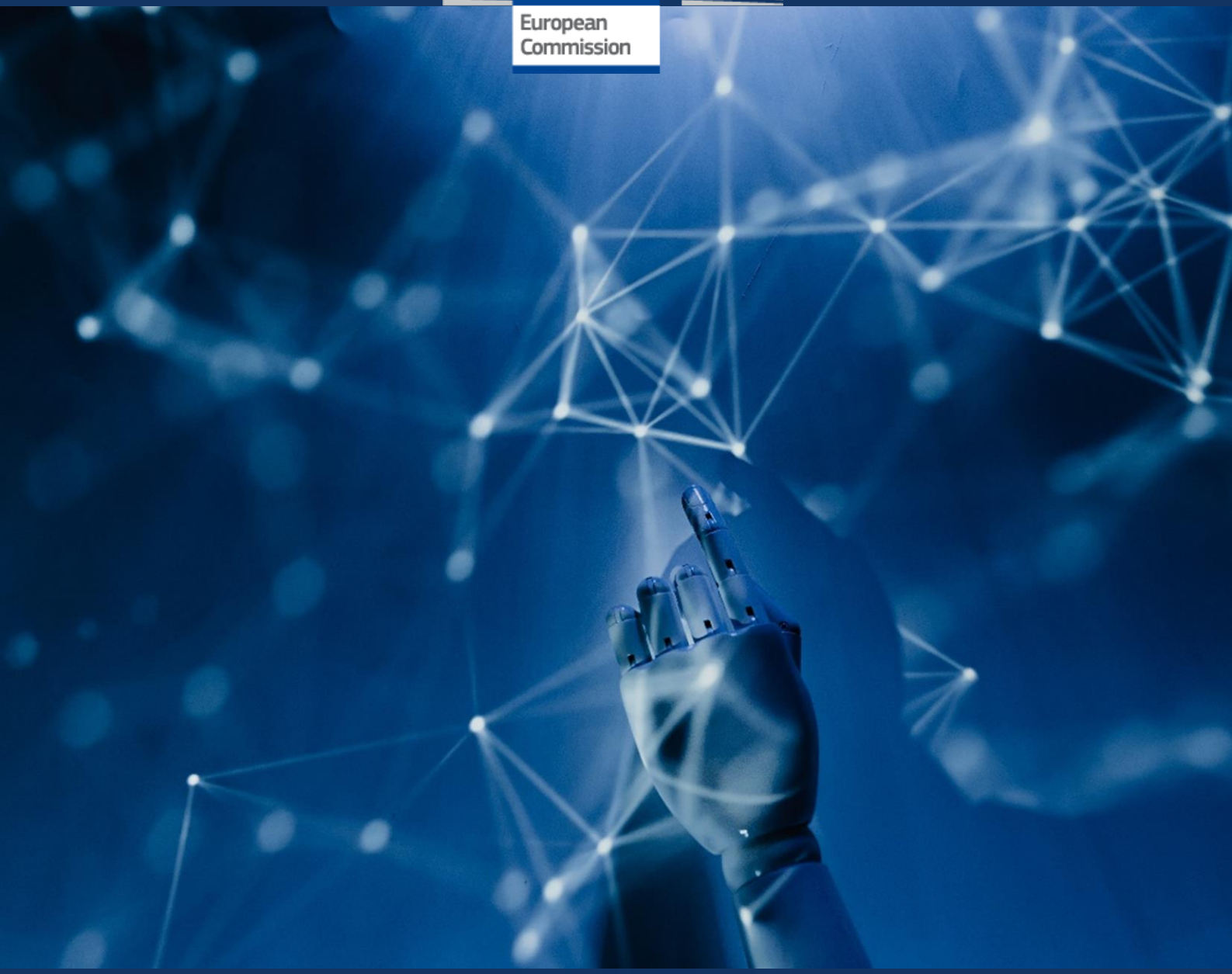

Digital path to recovery and resilience in the European Union

Directorate General for Informatics

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EUROPEAN COMMISSION

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Luxembourg: Publications Office of the European Union, 2022

PDF	NO-07-22-096-EN-N	ISBN: 978-92-76-48566-7	DOI: 10.2799/507229

This study was carried out for the European Commission by WAVESTONE

Digital path to recovery and resilience in the European Union

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Executive Summary

The unprecedented health and economic crises, caused by the COVID-19 pandemic, forced the European Commission to put forward various instruments aimed at helping Member States recover and better prepare for their future. As a matter of fact, the European Commission agreed on 27 May 2020 on the creation of a new temporary recovery instrument, the NextGenerationEU, meant to enable the investment of more than €750 billion through different funding mechanisms. The most important of these mechanisms is the Recovery and Resilience Facility (RRF), made up of €672.5 billion in loans and grants, which will directly fund reforms and investments put forward by the Member States in their Recovery and Resilience Plans. Each Plan submitted to the European Commission between April and July 2021 was accepted and adopted by the Council because they all effectively addressed partially, or entirely, the challenges identified by the Commission and the Council in the European Semester process, and particularly through the country-specific recommendations of 2019 and 2020. In addition, all the submitted Plans were in line with the priorities set by the European Commission, namely the achievement of climate neutrality by 2050 and setting the European Union on a path towards digital transition. In this regard, the RRF Regulation provides that each Member State must dedicate at least 20% of its total allocation to initiatives aimed at bolstering the digital transition. Member States have for instance included reforms and investments aimed at further deploying 5G and Gigabit connectivity, or at developing digital skills as well as increasing the availability and efficiency of public services through the deployment of new digital tools.

Therefore, the goal of the report 'Digital path to recovery and resilience in the European Union' is to analyse Member States'[1] Recovery and Resilience Plans by identifying and assessing the prominence and importance of digital initiatives within the Plans. To do so, a screening of the national Recovery and Resilience Plans was performed, in order to identify and provide an overview of the main investments, and when available, of the overarching reforms, that the Member States will undertake with regard to digital transformation. These have been categorised according to a common taxonomy providing insights into the Member States' investments in connectivity, eGovernment and digital public services, human capital, digital capacities and advanced technologies, research and development as well as the digitalisation of businesses. This common taxonomy is in line with the Commission Staff Working Document, which was drafted by the European Commission to provide guidance and a common direction to the Member States when drafting their Plans. The data screening of the Plans showed that each country has its own set of priorities and specific targets for 2026, but all are committed to progress in their digital transition.

While analysing the specificities of each Member State's Plan, the goal of the report was also to identify and highlight the main upcoming trends in the digital sphere and how these trends champion four out of the seven European flagship areas: Connect, Reskill and upskill, Modernise and Scale up, as these are the ones having a strong digital component. As specified by the European Commission, the pursuit of these flagship areas by the Member States would ensure the success of Europe's recovery and make the EU greener and more

[1] Please note that only 24 National Recovery and Resilience Plans have been analysed in this report.

digital. The data analysis showcased that many Member States are heavily investing in the development and deployment of high-speed networks with the goal of bridging the digital divide, as well as in the digitalisation of their public administrations through the simplification of internal administrative processes and procedures, the promotion of interoperability and the Once-Only principle, among others. Investments in human capital also appear as a clear investment priority for many Member States, as they are being urged to invest in the upskilling and reskilling of their citizens by boosting digital skills and training for all, as well as in transforming education systems to be continuously adapted to the challenges of the 21st century. Boosted by the COVID-19 pandemic, the digitalisation of businesses also appears as an evident investment priority when analysing the Recovery and Resilience Plans. Concretely, Member States are mostly focused on fostering the digitalisation of their SMEs, by promoting the introduction of advanced digital technologies and the improvement of their production processes through digitalisation. In fact, to increase the Union's resilience and its competitiveness at global level, Member States are also heavily investing in the deployment of advanced digital technologies, particularly in the fields of artificial intelligence, cybersecurity and blockchain.

The COVID-19 pandemic, and subsequent crisis, have highlighted the prominent role those digital technologies and infrastructures play, and will continue to play, in our lives as we rely more and more on digital solutions and services. Thus, in this unprecedented context, the European Commission also launched a new European funding programme focused on bringing digital technology to businesses, citizens and public administrations: the Digital Europe Programme. This programme is meant to reinforce key European digital capacities such as cybersecurity and advanced technologies, as well as their deployment in critical sectors such as climate change and health. These goals appear to be perfectly aligned with the investments and reforms put forward by the EU Member States and the main investment trends identified in the report. Thus, the Digital Europe Programme will most certainly support the Member States in the implementation and roll-out of their digital investments and reform priorities put forward through their Recovery and Resilience Plans.

