DigitUp.

Digital Upgrade skilling of SMEs and self-enterprises

DIGITUP

DIGITAL UPGRADE SKILLING

Work Package 2:

Online assessment tool for the measurement of digital skill levels

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Project overview

DigitUp. Digital Upgrade skilling of SMEs and self-enterprises – hereinafter referred to as "DigitUp" – is an Erasmus-funded project for advancing the digital transformation of small and medium-sized enterprise SMEs and self-entrepreneurs. The project aims to develop an innovative, accessible training course, a serious game, an online self-assessment tool, piloting activities, and awareness-raising events. Besides directly serving SME managers and self-entrepreneurs, the aforementioned expected results shall better equip Vocational Education and Training VET educators to train SME managers and self-entrepreneurs.

The main aim of DigitUp is to help the acquisition and consolidation of cutting-edge digital skills fit for the industry 4.0 framework. DigitUp is driven by the upskilling requirements of the digital transformation process. Inasmuch as, digital transformation is the adoption of digital technology by an organisation to digitize non-digital products, services or operations. The goal for its implementation is to increase value through innovation, invention, customer experience and or efficiency.

Aligned with the Erasmus+ priorities of addressing digital transformation and adopting vocational education and training to labour market needs, DigitUp has the following concrete objectives:

1. identify the digital skills that are highly demanded by SMEs and self-enterprises
2. provide cross-sectoral inputs towards the future digital skills
3. communicate to SMEs' managers and self-enterprises breakthroughs in emerging technologies
4. provide free access to high quality and up-to-date information, material, training, and support
5. develop assessment tools for digital skills measuring
6. provide training material relevant to SMEs digitalization
7. highlight the importance of digitalization for SMEs' and self-enterprises
8. expand digital skills policy, highlight transferable skills
9. develop a detailed and systematic methodology for VET educators

10. support VET educators and trainers with proper resources and materials
11. run pilot sessions with VET educators, trainers, managers, supervisors, and elf-entrepreneurs
12. perform dissemination and validation of the project outcomes
13. ensure the access to and use of innovative teaching and learning practices by the users
14. increase and enhance public debate about digital for SMEs, microbusinesses, and self-enterprises

The project is focused on vocational education and training VET in digitalisation. Hereby DigitUp seeks to assist SME managers and self-entrepreneurs in acknowledging and fulfilling their market potential by:

1. identifying the real digital upskilling needs in businesses and entrepreneurship;
2. creating tools for digital transformation pursuant to the identified needs of the Target Groups;
3. testing these tools to validate them as relevant, outcome-oriented, replicable, and scalable.

To attain the aforementioned results, DigitUp will execute the following activities; activities are grouped in thematic Work Packages WPs as it follows:

WP1. Online assessment tool for the measurement of digital skill levels
WP2. DigitUp training course
WP3. E-Learning platform & Serious game for SME's managers and self-entrepreneurs
WP5. Dissemination & Exploitation

The target groups DigitUp focuses on include, yet are not limited to:

- TG = Target Group
- Direct TG: SMEs managers and supervisors; self-entrepreneurs; feelancers Indirect TG: VET trainers and educators; VET teachers; VET providers

In line with the Work Packages listed above, the respective engagement of the target groups is:

- WP1 = TG assess their digital capacity via the online assessment tool
- WP2 = TG participate in the piloting sessions relevant to training course
- WP3 = TG participate in DigitUp serious game

The interaction with the TGs throughout the Work Packages will be complemented by National Strategic Advisory Groups (NSAGs). NSAGs will be formed in each partner country and they will reunite relevant experts and representatives of public authorities, policy makers and other relevant stakeholders.

Research outcomes

The chosen research items ought to provide a representative, topical, and up-to-date overview of the institutional set-up and policy framework in the partners' countries. DigitUp State of Play Report is intended to be a cross-country, individually-sensible, yet collectively representative material. In other words, DigitUp State of Play Report will act as a mapping of needs in SME managers and self- entrepreneurs in relation to digital transformation. The selection of the research topics and sub-topics is pursuant to the scope, objectives, and expected results of the project. Thus, the research that underpins it must be based on comparable research items and indicators. Moreover, to cover a similar time horizon, the research should cover institutional and policy developments from the past 10-20 years.

However, this greatly depends on the availability of data and historical relevance of each research item in the partners' countries. Thus, each of the partners has the discretion to research the items to their preferred/possible extent. Should not all of the research items be of relevance and/or sufficiently documented for any given partner to research, then the respective partner will exclude the item in question. Nonetheless, if a major topic is hereby not covered, the partner must indicate so in the desk research template. This will help in singling out any ensuing gap/s based on incomplete/insufficient data when devising the content of the State of Play Report. It is hoped the information collected hereby will lead to qualitative and meaningful findings.

DigitUp State of Play Report is an integral component of Work Package 2: Online assessment tool for the measurement of digital skill levels. The findings ensuing from the aggregate national desk research will feed into the creation of the DigitUp online self-assessment tool. This tool is the crux of the project: a practical application designed to be needs-informed and user-friendly. The online self-assessment tool will be a tangible output of the project and it will be widely disseminated. The tool is expected to be beneficial to the project target groups and the project partners, as some of them are SMEs. Ultimately, the State of Play Report builds into the online self-assessment tool which will be freely accessible and empowering for the end-users. Overall, the outcomes of the DigitUp Work Package 2 allow SMEs and self-entrepreneurs to gauge their digital readiness independently and easily.

To obtain the needed data, the desk research will focus on three areas of interest:

I. **Status quo of digital transformation in business sector**

- National digital transformation trends, special focus of digital transformation within the business sector, especially for SMEs;
- National legislation, strategic documents regulating digital transformation;
- Digital transformation of the country relative to the European average;

II. **Support and obstacles to digital transformation**

- Actions performed by public authorities to support digital transformation;
- Existence and availability of support resources, ie. excellence centres, coaching programmes, sectoral training, etc.;
- Public and/or private funding opportunities for digital transformation;

III. **Exploitation of BIC technologies: Big Data, Internet of Things and Cybersecurity**

- Status quo of BIC technologies in the country;
- Degree of application of BIC technologies within business sector, focus on SMEs;
- Expected developments in the use of BIC technologies in the country.

Throughout the research process, the partners will operate with the following concepts. The concepts' definitions are amendable to changes based on the national context.

- Small and medium enterprise – An enterprise is considered to be any entity engaged in an economic activity, irrespective of its legal form. This includes, in particular, self-employed persons and family businesses engaged in craft or other activities, and partnerships or associations regularly engaged in an economic activity (EU recommendation 2003/361).

According to European Commission, the main factors determining whether an enterprise is an

SME are:

- staff headcount
- either turnover or balance sheet total

Company category	Staff headcount	Turnover	or	Balance sheet total
Medium-sized	< 250	≤ € 50 m		≤ € 43 m
Small	< 50	≤ € 10 m		≤ € 10 m
Micro	< 10	≤ € 2 m		≤ € 2 m

❖ Digital transformation – Digital transformation is a customer-driven, digital-first approach to all aspects of a business, from its business models to customer experiences to processes and operations. It uses Artificial Intelligence, automation, hybrid cloud and other digital technologies to leverage data and drive intelligent workflows, faster and smarter decision-making, and real-time response to market disruptions. Digital transformation changes customer expectations and creates new business opportunities (IBM).

In line with "Europe's Digital Decade: digital targets for 2030", the digital transformation of businesses should follow these metrics:

- Tech up-take: 75% of EU companies using Cloud/AI/Big Data
- Innovators: grow scale-ups & finance to double EU Unicorns
- Late adopters: more than 90% of SMEs reach at least a basic level of digital intensity

National reports findings

Czech Republic

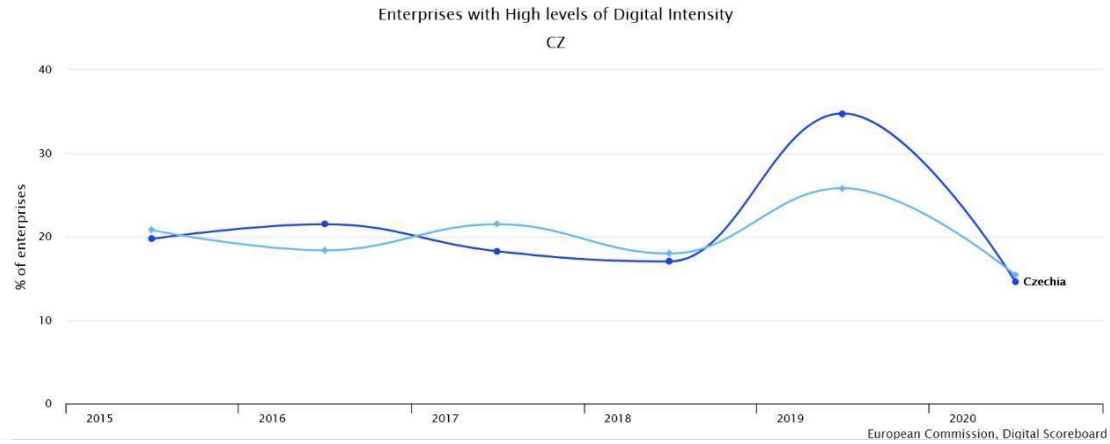
DigitUp. Digital Upgrade skilling of SMEs and self-enterprises	
Work Package 2 - Online assessment tool for the measurement of digital skill levels **Activity 2: State of Play Report**	
Identifier	European Development Agency, Czech Republic
Time horizon	2015 - 2022
Research objectives	• Assess the progress of digital transformation in the business sector • Identify national incentives to support digital transformation • Identify funding opportunities for digitalization and other available tools • Find obstacles to implementing digital technologies in SMEs • Exchange perspectives with partner countries
Research items	• Government initiatives to boost digitalization • Investments by businesses into digital technologies • Centers for Digital Innovation • Funding programs

Research body

The Czech Republic has for a long time been languishing at the bottom of digitalization rankings, with digital transformation mainly involving large international companies slowly introducing their expertise to the country. But in 2021, the government made a commitment to shift the focus to digitalization. The new policies are beginning to bear fruit. The government is now making concerted efforts to invest in infrastructure and to provide access to digital services to all citizens

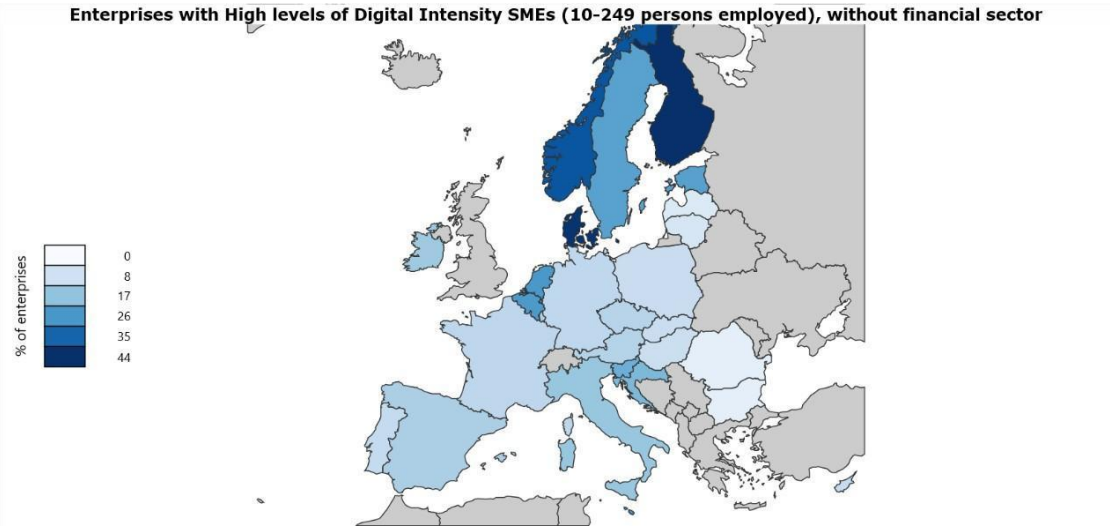
Digital Economy and Society Index created by the European Commission has been analyzing the advances in digitalization in Europe since 2015. We can for instance use the High levels of Digital Intensity indicator for SMEs to view the developments in the Czech Republic and compare it to the European average. The Digital Intensity score is based on counting how many out of 12 technologies are

used by each enterprise. High levels are attributed to those enterprises using at least 7 of the listed digital technologies.[2]



Dark blue = Czech Republic, Light blue = EU average

From 2015 to 2018, the percentage of enterprises using many digital tools in the Czech Republic was around 20%, similar to the EU average. This percentage, however, showed fluctuations in 2019 and 2020, with a rise in the percentage of highly digitalized SMEs followed by a significant decrease to around 15%. It is unclear what caused the fluctuations. The index only allows us to view data up until 2020, when the pandemic of 2020 could have played a role. The Covid-19 pandemic had a significant impact on the sector and the effects of this are still being felt. A year later, the newly elected Czech cabinet put a new priority on digitalization, signaling the importance of digital transformation for businesses in the Czech Republic. This emphasis on digitalization has the potential to reverse the decline in the usage of digital tools and increase the percentage of enterprises using digital tools to a greater extent.



A map using the same index and indicator shows the comparison of individual European countries in greater detail. This indicates that the level of digitalization of SMEs in the Czech Republic is comparable to neighboring countries from central Europe. It however falls behind the countries of northern Europe and Benelux, but it is also significantly behind Slovenia and Croatia. This variance among European countries has an impact on competitiveness of SMEs.

Over the last three years, there has been a significant expansion of digital tools in production and services. According to a survey conducted by the Ipsos agency for the Association of Small and Medium-sized Enterprises and Self-Employed of the Czech Republic (AMSP ČR) as part of the New Technologies 2022 project, almost 70% of companies plan to continue with digitalization. However, some companies do not plan to continue due to a lack of finances or a perceived lack of a benefit.
In the Czech Republic, large enterprises are much further in regard to implementing digital technologies, which can soon mean a great disadvantage for smaller businesses. SMEs often lack awareness about available technologies and their possibilities leading to a lack of interest from these businesses. MSPs need incentives to utilize artificial intelligence, and high-performance computing systems, enhance cyber security and implement digital technologies in business. To achieve the goals of digitalizing SMEs, quality coverage of the Czech Republic with high- speed internet is also essential. However, the current state of building and modernizing high-speed networks of electronic communications in the Czech Republic does not meet these development trends.

Large companies use **Big Data Analysis (BIC)** in the most common areas of application the most. For medium-sized companies, improving the quality of production is the top priority. Small companies focus on Big Data Analysis mainly on resource optimization. Companies are aware of the importance of Big Data Analysis not only for resource optimization, but also for quality improvement, maintenance optimization, and also for innovation processes in the company.

Most companies in 2021 **invested in digitalization** using their own resources, typically up to 500,000 Czech crowns. External financing is not always available or necessary for these amounts. A typical feature of SMEs is that they often invest only after they have earned the capital, which may slow down their development according to some analyses but provides them with financial stability. Also, only a relatively small percentage of companies used grants.

The situation is changing, especially after the crisis caused by Covid-19, which has strengthened companies' confidence that digital transformation can increase their resilience to crises and recessions. This is also reflected in the amount of money companies invest in digitalization every year. Since 2019, the proportion of companies investing 5 to 20 percent of their annual investment budget has increased

from 27 percent to 44 percent this year. Companies are clearly fulfilling their commitment to increase investments in Industry 4.0 technologies. This is also related to better informed top management and especially financial directors, who now better understand the importance of investments in digital transformation. The biggest obstacle to the implementation of Industry 4.0 technologies or overall digital transformation remains the lack of qualified workers. While in 2021, 66 percent of the companies surveyed identified a shortage of people as a major obstacle, just next year it was 77 percent. That is why the proportion of companies trying to invest in digital training of employees is growing.

The importance of the digitalization area, or digital transformation, as a key development priority for the Czech Republic is highlighted by its inclusion in the **National Recovery Plan**, specifically in its pillar of Digital Transformation, within which individual measures are implemented both in the public sector and towards businesses. National Recovery Plan is a plan of reforms and investments of the Czech Republic, which it intends to implement within the framework of the use of funds from the EU Recovery and Resilience Facility. Its aim is to provide citizens and business entities with access to data within public and public administration to solve life situations, including non-public data accessible to qualified entities through controlled access while preserving security principles, protection of personal data, protection of copyright, etc. A priority is to support the ecological transformation of small and medium-sized enterprises through digital technologies, in line with the objectives of the European Green Deal.

By 2023, the **Digital and Information Agency (DIA)** is planned to be created. Its main task will be to improve the digitization level of public administration. DIA is intended to improve services related to central coordination and data sharing, making it easier for citizens and companies to interact.

Five **European Centers for Digital Innovation** will be created in the Czech Republic to help develop small and medium-sized businesses. These centers will act as intermediaries between SMEs and universities/training providers, providing incubation activities and helping SMEs become part of data-driven ecosystems.

The EU Member States have an important role in selecting the Centers for Digital Innovation, and the cooperation programme of these centers will take place within a network that will be gradually created in the Czech Republic and connected across the EU. The activities of the centers will also be complementary to the Digital Europe programme. The Ministry of Industry and Trade is the main coordinator of the Digital Europe Program for the Czech Republic and will contribute to the financing of these centers from the National Recovery Plan.

These centers will provide free services such as pre-investment testing, training and skills development, investment seeking support, networking and access to innovation ecosystems, to support the digital transformation of businesses in the regions. Their expertise will focus on artificial intelligence, high-performance computing (HPC), cyber security and digital skills. The five centers: BRAIN FOR INDUSTRY, CYBERSECURITY INNOVATION HUB, EDIH ČVUT, EDIH DIGIMAT and EDIH OSTRAVA.[10]

Major current funding opportunities in Czech Rep.:

National Recovery Plan (NPO) - Component 1.5 Digital Transformation of Enterprises, Activity 1.5.1.3 Digital Enterprise

- Activities leading to the digital transformation of the company will be supported, consisting of the acquisition of ICT products or the use of ICT solutions provided as services (but not the acquisition of production machines and equipment).
- Allocation: 1.5 billion CZK for the 1st call (4 billion CZK for the entire period)
- Main target group: business entities (SMEs as well as large companies)
- Call announcement: 9th June 2022
- Application submission: 16th June - 16th September 2022
- Support rate: 30-60%

OP Technologies and Applications for Competitiveness: Direct Support for Digitalization - Priority 1 - Specific Objective 1.2 - Exploiting the Benefits of Digitalization for Citizens, Enterprises, Research Organizations and Public Administration

- Support will be provided for the acquisition of ICT products in the form of investments in tangible and intangible assets (in SW, HW and other machines and equipment directly related to ICT) and for the use of ICT products in the form of purchasing services, including expert advisory services.
- Allocation: 0.5 billion CZK for the call (1.5 billion CZK for the entire period)
- Main target group: SMEs

Main findings	• Digitalization of public administration is poor which consequentially slows down advancements in the private sector. • SMEs are falling behind in digitalization compared to large companies • Digitalization of SMEs in the Czech Republic is significantly behind advancements done by countries in northern Europe, the Benelux, Slovenia and Croatia, but it is at a comparable level to other central European countries. • Covid-19 pandemic boosted digitalization.

