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**INDUSTRY 4.0 IN THE  
AUTOMOTIVE SECTOR**

**OF SPAIN**

FLANDERS INVESTMENT & TRADE MARKET SURVEY

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# INDUSTRY 4.0 IN THE AUTOMOTIVE SECTOR OF SPAIN

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## EXECUTIVE SUMMARY

This market study investigates and discusses the development of Industry 4.0 in the automotive industry of Spain. This paper was the ideal opportunity for Flanders Investment & Trade to acquire correct information on its development while expanding a network of valuable partners for Belgian companies active in the sector. This means that this paper is made from the point of view of companies performing in a business-to-business environment.

Conducting field research consists of in-depth interviews that were conducted with different experienced professionals that currently work for organizations that help Spanish companies in the application of Industry 4.0. Two interviews were done with clusters of the Spanish automotive industry.

The interviews revealed that the arrival of the fourth industrial revolution positively impacts the Spanish companies of the automotive industry by awarding them with many advantages such as increases in efficiency, decreases in production costs, and new inventions. But Industry 4.0 provides organizations with barriers such as cybersecurity and high implementation costs. The companies need to overcome these barriers before being able to make maximum use of the concept. The research also reveals that the level of Industry 4.0 in the Spanish automotive industry is close to the levels seen in other European countries. This means that the sector is evolving rapidly. The Spanish companies do not only implement Industry 4.0 into their plants, but they have the tendency to be innovative by developing their own software that supports their business while providing added value to their consumers.

There are distinct regional differences with the Basque Country, the Community of Madrid, and Catalonia as the best developed regions, while the regions of the south of Spain lag behind on the implementation of this innovative concept. Important players such as Spanish companies Gestamp and SEAT stand out for adopting Industry 4.0 technologies such as predictive analytics, autonomous guided vehicles, and exoskeletons. Governments and clusters help the implementation of Industry 4.0 in Spain even further by promoting the concept and helping Spanish companies to implement it.



## INTRODUCTION

The fourth industrial revolution has arrived, forcing all companies to show interest in the innovative concept. This subject, launched in 2013 by the Germans, is a quite new feature in Spain, which causes a lack of knowledge and lack of recent valuable information due to the concept still being developed. The need for correct information about the development of Industry 4.0 in Spain and Industry 4.0 influencing the automotive sector of Spain increases each year, but the availability of research papers on this complex subject remains fairly limited.

In this paper, emphasis is placed on the development of Industry 4.0 in Spain and Industry 4.0 in the Spanish automotive sector, while researching other aspects of the concept. The objective of this paper is to achieve understanding of the subject while sharing all the knowledge obtained during the research with the reader. Hence the research question of this paper: *"How does Industry 4.0 influence the automotive industry of Spain?"*.

The research method of this paper is essentially performing desk and field research. The desk research is done by operating research from sources from the internet, mainly consisting of articles, blogs and other websites but also from scientific sources. In the first part of desk research, more information on Industry 4.0 in Spain will be provided and in the second part of the desk research, the research performed of Industry 4.0 in the automotive industry of Spain will be found.

Desk research is performed in a way for readers to understand the basics of Industry 4.0 in Spain. For the field research, several interviews were conducted. The field research is based on conducting in-depth interviews with professionals working in companies, clusters, and also an Internet of Things expert who provided information and their perspective on the given subject.

# 1. DESK RESEARCH

## 1.1 WHAT IS INDUSTRY 4.0?

Industry 4.0, also referred to as the Industrial Internet of Things (IIoT), Smart Factory or Smart Industry, represents the fourth industrial revolution introduced by the German government. It is a new approach to combining technology and traditional manufacturing processes by intelligent practices such as the Internet of Things (IoT) and Artificial Intelligence (AI) to improve the automatization of the use of real-time data and communication. (Epicor, sd)

Industry 4.0 provides a connected synergy between the machines and the human counterparts. All the employees from different departments will experience an impact by this new concept. Industry 4.0 refers to the interconnectivity of devices to create an automated real-time production process that uses the necessary data. It will reshape the entire production system and it will change how companies respond to customer demands. (Campbell, 2018)

In the fourth industrial revolution, nine technologies constitute the components of the transformation. These technologies are:

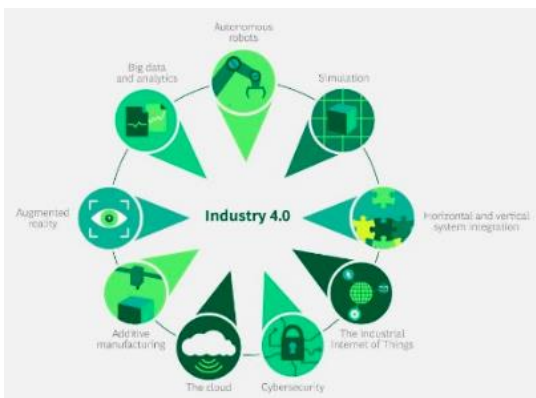
- Big data and analytics
- Robotics
- Simulations
- Horizontal and vertical system integration
- The Industrial Internet of Things
- Cybersecurity
- Cloud computing
- Augmented Reality (AR)
- Additive manufacturing (BCG, sd)

## 1.2 HISTORY OF REVOLUTIONS

The first industrial revolution occurred at the end of the 18<sup>th</sup> century and entailed the mechanization by water and steam power. The second revolution took place around the 1900s and was defined by mass production with assembly lines, powered by electricity. The third industrial revolution started around the 1970s and represented the use of computers to further develop automated production processes and machines. The perception of Industry 4.0 or the fourth industrial revolution is symbolized by Smart Factories and the full use of digital manufacturing.

(Rouse, Industry 4.0, 2018)

Figure 1: Nine technologies of Industry 4.0 (BCG, sd)



## 1.3 WHAT DRIVES INDUSTRY 4.0?

Four key components that define Industry 4.0:

- Cyber-Physical Systems
- The Internet of Things
- The Internet of Services
- Smart Factories

### 1.3.1 Cyber-Physical Systems

Because of the implementation of the Cyber-Physical Systems (CPS) in Industry 4.0, companies must obtain a clear understanding of these systems. They consist of computers that are integrated into a network to monitor physical manufacturing processes at all levels to make machines smarter. These smart machines continuously monitor, detect and predict malfunctions to prevent costs. An example of CPS is robotics such as digital assistants, autonomous robots, etc. Robotics reshape the way things are made because they are collaborative and connected to the cloud in the Industry 4.0 company. (Howard, 2018) Cyber-Physical Systems have a similar architecture to the Internet of Things, but it has a higher degree of coordination between the machines and the physical elements. (Mukerji, 2018)

### 1.3.2 The Industrial Internet of Things in Industry 4.0

#### 1.3.2.1 What is the Internet of Things?

The concept of the Internet of Things (IoT), devised by the British technology pioneer Kevin Ashton, dates back to 1999. The IoT is a network that involves intelligent computers and other devices that collect and share information that is valuable for the end-users to improve the dynamics of the device. (Werr, 2015)

#### 1.3.2.2 What is the Industrial IoT?

The Industrial Internet of Things, also known as IIoT or Industrial Internet, is a part of the Internet of Things. The IIoT gathers substantially larger amounts of information at an increased speed, thus revolutionizing the manufacturing process into a more efficient system. The IIoT connects all the robotics, equipment and computers in the organization and uses machine learning algorithms to enhance the processes. (Inductive Automation, 2018) More information on this matter can be found in the appendices.

