Analyzing digital transition in small and medium sized companies in Spain

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Abstract

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Digitalization and digital transformation are molding the world's economies and new disruptive innovations are born frequently. This megatrend brings challenges and opportunities that are common for many businesses and economies, but also ones that are sector and country specific. This thesis focused on Spanish SMEs digitalization by elaborating on three big questions: What are the digitalization challenges Spain should focus on to support its SMEs? How is the EU supporting Spain in digitalization? What are the Spain's plans to support its SMEs in digitalization?

This way the reader can get a good understanding of the Spain's governmental actions on defining the challenges and providing support for its SMEs in different business sectors.

The four cornerstones of digitalization in Europe are: population's digital skills, connectivity and digital infrastructure, public administration services, and integration of digital technologies in businesses, which all are closely related to each other. Evidently, the integration of digital technologies in businesses is directly related to digital transition of SMEs, but all the other aspects are potentially just as important as they are preconditions for integration of digital technologies to happen in the first place. In fact, they all need to be examined to explain the SMEs' situation. The SMEs are emphasized in this study because of the Spain's business fabric's composition, and because they seem to be in the middle of the overall digitalization of the country.

The documents that were analyzed and used to write this content analysis thesis can be found on the official websites of the European Commission and the Spanish Government.

With the help of the EU, Spain has recognized its main challenges of adapting its businesses for the modern digital era. Some of those challenges are, shortage of ICT competent workforce, and lack of disruptive technologies implemented in companies. The smaller the company, the less digital technologies it has in use, which adversely affects the company's e-commerce turnover and overall sustainability. Spain is taking a wide range of measures under the public and private sector collaborating Digital Spain 2025 plan, and other programs, to overcome their challenges. The EU supports Spain's digitalization plans by financing them through NextGenEU programs.

Timeframe of writing this thesis extended from November 2021 to May 2022.

Keywords
Digitalization, Digital transformation, Economy, SMEs, Spanish Government, Technology

Table of Contents

1 Introduction

This thesis analyses the digitalization in Spanish small and medium sized companies from the point of view of governmental policies. Spain makes a great example of a country that has recognized its digitalization related challenges and is making adequate procedures and plans to overcome them. There are a lot of public information in different documents regarding the country's digitalization in the recent years, and national plans for the future. However, some of the documents are only available in Spanish, and many of the documents present the digitalization from several different aspects, which makes it hard for the reader to focus on SMEs' aspect only. Also, the documents are long and full of numbers which makes them heavy to read. This thesis analyses and summarizes the important information from 4 different document sets that in total have more than 500 pages. The key documents of this thesis are presented in the methodology chapter.

The goal is to analyze and summarize the documents in such way that this complex topic would be easier to apprehend for a reader who is less informed about Spain's digitalization. Furthermore, this thesis presents conclusions that are not directly pointed out in the documents but are important for explaining why Spain's challenges and plans are the way they are. The three main questions that form a structure and scope for this content analysis thesis are:

What are the digitalization challenges Spain should focus on to support its SMEs?

How is the EU supporting Spain in digitalization?

What are the Spain's plans to support its SMEs in the digital transition?

The order of contents in this thesis starts with a compact overview on digitalization and its different nouns, and the four main aspects of digitalization in the EU. All the terminology and aspects of digitalization are connected and to get a holistic understanding of it, one needs to read a little bit about everything. After that, the Spain's digital transition and economic situation are briefly explained to give this research context and background information. In chapters 4-6, the research questions are answered in logical order, starting from the digitalization challenges of Spanish SMEs', moving to EU's digitalization support for Spain, and lastly, Spain's plans to combat the SMEs' digital transition challenges. Overall conclusions on the topic, development ideas, and author's self-evaluation are presented in the Discussion chapter.

This topic is relevant because lack of digitalization in modern businesses affects negatively to their online sales turnover, flexibility, and competitivity in the era of digital transformation. This sustainability issue makes companies more prone to crumble under economic and social turbulences, caused by e.g., a global pandemic. This thesis is about Spanish SMEs particularly because they seem to have hard time implementing digital technologies and in Spain the SMEs form 99% of the country's business fabric and employ half of the nation's workforce.

2 Conceptual framework

2.1 Digitalization and digital transformation

Let's start with explaining and making a differentiation on five important terms: digitization, digitalization, digital transition, digital transformation, and digital maturity. Digitization is the first step; it is the process of making information attainable in a digital format. For example, this thesis is available in pdf and not only as a handwritten paper.
Digitalization and digital transition are synonyms that mean making processes more efficient and automated through digital technologies. For example, this thesis does not need to be sent to a person manually through internet (although it can be), but the person can find it on Theseus website by searching for the author's name, key words, and other intelligent digitalized search methods (Theseus). Digital transformation is the most ground-breaking process. It is combining and advantaging all the digitized data and digitalized applications to create new business models and applications. (Global Cents 2021; Yokogava 2021.)

Easy everyday example of digital transformation: Ordering food online through a mobile application is a big transformation from having to go to a restaurant to order food for take away. The whole process of searching the restaurant, deciding the dish, paying, and moving physically to get the food has been replaced with a few taps on your phones tactile screen. A restaurant that offers the possibility to order food online has digitalized that sales process, but the company that offers the whole digital platform and courier service is a completely new concept, it has gone through the digital transformation, nowadays there are even delivery robots.

Digital maturity is an estimate of a company's capacity to create value through digitalized processes, and a predictor of success for companies reaching for the digital transformation (BCG). The digital maturity can be assessed by five main dimensions: market strategy, processes, infrastructures, products and services, and organization and people. Levels of digital maturity can be described (from low to high) for example as: stagnated, aware, competent, dynamic, exceptional, and leader. The first two levels need introduction to digital technologies, the following two are in development phase and can adopt disruptive technologies, and the exceptional and leader level companies need to consolidate their activity and level digital maturity. (Industria Conectada 4.0.)

One of the basic parameters of digitalized enterprises is the electronic commerce.
E-commerce explained in its most condense form, is making sales or purchases of services and goods over the internet. The product can be paid online, but doesn't have to be, and it

can be delivered or not delivered online - depending on the nature of the product. (Semerádová & Weinlich 2022, abstract)

Disruptive technologies are in the heart of digital transformation, they literally transform the way consumers, industries, or businesses operate. A disruptive technology replaces the old established systems or habits with its characteristics that are clearly better. Good examples of disruptive technologies are, 3D printing, automation and robotics, edge computing, 5G and improved connectivity, artificial intelligence and machine learning, cyber security advancements, virtual and augmented reality, voice-activated searches, and "As-a-Service" cloud computing. (Smith, Gordon & Eichler 2022; Simplilearn 2022)

Accelerated digitalization and digital transformation is a 21st century phenomenon that has changed and will change our lives profoundly, faster than ever, exponentially even. The digital transformation perhaps would be better described as a *digital evolution*, since it is a constant process, according to G. O'Brien, G. Xiao, and M. Mason in their 2019 book Digital Transformation Game Plan. You can see and feel the digitalized world all around you by listening to music, ordering your food or clothes online with algorithm created suggestions that know your taste. But this transformation is not just about selling faster and more with digital gadgets. That would be a rather short-sighted description of it. Digital era is about rethinking our ways of living, learning, and adapting constantly to innovate and improve further as a sustainable society. Managing that successfully needs a huge effort from our leaders. Since the early 2000s the majority of ten biggest corporations, by market capitalization, worldwide have been technology companies. For example, in 2017 those ten were (in order) Apple, Alphabet, Microsoft, Facebook, Amazon, Berkshire Hathaway, Alibaba, Tencent, Johnson & Johnson, and Exxon Mobil. Of those, only three are not technology companies. The growth and popularity are not only seen in the largest companies, but in smaller ones as well. It is a global megatrend indeed. As the digitalization continues to grow in an exponential manner, the companies have hard time keeping up with it and answering to its challenges. The three main challenges for businesses are: Inflated expectations of customers, fast pace of ambiguous changes, and abundance of emergent technologies that could facilitate a competitive advantage later - but need attention and investments today. (O'Brien, Xiao & Mason 2019, introduction.)

This thesis is about Spanish SMEs' digitalization. To give it a bit of context it is important to see what is happening in its highly affective surroundings, the European Union. The European Union has been preparing itself for a 'data-agile' economy since 2014 with several regulations on e.g., AI, big data use and cybersecurity. The European Commission is committed to develop the Europe towards climate-neutrality by 2050, and a sovereign, standardized digital transformation is a fundamental part of the plan. *A Europe fit for the digital*

age agenda includes ambitious but realistic goals for empowering the European businesses and citizens sustainably. (European Commission a.)

Europe's Digital Decade is a part of the *Europe fit for the digital age* agenda. Some concrete objectives that the European Commission has set to be reached by 2030 are, for example, to have a population of which at least 80 % have basic digital skills, unobstructed and fast 5G connectivity everywhere, 75 % of EU companies using AI/Big Data/Cloud, and that the key public services will be available 100 % online. All the objectives are based on the "Digital Compass's" four cardinal points of development: skills, infrastructures, business, and government. (European Commission b.)

2.2 Spain's economic situation and digital transition in a nutshell

Now a few words about the Spain's economy and digital maturity. This Southern European country with great market connections to the EU, North Africa, Latin America, and Middle East, is the fourth largest economy in the EU (UK now excluded). Spain is known to be a major exporter, in fact, in 2018 34.5% of Spain's GDP came from exports of goods and services. Spain has a population of about 46 million people, and in 2019 it had over 82 million visitors. More than 14,600 foreign companies practice their business in Spain, and 70 out of top 100 firms in Forbes Global 2000 operate there. (Invest in Spain a.)

The last two years have been rough for practically every country in the world due to the Covid-19 pandemic, and Spain is no exception. In 2020 Spain's GDP fell about 10% from what it was in the end of 2019. However, in 2021 Spain recovered its GDP, taking a notable spurt in the last quarter too, so that it was only about 3-4% smaller than before pandemic. Spain's GDP in the end of 2021 was €1,205,063.0 million, or €1.205 billion, in current prices (Eurostat 2022). Spain's GDP is expected to grow 5.5% in 2022 and 3.8% in 2023, according to OECD's economic forecast from December 2021. The growth results are likely to come because of improved fiscal and monetary policies, better labor market conditions - as the Covid-19 pandemic starts to faint, and with the help of NextGenEU funds, which will boost private consumption and investment. (OECD 2021.)

