digitalization for SMEs (€3,118 million)	<ol style="list-style-type: none"> 1. Digital Toolkit (€3,000 million) 2. Connectivity grants 3. Digital security 4. Acelera PYME (training, advice and financial support)
Change Management (€656 million)	<ol style="list-style-type: none"> 5. Directives training programs 6. Training for experts in digital transformation 7. Program for change agents
Disruptive innovation and digital entrepreneurship (€439 million)	<ol style="list-style-type: none"> 8. Disruptive innovation for Digital transformation 9. Support to innovative SMEs 10. Support to Digital Innovation Hubs 11. Support to Digital Entrepreneurs
Sectoral Digitalization (€443 million)	<ol style="list-style-type: none"> 12. Active Industry 13. Digital Tourism 14. Ecommerce
Coordination, efficiencies, and reforms (transversal)	<ol style="list-style-type: none"> 15. Support network and capacity building 16. Digital SME certification

Own elaboration with data retrieved from the Spanish Government

Although all the aforementioned issues represent relevant constraints for the implementation of Big Data technologies in Spanish companies, their biggest constraint is related to the lack of skilled personal to work with Big Data. According to the DESI index released in 2020, Spain is below the EU-27 average in basic, and advanced digital skills (

Figure 16).

Figure 16 Digital Human Capital dimension in the DESI index by category.



Source: own elaboration with data from the European Commission

Investment on digital training is the main reason behind the poor performance of Spanish digital talent (Accenture & Oxford Economics, 2017), which has been amplified by the financial crisis of 2008. According to the European Commission (2020b, p.9), Spain must *“increase its number of specialists by up-skilling and re-skilling, and narrowing the substantial gender gap (...) to move at full speed to join the dynamic digital environment and help prepare all Spanish citizens to embrace the benefits of the digital economy”*.

The Digital Agenda for 2025 has set ambitious goals to boost digital talent in Spain. The Spanish Ministry for Digital Transition has devoted over €4billion to build up a new digital skills strategy whose objective is to reach the objectives 3 and 4 of the Digitalization Plan (European Commission, 2020b) (Image 4): boosting digital literacy and digital specialists within its economy. Despite these destinations will have a great impact in the medium run for the national businesses, because they will operate in a fully digital business environment with qualified professionals, companies wanting to attend to current calls should target the opportunities that promote training within their own organizations.

Investments in technologically innovative solutions such as Big Data are scarce in Spain given the Spanish traditional consumer behavior compared to other European countries (Accenture & Oxford Economics, 2017) . Thus, many businesses have been reluctant to invest in digital solutions. SMEs can get funding for their own training programs by attending to any of the calls from the SMEs’ digitalization program previously addressed or through other funding schemes such as the Recovery and Resilience Mechanism (RRM), which manages additional funds that have been invested to lead the Spanish economic recovery after the pandemic. Currently, Spain is still defining its recovery plan, which must be submitted by 30 April, however, the draft version of the “España Puede” agenda is almost

completed and most of the destinations of the Recovery and Resilience Mechanism have been already assigned (Gobierno de España, 2021a).

According to Table 3, a major part of the key priorities in the recovery plan will be directly targeted to enhance the Spanish digitalization, as it is considered a basic element for the economy's recovery. Spanish businesses should be aware of the main ambitions of the “España Puede” plan in order to know where to look for public funding.

Digital Open Data supply will exponentially increase within the next years, which may be of interest for companies trying to access Big Data. Moreover, SMEs considering working with Big Data, will also find funding opportunities through the RRM, because tackling SMEs' digital issues is one of the primary destinations of the recovery agenda. Moreover, small businesses will be able to take advantage from the transversal Digital Skills Plan to deal with one of their major weaknesses.

Table 3 Top ten destinations of the Spanish recovery, transformation and resilience Plan

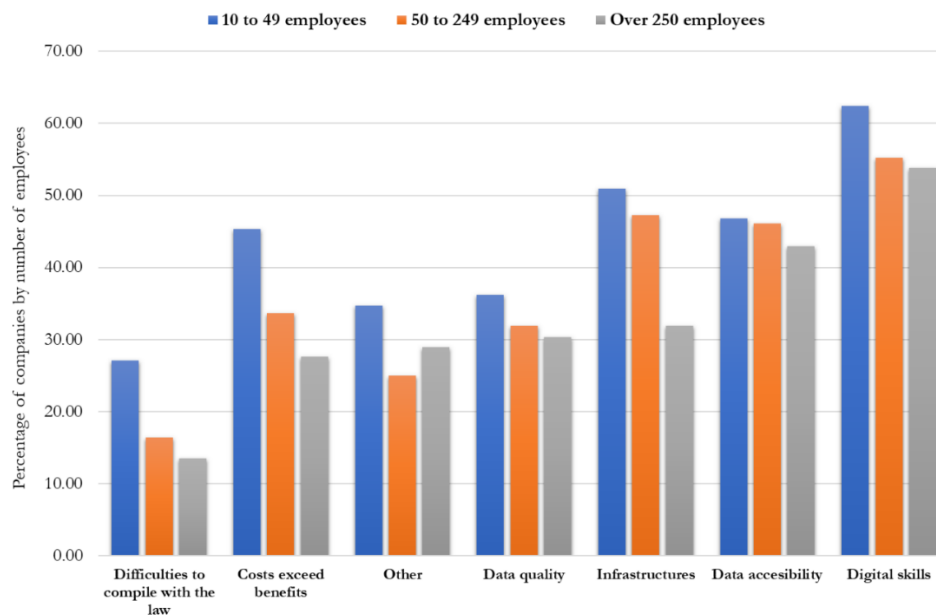
DESTINATION	BUDGET (€ billion)
1. Sustainable, secure and connected mobility	13.36
2. Housing and urban renewal	6.82
3. Public Administration modernization	4.32
4. SMEs Digitalization	4.06
5. Roadmap for 5G	4
6. Industrial Strategy & Circular economy	3.78
7. Digital skills	3.59
8. Modernization of the touristic sector	3.4
9. Science and Innovation development	3.38
10. Renewable energy development and integration	3.17
....	...
TOTAL RECOVERY, TRANSFORMATION AND RESILIENCE PLAN	70