#### 1.3.2.3 What is edge computing?

In the IIoT, edge computing is a practice that could be critical for the implementation of Industry 4.0. According to Networkworld, edge computing is the practice of data collected by IoT devices to be processed close to where it is created instead of sending it across long routes to data centers or clouds.



Edge computing will also guide companies to adopt real-time processing and collect smart data without worrying about low latency. (Butler, sd)

### 1.3.3 The Internet of Services

Advancements in technology have created possibilities for electronic devices to be connected to a smart device. However, many complexities arise from the diversity of the devices. The Internet of Services simplifies the integration process to ensure that the devices are efficient and can pay off. (Mukerji, 2018)

### 1.3.4 Smart Factory

An important practice for Industry 4.0 are Smart Factories. In a Smart Factory, Big Data is collected from performed operations from all parts of the business. Smart Factories have the ability to adapt the operations to real-time customer demands and it can predict changes. According to Deloitte Analysis, every Smart Factory has five core features. These core features can be found in the appendix. (Rouse, Industry 4.0, 2018)

## 1.4 ASSOCIATED TECHNOLOGIES

### 1.4.1 Artificial Intelligence in Industry 4.0

Industrial manufacturing is continuously progressing. Artificial Intelligence benefits the evolution of Industry 4.0, but understanding Artificial Intelligence is very complex. Companies must obtain a solid understanding of AI before the implementation process. (Towers-Clark, 2019) AI has an impact on the entire ecosystem. The impact on manufacturing can be organized into five main areas. (Seebo, sd) These areas can be found in the appendices.

Artificial Intelligence permits companies to gain deeper insight into their devices and data. Every enterprise acquires data that can be made of use. In a Smart Factory, predictions are made based on large amounts of collected data. This process is called machine learning. This branch is able to recognize different patterns and has the ability to gain knowledge from experience. (Hannover Messe, sd)

Combining Artificial Intelligence and Cloud Computing can deliver great outcomes. The organization enjoys a network that is capable of storing Big Data without having complications, which is what Cloud Computing offers. (Burge, 2018)

### 1.4.2 Big Data Analytics

According to TechTarget, Big Data is a term that describes a large volume of structured, semi-structured and unstructured data intended to be used in machine learning projects and in other advanced analytics applications. (Rouse, Big Data, 2018)

Big Data Analytics is a combination of complex applications entailing components such as predictive models, statistical algorithms and other applications. It analyzes data to uncover hidden patterns, market trends, customer preferences, and other analytics that guide organizations to generate informed decisions. (Rouse, Big data analytics, 2018)

#### 1.4.3 Augmented Reality, Simulations, and Additive Manufacturing

Augmented Reality (AR) technology offers opportunities to users to experience an augmented world by overlapping virtual information into the real world. By using AR, the user can simultaneously be in touch with the real and virtual world and collect real-time data. AR advances the Industry 4.0 concept in many ways. It can present relevant data to the employees in a company by allowing them to obtain real-time data from their work performance. Another gain of AR is the possibility of advancing industrial training and learning while reducing risks and costs. (Seabery, 2018)

Simulations used in Industry 4.0 will ensure an increase in the quality of the products due to the use of real-time data to mirror the physical world in a virtual model. (Bondar, 2018)

Another Industry 4.0 technology is Additive Manufacturing (AM). It describes technologies that build 3D objects by adding layers of material. (Additive Manufacturing, sd) In Industry 4.0, it presents the capability to produce personalized products with low production costs, short lead times, less material waste and less energy consumed during the manufacturing process. (Zimmermann, 2018)

## 1.5 BENEFITS OF ADOPTING INDUSTRY 4.0

According to the Spanish Confederation of Employers and Industries (CEOE), digitized companies are ten percent more productive than companies that are not digitized. The export doubles and there is a high creation of employment. (ASTI, 2018)

#### 1.5.1 Boost the entire organization

Industry 4.0 influences the entire life cycle of the product and the entire manufacturing process, from design to inventory to scheduling. (Epicor, sd) According to Directives y Empresas, Spanish companies are expected to increase revenues by eleven percent and reduce costs by 19,4 percent. (Perez, 2018)

Implementing Industry 4.0 offers a number of benefits for companies such as improvement in efficiency of production processes which provides an overall increase in the productivity of the company. In the long-term, it will decrease costs. (Rouse, 2019) Industry 4.0 trims costs and increases profits while expanding the growth of the business. The use of Industry 4.0 technologies will give correct real-time data and insights while boosting the effectiveness, efficiency, and profitability of the entire operation within a company. (Epicor, sd)

### 1.5.2 Smart devices

Industry 4.0 technologies recognize and fix potential issues before the problems occur in real life, which decreases the financial costs that would otherwise be unavoidable. In Smart Factories, all the Industry 4.0 technologies such as real-time data, predictive analytics, internet-connected machinery, and automations can help to predict and prevent these potential issues from happening. (Epicor, sd)

### 1.5.3 Mass personalization and made-to-measure

In a smart manufacturing process, companies have the possibility to react immediately to customer needs. Customers can participate in each phase of the product life cycle. This means that in the end, the level of satisfaction is high. Customers will have to pay a lower cost, compared to what they used to pay for personalized products. Because of the IoT, companies are able to produce personalized goods in large volumes while staying cost-effective. This process is called mass personalization. (Yi Wang, 2017)

Another opportunity is that transparent companies are able to adjust their production mechanisms to the needs of an individual. This opportunity is called made-to-measure. When using Industry 4.0 technologies, enterprises are offered agile manufacturing. They are able to produce several small-volume series, which means that companies can offer their customers a wider variety of styles of a product. (Booth Welsh, 2017)

## 1.6 CHALLENGES OF ADOPTING INDUSTRY 4.0

### 1.6.1 Cost and complexity of implementation

A big downside to smart manufacturing is the huge implementation cost. Many enterprises are not able to afford the expense of Industry 4.0 technologies such as AI technology. This creates a competition problem for these companies relative to other competitors that are able to implement the technology. (Rouse, 2019)

The technology of Industry 4.0 is very complex, and if the systems are poorly designed or are not implemented in the correct way, this can cause errors. For example, it could lead to bad quality of products or incorrect production processes which lead to an increase in costs for factories, which in turn, make them lose profit. If the technology is set up in a good way, it will take a long time to set-up, which means that during this time it will not be possible to produce. (Rouse, 2019)

### 1.6.2 Cybersecurity

The threat of cyber-hacking continues to grow each year, and highly automated factories that are computer algorithms have a high risk of being the victim of hacking, leaking of information or data given to the competition or the general public. This means that companies implementing Industry 4.0 should invest in high-security measures to keep their valuable information or data free from all danger. (Bondar, 2018) Cybersecurity should be secure, resilient and fully integrated into the organizational strategy from the beginning. (René Waslo, sd)

European countries such as Spain have been resolving the issue surrounding cybersecurity. The government of the Basque Country has appointed the Basque Cybersecurity Centre (BCSC) to promote awareness on cybersecurity in the Basque Country. (Basque Cybersecurity Centre, sd) Europe has also implemented the European Cyber Security Organization (ESCO) to support all types of projects aimed to develop and encourage European cybersecurity. (ESCO, sd)

### 1.6.3 Employment conditions

It still remains too early to assess how the employment conditions will change with the implementation of Industry 4.0. It will be a necessity for employees to gather an applicable set of skills by new forms of education. The level of complexity of this issue is high, and companies need to take into account how they can help their employees to evolve towards this revolution.