1 Context and Background

1.1 The impact of COVID-19 on EU's society and economy

The COVID-19 outbreak in early 2020 suddenly changed the economic, social and budgetary outlook in the European Union. While countries were affected in different ways by the pandemic and were able to react to it at different speed and in a more or less efficient way, some common challenges at EU level can be identified. On the private sector side, businesses, and particularly small and medium-sized enterprises (SMEs), were drastically impacted by the pandemic, although the magnitude of such impact varied considerably across industries and firms depending on several factors, such as the possibility to adapt to disruptions in supply chains, and the existence of inventories or reliance on just-in-time production processes. As a consequence, the coronavirus crisis put a halt on a six-year positive employment progress, with an employment rate of 7.5% by the fourth quarter of 2020, which was at 6.6% in December 2019. In this scenario, many governments were forced to increase public expenditure for the preservation of employment[2]. Among others, tourism stood out as one of the hardest hit sectors, as all of its ecosystem was deeply affected by restrictions on movement and travel imposed in the wake of coronavirus crisis. In other cases, it was possible for both employers and employees to limit the negative effects of such measures and re-think the day-to-day work to accommodate – when possible – more flexible approaches, with the adoption of teleworking policies resulting in one of the biggest workplace changes for almost all employees across the EU. This was particularly the case for the public sector, which experienced a rapid switch to teleworking schemes thanks to the ability of national public administrations to leverage digital solutions to guarantee access to public services which proved essential to curb at least some of the disruptive effects of the pandemic.

Put together, these factors led to a sharp contraction of the EU's economy as shown in Figure 1, which reports selected indicators[3] from Eurostat's Recovery Dashboard. When looking at the quarterly GDP growth at EU level, the COVID-19 crisis hit particularly hard in the second quarter of 2020, with a decrease of 11.3% as compared to the same period in 2019. This was followed by a growth of 11.8% in the third quarter of 2020, and another setback in the fourth quarter of 2020. The European economic rebound gathered pace with quarter-on-quarter growth of 2.1% in GDP in the third quarter of 2021, after a 2.0 % rise in the second quarter of 2021.

[2] European Commission (n.d.), SURE The European instrument for temporary Support to mitigate Unemployment Risks in an Emergency (SURE). Accessed on 12 October 2021.
[3] To provide a high-level overview of the recovery process of the EU, the selected indicators fall within the following Eurostat categories: Economy and prices (GDP growth and Government debt), Business and trade (Industrial production and Exports) and People and Work (Unemployment rate).

Figure 1. Overview of selected Eurostat indicators

Source: European Statistical Recovery Dashboard, Eurostat. Adapted by Wavestone, Oct 2021.

However, as in many cases governments across the EU had to increase their spending to address the growing issues brought by the unprecedented COVID-19 health crisis, EU government debt remains well above its pre-pandemic levels. Indeed, government debt rose significantly since the first quarter of 2020 when it was at 78.9%, reaching a peak of 92.4% in the first quarter of 2021 and then slowly recovering to reach 90.9% in the second quarter of 2021. Looking at the business and trade side, industrial production was also severely affected by the pandemic, with its lowest point recorded in April 2020, registering a decrease of 19.2% compared to the previous year. As of September 2021, industrial production was still slightly below the pre-pandemic levels, as the shortages of semiconductors and other materials continued to weigh on manufacturers. EU exports to the rest of the world started declining as of February 2020, reaching their lowest levels in April 2020, when a 24.4% decrease was registered compared to 2019. The situation, however, improved in May 2020, although export levels in September 2021 were still lower that their pre-pandemic levels. Finally, unemployment rate, which was relatively stable at 6.6% of labour force aged 15-74 in the months before the outbreak of the pandemic, rose from March 2020 onwards, reaching a peak of 7.7% between August and September 2020. Since then, it has gradually been getting closer to its pre-pandemic levels, with a 6.7% EU unemployment rate registered in September 2021.

What appears clear is that the medium and long-term consequences of the COVID-19 crisis will critically depend on how quickly Member States' economies and societies will recover from the crisis. This largely revolves around the available fiscal space of Member States to take measures to mitigate the social and economic impact of the crisis. In this scenario, sustainable and growth-enhancing reforms and investments that address structural weaknesses of Member States' economies, while at the same time strengthen the resilience of their economies and societies, seem to be essential to set those economies back on track and in turn reduce inequalities and divergences in the Union.

1.2 NextGenerationEU and the Recovery and Resilience Facility

To quickly respond to this unprecedented health crisis, that soon turned into a drastic economic crisis, the European Commission put forward on 27 May 2020 a new temporary recovery instrument, with a strong focus on investing in "a collective recovery and a better future for next generations"[4]. The so-called NextGenerationEU, agreed by the European Council on 21 July 2020 and operative from 2021 to 2023, will be tied to the regular 2021–2027 budget of the EU's Multiannual Financial Framework (MFF) and will enable the investment of more than €750 billion[5] through different funding instruments. Among these, the Recovery and Resilience Facility stands out as its centrepiece, making up to €672.5 billion in loans (€360 billion) and grants (€312.5 billion) available to support reforms and investments undertaken by Member States. In particular, the Facility, which came into force on 19 February 2021 after the approval of the European Parliament, aims at "promoting the Union's economic, social and territorial cohesion by improving the resilience, crisis preparedness, adjustment capacity and growth potential of the Member States, by mitigating the social and economic impact of [the] crisis, in particular on women". To do so, its scope covers different policy areas, which feed into six main pillars, as shown in Figure 2: green and digital transition (often referred to as the "twin transitions"); economic cohesion, productivity and competitiveness; social and territorial cohesion; health, economic, social and institutional resilience; and policies for the next generation.

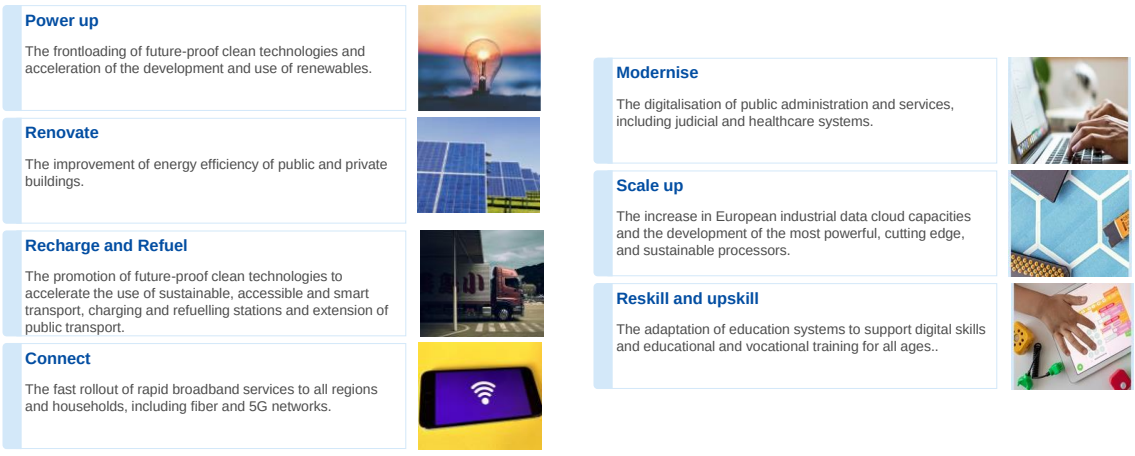
Figure 2. The Recovery and Resilience Facility

Source: The Recovery and Resilience Facility, European Commission. Adapted by Wavestone, Nov 2021.

[4] COM(2020) 456 final, Europe's moment: Repair and Prepare for the Next Generation, Brussels, 27.5.2020. Accessed on 22 November 2021.
[5] Figures referring to the NextGenerationEU instrument and the Recovery and Resilience Facility are expressed in this report as referring to the year 2018. Please note that values in current or 2018 prices represent the same amount in nominal and in real terms. Further information can be found here: https://op.europa.eu/en/publication-detail/-/publication/d3e77637-a963-11eb-9585-01aa75ed71a1/language-en

To receive the Facility's financial support, Member States had to submit their Recovery and Resilience plans to the European Commission. Each plan sets out the reforms and investments to be implemented by the countries by the end of 2026, in compliance with the Facility's objectives and taking stock of the Country-Specific Recommendations (CSRs) of 2019 and 2020 adopted by the Council, as part of the European Semester annual cycle. Particular attention is to be devoted to the "twin transition": indeed, to reinforce the commitment of each Member State to advance both the green and digital transition, national plans must reach a target of 37% of expenditure for climate investments and 20% of expenditure to foster the digital transition. Further to that and as shown in Figure 3, in the Annual Sustainable Growth Strategy 2021 the Commission strongly encourages Member States to use this opportunity to include any investment and reform within the seven European flagship areas in their plans (i.e. Power up, Renovate, Recharge & Refuel, Connect, Modernise, Scale-up, and Reskill & Upskill), which address issues that are common to all Member States, as significant investments in these areas are likely to bring tangible benefits for the economy and citizens across the EU.

Figure 3. The European flagship areas



Source: The European flagship areas, summarised by Wavestone,Dec 2021.