	• The government is starting several initiatives to digitalize the state as well as to support digitalization in the private sector. The digital revolution is a priority and EU funds are being used.

List the source used throughout the research process. You can opt for a citation style of your choice. For online sources, hyperlink has to be included.

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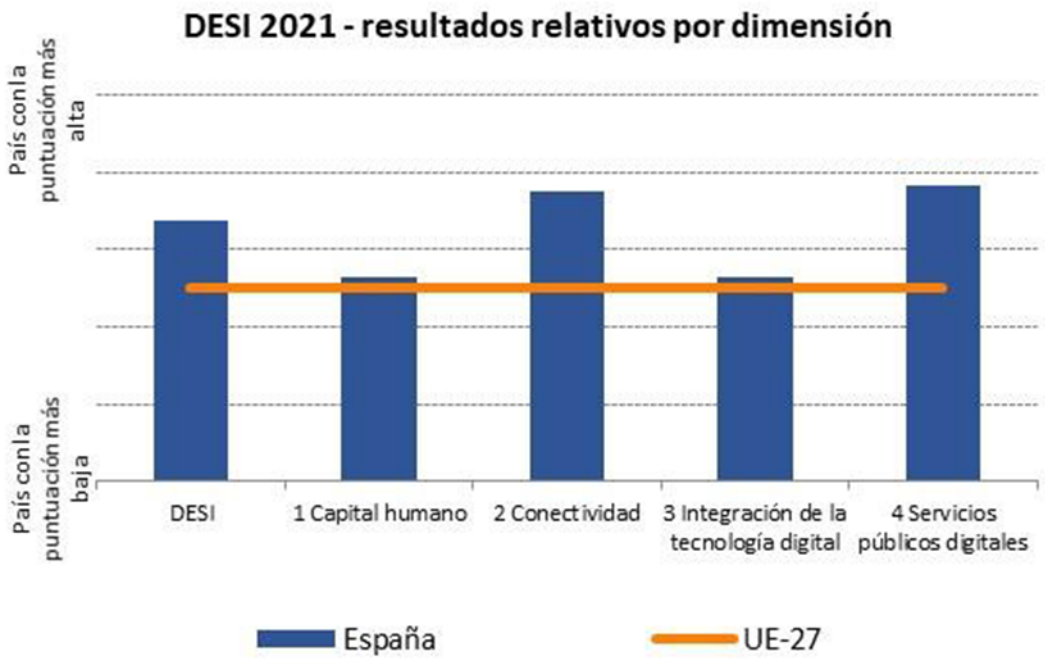
DigitUp. Digital Upgrade skilling of SMEs and self-enterprises	
Work Package 2 - Online assessment tool for the measurement of digital skill levels **Activity 2: State of Play Report**	
Identifier	Gestión Estratégica e Innovación SL Spain
Time horizon	2014 - 2022
Research objectives	• Identify the current level of digitalization of Spanish SMEs • Compare the digitalization of Spanish SMEs with Europe • Identify problems, challenges and deficiencies of Spanish SMEs' technological infrastructure and digitalization • Present the "SME Digitalization plan 2021-2025" aimed at supporting the transition of the economy towards national digitalization • Identify which support Spanish SMEs need for the improvement of their level of digitalization • Spain's current situation with regards to Big Data, Internet of Things and Cybersecurity • Show benefits of digitalization for SMEs • Identify areas in which Spain is expected to see developments in terms of digitalization
Research items	• SME Digitalization Plan 2021-2025 • Challenges of digitalization • Expected future developments of digitalization in Spain
Research body	
<u>Status quo of digital transformation in business sector</u> Digital transformation is a process that involves all departments and employees of an organization to increase efficiency and productivity and find new opportunities for success. In Spain, SMEs have	

faced challenges in the digital arena due to the Covid-19 pandemic, but lack the resources and expertise to implement effective digital strategies. Teleworking has been a growing trend in Spain during the pandemic, leading many SMEs to implement digital tools to facilitate remote working and team collaboration. However, there are challenges in terms of information security and privacy, competition with large companies, and lack of experience in the digital arena. SMEs need to adapt quickly to the new trends brought about by Covid-19 and the development of various digital tools and market trends.

The EIBIS (Group Survey on Investment and Investment Finance) found that 46% of companies in the European Union had taken digitalization measures to adapt to online business and operations. The Ministry of Economic Affairs and Digital Transition presented a report in January 2022, analysing data from the first half of 2020 through the DESI (Digital Economy and Society Index). This index measures the four indicators related to the methodology established to follow the criteria established in the Recovery and Resilience Plan and the objectives set out in the Digital Compass of the European Union's Digital Decade. Spain remains ahead of the European average in the four categories analysed, with 57% of the population having basic digital skills. The goal set for the year 2030 is to include the promotion of digital skills of the population in the National Digital Skills Plan. Finally, the integration of digital technology is the most relevant index, with 62% of SMEs having a basic level of digital intensity and 24% having implemented e-commerce among their services.



The SME Digitalization Plan 2021-2025 proposes five lines of action to increase the number of companies benefiting from these tools. These include digital change management support, foster disruptive innovation and digital entrepreneurship, support for sectoral digitalization, coordination and efficiency, and implementation of 5G. The Government of Spain has approved the "Digital Generation of SMEs" program to encourage and promote training as a lever of digital transformation for small and medium-sized enterprises (SMEs). The program aims to provide managers of SMEs with between 10-249 employees with the knowledge and skills necessary to drive the digital transformation of their companies, provide future "agents of change" with the knowledge and skills necessary for their incorporation or re-qualification in the labor market, show how technology impacts on business, provide the business network with talent and the capacity to implement concrete and specific actions under an Action Plan, and reduce the gender digital divide by increasing the number of women trained in digital management of SMEs. This government initiative seeks to address the challenges faced by any SME when undertaking digital transformation.

Operational improvement is key to gaining a long-lasting competitive advantage in the market. This includes using technological tools such as CRM (Customer Relationship Management), social networks, the deployment of new online tools and marketplaces, innovation through customer insight tools, management and decision-making based on data analysis, and cybersecurity. To ensure the use

of tools that protect the business against cyber threats in the digital world, steps must be taken to improve technological equipment, address the lack of digital culture and skills, adapt to changes in demand, and promote a low-carbon economy. These steps include improving technological equipment, addressing the lack of digital culture and skills, adapting to changes in demand, and promoting a low-carbon economy. Implementation planning, gathering information from different sources, knowing users, getting the whole team involved, employee training, and analysing and measuring the results obtained in the process are all important for SMEs in digital transformation.

Implementation planning involves knowing the changes that are likely to occur in the environment, the people who will be part of the change, and the new work methodology that will be carried out. Knowing users is key to focusing the strategy towards them and satisfying their needs. Getting the whole team involved in the process is essential to engage all of them in the new challenges and processes. Employee training is necessary to inform and tutor the staff on things ranging from the installation of software to improve productivity to the management of customer service digitally. Finally, analysing and measuring the results obtained in the process is necessary to study the effectiveness of the strategy and whether it is necessary to change it, maintain it, or implement actions aimed at improving the company's performance in the digital sphere.

Support and obstacles to digital transformation

Digital transformation can be challenging for SMEs due to several factors, such as fear of change, cost, and lack of skills. The Spanish government implemented the "SME Digitalization Plan 2021-2025" in 2021 to help and facilitate companies in this transition period. The plan aims to provide companies with the necessary skills, infrastructure, devices and solutions, security, legal certainty, management commitment, customer service, logistics, and commercial process to offer a good service, with fast and economical shipments at national or international level. It also aims to provide companies with the necessary skills, infrastructure, devices and solutions, security, legal certainty, management commitment, customer service, logistics, and commercial process. The DTK Program is part of the European program "Next Generation European Funds" and provides grants of up to 12,000 euros to cover the sectors of business analytics, process management and customer management.

The plan offers a series of categories with their corresponding budgets, such as website and basic Internet presence, e-commerce, social media management, customer management, BI and analytics, virtual office services and tools, process management, electronic invoice, secure communications, cybersecurity, advanced internet presence, marketplace. Digitalizing Agents are digital solution

providers who provide the company or self-employed with the digital products and services envisaged in the DTK Packages.

The "Acelera Pymes" program consists of two categories of digitizing agents: networks and support centres for the digitalization of SMEs and the self-employed, and promoters. A Collaboration Model of Facilitating Agents is proposed to improve the digitization of SMEs and self-employed through collaboration in critical processes such as diagnosis, recommendation, advice, support in the implementation and management of aid. There are more than three thousand digitalizing agents and the Government has set up a search page where users can find the solution to the digital problem that arise.

According to the sector of activity, they are grouped into:

Group A	Agriculture, livestock, forestry, and fishing
Group B	Extractive industries
Group C	Manufacturing industries
Group D	Supply of electric power, gas, steam and air conditioning.
Group E	Water supply, sewerage, waste management and decontamination activities
Group F	Construction
Group G	Wholesale and retail trade; repair of motor vehicles and motorcycles
Group H	Transportation and storage
Group I	Catering
Group J	Information and communications
Group K	Financial and insurance activities
Group L	Real estate activities
Group M	Professional, scientific, and technical activities
Group N	Administrative activities and auxiliary services
Group O	Public administration and defence; Compulsory social security
Group P	Education
Group Q	Health and social services activities
Group R	Artistic, recreational and entertainment activities
Group S	Other services

Group T	Activities of households as employers of domestic servants; activities of households as producers of goods and services for own use
Group U	Activities of extraterritorial organizations and agencies

The government of Spain has launched the "Next Tech Fund" to support companies in the development of digital projects, artificial intelligence, internet of things or cloud storage. The objective is to mobilize joint resources in public-private collaboration of 4,000 million euros (half public funds and half private investment) over an initial period of four years, with reference contributions during this period of approximately 2,000 million euros of joint resources between ICO-AXIS and SEDIA. The fund is constituted as a fund of venture capital funds, for the financing of high-tech growth companies, either directly or through venture capital funds, corporate funds or other investment vehicles.

The CEOE and DigitalES point out the importance of a good financial skeleton on the part of the companies to be able to benefit from the plans implemented by Spain. The CEOE warned that certain budget items, especially those earmarked for R&D&I activities, have not been fully executed due to the lack of attractiveness in the investment conditions and the difficulty of justifying the projects.

Exploitation of BIC technologies: Big Data, Internet of Things and Cybersecurity

The most important details in this text are the concepts of Big Data, IoT and cybersecurity. Big Data refers to the vast amount of data generated by people, businesses and devices connected to the Internet, which can be structured or unstructured and can include information on business transactions to data generated by sensors and mobile devices. The Internet of Things (IoT) refers to the connection of physical devices to the Internet, allowing them to collect and share data. Enterprise cybersecurity refers to the protection of an organization's systems, networks and devices against cyber-attacks. Big Data generated more than 251 million in 2019 and Spanish providers have obtained most of their revenues thanks to the services and solutions offered by big data.

The consulting firm Quint Wellington Redwood has predicted that big data and cloud computing will be the most commercialized services in the short and medium term by Spanish companies. According to the European Commission and IoT (Internet of things), prosperity in the development of Big Data can be understood by means of six value chain indicators. The first indicator is the number of workers in this field, with specialists in data extraction, processing, visualization or analysis being the most important. The second indicator is the increase of those companies providing big data, with companies from Spain, the United Kingdom, Germany, France and Italy accounted for the largest share of the market. The gap between the supply and demand of professionals is another key indicator to be filled.

Citizens rely on the data market, and decision making has been highly affected by the growth of big data. One of the objectives set for 2022 was to achieve a "data centric", i.e. that more than 50% of business would be generated from data. Spain has seen a 48% growth rate in platforms that integrate big data and a 12% growth in the services sector. This is due to the improvement of security, internal improvement, cost reduction, and the search for cost reduction in operations. In particular, the agricultural sector (27.21%), service sector (25.77%), and facilities management (20.63%) are the sectors that stand out most for having implemented this technology.

However, Spain is in a low position in the ranking of countries with the best digital skills. Spain is in the thirtieth position out of the sixty-six countries surveyed, with a score of 68.21. Edge Computing technology has been developed to bring the user closer to the experience of the cloud. This type of IoT would enhance the 5G network and improve the development of smart cities. A study published by IESE (2020) ranked Madrid first in mobility and transportation, social cohesion and international projection, with Barcelona close behind in terms of mobility, transportation and social cohesion.

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The cybersecurity situation in Spain is more complex due to the high degree of digitization that companies have gone through. Deloitte gathered information from 100 companies about their security and the most common threats and incidents they faced in 2021. Among the most common threats are phishing, ransomware, and malware. In terms of security incidents, there was an increase in cyber-attacks due to the pandemic. The sectors with the most attacks in this field are Insurance, TMT, Manufacturing, Banking, and Public Administration. Training and education of security personnel is key to identify these attacks and stop them before they manage to steal data.

Degree of application of this type of technology for SMEs

The Internet of Things (IoT) is a set of platforms designed to help small and medium-sized companies access this type of technology developed by large companies and implement it in their field of action. In Spain, the sectors that invest the most in this type of technology are those related to information,

telecommunications and tourism. This technology involves the analysis of information generated through social networks, and with the support of other related tools, the implementation is more than 17% of use in SMEs and large companies. The business sectors in which these types of technology are most commonly used are the financial sector, insurance companies, scientific sector, sports sector, and culture. Digital transformation is becoming increasingly important for SMEs to stay competitive and adapt to the changing business environment.

The most important details in this text are the proposed measures to be implemented by 2023 to improve data protection, network security and Zero Trust models. These measures include web unification, artificial intelligence, business resilience, and regulation of ransomware cyber-attacks. Web unification is planned for 2025, with the majority of companies adopting a strategy that unifies cloud services, access to private applications and the web from SSE (Security Service Edge) platforms from a single provider. Artificial intelligence is used to detect and respond to threats more quickly and efficiently. Business resilience is defined as a company's ability to adapt and thrive in a changing environment.

The Zero Trust philosophy approaches security in such a way that each user and device verifies their identity in order to access the data. Regulation of ransomware cyber-attacks is also proposed, with several countries passing legislation regulating the management of payments and fines. Authentication and access management tools (fingerprint or biometrics) have also been improved. Blockchain technology is being explored in various industries, such as finance, healthcare, and logistics. Spain is expected to see growth in the use of blockchain, AI, and IoT technologies in government and public services, smart contracts, natural language processing (NLP), smart cities, healthcare, finance, and healthcare.

Blockchain technology can be used for secure and transparent tracking of government documents, AI for tasks such as fraud detection, and IoT for connected devices and smart cities. Smart contracts are self-executing contracts with the terms of the agreement directly written into code, AI for applications such as chatbots, customer service, and language translation, and IoT for smart lighting, traffic management, and air quality monitoring. Healthcare is also expected to benefit from the use of Blockchain, AI, and IoT technologies. Blockchain technology can be used to securely store and share patient data, AI can be used for tasks such as medical imaging analysis and drug discovery, and IoT can be used for remote monitoring of patients. Finance is expected to see growth in the use of

blockchain for financial transactions, AI can be used for tasks such as fraud detection and risk assessment.

Spanish banks and financial institutions are already exploring the use of blockchain, AI, and IoT technologies in the field of transportation, energy management, e-commerce and retail, smart homes and buildings, tourism, education, and smart classrooms. In the field of legal, blockchain technology can be used for secure and transparent tracking of legal documents, while AI can be used for tasks such as contract analysis and document review. In the construction world, they can be used for secure and transparent tracking of construction projects and payments, while AI can be used for tasks such as project management and design optimization.

Spain is actively promoting IoT technology by investing in research and development and providing support and funding to start-ups and companies working on blockchain, AI, and IoT projects. These technologies are expected to have a major impact on industries and sectors, driving economic growth and improving citizens' lives.