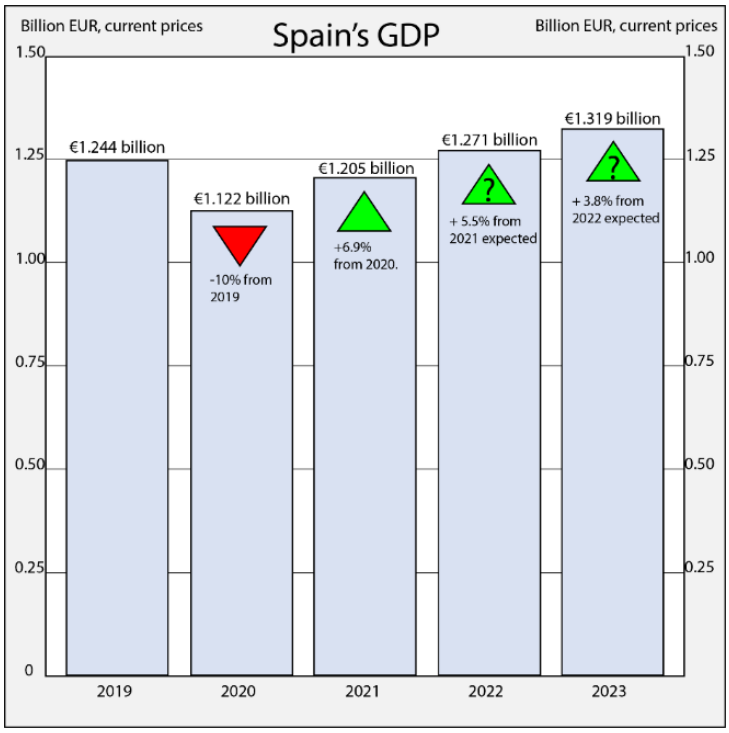

Table 1. Spain's gross domestic product in recent years and expectations for the future. Data source (2019, 2020, 2021): Eurostat

Automotive industry is regarded as the industry leader in Spain. It represents 10% of the country's GDP and 18% of total exports. Spain ranks 2nd on the list of biggest car manufacturers in Europe, and 9th in the world. The industry employs nearly 2 million people in Spain and 300 000 of them work directly at car manufacturing. The production plants are among most automated and efficient in Europe, with the ratio of 1000 industrial robots per 10 000 employees. The Spanish automotive industry works closely with technology centers, universities, and industrial clusters, and makes significant investments in modernization and automation. (Invest in Spain b.)

The Spanish tourism sector took a hard hit with the Covid-19 pandemic and its restrictions, which translates to 2021 numbers that show the sector's decline of 42% in revenue, compared to pre-pandemic era. However, in 2022 the tourism sector's revenue is expected to rise to €135 billion, which would be equivalent to 10.5% of the country's GDP, and 87.5% of what the sector's revenue was before the pandemic. (Allievi January 2022)

Moving on to assessing the Spain's overall digital maturity. Spain has had various programs that have guided major public and private investments in the field of digitalization of the country over the last two decades, according to the Executive Summary report of Digital Spain 2025, which is the Spain's current digitalization plan and one of the essential documents analyzed in this thesis. To name a few of those predecessor plans, Plan Info XXI, Programa España.es, Plan Avanza, and lastly the Digital Agenda for Spain of February

2013. Plans have resulted a strong basis for infrastructure, economic activity, technology, and social and territorial cohesion development. Although significant steps forward have been taken in every area, the focus has been on extending Spain's physical telecommunication networks. On the flip side of the coin, the digitalization and digital transformation of industry and business, especially in SMEs has been narrow, which also has had its toll on the population's digital skills.

A good way to measure just how good or bad Spain has been doing in digital transition is to look at how it compares to other EU countries in those four key aspects that were mentioned earlier in Abstract.

Spain has moved up two places in DESI ranking from 2020 to 2021, making it 9th on the list. Much of the improved ranking is due to steps Spain has been taking to improve digital accessibility of public administration and developing the country's connectivity. Spain ranks 7th in digital public services, and 3rd in connectivity and infrastructure. The areas where Spain has got more work to do, are its human capital's digital skills and integration of digital technology to businesses. Spain ranks 12th in human capital and 16th in integration of digital technology to businesses.

The integration of digital technologies in Spanish micro, small, and medium sized enterprises is analyzed more closely in the upcoming chapters, and for that reason it is important to know the definition of the SMEs.

A company is **medium-sized** when **a)** staff headcount is 249 or less **b)** yearly turnover is €50 million or less, **or** the balance sheet total (including all the company's assets) is €43 million or less.

A company is **small** when **a)** staff headcount is 49 or less **b)** yearly turnover is €10 million or less, **or** the balance sheet total (including all the company's assets) is €10 million or less.

A company is **micro** when **a)** staff headcount is 9 or less **b)** yearly turnover is €2 million or less, **or** the balance sheet total (including all the company's assets) is €2 million or less. (European Commission c.)

3 Methodology of research

This thesis was written by using a qualitative content analysis method to derive the important information and conclusions from essential documents. The documents that were analyzed for this thesis are: European Council's Country Specific Recommendations for Spain 2021, European Commission's DESI Spain country profile from 2021, ONTSI report for SMEs from 2021, and Spanish Government's Digital Spain 2025 Plan. Other important sources of information are web articles and books, which can be found listed in the References. Since the documents vary from one another so much in content, a classical analysis unit model does not fit into this study. (Drake & Salmi 2018.)

The scope of information that was considered important for this thesis is limited by the three research questions. Originally, this thesis focused on finding information and drawing conclusions about Spain's overall situation in digitalization. Then in the process of writing, it was discovered that the digitalization of SMEs has a huge emphasis in Spain's plans to develop the country's overall level of digital maturity. This led to searching for the reasons why it is so, what are the SMEs' digitalization challenges, and the Spain's plans to combat those challenges.
Supporting the digitalization and digital transformation is important for the EU to maintain its competitivity in this modern digital era, especially now as the Covid-19 pandemic has revealed vulnerabilities in European economies with a sudden increase of remote work and data usage. The digital transformation gets a lot of support in EU programs and financing instruments. Spain benefits a lot from the EU financing. The EU financing is a key enabler for executing Spain's plans to overcome the digital maturity deficiencies in SMEs, and thus the EU's current financing instruments that directly benefit Spain in digitalization are explained. Here is a brief description of the documents that were analyzed for this thesis:

Like other EU Member States, Spain gets guidance from the EU on how to develop the country and its economy to the right direction. The Country Specific Recommendations provided by the European Commission, by concluding the European Council's opinions and advice for the EU Member States is an annual report of each country's situation on following the commonly agreed development agendas. Analysing the 2021 Country Specific Recommendations report for Spain added value to this thesis by offering information on what Spain should be pursuing in its policies, which of course are closely related to the digital transition of the country and its SMEs. This document was only analyzed in chapter 5. (European Commission 2021.)

Since 2014 the European Commission has been tracking the EU Member States' level of digitalization and providing them with annual country profile reports. The Digital Economy

and Society Index reports include up to date information about the country's digital maturity and a ranking that shows how they compare to other Member States. The Commission has made a few changes to the indicators of the DESI report of 2021. (European Commission Spain DESI 2021.) The indicators are now, and in the future, more closely related to the four main sectors of the Digital Decade Compass, and in line with Europe's Recovery and Resilience Facility (European Commission d).
The four cardinal points of the Digital Compass and DESI 2021 are:

1. Population's basic digital skills and advanced digital skills of ICT professionals
2. Sustainable and secure digital infrastructures
3. Integration of digital solutions in businesses
4. Digital public services

The 2021 DESI report's data is from 2019, 2020, and 2021 – mostly from 2020. The report has valuable information about Spain's overall digitalization. The four cardinal points helped to identify the digitalization weaknesses in Spanish SMEs. Furthermore, the report's indicators helped to understand the specific deficiencies and challenges, and so guided the author's focus to investigating those indicators in the ONTSI report. This DESI report was analyzed widely in different chapters of this thesis, but mostly in chapter 4. (European Commission Spain DESI 2021.)

Observatorio Nacional de Tecnología y Sociedad (ONTSI) provides public information on digitalization and participates in the preparation of reports that help to evaluate and update the status of the steps indicated in the digital transition agenda of Digital Spain 2025 plan. ONTSI works under the Spanish Ministry for Economic Affairs and Digital Transformation. ONTSI report for SMEs from 2021 provides complete information and numeric data about Spanish enterprises and their state of digitalization. In both the sector specific and the comparative part of the report, ONTSI has gathered reliable and up to date data from INE (Instituto Nacional de Estadística) and DIRCE (Directorio Central de Empresas), while also giving context and background information in text. The report's newest data is from the first trimester of 2020, just before Spain declared emergency state of pandemic. So, the impacts of lockdowns don't show on the graphs. The report's indicators data is categorized so that the SMEs and big companies are together, and micro companies have their own statistics. This document was analyzed in chapter 4. (ONTSI 2021.)

And lastly presented, the Digital Spain 2025. *España Digital 2025* is the Spanish Government's current digital transition plan that consists of an agenda of almost 50 measures that are grouped into ten main objectives. The mission is to promote Spain's digitalization and digital transformation through strengthening public and private sector collaboration. The

Digital Spain 2025 program is designed to make social and economic advancements by reducing inequality, relaunching economic growth, increasing productivity, and advantaging new technologies, with respect to constitutional and European values, and the protection of individual and collective rights. This thesis analyses and summarizes information from the Digital Spain 2025 Plan's Executive Summary report and the SME Digitalization Plan report to answer the research questions. This document set was also analyzed in different parts of this thesis to compliment information, but mostly in chapter 6. (Gobierno de España.)

4 What are the digitalization challenges Spain should focus on to support its SMEs?

First, we need to understand why the digitalization and digital transformation are needed in Spanish companies, and why exactly micro, small, and medium sized companies are primarily supported, and not just all business activity in general.
The Covid-19 pandemic has emphasized Spain's necessity to improve their connectivity and digital skills as the country witnesses all data traffic (mobile data and voice, fixed-line data and voice) massively increasing from 2019 to 2020. A stable connection is essential for any modern company, and an initial step of digitalizing business processes.
Lack of digitalization in businesses affects negatively to online sales turnover, flexibility, and competitivity. This sustainability issue makes companies more prone to crumble under economic and social turbulences, caused by e.g., a global pandemic. Big companies often do not need governmental intervention to implement digital technologies and advancements because they already have the resources needed. Smaller companies face many adversities in business processes such as information, finance, access to suitable products under favorable conditions, and technical training of the staff.