## 2. SPAIN

### 2.1 THE ECONOMY OF SPAIN

Although being hit by the financial crisis in 2007-2008, the economy has significantly grown over the past decade. (Kiprop, 2018) Spain, a country with over 46 million consumers, has been sustaining positive economic growth over recent years and holds the fourteenth place in the ranking of the largest economies worldwide. (ICEX - Invest in Spain, 2018) The GDP of Spain amounted to a total of 1,314 trillion dollars. GDP growth is estimated between 2.5 and three percent. As seen from the graph provided by World Development Indicators, the growth rate of Spain of 2014 was 1.4 percent. In 2015, the growth rate of Spain was 3.6 percent, while the growth rate of the EU was 2.3 percent. In 2017, Spain had a growth of three percent and the EU had 2.5 percent. Comparing the growth rate of Spain to the European Union, it can be concluded that in recent years, Spain has been performing better in advancing the GDP. (The World Bank, sd)

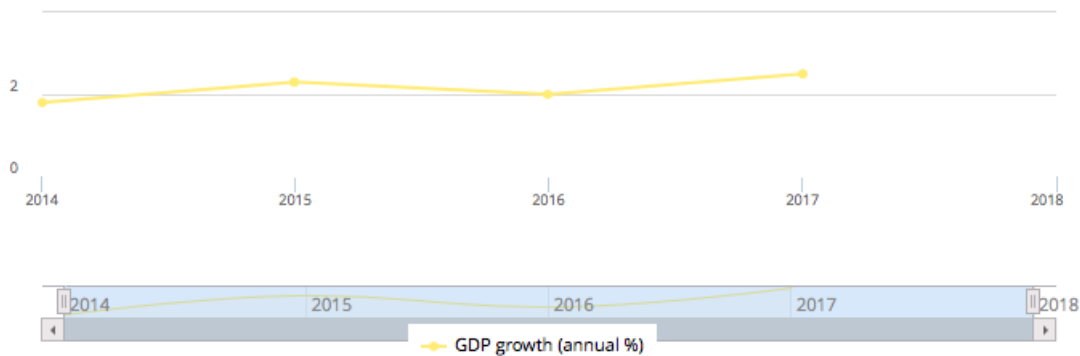


Figure 2: GDP growth of EU (The World Bank, sd)



Figure 3: GDP growth of Spain (The World Bank, sd)

Spain takes the sixteenth place as the largest exporter in the world. In 2017, the country exported 298 billion dollars and imported 332 billion dollars, resulting in a negative trade balance of 35.7 billion dollars. The three primary exports of Spain are cars (36.4 billion dollars), refined petroleum (10.8 billion dollars),

and vehicle parts (10.2 billion dollars). The leading three export destinations are France (40.5 billion dollars), Germany (33.9 billion dollars), and Portugal (24,2 billion dollars). Germany (43.5 billion dollars), France (37.6 billion dollars), and China (28.6 billion dollars) are Spain's three principal sources for import. (The Observatory of Economic Complexity, sd)

## 2.2 THE PRODUCTIVITY OF SPAIN

The productivity of Spain has been increasing as seen in the graph below. From the lowest record of 85.70 Index Points in the year 1995 to the highest record yet of 112.30 Index Points in the third quarter of 2017. In 2019, the first quarter reached almost 112 Index Points. The rise in Index Points implies that Spain has efficiently improved its productivity. The fluctuations in the quarters are directly attributable to the fluctuations in factors such as new technologies, human capital, physical capital and many more. All these factors contribute to the productivity of Spain. Economic growth and productivity of Spain are closely linked. When economic growth occurs in Spain, the productivity of Spain increases. (Trading Economics, sd)

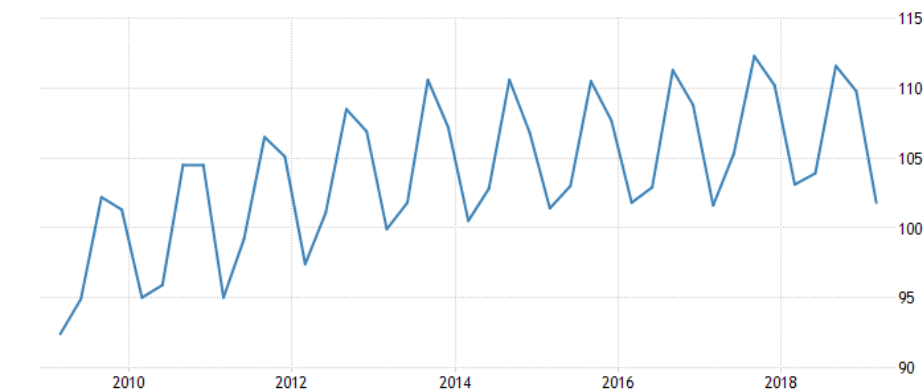


Figure 4:

The Productivity of Spain (Eurostat, sd) (Trading Economics, sd)

Comparing the productivity of Spain and the productivity of Belgium shows that in previous years, Belgium had increased its productivity better than Spain, but since 2013, the Index Points have increased which indicates that the productivity of Spain is advancing. (Trading Economics, sd)



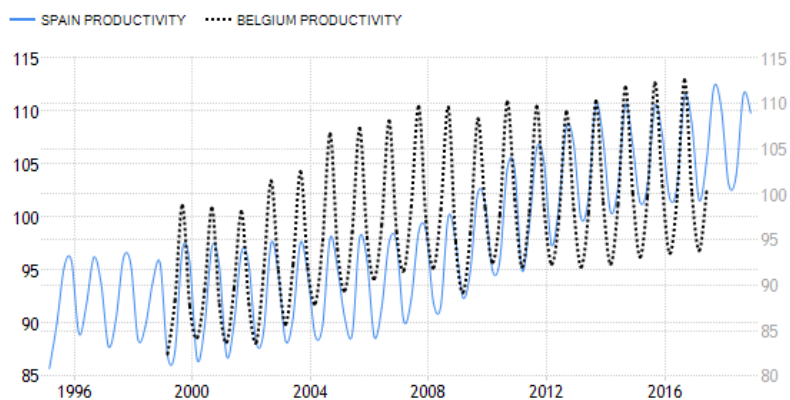


Figure 5: The Productivity of Spain and Belgium (Eurostat, sd) (Trading Economics, sd)

The implementation of Industry 4.0 will influence the entire country, including the productivity of Spain. For countries promoting Industry 4.0 and countries in which many companies are implementing the fourth industrial revolution, there will be productivity gains. (Suri, 2018)