Own elaboration with data from the Plan España Puede

3.2.2. The Spanish data market

Although Big Data has been proven to be extremely beneficial, it seems that most companies within the Spanish borders are not aware of its potential, in view of the fact that over 80% of the SMEs not analyzing Big Data, are not considering it (Instituto Nacional de Estadística, 2020a).

Figure 17 Spanish Companies not analyzing Big Data in 2020 by reason and Company size.

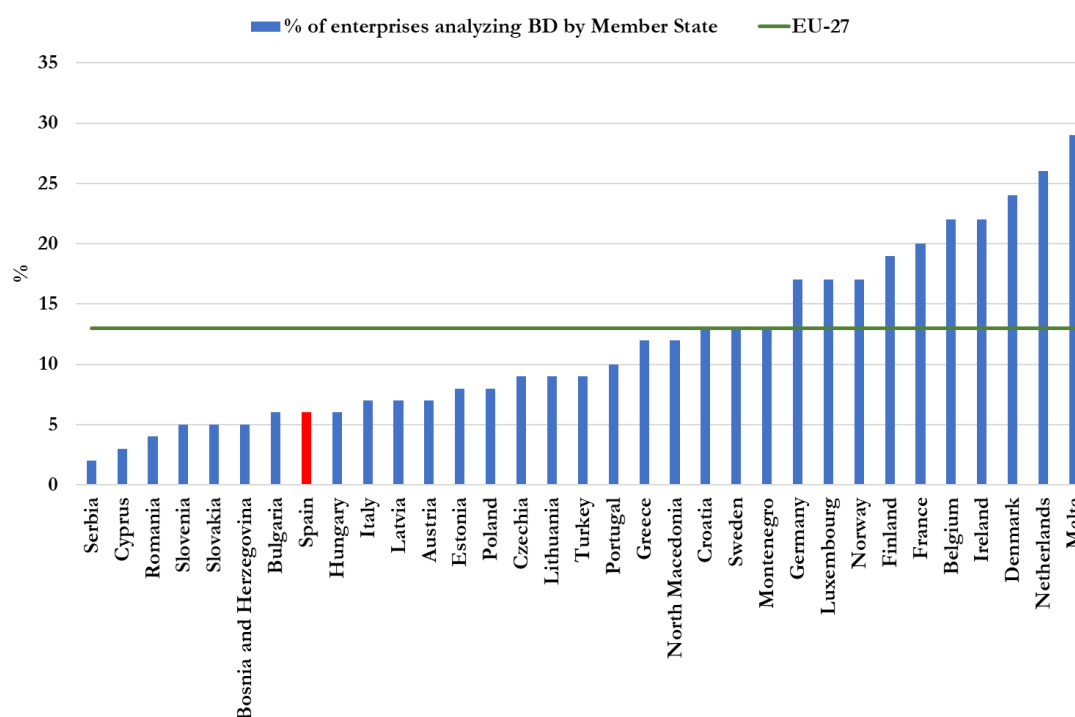


Source: own elaboration with data from the “Instituto Nacional de Estadística” (INE).

The main barriers encountered by Spanish SMEs when trying to work with Big Data have been unavailability to find appropriate workforce or difficulties finding suitable quality data to carry out a profitable analysis (Figure 17). In addition, smaller companies face more barriers compared to larger firms when working with large datasets, especially in terms of law compliance (Figure 17). The ability to profit from a Big Data strategy is also a major hurdle for the smallest firms. The public investments on digitalization will intend to cut costs from the data operations in order to make investments in this area profitable for companies of all sizes and sectors.

Spain is among the most backward countries in Europe when it comes to analyzing large and varied data (Figure 18). Undoubtedly, the lack of digital talent is the main cause of this delay as shown in Figure 17. Nonetheless, other factors such as insufficient data access or the dubious data quality data are key factors for the poor national data analysis (Figure 17).

Figure 18 Percentage of enterprises analyzing Big Data internally or externally in the EU.



Source: own elaboration with data from Eurostat.

The Spanish digitalization plan has placed Big Data at the forefront of its objectives for 2025 and has set the ambitious goal of implementing AI and Big Data in more than 25% of the Spanish companies by 2025 (less than 10% in 2020, Figure 18). Furthermore, the Digital Agenda will establish a Data Office within the Central State Administration, whose main purpose will be to increase the availability of public data in the data markets.

The Data Office will be in charge of proposing data governance mechanisms, establishing the necessary measures to create secure environments to share Big Data between the Administration and the companies (Ministerio de Asuntos Económicos y Transformación Digital, 2020). Tackling the data accessibility issue is necessary to increase the use of Big Data in Spain, especially for SMEs, who are unable to generate Big Data by themselves.