In Spain the proportion of SMEs contribution to employment and their gross corporate value added is approximately five percentage above the European averages in 2018. Companies with less than 50 employees form 99% of the country's total business fabric, while also being responsible for 49% of business employment. The average size of Spanish companies' workforce is 4.4 employees, while the EU average is 5.9.
In 2019 Spain's TEA (Total early-stage Entrepreneurial Activity) rate was 6.1% which is less than EU average. This indicator regards to the number of potential entrepreneurs in country, percentage of consolidated enterprises, and to the levels of initial (early-stage) entrepreneurial activity. The percentage of Spanish entrepreneurs with new businesses is still 'good' compared to the EU's average and the percentage of Spanish entrepreneurs who are shutting their businesses is well below the EU average. However, Spain must raise its level of entrepreneurial initiative because new innovative start-up businesses are needed to make digital transformation happen. They can be regarded as agents of change that also help their stakeholder companies rethink their business processes and adopt new digital technologies.

Like concluded in the chapter 2.2, Spain's connectivity and digital infrastructure are among the best in Europe. Even though there still are gaps in connectivity between urban and rural areas, the Spanish SMEs seem to have good access to internet and computers.
In 2020 over 95% of all SMEs and big companies in all sectors had internet connection and computers. The fact that most of the companies are in densely populated big cities like

Madrid, Barcelona, Bilbao, Valencia, Sevilla, and Malaga, suggests that the connectivity problems of rural areas is not one of the major limiting factors of the digital transformation potential of Spanish SMEs. At least not until people start habiting those regions in the first place. It is anything but urgent to build 5G towers in the deserted lands and mountains of Iberian System that extends to provinces of Soria and Teruel, where the population density per square kilometer can be counted in single digits. However, it is important to improve the connectivity where there are users, as the remote work and demand for a fast and steady internet connection increases.

The connectivity issues can also impact negatively on tourist destinations' experience offering. Tourism is a huge source of income for Spain with its collateral, indirect benefits as tourists spend money in a variety of different businesses in country. The sector has suffered a lot for the pandemic, and its vulnerability to global catastrophes needs to be resolved with innovative and sustainable solutions.

The other aspect where Spain is doing well is the digital public services. So, filling the tax returns and other legal paperwork no longer really needs paper and can be done swiftly online. One public service factor that might slow the digital transitioning of the Spanish SMEs is the bureaucratic factors of deploying NextGenEU funds (explained in chapter 5), because the process involves many stakeholders like the EU, Spanish ministries, provincial officials, and private organizations. Making this financing process as smooth and fast as possible is important for providing funds for the SMEs in urgent need of digital technologies.

4.1 ICT skills of the workforce

One of the biggest digitalization challenges of Spanish SMEs seem to be the lack of ICT competent workers, and the situation has only been worsening in the recent years.

From 2015 to 2020 the number of SMEs and big companies with ICT specialists in staff declined 7.9%. Now the total number of all SMEs and big companies that have ICT specialists in workforce is 18.4%. Apart from the ICT sector, only two sectors increased the total number of SMEs and big companies with ICT specialists in staff in 2020. Those are the Sales and Repairs of Vehicles sector and Logistics and Warehouses sector. Micro enterprises have declined 2% in this indicator and currently (in 2020) only 2.5% of all Spanish micro enterprises have ICT specialists in staff.

Companies that offer ICT skills training is in decline in all Spanish business sectors.

In 2020, 20.8% of Spanish companies with 10 or more employees offered their staff ICT skills training, which is 2.6% decline from 2015. Micro enterprises never surpassed the 4% maximum that they had in 2016 on this indicator.

Even as the total number of ICT specialists in Spain has increased over the last 5 years, almost all of them seem to work in big companies, leaving the SMEs behind in development. Also, there are gender inequality in the Spanish population's ICT competencies. Only 1.1% of the working women in Spain are ICT specialists. The same trend is seen in universities too. In 2018, only 7% of undergraduates in Spain study technological degrees, and of that number 28% are women. It seems, that the digitalization creates opportunities in areas where women are less present, which shows in low rates of start-ups that are founded by women. This problem not only hinders the early-stage entrepreneurial activity, but also affects the probability of women getting good and well-paid jobs as the digitalization and digital transformation change the skill requirements in labor market.

The unfortunate state of ICT competent workforce in Spanish enterprises requires actions and recruitment of new workers, even from the 'outside', to assure that the digital development continues. Without digital competencies, it seems impossible that Spanish enterprises would reach a proper level of using new digital technologies any time soon.

4.2 Disruptive technologies and e-commerce

Another big challenge is the absence of using new disruptive technologies like AI, big data, and cloud, which also hinders the e-commerce turnover of businesses. Especially, enterprises with less than 10 employees are not on a sufficient level of digital maturity. The smaller the company, the more unlikely it has wide use of digital technologies in its business processes.

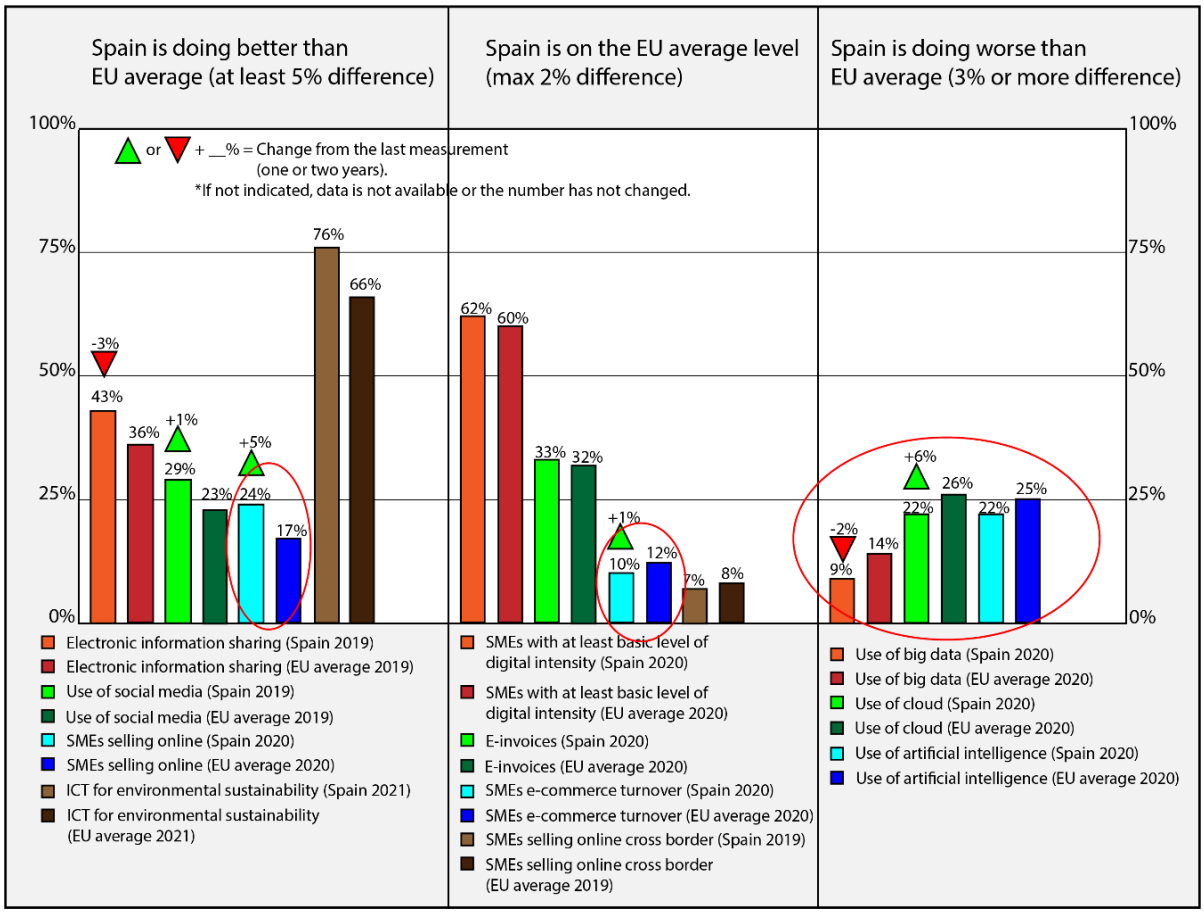

Table 2. Indicators of digitalization in Spanish companies compared to EU averages. NB: bars that do not say "SMEs" have data combined from all sized companies. Data source: European Commission Spain DESI 2021

Interesting correlation, that supports the suggestion that not advantaging AI, big data, and cloud negatively affects the company's e-commerce turnover, is that even though the percentage of Spanish SMEs selling online is greater than the EU average (24% vs. 17%), the Spanish SMEs' e-commerce turnover is in fact a bit smaller than the EU average (10% vs. 12%) in 2020 - see table 2. Now let's figure out what is going on with those disruptive digital technologies and e-commerce in Spanish businesses, SMEs precisely.

Use of cloud computing is growing in SMEs and big enterprises. In 2020, 28.2% of SMEs and big companies used cloud services, which is 8.9% growth from 2016. However, in 2020 the growth has been somewhat stagnated, except in Professional, Scientific, and Technical activities sector and Retail Trade sector where the number of companies that use cloud services grew by more than 3% for each. Micro-enterprises had the same growth trend of cloud computing up until 2019, reaching 10.4% on this indicator, but 2020 graphs show a decline in this aspect, falling back to 8.6%.

Use of big data is in decline for SMEs and big companies. In 2020, total number of SMEs and big companies that used big data was 8.5%, which is 2.7% less than in 2016.

In microenterprises the number is 3.1% in 2020, which is more than ever before, but still very low. The leaders in big data analysis are ICT sector and Hotels and travel agencies sector, which both get most of the big data generated from social medias. ICT companies are most likely using it for processes that are tailored for their clients, and Hotels and travel agencies use it for market research purposes.
Internet of things is closely linked to big data. The companies that are advantaging big data, are more likely to use IoT systems too. Because of the multitude of different kinds of IoT sensors and their uses, there is not one sector above the others. All business sectors use them for their specific needs. For example, Logistics and Warehouses sector uses it to track vehicles and deliveries, while Retail trade, and Wholesale trade sectors use it for tracking the customer experience feedback. The rest use it mostly for optimizing the energy consumption of the company premises. The IoT indicator is brought into the ONTSI report for the first time in 2021, and for that reason does not have data to compare the development from recent years.

In 2019, all Spanish enterprises notably improved their offering of e-commerce. This could be result of growing social media presence. Social medias are a modern and effective marketing and sales channel. A total of 63% of Spanish SMEs and big companies used social medias in 2020, which is 20.1% more than in 2016. Micro enterprises increased their use of social medias up to 35.2% in 2020, which is 4.8% growth from 2016. Micro enterprises even seem to prefer social medias as an easier alternative home page platform, which has led to 3% decline in total number of micro enterprises that have a website. A comprehensive table with more indicators and numbers for comparing digitalization in Spanish companies by sector and size can be found in the Appendices of this thesis.