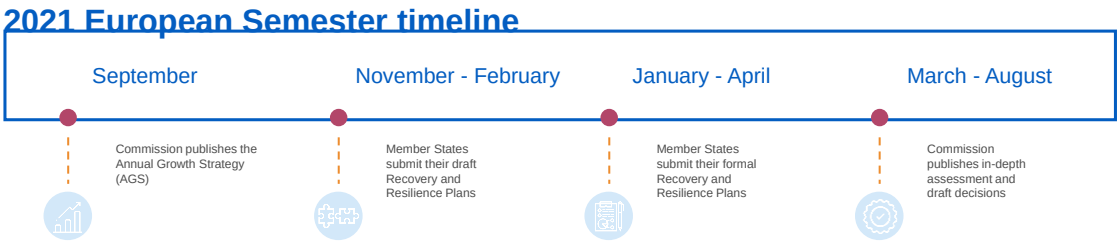
Upon assessment of the Commission, which translates the content of the plans into legally binding acts, and following the Council's adoption of the Commission proposal, Member States are then entitled to receive a disbursement of a 13% pre-financing to start their recovery process. After this, up to twice a year and upon the achievement of agreed-upon milestones, Member States can request the disbursement of further resources, which will be granted after an assessment of the request done by the Commission.

1.3 The 2021 European Semester cycle

Since 2010, EU Member States are subject to the European Semester, a yearly cycle of economic policy coordination that provides the framework for steering and monitoring their economic and social reforms to reach the Europe 2020 targets. The usual cycle starts in November when the Commission sets the priorities for the year to come and ends in October of the following year, when national governments submit draft budgetary plans taking into account the EU recommendations adopted by the Council during the summer. The 2020 edition of the European Semester cycle, while maintaining the same timeline, was greatly impacted by the COVID-19 pandemic in terms of content. Indeed, the severe health crisis that has affected Europe since March 2020 was reflected in the investments and reform priorities put forward by many Member States, as also documented in the 2020 edition of the European Semester report.

However, as we saw in previous paragraphs, in the course of 2020, important measures were taken at EU level to ensure a coordinated and swift response to the COVID-19 pandemic. This led to the decision to temporarily adapt the European Semester cycle to better coordinate it with the newly created Recovery and Resilience Facility and the consequent submission of the national Recovery and Resilience Plans. To reduce the burden on them, Member States were therefore encouraged to submit their National Reform Programmes (NRPs) and their Plans into a single integrated document, thus providing an overview of their national reforms and investments to be undertaken in line with the objectives of the Facility, while addressing relevant recommendations coming from the 2019 and 2020 CSRs. Consequently, the timeline of the European Semester cycle was also adapted to comprise four main steps, as shown in Figure 4.

Figure 4. 2021 European Semester cycle timeline – Main steps



Source: European Commission, European Semester 2021 – an exceptional cycle. Adapted by Wavestone, Oct 2021.

The publication of the Annual Sustainable Growth Strategy, which launches the new cycle of the European Semester and usually takes place in November, was moved to September 2020. The national Recovery and Resilience plans, which became the main reference documents of the Member States' forward-looking policy initiatives to be undertaken in the next years, were submitted in their draft form by the Member States between November 2020 and February 2021, while the final version was expected in April. In fact, the final versions of the Recovery and Resilience Plans were submitted by the majority of the Member States between April and October 2021, while Bulgaria submitted its Plan on 15 October 2021. Lastly, the analysis by the European Commission of these Plans, replacing the Country reports, took place between March and August 2021 for the vast majority of the countries. By early March 2022, 24 National Recovery and Resilience Plans had been approved, and 21 Members Sates had already received a maximum of 13% of pre-financing[6], both in loans and grants or only in grants. Only Sweden, Bulgaria and Ireland have not yet requested a payment. Spain was the first EU Member State to sign, in November 2021, the entry into force of its Recovery Plan Operational Arrangements (OA), which establishes the monitoring mechanisms put in place between the Spanish authorities and the European Commission for the implementation of their national Plan, and to officially request the first disbursement. Since then, seven other Member States signed the entry into force of their Recovery and Resilience Plans OA and are progressively submitting their payment requests.[7] On 27 December 2021, Spain was the first country to receive a first payment of EUR 10 billion in grants under the RRF, following its request filed on November 2021, and the assessment by the European Commission of the

[6] The pre-financing payment will help kick-start the implementation of the investment and reform measures outlined in the EU countries' Recovery and Resilience Plans. The amount of pre-financing requested by a Member State is specified in its Recovery and Resilience Plan.
[7] Namely, Croatia, France, Greece, Italy, Latvia, Portugal, Slovakia.

implementation of the investments and reforms it had outlined in its Plan. On 7 March 2022, France also received a first payment of EUR 7.4 billion.

2 Boosting Digital Transformation: An analysis of the national Recovery and Resilience Plans

The report is meant to thoroughly analyse how EU Member States' national Recovery and Resilience Plans address the digital transition, by identifying and assessing the prominence of digital initiatives within the Plans themselves.

By clicking on the EU Member States below, you will be redirected to its specific country analysis where you will be able to find more information on each country's planned digital investments and associated reforms, when available:

Austria 

Belgium 

Bulgaria 

Croatia 

Cyprus 

Czechia 

Denmark 

Estonia 

Finland 

France 

Germany 

Greece 

Hungary 

Ireland 

Italy 

Latvia 

Lithuania 

Luxembourg 

Malta 

Netherlands 

Poland 

Portugal 

Romania 

Slovakia 

Slovenia 

Spain 

Sweden 

3 EU main trends

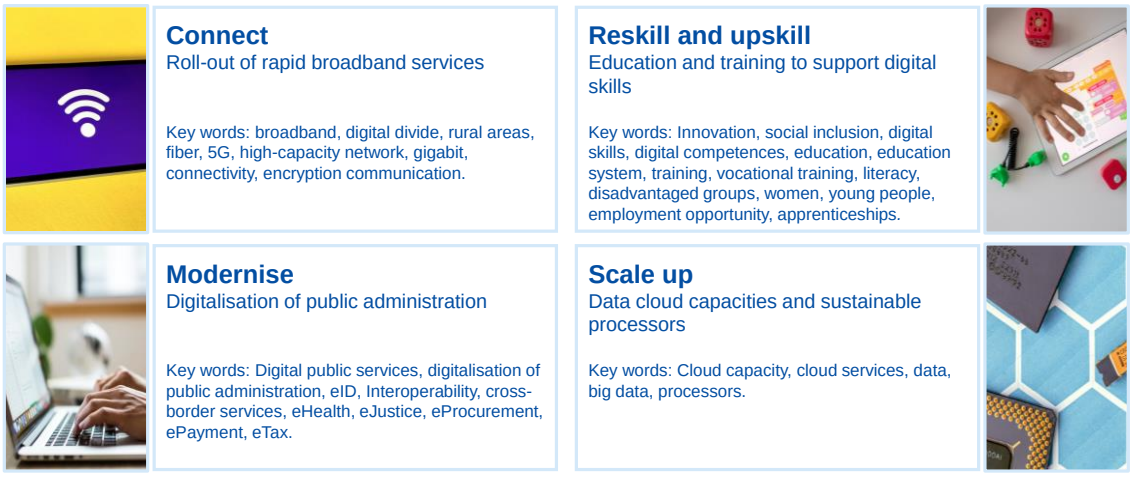
Based on the findings of Chapter 2 on national investments and associated reforms, when available, this chapter aims at providing an overview of the main upcoming trends in the digital sphere according to the six categories identified and how these trends champion four of the seven European flagship areas, namely Connect, Reskill and upskill, Modernise and Scale up.

3.1 Overview of main highlights based on investment categories

With an eye toward shaping the future of Europe and ensuring a robust financial recovery post-COVID-19, the EU Member States put forward individual national Recovery and Resilience Plans in 2020. These documents, while reflecting the specific situation of each country, also form part of a broader, coordinated response across all Member States to EU-wide challenges. To this end, the European Commission identified seven European flagship areas (Power up; Renovate; Recharge and refuel; Connect; Modernise; Scale-Up; and Reskill and upskill) which Member States are encouraged to focus investments in to address shared European challenges, foster the 'twin' green and digital transitions and in turn, boost economic growth throughout the Union.

In this context, it is important to understand where national governments intend to invest as part of their Recovery and Resilience Plan and the extent to which such investments are contributing to certain flagship areas. Given that this study is primarily concerned with the digital transition of the EU, four of the seven flagship areas will be examined, as summarised in Figure 5.