### 3. INDUSTRY 4.0 IN SPAIN

According to data presented in Vivir en un Mar de Datos, in 2014, the turnover of Spanish 4.0 industries amounted to 2,575 million euros. The data shows the objective of 14,500 million euros in 2024. (BBVA, 2016) By 2021, an increase of 3.6 percent in the gross domestic product (GDP) is expected because of the impact of Industry 4.0. (Advanced Factories, 2019)

A report by the Spanish Confederation of Employers and Industries (CEOE) shows the relevance of industrial activity in Spain has gradually increased during the period of 2009-2012. Industries currently represent fourteen percent of the national GDP. The industry sector provides work to more than two million individuals. Concerning technology and innovation, it should be recognized that four out of ten Spanish companies invest in their R&D department what benefits the development of Industry 4.0. (Macario, 2018)

The Ministry of Economy, Industry, and Competitiveness of Spain operates “Industria Conectada 4.0 (Connected Industry 4.0) to promote the digital transformation in the industrial sector of Spain. (Macario, 2018)

#### 3.1 EXPENDITURES ON RESEARCH & DEVELOPMENT (R&D)

##### 3.1.1 The public sector

The gross domestic spending on R&D peaked in 2008 at 20.306 million dollars. After 2008, it decreased and reached a low point in 2014 with 17.591 million dollars. From 2014, it gradually increased with gross domestic spending on R&D in 2017 of 18.892 million dollars. There is a substantial increase that could be caused by the arrival of new technologies for Industry 4.0. (OECD, sd)

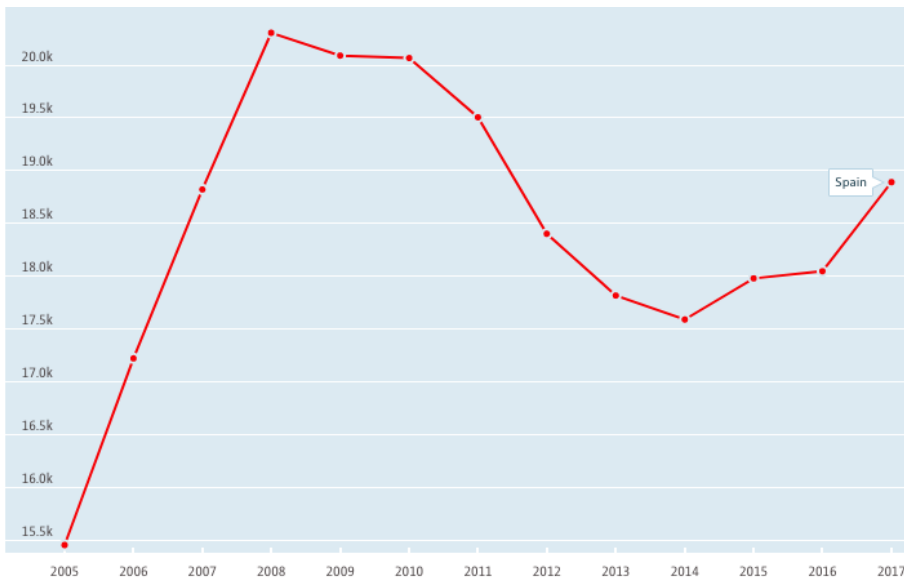


Figure 6: GDS on R&D by the public sector (OECD, sd)

### 3.1.2 The private sector

In 2017, all the Member States of the European Union spent a total of 320 billion euros on Research & Development (R&D). The R&D intensity of the EU stood at 2.07 percent in 2017 compared to the R&D intensity of 2.04 percent in 2016. Increasing the R&D intensity to three percent is one of the targets of the Europe 2020 strategy. (Eurostat, 2019)

Spain contributes to the total of R&D with an R&D intensity of 1.2 percent. The low number can be blamed on the lower cost of labor and the financial crisis of 2008. Spain still suffers from this, but the country has been trying to overcome this battle. Business enterprises expenditures on R&D in 2017 were 55 percent of the total, while governments spent 18 percent of the total and higher education contributed 27 percent. (Eurostat, 2019) Four out of ten companies that invest in R&D are active in the industrial sector. In Spain, 13.6 percent of R&D is funded by companies from the industrial sector compared to 5.3 percent from other sectors. (Macario, 2018) (European Commission, sd)

## 3.2 PROGRESS OF IMPLEMENTATION OF INDUSTRY 4.0 IN SPAIN

Spain has not played a significant part in previous industrial revolutions. But today, Spain has the opportunity to become a strong leader relating to Industry 4.0. Though Spain still has a long road ahead before achieving a good implementation in the Spanish industries. According to a study done by Inesdi and Incipy in collaboration with Indigital Advantage, 76 percent of companies did not pass the degree of digital maturity. From this research, the conclusion is that many Spanish companies still need to implement Industry 4.0. (ASTI, 2018)

The urgency to achieve fast implementation of Industry 4.0 in the industries of Spain is significant. According to the statement of the Executive Chairman of BBVA, Francisco González, the fourth industrial revolution will ultimately lead to more wealth and prosperity for the whole world. (BBVA, 2018)

The flagship of this digital transformation is Germany, but it spreads to other countries that are interested such as Spain. The innovative process offers opportunities to Spanish factories in the sector to improve their current competitive position. Many industrial sectors such as the automotive industry have been striving to be part of this new trend, but it remains too early to examine the results and make a valuable conclusion. (Bondar, 2018)

According to a study done by Bondar, the concept of Industry 4.0 and its associated technologies are not generally known of the general public. The awareness of Industry 4.0 exists in Spanish companies, but it has not yet translated in their strategic plans. The biggest obstacles of achieving a faster implementation of Industry 4.0 are the lack of qualified professionals, the lack of communication infrastructures and the need for higher cybersecurity requirements mandatory for the type of technologies of Industry 4.0. (Bondar, 2018)

### 3.2.1 Influence of the public sector

The public sector, for instance governments, significantly contributes to the breakthrough of the fourth industrial revolution. In this next part, several examples of governments activities will be discussed.

#### **3.2.1.1 Governments of Spanish regions**

The Community of Madrid offers many opportunities to companies and industries that want to adopt Industry 4.0 technologies. An example of this is MadrIDtech. It is aimed to support innovations such as Industry 4.0. In this project, they focus on financing innovations within companies. The Community of Madrid links large companies with researchers to help the process of innovation. They also provide information and locations for companies to work on projects related to the fourth industrial revolution. (Madridtech, sd)

Basque Industry 4.0 is a movement by the Basque government promoting the incorporation of intelligent systems into the production processes and promoting the use of emerging technologies in processes to ensure efficiency and sustainability of resources. The government of the Basque Country has entrusted Basque Industry 4.0 to attract foreign investments by making subsidies available and helping the companies with their projects relating to Industry 4.0. (Basque Industry 4.0, sd)

The government of Aragon, which is a region located in the northeast of Spain, has allocated twelve million euros to the development of Industry 4.0 technologies. Not only is this to further develop Blockchain technologies, but also to develop other technologies such as Artificial Intelligence related to Industry 4.0. (Alexandre, 2019)

The Spanish Chamber of Commerce introduces meeting days in which presentations are held to promote Industry 4.0. For example, the introduction of the event “Big Day, Digital Data” supports the digitization of Spanish SME. (Cámara de Comercio de España, sd)