Apart from the lack of AI, big data, and cloud, each sector has its own challenges and deficiencies in digital technologies. In some cases that is result of present-day digital technologies being unfit for their line of work. For example, hotels and travel agencies might not benefit from using robots and 3D printing as much as companies in the industry sector. But then again, many support processes, e-commerce and cybersecurity could potentially be equally important for all companies. The ICT sector, Hotels and Travel agencies sector, and Wholesale trade sector are the leaders in implantation of digital technologies in Spain. In contrary, the Construction sector, and Logistics and Warehouses sector have fallen behind the most in overall use of digital technologies.

Quick assumption would be that Spain needs to put most of the effort in digitalizing the Construction sector and Logistics and Warehouses sector. But it is not as black and white as it seems. Spain must thoroughly assess from many aspects wheatear it is more important to force digitalization to a sector where it has not flourished yet, or to invest more in a sector

that has a good base for digital transformation. Return on investment and impacts to society and economy must be considered, and not just digitalize for the sake of digitalizing. Digital technologies are tools for achieving company's strategic goals.
Industry is not one of the least digitalized sectors in Spain, but it has most of the country's SMEs and big enterprises (See appendix 1) which makes it responsible for a huge portion of Spain's employment. The industry sector is also very lucrative because it brings Spain a lot of foreign money in exports trade, like said in chapter 2.2. So, focusing on developing the industry sector's digital maturity would not only be assuring the international competitivity of already booming business sector, but also providing the much-needed digital skills training for a huge portion of population. And this is exactly what Spain is doing. The plans Spain has for supporting its SMEs in digital transformation are analyzed in the chapter 6.

4.3 Summary

ICT skilled staff and use of big data are in decline in Spanish SMEs. Use of cloud computing has been increasing, but the growth is starting to slow down and even turn negative. Use of social medias is growing and at the same time the number of Spanish SMEs selling online is growing. However, the e-commerce turnover remains small, which is result of the lack of digital technologies in SMEs. In some cases, lack of certain digital technologies is result of them being unfit for companies in that sector. Basic contextual factors that need to be examined to find adequate digital technologies for each company individually are: sector, size, location, digital maturity, and impact of the pandemic.
Depending on the company's diagnosis of contextual factors and the company's strategic goals, the digitalization dimensions that should be developed accordingly are: technology and infrastructure (existing or disruptive), cultural change, products and services, customer experience, digital skills training, and automating internal processes.

Digital technology shortages of Spanish SMEs are most likely caused by the combination of ICT incompetent workforce and their ignorance on new technologies and their possible implementations to companies, and the scarcity of resources to invest in new technologies. Spain needs to assure that everyone, and especially women get ICT skills training, to increase country's start-up activity and decrease gender inequality. Spanish SMEs have good connectivity and basic level of digital intensity. Now it is time to scale up the connectivity - to make it faster and capable to handle heavy data traffic in the future. SMEs need to step up from the 'basic level' and implement more disruptive technologies to stay competitive and get the benefits of digital transformation, and for that they need money and guidance. Tourism sector should be paid special attention as it is vulnerable to global catastrophes that affect travelling. Also, investing more in industry sector assures its profitability in the

future too, which brings good return on investment and the multiplied money can later be used to make more investments in other sectors' digitalization. At the same time a huge portion of the Spanish workforce can get ICT training.

Spain needs to address the challenges relatively quick, to be more resilient and sustainable when, not if, the next economic and social turbulences hit. For that reason, the digital public services need to be smooth and accessible for the businesses applying for financing and consulting.

5 How is the EU supporting Spain in digitalization?

In the EU there are new legislations and common programs to increase cohesion and co-operation in digital development, of which Spain benefits. However, this thesis only grabs onto the Spain specific digitalization support. The European Union supports Spain's digital transitioning directly by providing Spain financing and guidance. Let's start this chapter by breaking down the financing aspect.

5.1 Financing

NextGenEU is the biggest stimulus package ever financed in Europe, that alongside with the EU's long-term budget plan Multiannual Financial Framework (MFF) will help the euro-zone back on its feet after the pandemic by prioritizing and further developing the EU's strategic goals on e.g., digital transformation with new programs. NGEU is meant to give a kickstart to rebuilding a greener, more digital, and more resilient Europe with its total budget of €806.9 billion which is roughly 67 % of the size of MFF for 2021-2027. NGEU is separate of the MFF budget. (European Commission e.) The NextGenEU was officially accepted in July 2020 by the European Commission, and they assigned it to be applied for, and deployed in Member States in 2021-2023 (European Council).

The two biggest instruments of the NGEU are Recovery and Resilience Facility and REACT-EU. **Recovery and Resilience Facility** (RRF) is meant to help EU Member States to recover and rebuild sustainable and resilient economies, all while developing towards the ecological and digital goals of the EU. In current prices, the total budget for the RRF is €723.8 billion, of which in grants €338 billion, and in loans €385.8 billion.
REACT-EU is the second largest financing program of the NGEU. REACT-EU's additional funds are meant for structural changes with similar objectives. It is more flexibly accessed of the two, made available through the European Regional Development Fund, European Social Fund, and European Fund to Aid to the Most Deprived. In current prices, the budget of REACT-EU is €50.6 billion. (European Commission e.)
One of the purposes of such programs is to build a stronger digital economy that bridges the gap of Europe's investment deficit compared to China and United States. The deficit estimated by the European Commission is around 125 billion euros.

Spain got their Recovery and Resilience plans accepted by the European Commission on June 16, 2021, at Brussels. Spain's plan was transparently assessed by the Commission and proved to be solid. The assessment considers six key pillars to determine whether the

plan gets approval or not. The six pillars include regulations on e.g., use of the money, and that the measures will have lasting impact. (European Commission f.)
Now the total amount that Spain will receive under the NextGenEU RRF fund in 2021-2026 period is €69.5 billion in grants (European Commission g). Spain can extend its financing up to €140 billion with loans (Ministerio de Industria, Comercio y Turismo).

Spain was the first EU Member State that got their Recovery and Resilience Plan accepted by the European Commission. The first disbursement of NextGenEU RRF funds for Spain was granted on December 27, 2021. Spain in this sense is a pioneer in recovering from the economic setback of the pandemic. The president of the European Commission Ursula von der Leyen congratulated Spain on facilitating a plan that has allowed the payment of €10 billion to be made. Von der Leyen hopes that the other Member States follow Spain's example. (La Moncloa 2021.) Before this first official payment of NextGenEU Recovery and Resilience fund, Spain had received €9 billion in pre-financing disbursement on August 17, 2021 (European Commission h).
In total Spain received about €19 billion in NextGenEU grants in 2021. That amount is approximately 27% of the total amount of €69.5 billion that Spain will receive over the course of NGEU.

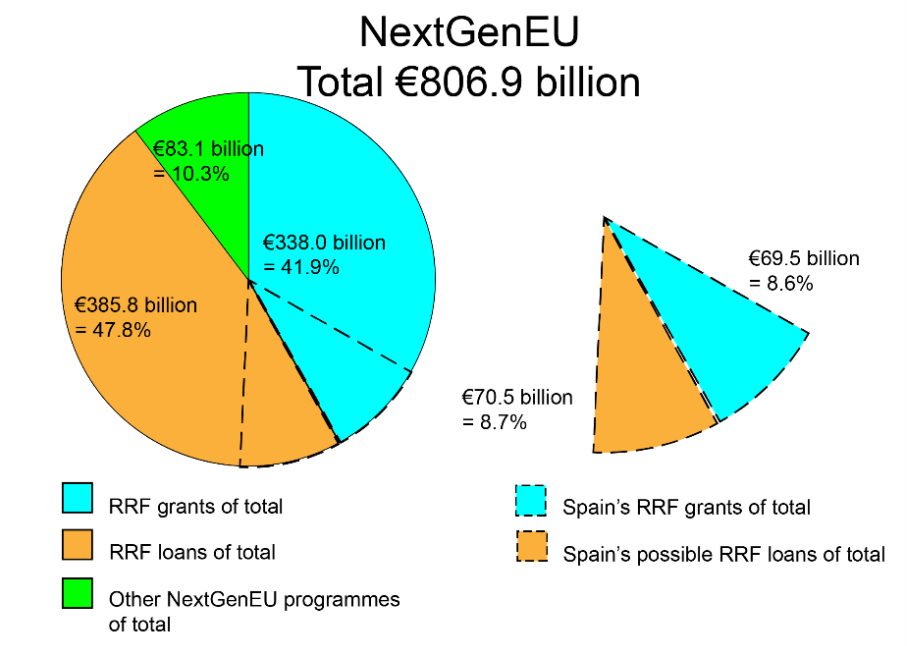

Table 3. NextGen EU finances as a pie chart.

Spain's plan devotes 28%, (RRF Regulation's minimum requirement is 20%) or roughly €19.5 billion to the digitalization of the country. The plan also devotes 40% of the grant (RRF Regulation's minimum requirement is 37%) to climate objectives, such as improving energy efficiency of buildings, decarbonizing industries, and promoting urban and long-distance

sustainable mobility. Spain's digital transition plan is aiming at digitalizing public administrations, improving digital skills with investments in new digital equipment, digitalizing industry and business, and a specific program for the digitalization of SMEs. (European Commission g.)

5.2 Country Specific Recommendations

Spain has addressed the recent years' (2019 and 2020) Country Specific Recommendations by making several reforms to their Recovery and Resilience Plan. Apart from the forementioned green and digital transition goals, Spain has followed the Council's advice on, for example, creating a spending review system to fight tax frauds, new stabilization and flexibility mechanism to be better prepared in case of unexpected economic shocks, and a reform to the pension system. (European Commission f.)

In the 2021 Country Specific Recommendations the European Council recommends Spain to use its RRF funds to support the country's recovery. Moreover, Spain should pursue a prudent and sustainable fiscal policy for medium-term, while enhancing investment to boost growth potential. Spain should also aim at creating long-term sustainable public finances and pay close attention to both, revenue, and expenditure sides of the budget. Prioritizing investments in green and digital transition is the key for creating a sustainable economy.

5.3 Summary

European Union supports the overall recovery of the eurozone with the huge economic stimulus package NextGenEU, and long-term budget plan (MFF), which both include several support programs for the EU Member States. Regulations and transparent co-operation between the EU and its countries assure that at least 20% of the recovery funds go to digital transition goals.

The European Union supports Spain's digital transition by providing them consulting in the form of Country Specific Recommendations, and by giving Spain €69.5 billion in NextGenEU Recovery and Resilience grants over the course of 2021-2026. That is more than 20% of the total RRF grants (€338 billion) for the whole EU. Spain also has the possibility to extend their financing support with loans approximately the same size as their grant. Spain has followed the Council's recommendations, which has resulted favorable conditions for Spain's RRF to get approved and the first payments of the grant have been made. The money will tremendously help financing the country's digitalization plans, like the Digital Spain 2025 in which Spain plans to invest 28% of the total amount.