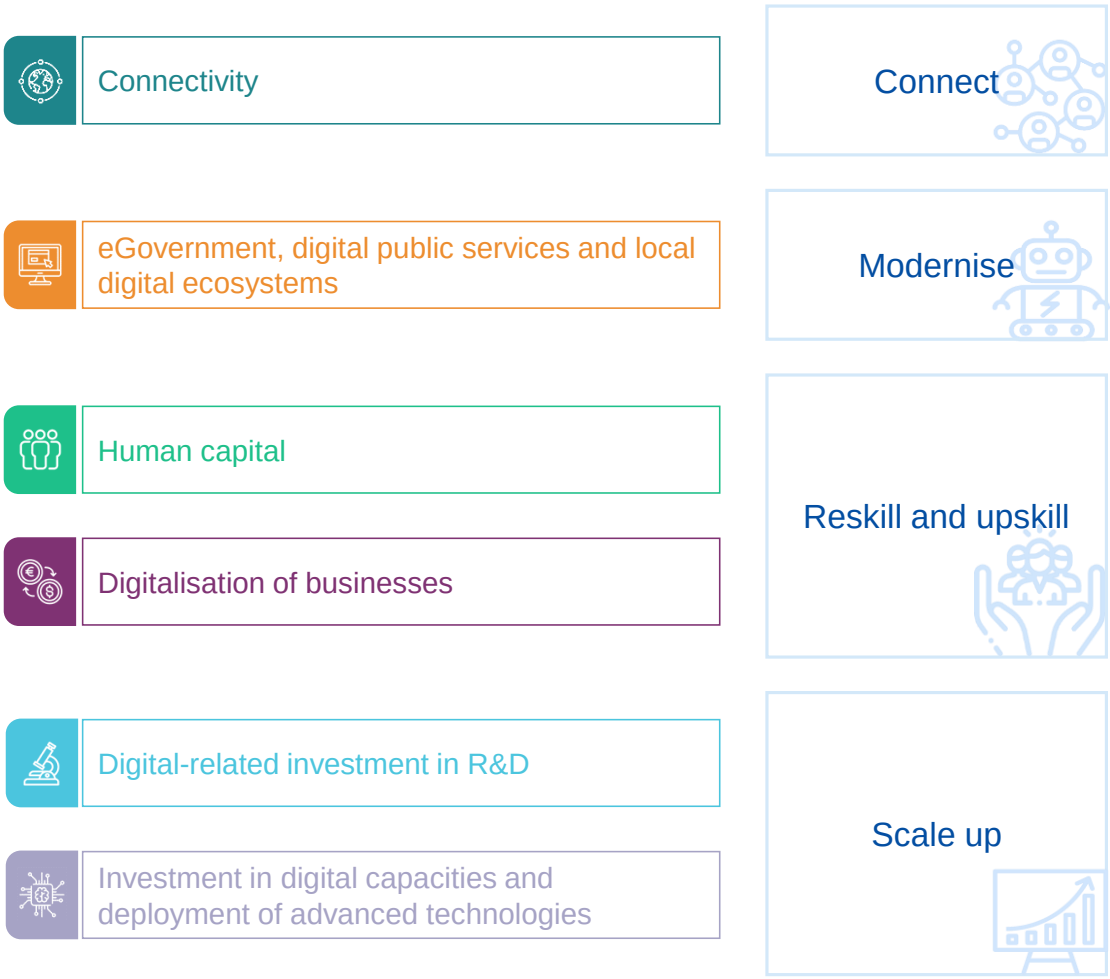
Figure 5. European flagship areas with a digital component



Source: Main challenges under the European flagship areas Connect, Reskill and upskill, Modernise and Scale up, summarised by Wavestone,Oct 2021.

Leveraging on the categories used in Chapter 2 to cluster Member States' investments, the following section of this report will provide an overview of Member States' planned investments and their linkages to the flagship areas which they are meant to contribute to. The results of this linking exercises have been summarised in Figure 6.

Figure 6. Links between investment categories and European flagship areas



Source: Clustering of investment categories according to the European flagship areas Connect, Reskill and upskill, Modernise and Scale up, summarised by Wavestone,Oct 2021.

3.1.1 Connectivity

EU Member States are planning to invest more than EUR 13 billion from the Recovery and Resilience Facility to develop or further enhance their connectivity, making this the second investment priority identified at EU level. Only one country did not foresee investments in connectivity in its national Plan. While looking at concrete investment trends in this domain, the analysis for this report highlights that most Member States are concentrating their efforts on the development and deployment of **high-speed networks** that are accessible to all European citizens, with the goal of bridging the digital divide.

High-speed networks

High-speed networks[8] or 'high-speed broadband' refer to high speed telecommunications systems, i.e. those capable of simultaneously supporting multiple information formats such as voice, high-speed data services and video services on demand[9]. This term also refers to 5G, fibre and very-high capacity (VHC) networks.

As part of its Recovery and Resilience Plan, **Romania** intends to invest EUR 94 million to improve its national broadband coverage by installing very high-capacity networks and fixed-point Internet access services in approximately 790 rural localities and villages.

Additionally, EU Member States are investing in the uptake and further development of **advanced communication technologies**, although to a lesser extent. This is particularly the case for quantum communication technologies, which provide an extremely secure form of encryption for digital transactions and the transfer of confidential information.

Advanced communication technology

Advanced communication technology and services refer to the research and development of various communication areas as the high-speed networking and the quality, security and safety of communications services and systems[10]. It includes technologies such as quantum and satellite communication.

Luxembourg will invest EUR 10 million in the creation of a new research centre focused on the development of a quantum communication network, which will be based on two components: a fibre optic component complemented by a space component which is needed to cover long distance connections.

Both these investment trends in the field of connectivity are to champion and feed into the European flagship area 'Connect'.

3.1.2 eGovernment, digital public services and local digital ecosystems

All EU Member States have foreseen investments aimed at boosting the digitalisation of their public sector as part of their National Recovery and Resilience Plans, to the sum of approximately EUR 28 billion. Given the almost all-encompassing nature of this investment category, several investment trends have been identified, ranging from cross-cutting to sector-specific ones.

Looking at cross-cutting investment trends, EU Member States are planning to further invest in the **digitalisation of their public administrations**. This is typically done through the creation of a holistic digital

[8] The definition of "high speed" can vary considerably from one country to another.
[9] Further information can be found here: https://digital-strategy.ec.europa.eu/en/policies/broadband-glossary#ecl-inpage-kt8pwekw
[10] Further information can be found here: https://cordis.europa.eu/article/id/3004-advanced-communications-technologies-and-services

strategy at national level, which focusses on different and often intertwined aspects. An overview of these is provided below, complemented by examples of initiatives to be put in place at national level.

Simplification of internal administrative processes and procedures

The simplification of internal administrative processes and procedures is a key aspect of public administrations' digitalisation, given its multi-layer governance and the implication of different stakeholders. To do this, Member States are putting forward various initiatives aimed at reducing administrative burden and bottlenecks, which include:

- Management approaches: The goal is not only to introduce new management approaches through, for instance, the adoption of the Agile/Scrum methodology to redesign procedures, but also to increasingly leverage data and predictive analysis tools (e.g. AI, ML, big data) to foster data-based nowcasting and forecasting and to inform and monitor policies[11].
- Base registries: In the past years, the importance of base registries has been growing in parallel to the increasing reliance on a digitalised world, as they represent authoritative databases and a trusted source of basic information on data items such as people, companies, vehicles, licences, buildings, locations and roads. In light of this, European countries are working to optimise the organisation of their registries and ensure their maintenance at the lowest possible costs[12].
- eDocuments: EU Member States are further encouraging the use of electronic documents within their public administration, leveraging the integration of new digital tools and emerging technologies such as artificial intelligence (AI) and machine learning (ML) so as to facilitate the collection, consolidation, management and analysis of public data[13].
- ICT capacity building: By modernising IT infrastructures, Member States aim to have an increased transmission capacity in connection with the development of next-generation networks[14].

The promotion of interoperability and the Once-Only principle

As also stressed by the Commission in its communication Shaping Europe's digital future, EU Member States should work towards the reinforcement of their interoperability strategy, aiming to foster coordination and the adoption of common standards for public services and data flows. This need has become even more prominent as a result of the COVID-19 crisis, which led many countries to put forward several initiatives in the field of interoperability. These included the further development of open data and public data pools, the promotion of data re-use across administrations and the consequent possibility to provide digital public services based on registers kept by other administrative bodies, as well as the development of a legislative proposal for the Once-Only principle to reduce the bureaucratic burden of administrative processes for economic operators and citizens. Furthermore, it includes an institution-wide interoperable use of the data,

[11] Croatia, for example, set up a new centralised data ecosystem to allow the extraction, charging, transformation, storage, analysis, visualisation and analytics of data required for decision-making processes.
[12] Belgium, for example, put in place a procedure to optimise the organisation of the state administration's registers to ensure their maintenance with the lowest possible costs.
[13] Luxembourg, for example, implemented a central platform offering new functionalities required for electronic document and case management with the aim of fully covering document management of public administrations and as such, facilitate document exchanges between administrations.
[14] The Czech Republic, for example, is planning to modernise IT infrastructures by increasing their transmission capacity in connection with the development of next-generation networks, as well as the implementation of new customer and high-capacity services.

which implies that data needs to be provided only once and is afterwards exchanged by the different authorities and government units in accordance with data protection regulations[15].

The introduction of more flexibility in working conditions

The COVID-19 pandemic significantly impacted the way Europeans work, as both the private and the public sectors had to accommodate more flexible working conditions and remote work. This also led Member States to put forward different initiatives to guarantee efficiency and effectiveness for the work of its civil servants. Examples of these range from the development of mobility and teleworking within ministries and the provision of the necessary equipment for remote working, as well as the creation of the necessary secure infrastructures such as VPN networks to ensure business continuity[16].

The improved delivery of digital public services

The delivery of digital public services has become an essential part of public administrations, even more so in the wake of the COVID-19 pandemic. Indeed, both citizens and businesses are heavily relying on them not only to be in contact with the public administration, but also to complete administrative procedures and access personal data. Considering this, Member States are working to improve the delivery of such services, for instance by focusing the design of services on adaptability and on user experience, as well as establishing a one-stop shop for all digital public services that provides customer support to citizens and business entities. Finally, European countries are also putting efforts in providing more secure electronic identification methods needed to access digital public services[17].