Main findings	• Spanish SMEs lacked resources, knowledge and technological infrastructure for a rapid digital transition during the Covid-19 pandemic especially in rural areas • integration of digital technology needs to be improved through the Digitalization Plan because digital transformation is increasingly important for SMEs to stay competitive • steps to be taken in order to improve the digitalization of SMEs are the provision of Digitizing Agents that support SMEs especially at the local level, improve knowledge and skills of managers of SMEs with regards to digitalization, improve technological equipment and raise awareness of the importance of digitalization • cybersecurity is threatened especially through cyber-attacks like “phishing” • Spain is expected to see developments in the use of Blockchain, Artificial Intelligence (AI), and the Internet of Things (IoT) technologies
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Italy

DigitUp. Digital Upgrade skilling of SMEs and self-enterprises	
Work Package 2 - Online assessment tool for the measurement of digital skill levels **Activity 2: State of Play Report – ITALY**	
Identifier	Hypatia, Italy
Time horizon	2012-2025
Research objectives	- Status quo of the digital transformation in Italy - Support and obstacles to digital transformation - Exploitation if BIC Technologies In Italy
Research items	● Status quo of the digital transformation in Italy ○ National digital transformation trends ○ National legislation ○ Digital transformation (Italy – Europe benchmark) ● Support and obstacles to digital transformation ○ Actions performed by public to perform digital transformation ○ Resources to perform digital transformation ○ Funding opportunities for digital transformation ● Exploitation if BIC Technologies In Italy ○ BIC Technologies in Italy ○ Degree of application of BIC technologies within business sector ○ Expected developments

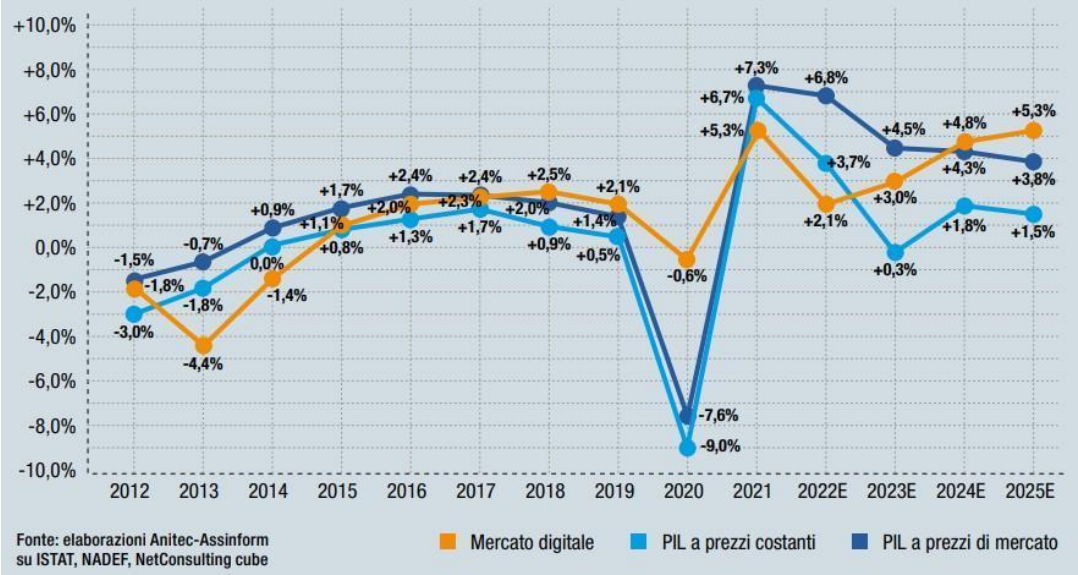
Research body

1. Status quo of digital transformation in business sector

1.1. National digital transformation trends

The Italian digital market is a very dynamic segment of the Italian economy. Looking at the value added, growth, number of enterprises, productivity, the growth of the digital market is constantly higher than the general economy: based on historical data, digital market drags the economy since 2015, when the European Digital single market and the "Industry 4.0" plan (than called "Enterprise 4.0" and "Transition 4.0") moved their first steps, while key enabling technologies, cloud, big data, IoT, cybersecurity technologies entered into the scene.

This dynamic has been maintained positive during the pandemic years too, with the digital market less affected by the crisis (-0,6%) respect manufacturing and services and the Italian GDP in general (-7,6% in 2020).



Source: Anitec-Assinform

Legenda: yellow: Digital market; blue: GDP at constant prices; dark blue: GDP at market prices

In this framework, the Digital Enabler and ICT are the competition drivers of the knowledge economy, affecting not only organisational structures, but also products, services, processes, business model, markets of the enterprises, especially SMEs.

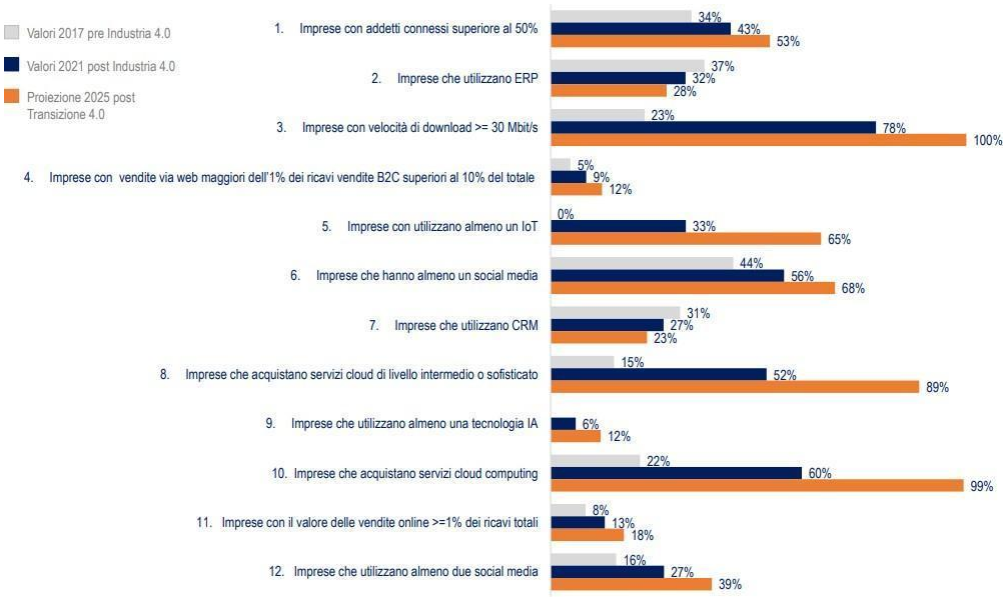
Since 2022 onward, a new scenario opens up, with a new strategic and political vision that puts the digital transformation at the core of the economy evolution of the country, leveraging on specific context conditions: a) incentives for the adoption of the digital technology to improve productivity of

SMEs; b) investment in human capital, (specialist) digital and STEM skills, digital experts; c) a strong integration of manufacturing with digital sector by means of different tools, e.g. tax credits.

1.2. National legislation, strategic documents regulating digital transformation

The most important investment dealing with digital transformation of enterprises, in Italy, is the **"Transizione 4.0" Plan**, based on a series of tax incentives to boost the digital integration of enterprises. In particular, this measure focuses on three kinds of tax credits to enterprises that invest in: a) capital assets (tangible and intangible, directly linked to the digital transformation of productive and manufacturing processes); b) research, development and innovation; c) training to improve and develop digital skills.

The latter point, in particular, is focussed on the "**SMEs upskilling"**. It is expected that about 181.600 Italian enterprises will use the tax credits in 2021-2023 (which is 3.000 for training to improve digital skills).



Source: Digital Intensity Index 2021, percentage values of Italian SMEs; The European House – Amrosetti elaboration on Istat data (2022).

Legenda: 1. Enterprises with online employees > 50%; 2. E. using ERP; 3. E. with download speed > 30 Mbit/s4. E. with web sales >1% and B2C sales>10%; 5. E. using almost an IoT; 6. E. managing almost a social media; 7. E. using CRM; 8. E. purchasing intermediated/advanced cloud services; 9. E. using almost an A.I. technology; 10. E. purchasing cloud computing services; 11. E. with online turnover => 1% of the total turnover; 12. E. using social media.

Indicators foresees an overall increase of 4,5% per year of the basic digital level of SMEs for 2025 (in line with the 4,1% of 2017-21, boosted by the previous “Industry 4.0” Plan, similar to the “Transition 4.0” Plan). On the basis of this trend, more than 80% of SMEs are expected to reach a basic digital level within 2026, and 97% within 2030, overtaking the EU target of 90%.

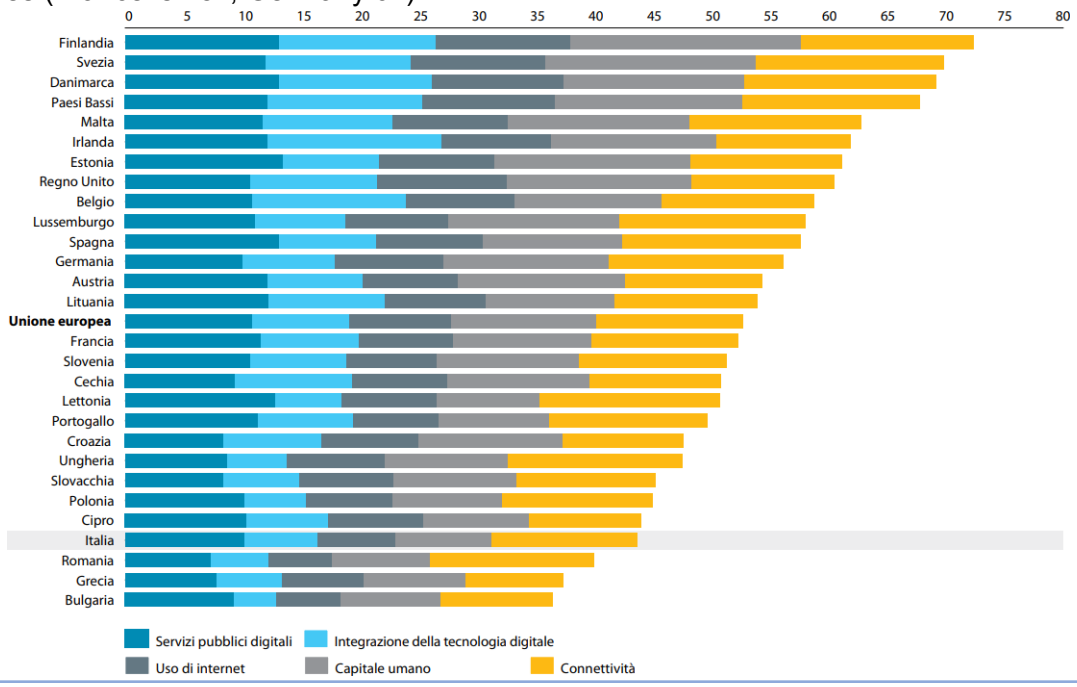
1.3. Digital transformation of the country relative to the European average

The Italian SMEs have a primary ***role*** in the Italian economy, representing 99,9% of the total number of enterprise (4,4 million of SMEs), about 80% of jobs, 70% of value added (Istat and Eurostat). The micro-enterprises (less than 10 employees and less than 2 M€ of turnover) are the greater SMEs segment, contributing to the 53% of the export (a percentage greater than the UE average).

The overall productivity of the Italian SMEs is lower than the average of the SMEs of the other EU countries. It is difficult and complex to find an exhaustive reason, it seems to be related to the sectorial mix, but it is commonly considered that the level of digitalisation can have a crucial role.

Italy ranks 25th among the 28 Member States regarding the EU Digitalisation of the Economy and Society Index (DESI); among the 5 components of this index, Italia ranks 28th in the category “human capital”. Italy has low performance also in the Digital Intensity Index (it is 21st on 28). About the 40% of the Italian SMEs seems to poorly invest in digital technologies, owning less than 3 of the 12 monitored

technologies (France is 18th, Germany 9th).



Source: DESI Index

Legenda: From top left: Digital public services (dark blue); Integration of the digital technology (blue); Internet use (dark grey); Human capital (grey); Connectivity (yellow)

2. Support and obstacles to digital transformation

2.1. Actions performed by public authorities to support digital transformation

Several are the actions performed by the Italian public authorities to support the SMEs digital transformation.

As already mentioned, the first and most important action is the **"Transition 4.0" Plan**, with more than 13,4 B€ of investment dedicated to the digitalisation of enterprises. An increase of productivity, competitiveness and sustainability of Italian is foreseen both on demand (transformation of digital processes, investment in intangible assets) and supply sides (strengthen of the R&D and technology transfer). The second action is referred to a set of funding measures for the digital transformation such investments in ultra-fast networks with 6,71 B€ allocated: the **"Italia a 1 Giga" Plan**, to speed-up to 1Gbit/s the internet in remote areas, the **"Italia a 5G"**, to develop the 5G infrastructure. These investments will produce an expected increase of value added, for each SME, between the 1% and 2% and a structural impact of +0,45% of the Italian GDP.

Other actions are related to investment for *startup*, in the framework of the **"Fondo Nazionale per l'Innovazione (National Fund for Innovation)**, the financing facility promoted by Cassa Depositi e Prestiti (Deposits and Loans Fund), allocating 550 M€ to sustain the development of venture capital in Italy and support the Italian ecosystem of innovation.

An additional action has been taken with a focus on aerospace sector, satellite technologies and **space economy**, with a 1,5 B€ allocated. The investment will lead to the creation of 6.000 new jobs, with an expected additional value added of 450 M€.

Finally, a further action is referred to the **digitalisation of the Public Administration**, conceived as a key enabler to develop competitiveness and innovation for citizens and enterprises by means of modern infrastructures, interoperability, digital platforms and services, cybersecurity and so on. Italy is following the examples of other European countries, who have already invested in cloud public services and modern public administration-citizens interfaces, reaching the target of 32h per year of

time savings for enterprise. These measure will free up, for Italy, 38,8B hours per year (approximately 0,2% of the GDP).

2.2. Existence and availability of support resources

The Italian SMEs have access to a broad and diversified ecosystem of innovation to support their strength in facing the digital transformation challenges:

- SMEs Associations: point of contact of the Italian SMEs to knowledge and competences;
- Innovation poles and Digital Hubs: they are innovation centres born on the impulse of the Italian Minister of the Economic Development in the framework of the "Impresa 4.0" Plan. They are based in all the Italian Regions, generally closely linked to the territory. They are considered the "spine" of the digital transformation practices promoted by the Italian Government
- Competence Centres: they support the "Digital Innovation Poles" in the promotion of the Italian "4.0 Plan", driving the R&D, providing SMEs with examples and use cases related to the digitalisation. They generally operate at local level but they ar becoming a national contact points for the digital sector;
- Interest Groups (almost 7) including technology cluster, Innovation Districts, Accelerators, etc. acting differently.

However, despite significant public actions, Italy shows weaknesses and barriers to digital transformations for SMEs such as:

a) lack of investments: Italian SMEs invest less in digitalization than other EU SMEs. This lead to lower level of digital technology adoption;
b) lack of competences: Italian SMEs shows a lower level of digital skills. In particular, the gap Italy is:
   - penultimate in the EU-27 for persons in working age having digital skills upper to the basic levels and ICT graduated;
   - 22° for enterprises providing training in ICT;
   - 20° for enterprises having ICT experts.

In this framework, the **"Transition 4.0" Plan** foresees a series of support measures dealing with the digital skills:

- The introduction of the obligation, inside the academic curricula in ICT, to foresee almost one course dealing with digitalisation, ethics, inclusion and sustainability;

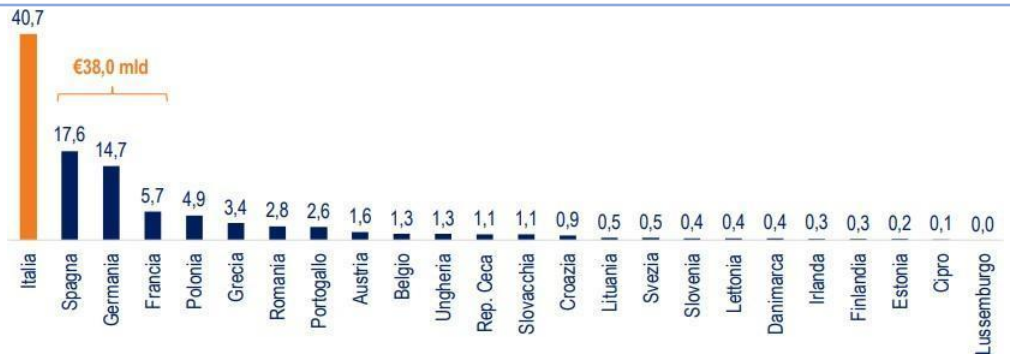
- The explicit provision of the “Formazione 4.0” (Training 4.0) to upgrade the digital skills of human capital of Italian enterprises.

Other peculiar tools to enhance digital transformation of enterprises are referred to the opportunities coming from the “enterprises – school relationship”. For example:

- the “***School-Work Alternance***” programmes of the upper secondary Schools (technical institutes, professional institutes, T-VET); the policy stated by the 2019 Italian Budget Law redefines the process started in 2005, following the European trend and strategies on this topic (e.g. from Copenaghen Declaration[1] of 2002 onwards) strengthening more inclusive and innovative ecosystems by means of the “technical and professional training” as tool to play a key role in a new form of interaction with enterprises and society. On the basis of studies and monitoring (e.g. PRIN-PCTO project) on “*Work- School Alternance*”, several are the projects performed by the Italian technical institutes collaborating with enterprises, also in the field of digital skills and transformation.
- Enterprise schools and ITS Foundations: annual and biennial courses for young students, with the presence of enterprises;
- Scuola Diffusa (“Widespread School”) initiative: a project of the Italian Department of the Digital Transformation to create a network of ICT companies and schools to identify the most requested digital skills

2.3. Funding opportunities for digital transformation

The main funding scheme to improve digital transformation in Italy is linked to the ***Recovery and Resilience Plan*** linked to the Next Generation EU and Programme and the Recovery and Resilience Facility (RRF). Considering the total fund allocated, Italy is the first beneficiary country with a total of 191,5 B€. In particular, the **digital transformation** is one of the six mission of the Plan for funding allocation, with **40,7 B€** available. If we include funding allocated for the other Missions, Italy counts approx. one third of the PNRR to digital investments. Benchmarking with other EU countries beneficiaries of the Next Generation EU, Italy is the country who allocates the major amount of funds.



Funds allocated in the "Digitalization" Mission of the Next Generation EU (B€). Source: The European House – Ambrosetti, on single countries' plans.