At a time when Spanish eCommerce is growing at a historic pace, SMEs' marketing plans must be more dynamic than ever. According to J.P. Morgan (2019), *"Spain is one of the world leaders in terms of e-commerce growth, (...) with a compound annual growth rate of 13.5 percent"*. However, this market is dominated by large corporations like Amazon or Zara.

In order to respond to this new market, need for online marketplaces, Spanish SMEs will have to make use of large, insightful databases to be able to compete and target new customers. Nevertheless, companies will not be able to obtain great profitability from the

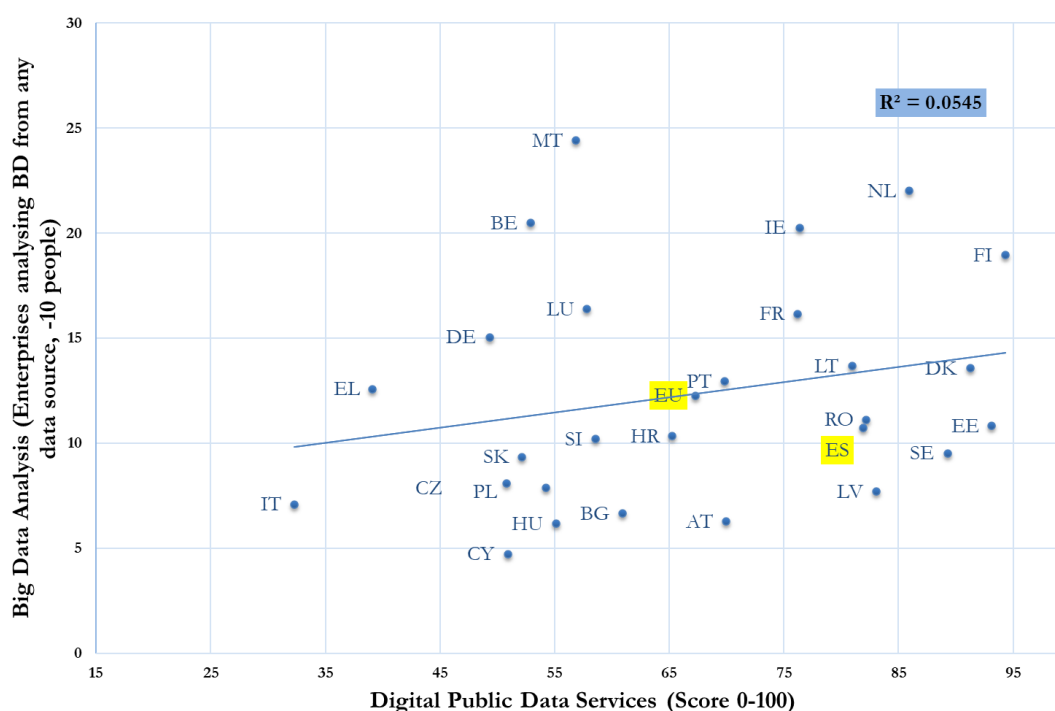
public data offered by the State, as it will be argued in the following lines. In order to optimize their strategies, companies from different fields must collaborate by sharing data. To this end, the development of digital innovation hubs for data analysis has been pointed out as the most efficient collaboration tool.

Data innovation hubs support smaller businesses with their smart specialization by granting them access to private databases, training on how to analyze the data, financing, and support when compiling with their legal obligations (European Commission, 2021c). In these common regional spaces where data providers, users, and regulators interact, the most significant hurdles for Spanish SMEs trying to implement Big Data will be addressed.

Although the public procurement of data services has been outlined as one of the main destinations of the recovery plan, Spain is already a leader in this area (ranks 2nd in Europe in the supply of Digital Public Services according to 2020's DESI). Moreover, in light of the results of the present analysis, an increase in the procurement of public Big Data does not guarantee the implementation of Big Data analysis within organizations, since they are not correlated.

Figure 19 shows that only 5% of the Big Data use cases in Europe are explained by an increased Big Data supply in public open repositories. In Spain, Big Data public supply is a worldwide referent, while its national companies are some of the organizations with the poorest Big Data analysis at European level (Figure 19).

Figure 19 Procurement of public Big Data vs Big Data Analysis in the EU



Source: Own elaboration with Data from Eurostat and the DESI

In the light of the results encountered, Spanish businesses should be aware of the limitations that public data has for their business plans. Although the national digitalization plan encourages businesses to use this data, it may not be the most profitable strategy for them. Before rushing to work with public Big Data, Spanish businesses must assess whether the open public data are aligned with their organizational objectives, in order to avoid incurring in losses by wasting their limited resources.

Applications to data training programs, business acceleration processes or the integration of SMEs in common spaces for smart specialization, usually have larger impact in their data productivity.

In addition, it is necessary to promote digital innovation within the Spanish entrepreneurial culture. Owing to the fact that Spanish e-commerce is currently facing an exponential growth, small businesses can find the push to invest in digitalization. The 656 million € devoted to “change management” will seek to provide digital training to directives so that they are motivated to invest in digital technologies and lead the digitalization of their own businesses (Gobierno de España, 2021b). Moreover, they can attend to workshops organized by the National Office of Entrepreneurship through the Business Entrepreneurship Support Program.