The enhancement of digital skills and digital awareness among civil servants

Many Member States recognised that the enhancement of digital skills and digital awareness among civil servants is key to prepare the public administration for the challenges of the digital transition, as well as to create the conditions for the adoption of more agile and adaptive models for providing public services[18].

Digitalisation of the public administration

The digitalisation of public administration entails the use of ICT and innovative technologies to enhance the effectiveness, efficiency and relevance of government action, taking into account current challenges, needs, and expectations of both citizens and businesses when delivering public services.[19]

[15] Austria, for example, put forward legislative proposals for the Once-Only principle aimed at reducing the bureaucratic burden of administrative processes for economic operators and citizens. In addition, these proposals include an institution-wide interoperable use of data, implying that data will only need to be provided once and can then be exchanged between the different authorities and government units.
[16] Greece, for example, has put in place various secure infrastructures throughout its public administrations and businesses, such as VPN networks, in order to ensure business continuity.
[17] Estonia, for example, is the first country to have created a chat room or voice-activated artificial intelligence-based virtual assistant aimed at providing users with the most important public digital services.
[18] Portugal, for example, has created conditions for the adoption of more agile and adaptive models for providing work in public functions and thus prepare public administrations for the challenges of the digital transition.
[19] Further information can be found here: https://ec.europa.eu/competition/state_aid/what_is_new/template_RFF_digitalisation_of_public_administration.pdf

Czechia will invest EUR 36.7 million to build modern information systems based on modular architecture that will support enhanced interconnectivity between individual systems and the digitalisation of offices and institutions. New functionalities and existing ones will be further developed to allow a comprehensive digitalisation of these systems and to permit the mutual transfer of data.

Strongly related to the previous trend and given the commitment of the EU to become a data-driven economy, investing in the promotion of **data and interoperability** emerges as a prominent trend across the EU. As mentioned in the proposed Regulation on European data governance "data is at the centre of [the digital] transformation: data-driven innovation will bring enormous benefits for citizens, for example through improved personalised medicine, new mobility, and its contribution to the European Green Deal". To reap these benefits, however, Member States need to lay the foundations to make the best use of such data. For this reason, many are developing innovative national data strategies and policies and investing in the development of their digital data infrastructure and the creation of government data centres. In parallel to this, some Member States are working to adapt their governance around the secure reuse of data and promote innovative data usage (e.g. analytics tools in the planning of government services).

Similarly, interoperability is increasingly being considered as a key enabler for digitalisation and data sharing. More and more Member States are adhering to the European Interoperability Framework (EIF) and developing policies that take its principles into account. In line with this framework, EU countries are investing in the adoption and reuse of standards and specifications to ensure the secure sharing of data not only between different bodies within their public administration, thus breaking the silos in which they often work, but also across borders, for instance, through the Single Digital Gateway. This goes hand in hand with the consolidation and modernisation of base registries, as well as their integration into national IT systems and the preservation of the Once-Only principle. In parallel, some Member States are planning to harmonise their national legal frameworks to foster legal interoperability and ensure that organisations operating under different legal frameworks, policies and strategies are able to work together.

Data and interoperability

Interoperability refers to the ability of organisations to interact towards mutually beneficial goals, involving the sharing of information and knowledge between these organisations through the business processes they support by means of the exchange of data between their ICT systems.[20]

Croatia will invest EUR 14 million to establish a central interoperability portal in line with the EIF and to promote the adoption of standards and policies related to interoperability. In addition, the full application of the Once-Only principle will be implemented by 2023.

Moving to sector-specific investment trends, **eHealth** appears as the prevalent trend when it comes to digital public services. To enhance the quality and speed of their healthcare systems, EU Members States are

[20] Definition retrieved from: https://ec.europa.eu/isa2/sites/default/files/eif_brochure_final.pdf

investing in the further digitalisation of the health sector by developing and deploying new information systems and platforms to improve the electronic management of health data. This is also strongly related to the creation of shared medical records and online digital health spaces, where citizens can directly access their health data. Finally, several investments put forward by the Member States intend to promote the adoption of telemedicine solutions for the remote medical monitoring of patients.

eHealth

eHealth refers to ICT tools and services which can improve prevention, diagnosis, treatment, monitoring and management. It can benefit the entire community by improving access and quality of care and by making the health sector more efficient[21].

Cyprus intends to invest EUR 1.94 million to deploy generic cross-border eHealth services and become part of a secure peer-to-peer network between European healthcare systems, allowing for the exchange of patient summaries and ePrescriptions.

EU Member States are also planning to improve their judicial systems by leveraging digital solutions. **eJustice** measures will be rolled out by several EU countries, including for instance the digitalisation of files and exchanges of information during court proceedings, the creation of shared information systems among courts, as well as the provision of new eJustice services to citizens and businesses, such as dedicated online one-stop shops for judicial matters. These efforts are complemented by investments aimed at ensuring secure cross-border data flows at EU level.

eJustice

The eJustice approach uses ICT to improve citizens' access to justice and to make legal action more effective. It also contributes to making the judicial system more accessible and transparent.[22]

Bulgaria will invest EUR 14.05 million to expand the functionalities of the Unified Court Information System (UCIS), which is a key tool for the introduction of eJustice in the country. The system integrates and manages all electronic cases and reports on the workload of the courts, while collecting and processing statistical information on the courts' activities.

An additional trend emerges from the analysis of the EU Member States' Plans, namely the importance of the **digitalisation of social security and welfare**. Investments in this area will, on the one hand, support public administrations in better integrating, monitoring and analysing data on users and services in the social

[21] Further information can be found here: https://wayback.archive-it.org/12090/20210302044434/https://ec.europa.eu/digital-single-market/en/glossary
[22] COM (2008)329 final, Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee on Towards a European e-Justice Strategy, Brussels, 30.5.2008.

welfare system, and, on the other hand, help citizens digitally manage and store their social security queries and information in a secure and automated way.

Digitalisation of social security and welfare

It refers to the use of ICT tools to manage citizens information and queries related to social security, such as unemployment benefits, reimbursement of healthcare costs, and old-age pension, as well as welfare which covers family benefits and provides resources to low-income families, in a faster, more efficient, and transparent way.[23]

Belgium will invest EUR 60 million in their existing social security portal to evolve it into an efficient digital ecosystem and create a new digital social security platform. Cooperation, interoperability and reuse will be central aspects of this platform.

Finally, this analysis has shown that EU Members States are also allocating part of their investments to **eTax** initiatives. The main aim is to further enhance existing digital public services for taxpayers, as well as create new ones. In parallel to this, the Member States will continue to modernise their IT systems, simplify administrative procedures and promote electronic documents. In addition, several countries are planning to develop a digital integrated risk management system to increase the number and the efficiency of tax controls and support the identification of tax risks.

eTax

Taxation becomes easier, faster and more efficient through digitalisation. eTax measures enhance the quality of public administration services, making the tax collection process more uniform.[24]

Latvia will invest EUR 1.88 million to support the creation of a new taxpayer segmentation system providing online information for taxpayers, as well as the development of a data visualisation tool that will be included in the Latvian Electronic Declaration System.

All these investment trends in the field of eGovernment and digital public services aim to bolster the European flagship area 'Modernise', which advocates for the modernisation, digitalisation and increased accessibility of key digital public services for all. The continued digitalisation of European public administrations and services will increase the effectiveness of online digital services and facilitate citizens' and businesses' everyday lives.

[23] Definition adapted from: https://ec.europa.eu/social/main.jsp?catId=1543&langId=en
[24] Definition adapted from: Collins Dictionary (n.d.). e-Taxes. Accessed on 9 December 2020.

3.1.3 Human capital

Investments in **human capital** emerge as a clear investment priority when analysing the EU Member States' Recovery and Resilience Plans. Indeed, EU countries are putting forward investments in this field, allocating approximately EUR 19.57 billion of the RRF budget.

As our society rapidly becomes more and more digital, Member States are being urged to invest massively in the **upskilling and reskilling** of their citizens by boosting **digital skills and training,** which appears as the main investment trend identified in this category. Indeed, investing in workers' digital skills is meant to ensure higher productivity and competitiveness of enterprises and therefore, investing in civil servants' digital skills can help strengthen the overall digital capacity of public administrations, with the end goal of creating a digitally skilled public administration at national and sub-national level. The Member States are also heavily investing in students' digital skills so as to reach the European Commission's target of reducing the level of 13–14-year-olds underperforming in computing and digital literacy from 30% to 15% by 2030. It will also be crucial to rethink and invest in new training courses for jobseekers. This includes access to digital skills and emerging technologies in order to develop their employability and ensure they are ready to address the future challenges and needs of the labour market.

Upskilling and reskilling through digital skills

It refers to the process of learning new digital skills so that an individual can do a different job or do their current job differently, as well as providing training following initial education or training with the aim of supplementing, improving, or updating knowledge, skills and/or competences acquired during previous training.[25]

Latvia will invest EUR 17 million to significantly increase the number of ICT specialists with high-level digital skills in the next six years. These specialists will be able to use digital technologies in the development of knowledge, as well as for new products and services in various economic sectors.