6 What are the Spain's plans to support its SMEs in digital transition?

Earlier chapters discussed the current state of digitalization in Spanish SMEs, what are the challenges that need attention, and magnitudes of financial support from the EU. This chapter focuses on answering how Spain plans to tackle those challenges with the help of EU financing. Let's start by explaining Spain's newest general digitalization plan, what it consists of and what its goals are.

6.1 Digital Spain 2025

The new Digital Spain 2025 Plan is the most thorough and complete of all the digitalization plans Spain has launched so far. The plan has a tight connection with Spain's Recovery and Resilience Plan that brings in the EU financing. Public and private sector collaborating Digital Spain 2025 plan was first introduced in July 2020, and since then it has been updated with additional specific plans to meet the challenges in areas such as population's digital skills, connectivity, and digitalization of businesses. In total, the Digital Spain 2025 plan has about 50 measures for developing the country's level of digitalization. Those measures are categorized and divided into specific plans (SME Digitalization Plan, Digital Skills Plan, Connectivity Plan, Digitalization of Public Administrations Plan, Spain Audio-visual Hub of Europe…) and are overseen by different Spanish ministries. Ten main objectives that Spain has set to be reached by 2025 are:

1. 100 % of the population have 100Mbps internet coverage
2. 100 % of the radio spectrum to be ready for 5G
3. 80% of people have basic digital skills and that half of them are women
4. 20 000 specialists working on cybersecurity, artificial intelligence, and big data
5. 50 % of public services available through mobile app
6. **At least 25% of the business volume of SMEs to come from e-commerce**
7. Reduce CO2 emissions by 10% due to the digitization of the economy
8. Increase the audio-visual production in the country by 30 %
9. At least 25 % of the companies to use Big Data and Artificial Intelligence
10. Guaranteed digital rights, security and privacy for businesses and people

Around €70 billion are meant to be invested in 2020-2023 under the Digital Spain 2025 plan. Public investments are estimated around €20 billion, of which 75 %, or €15 billion are from

different financing programs of the European Union's NextGenEU funds. The rest (€50 billion) are supposed to come from private investments.

6.2 SME Digitalization Plan

In January 2021 the SME Digitalization Plan 2021-2025 was published under the Digital Spain 2025. The plan's purpose can be summarized into five main action lines with specific objectives, and the plan is estimated to reach up to 1.5 million Spanish SMEs of which at least 80% are micro enterprises.

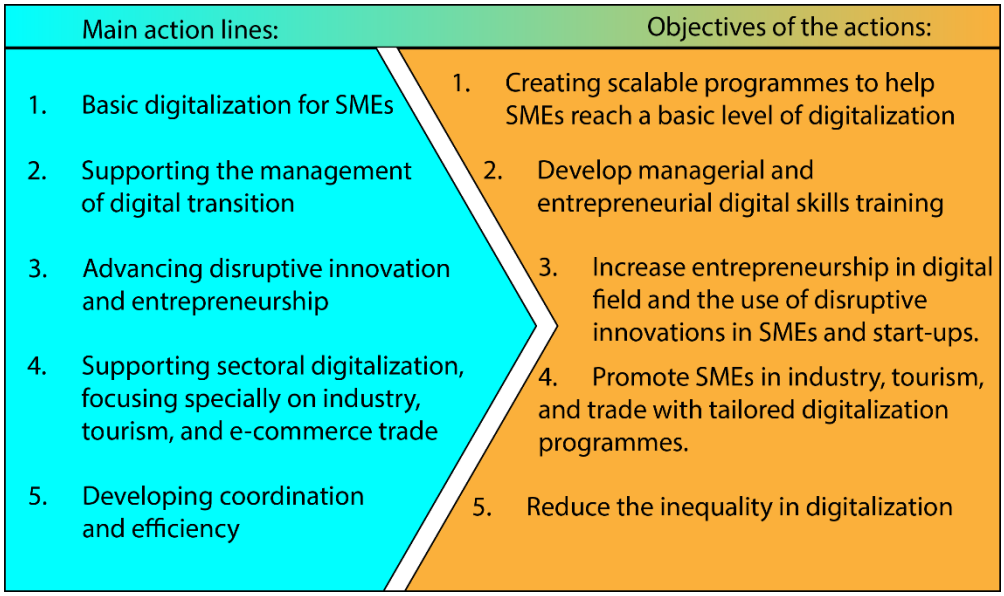

Figure 1. SME Digitalization Plan's purpose

SME Digitalization plan specially aims to achieve one of the main goals of the Digital Spain 2025, which is increasing the e-commerce's share of SME's turnover to at least 25%. Currently the number is 10% (in 2020). The plan also seeks to boost entrepreneurship and disruptive innovations in digital fields. All this ideally leads to assuring decent work and economic growth, building a resilient infrastructure, and innovative and sustainably industrialized economy – which are two of the seventeen United Nation's Sustainable Development Goals for 2030 (goals 8 and 9).

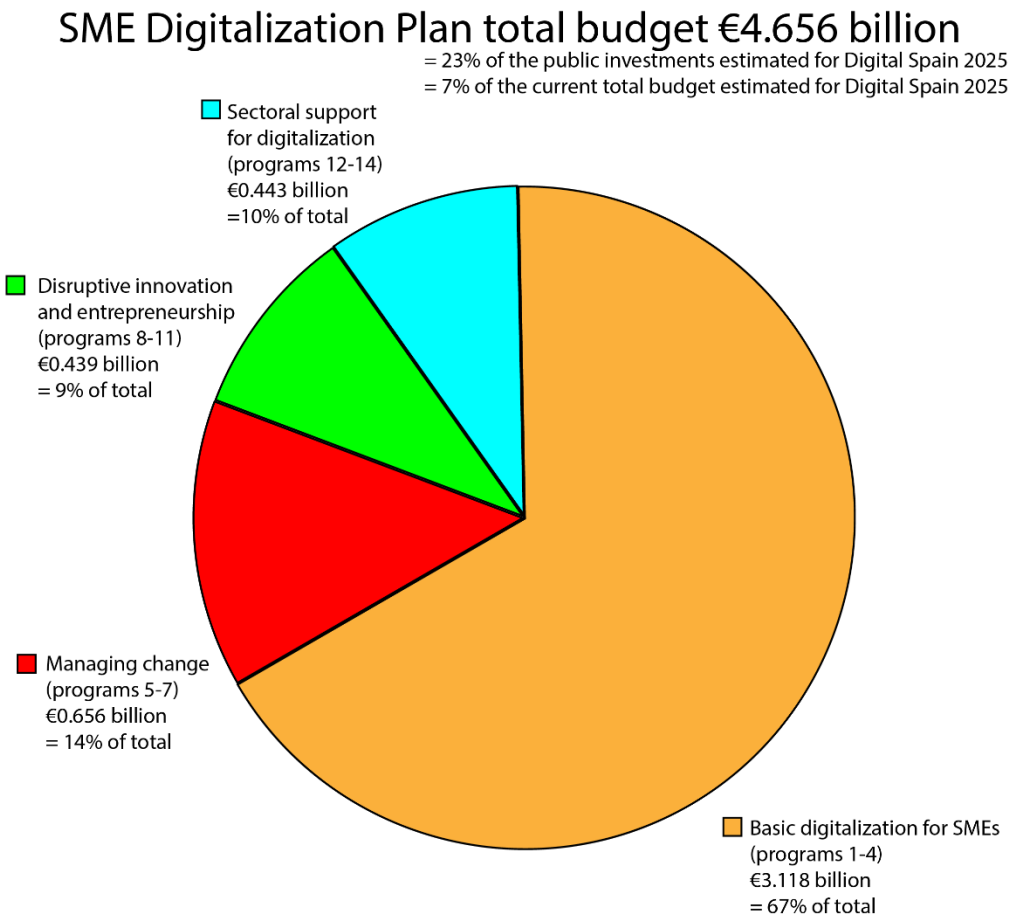

Table 4. SME Digitalization plan's budget is made with recommendations of the Spanish Independent Authority for Fiscal Responsibility 'AiREF'. Data source: Gobierno de España

Like said earlier, innovative SMEs and start-ups are the agents of change that drive the economy toward digital transformation and for that reason Spain is investing most of the SME Digitalization plan's funds to provide its SMEs, in all sectors, with basic digitalization tools and strategies. A strong basic level of digitalization and understanding of it are needed before it is even possible to advantage more disruptive technologies. Total number of Spanish SMEs that have a basic level of digital intensity is 62% (see table 2) and raising that number closer to 100% creates a bigger "pool" of companies that can create innovative disruptive technologies and business processes to promote digital transformation. All sectors are being supported to build more equal and balanced economy, but the Industry, Tourism, Retail Trade and Wholesale Trade sectors have extra focus, for the reasons mentioned in chapter 4.

Now, let's summarize the plan's 14 specific programs.

The first area is **Basic digitalization for SMEs**, which consists of four programs.

1. Digital Toolkit program is a set of basic digitalization resources for micro enterprises and SMEs. The program offers companies an initial package of tools to implement e-commerce,

e-invoices, digital marketing, and digitalized communications with customers and public administration. This service-oriented toolkit made by the Secretary of State for Digitalization and Artificial Intelligence in collaboration with the private sector, has a budget of three billion euros for 2021-2023. Key stakeholders to carry out the program are the *Acelera* PYME offices with the support of other public and private business networks.

2. SME Connectivity Voucher program provides financial assistance for the SMEs that participate in connectivity-related digitalization programs. Through this program companies with internet connection can apply for financial help to incorporate remote working and communication platforms, and new technologies to boost productivity. The Ministry for Economic Affairs and Digital Transformation's Secretary of State for Telecommunications and Digital Infrastructure oversees this program and invests 50 million euros in 2021-2023.

3. "Protect Your Company" is a cybersecurity program for the SMEs and micro-enterprises, created by the National Institute for Cybersecurity (INCIBE). The program provides education and training to raise awareness of cybersecurity threats and safe measures. The program will make an investment of 42 million euros during the period 2021-2023 and is overseen by the Ministry for Economic Affairs and Digital Transformation.

4. Public business organization RED.ES has developed the "Acelera PYME" (Accelerate SMEs) program that consists of three parts. **a)** Creating a network of advisory services and tech demand promoting offices in collaboration with the Chambers of Commerce of Spain, and professional technology and business associations. **b)** Establishing 'a digital meeting point for SMEs', or simply put, a web platform for sharing best practices and information on using digital resources and diagnostic tools. **c)** The physical Acelera PYME office network will organize digital transformation related seminars and workshops all around Spain. The Acelera PYME program makes an investment of 26.4 million euros in 2021-2023 and is overseen by the Ministry for Economic Affairs and Digital Transformation. (Stakeholder of the measure 15)

The second main action area, **supporting the management** of digital transition consists of three programs (5-7).