As it has been addressed in for the European case, data sharing across organizations is essential if the smaller actors want to profit from Big Data. To optimize data interoperability, all data must be governed by the same laws and stored in a similar space, so that their transfer is simple and does not generate quality losses. To address this challenge, the European Commission has already proposed different solutions within the European Data Strategy, such as the development of a European Cloud Federation, which aims at coordinating and bringing together local initiatives in the Member States (Ministerio de Asuntos Económicos y Transformación Digital, 2020).

The Spanish Government considers that carrying out a joint European Cloud Initiative will benefit Spain to a greater extent, since operating in a cloud single market opens up more opportunities and eases cross-national data sharing. To become a leader a leading actor within the European Cloud federation, the Spain has already shown its commitment to share its data with all Member States and thus contributing to increase data availability in Europe. The Spanish Government has addressed the need to build the Spanish data market under the FAIR guiding principles, to make data Findable, Accessible, Interoperable, and Reusable (Ministerio de Asuntos Económicos y Transformación Digital, 2020). Furthermore, the Digitalization Plan will devote its cloud budget to support the participation of Spanish companies and institutions in international and European cloud projects.

3.2.3. Digital Marketing Opportunities for Spanish SMEs.

According to the global ecommerce market ranking of 2019 (eshopworld, 2018), Spain is among the fastest growing ecommerce marketplaces in the world, with an expected compound annual growth rate of 7.6% between 2020 and 2024 (Coppola, 2020).

In the first quarter of 2020, Spanish ecommerce accounted for over €12 billion, a 11.6% increase with respect to the previous year (Comisión Nacional de los Mercados y la Competencia, 2020). Nonetheless, less than half of the online purchases made by Spanish consumers were through domestic online websites (Comisión Nacional de los Mercados y la Competencia, 2020). The current situation has revealed the serious weaknesses of the Spanish businesses in meeting the online demands of its customers. To remain competitive in this new environment, many Spanish SMEs must carry out a digital acceleration.

In Spain, only 18% of the Spanish SMEs sell online (European Commission, 2020b). Moreover, only 13.5% of the Spanish small and medium sized enterprises use digital specialists compared to the 72% of the large corporations.

Because Spanish SMEs represent a major share of the Spanish businesses, their digitalization is a key priority within the Government's agenda, in order to make them competitive and take advantage in the online marketplace. SMEs taking advantage from public funding opportunities to digitalize their businesses and count with skilled professionals will count with a competitive advantage. However, digital companies have to implement alternatives to traditional marketing, and must adapt their marketing plans to build long term relationships with their new online customers.

By accessing the public financing opportunities that are yet to come, any firm, regardless of its size, will face a significant competitive advantage over other businesses. SMEs able to identify and request the most appropriate funds for them, will be able to access the funding, training and infrastructures necessary to develop a competitive marketing strategy within the new digital framework.

In order to understand the new public, firms must make use of large external and insightful Big Data, and analyze them through the use of digital marketing tools presented in previous sections (SEO, SEM, Display Advertising, Social Media Advertising...). However, digital talent and technological infrastructures are needed to implement a data-powered marketing strategy.

Due to the massive amounts of public financing information published through multiple platforms, smaller companies may feel overwhelmed when trying to attend to calls to implement Big Data in their operations. The following section is intended to serve as a guide for those SMEs that do not want to miss the digitalization boat but cannot look for all the digital acceleration programs on their own. For this purpose, this guide will present the most suitable opportunities for SMEs to apply for, as well as the means to do it.

4. A PRACTICAL GUIDE FOR SPANISH SMES: HOW TO IMPLEMENT BIG DATA BY TACKLING ADVANTAGE OF PUBLIC FUNDING OPPORTUNITIES

In previous sections, the European and Spanish digitalization agendas have been analyzed. Having presented how businesses can benefit from Big Data analytics and once the main funding opportunities for them have been outlined, this guide will be aimed to ease Spanish SMEs access these upcoming opportunities.

Digital talent and technological infrastructures are the main cornerstones for the implementation of a successful Big Data strategy in any firm. Nonetheless, before investing in technology or training, companies should get informed about where to invest, how much it will cost, and what type of public funding they can expect.

Spanish SMEs can access multiple initiatives to ask for basic information, network, scale up and get updated in relevant funding opportunities. These are some of the most relevant ones:

- **Europe Direct.** Europe Direct is a platform which answers general questions related to EU funding opportunities in 24 languages and offers relevant contacts to solve specific inquiries. They have a list of phone numbers available in their page (Table 4).
- **Startup Europe.** This network's main goal is to build up a digital single market where European firms can grow. The Startup Europe Club brings together relevant stakeholders in the European business ecosystem to provide European SMEs with knowledge on how to access funding processes and scale up, as well as with support with their networking initiatives by organizing events, summits... In addition, the Startup Europe club counts with several funding instruments and acceleration platforms that can be of interest for newborn companies that want to grow in a digital environment. Some of the most relevant funding opportunities within the Startup Europe platform are the European Innovation Council (EIC) accelerator or the Eureka-Eurostar programs, nevertheless, each business can find the most appropriate instrument in their website (Table 4).
- **European Enterprise Network.** This network offers a meeting point where businesses can find advice, support and partnership opportunities to carry out their digital transformation and grow. Furthermore, the European Enterprise network counts with the largest data in Europe on business opportunities. Each firm will be able to receive news on the events and resources of their interest by signing up in their webpage (Table 4).