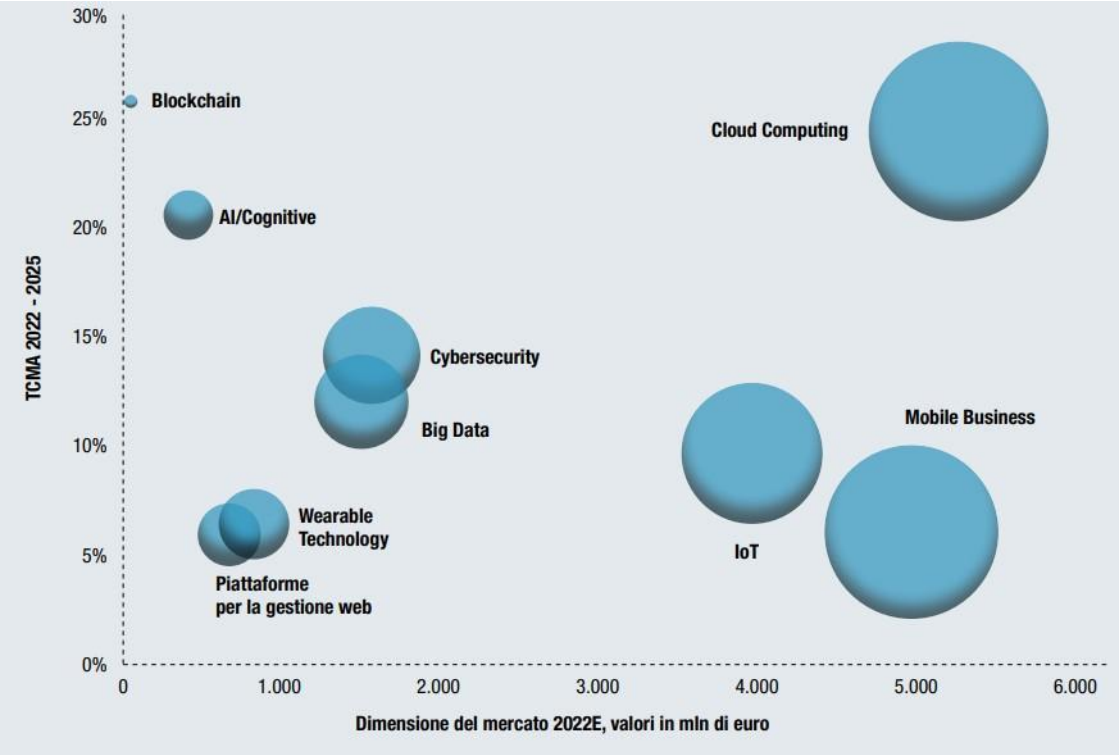
3. Exploitation of BIC technologies: Big Data, Internet of Things and Cybersecurity

3.1. Status quo of BIC technologies in Italy

In general terms, the Italian digital market trend is affected – almost until 2025 – not only by the macroeconomic difficulties, but also by the initial stage of the PNRR projects, who don't still manifest relevant impacts. On the basis of Assinform data[2], in 2023 a slight increase of the Italian digital market is however expected respect to 2022 (+3%, for a total amount of 79.138 B€, about 2,3 B€ respect to 2022). For the following years, a more sustained growth is expected: +4,8% in 2024 and +5,3% in 2025, with a market that could exceed 87 B€ in 2025. In 2023-2025, a growth of all sectors is expected, except for "Netework services".

Focussing on the "Digital Enabler", it is expected that these technologies will be the booster of the Italian digital market in 2022-2025. Among these technologies, three cluster can be identified:

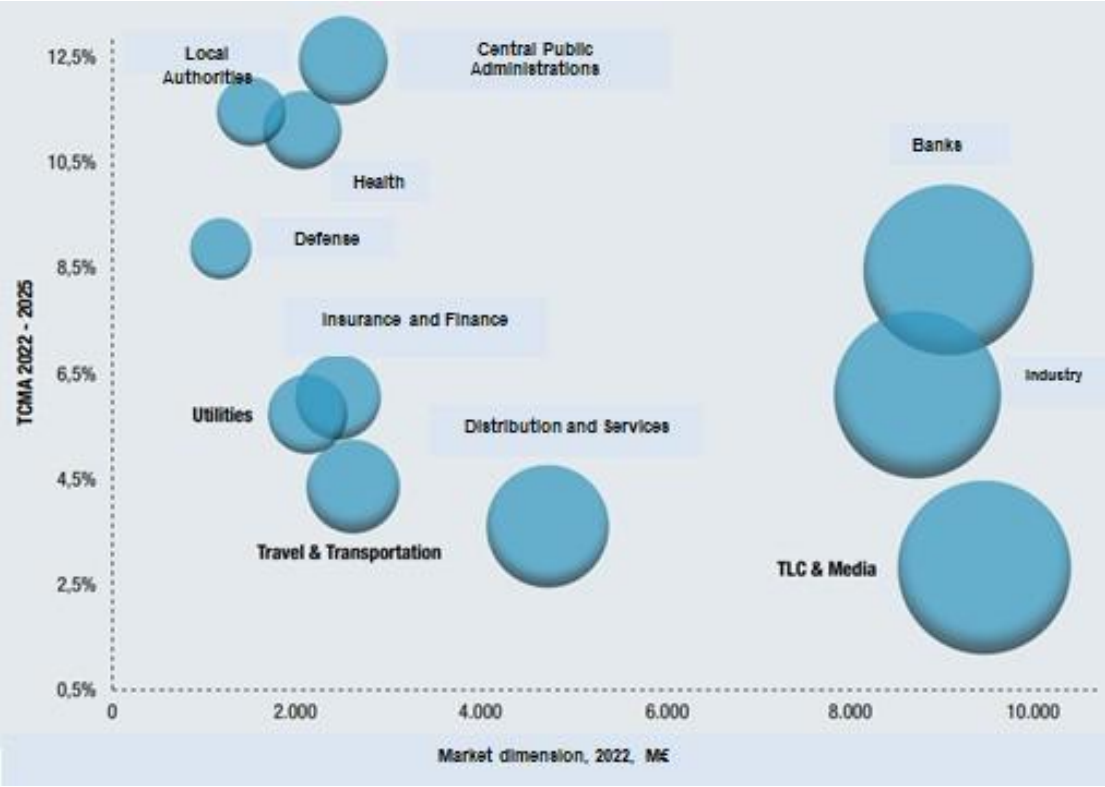
1. Cloud Computing: it should exceed 10 B€ in 2025 (CAGR 24,5% in 2022- 2025); **Internet of Things**: the second in terms of performance, with 4 B€ (+8,8%), and a pillar of the PNRR; Mobile Business: 5 miliardi di euro, +6,1%, continuously growing thanks to the mobility demand;
2. **Cybersecurity**: 1,6 B€ (miliardi di euro, +14%) and **Big Data**, 1,6 B€ (+12,7%).
   Cybersecurity confirms its constant growth pushed by the data protection need due to enduring threat of attack. The market of Big Data is sustained by the need to manage and exploit data;
3. Other "Niche technologies" for specific use cases.



Source: NetConsulting Cube, 2022

3.2. Degree of application of BIC technologies within business sector

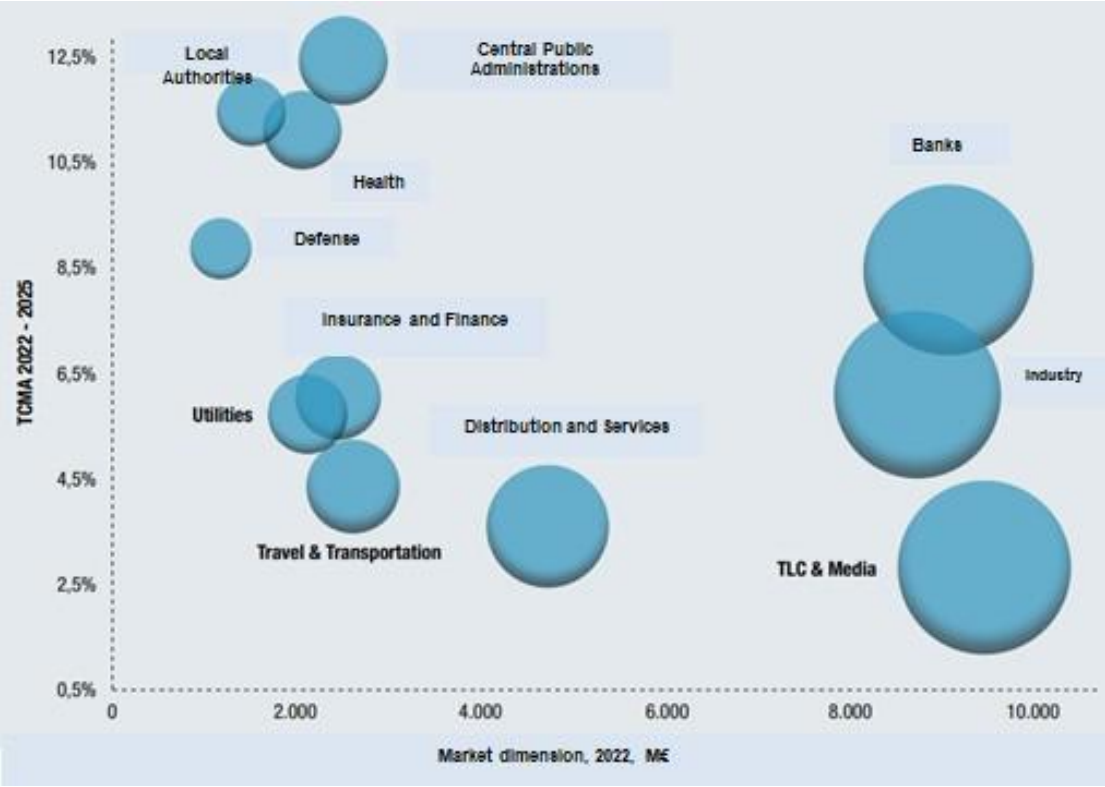
The expense in digital technologies for the "Industry" sector, in particular, is about 8.792,5 B€ in 2022 (+3% than 2021). A stronger demand is reported for Cybersecurity solutions, Business Intelligence, Advanced Analytics technologies. The "Smart Factories" sector, furthermore, is pushed by the "Industrial IoT" and by the Predictive Maintenance solutions. Several SMEs invested in the e-commerce to improve the multi-channel marketing, Cloud Computing (e.g. for ERP applications and infrastructures).



Source: NetConsulting Cube, 2022

3.3. Expected developments in the use of BIC technologies in the country.

In 2022-2025 an increase of the digital demand is expected for all business sectors, due to the strong awareness that digital investments are fundamental for competitiveness. Investments are focussing, as already reported, on Cloud, Cybersecurity and Big Data. The PNRR is currently boosting the investing of enterprises, in particular SMEs, starting from 2024, especially in the Health and Industry sectors.



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Main findings	• Digital transformation drives the general Italian economic system, with higher degree of performance respect the economy in general; • Public budgets are investing in digital transformation, with particular emphasis on the digital-manufacturing interconnection and the adoption of digital technologies within SMEs; • Big Data, Cybersecurity, Internet of Things, are high-performing technologies; SMEs and micro are also focused on ERP and e-commerce demand;

	• Digital skills are at the core of the Italian policies dealing with digital transformation • Several Work-School alternance (or similar initiatives) have been experimented to effectively link VET institutions with enterprises, dealing with digital transformation.

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Greece

DigitUp. Digital Upgrade skilling of SMEs and self-enterprises	
Work Package 2 - Online assessment tool for the measurement of digital skill levels **Activity 2: State of Play Report**	
Identifier	Innovation Hive, Greece
Time horizon	1. Data analysis from 2015 to 2022 2. Future framework up to 2027
Research objectives	To investigate institutional and policy developments data regarding digital transformation of SMEs covering the period 2015 to date To explore the current status quo of Greek SMEs in relation to the European context To highlight the importance of digitalisation of SMEs' and self-enterprises
Research items	**The state of digital transformation in business sector from 2016 up to date- an overview** ● Status quo of digital transformation of the country relative to the European average; ● National digital transformation trends, special focus of digital transformation within the business sector, especially for SMEs; **Support and obstacles to digital transformation** ● Actions performed by public and private authorities to support digital transformation; **Exploitation of BIC technologies: Big Data, Internet of Things and Cybersecurity** ● Status quo of BIC technologies in the country; ● Future developments;

Research body

1. Introduction

Digitization in Greek enterprises refers to the process of incorporating technology and digital systems into various aspects of business operations. This can include things like automation of processes, use of data analytics and digital marketing, Big data, open API's, the Internet of Things, adoption of cloud computing and other emerging digital tools such as e-commerce and augmented reality. The goal of digitization is to improve efficiency, increase productivity, and ultimately drive growth and success for the enterprise. Exploiting the opportunities of the digital revolution largely determines the development of the national economy and the well-being of Greek society. For this reason, the Greek government and SMEs have realized the significance of moving towards digitalization.

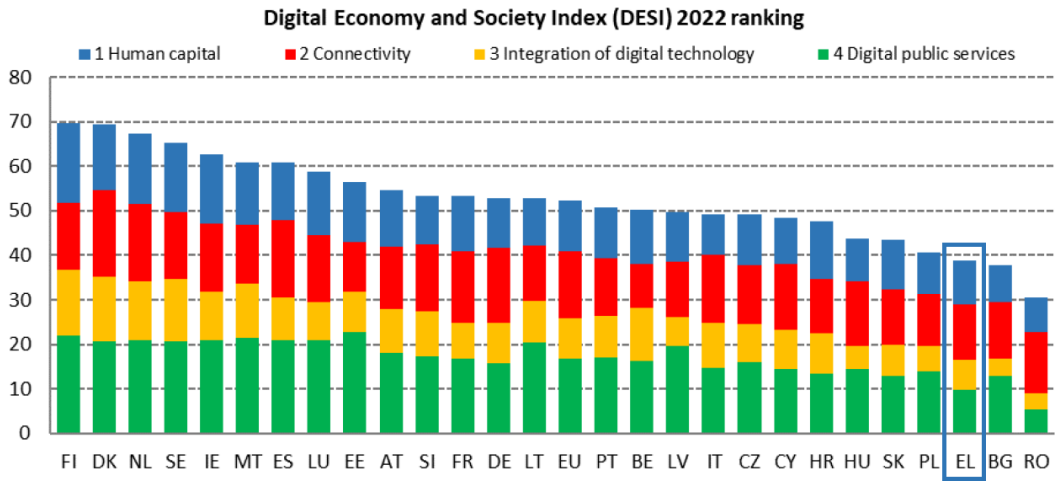
2. The state of digital transformation in business sector from 2016 up to date- an overview

2.1 Status quo of digital transformation of the country relative to the European average

According to the country's key digital statistical indicators, Internet penetration is 66,84%. In terms of ICT development, the country is ranked 36th in the world.

Europe's Digital Progress Report (EDPR) tracks Member States' digitisation progress by combining quantitative data from the Digital Economy and Society Index (DESI) with qualitative information on country-specific policies. With a few exceptions in some sectors, Greece did not make much progress in comparison to other EU Member States from 2014 to today. Its poor performance in digital skills stifles further development of its digital economy and society.

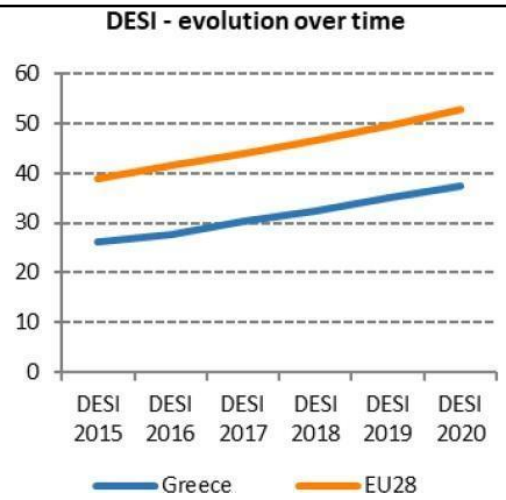
	Greece		EU
	rank	score	score
DESI 2022	25	38.9	52.3



Source: *https://digital-strategy.ec.europa.eu/ 1*

Greece is ranked 25th out of 27 EU Member States in the Digital Economy and Society Index 2022. (DESI). However, Greece has made significant progress in recent years when compared to other EU Member States, indicating that Greece is catching up.

Specifically, Greece has made significant progress in connectivity, particularly in Very High-Capacity Networks (VHCN) and 5G coverage. However, the country still needs to make progress, particularly in terms of taking up at least 100 Mbps fixed broadband compared to the EU average (41%) and improving 5G coverage. The number of active users of e-government services (69%) has increased since last year (67%) and is now 4 percentage points higher than the EU average (65%). Greece also made progress in terms of having at least basic digital skills, with 52%, which is very close to the EU average (54%).



2015-2020

Source: https://digital-strategy.ec.europa.eu/ 2

In terms of the DESI parameters over the years, Greece has made continuous steady progress. However, it fell short of the EU average in terms of digital skills indicators and business digitalisation, and it lagged behind in the deployment of Very High- Capacity Networks (VHCN). The metrics for digital public services increased, nevertheless, they were still below the EU average.

Overall, digitalization in Greece has been a growing trend in recent years, driven by a combination of government initiatives, private investment, and increased internet and mobile penetration.

2.2 National digital transformation trends, special focus of digital transformation within the business sector, especially for SMEs;

Digitization in Greek SMEs (small and medium-sized enterprises) lags behind other European countries, show European Commission's statistics. According to DESI 2022, and despite progress since 2019, although Greek SMEs use social media at a rate of 20%, which is the same as the average for the EU, and have increased their electronic sales channels, are still underperforming their EU counterparts in terms of integrating digital technologies, ranking 22/27. Data on SMEs digitisation have been available by the European Commission since 2016.

	Greece				EU
	DESI 2016		DESI 2015		DESI 2016
	value	rank	value	rank	value
4a1 Electronic Information Sharing % enterprises (no financial sector, 10+ employees)	37% (2015) ↓	12	40% (2014)	7	36% (2015)
4a2 RFID % enterprises (no financial sector, 10+ employees)	2.6% (2014)	26	2.6% (2014)	26	3.8% (2014)
4a3 Social Media % enterprises (no financial sector, 10+ employees)	18% (2015) ↑	11	17% (2014)	11	18% (2015)
4a4 eInvoices % enterprises (no financial sector, 10+ employees)	4.1% (2015)	28	n.a.	-	n.a.
4a5 Cloud % enterprises (no financial sector, 10+ employees)	6.5% (2015) ↑	21	4.7% (2014)	25	n.a.
4b1 SMEs Selling Online % SMEs (no financial sector, 10+ employees)	6.1% (2015) ↓	27	9.1% (2014)	23	16% (2015)
4b2 eCommerce Turnover % turnover of SMEs (no financial sector, 10-249 employees)	1.2% (2015)	28	n.a.	-	9.4% (2015)
4b3 Selling Online Cross-border % SMEs (no financial sector, 10+ employees)	3.4% (2015) ↓	26	4.3% (2013)	22	7.5% (2015)

2015-2016

Source: https://digital-strategy.ec.europa.eu/en 1

In 2016, SMEs' average online sales turnover increased significantly (5.9%), compared to 2015. In 2015, this figure was only 1.2%. But only a small number of businesses use technologies like e-Invoices (3%) or cloud services (6%). While manufacturing enterprises are scoring slightly better (12%) than the EU average (11%), in terms of digital intensity (ICT users and eCommerce), this highlights the significance of creating an Industry 4.0 plan for Greece's digital potential.