### **3.2.1.2 Europe**

The European Regional Development Fund (ERDF) co-financed a donation of twelve million euros. This donation will be used to educate and promote the concept of Industry 4.0 and its associated technologies to the public. (Alexandre, 2019) Promoting partnerships between companies from various industrial sectors including research centers and technology companies is included to further develop the digital solutions of Spanish companies that will benefit the industry. For small and medium enterprises (SMEs), it will become possible to integrate digitization into their processes. The empowerment provided to technology companies in this program will increase further advancements. The research done will eventually lead to the acceleration of industry digitization. (Guia, sd)

In 2017, the European Investment Bank (EIB) and Banco Bilbao Vizcaya Argentaria (BBVA) collaborated to provide funds to Spanish SMEs that they might need to implement digitization into their processes. They provided a sum of 300 million euros. (BBVA, 2017)

### **3.2.1.3 Schools**

The School of Industrial Organization (Escuela de Organización Industrial) promotes the implementation of Industry 4.0 and its applications such as Artificial Intelligence and the Internet of Things. They do this by educating future generations of managers and leaders to ensure accurate leadership in a digital world. (Escuela de Organización Industrial, sd)

## **3.2.2 Influence of the private sector**

Many Spanish companies and consultancies are promoting the adoption of Industry 4.0. For instance, Lantek, a Spanish manufacturing technology consultancy presents innovative tools worldwide to implement an intelligent factory. Spanish companies are allocating their focus and money towards a faster achievement of the digital factory. The Spanish company Sisteplant, located in Madrid, is a company with more than two thousand high-profile clients such as Mercedes-Benz, SEAT, Gamesa, etc. The company has allocated twenty percent of its profits to R&D to obtain boosts in the commitment to the digital factory. (Prieto, 2019) These establishments encourage the progression of Industry 4.0 in Spain.

## **3.3 TRADE FAIRS IN SPAIN ABOUT INDUSTRY 4.0**

In Spain, many fairs are held incorporating Industry 4.0 or any of its associated technologies. The Smart City Expo World Congress is an international trade fair covering the urban environment including digital transformations. This exhibition is held every year in Barcelona. The Digital Enterprise Show is a fair held in Madrid addressing and promoting Industry 4.0. Another exhibition is the Automotive Meetings Madrid

for the automotive sector, which incorporates some new technologies of Industry 4.0 for the sector. Another example is MATELEC in Madrid. It is a trade show concerning electric innovations including Industry 4.0 innovations. Many fairs in Spain review the digital transformation in different sectors, which helps the encouragement for Spanish companies to apply it. Another important fair is the World Mobile Congress in Barcelona. This fair discusses Industry 4.0 and its components such as AI.



## 4. INDUSTRY 4.0 IN THE AUTOMOTIVE INDUSTRY IN SPAIN

The automotive industry is often associated with cars, but it consists of a broader range of vehicles such as trucks, buses, forklifts and much more. In this paper, the focus will be on car factories.

The assembly line of cars, introduced by Henry Ford in 1913, was established during the second industrial revolution. Now, more than a hundred years later, the automotive industry bursts with new ideas and inventions because of the increase in efficiency brought along by Industry 4.0. This transition ensures an enhanced manufacturing process in terms of the cost of production, labor rates, etc. Industry 4.0 in the automotive industry is defined as constantly being interconnected. It connects devices and human interfaces, which creates real-time data from sensors. This interconnectivity is incredibly powerful. Industry 4.0 influences the entire business system from the design process to the delivery process of the products. (Masters, 2017)

But this dramatic shift is not an easy matter. Many automotive companies have not reached the ideal connection between machines and humans to work together. But suppliers and manufacturers have been taking the shift voluntarily as a positive aspect of the automotive industry because of the great gainfulness that it provides. According to Automotive World, sensors in the supply chain of products have been of great value. For example, the company Bosch has already implemented sensors in their supply chain, which delivered them an increase of 25 percent in their output for the electronic stability program and the automatic braking system (Masters, 2017).

### 4.1 THE AUTOMOTIVE SECTOR IN SPAIN

Spain is a big player in the world of the automotive sector. In Europe, Spain is the second largest manufacturer of automobiles and occupies the ninth place worldwide. Each year, an average of 1.7 billion euros is invested in the Spanish automotive sector. This sector represents ten percent of the Gross Domestic Product (including distribution and associated actions) and 19 percent of the total export of Spain. The industry produces 300,000 direct jobs and two million indirect jobs. (Aznar, 2017)

In the last four years, vehicle manufacturing has been increased compared to other years. Between 2012 and 2016, production increased by 45 percent, which represents over 900,000 units. In 2016, almost three million vehicles were manufactured, which is an increase of 5.9 percent compared to the previous year. (Aznar, 2017)

In 2016, 85 percent of the manufactured vehicles were exported to over a hundred countries worldwide. Almost 2.5 million were exported, which shows an increase of seven percent in exports of cars compared to the previous year. (Aznar, 2017)

The progress in technology is increasing due to innovations made possible by universities, technology centers, and clusters (associations of technology industries). In Spain, 34 technology centers focus on advancing the manufacturing of vehicles. (Aznar, 2017)

## 4.2 INDUSTRY 4.0 IN THE SPANISH AUTOMOTIVE SECTOR AND IN CAR FACTORIES

The automotive sector of Spain is a flourishing sector that continues to develop. The sector is very ambitious regarding Industry 4.0 initiatives compared to other sectors. The European Union invests huge amounts into Research & Development (R&D). The annual investment in R&D of the automotive sector of the EU has reached a historical amount of 53.8 billion euro, which is an increase of more than seven percent compared to the year before. (ACEA, 2018)

According to a report by Capgemini and the Institute of Digital Transformation, by 2023, the automobile industry will achieve a yearly result of 160 billion dollars because of the adoption of smart factories. These figures are based on the expectations that by the end of 2022, 24 percent of the plants of the car manufacturers are smart. Almost fifty percent of companies in the automotive industry have already been digitalizing their plants. Forty-two percent of car manufacturers recognize that there is still a long way to go for the realization of the digital transformation of their plants. (Roy, 2018)

According to Nick Gill, Chief Responsible for the automotive area worldwide at Capgemini, the coming years will be critical for companies in the automotive sector. They need to achieve Industry 4.0 to maximize the benefits of their business. (Roy, 2018)

The transformations in car factories will make things possible that weren't before. The introduction of autonomous driving is now a possibility thanks to the implementation of Industry 4.0. But this possibility could face problems with regulations from local government. The autonomous vehicle will have to overcome these setbacks. Another possibility is the electrification of cars. Replacing current cars with electric cars will benefit the world as a whole, because it is not as polluting for the environment. (FaCyl, 2018)

### 4.2.1 Progress of implementation

The infiltration of Industry 4.0 in the Spanish automotive sector has already reached thirty percent of the main manufacturers (IFEMA, sd). According to Tecnología, implementing Industry 4.0 in the automotive sector moves at an accelerated pace. The automotive sector and technology cooperate towards a digital future focusing on the customer as the center of attention. Because the Spanish automotive sector presenting ten percent of the country's GDP and being the second largest car manufacturer in Europe, it possesses a lot of potential. Tecnología reports that the sector is already immersed in a deep digital transformation by applying the basics of Industry 4.0, but still, many challenges need to be overcome. (Tecnología, sd)

## 4.3 THE OPPORTUNITIES

The implementation of Industry 4.0 in the vehicle manufacturing area will reshape the entire factory. The use of dynamic robots will ensure the arrival of many new opportunities.