- **National Contact Points** are national representatives from each member state that are in charge of providing information regarding relevant events or webinars. Moreover, they offer networking opportunities and advice on how to participate in EU projects. While the previous opportunities are framed in a European context, National Contact Points operate at a country, or even regional, level. Small businesses facing language and cultural barriers may find this resource more appropriate to get information and advice regarding EU funding initiatives. The Spanish Government periodically updates the list of national contact points in its website (**Table 4**) so that interested businesses can easily reach this advice on European funding opportunities.
- **Other meeting points for Big Data users and providers:** Some Big Data partnerships, like the European Data Incubator, support SME's Big Data initiatives. Private platforms such as the Big Data Value Association, have created public-private contractual agreements with the Commission (**The Big Data Value Public-Private Partnership**) to promote, coordinate, and dynamize European projects and innovation hubs based on Big Data (Big Data Value Association, 2021). Future Big Data projects financed under the 2021-2027 MFF, will be linked in their site once the destinations to this partnership are signed by the EU (Table 4).
Smaller businesses may find accessing European Digitalization Hubs challenging. For this purpose, Spain has devoted a significant amount of its resources to fund regional Digital Innovation Hubs (DIHs) to boost data use across the national borders. Some of the most significant DIHs can be encountered in Appendix 1.

Previous analyses have pointed out “**insufficient Big Data skills**” as the biggest hurdle for the implementation of Big Data and its analysis in Spanish SMEs’ strategies. As highlighted before, publicly funded training initiatives will be mostly administered by the Spanish Government, as

they have a better understanding the regional needs. SMEs seeking to train their employees in the data field can benefit from the multiple tools that the Spanish Government will make available during the next cycle.

- **The Digital Toolkit.** As it has been addressed before, the Digital Toolkit is one of the basic instruments for SME’s digitalization strategy. Nonetheless, the Government has not specified how to apply to this program although it has pointed out that synergies with the “Acelera PYME” program will be exploited. Thus, it is

recommended for businesses interested in this digital toolkit to address the “Acelera PYME” coordinators to solve their doubts (Table 4).

- **The “Acelera PYME” program**, is a special recovery instrument that will follow a lifelong learning approach to digital training and will promote specific data initiatives. Spanish SMEs seeking to promote the digital talent in their organizations can sign up in the “Acelera PYME” landing page or attend to one of the 60 physical offices in Spain that will be opened within the next 2 years (Table 4).
- **Alternative training platforms.** Joined to the previous initiative, Spanish companies will also be able to find free training courses through alternative public platforms such as the “Fundación Estatal para la Formación en el Empleo” site, where large private corporations experts in Big Data analytics, such as Amazon or Google, will share their experiences.
- **DigitalXBorder** The School of Industrial Organization network offers an excellent training opportunity for small businesses’ directors. This platform offers intensive training programs at a regional level (digitalxborder), aimed at training SMEs’ managers so that they can build strategic Big Data-based plans that allow them to leverage a competitive advantage in the digital market. Businesses interested in taking part in this free program will find all the deadlines and application requirements detailed in the program site (Table 4).

Access to and quality data which fits the business’s strategic goals have been pin pointed as the second biggest challenge to work with data among Spanish smaller companies.

- **Open Data Portals.** The Spanish government has established the public procurement of data as a main priority in the Digital Agenda, and it can be reached through the datos.gob webpage’s catalogue. The European Data Portal also provides large sets of public open data (Table 4).
- **Acelera PYME.** In order to operate with Big Data, businesses must have the adequate infrastructures to manage them, the program “**Acelera PYME**” finances the adoption of key enabling technologies such as Big Data management infrastructures or Artificial Intelligence and interested businesses may obtain more information by contacting the program coordinators through their page (Table 4). The Digital Toolkit Program will also provide public grants to be spent by SMEs in their digitalization.

- **Activa crecimiento.** The support program “Activa Crecimiento” will provide consultancy services to the applicants in order to help them with their data management. Moreover, they will help small businesses with the implementation of their digital marketing strategy. To benefit from this initiative and develop an efficient ecommerce strategy, the applicant must be an SME producing in Spain. Applications to this program are via email (Table 4).

To implement all the disruptive digital technologies in the Big Data field, Spanish entrepreneurs must have the knowledge but also de will to implement innovative business solutions. Aimed at promoting the digital innovative entrepreneurship culture in Spain, the Spanish government has established the following mechanisms:

- **Data Innovation Hubs (Appendix 1).** As previously addressed, DIH will serve as a meeting point to dynamize the Big Data culture across Spanish businesses.
- **Coworking spaces by the Organizational Industry School.** This network aims at promoting an innovative entrepreneurship ecosystem in Spain by providing innovators with infrastructures (over 50 offices in Spain), networks and mentorship programs. Companies applying to this program (Table 4) must be star-ups with less than 6 months.

Finally, Spanish SMEs may attend to Horizon Europe program’s calls for innovative Big Data projects together with a consortium. Due to the limitations for an SME to network at an international level, they can approach potential partners through the national contact points (Table 4). To access innovation funding opportunities, Spanish SMEs do not need to be technological disruptors, but they can participate as part of the pilot business where the Big Data technology is tested.

Spanish SMEs typically achieve better success rates when they apply to national calls through the CDTI ‘s (Centro para el Desarrollo Tecnológico Industrial) mechanisms (Table 4).