	Greece				EU
	DESI 2018		DESI 2017		DESI 2018
	value	rank	value	rank	value
4a1 Electronic Information Sharing % enterprises	37% 2017 →	12	37% 2015	11	34% 2017
4a2 RFID % enterprises	3.1% 2017 ↑	21	2.6% 2014	26	4.2% 2017
4a3 Social Media % enterprises	21% 2017 ↑	12	20% 2016	11	21% 2017
4a4 eInvoices % enterprises	6.5% 2017 ↑	27	2.7% 2016	28	NA 2017
4a5 Cloud % enterprises	5.5% 2017 →	28	5.5% 2016	25	NA 2017
4b1 SMEs Selling Online % SMEs	10.7% 2017 ↑	22	10.0% 2016	22	17.2% 2017
4b2 E-commerce Turnover % SME turnover	3.4% 2017 ↓	27	5.9% 2016	23	10.3% 2017
4b3 Selling Online Cross-border % SMEs	6.6% 2017 ↑	21	3.5% 2015	26	8.4% 2017

Source: https://digital-strategy.ec.europa.eu/ 3

Greece's industry as a whole performs weakly in incorporating digital technologies, despite progress. Businesses in Greece utilize social media at a rate of 20%, which is the same as the average for the EU. Small and medium-sized businesses (SMEs) are increasingly using electronic sales channels. The use of electronic information sharing is, however, higher than the EU average (34%), at 37%. Businesses utilize social media at the same rate as the EU as a whole (21%). While the proportion of businesses using electronic invoices rose to 6.5% in 2017, only 5.5% of them continued to use cloud services. Small and medium-sized businesses (SMEs) have a modest e-commerce turnover, yet 60% of those who sell online do so to foreign nations.

	Greece			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
4a1 Electronic information sharing % enterprises	37% 2017	37% 2017	38% 2019	34% 2019
4a2 Social media % enterprises	21% 2017	21% 2017	19% 2019	25% 2019
4a3 Big data % enterprises	11% 2016	13% 2018	13% 2018	12% 2018
4a4 Cloud % enterprises	5% 2017	7% 2018	7% 2018	18% 2018
4b1 SMEs selling online % SMEs	11% 2017	11% 2018	9% 2019	18% 2019
4b2 e-Commerce turnover % SME turnover	3% 2017	4% 2018	4% 2019	11% 2019
4b3 Selling online cross-border % SMEs	7% 2017	7% 2017	4% 2019	8% 2019

Source: https://digital-strategy.ec.europa.eu/ 6

In the EU, Greece is ranked 24th in 2020. The proportion of Greek businesses that share electronic information is still higher than the EU average. However, the proportion of businesses utilizing social media and the proportion of SMEs selling online both decreased in 2019 (9%, down 2% from 2018). Their percentage of online turnover remained modest at about 4% of total turnover, but it did not increase.

Greece took a major step in 2019 in terms of the digital services offered to launch a business. It created services for the online one-stop-shop platform, drastically cutting down on the time needed to launch a firm. By passing new legislation that was supported and put into effect by digital technology and applications, it achieved progress on licensing and inspection for all areas of the economy.

	Greece			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
3a1 SMEs with at least a basic level of digital intensity % SMEs	NA	NA	39% 2021	55% 2021
3b1 Electronic information sharing % enterprises	38% 2019	38% 2019	35% 2021	38% 2021
3b2 Social media % enterprises	19% 2019	19% 2019	29% 2021	29% 2021
3b3 Big data % enterprises	13% 2018	13% 2020	13% 2020	14% 2020
3b4 Cloud % enterprises	NA	NA	17% 2021	34% 2021
3b5 AI % enterprises	NA	NA	4% 2021	8% 2021
3b6 ICT for environmental sustainability % enterprises having medium/high intensity of green action through ICT	NA	65% 2021	65% 2021	66% 2021
3b7 e-Invoices % enterprises	9% 2018	NA 2020	NA 2020	32% 2020
3c1 SMEs selling online % SMEs	9% 2019	NA 2020	20% 2021	18% 2021
3c2 e-Commerce turnover % SME turnover	4% 2019	NA 2020	11% 2021	12% 2021
3c3 Selling online cross-border % SMEs	4% 2019	4% 2019	7% 2021	9% 2021

Source: https://digital-strategy.ec.europa.eu/ 8

Regarding the incorporation of digital technology into commercial activity, Greece is ranked 22nd in the EU.

According to the "Digital Readiness of Small and Medium-sized Enterprises in Greece" survey, which was carried out by the Athens University of Economics and Business' E-Business Research Center (ELTRUN) on behalf of COSMOTE, small and medium- sized businesses will become more digitally mature in 2022. The average Digital Readiness Index has increased by 10% since 2020, and 1 in 5 small and medium- sized businesses (SMEs) are already at an advanced level of digital readiness, compared to 1 in 2 SMEs that are still in the early stages. The biggest barriers to small and medium-sized firms using digital technologies appear to be a lack of knowledge, education, resources, and skills.

	Greece			EU
	DESI 2019	DESI 2020	DESI 2021	DESI 2021
3a1 SMEs with at least a basic level of digital intensity % SMEs	NA	NA	NA 2020	60% 2020
3b1 Electronic information sharing % enterprises	37% 2017	38% 2019	38% 2019	36% 2019
3b2 Social media % enterprises	21% 2017	19% 2019	19% 2019	23% 2019
3b3 Big data % enterprises	13% 2018	13% 2018	13% 2020	14% 2020
3b4 Cloud % enterprises	7% 2018	7% 2018	NA 2020	26% 2020
3b5 AI % enterprises	NA	NA	34% 2020	25% 2020
3b6 ICT for environmental sustainability % enterprises having medium/high intensity of green action through ICT	NA	NA	65% 2021	66% 2021
3b7 e-Invoices % enterprises	9% 2018	9% 2018	NA 2020	32% 2020
3c1 SMEs selling online % SMEs	11% 2018	9% 2019	NA 2020	17% 2020
3c2 e-Commerce turnover % SME turnover	4% 2018	4% 2019	NA 2020	12% 2020
3c3 Selling online cross-border % SMEs	7% 2017	4% 2019	4% 2019	8% 2019

Source: https://digital-strategy.ec.europa.eu/ 7

The statistics show that Greek businesses are slowly embracing digital technologies; Greece's businesses are among the top users of artificial intelligence (34%), far higher than the EU average (25%), when it comes to the adoption of cutting-edge digital technologies. At 65%, Greece is just behind the EU average of 66% in terms of ICT for environmental sustainability. The same is true for big data analytics, where Greece ranks close to the average for the EU at 13%.

3.1 Actions performed by public and private authorities to support digital transformation

- The Public Sector

The Greek government has been actively promoting digitalization through various policies and programs. In 2016, the government launched the "Digital Greece"[2] program, which aims to promote digital literacy and innovation, as well as to improve access to digital services for citizens and businesses. The program includes initiatives such as the creation of digital hubs and the establishment of a national digital skills framework. In May 2016, in the context of the ex-ante Conditionalities of the European Structural and Investment Funds (ESIF)[3], the Greek government established a General Secretariat for Digital Policy, which is in charge of policy formulation, design, overall coordination, and monitoring of ICT investment implementation in the country. The new Ministry of Digital Policy, Telecommunications, and Media was also

established. Greece updated its National Digital Strategy, set up a new governance structure, and developed a new framework of the production of ICT projects.

In 2017, the "Document and Workflows Digital Management System, with Embedded Remote Digital Signatures" project was launched by the Ministry of Digital Policy, Telecommunications and Media after the Greek government inked a contract with OTE, the top telecom provider in the country. The goal of the digital document management initiative was to improve how the public interacts with government services.

Furthermore, Greece was the 12th nation to sign the High-Performance Computing declaration joining the rest of Europe in constructing the next generation of computing and data infrastructures (the EuroHPC declaration).

The 'Digital Transformation Bible' was put into effect by the Ministry of Digital in 2021. It sets out the strategic roadmap for Greece's digital transformation until 2025. The strategy covers six pillars: (i) connectivity; (ii) digital skills; (iii) digital state; (iv) digital business; (v) digital innovation; and (vi) integration of digital technology in every sector of the economy. Furthermore, Greece went on to publish its Operational Programme for the digital transformation (2021-2027) under the EU cohesion policy in October 2021, which will help it to implement all pillars of the strategy. It also participates in European initiatives and programs such as the Research and Innovation funding program Horizon 2020 (e.g. GLASS project) that contribute to the country's digital transformation.

In 2020, Greece launched the National Recovery and Resilience Plan Greece 2.0.[4] The Plan takes into account digital transformation in SMEs. Specifically, it includes steps to speed up the digitalization of Greek businesses, including incentives for SMEs' digital transformation initiatives (such as the Action "Digital Transformation of SMEs"[5]). Also, the plan's reforms and investments are meant to assist SMEs in adopting new digital technologies, creating innovative digital solutions catered to the unique requirements of their industries, and expanding their digital presence.

The plan also includes a budget for the digitalization of major businesses and €330 million for the digitalization of SMEs as loan facility funding. There is also a measure called "Accelerating Smart Manufacturing" that aims to give financial support to small and medium-sized manufacturing enterprises so they can upgrade their manufacturing equipment using cutting-edge smart technologies with minimal environmental impact, and improve their technological infrastructure.

The Ministry of Digital Governance's KEP Plus pilot program is a noteworthy effort which will build on the network of Citizen Help Centers in order to give start-ups and young entrepreneurs tailored support.

- The private sector

There has been a growing number of technology startups and companies in Greece, particularly in the areas of fintech and e-commerce. The Athens Stock Exchange[6] has also launched a new platform for trading and clearing of derivatives, a move towards digitalizing the stock exchange. The Hellenic Development Bank established the "Business Innovation Greece" program for projects in green industry innovation, blue growth, and ICT, as well as the "4th Industrial Revolution" program to invest in new or existing SMEs to develop products and services related to digital technology. Both of these funding schemes aim to support the digital development of businesses. The Operational Programme "Competitiveness, Entrepreneurship and Innovation" (EPAnEK) under the European Regional Development Fund is another source of funding for digitizing businesses.

Hellenic Federation of Enterprises (SEV), which is a private organization, supports Greek companies as they adjust to the reality, demands, and opportunities of the digital economy and society. Building business capability and exchanging knowledge on new OT/IT trends, opportunities, risks, advantages, and best practices are part of the first pillar. This is accomplished through specialized meetings with experts, workshops, seminars, and networking events on subjects including the Internet of Things, artificial intelligence, cloud computing, connectivity, cybersecurity, digital twins, workflow automations, and so on.

However, there are still some challenges to digitalization in Greece. One major challenge is the lack of digital skills among the population and the lack of ICT training that enterprises provide to their employees.

4 Exploitation of BIC technologies: Big Data, Internet of Things and Cybersecurity

4.1 Status quo of BIC technologies in the country

Greek SMEs have a lower rate of big data adoption compared to the EU average. Factors that contribute to this include a lack of understanding of the benefits of big data and a lack of digital skills among Greek SME employees.

Greek SMEs also face challenges in accessing and analyzing large amounts of data, as well as a lack of funding to invest in big data technologies. Additionally, the data protection and privacy laws in Greece may make it difficult for SMEs to collect and use customer data.

Greece usually follows other countries in terms of technology adoption rate and penetration, due to the barrier of language in many cases. Voice controlled devices is such a case, since there is no Greek language support in any of the big platforms (Apple, Google, Amazon), although there is partial support by Google's Search Assistant and there is a Greek company, MLS Multimedia, that builds its own voice control systems. Virtual/augmented reality is gradually catching up, but is more often used in advertising/marketing campaigns than in business applications. The use of the cloud is quite usual in Greek enterprises, but more advanced technologies like robotics and machine learning are currently used mostly in lab and academic environments. Internet of Things and Big Data technologies are also catching up gradually, while some other pioneering technologies like Blockchain are next on the hot list for enterprises.

Greece continues to show commitment to advancing new digital technologies - in line with the Digital Europe Programme - by signing the Quantum Declaration(6) of cooperation to develop and deploy a European Quantum Communication Infrastructure. Following the signature of the declaration on cooperation on Artificial Intelligence (AI) in 2018, Greece is now developing a national strategy on AI, consulting stakeholders, and working on issues related to data collection and quality, ethical dimension of AI and skills for AI.

At the beginning of 2020, Greece has 14 Digital Innovation Hubs (9 fully operational, and 5 more in preparation(7)) covering market sectors as diverse as agriculture, fishing, construction, manufacturing, transport and electricity through a wide spectrum of advanced technologies such as additive manufacturing, AI and cognitive systems, cybersecurity and blockchain, big data and photonics.

4.2 Future Developments

The digitization of the public sector helped significantly the evolution of SMEs as 21% of digital services available on the gov.gr platform involve digital interaction between businesses and public administration. Digitalizing processes, and simplifying them along the way, makes a difference in terms of saving time and resources, according to the Hellenic Federation of Enterprises SEV. It should be noted that, during the pandemic, emphasis was given on digital interaction with citizens, and rightly so.

Enterprises are now eager to see more digital steps related with doing business and investment, such as interoperability of different public administration platforms and registries, or digitizing processes

related with state aid, taxation, public procurement, commerce, trade, logistics, cargo, invoicing and the supply chain.	
Main findings	• Digitization has been slow to take off compared to other European countries due to a lack of government support and a lack of technological infrastructure. • Poor DESI scores are the result of both inefficient national strategies and the lack of cooperation between the public and the private sectors. • The country needs to address its serious lack of digital skills. Greece experiences a "brain drain," yet tackling the scarcity of ICT professionals is still essential to advancing the industry's digital transformation. The emphasis on digital competencies and abilities should be given top priority in the education sector. If put into practice effectively, the Greek National Coalition for the Digital Skills and Jobs might also contribute to the development of industrially relevant digital skills and better collaboration, particularly between the public, the educational, and the business sectors. • A key factor in the digital transformation is encouraging business adoption of digital technologies. Greece would also gain from an Industry 4.0 program that would help the country create detailed digitalization strategies for the industry. • The longer it takes to close the digitalization gap between Greek SMEs and their EU counterparts, the greater the competitiveness loss. Regardless of the industry, the companies that stand out are those that are already planning for a digital future.

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DigitUp. Digital Upgrade skilling of SMEs and self-enterprises	
Work Package 2 - Online assessment tool for the measurement of digital skill levels **Activity 2: State of Play Report**	
Identifier	Prios, Norway
Time horizon	2019-2025
Research objectives	Describe the main objectives of your State of Play Report research. Use bullet point list format. - Status quo of digital transformation in Norway - Support and obstacles to digital transformation in the business sector - Support and obstacles to digital transformation - The exploitation of BIC technologies: Big Data, Internet of Things and Cybersecurity
Research items	**I. Status quo of digital transformation in the business sector** ● National digital transformation trends, a special focus on digital transformation within the business sector, especially for SMEs; ● National legislation, strategic documents regulating digital transformation; ● Digital transformation of the country relative to the European average;

	II. Support and obstacles to digital transformation ● Actions performed by public authorities to support digital transformation; ● Existence and availability of support resources, i.e.. excellence centres, coaching programs, sectoral training, etc.; ● Public and/or private funding opportunities for digital transformation; **III. The exploitation of BIC technologies: Big Data, Internet of Things and Cybersecurity** ● Status quo of BIC technologies in the country; ● Degree of application of BIC technologies within the business sector, focus on SMEs;

Research body

I. Status quo of digital transformation in the business sector

In a survey among Norwegian companies (KPMG, 2020), 93 per cent say that they have carried out digitization projects in the last two years. This is an increase from 83 per cent in 2014. 65 per cent say that the project has been successful, compared to 47 per cent in 2014. The most used technologies are digital interaction tools and the use of cloud services and cloud platforms. The most important motivation for digitizing is efficiency, but more than half also say that they digitize to give customers a better experience. In professional terminology, a distinction is made between digital optimization and digital transformation. Digital optimization is about streamlining existing activities, e.g. in that traditional banking services are offered via mobile devices. Digital transformation aims at more comprehensive changes with the help of ICT, where all or parts of the value chain are embodied in software. It can be about process innovations, organizational innovations or new business models. Digital transformation involves greater restructuring and risk than digital optimisation, but the potential gains and consequences for established industries and workplaces can also
be greater.

Public sector has a government strategy. The strategy that is applied to the public sector in the period 2019–2025. The direction for the work on digitization of public services is firmly in line with

the guidelines in Meld. St. 27 (2015–2016) Digital agenda for Norway, and the strategy is a follow-up to this. The strategy applies at an overall level and provides guidance for digitization work in the public sector and any sector- specific strategies. The strategy is cross-sectoral and must both safeguard an overall perspective and support sectoral targets for digitalisation of the public sector.
The change in the use of digital tools when the pandemic hit Norwegian businesses has been referred to as shock digitalisation. The SME barometer for 2023 nevertheless shows that only 6 out of 10 are now implementing measures to digitize their business. This is a decrease from 7 out of 10 last year.
The decline can partly be explained by a more weakened economy: 10 per cent justify the company's finances by not implementing measures, compared to 2 per cent last year. The main reason why measures are not implemented is nevertheless that half of the businesses do not see the need or feel digitization is relevant to their business. This suggests a competence gap in SMEs in digitalisation.

Despite the fact that digitization is progressing more slowly, it is still a positive development. The degree of measurement and reporting of measures has increased. 1 in 3 measures implemented measures, compared to 21 per cent last year, and we see a corresponding increase in systematic reporting. SMEs seem to have a more targeted approach in their work, and profit realization is the focus. It reflects an increased maturity.
When more people also express dissatisfaction with their own ability to digitize, this shows an increased awareness of an unmet need and that they are not where they want to be. The digitization measures are more advanced than last year. Especially in the larger companies. They state that they have measures that deal with solutions to put in place complete financial systems, quality systems, order management solutions, e-commerce solutions and CRM, as well as digital production systems with reporting.

In the case of the smallest businesses, we see that the digitization measures are simpler, such as a transition to digital storage solutions, the introduction of an accounting system or simple solutions for websites and online orders.

1.1. National digital transformation trends, a special focus on digital transformation within the business sector, especially for SMEs

Trends that affect business Digital technologies, often in combination with other enabling technologies, bring with them new opportunities for job and value creation, but also lead to challenges for existing industries and social structures.
BDO`S SMB Barometer says:
The change in the use of digital tools when the pandemic hit Norwegian businesses has been referred to as shock digitalisation. The SME barometer for 2023 nevertheless shows that only 6 out of 10 are now implementing measures to digitize their business.