The COVID-19 pandemic has also severely impacted the way students learn. Indeed, the sudden switch to **remote learning** for around 76.2 million pupils and students enrolled in schools and pre-schools throughout the EU has forced governments to rethink their education and learning priorities[26]. As can be seen from the analysis of the Member States' National Recovery and Resilience Plans, this new reality has encouraged governments to heavily invest in the development of new learning tools and training courses able to support an efficient education for all students, from kindergarten to university, regardless of their location. However, education systems throughout the EU should be continuously adapted to the challenges of the 21st century by fine tuning the combination between traditional training and learning methods and digital and remote ones.

[25] Definition adapted from https://iate.europa.eu/search/result/1639988842133/1 'Upskilling' and 'Reskilling'
[26] Further information can be found here: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20200604-1

Digital education

This trend refers to the pedagogical use of digital technologies and tools to support, improve and transform learning and teaching, including distance learning.[27]

Germany will invest EUR 500 million to digitalise education in the country by providing teachers with the necessary equipment and tools to digitalise their lessons and learning environments and ensure largescale digital learning and teaching.

The COVID-19 crisis further exacerbated the digital divide that was already in place in many countries throughout the EU. Hence, Member States have placed the reduction of this inequality as a top priority for the years to come, as can be seen through the analysis of their National Recovery and Resilience Plans. Investments in **eInclusion** will aim to reduce the risks of digital exclusion and to encourage the participation of vulnerable groups, including women and the elderly, in ICT by building their confidence in using technology. By promoting an equal access to digital for all, Member States hope to reduce the gaps in ICT usage and bridge the digital divide that persists in many countries.

eInclusion

eInclusion policies aim at reducing gaps in ICT usage and bridging the digital divide. Governments can organise teaching sessions, for example, to promote the use of ICT and allow all citizens to participate in the many aspects of information society. This will also benefit people's employment opportunities, cohesion, quality of life and the country's digital economy performance.[28]

Slovakia will invest EUR 69.4 million to improve the digital skills of at least 172 800 seniors and disadvantaged persons through face-to-face and eLearning training; by providing them with tablets and other digital tools, ensuring access to special applications addressing their needs, and implementing voice control to simplify access to the use of some functionalities. In addition, further digital tools for communication shall be made available for seniors to facilitate their communication with family or their search for accessible and reliable health information.

All investment trends in the field of human capital aim to bolster the European flagship area 'Reskill and Upskill', which advocates to support the digital transition, enhance innovation and growth potential, foster economic and social resilience, and ensure quality employment and social inclusion through reskilling and upskilling. Investing in a more digitalised and modern education and in the provision of adequate training to build the right skills are key elements to achieve the flagship objectives, especially when it comes to disadvantaged groups, such as women, and young people.

[27] https://iate.europa.eu/search/result/1638454606458/1 "digital education"
[28] European Commission (2006). Riga Ministerial Declaration on ICT for an Inclusive Society. Accessed on 10 December 2020.

3.1.4 Digitalisation of businesses

The digitalisation of businesses emerges as a clear investment priority when analysing the EU Member States' Recovery and Resilience Plans. Indeed, EU countries are putting forward investments in this field, allocating approximately EUR 12.91 billion from the RRF. Looking at concrete investment trends, Member States are primarily fostering the **digitalisation of SMEs**. This often translates into the promotion of digital entrepreneurship and the integration of advanced digital technologies (e.g. AI, blockchain, cloud computing, robotics and automation) within existing and future SMEs, but also in providing the tools to overcome possible barriers to the use of such technologies. The main goals pursued by the Member States are improving SMEs' production processes, their adaptability to market requirements, as well as their capacity to innovate. For instance, Regulatory Sandboxes are being created to facilitate SMEs' innovation in the Financial Technology (FinTech) area, including alternative finance platforms and solutions. In parallel, Member States are further encouraging interactions between large enterprises et innovative start-ups, as well as working towards the development of networks of European and national digital innovation hubs to facilitate the transfer of digital competences.

Digitalisation of SMEs

It refers to the transition of SMEs towards the use and integration of digital technology and digitised information to improve existing processes and working methods to make them simpler, faster, more efficient and/or more cost-effective.[29] In the context of this report, this term also includes the pursuit of innovation.

Denmark will invest EUR 8.74 million to help Danish companies to take advantage of business opportunities in the digital domain and in eCommerce. SMEs in particular need help to overcome barriers to invest in and use new and advanced technologies as well as to integrate eCommerce solutions that could help strengthen eBusiness and exports in their business models.

Further to that, EU Member States are also pushing to achieve a better **digitalisation of business processes** within the private sector, which goes hand in hand with the further development of digital skills and the creation of innovative services. This is meant to bring greater operational efficiency through the reduction of manual activities, better data sharing and regulatory compliance thanks to digital transmission and the use of eDocuments, and enhanced transparency.

Digitalisation of business processes

It refers to the increasing use of technologies by businesses, which are considering digital tools as an advantage in their internal and external operations to create new value in their business models, customer experiences and internal capabilities supporting their core operations.[30]

[29] Definition adapted from https://iate.europa.eu/search/result/1638454606458/1 'digital transition'
[30] Definition adapted from https://iate.europa.eu/search/result/1638454606458/1 'digital business'

Slovenia will invest EUR 44 million to achieve greater efficiency, productivity, and competitiveness in the private sector, while addressing the digital transformation of business processes and reducing administrative barriers and burdens on businesses.

The analysis carried out in Chapter 2 also highlighted a final trend in this field, which is the increasing focus of Member States on the **digitalisation of tourism and culture**. Indeed, in the wake of the COVID-19 crisis, the need to strengthen the resilience of these sectors became clear, as they have been among the hardest hit sectors in the worlds' economy since the beginning of the pandemic. Member States are addressing this challenge by betting on the benefits of enhanced digitalisation. To this end, they are investing in the development of IT infrastructures and applications to make cultural heritage accessible to all, as well as to accelerate the development of digital processes and solutions to support eArchiving. Digitalisation is also seen as a way to help both the culture and tourism industry to create more effective marketing tools to attract new markets and evaluate current and future trends to propose fit-for-purpose services, as well as to boost sustainability.

Digitalisation of tourism and culture

New technology-based access to culture is expected to change both its production and dissemination. Culture is preserved and promoted through digital means, by increasing people's access to culture and offering them new ways to participate in cultural experiences and learn[31]. Similarly, the digitalisation of tourism will help businesses in this sector to adapt to market developments and improve their competitiveness by making the maximum use of possible synergies between ICT and tourism.[32]

Italy will invest EUR 110 million to create a hub for digital tourism on a unique dedicated platform that will sustain and promote the Italian cultural heritage for the next generations and promote the Italian tourism ecosystem.

These investments in increasing the digitalisation of the business sector are expected to contribute to the challenges identified under the 'Reskill and upskill' flagship area, which recognises that the green and digital transitions in all sectors need to be supported by adequate skills. In this sense, highly skilled workers who are prepared to meet the challenges of the 21st century are fundamental for businesses to transition towards an increasingly digital world.

[31] Definition adapted from: Dictionnaire Sens Agent le Parisien (n.d.). eCulture
[32] Definition adapted from: Digital tourism in the European Union (2018) European Parliament https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/628236/EPRS_BRI(2018)628236_EN.pdf

3.1.5 *Investment in digital capacities and deployment of advanced technologies*

As part of their National Recovery and Resilience Plans, EU Member States have foreseen investments in **digital capacities** as a precondition for the large-scale deployment of advanced digital technologies, among others. This represents approximately EUR 8.3 billion of the total money coming from the RRF.

Looking at specific investment trends, EU Member States are planning to invest in **cybersecurity** to further strengthen and protect the security of European citizens online as well as to ensure proper security requirements for operators of essential services and digital service providers. Many business models nowadays are built around the smooth functioning of information systems, which are increasingly the targets of cyber-attacks or other cybersecurity incidents and threats. Henceforth, these should be further prevented and in case they occur, Member States should have the right tools and capacities to ensure the most efficient response.

Cybersecurity

Cybersecurity refers to all means used to protect the availability and integrity of networks and infrastructures, as well as the confidentiality of the information contained therein.[33]

Portugal will invest EUR 47 million to strengthen training in cybersecurity and information security, to increase security in information life cycle management, to implement the national cybersecurity framework and transform the model of coordination of cybersecurity and information security, and to create the physical and technological conditions for the implementation and operation of the new cybersecurity coordination model.

Member States are also heavily investing in the deployment of **advanced digital technologies** to increase the Union's competitiveness at global level and help make the Union more resilient. At EU level, Member States are being encouraged to work together on the development and deployment of these technologies, particularly by establishing a European AI testing and experiment facility (AI TEF), and directing investments into the European Blockchain Services Infrastructure, among others.