Table 4 below encapsulates all the aforementioned information in a single page, aiming at helping Spanish SMEs to overcome the bureaucratic constraints they face when trying to choose between the different funding alternatives. Furthermore, for every dimension to be financed with the European budget, the table depicts whether the mechanism articulating the funding program is either European or national, thus favoring a more efficient allocation of SME’s scarce resources. By looking at the dual classification of the funding opportunities, Spanish SMEs will be able to determine at a glance to which calls they should assign English

speaker employees or workforce who perform better in multicultural environments. On the other hand, workers who are more proficient in their native language or projects that have a better fit for the Spanish market can apply directly to calls for proposals articulated at a national level.

Table 4 Funding opportunities for Big Data implementation for Spanish SMEs

EUROPEAN FUNDING OPPOTUNITIES

FOR SPANISH SME WILLING TO IMPLEMENT BIG DATA.

INFORMATION, NETWORKING AND MENTORING TRAINING OPEN DATA AND CLOUD SERVICES PROMOTION OF INNOVATIVE TECHNOLOGIES AND ACCESS TO FINANCE	EUROPE DIRECT https://n9.cl/eudirec	EUROPEAN ENTERPRISE NETWORK https://n9.cl/enterpriseeu	BIG DATA VALUE PUBLIC-PRIVATE PARTNERSHIP https://n9.cl/bigdatappp
	DATA TRAINING WITHIN A EUROPEAN SCOPE WILL ONLY BE PROMOTED THROUGH DATA HUBS, OTHERWISE, TRINING PROGRAMS WILL BE DELIVERED AND FINANCED AT A NATIONAL/REIGONAL LEVEL		
	EUROPEAN DATA PORTAL https://data.europa.eu/es	BIG DATA VALUE PUBLIC-PRIVATE PARTNERSHIP https://n9.cl/bigdatappp	EUROPEAN CLUD ALLIANCE https://www.europeanclo-udalliance.com/join/
	HORIZON EUROPE https://n9.cl/upcomingbdfunding	LOAN GUARANTEE FACILITY https://www.eif.org/generic/contacts/index.htm	

SPANISH FUNDING OPPOTUNITIES

FOR SPANISH SME WILLING TO IMPLEMENT BIG DATA.

INFORMATION, NETWORKING AND MENTORING TRAINING OPEN DATA AND CLOUD SERVICES PROMOTION OF INNOVATIVE TECHNOLOGIES AND ACCESS TO FINANCE	MINECO https://n9.cl/minecoquestions	ACELERA PYME info@acelerapyme.gob.es	DATA INNOVATION HUBS APPENDIX 1	
	ACELERA PYME https://acelerapyme.gob.es/suscribete	DIGITALX BORDER https://n9.cl/digitalxb-order	ACTIVA CRECIMIENTO industriaconectada4.0@mincotur.es	DIGITAL TOOLKIT To be determined, contact Mineco or Acelera PYME
	DATOS.GOB https://datos.gob.es/es/catalogo	CLOUD SPACES WILL ALL BE PROMOTED WITHIN A EUROPEAN FRAMEWORK		
	CDTI https://n9.cl/funding_cdti	COWORKING SPACES https://n9.cl/coworking_calls	NATIONAL CONTACT POINTS https://n9.cl/national-contactpointslst	

Source: own elaboration

5. CONCLUSIONS

The digital revolution has impacted our economy in a way never seen before and has forced businesses to constantly adjust to meet market imperatives. The pandemic has only accelerated the digital transformation of business ecosystems, forcing organizations of all sizes to make use of online platforms to access markets. However, accessing new markets means having to appeal to new customers with different preferences. Online customer behavior differs from traditional consumer behavior and requires new targeting techniques.

Big Data has recently been referred to as "the new oil" and **digital marketing has been one of the big winners in the implementation of Big Data analytics**. This paper is an **innovative user's manual for Spanish SMEs that want to take advantage of the upcoming European opportunities in the Big Data field**. Nevertheless, to carry out a successful implementation of Big Data, organizations must first know how to deal with such a high-sounding concept. Many times, it has been thought that only large companies can profit from this technology, however, thanks to recent technological advances in cloud computing joined to the up-rise of Artificial Intelligence and the development of precise algorithms, the use of Big Data has become a widespread solution for many businesses of any size and industry.

Despite the overall Big Data large-scale adoption, Spanish businesses have shown a poor Big Data use, behind most developed countries. Despite the fact that ecommerce is growing in Spain, online domestic companies are failing to attract national consumers since they are not able to predict their behavior because there are missing insightful data.

In order to bring the idea of Big Data closer to Spanish SMEs, this study presents a novel exercise goes beyond the state of the art in works that address the issue of implementing Big Data in businesses.

The first innovative concept of this paper is **that it takes a complete journey in the process of implementing the idea of Big Data in SMEs' marketing strategies to enable them to compete efficiently in the digital market**. It does not only analyze what it means for a company to work with Big Data and what tools it should use, but it also addresses what challenges Spanish SMEs must overcome and how it can finance such the strategies to tackle them.

Choosing the right analytical technique among the multiple options available in the market can be a challenge for a company new to the Big Data landscape. This report provides guidelines on how to use some of the most common and easy to implement techniques, indicating when each tool is best suited, thus guiding companies in their marketing strategies. Among the main technical recommendations of this work, it is worth highlighting the need for companies to use techniques such as **behavior analytics together with predictive analysis to engage with customers along its journey**. Besides, the employment of instruments to enable marketers to measure different indicators along the customer lifetime, such as **cohort or funnel tools**, it is also recommended.