This is a decrease from 7 out of 10 last year. The decline can partly be explained by a more weakened economy: 10 per cent justify the company's finances by not implementing measures, compared to 2 per cent last year. The main reason why measures are not implemented is nevertheless that half of the businesses do not see the need or feel digitization is relevant to their business. This suggests a competence gap in SMEs in digitalisation. A business must have enough digital competence to understand the value of technology and digital tools.

There is therefore reason to believe that several businesses have more to gain from digitalisation than they themselves are aware of. Despite the fact that digitization is progressing more slowly, it is still a positive development. The degree of measurement and reporting of measures has increased. 1 in 3 measures implemented measures, compared to 21 per cent last year, and we see a corresponding increase in systematic reporting.
SMEs seem to have a more targeted approach in their work, and profit realization is the focus. It reflects an increased maturity. When more people also express dissatisfaction with their own ability to digitize, this shows an increased awareness of an unmet need and that they are not where they want to be.

The digitization measures are more advanced than last year. Especially in the larger companies. They state that they have measures that deal with solutions to put in place complete financial systems, quality systems, order management solutions, e-commerce solutions and CRM, as well as digital production systems with reporting. In the case of the smallest businesses, we see that the digitization measures are simpler, such as a transition to digital storage solutions, the introduction of an accounting system or simple solutions for websites and online orders. Among these, only half say that they implement measures, and then with little measurement and reporting.

This year's survey shows that information security is now on the agenda for SMEs. Information security is one of the most central trends in digitalisation, and with a media image that reports on daily attack attempts against Norwegian businesses, even the smallest have realized that they are possible targets. Regulatory requirements change continuously and create uncertainty around framework conditions. 1 in 3 businesses believe that digitization can contribute to better compliance with the requirements. Together with the security aspect, we see that SMEs are concerned with securing the framework for their operations. The ability of SMEs to contribute to an increased pace of innovation is critical for Norwegian business to remain strong. We are tracking a positive development in terms of digital maturity and digitization breadth, even if the economic situation is helping to slow down the pace.

1.2 National legislation, strategic documents regulating digital transformation

The National Resource Center for the Sharing of Data has established an input solution where the target groups can record regulatory challenges. So far, it appears that obstacles often stem from complexity, low competence and uncertainty around the regulations. The resource center would like input on concrete obstacles in the link below. The resource center also provides guidance on the legal framework for sharing data and collaborates with the "cohesive services" project in Digdir. Guide for digitization-friendly regulations and clear legal language was published in 2021. When the guide is published, in 2022 the initiative will be taken up to mention and refer to a guide for digitization-friendly regulations in the guide Legislative technique and legislative preparation.

1.3 Digital transformation of the country relative to the European average

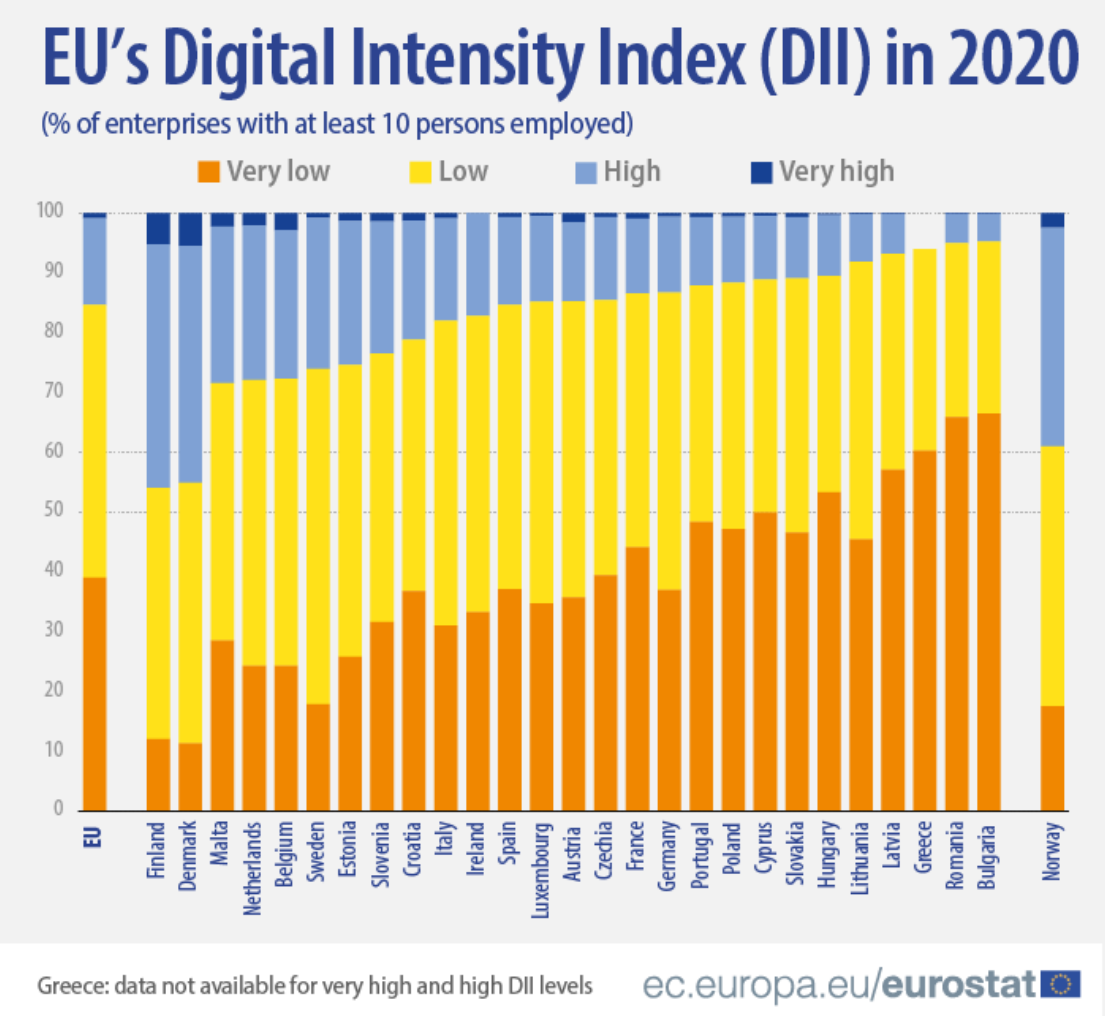
The uptake of digital technologies by businesses has the potential to improve services and products as well as to increase competitiveness. The crisis caused by COVID-19 has also shown that digitalisation is a crucial tool to improving the economic resilience of businesses.

In 2020, only 1% of EU enterprises with at least 10 persons employed reached a very high level of digital intensity while 14% reached a high level. The majority of the enterprises recorded low (46%) or very low (39%) levels. Compared to 2018, the Digital Intensity Index (DII) has seen a general improvement at the EU level, with increases at both very high (+5.0 percentage points (pp)) and high (+0.4 pp) levels.

The DII measures the use of different digital technologies by enterprises and its score (0-12) is determined by how many of the 12 selected digital technologies the enterprises use. The higher the score, the higher the digital intensity of the enterprise, ranging from very low to very high.

Eurostat data show that 9% of the EU's large enterprises had a very high DII and 42% a high level, while only 2% of medium-sized companies registered a very high-intensity level and one-quarter (25%) a high DII. Only 0.4% of small enterprises reached a very high digital intensity, with only 12% scoring a high DII.

Almost half of the medium (47%) and small (46%) size enterprises showed a low level of digital intensity.



II. Support and obstacles to digital transformation

Investments in digital processes and the digital expertise required to develop and operate them can be more demanding for small and medium-sized enterprises than for large enterprises. SMEs (fewer than 100 employees) make up 99 per cent of Norwegian companies and 47 per cent of employees in the private sector. Norwegian business reports that competence is the most important obstacle to digitalisation, both in its own industry and in its own business. Close to half of the respondents in the KPMG survey state that a lack of expertise prevents digitization of their business processes to a large or very large extent.

There is several institutions that offers skills development, education and other business consultancy to help SME`s.

2.1 Actions performed by public authorities to support digital transformation Digitization measures still about digitizing or automating established processes. The companies highlight the following examples of digitization measures:

- Digitization of payroll and personnel systems, accounting, invoicing and HSE.
- Digitization of customer data and customer management, electronic communication with customers.
- Transition to cloud services and cloud solutions.
- Facilitate trading via the website and general ease of use for the customer.
- IT security measures and quality assurance.

2.1 Existence and availability of support resources, ie. excellence centers, coaching programs, sectoral training, etc.

SMEs in Norway have access to a broad and diversified ecosystem of innovation to support the digital transformation challenges:

- SME`s Associations
- Innovation Norway with local Hubs spread out over the country,
- Study centers, VET Schools, University/University Colleges offers a wast variety of education to people in all vocations and to enhance competencies in all areas.
- Local Business hubs systems that represents the various industries in relevant arenas and is an active player in the collaboration with municipalities and other public players. They covers large parts of the country from the coast to the mountains. The hubs work closely with both

political and administrative management in all municipalities. These are independent organizations whose purpose is to promote business in the region, and thus contribute to increased value creation in existing businesses and an improved basis for new establishments

2.3 Public and/or private funding opportunities for digital transformation

Main funding in Norway for digital transformation is from the national budget, EU funding and county funding one can apply for. Education is provided at low or no cost as continuing education where Businesses are linked with educational institutions that provide the skillset SME`s require. There are several private companies/ educational institutions that provides this for a price.

III. The exploitation of BIC technologies: Big Data, Internet of Things and Cybersecurity

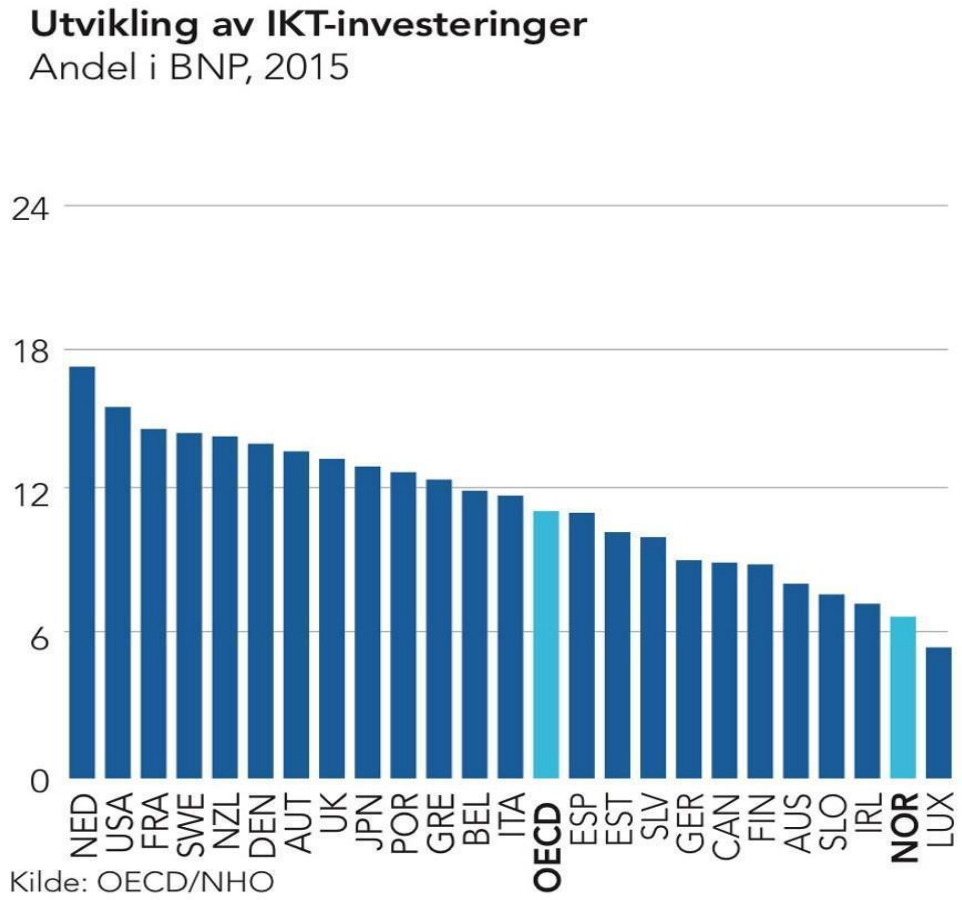
In the mature economies, data-driven innovation may become one of the most important drivers behind economic growth going forward. More data is now being produced every week than there was during the entire previous millennium (Meld. St. 27 (2015—2016)). Large amounts of data are included in production processes and business models that are becoming increasingly valuable for the countries' economies. The development is driven by increased data capacity and computing power and includes technologies such as the Internet of Things, big data, cloud solutions and artificial intelligence. These technologies provide unimaginable possibilities for monitoring, managing and analyzing production processes within almost all industries. The OECD refers to studies which estimate that companies that manage to benefit from data-driven innovation have 5-10 per cent higher productivity growth than others. They also have a higher return on invested capital and a higher market value (OECD 2015a). But there is great uncertainty attached to these figures, and the variations are large between industries.

At the same time as digitization and the data-driven innovation economy have great potential for higher competitiveness and value creation in both the private and public sector, the development presents challenges, including that certain tasks may be taken over by digital solutions. The OECD estimates, for example, that 14 per cent of workers in industrialized countries have a high risk that many of their work tasks will be automated in the next 15 years, and that a further 30 per cent will

face major changes in their work tasks, and consequently in the competence requirements as a result of automation (OECD 2018).

Measured as a share of GDP, Norway invested less in ICT in 2015 than in 2000, and less than the average in the OECD area (OECD 2017a). Together with low use of key technologies and low diffusion of innovations in the business world, low ICT investments can prevent job and value creation in the Norwegian economy in the future.

The oil and gas industry has signaled that in the coming years they will invest significantly in digitalisation, automation and robotisation in order to compete for global market shares. This can be an important contribution to securing volume, capital and development of a Norwegian digital supplier industry that can deliver products and services for use in industry, in the same way that the oil and gas industry was essential to building up a mechanical supplier industry in Norway.



3.1 Status quo of BIC technologies in the country

Norwegian companies should be proactive and find niches in the markets, develop digital platforms themselves and take part in digital ecosystems. The increased impact decentralized networks have - for example made possible through blockchain technology - means that companies must both be able to reduce their own transaction costs and seek new income opportunities and new markets. In sum, the triple disruption is about combining two aspects of digitization – producing goods and services more efficiently and with better quality and developing new revenue models based on the needs that arise in the markets. In a situation with many and rapid technological changes and higher competitive pressure, the ability to test out new solutions also becomes absolutely central, even where the new solutions prove to challenge existing business models in the companies.

Norway is a country of small and medium-sized enterprises. It can mean an additional challenge to carry out the changes required - both in terms of resources and expertise. Norway's advantage is therefore not in size and scope, or necessarily in the technology as such, but in our overall ability to go from technology to profit realization faster than our competitors. Cooperation and trust - between small and large companies, between companies from different industries and between companies and the public sector - will be central to our companies being able to increase their competitiveness in the face of the changes digitization opens up.

3.2 Degree of application of BIC technologies within the business sector, focus on SMEs

First and foremost, the business world should face the digital upheaval – or the triple disruption – by getting its own house in order. To take advantage of the new technologies that are coming, companies must have the basic digital infrastructure in place, good information management and clear goals. Without this, you will not be able to utilize the information internally in the company, not be able to interact and share information with other companies or be able to build new services based on the data and infrastructure you have.

Disruptive innovations and new technologies have no effect in themselves, unless one is willing to implement the changes that need to be put in place - in the organization (structure, competence, partnerships, etc.) in work processes and probably also in business models.

The fact that data-driven innovation will become more important in the future means that the ability to turn data into insight will be decisive for which companies and industries will succeed in the future. For companies, it will be particularly important to acquire knowledge about the possibilities that lie in the use of the Internet of Things, big data analysis and artificial intelligence. The increasingly important digital platforms mean that companies should seek to exploit the advantages of this form of open ecosystem.

Main findings	• Digital transformation drives the general economic system, with higher degree of performance respect the economy in general; • Public budgets are investing in digital transformation, with particular emphasis on the digital-manufacturing interconnection and the adoption of digital technologies within SMEs; • Big Data, Cybersecurity, Internet of Things, are high-performing technologies; SMEs and micro are also focused on ERP and e-commerce demand; • Digital skills are now at the core of the policies dealing with digital transformation • Several institutions of education (or similar initiatives) have been experimented to effectively link VET institutions with enterprises, dealing with digital transformation.

Sources

List the source used throughout the research process. You can opt for a citation style of your choice. For online sources, hyperlink has to be included.

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Cyprus

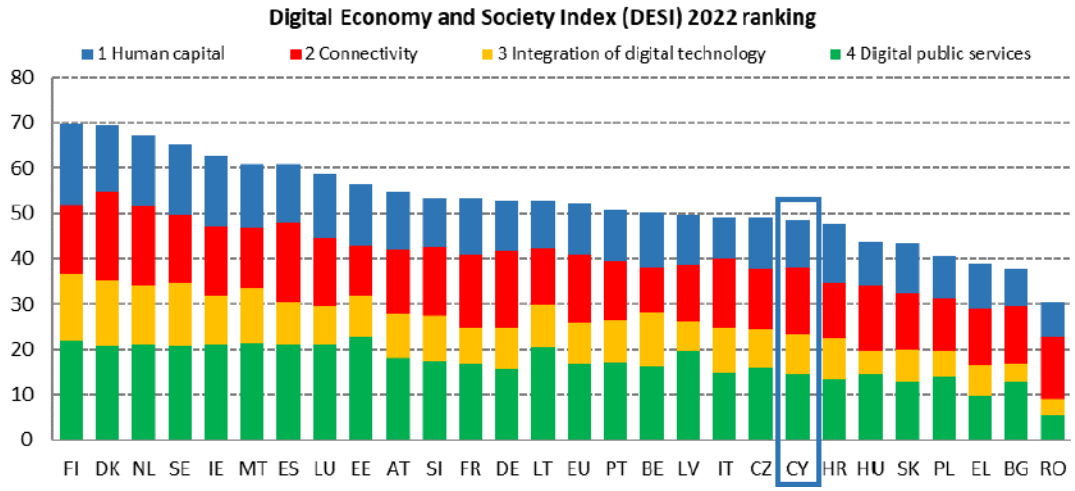
DigitUp. Digital Upgrade skilling of SMEs and self-enterprises	
Work Package 2 - Online assessment tool for the measurement of digital skill levels **Activity 2: State of Play Report**	
Identifier	SYNTHESIS CENTER FOR RESEARCH AND EDUCATION LIMITED (Synthesis) Republic of Cyprus (Cyprus)
Time horizon	1. Analysis 2016- 2022 2. Strategic overview up to 2030
Research objectives	• Analyse Cypriot business sector development in terms of digital transformation and in relation to the EU average; • Identify national digital transformation trends; • Map out the legislative framework and incentives that regulate and encourage digital transformation in Cyprus; • Identify challenges and obstacles to the use of digital technologies by SMEs; • Identify funding opportunities and support resources for digital transformation; • Indicate the national aims in terms of BIC technologies exploitation.
Research items	• National digital transformation trends in business sector, as relating to SMEs; • National legislation and funding schemes; • Funding programmes, governmental and non-governmental initiatives and opportunities supporting digital transformation; • Business investment in BIC technologies; • Forecasts and national strategies relating to digital transformation.