5. Management Training program focuses on achieving two goals. One, promoting managerial training on use of digital technologies (e-commerce, marketing ERP and CRM systems…) to improve productivity, growth, and internationalization. The other goal is to reduce the gender inequality in digital fields by promoting digital skills training for women. This program will invest up to 256 million euros in 2021-2023 and is overseen by the Ministry for Economic Affairs and Digital Transformation's State Secretary for Digitalization and Artificial

Intelligence in collaboration with the School of Industrial Organization. This program is also part of the National Plan for Digital Skills framework (Another Digital Spain 2025 plan).

6. Training program for experts in the digital transformation in SMEs is aiming to train young experts to work as 'agents of change' in digitalization of SMEs, by incorporating already existing public-private programs for digital skills training. This program overseen by the Ministry for Economic Affairs and Digital Transformation has a budget of 100 million euros.

7. "Agents of Change" program brings more financial support for SMEs to recruit digital transition experts. The experts are supposed to develop the companies' digitalization plan and speed up the implementation of digital technologies. This program will invest 300 million euros over the course of 2021 to 2023 and is overseen by the Secretary of State for Digitalization and Artificial Intelligence.

Advancing **disruptive innovation and entrepreneurship** is the third big action area of the SMEs Digitalization plan and it has four programs (8-11).

8. Disruptive Innovation for Digital Transformation in SMEs is a program that offers financing for innovative technology companies to adopt more key technologies like blockchain, AI, cloud computing, and big data, to develop new products and redesign business processes. Secretary of State for Digitalization and Artificial Intelligence in collaboration with the RED.ES will invest 100 million euros into this program over 2021-2023.

9. Innovative business clusters (IBC) program promotes SMEs and start-ups to form collaborations, which will help them to take advantage of the multiplier effects of digitalization and networking. This program is overseen by the Ministry for Industry, Energy and Tourism's General Secretariat for Industry and SMEs. The investment will be 115 million euros in 2021-2023. (Stakeholder of the measure 15)

10. **D**igital **I**nnovations **H**ubs support program supports the development of DIHs to provide SMEs with all the services, information, and facilities, needed to launch digital transformation successfully. The DIH services include advisory on defining the adequate technological solutions, trialing and educating their use before investing in them, and information about investment financing. The DIH are also a gateway to co-operate with other similar EU and Spain networks. General Secretariat for Industry and SMEs oversees the program and invests 42 million euros in it over 2021-2023. (Stakeholder of the measure 15)

11. Digital entrepreneurship supporting programs like The National Entrepreneur Office's (NEO) virtual platform program for SMEs and newly created businesses, Support for the

start-ups by female entrepreneurs program, Start-up Portal program, and RENACE 'a network of entrepreneurship support centers' program serve the Spain's Entrepreneurial Nation Strategy's priorities of increasing early state entrepreneurial activity and gender equality. These programs collaborate two different Spanish ministries' secretaries of state (Secretary of State for Digitalization and Artificial Intelligence, and General Secretariat for Industry and SMEs), National Innovation Company (ENISA), and RED.ES (RED.ES only participates in the NEO program). The ministries together with RED.ES and ENISA will invest **100 or 182** million euros in these programs during the period 2021-2023. (Stakeholder of the measure 15)

The fourth main action area is **Sectorial support for digitalization**, which includes the measures 12-14.

12. ACTIVE Industry programs are devoted to Spanish SMEs in the Industry and Manufacturing sector. This measure is implemented by the General Secretariat for Industry and SMEs which will invest 38 million euros to the programs in 2021-2023. There are four ACTIVE Industry programs.
a) The HADA online diagnostic tool is for measuring a company's digital maturity level with a questionnaire and observation on progress made with Industry 4.0 solutions. The tool also includes options for benchmarking a company with other companies.
b) ACTIVE Industry 4.0 is a personalized advisory program for SMEs in Industry sector.
c) ACTIVE Growth is a 50-hour long consulting program on digital maturity key dimensions.
d) ACTIVE Cybersecurity is a pilot program made in collaboration with INCIBE. This program helps SMEs to determine their level of cybersecurity and guides them to take measures to secure their systems and information.

13. Tourism sector digitalization programs promote basic digitalization and use of disruptive technologies in companies that operate in the tourism sector. It is a highly fragmented sector, meaning that almost 80% of the companies in sector have only one or two employees, and only 2% have more than 20 employees (in 2017). Ministry for Industry, Energy and Tourism invests 80 million euros in 2021-2023 to tourism sector's SMEs that initiate projects either **a)** related to developing new innovative technologies that advantage the use of artificial intelligence, or **b)** projects that create innovations through use of other technologies like IoT, big data, 5G, mobile applications or cybersecurity improvements. These projects will get a total investment of 80 million euros in 2021-2023, and the plans are overseen by the Secretariat of State for Tourism in collaboration with SEGITTUR (State Mercantile Company for the Management of Innovation and Tourism Technologies).

14. Programs for Retail and Wholesale trade sectors' e-commerce will get a total investment of 324.59 million euros from the Ministry for Industry, Energy and Tourism's Secretariat of State for Commerce (in collaboration with the Chambers of Commerce of Spain and ICEX Spain Exports and Investments). The e-commerce programs are:

a) Sustainable Markets program, which is aimed for local businesses of different autonomous communities to develop toward more digitalized and environmentally sustainable model. This particular program has a budget of 215 million euros and 15 million of that are directed to under-populated areas that have less than 10 000 inhabitants.

b) Trade Modernization program gets 80% of its total finances (€102.1 million) from public funds of the Secretariat of State for Commerce and 20% from RED.ES in the framework of Acelera PYME program. This program exemplifies well the public-private collaboration of Digital Spain 2025 plans. The goal of this program is to enable local businesses to take on new technologies in response to changing consumer habits, like increased online shopping.

c) Trade Innovation Diagnosis program offers Retail Trade sector's SMEs free individual advisory services and analytics to support them in defining and acquisition of new adequate digital solutions for renovated and optimized management processes. This program has a budget of €2.49 million for the period 2021-2023.

d) ICEX eMarket Services program will help Spanish SMEs in internationalizing their e-commerce by providing training, consultancy, commercial promotion, and more. This program will invest five million euros in 2021-2023 and will help about 500 Spanish SMEs. Currently (2019 data) only 7% of Spanish SMEs sell online cross-border.

Developing coordination and efficiency is the fifth, and last main action are with two programs (15 and 16)

15. You may have noticed the "incoherency" between the figure 1 and table 4. Figure 1 says that there are five main action lines, but then in table 4 only four areas are found. That is because the SME Digitalization plan's 15th and 16th measure do not have a separate budget. The measure 15 is a combination of the measures 4,9,10, and 11. The measure 15 is called Integrated Network to Support Innovation, Digitalization and Entrepreneurship, it is public-private collaboration at its best – to provide Spanish SMEs and self-employed entrepreneurs a good support network with all the information and access to resources needed.

16. Another area for developing coordination and efficiency is the Digital Certification for SMEs. This measure seems to be still in its early stages and there is not much tangible information about it in the SME Digitalization plan. Supposedly, the digital certificate would function as a profile for companies to show their level of digital transformation that could be used as a badge of honor or a proof of complying with digital standards "where appropriate". This program does not have a separate budget yet. It is a project of The Secretary of State

for Digitalization and Artificial Intelligence in collaboration with the Spanish Standardization Body (UNE).

One important stakeholder in digital transition of Spanish SMEs is the Consultative Council for Digital Transformation (*Consejo Consultivo para la Transformación Digital de España*). This council created by the Government is a kind of "connector" between public and private sectors. It is meant to facilitate dialogue and participation of the different economic and social agents for the digital transformation of Spain. The Council consists of board members from more than 80 different organizations that are directly, or indirectly related to digitalization. Some examples of those organizations: DIGITALES, ADigital, ASTEL, RTVE, CERMI, CEPYME… (La Administración al Día 2021.)

6.3 Other programs

Apart from Digital Spain 2025, Spain has also other government-controlled digitalization programs that *****indirectly help Spanish SMEs in digital transition, by tackling some of the essential challenges that the SMEs have (concluded in chapter 4). Some programs are in co-operation with national institutes, and others in collaboration with EU projects. Naming a few of those programs that were mentioned in DESI report:

- National AI strategy (Digital Spain 2025 + European High-Performance Computing Joint Undertaking)
- Strategic Plan for the Spanish supercomputing network (RES – Red Española de Supercomputación)
- National Guide to Notification and Management of Cyber Incidents (INCIBE - National Cybersecurity Institute)
- GAIA-X for cloud and edge computing (Governmental Advisory Board in EU + collaboration with the industry in Spain)

*****By indirect help it is meant that the programs benefit Spanish SMEs, but there is no general direct funding and guidance to be implanted by these programs for majority of SMEs. The programs and their challenges are for the appointed organizations to solve.

6.4 Summary

Most of the SMEs Digitalization Plan's programs are overseen by the Secretary of State for Digitalization and Artificial Intelligence and the General Secretariat for Industry and SMEs - but also involves many other public and private organizations. The plan is estimated to reach more than half of the country's companies, and the smallest companies are in the spotlight. The current total investment for digitalizing the country's SMEs is €4.656 billion, and the investments will be made during the timeframe of 2021-2023 to answer the call for urgent help. Almost all that money comes from public financing, and more specifically, from the EU's RRF grants that Spain receives.

The basic digital maturity is needed before pursuing disruptive innovations, and that is why Spain intends to raise the basic digital intensity level in all its SMEs. More basic level digitalized companies = more possibility for new innovations and digital transformation to take place. Digital Toolkit gets the biggest budget of all SME Digitalization plan's programs, and it directly aims at reaching the 6th objective of the Digital Spain 2025 general plan (At least 25% of the business volume of SMEs to come from e-commerce).
Now the e-commerce turnover is relatively low in Spanish SMEs and that causes sustainability problems. The Digital Toolkit program alone might not cut it, so Spain has sector specific programs to increase e-commerce in Retail and Wholesale trade sectors' companies. Industry sector is also paid special attention in SME Digitalization Plan. It is not one of the least digitalized sectors in Spain, but the ROI is better than e.g., forcing digitalization to Construction sector. Tourism is a huge source of income for Spain, and its vulnerability to global catastrophes forces Spain to address it in SME Digitalization plan. Digitalizing tourism sounds unattractive and recalls images of paying the flight ticket price for staying in your house and "travelling" with augmented reality glasses and headset. Clearly that cannot be the solution, at least not all of it, so it is interesting to see what kind of technologies and transformations the Tourism sector gets in the future.