Accessing and managing Big Data, is not an easy task, especially for small-sized businesses. In order to seize the potential of Big Data, smaller companies will need to break down the core barriers they face when working with large and timely data coming from multiple sources. The analysis has identified **lack of data talent, organizational culture, data accessibility and lack of infrastructures to manage the data, as core weaknesses** inside the Spanish businesses' marketing departments when trying to work with Big Data.

The European Commission as well as the Spanish Government, have brought together the main problems in the Big Data field to design the most efficient financing mechanisms that will allow SMEs to unleash the potential of Big Data and lead the economic recovery after the pandemic. Both institutions have shown their ambition to make data be the driving force of economic recovery and have devoted a large part of their all-time high budgets to the digital acceleration of the business fabric by creating programs such as Digital Europe and Horizon Europe and designing special mechanisms for the economic recovery like the Next Generation EU.

Despite the efforts by public institutions to encourage access to finance for speeding up the digitization process of the most vulnerable companies, they have developed a very complex and dispersed bureaucratic scheme. The second innovation of this paper is that it sets a **single record to reach all the relevant upcoming funding opportunities for Spanish SMEs' Big Data adoption**. It does not only filter the public calls by analyzing their relevance to the topic and their profitability, but it also selects the opportunities with higher success rates and it provides a direct link to apply to each program.

As has been analyzed, companies must apply funding opportunities to train their employees' data skills if they want to successfully implement Big Data. Most of the funds devoted to training programs will be managed by the Spanish public administration. Table 4 presents

the most relevant ones. The public authorities have opened a great number of opportunities to finance Spanish digital talent as it is one of the nation's greatest weaknesses, especially in the case of advanced digital skills (Figure 16). Since senior managers' reluctance to adopt Big Data, has hindered their adoption, training programs oriented to boost directives' knowledge on this disruptive technology will be key for the Spanish business ecosystem to embrace Big Data and catch up with its European partners.

On the other hand, programs aimed to promote innovative digital infrastructures, another fundamental constraint among the Spanish SMEs, will be mostly funded through the Horizon Europe program and at the national level, the funds will be managed by the CDTI. Big Data disruptive technological developments will be fostered through data innovation hubs.

Finally, data access, will be enhanced through the development of a pan-European federated and interoperable cloud space. In addition, both Europe and Spain, will increase their supply for Open Data. As analyzed, Spanish SMEs will have to analyze the profitability of working with public open Big Data, which often is too broad and fails meet the market organizations' needs. Businesses are more likely to find better fitting data by collaborating in public-private partnerships (PPP) with data providers such as the Big Data Value PPP.

The potential of Big Data is undeniable and there is still much to exploit. In the next years, making an efficient use of them will be necessary for businesses who want to stay competitive in the market. Public institutions have bet on Big Data to drive the economic recovery since they consider it *"an essential resource for economic growth, competitiveness, innovation, job creation and societal progress in general"* (European Commission, 2020c). The European Union will devote historic financial stimulus to transform the European economy into a global data leader. However, they have stressed that despite the volume of the financial grants, they will not be given away for free, companies will have to earn them by submitting successful proposals to the appropriate calls.

This report can be a key tool for many companies wishing to access these upcoming opportunities. The calls for proposals are still open or are forthcoming, so this is the perfect time to plan an appropriate strategy and carry out the digital transformation.