Advanced technologies (AI, 6G, quantum computing, blockchain)

Advanced technologies are a fusion of digital and key enabling technologies and the integration of physical and digital systems. They give rise to innovative business models and new processes, and the creation of smart products and services.[34]

[33] Definition retrieved from https://iate.europa.eu/search/result/1638454606458/1 'Cybersecurity'
[34] Definition retrieved from https://ec.europa.eu/growth/industry/strategy/advanced-technologies_en

Slovakia will invest EUR 74.8 million in the development of competence centres and platforms focused on cutting-edge technologies, which will aim to strengthen the internal capacities of operators in the field of high-performance computing, quantum technologies, artificial intelligence, decentralised recording technologies, embedded systems, Internet of Things (IoT) technologies, cloud, cybersecurity, and others.

During the COVID-19 crisis, Member States have become more aware of the need for and importance of promoting better access to **data** through secure and interoperable data infrastructures. Hence, Member States are heavily investing in the establishment of data sharing platforms that aim to improve the lives of their citizens and businesses by facilitating data sharing both in the public sector and between the public and private sectors. Platforms for data exchange will also facilitate inter-institutional cooperation, and better implementation of the Once-Only principle.

Data and data centres

This category refers to the unilateral or reciprocal transfer of individual facts, statistics or items of information between two or more parties for the purpose of enhancing knowledge of the participants. [35] In the context of this report, this section focuses particularly on data sharing and exchange, as well as on the creation of data centres that aim to facilitate the stockage and exchange of data.

Ireland will invest EUR 39 million to establish a new Government Data Centre, replacing the four most essential data centres of the State. The aim of this data centre is to meet the government's current and future requirements in data management, as well as to support greater integration and standardisation of administrative processes, and to reduce duplication.

Cloud computing is a key goal for the EU to boost its data sovereignty, as outlined in various political communications such as the EU's Data Strategy, and the Commission Staff Working document meant to guide Member States' National Recovery and Resilience Plans. Indeed, Member States are defining and implementing new cloud policies for the needs of European public administrations and businesses. The European Commission is also encouraging Member States to work together towards the establishment of a European data cloud infrastructure.

Cloud

The cloud, or cloud services, refers to network of servers connected together via the Internet and providing storage and computing power to users who are also connected to the Internet.[36]

[35] Definition adapted from: https://iate.europa.eu/search/result/1640105094122/1 'Data exchange'
[36] https://iate.europa.eu/search/result/1638454606458/1

Greece will invest EUR 97 million for the creation of a centralised cloud infrastructure and related services in order to enhance interoperability and interconnections of systems and registers between public sector bodies.

The investments trends related to digital capacities and the deployment of advanced technologies will champion the European flagship area 'Scale-up', which aims to equip European countries with all the necessary tools to benefit from the digital transition and its innovative potential while maximising productivity and economic growth at national and European level.

3.1.6 Digital-related investment in R&D

Member States are laying the foundations in their Plans to sustain investments in ICT R&D (e.g. artificial intelligence, cybersecurity, block chain), allocating approximately EUR 23.6 to this goal. To do so, they are following two main investment trends. On the one hand, EU countries are putting efforts into improving the **infrastructures that are meant to support R&D**. This entails the establishment of Digital Innovation Hubs, the upgrade of R&D capabilities of academic institutions and research centres, the creation of new or the upgrade of existing laboratories and research and experimentation environments, which are needed to design and test innovative technologies.

Infrastructures to support R&D

It refers to facilities, resources and related services that are used by the scientific community to conduct top-level research in their respective fields and covers major scientific resources, equipment or sets of instruments.[37]

Finland will invest EUR 8 million to update the research infrastructure of the Academy of Finland according to the targets of the Strategy for National Research Infrastructures 2020-2030, with a strong focus on digitalisation.

On the other hand, Member States are planning to invest in concrete **R&D projects on innovative technologies**. These include R&D projects fostering research on new applications of advanced digital technologies, cybersecurity, robotics, as well as digitalisation more generally. Particular attention is being paid to the space sector, which was deeply affected by the COVID-19 crisis. Despite the different focus of the projects, the common goal is to enhance collaboration between research/academic organisations and industry to cross-fertilise R&D approaches by encouraging interdisciplinarity and collaborative projects, with an eye to further foster synergies at both national and European level.

[37] https://iate.europa.eu/search/result/1638454606458/1 "research infrastructure"

R&D on innovative technologies

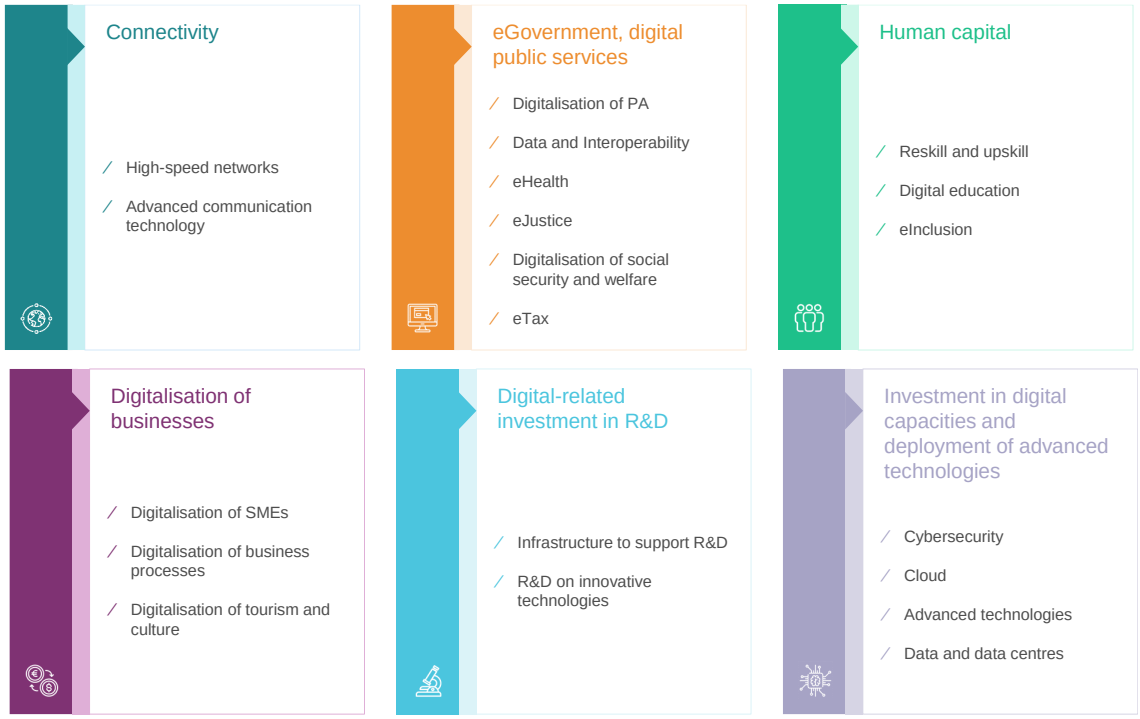
It refers to creative work undertaken on a systematic basis in order to increase the stock of knowledge on innovative technologies (including knowledge of man, culture and society), and the use of this knowledge to devise new applications of these technologies.[38]

France will invest EUR 750 million to encourage innovation, to cross-fertilise R&D approaches by encouraging interdisciplinarity and collaborative projects, and to orient R&D within companies towards a long-term vision of climate and energy.

Investment trends identified in the field of R&D with a focus on digitalisation are meant to bolster the flagship area 'Scale up', which aims to ensure that the EU has what is needed to sustain its digital transition in the long run. In this regard, R&D in the digital sphere becomes essential to guarantee competitive advantage on the market and ensure further resilience.

Figure 7 below summarises the main trends identified for each investment category.

Figure 7. Main investment trend per investment category



Source: Main investment trends per investment category identified in the national Recovery and Resilience Plans of the EU Member States, summarised by Wavestone, Dec 2021.

[38] Definition adapted from https://iate.europa.eu/search/result/1639999935923/1 'Research and development'

The European Commission, through its newest Recovery and Resilience Scoreboard, is also providing an overview of how the implementation of the Recovery and Resilience Facility and the Member States' Recovery and Resilience Plans is advancing. It aims to do so for the six policy areas put forward by the RRF Regulation[39]. For instance, the thematic analysis performed by the Commission for the digital transformation policy area concludes that initiatives aimed at digitalising public services and at introducing or improving eGovernment solutions to revamp and modernise public administrations' processes figure prominently across the Member States' Recovery and Resilience Plans. This analysis by the European Commission therefore complements and sustains the main findings gathered through our report and summarised here above.

[39] Namely, the green transition, digital transformation, smart sustainable and inclusive growth, social and territorial cohesion, health and economic, social and institutional resilience, and lasty policies for the next generation.

4 Supporting a Digital Europe: The way forward

The COVID-19 pandemic, which started in February 2020, marked the beginning of a new era for various reasons, shaping both the present and future of the European economy and society. It is often said that this unprecedented health crisis has further highlighted the critical role of digital technologies and infrastructures in our lives and demonstrated how our societies and economies rely on digital solutions. Indeed, the COVID-19 pandemic acted both as an **accelerator** in this field, with countries with a higher level of digitalisation reaping the benefits by responding faster to some of the challenges posed by the pandemic, as well as a major **divider**, impacting rural and low-income communities heavily, which in many cases are denied access to technology.