### 4.3.1 Use of all data and quick identification of problems

The technologies of Industry 4.0 gather data produced in the factory. According to George Whittier, 60-73 percent of data goes unused by companies. Industry 4.0 will not overlook any of the necessary information but take full use of this data. Having Industry 4.0 implemented in factories will increase efficiency because of the self-monitoring capabilities. Factories will move towards a 24-hour production monitored by computers that will detect problems and solve them on their own. (Whittier, 2018)

### 4.3.2 Customization

Customization in the car-buying experience has not been customary in the automotive industry, but with the implementation of Industry 4.0, personalization will be possible. The interconnectivity between the different parts of the supply chain of the automotive industry will make it possible to adjust to the preferences of the customer more quickly, which will make the process efficient and timesaving. When the companies of this industry would focus on the high demands of personalized cars, it can lead to fewer costs, which could push the prices of the cars down. Manufacturers can lower the prices of the cars while maintaining or even increasing profit margins. (Whittier, 2018)

### 4.3.3 Connectivity of international locations

Manufacturers of the automotive industry have international sites. Manufacturers who implemented Industry 4.0 can connect all these locations to create a connection. When customer demand changes, production operations can move among the diverse districts, for example, higher demand for a particular car, but one facility cannot produce enough cars to meet customer expectations. Industry 4.0 technologies will immediately react by producing these cars in another facility to increase supply. (Masters, 2017)

### 4.3.4 Reshape the future

In 2019, self-driving cars have already been introduced by GM. Many manufacturers in the automotive industry have expressed that Industry 4.0 will leave its mark by reshaping future vehicles. (Whittier, 2018)

## 4.4 THE CHALLENGES

The fourth industrial revolution also shows some key challenges that the manufacturers of car factories must overcome if they want to implement Industry 4.0 successfully. The need for data security increases, because in Industry 4.0, every manufacturing company is vulnerable to suffer from cyberattacks. This threat is very dangerous because companies are dealing with expensive materials, private information about the manufacturing process or company secrets that could be exposed.

## 4.5 SWOT-ANALYSIS OF THE SPANISH AUTOMOTIVE SECTOR

This SWOT-analysis consists of information obtained by reading articles and by understanding the Spanish market. The Spanish automotive sector has many strengths and many opportunities combined with weaknesses and threats. The reason for choosing a SWOT-analysis is for Belgian companies to have a clear overview on the strengths and opportunities of the Spanish automotive sector, whereas a PESTLE analysis does not show a complete overview of the strengths and opportunities.



Figure 7: SWOT-analysis of the Spanish automotive industry (Olesa, sd) (Int-team, 2015) (Atradius, 2016)

## 4.6 IMPORTANT PLAYERS

Spanish companies understand the importance of the fourth industrial revolution in their plants, which is why many are adopting the principles of the concept.

The Enterprise Europe Network (EEN) provides support to SMEs of European countries. The Enterprise Europe Network aims to support businesses to innovate by giving access to local sources of funding, build relationships with local innovation stakeholders and much more. (Enterprise Europe Network, sd)

Gestamp is building its path towards a Smart Factory as it currently has diverse ongoing Industry 4.0 initiatives that stem from the different production processes such as hot stamping, cold stamping or arc welding to auxiliary processes, such as maintenance, logistics, quality or energy

During the Barcelonian Economic Society of Friends (SEBAP), the President of SEAT Luca de Meo declared that they invested 962 million euro in R&D investigating Industry 4.0. They are committed to achieving innovation in their plants. SEAT has incorporated Industry 4.0 in their plants in Martorell. They have autonomous guided vehicles that transport the needed parts and for heavy loads. SEAT also uses exoskeletons to assist workers. (Cristina Vall-Llosada, 2018)

Many associations have been formed over the years. Some examples of associations are ANFAC (Association manufacturers of automobiles and trucks), ANIACAM (National Association of importers of automobiles, trucks, buses and motorcycles), ASEPA (Spanish Association of automotive professionals), CONEPA (Spanish Federation of automotive entrepreneurs), SERNAUTO (Association of manufacturers of equipment and components of automotive sector), etc.

## 4.7 COMPARISONS

Many countries are still more powerful when it comes to car manufacturing. China is the world's leading car manufacturer. In 2015, this country produced almost 25 million vehicles, while Spain produced three million vehicles in 2016. Other countries such as the United States of America, Japan, Germany, India, and South Korea are still larger than Spain. The biggest competitor of Spain in relation to the biggest car producer in Europe is Germany, with a production of 6 million vehicles in 2015. (Gorton, 2016)

Undoubtedly, the Spanish automotive industry has a tremendous impact on the GDP of Spain. However, some sectors in Spain still have the upper hand. For example, the food and beverage industry is one of the biggest Spanish industries. The revenue of this industry is expected to count for \$2.739 million in 2019 and it is expected to grow fifteen percent by 2023. (Statista, sd). Tourism is an important economic driver of Spain that accounts for eleven percent of Spain's annual GDP, while the automotive sector of Spain represents ten percent of the GDP of Spain. (Kiprop, The Biggest Industries In Spain, 2018)

## 5. REGIONAL DIFFERENCES IN SPAIN

This chapter will focus on the regional differences of Industry 4.0 in Spain. Firstly having the focus on Industry 4.0 in general, subsequently, the regional differences in research in the automotive sector in Spain.

### 5.1 GENERAL DIFFERENCES IN SPAIN

The noticeable difference in regions shows not only differences in the implementation of Industry 4.0 in companies but also differences in the development of policies about Industry 4.0 and the involvement of governments to encourage the digitalization.

The research also displays that the Basque Country, Catalonia, and Castilla y Leon take up the first positions in Spain. These regions focus on the transformation of the industrial sector. The governments of these regions help by granting financial support, subsidies and other benefits to Spanish companies. (Restart 4.0, sd) The Community of Madrid is a close follower that is doing quite well in the development of Industry 4.0. (Industria Conectada 4.0, 2019)

In the Basque Country, events such as Basque Industry 4.0 create awareness for the digitalization process. Provided by the Basque Industry 4.0, the Basque Digital Innovation Hub is an infrastructure where training, research and testing surrounding Industry 4.0 technologies take place. According to Industria Conectada 4.0, the level of implementation of Industry 4.0 in Catalonia is quite extensive. The awareness of Industry 4.0 in this region is noticeable because of the presence in conferences, fairs, workshops, etc. In Catalonia, subsidies and financing to promote Industry 4.0 are given to Catalonian companies by the Agency for the Competitiveness of the Company. In Castilla y Leon, the awareness of Industry 4.0 increases in programs such as Centr@Tec by Institute for Business Competitiveness (ICE). Public subsidies are distributed between development projects, supporting the SMEs to incorporate technology innovations, R&D projects, etc. All these regions have the advantage of being supported by the government, which is not happening in other regions.