Many programs and measures like 4,9,10,11, and 15 overlap and collaborate a lot, which obviously is the purpose of programs like that. Creating a tight network of public and private business entities benefits all its members as they can share their best practices of uses of digital technologies (learn ICT skills). This network also supports employment and entrepreneurship, healthy and fair competition, digital transition of the SMEs, and digital transformation development of the whole country.

Even though Spain's connectivity and infrastructure are outstanding, Spain is investing more to make it better. Providing good connectivity even for the rural areas is one of their

main goals of the Digital Spain 2025. This perhaps can make rural areas more attractive for the people in the future, as the connectivity will not be an issue for remote working or starting a modern business there. And it will certainly be good for the companies that are in those regions already. Also, good connectivity can make those regions more attractive for tourism – and that way possibly reduces tourism a little bit in locations where it has gone over the top and is not sustainable for the environment anymore. More geographically balanced tourism is sustainable and does not wear out nature as much.

One could argue that the connectivity of rural areas is not as urgent as the other challenges, but on the other hand, Spain has a budget of billions of euros. Constructing the infrastructure for connectivity is a good investment in the long run, and at the same time it creates employment now and maybe even helps the constructing companies digitalize themselves in the process of installing new 5G technologies and more (Construction sector is the least digitalized business sector in Spain now). This is an indirect way of Spain supporting its SMEs in digital transition since the Connectivity plan is separate from the SME Digitalization plan in the Digital Spain 2025. But like said, all the aspects of digitalization are interconnected, and businesses really seem to be in the middle of it. No wonder why Spain is investing huge amounts of money in digital transition of its SMEs.

7 Discussion

7.1 Conclusions

To not repeat too much of what has already been said, I invite the reader to go through the **Summary** parts again for reviewing the important findings. Here are some overall conclusions and thoughts about this topic and the documents analyzed.

Spanish SMEs main challenges in digital transition seem to be lack of ICT competent workforce, low levels of using digital technologies in small businesses, and inequalities between genders and business sectors for digital transformation and entrepreneurship opportunities. Spain is deploying many overlapping plans with a huge overall budget to support its SMEs to overcome those challenges. The plans are roughly speaking of three sorts: financing and consulting, basic and advanced tools for digitalization, and a public-private collaborating support network. The EU supports Spain in digitalization plans by providing advice and financing for them.

In ONTSI report they say that ICT competencies of Spain's population are currently in so bad shape, that the country requires ICT competent workforce even from the 'outside'. This for me sounds like an invitation for foreign ICT specialists to go work in Spain, and a great possibility for foreign ICT sector companies to start business activities and co-operation in Spain. That way they could also benefit from the EU financing that Spain receives and disburses to its SMEs.

It will be interesting to see in the future what effect the Spain's measures to support their SMEs in digital transition have had, and if there still comes new programs and plans. It is probable because the digital transformation creates new necessities as everything keeps changing, hence the transformation. Also, next reports from ONTSI and DESI will show better the consequences that the pandemic and lockdowns had on the use of digital technologies in Spanish SMEs.

One incoherency was found when comparing the SME Digitalization plan's budget numbers from the table on page 47 of the document vs. its text explanations about the measure 11 on page 38. It could be that in one they calculated only the public investment, and in the other they added also the estimated private investments. In ONTSI report, the average numbers of some indicators presented in text had small incoherencies (max 1% variation) to manually calculated numbers. That could be explained by rounding the numbers up or down carelessly at some point by me, or the ONTSI.

This thesis could be continued by investigating how the SME digitalization plans presented in this thesis are implemented in practice, and the different business sectors' digital transition could be investigated more closely. Or by investigating Spain's other actions to support its SMEs, like the new start-up legislation that they have, or new tax policies, or Next Tech venture capital and private investment collaborating financing program. This thesis is on macroeconomics level and provides a compact and simplified overview on digital transition of Spanish SMEs in general, but also creates a good base for further inspections.

7.2 Learning process

The most difficult part of writing this thesis was to narrow down the scope and to create a logical story of it. Digitalization has so many aspects (human capital, connectivity and infrastructure, digital public services, and digital transition of businesses) that analyzing it from the governmental policies point of view for an EU country's different business sectors' certain sized companies makes it easy to slip on the subject. Initially I did not fully understand the method of writing a document analysis, and all the liberty of combining information and interpretating that it allows. Writing this thesis was originally just summarizing the information from different documents and trying to decide between what information is relevant for the topic and what is not. However, it was not waste of time, quite the opposite. I learnt a lot about writing and outlining research on a big topic. Also, it obviously made me rethink, re-analyze, and rewrite the whole digital transition from Spain's perspective several times and because of that I am sure the conclusions of this thesis are accurate.

Feedback from my thesis advisors had a big impact on editing the final version. Also, I want to give personal thanks for Sari Rautio (Ambassador of Finland) and Otso Salvi (Diplomatic), from the Embassy of Finland in Madrid, who helped me to find information on this topic and offered valuable points of view in an interview that took place at the Embassy on December 16 and 17, 2021.

The best realizations and conclusions were made when I was critically thinking Spain's plans and searching for faults in them. By creating counter arguments, I ended up finding the reason and logic of why the plans are the way they are. Take for example, the reasonings on why the industry sector is prioritized, or, how the least digitalized sector (Construction) is benefitting indirectly from developing the connectivity infrastructure.

Huge numbers in financing programs and budgets sometimes caused confusion, as translating, and thinking them through in Spanish, English, and Finnish has its own twist. The English word billion sounds like '*biljoona'* (million millions) in Finnish, when in reality billion means thousand millions (*miljardi*). In Spain they talk about '*miles de millones'*. The bilingual

and analytical nature of this thesis emphasizes the work's value for me because I studied the Multilingual Management Assistant Degree Programme at Haaga-Helia.

Overall process of writing this thesis deepened my knowledge of modern international businesses, technologies, and EU level co-operations. It was a great continuation to my university exchange studies in Madrid and internship at the Embassy of Finland in Madrid. I am grateful for all the support I got and of course satisfied of my own hard work, as I can proudly hand in a finished product in time.

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Appendices

Appendix 1. Table of the number of companies by size and sector in Spain in 2020, and the change from 2019

Spanish business sectors in 2020	Industry	% Change from 2019	Construction	% Change from 2019	Sales and repairs of vehicles	% Change from 2019	Wholesale trade	% Change from 2019	Retail trade	% Change from 2019
Total number of enterprises in sector	193,641	-1.4	420,118	-0.5	74,479	-1.1	216,258	-2.9	435,836	-1.7
Micro enterprises	162,851	-2.3	401,936	-0.8	70,711	-1.2	201,697	-3	428,869	-1.8
Small enterprises	24,968	?	16,473	+5.5	3,240	+0.6	12,032	-2.5	6,028	+1.4
Medium enterprises	4,478	+3.8	1,509	+9.1	431	+4.4	2,013	+4.5	674	+0.2
Big enterprises	1,344		200	+8.7	97	+4.3	516	+4.5	265	+0.1
% of micro enterprises in sector	84.1		95.7		94.9		93.3		98.4	
% of SMEs in sector	15.2		4.3		4.9		6.5		1.5	
% of big enterprises in sector	0.7		0.05		0.1		0.2		0.1	
	Hotels and Travel Agencies	% Change from 2019	Logistics and warehouses	% Change from 2019	ICT	% Change from 2019	Real estate, Administrative, and Support activities	% Change from 2019	Professional, Scientific, and Technical activities	% Change from 2019
Total number of enterprises in sector	43,988	+3.8	204,921	+5.5	69,369	+1.8	375,873	+3.4	417,710	+1.1
Micro enterprises	40,030	+3.8	195,564	+5.6	64,382	+1.4	364,100	+3.4	407,446	+1
Small enterprises	3,054		7,973	+2.6	3,859		9,333		8,811	
Medium enterprises	684	+5.4	1,047	+1.7	798	+6.6	1,657	+3.5	1,037	+4
Big enterprises	220		337	+9.4	330		783		416	
% of micro enterprises	91.0		95.4		92.8		96.9		97.5	
% of SMEs in sector	8.5		4.4		6.7		2.9		2.4	
% of big enterprises in sector	0.5		0.2		0.5		0.2		0.1	

Source: ONTSI (DIRCE, INE)

Data source: ONTSI 2021

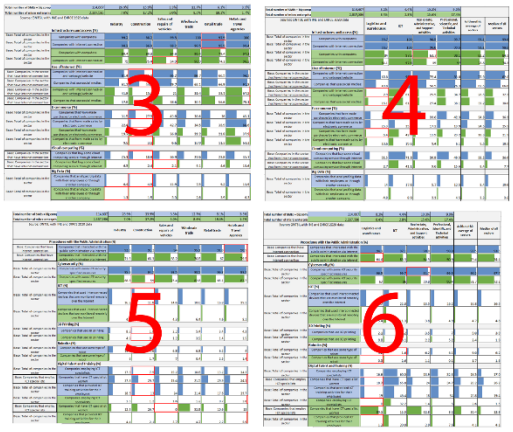
Appendix 2. Instructions for reading the appendices 3-6

Appendices 3-6 represent an Excel table about 16 main indicators of digitalization in Spanish SMEs. The compact table packs a lot of data in a form that cannot be found in the original ONTSI report. The reader can make their own comparisons and observations from the table and read this thesis to understand the important findings in the table, and beyond it.

How to read the table:

1. The blue cells are small, medium, and big enterprises, all together. (≥10 employees)
2. The green cells are micro enterprises. (≤9 employees)
3. Two highest rows indicate the total number of companies in Spain
4. In two highest rows the percentages over each business sector (Industry, Construction…) indicate the number / fraction of companies in that sector vs. the total number.
5. The 'grey' column on the left indicates each row's (measured indicator's) base data criteria, on which the percentages of each sector in that row are calculated on. (Total of companies in the sector, Companies in the sector with internet connection…)
6. In the appendices 4 and 6 the last two columns on the right indicate arithmetic average and median for each measured indicator (row). The arithmetic averages and medians are not all directly indicated in the ONTSI report. They are calculated by the author of this research by using the ONTSI report's data.
7. Red borders on a cell indicate the lowest value in that row.

If the appendices 3-6 were to put together in the way they are in the original Excel workbook, they would be in this order:



Also, appendices 4 and 6 would not include the "base data" columns on the left, it is only modified to this form, to make the tables readable.