Research body

1. Digital transformation in Cyprus in relation to the EU average

Digital Economy and Society Index (DESI) is a monitoring tool of the European Union, recording the digital progress of the Member States since 2014. The 2022 country report on Cyprus[1] presents the 2021 research results, according to the indicators outlined in the Commission's 'Path to the Digital Decade Policy Programme' which sets targets for the 2030 sustainable digital transformations across EU. Considering the results pertaining to indicators grouped to 4 main themes including Human Capital, Connectivity, Integration of digital Technology, and Digital Public Services, Cyprus ranks 20th amongst the EU Member States. Although Cyprus scores below the EU average, the country's relative progress is above expected rate.

	Cyprus		EU
	rank	score	score
DESI 2022	20	48.4	52.3



Source: https://digital-strategy.ec.europa.eu/en/policies/desi

3 Integration of digital technology	Cyprus		EU
	rank	score	score
DESI 2022	17	35.3	36.1

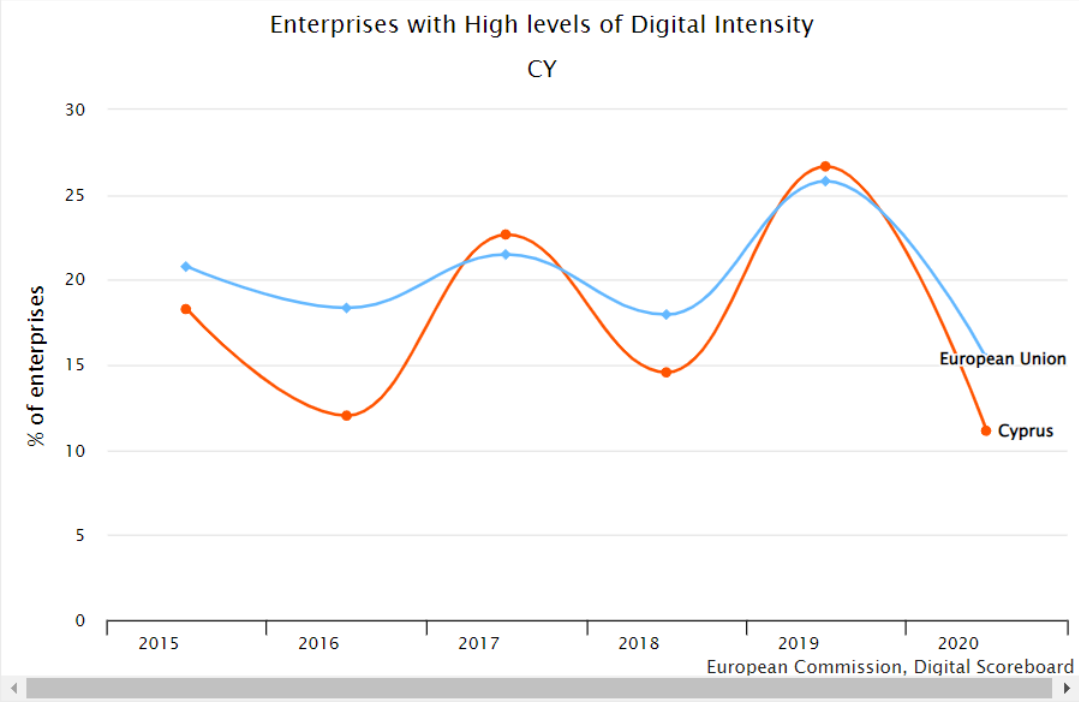
	Cyprus			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
3a1 SMEs with at least a basic level of digital intensity % SMEs	NA	NA	66% 2021	55% 2021
3b1 Electronic information sharing % enterprises	33% 2019	33% 2019	34% 2021	38% 2021
3b2 Social media % enterprises	38% 2019	38% 2019	42% 2021	29% 2021
3b3 Big data % enterprises	5% 2018	6% 2020	6% 2020	14% 2020
3b4 Cloud % enterprises	NA	NA	42% 2021	34% 2021
3b5 AI % enterprises	NA	NA	3% 2021	8% 2021
3b6 ICT for environmental sustainability % enterprises having medium/high intensity of green action through ICT	NA	NA 2021	NA 2021	66% 2021
3b7 e-Invoices % enterprises	11% 2018	13% 2020	13% 2020	32% 2020
3c1 SMEs selling online % SMEs	12% 2019	15% 2020	17% 2021	18% 2021
3c2 e-Commerce turnover % SME turnover	8% 2019	5% 2020	5% 2021	12% 2021
3c3 Selling online cross-border % SMEs	9% 2019	9% 2019	8% 2021	9% 2021

Source: https://digital-strategy.ec.europa.eu/en/policies/desi

Moreover, DESI Report on Cyprus outlines the progress of integration of the digital technology in business activities. Here Cyprus ranks higher position, as 66% of SMEs are reported to have at least basic level of digital intensity, which is over 10% more than the European average. The digitization of Cypriot enterprises follows different trends to the European averages:

- Social media is widely used for information sharing, although generally sharing information electronically is less frequent than EU average.
- The online trade within the country and beyond its borders is equivalent to the EU average.
- BIC technologies: The use of cloud services is popular in Cyprus, scoring above EU average. Nonetheless, much fewer businesses use big- data analytics and AI than in other EU states. With percentages as low as 6% and 3% respectively, there is a steep need for improvement in the use of BIC technologies to reach the 75% Digital Decade targets.
- E-commerce turnover data also exposes the need for improvement, with the use of e-invoices and corporate turnover falling far below EU averages.

Overall, according to the data published by Eurostat[2] it can be observed that the digital developments and intensity of digital activity performed by SMEs in Cyprus corresponds to the EU trends, being affected by the European and global economic and social changes. Alike the other EU Member States, Cyprus is currently facing a steep decline of digital intensity, which follows the initial peak of activity in response to the Covid-19 pandemic.



Source: Eurostat - Community survey on ICT usage and eCommerce in Enterprises

2. National legislation and strategies to incentivize digital transformation.

A governmental body, The Deputy Ministry of Research, Innovation and Digital Policy[3] has been appointed to implement an ambitious digital reform which seeks to support the development of a dynamic digital economy.

The digital reform in question is the *Digital Strategy 2020-2025*[4], a key policy document to accelerate digital transformation in Cyprus. The vision of the strategy is for "Cyprus to become a fit-for-the-future society and knowledge-based economy enabled by digital and emerging technologies that will drive sustainable economic growth, social prosperity and international competitiveness."[5] The strategy focuses on four objectives including creating a democratic, inclusive digital society, user-centered technology, sustainability, and resilient economy.

The impact on SMEs of the strategy relates to its aims, outlined within the Digital Economy Portfolio:

- Supporting the digitalization of local businesses and business sectors by providing upskilling, tools, support and guidance, to enable businesses regardless of type, sector and digital maturity level to make the most out of digital and build a more efficient and profitable way of delivering higher quality services/products.
- Boosting digital entrepreneurship by supporting start-ups and development of digital entrepreneur skills.
- Strengthening digital competitiveness by increasing businesses' capacity to adopt and explore digital technologies.
- Driving up the adoption if frontier and emerging technologies (incl. the adoption if national strategies for AI and Blockchain).

Furthermore, *The Cyprus Industrial Strategy Policy for 2019-2030*[6] adopted by the Council of Ministers includes a national action plan for transitioning to circular economy, of which the adoption of technologies, especially BIC and AI, is recognized as essential. Additionally, it seeks to boost the uptake of digital production systems and applications, build more smart factories, and integrate more advanced technologies and digital service infrastructures into Cypriot industry. The strategy is implemented by the *Ministry of Energy, Commerce and Industry.*

Moreover, Cyprus participates in the EU coordinated programmes and plans such as: *High Performance Computing (HPC), AI and quantum communication infrastructure (QCI) Declaration; EuroHPC Joint Undertaking on HPC, The EU Recovery and Resilience Fund, Digital Europe Program, Connecting Europe Facility, Horizon Europe, ETC* and other.

The legislation supporting **the exploitation of BIC technologies** includes:

- *The National Strategy on AI*[7]*:* with the implementation period until 2026. The strategy seeks to (i) to maximise investment through partnerships; (ii) to create national databases; (iii) to nurture talents and lifelong learning; (iv) and to develop ethical and trustworthy AI. The strategy calls for initiatives including improving public services, developing new forms of cooperation through AI, and deploying AI solutions in both internal public service operations and citizen services, including AI chatbots.
- *National Blockchain Law, 2021*[8]*,* establishing European Blockchain Service Infrastructure (EBSI) node(s). Cyprus is one of the few adopters of EBSI and in 2022 released a call

supported by the Digital Europe Programme to fund initiatives that reinforce EBSI infrastructure and EBP use cases, with the budget of 15 mln.

- *The National Cypersecurity Strategy* published in 2020[9] aims to consolidate a secure electronic environment and outlines special provisions and actions seeking to protect critical information infrastructures. National Cybersecurity Certification Authority has been established to implement the strategy and manage a budget of 6.5 mln for 2022.

The **strategies to incentivize the digital transformation of SMEs**, which result from the aforementioned legislation are:

- *The Sponsorship Scheme for the Digital Upgrade of Business*[10], funded by the EU Recovery and Resilience Facility (€30mln), subsidizes equipment, software and services required for digital upgrade, including cloud computing, big data, data analytics and the use of AI.
- *Certificate of Innovative Enterprises* issued as a support tool for the usage of tax incentives for natural persons investing in an innovative small and medium- sized enterprise (SME).
- *Cyprus Startup Visa* allowing talented entrepreneurs to enter, reside and work in Cyprus in order to establish / operate / develop a Startup with a high growth potential.
- *National Digitalization Funds* allocated within national budget.

3. Support and obstacles to digital transformation

Digital Innovation Hubs in Cyprus are supporting the digital developments in the country.*Cyprus Digital Innovation Hub (CyDI-Hub)*[11] is specifically networking universities, governmental bodies, investors, and businesses to develop cutting edge technology and to help Cypriot enterprises adopt them. The services provided by CyDI-Hub include: Business Support Services, Incubation Services, Technical Support Services, Interactive Media And Robotics support. Moreover CyDI-Hub supports the BIC technologies implementation through services such as:

- Corporate Operational Infrastructure Implementation and Maintenance, including a hybrid datacentre
- Public Cloud implementations, including pure cloud solution, cloud IaaS and hybrid cloud infrastructures
- Internet of Things [IoT] to Cloud research and innovation development
- Big Data analysis and a focus in contextual data analysis

- Enterprise grade SaaS developments with high degree of versatility through cutting edge web interfaces and mobile device endpoint implementations.

DiGiNN[12] has been approved and received funding as a European Digital Innovation Hub in Cyprus. DiGiNN brings together Cyprus' leading expertise in Artificial Intelligence, High Performance Computing, Cybersecurity, and other advanced digital technologies by engaging the country's Centres of Excellence and organizations addressing the twin European Transformation having excellence at their core. The hub supports SMEs by providing services such as upskilling and training in new technologies; providing support to find financing for digital upgrading; building innovation ecosystem and network of SMEs and start-ups around digital technologies; providing facilities for testing and evaluating technologies before making an investment.

Despite many recent developments and Cypriot's relative fast progress in terms of digital transformation, there are still many **obstacles that prevent SMEs from reaching the national and EU goals** (90% reaching basic levels of digital intensity by 2030. The obstacles referred to in the literature (Kapetaniou & Lee, 2019)[13], (Efstathiades & Papageorgiou, 2016)[14] (Matt et al., 2020)[15] include:

- Lack of awareness
- Limited access to digital resources
- Limited human resources and time
- Lack of internal knowledge base
- Limited interaction with international and domestic open innovation and luck of funding schemes supporting open innovation
- Low Customer Involvement and Co-creation to stimulate technological innovation
- Lack of financial resources, knowledge transfer from experts to SMEs and management tools to acquire and implement 4.0 technologies.

According to DESI, the digital transformation of the Cypriot economy depends on the digitization of SMEs, hence the following strategies in the national level should be considered: (i) the use of resources; (ii) public-sector processes; (iii) budget allocations; and (iv) other modes.

Main findings	• Cyprus ranks 20th in Digital Economy & Society Index, below EU average. • The digital transformation in Cyprus progresses at a faster rate than average, and substantial developments have been made in recent years in terms of legislation and support for digitalization of SMEs. • 66% of SMEs in Cyprus have at least basic level of digital intensity. • The use of BIC technologies is encouraged by the national legislation and schemes, however few SMEs use big- data analytics and AI (with percentages as low as 6% and 3% respectively) posing a big challenge to meet envisioned targets. • The obstacles preventing digitization of SMEs involve: lack financial, human and technological resources; inadequate public-sector processes; lack of knowledge base and knowledge transfer.

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Bulgaria

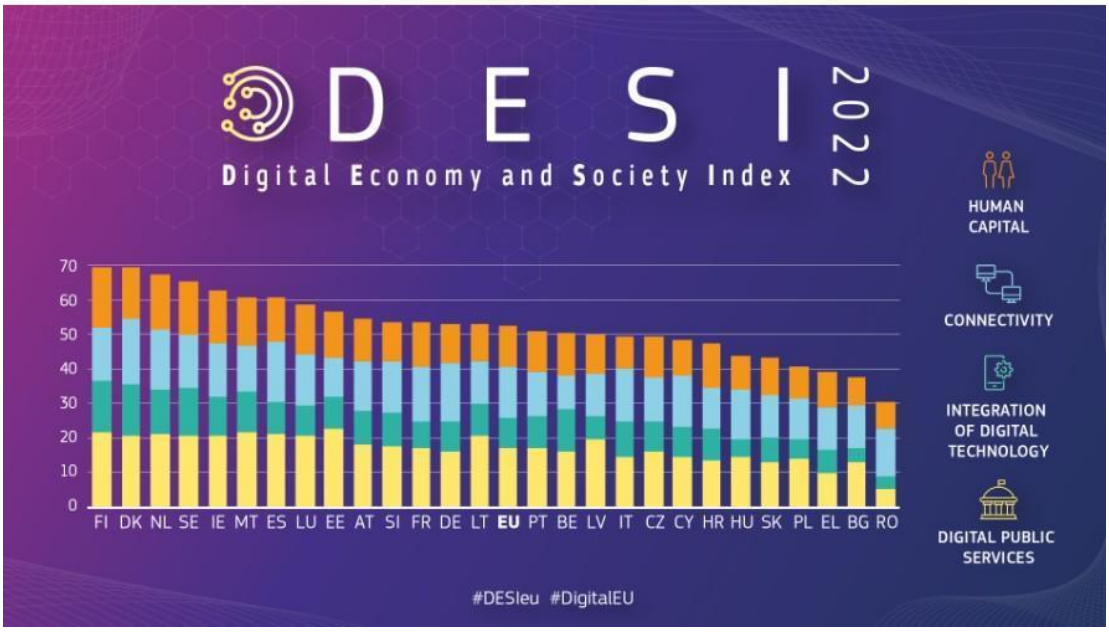
DigitUp. Digital Upgrade skilling of SMEs and self-enterprises	
Work Package 2 - Online assessment tool for the measurement of digital skill levels **Activity 2: State of Play Report**	
Identifier	Balkan Bridge, Bulgaria
Time horizon	Time horizon of the current research State of Play Report on Bulgarian level outlines 2 main time dimensions: 1. Analysis/Data up till 2022 2. Strategic overview to 2030
Research objectives	I. Defining the overall level of digital transformation in the Bulgarian business sector within the European context II. Following the percentage of exploitation of technologies (Big Data; AI; Cloud Computing; e-Commerce) of Bulgarian SMEs & self-enterprises through DES Index III. Mapping the supporting actions performed by Bulgarian national authorities IV. Summarising the assessed financial resources required & Identifying the sources of financing
Research items	❖ National digital transformation trends, special focus of digital transformation within the business sector, especially for SMEs; ❖ Digital transformation of the country relative to the European average; ❖ Actions performed by public authorities to support digital transformation; ❖ Digital transformation of the country relative to the European average; ❖ Status quo of BIC technologies in the country; ❖ Degree of application of BIC technologies within business sector, focus on SMEs;

The digital transformation is a necessary process of technological development of Bulgaria in order to create conditions for innovation and business growth, increase the efficiency of the workforce, a competitive digital economy, and a high citizens' standard. Guided by the strategic goals of our country for accelerated economic development, demographic growth and reduction of social inequalities, set in the "National Development Program of Bulgaria 2030", by 2030 Bulgaria should build a functioning and secure environment to unlock the full potential of digital technologies for the digital transformation of all key sectors, reaching the average European values under the Digital Economy and Society Index DESI.

1. **What is the Digital Economy and Society Index (DESI)?**

The European Commission reports annually on digital progress in the EU Member States through indicators that compose the Digital Economy and Society Index (DESI).The Digital Economy and Society Index (DESI) summarises indicators on Europe's digital performance and tracks the progress of EU countries. The European Commission has been monitoring Member States' digital progress through the Digital Economy and Society Index (DESI) reports since 2014. Bulgaria ranks last under this Index with amounts below 40 as 53 is EU members' average.