A report done by Industria Conectada 4.0 shows that the Canary Islands, Castilla-La Mancha, and the Balearic Islands are three Spanish regions that hold a low number of policies supporting Industry 4.0. The recognition of the importance of Industry 4.0 is present but some regions such as the Canary Islands do not have an action plan for Industry 4.0. The reasons for the lack of industrialization in these regions can be blamed on the focus on tourism. (Restart 4.0, sd) (Industria Conectada 4.0, 2019)

The inequality of Industry 4.0 in the regions of Spain can be explained by diverse levels of industrialization in the Spanish regions. Nonetheless, these less industrialized Spanish regions have been creating powerful public efforts to advocate the effective transformation of Industry 4.0. For instance, the governments of the regions promote Industry 4.0 by developing projects about industrialization. (Restart 4.0, sd) (Industria Conectada 4.0, 2019)



## 5.2 REGIONAL DIFFERENCES IN THE SPANISH AUTOMOTIVE SECTOR

Many regions play a role that contributes to the GDP of the Spanish automotive sector. By performing desk research and conducting interviews, it can be concluded that the top three essential regions for the automotive industry of Spain are the Basque Country, Catalonia and the Community of Madrid. Retrieved from interviews (Azua, 2019) (Guasch, 2019), it can be concluded that Extremadura is less developed.

The Basque Country enjoys a noticeably innovative and competitive automotive sector. Significant multinationals such as Mercedes Benz (Daimler) and Irizar (bus and coach manufacturer) are operating in this territory. According to Invest in Basque Country, more than 45 percent of the production volume of Spain's car industry takes place in the Basque Country. (Invest in Basque Country, sd) According to ACICAE, 70 percent of automotive companies in the Basque Country have R&D departments because of the importance of Industry 4.0 in Spain. (ACICAE, sd)

A study by the Agency for Business Competitiveness, confirms a high level of awareness related to digitalization of processes in Catalonia. According to Catalonia Trade & Investment (ACCIO), more companies are integrating the technologies rather than developing them. Sectors such as the automotive industry, machinery, and equipment significantly progress the most in the digitization process of Catalonia. The technology and research centers further evolve the development of Industry 4.0 in Catalonia. Local and foreign firms of the automotive industry in Catalonia such as TI Automotive System have applied the concept of Smart Factory in industrial plants because of the solutions provided by TAI Smart Factory which is based in Catalonia. (Catalonia Trade & Investment, sd)

According to the completed interviews (Murillo, 2019) (López, 2019), the Community of Madrid is very involved in the development of Industry 4.0 in the automotive industry. The Community of Madrid initiates many projects to promote Industry 4.0. For example, the region encourages the implementation of Industry 4.0 by inaugurating the Industrial Plan of the Community of Madrid 2018-2023 with the objective to boost the digital transformation of the region. In 2017 and 2018, a total of 5.9 million euros of subsidies by the Ministry of Economy, Employment and Finance helped over 60 industrial SMEs in Madrid. (Comunidad de Madrid, sd) In 2019, The Community of Madrid will allocate four million euros to advance the development of Industry 4.0, aimed at industrial SMEs to promote digital transformation. (S, 2019) The automotive sector of the Community of Spain benefits from all these subsidies and benefits given by the government.

## 5.3 CONCLUSION OF THE DESK RESEARCH

From the desk research, it can be concluded that there are still many challenges that need to be overcome before fully benefiting from the technologies of the fourth industrial revolution. The economy of Spain is doing great and combined with the implementation of Industry 4.0 in the Spanish companies, the GDP is expected to grow. The expenditures on Research and Development have been increasing, this can be explained because of the arrival of new technologies by Industry 4.0. The excitement of achieving a fast implementation is very high, but the level of implementing the concept is quite low due to a lack of

knowledge by the Spanish companies, but thanks to governments, schools and other institutes promoting and researching Industry 4.0, more awareness is being created on the concept.

For the Spanish automotive sector, the fourth industrial revolution is a dramatic but much needed shift. The interconnectivity created by technologies is incredibly powerful. The concept of Industry 4.0 influences the entire business system from the design process to the delivery of the products. Already thirty percent of the main Spanish manufacturers have incorporated Industry 4.0 into their plants such as SEAT and Gestamp. It provides many opportunities for companies in relation to efficiency, profits, customization etc. The vehicle manufacturing business has been growing every year thanks to the introduction of innovative technologies. By the end of 2022, 24 percent of the car factories will be digitalized in regard to Industry 4.0 being applied in their plants. With the fourth industrial revolution, it will be possible to create new cars that impossible to build before the existence of Industry 4.0. Spanish companies implement new software and technologies, which is great for development.

Comparing the Spanish automotive sector to other Spanish sectors reveals that other sectors remain bigger in size, but it also proves that the Spanish automotive sector is one of the most influential sectors of Spain. The Spanish automotive sector is not the biggest automotive sector in the world, which means that there are still many countries ahead of Spain. Spain has to make sure to thoroughly benefit of Industry 4.0 to secure a position at the top.

The regional differences show that many regions such as the regions in the south of Spain are not ready for the full implementation of Industry 4.0, while many large Spanish companies of the Basque Country, Catalonia, the Community of Madrid and Castilla y Leon have already applied the technologies of the fourth industrial revolution, while the SMEs have a hard time applying the expensive technologies. It is a possibility that the Spanish SMEs develop the technologies of Industry 4.0, while the larger Spanish companies only implement it. Not only do the Spanish companies have a role in the progress, but the importance of the interference of the government by granting subsidies or implementing new regulations will add to a faster application and a further development of the concept.

## 6. FIELD RESEARCH

### **Aim of field research**

For this field research, in-depth interviews have taken place because questionnaires did not meet the needs of the outcomes of this paper. It made sense to perform in-depth interviews with people containing the necessary knowledge who could contribute to the conclusion of this paper in a valid way.

### **Target Group**

The target for the interviews of this field research were professionals who deal with the fourth industrial revolution on a daily basis, which means that these people have a clear understanding of the concept.

Consultants or strategists that aid Spanish companies to implement Industry 4.0 into their processes were the target. These people can provide correct information on the current state of Industry 4.0 and the innovativeness and openness of companies to adopt it. Another target audience for the interviews were automotive industry clusters. Clusters have the opportunity to turn the problems into opportunities by providing solutions to their members.

### **Structure of interviews**

In the first part of the interview, multiple questions were asked on Industry 4.0 in Spain. For example, their perspective on the current state of development, the regional differences, the key issues, and opportunities, etc. In the second part of the interview, the questions focused more into detail on the automotive sector. What is the current state of Industry 4.0 in the automotive sector, the regional differences, etc. .... ?

## 7. CONCLUSION

First of all, this study shows that Spanish companies of the Spanish automotive industry are positively influenced by Industry 4.0 and they are profoundly prepared to invest in the concept to innovate their plants. The Spanish automotive sector is evolving better compared to the other sectors of Spain. The level of Industry 4.0 in the automotive industry is close to the level of the same sector in other countries, which means that the Spanish sector is evolving rapidly. According to the interviews performed, the companies of the Spanish automotive industry are implementing Industry 4.0 well into their company and plants. Not only are they implementing the concept into their company, but they also develop other technologies that can be applied in the fourth industrial revolution, because the companies understand the importance of the concept. The biggest companies in the Spanish sector are Nissan, SEAT, and Renault. All these companies have implemented Industry 4.0 successfully. Industry 4.0 in the Spanish automotive industry will bring many opportunities. The possibility of rapidly bringing new inventions such as intelligent cars and autonomous cars to the market in the near future will be feasible, due to the technologies of the fourth industrial revolution.