Appendix 3. Table 1/4 of ONTSI reports key indicators for comparing the digital transition in Spanish SMEs

Total number of SMEs + big comp	114,607	26.9%	15.9%	3.3%	12.7%	6.1%	3.5%
Total number of micro enterprise	2,337,586	7.0%	17.2%	3.0%	8.6%	18.3%	1.7%
Source: ONTSI, with INE and DIRCE 2020 data		Industry	Construction	Sales and repairs of vehicles	Wholesale trade	Retail trade	Hotels and Travel Agencies
	Infrastructures and access (%)						
Base: Total of companies in the sector	Companies with computers	99.2	98.2	99.5	100	97.9	100
Base: Total of companies in the sector	Companies with internet connection	98.2	96.9	98.2	99.5	95.9	99.4
Base: Total of companies in the sector	Companies with computers	80.4	80.3	84.6	95.4	79.4	97.2
Base: Total of companies in the sector	Companies with internet connection	75	75.4	54.9	93.9	74.1	96.2
	Use of Internet (%)						
Base: Companies in the sector that have internet connection	Companies with internet connection and webpage/website	81.4	65.3	86.2	84.7	66.5	94.3
Base: Companies in the sector that have internet connection	Companies that use social medias	61.7	44.4	79.7	65.1	66.9	91.8
Base: Companies in the sector that have internet connection	Companies with internet connection and webpage/website	41.8	15.4	21	31.4	33.1	67.5
Base: Companies in the sector that have internet connection	Companies that use social medias	37.8	18.9	38.6	30.1	56.6	70.1
	E-commerce (%)						
Base: Total of companies in the sector	Companies that have made purchases by electronic commerce	31.5	27.9	43.8	36.6	36	45.1
Base: Total of companies in the sector	Companies that have made sales by electronic commerce	22.4	8	42.7	34.5	35.9	88.6
Base: Total of companies in the sector	Companies that have made purchases by electronic commerce	19.7	12.1	26.8	21.2	21.8	37.9
Base: Total of companies in the sector	Companies that have made sales by electronic commerce	9.9	3.1	6.6	10.9	11.3	63.3
	Cloud computing (%)						
Base: Companies in the sector that have internet connection	Companies that buy some cloud computing service through internet	25.1	18.8	26.9	27.6	22.8	35.7
Base: Companies in the sector that have internet connection	Companies that buy some cloud computing service through internet	6.3	2.4	2.1	9.1	4.6	15.6
	Big Data (%)						
Base: Total of companies in the sector	Companies that analyzed big data with their employees or through another company	6.4	4.3	11.9	7.5	9.2	13.9
Base: Total of companies in the sector	Companies that analyzed big data with their employees or through another company	1.1	1.5	3.3	2.8	3.9	6.3

Data source: ONTSI 2021

Appendix 4. Table 2/4 of ONTSI reports key indicators for comparing the digital transition in Spanish SMEs

Total number of SMEs + big comp	114,607	8.2%	4.4%	10.3%	9.0%		
Total number of micro enterprise	2,337,586	8.4%	2.8%	15.6%	17.4%		
Source: ONTSI, with INE and DIRCE 2020 data	Infrastructures and access (%)	Logistics and warehouses	ICT	Real estate, Administrative, and Support activities	Professional, Scientific, and Technical activities	Arithmethic average of sectors	Median of all sectors
Base: Total of companies in the sector	Companies with computers	99.7	100	98.5	99.7	99.1	99.6
Base: Total of companies in the sector	Companies with internet connection	98.7	100	96.6	99.5	98.1	98.5
Base: Total of companies in the sector	Companies with computers	84	97.6	63.7	98.1	83.2	84.3
Base: Total of companies in the sector	Companies with internet connection	81.1	97.6	59	97	78.8	78.3
	Use of Internet (%)						
Base: Companies in the sector that have internet connection	Companies with internet connection and webpage/website	68.8	95.9	72.4	83.8	77.9	82.6
Base: Companies in the sector that have internet connection	Companies that use social medias	49.8	93.1	56.5	76.3	62.5	66.0
Base: Companies in the sector that have internet connection	Companies with internet connection and webpage/website	7.9	61.8	25.5	34.7	28.5	32.3
Base: Companies in the sector that have internet connection	Companies that use social medias	16.1	61.8	27.4	38.1	35.2	38.0
	E-commerce (%)						
Base: Total of companies in the sector	Companies that have made purchases by electronic commerce	25.6	62.3	33.6	42.3	34.8	36.3
Base: Total of companies in the sector	Companies that have made sales by electronic commerce	25.3	25.7	17.2	13.9	24.5	25.5
Base: Total of companies in the sector	Companies that have made purchases by electronic commerce	6.4	42.6	11.9	23.2	18.3	21.5
Base: Total of companies in the sector	Companies that have made sales by electronic commerce	10.6	19.6	9.4	6.1	9.5	10.3
	Cloud computing (%)						
Base: Companies in the sector that have internet connection	Companies that buy some cloud computing service through internet	21.5	71.2	20.9	49.5	28.2	26.0
Base: Companies in the sector that have internet connection	Companies that buy some cloud computing service through internet	2.7	41.1	9.6	15.6	8.4	7.7
	Big Data (%)						
Base: Total of companies in the sector	Companies that analyzed big data with their employees or through another company	14	17.6	5.7	12.5	8.4	10.6
Base: Total of companies in the sector	Companies that analyzed big data with their employees or through another company	4.8	8.9	2.1	4.5	3.3	3.6

Data source: ONTSI 2021

Appendix 5. Table 3/4 of ONTSI reports key indicators for comparing the digital transition in Spanish SMEs

Total number of SMEs + big com		114,607	26.9%	15.9%	3.3%	12.7%	6.1%	3.5%
Total number of micro enterpris		2,337,586	7.0%	17.2%	3.0%	8.6%	18.3%	1.7%
Source: ONTSI, with INE and DIRCE 2020 data			Industry	Construction	Sales and repairs of vehicles	Wholesale trade	Retail trade	Hotels and Travel Agencies
Procedures with the Public Administration (%)								
Base: Companies that have internet connection	Companies that interacted with the public administration via internet		92.9	91.2	94	95.1	91.8	90.5
Base: Companies that have internet connection	Companies that interacted with the public administration via internet		71.9	66.3	68.2	76.8	67	79.5
	Cybersecurity (%)							
Base: Total of companies in the sector	Companies with some ICT security specified measures		95.6	94.2	98.5	98.5	96.8	99.2
Base: Total of companies in the sector	Companies with some ICT security specified measures		68.8	59	75.4	82.8	65.1	87.7
	IOT (%)							
Base: Total of companies in the sector	Companies that used interconnected devices that are monitored remotely over the Internet		16.2	11.8	14.6	18.6	16.8	19.1
Base: Total of companies in the sector	Companies that used interconnected devices that are monitored remotely over the Internet		4.7	2.8	4.3	6.4	4.6	8.1
	3D Printing (%)							
Base: Total of companies in the sector	Companies that use 3D printing		8.2	1.8	2.2	5.4	3.4	4.3
Base: Total of companies in the sector	Companies that use 3D printing		4.9	0.3	1.2	3.9	1.4	1.5
	Robotics (%)							
Base: Total of companies in the sector	Companies that use some type of robot		19.3	4.6	6.8	6.3	6.2	4
Base: Total of companies in the sector	Companies that use some type of robot		6	1.7	7	0.4	2.5	1.4
	Digital Talent and Training (%)							
Base: Total of companies in the sector	Companies employing ICT specialists		17.3	7.5	19.2	18.8	13.2	14.3
Base: Companies that employ ICT specialists	Companies that have ICT specialist women		27.8	29.7	19.4	21.5	29.9	24.5
Base: Total of companies in the sector	Companies that provided ICT training activities for their employees		18.5	13	24	21.4	17.8	19.7
Base: Total of companies in the sector	Companies employing ICT specialists		1.5	1.2	1.6	1.2	0.7	2.8
Base: Companies that employ ICT specialists	Companies that have ICT specialist women		12.3	26.7	0	52.9	10.6	13
Base: Total of companies in the sector	Companies that provided ICT training activities for their employees		4.4	2.1	3.7	4.7	2.2	5.9

Data source: ONTSI 2021

Appendix 6. Table 4/4 of ONTSI reports key indicators for comparing the digital transition in Spanish SMEs

Total number of SMEs + big comp	114,607	8.2%	4.4%	10.3%	9.0%			
Total number of micro enterpris	2,337,586	8.4%	2.8%	15.6%	17.4%			
Source: ONTSI, with INE and DIRCE 2020 data		Logistics and warehouses	ICT	Real estate, Administrative, and Support activities	Professional, Scientific, and Technical activities	Arithmethic average of sectors	Median of all sectors
Procedures with the Public Administration (%)							
Base: Companies that have internet connection	Companies that interacted with the public administration via internet	94.9	97.1	90.8	98.8	93.5	93.5
Base: Companies that have internet connection	Companies that interacted with the public administration via internet	64.4	85.3	84.5	90.6	75.4	74.4
	Cybersecurity (%)						
Base: Total of companies in the sector	Companies with some ICT security specified measures	96.5	99.7	91.7	99.5	96.2	97.7
Base: Total of companies in the sector	Companies with some ICT security specified measures	67	96	59.8	93.4	71.7	72.1
	IOT (%)						
Base: Total of companies in the sector	Companies that used interconnected devices that are monitored remotely over the Internet	26.7	22.8	13.5	16.2	16.8	16.5
Base: Total of companies in the sector	Companies that used interconnected devices that are monitored remotely over the Internet	5.4	11.3	3.8	4.9	4.7	4.8
	3D Printing (%)						
Base: Total of companies in the sector	Companies that use 3D printing	2.1	5.2	3.5	7	5.0	3.9
Base: Total of companies in the sector	Companies that use 3D printing	0.8	3.1	2.2	5.2	2.4	1.9
	Robotics (%)						
Base: Total of companies in the sector	Companies that use some type of robot	4.2	1.6	6.2	6.1	9.0	6.2
Base: Total of companies in the sector	Companies that use some type of robot	0.3	2.6	1.1	0.1	1.7	1.6
	Digital Talent and Training (%)						
Base: Total of companies in the sector	Companies employing ICT specialists	16.6	60.5	13.9	32.3	18.5	17.0
Base: Companies that employ ICT specialists	Companies that have ICT specialist women	18.7	65.8	24	34.7	28.2	26.2
Base: Total of companies in the sector	Companies that provided ICT training activities for their employees	19	46.4	18	34	20.8	19.4
Base: Total of companies in the sector	Companies employing ICT specialists	0	32.2	1.4	5	2.6	1.5
Base: Companies that employ ICT specialists	Companies that have ICT specialist women	80.1	12.5	62.8	8.2	30.4	12.8
Base: Total of companies in the sector	Companies that provided ICT training activities for their employees	1.2	20.8	2.9	7.6	4.1	4.1

Data source: ONTSI 2021