DESI 2022



Source: https://digital-strategy.ec.europa.eu/en/policies/desi

2. **Technology usage among Bulgarian SMEs & Enterprises. What does the data say?**

The Path to the Digital Decade target requires that more than 75% of EU companies adopt big data by 2030. Big data is characterized by volume, variety and velocity, i.e., vast amounts of data, which are complex in nature, in different formats and frequently generated. Big data analytics refers to the use of technologies, techniques or software tools such as data or text mining and machine learning, for analysing big data extracted from the enterprise's own data sources or other data sources.

Figure 51 Enterprises analysing big data (% of enterprises), 2020

Source: Eurostat, European Union survey on ICT usage and e-commerce in enterprises.

2.1 Artificial intelligence (AI)

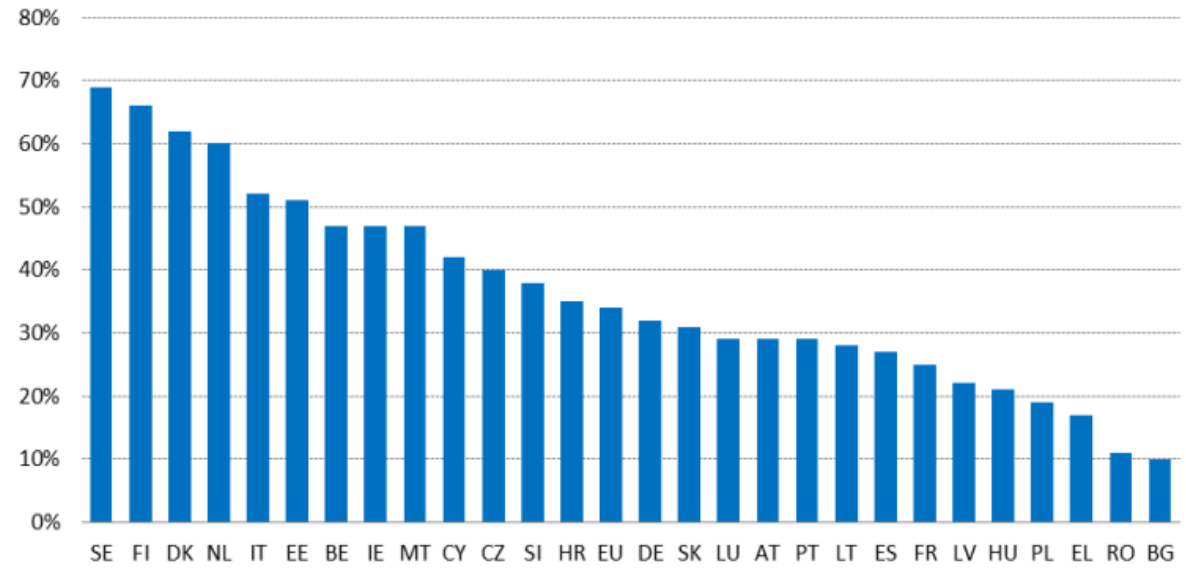
The Path to the Digital Decade target[1] requires that more than 75% of EU companies adopt AI technologies by 2030. The uptake of AI technologies in the European Union is generally quite low, at 8%. However, there are some differences among Member States.

As the graphic above illustrates, there are 10 countries that have an adoption rate of AI technologies of more than 10%, with Denmark (24%), Portugal (17%) and Finland (16%) leading this group. There are seven countries with an uptake rate between 5 and 10%, Croatia, Austria, Spain, Ireland, France, Italy and Slovakia. Another 10 countries have a very low adoption rate, and do not reach 5% (such as **Bulgaria**, Estonia, Cyprus, Hungary and Poland, each **3%**). With 1%, Romania has the lowest uptake in the EU. This is in line with the very low level of overall digitisation of enterprises in Romania. Even basic technologies are not widely used by enterprises (the share of

SMEs with at least a basic level of digital intensity is the lowest in the EU), consequently more advanced technologies are not widespread either.

2.1. Cloud computing

The Path to the Digital Decade proposal requires that more than 75% of EU companies adopt cloud computing by 2030. In 2021, 34% of EU enterprises purchased sophisticated or intermediate cloud computing services (i.e. at least one of the following: finance or accounting software applications; enterprise resource planning (ERP) software applications; customer relationship management (CRM) software applications; security software applications; hosting the enterprise's database(s); computing platform providing a hosted environment for application development, testing or deployment) and incorporated technologies to improve their operations while reducing costs. The cloud uptake of large companies (60%) almost doubled that of SMEs (33%) in 2021. cl



Source: Eurostat, European Union survey on ICT usage and e-commerce in enterprises.

As shown from the graphic above, the percentage of **Bulgarian** Enterprises using Cloud Computing is **10%** with an average for the EU of 34%.

2.1 e-Commerce: Trading of goods and services on the internet

The European Commission put forward two legislative proposals to upgrade rules governing digital services in the EU: the Digital Services Act (DSA) and the Digital Markets Act (DMA). They form a single set of new rules applicable across the whole EU to create a safer and more open digital space.

The DSA and DMA have two main goals:

(i) to create a safer digital space in which the fundamental rights of all users of digital services are protected; and

(ii) to establish a level playing field to foster innovation, growth and competitiveness, both in the single market and globally.

Around one in five EU small and medium sized enterprises (SMEs) made online sales in 2021, amounting to 12% of total turnover. Between 2015 and 2021, the percentage of SMEs selling online increased by 3 percentage points and the turnover of these companies achieved from online sales increased by 2 percentage points.

Enterprises benefit from cross-border e-commerce by exploiting economies of scale. This helps to reduce costs, increase efficiency, promote competitiveness and improve productivity. Cross-border e-commerce is even more important for enterprises and especially SMEs that are confined to a small home market. However, only 9% of SMEs made web sales to customers in other EU countries in 2021. SMEs in Denmark, Sweden, Ireland, Lithuania and Belgium have the largest proportion of online sales (30% or more). Austria leads in cross-border online sales (16% of Austrian enterprises have online sales across borders to other EU countries), followed by Belgium, Denmark, Malta and Slovenia (all above 13%).

Vision for the Future: National Development Programme BULGARIA 2030[2]

The National Development Programme BULGARIA 2030 adopted by Protocol No. 67 of the Council of Ministers of 2 December 2020 is a strategic framework document of the highest order in the hierarchy of national programming documents.

The document is based on the vision, goals and priorities of the National Development Programme BULGARIA 2030 approved by Decision No. 33 of the Council of Ministers of 20 January 2020. Three strategic goals have been determined – accelerated economic development, demographic upswing and reduction of inequalities, the implementation of which is envisaged through targeted policies and interventions, grouped into five interconnected and integrated development axes and 13 identified national priorities. The National Development Programme BULGARIA 2030 consists of

detailed strategies for the priorities, an indicative financial framework, a preliminary impact assessment, as well as a mechanism for monitoring the implementation of the strategic document. For the purpose of DigitUp State of Play Report, Priority 3.1 will be reviewed.

Priority 3: Smart Industry

Digitalisation of the economy and industry

The main goal of the sub-priority is to provide conditions for digital transformation of the economy and the industry and catching up in its digitalisation, through targeted and focused government support, to create opportunities to increase the share of Bulgarian enterprises in existing and emerging product niches, while increasing the specialization in products and sectors characterized by higher technological and R&D intensity, which will allow them to occupy better and more prestigious positions in global value chains.

Policies in this area will focus on supporting the human and physical capital of enterprises in order to integrate digital technologies into the country's business processes, including increasing the use of online marketing and commerce, increasing the level of information security and improving the competitiveness of the product. In addition, targeted measures will be taken to introduce high-tech digital solutions in the private sector related to Industry.

Indicators

name	source	current value	target value	EU average
Small and medium-sized enterprises selling online, % of all	EC, DESI	6	12	17
Small and medium-sized enterprise turnover from e-commerce, % of total turnover	EC, DESI	2	6	10
Share of SMEs that carried out electronic sales to other EU countries, %	EC, DESI	3	6	8
Software expenditure, % of GDP	INSEAD, Cornell University, WIPO; GII	22.7	27.0	37.6

Sources:https://www.mtc.government.bg/sites/default/files/nationaldevelopment programmebulgaria 2030-en.pdf p.21

- *Areas of impact*

Digital tools and competence

Measures will be taken to stimulate the widespread use of digital technologies by businesses in order to increase the competitiveness of Bulgarian enterprises and improve the efficiency of business processes. Targeted efforts will be made to overcome the many barriers associated with limited human and organizational capital and knowledge gaps, including facilitating companies' access to digital know-how and information and communication technologies. The development of e-commerce tools and the implementation of management information systems as well as the deployment of information security systems will be encouraged.

Bulgarian enterprises will be supported through training in the field of digital technology and information security, including using the opportunities of the ecommerce and e-marketing to increase cross-border sales. Digital solutions for business development and promotion will be sought and implemented as a priority for improving the business environment. In parallel to stimulating the use of digital tools, the increase of digital competences of staff in enterprises and opportunities to use digital technologies will be supported.

Assessment of the financial resources required	Sources of financing
BGN 587,349,000	- State budget - European funds and instruments

Industry 4.0

Digitalisation of the enterprises will be carried out through the introduction of leading edge technologies, with maximum efficiency sought through Industry 4.0 technologies. Connecting physical to digital systems, the use of industrial Internet (Internet of Things), 3D printing and prototyping, Big Data, cloud computing, added reality, the use of artificial intelligence and cybersecurity systems, machine learning, robotics, etc. will be supported as a priority to increase the competitiveness of Bulgarian enterprises and the added value created.

In order to strengthen the link between science and industry for the development of Industry 4.0, a fund will be established to finance projects in the field of Industry 4.0 and Artificial Intelligence, as well as to support project proposals that have applied under the Horizon 2020/Horizon Europe Framework Programme and received a Seal of Excellence but have not received financing under the programmes. The measures will be aimed at supporting the deployment of Industry 4.0 products, technologies, standards and business models and processes; improving SMEs' access to artificial intelligence technologies, cloud computing, etc.; introducing Industry 4.0 standards; building a demonstration ecosystem through testing centres for testing Industry 4.0 technologies; information campaigns aimed at SMEs to explain the nature and benefits of digital transformation, as well as to increase the skills and knowledge of employees and their managers. It will also support the digital transformation of large enterprises by identifying throughout the chain the technological process of the units that are primarily in need of digitalisation and by supporting the deployment of digital technologies, qualifications and retraining of staff in these units. Measures will be taken to upgrade Sofia Tech Park as a real platform for providing specialized services supporting automation and digital transformation in the Bulgarian industry.

Assessment of the financial resources required	Sources of financing
BGN 491,166,000	- State budget - European funds and instruments

Main findings	1. Bulgaria ranks last under the overall Digital Economy & Society Index (DESI) with amounts of 38 as 53 is the EU members average which places Bulgaria second to last among the EU members per 2022. 2. The percentage of Bulgarian Enterprises using Cloud Computing is 10% with an average for the EU of 34%. 3. With 3% Bulgaria is among the 10 EU countries that do not reach the average 5% of European SMEs using AI within their daily work process, listing second to last after Romania with 1%, the lowest uptake in the EU. 4. Within the Strategic framework document National Development Programme BULGARIA 2030 certain targets for the Bulgarian business are set as part of Priority 3: Smart Industry.

	5. Estimated budget for accomplishing the expected impact of the areas of Digital tools and competence (3.1) & Industry 4.0 (3.2) is assessed to be 1 087 515 000 BGN (Bulgarian currency approx = 1.95 EUR)

Sources

- https://www.mtc.government.bg/sites/default/files/digital_transformation_of_bulgaria_for_the_period_2020-2030_f.pdf
- https://digital-strategy.ec.europa.eu/en/policies/desihttps://www.mtc.government.bg/sites/default/files/nationaldevelopmentprogrammebulgaria2030-en.pdf
- https://www.minfin.bg/en/1394

State of play findings

For European economies to remain relevant and competitive in the global market, a digital transformation is necessary. The European Union has defined its ambition: reaching a digitalisation rate 75% by 2030, for Small to Medium size Enterprises (SMEs). These form the backbone of European economies, but great development discrepancies exist between all of the EU's members. Some regional patterns exist, such as among the Visegrad group, which have similar levels of digital intensity.

The overall lack of digital transformation means that SMEs are falling behind bigger companies, that already are hugely investing in the digital sector, and effectively becoming less competitive. This directly impacts the state's economy as it can cause a 'brain drain' phenomenon, such is the case in Greece. The COVID-19 pandemic was, as Norwegians described it, a shock digitalisation. At first, SMEs were forced to quickly digitalise their operation but, a subsequent decrease followed as the pandemic weakened economies and growth. To a certain degree, SMEs are investing in digitalisation by themselves however, it is a costly and time-consuming process that slows down their development. To this day, SMEs are still lacking behind with digital transformation, but it is also a consequence of a variety of other factors.

There is a consensus that there is a lack of infrastructure and technology that can support digital transformation; many rural regions of Europe still requires better Internet connection. In addition to that, there is a wide gap in many essential aspects to digitalisation: lack of awareness of the benefits, lack of support from the state, lack of capital to finance such expensive transition, lack of understanding of the cyber sphere and cybersecurity, and lack of human capital in the form of knowledge and skills. However, not only the private sector faces these issues, state infrastructures and public services are also in dire need of adaptation.

Existing approaches

All the nations' governments participating to this report have acknowledged the need for digitalisation by formulating digital transformation plans, partly funded with the EU's recovery funds. Focus of these recovery plans evolve around BIC technologies: Big data, Internet of Things and Cybersecurity, but also incorporate human capital investment, tax incentives, skills training, research and development and infrastructure development. On the one hand, some SMEs already use BIC technologies as they realised the added value it brings in optimisation, efficiency and profit making. On the other hand, some SMEs are making use of social platforms and online marketing, but still are greatly lacking behind in all fields of digitalisation.

An additional supportive approach is the use networks, support centres and promoters as agents to advertise and bolster digital transformation. In several countries, associations, cooperation groups,innovation hubs and centres have come into existence to support SMEs. In certain cases, such as in Italy and Norway, programs combining educational institutions, such as schools or universities, with professional sectors have been created with the aim of bridging the educational and private sectors to develop skills and form the foundation for digital transformation.

Best practices

Besides the modernisation of public administration and technological infrastructures, the best practices that can be adopted for the SMEs to meet the EU's target is to provide financial capital that will help with digital development, invest in human capital by means of education in digitalisation. Providing widespread support will ensure the smooth and efficient implementation of modern technologies. In addition to that, platforms such as hubs, groups and innovation centres are useful means to provide support and allow for cooperation in digital transformation between SMEs. Finally, uniting the public and educational institutions with the private sector through training or cooperation programs would guarantee an efficient moulding of a new generation of skilled digital professionals that will spearhead Europe's digital transformation and ensure the continent's competitiveness.

DigitUp action plan

These critical findings indicate that the project results of DigitUp ought to:

Overall project objectives	Resolution means via DigitUp Project Results
1. **Identify digital skills that are in high demand among SMEs and self-enterprises**	SMEs need capable workers adept of using BIC technologies (Big Data, Internet of Things, Cybersecurity). It will open new marketing possibilities such as E-commerce and social media.
2. **Provide cross-sectoral inputs towards the future of digital skills**	A training program will promote digital skills that can be applied in various sectors: educational institutions (schools, universities), public institutions (public service), private entities (businesses, companies), and cooperation establishments (innovation hubs and centres, associations, groups).
3. **Communicate to SMEs' managers and self-enterprises breakthroughs in emerging technologies**	Constant communication and interaction between various groups involved in digitalisation will be guaranteed so that they are aware of brand-new developments in the field and so they remain competitive on the market.
4. **Provide free access to high quality and up-to-date information, material, training, support**	SMEs will have an equal opportunity to learn, access and implement the program's offer into their practice. The program itself will also be regularly updated with the latest developments in digital transformation to guarantee accurate data.
5. **Develop assessment tools for digital skills measuring**	SMEs will be provided with instruments, training sessions and support materials that will allow them to regularly assess their workers' skills. As such, gaps in skills will be easily identified and tackled.
6. **Provide training material relevant to SMEs digitalisation**	Material for training purposes will be provided according to the latest and newest findings in digital upskilling. Assessing tools, piloting activities, social events, and educational programs regularly revisited will test SMEs' knowledge and expertise.

7. **Highlight the importance of digitalisation for SMEs' and self-enterprises**	Digitalisation is the new frontier; it is the next step in economic development and if SMEs do not modernise their operational model, they will be competitive and face greater risk of failure. The program will lay the foundation for a strong and reliable understanding of the importance of modern technology for a business. Digitalisation allows us to take a user-centric approach and exploit data facilitating business decisions.
8. **Expand digital skills' policy, highlight transferrable skills**	Transferable skills, or core skills, are a set of abilities that can be applied in all fields; some of these are efficiency, flexibility, cooperation, communication, planning and management, innovation, and the use of technology.
9. **Develop a detailed and systematic methodology for VET educators**	VET educators will be provided with an in-depth and clearly defined educational program specifically created for the instruction of the necessary skills and knowledge for digital transformation.
10. **Support VET educators and trainers with proper resources and materials**	For academic purposes, teachers will be assisted by educational and public institutions, and by a properly defined curricula and upskilling activities both during the program and after, so that SMEs have the most recent developments at their disposal.
11. **Carry out pilot sessions with VET educators, trainers, managers, supervisors, self-entrepreneurs**	To ensure that insights and skills for digital transformation are acquired and then fully mastered, regular hands-on courses with a vast array of participants will be provided to assess and adjust all participants' skills.
12. **Perform dissemination and validation of the project outcomes**	The method will be promoted by advertising and publishing the outcomes of the teachings. As such, other SMEs will be inspired to join thanks to the indisputable benefits of the program.
13. **Ensure the access to and use of innovative teaching and learning practices by the users**	Time and resources will be invested in advertising the teaching method through training and social events so that all SMEs have an equal opportunity to benefit from the innovative practices.

14. **Increase and enhance public debate about digital for SMEs, microbusinesses, and self-enterprises**	Social and interactive platforms such as innovation centres, associations, and cooperation groups where professionals can exchange their experience and discuss their practices will promote digital transformation and innovation. It will increase the teachings' visibility and affirm the added competitive value it brings.