Secondly, the fourth industrial revolution bears issues and opportunities. These issues are barriers to implement Industry 4.0 into companies of the Spanish automotive industry. The primary issues mentioned are cybersecurity, lack of knowledge about the concept, huge implementation cost and the conservative mindset of Spanish companies. The Spanish companies of the automotive industry also have many opportunities such as increases in efficiency, less human errors, a better decision-making process, fewer production costs, creation of new jobs, and the possibility to construct products without limitations. Many of the interviewees expressed that the opportunities outweigh the issues of Industry 4.0.

Thirdly, this study also demonstrates the huge regional differences. These regional differences have an impact on where the location of the Spanish companies of the automotive industry should be. From the interviews, it can be concluded that the Basque Country, Catalonia and the Community of Madrid are the three best-developed regions of Spain regarding Industry 4.0 and Industry 4.0 in the automotive sector. The differences could be explained due to the already existing high level of industrialization before the introduction of Industry 4.0 in Spain, the interference of the government with the development of the concept by granting subsidies to the Spanish companies, the investment in R&D of the concept by the regional governments, the involvement of clusters, and the educational progress provided by universities. The less developed regions are the regions in the south of Spain such as Extremadura. In these regions, Spanish companies of the automotive industry do receive much less assistance from the regional and local governments.

From the interview with the Internet of Things specialist, it can be concluded that the development of the Internet of Things is different in each region and city, because of the number of IoT companies in that region and the involvement of the government. In Spain and in the rest of Europe, the Internet of Things is becoming a hot topic. Spanish companies understand the effectiveness and profitability that it brings in the organization but many Spanish companies are hesitant to use it in projects.

All the interviewees agreed that, the application of Industry 4.0 into Spanish companies in the automotive sector and all sectors is a must to survive the extensive competition in the Spanish market, but it is not accessible for all sizes of companies because of the huge implementation cost. Some advised that smaller and medium companies should focus on a particular part of Industry 4.0 and not on the entire line of different technologies.

Although Spanish SMEs receive help from the Spanish government by introducing events or governments of certain regions granting subsidies to the SMEs, it will be hard for them to overcome the issues concerning implementing the technologies of the fourth industrial revolution. The Spanish SMEs can choose to concentrate on developing the technologies of Industry 4.0 instead of implementing them. The large Spanish companies simply implement them, because they do not have any difficulties concerning the expenses.

The advice for Belgian companies given by the Spanish interviewees showed many similarities. Belgian companies should establish relationships with clusters that offer many opportunities and with Spanish companies from the well-developed regions. Belgian companies should obtain good expertise in the subject and most importantly: the fourth industrial revolution is still in development, which means that Belgian companies should act now and not in five years, because they will have lost their chance to be a pioneer.

## 8. RECOMMENDATIONS

From the conclusion of desk research and field research, recommendations can be made on the subject of Industry 4.0 in the Spanish automotive sector and Industry 4.0 in Spain.

Spain is not yet at the level that it should be, which means that the Spanish companies of the automotive industry and all other industries need to implement the concept as quickly as possible because if they do not do so, they will no longer be equipped for survival and their position will deteriorate because of intense competition. The Spanish companies should implement the technologies in the next couple of years. Spain needs to ensure that all sizes of companies are applying Industry 4.0 because if they do not implement it, other strong countries such as China and Germany will hold the first position, which could lead to great losses for Spain.

The companies of the Spanish automotive industry have to re-evaluate their strategies because of the fourth industrial revolution. As recommended by Azua, Spanish companies need to transform their business plan in a logical way. This paper encourages companies to work together with other companies and consultants specialized in this area. For example, Spanish companies should implement the Internet of Things into their projects to make precise decisions based on the data obtained. They can make use of the Belgian companies specialized in the Internet of Things to assist them with implementing these complex technologies correctly to ensure correct outcomes.

Overcoming setbacks such as the need for cybersecurity and lack of knowledge of the Spanish companies is extremely important to enjoy the full Industry 4.0 experience. The importance of ensuring proactive data security is crucial. This paper advises companies to immediately invest in excellent security that withholds all outside threats from entering critical information. For Spanish companies, defining the essential competencies of the employees needed in an Industry 4.0 environment is important.

Organizations such as Flanders Investment & Trade can benefit the development and awareness of Industry 4.0 in Spain for large Spanish companies and SMEs. Flanders Investment & Trade can introduce the Belgian companies to Spanish 4.0 companies, create the needed relationships between Belgian companies and clusters, organizing missions focusing on Industry 4.0 in Spain. Belgian companies should participate in fairs and work on strong relationships with Spanish 4.0 companies in the targeted sector.



## 9. TRADE FAIRS IN SPAIN ABOUT INDUSTRY 4.0

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Many fairs in Spain include Industry 4.0 or associated technologies into their program. Below, you can find examples of these fairs.

### 1. Industry Tools by Ferroforma

**What?**

Fair for the industry sector.

**Where and when?**

Bilbao – Bilbao Exhibition Center

Every 2 years

### 2. BIEMH

**What?**

Fair presenting metal cutting, metal forming, product development, automation of processes, handling, robotics, etc.

**Where and when?**

Bilbao - Bilbao Exhibition Center

Every 2 years

### 3. Smart City Expo World Congress

**What?**

Fair on digital transformation, urban environment, etc.

**Where and when?**

Barcelona – Fira de Barcelona

Every year

### 4. HYGIENALIA+PULIRE

**What?**

Hygiene fairs presenting industrial cleaning machinery and other cleaning tools.

**Where and when?**

Madrid – Pabellon de Cristal

Every 2 years

### 5. SIL Pabellon

**What?**

Logistics fair presenting transport & logistics systems, infrastructures, equipment and material handling, etc.

**Where and when?**

Barcelona – Fira de Barcelona

Every year

**6. Automotive Manufacturing Meetings Madrid**

**What?**

Fair for the automotive sector.

**Where and when?**

Madrid – IFEMA Feria de Madrid

Every 2 years

**7. Equiplast**

**What?**

Fair on plastics presenting machinery, equipment and automation systems, hardware, software, control, etc.

**Where and when?**

Barcelona – Gran Via Exhibition Centre

Every 3 years

**8. EXPOQUIMIA**

**What?**

Chemistry fair presenting fine chemistry, raw materials, but also developments and innovations.

**Where and when?**

Barcelona – Gran Via Exhibition Centre

Every 3 years

**9. MATELEC**

**What?**

Fair on electrics presenting electric innovations and Industry 4.0.

**Where and when?**

Madrid – IFEMA Feria de Madrid

Every year

**10. Digital Enterprise Show – DES**

**What?**

Fair on digital transformation in Spanish companies and other international companies.

**Where and when?**

Madrid – IFEMA Feria de Madrid

Every year

**11. Mobile World Congress**

**What?**

Fair on Industry 4.0 and its components such as Artificial Intelligence.

**Where and when?**

Barcelona

Every year

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