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APPENDIX 1: SPANISH BIG DATA INNOVATION HUBS

DIH Name	Location	City	Website
AIR4S - Artificial Intelligence & Robotics for Sustainable Development Goals	C/Ramiro de Maeztu 7	Madrid	http://www.upm.es/dih-air4s
AI4GALICIA: Artificial Intelligence for Galicia	Universidade da Coruña. Campus de Elviña s/n 15071, A Coruña (Spain)	A Coruña	http://ai4galicia.eu
Associació Clúster Digital de Catalunya	Carrer Bilbao 72, Ed. A, Complex Cornerstone	Barcelona	http://www.clusterdigital.cat
ASTURIAS DIGITAL INNOVATION HUB	Parque Tecnológico de Asturias	Llanera	https://www.asturiasindustria40.es/en/
Barça Innovation Hub (BIHUB)	Aristides Maillol s/n	Barcelona	http://barcainnovationhub.com/
Barcelona Science Park	Parc Científic de Barcelona c/ Baldri Reixac, 10-12, 08028 Barcelona (Spain)	Barcelona	http://www.pcb.ub.edu
Basque Digital Innovation Hub (BDIH)	Alameda Urquijo 36	Bilbao	http://www.spri.eus/en/basque-industry/basque-digital-innovation-hub/
Catalonia AI DIH	Carrer de Bilbao, 72 A Building	Barcelona	https://www.bigdatabcn.com/en/catalonia-ai-dih/
Centre d'Innovació i Tecnologia de la UPC (CIT UPC)	Jordi Girona 31	Barcelona	https://cit.upc.edu/en
Cybersecurity Innovation HUB	Avenida José Aguado, 41.	León	https://www.cyberdih.com/
Data Science and Artificial Intelligence (DASAI)	Daniel Saucedo Aranda, s/n, 18071, Granada (Spain)	Granada	https://dasciuhub.dasci.es/
DATALife	Edif. Emprendia, Campus Vida, S/N, USC	Santiago de Compostela	http://dihdatalife.com/
Digital Impulse Hub	Blasco de Garay, 29-49	Terrassa	https://digitalimpulshub.eu
DIH-BAITUR: Digital Innovation Hub of the Balearic Islands for Artificial Intelligence and Tourism	Parc Bit	Palma	http://www.dihbai-tur.com
DIHBU Industry 4.0	C/ López Bravo nº 70.	Burgos	https://dihbu-industry.fundingbox.com/
Dinapsis DIH	Avenida Alfonso Puchades nº3	Benidorm	https://www.dinapsis.es/dih-dinapsis/
Ecosistema W	C/ Virgen de la Soledad 22	Badajoz	http://www.conectoride.com/
ETICOM, Digital economy cluster in Andalusia	Av. Eduardo Dato, 69, 4th floor, 2 office	Seville	http://www.eticom.com
Experience-based industries Hub (elxperience)	Edifici Cornerstone. C/Bilbao, 72	Barcelona	https://eurecat.org/en/sectors/cultural-and-creative-industries/
FIWARE Space	Avenida Javier Blanco Palenciano, s/n	Badajoz	https://www.fiware.space/
FIWARE Zone	Concejal Muñoz Cerván 3, Edificio Tabacalera, Módulo 5	Málaga	https://fiware.zone/
Fundación Cajamar	Puerta de Purchena, 10	Almería	https://www.cajamar.es/es/agroalimentario/innovacion/
GALician manufACTuring Innovation ConsortiA (GALACTICA)	Polígono Industrial de Cataboi SUR-PPI-2 (Sector 2) Parcela 3 36418 O Porriño (Pontevedra)	O Porriño	http://www.galacticaDIH.eu/
Granada Health Technology Park	Avenida del Conocimiento, 33	Granada	http://www.ptsgranada.com/

HPC-Cloud and Cognitive Systems for Smart Manufacturing processes, Robotics and Logistics.	C/ María de Luna 7-9	Zaragoza	https://www.aragondih.com
Hub 4.0 of Manufacturing Sectors in Valencian Region	Universitat Politècnica de Valencia. Instituto Universitario de Automática e Informática Industrial	Valencia	http://hub4manuval.ai2.upv.es
iAsturias 4.0	Avda. Jardín Botánico, 1345	Gijón	http://www.prodintec.es/es/
Industrial Technology Knowledge Linares DIH	Centro de Innovación Campus Científico-Tecnológico, RONDA SUR S/N	Linares	http://dih-itkl.es/
Innovation for Manufacturing in the South (I4MSOUTH)	Parque Científico Murcia 1 Floor Bulding T	Murcia	https://i4msouth.fundingbox.com/
Insomnia Digital Innovation Hub	Muelle de Poniente Poblados Marítimos	Valencia	http://www.innsomnia.es/
Intelligent Urban Lab, Alcobendas	Av. Doctor Severo Ochoa, 45	Alcobendas	https://alcobendashub.com/en/intelligent-urban-lab/
IoT Catalan Alliance	Carrer Gran Capità 2-4	Barcelona	https://www.cataloniaiot.com/
IRIS: European Digital Innovation Hub Navarra	Tajonar Street, 20	Pamplona	https://www.irisnavarra.com/
ITI Data Hub (The Data Cycle Hub)	Ciudad Politécnica de la Innovación - UPV Camino de Vera, s/n. Bldg. 8G. Acc. B – 4th Floor	Valencia	https://thedatacyclehub.com/en/
La Salle Technova Barcelona	Sant Joan de La Salle, 42	Barcelona	http://technovabarcelona.com/en
MaDIH: Manufacturing Digital Innovation Hub	Madrid Clúster de Automoción C/Príncipe de Vergara, 74. 1º Planta 28006 - Madrid	Madrid	https://madih.fundingbox.com/
Neàpolis	Rambla de l'Exposició, 59	Vilanova i la Geltrú	http://www.neapolis.cat
Parque Tecnológico de Andalucía (PTA)	Calle María Curie 35	Malaga	http://www.pta.es/es/
REIMAGINE Textile	Av. d'Ernest Lluch 36	Mataró	http://www.reimaginetextile.com/en/
RIOHUB	Calle Francisco Muro de La Mata 13	Logroño	http://riohub.fundingbox.com/
Science and Technology Park of Almeria, PITA S.A.	Avd./ de la Innovación nº15. 04160 Almería	Almería	http://pitalmeria.es/
SmartCityTech	14 - 1º. Edificio Ibaeta 20.018 - Donostia	San Sebastián	http://www.smartcitytech.eu/
Spanish Digital Innovation Hub for HPC (esHPC)	c/Jordi Girona 29	Barcelona	https://www.res.es/es
Technologies for Efficiency Digital Innovation Hub Extremadura (T4E DIH)	Avenida de la Investigación, s/n. 06006 Badajoz	Badajoz	http://www.dih4e.eu
TECNOCAMPUS TECHNOLOGY PARK	Avinguda Ernest lluch 32, 08302 Mataró, Barcelona	Mataró	https://www.tecnocampus.cat/
University of Valencia Science Park DIH	Calle Catedrático Agustín Escardino, 9	Paterna (Valencia)	https://www.pcuv.es/en/dih

Source: Own elaboration with data from the Smart Specialisation Platform.