The Council conclusions of 9 June 2020 – which followed the presentation by the Commission of its ambitious strategy on Shaping Europe's digital future as well as of its wide-ranging package combining the 2021-2027 Multiannual Financial Framework (MFF) and an extraordinary recovery effort under Next Generation EU – further recognised the importance of digital technologies in the transformation of the European economy and society. These initiatives also stressed that the acceleration of digital transformation is an essential component of the EU's response to the economic crisis caused by the COVID-19 pandemic. With this in mind, in February 2021, EU Member States were called upon to put forward a comprehensive package of reforms and investments until the end of 2026 under the yearly European Semester cycle.

In this context and to further support national efforts, in November 2021 the Commission launched the Digital Europe Programme, a new funding programme focused on bringing digital technology to businesses, citizens and public administrations. The programme aims at reinforcing critical EU digital capacities by focusing on the key areas of artificial intelligence (AI), cybersecurity, advanced computing, data infrastructure, governance and processing, the deployment of these technologies and their best use for critical sectors like energy, climate change and environment, manufacturing, agriculture and health.

Following the publication of its Work Programmes, the Digital Europe Programme's main goals seem to be in line with the investments put forward by the EU Member States, as clustered in Chapter 2, and coherent with the investment trends identified in Chapter 3. In particular, **clear synergies** between what the programme will offer, and the needs of the countries in relation to the implementation of their Plans are recognised and summarised below according to the main chapters of the Work Programme 2021-2022.

Cloud, Data and Artificial Intelligence

Potential synergies with national investment trends			
	Data and interoperability		Data and data centres
	Advanced technologies		Infrastructure to support R&D

The Digital Europe Programme aims at setting up **European common data spaces**, supported by a **Data Space Centre**, and laying the foundations for building **interconnected, trusted, interoperable and sustainable cloud-to-edge capabilities** including infrastructures, platforms, marketplaces and services. These will be open-source and accessible to businesses and the public sector across the EU. This is meant to enable the secure and cross-border access to key data in different sectors. The programme will also promote the testing and adoption of trustful AI technologies with world-class **testing and experimentation**

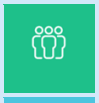
facilities boosting the development of AI in four prioritised sectors, namely health, smart communities, manufacturing, and agriculture. An **AI-on-demand platform** will also be consolidated as a catalogue of AI-based resources, as well as a marketplace for trustworthy AI tools made in Europe for both the private and public sector.

High Performance Computing and Cybersecurity

Potential synergies with national investment trends			
	High-speed networks		Advanced communication technologies
	Advanced technologies		Cybersecurity

The programme will fund the further development of capacities related to **high performance computing** and **quantum computing**. In particular, it will ensure the deployment of a secure quantum communication infrastructure for the EU, known as EuroQCI. This infrastructure is meant to become the backbone of a future "quantum internet", connecting quantum computers, simulators and sensors to radically enhance their performance and enable a new technological revolution. This also entails that effort will be made to support the development of **cybersecurity infrastructure** and strengthen cybersecurity uptake, specifically in sectors affected by the COVID-19 pandemic. Finally, the programme will also support the implementation of relevant **EU legislation and political initiatives**, such as the NIS Directive and the Cybersecurity Act.

Advanced Digital Skills

Potential synergies with national investment trends			
	Reskill and upskill		eInclusion
	Remote digital education		Advanced Technologies
	R&D on innovative technologies		Digitalisation of SMEs

The Digital Europe Programme targets the **reskilling and upskilling** of both the existing workforce and of future experts in key capacity areas. The programme will support networks of education and training institutions, research centres and businesses for the design and delivery of specialised education programmes as well as traineeships to acquire advanced digital skills needed for specific technologies. Further to that, it will work to ensure the sustainability of the EU digital platform for skills and jobs, as well as the coordination of the **digital transformation of the education sector** at European level.

Accelerating best use of technologies

Potential synergies with national investment trends			
	Digitalisation of public administrations		Digitalisation of social security and welfare

	eHealth		Digitalisation of business processes
	eJustice		Digitalisation of tourism and culture
	eTax		Digitalisation of SMEs

As the programme aims at driving the digital transformation of Europe, it also supports industry, small and medium-sized enterprises (SMEs), and the public administration in their digital transformation through different means. When it comes to businesses, it will enable the deployment and enhancement of the European Blockchain Services Infrastructure **(EBSI)**, which was set up in the context of the CEF Telecommunications Programme (2014-2020), contributing to the deployment of use cases as well as providing a regulatory sandbox for Blockchain standardisation with a reinforced network of European Digital Innovation Hubs **(EDIHs)**. Looking at the public sector side, the Digital Europe Programme goes in the direction of establishing a **European Digital Government Ecosystem** for the digital transformation of public administrations, building on projects funded through the CEF Telecommunications Programme (2014-2020) and ISA^2 Programme (2014-2020), and in line with the recently launched Interoperable Europe, the European Commission's initiative for a reinforced interoperability policy in the public sector . This will be achieved by providing Member States and Associated Countries with a platform of common services for public administrations, deploying an EU electronic identity system, supporting the rollout of the Once-Only principle in line with the Single Digital Gateway Regulation, and deploying an interoperability incubator fostering the deployment of new digital services. In addition, the programme will pay particular attention to the digitalisation of the European **judicial system**, including the piloting of AI-based law enforcement digital solutions, **healthcare** and **consumer protection**.

On the basis of this, and in synergy with other EU programmes such as the Horizon Europe programme for research and innovation and the Connecting Europe Facility for digital infrastructure, the Recovery and Resilience Facility and the Structural funds, the Digital Europe Programme seems to be well placed to support Member States in the implementation of the digital investments put forward in their Recovery and Resilience Plans and in the acceleration of Europe's recovery.

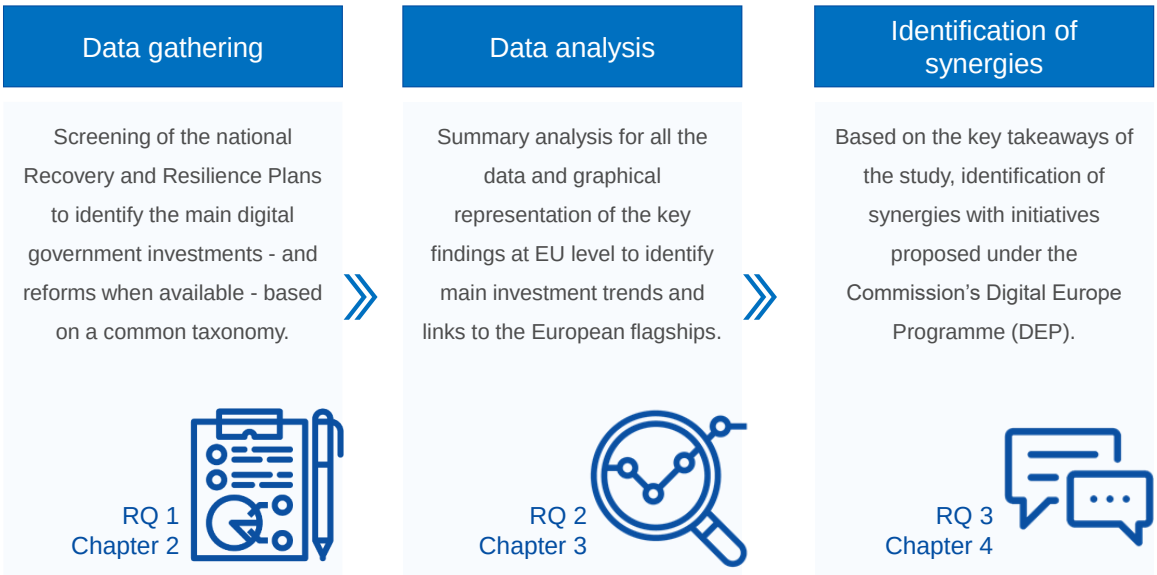
Annex I – Methodology

The report aims at analysing EU Member States' national Recovery and Resilience Plans with a focus on the digital transition. To do so, the report aims at answering the following research questions:

- **RQ1**. How do the Plans address digital transformation according to selected categories provided by the Commission Staff working documents (SWD(2021)12 final), aimed at guiding Member States to draft their Recovery and Resilience plans?
  The purpose of this research question is to provide an overview of the main investments – and, when available reforms – that the Member States will undertake when it comes to digital transformation.
- **RQ2**: What could be the main upcoming trends in the digital realm at EU level, taking stock of the so-called European Flagship areas?
  The purpose of this research question is to identify the possible main trends in terms of national investments that are likely to contribute to the European flagship areas, in particular to those having a strong digital component.
- **RQ3**. Based on the finding of our analysis, how can the Commission better support Member States in their digital transformation?
  The purpose of this research question is to provide the main findings regarding the ways in which digital transformation is addressed in the Plans and identify the main synergies with initiatives at Commission level, most notably the Digital Europe Programme.

The methodological approach taken to conduct this study is designed to provide answers to the research questions in a structured way. It comprises three steps, as illustrated in Figure 8.

Figure 8. Overall methodological framework



Source: The overall methodological framework of the study summarised by Wavestone, Dec 2021.

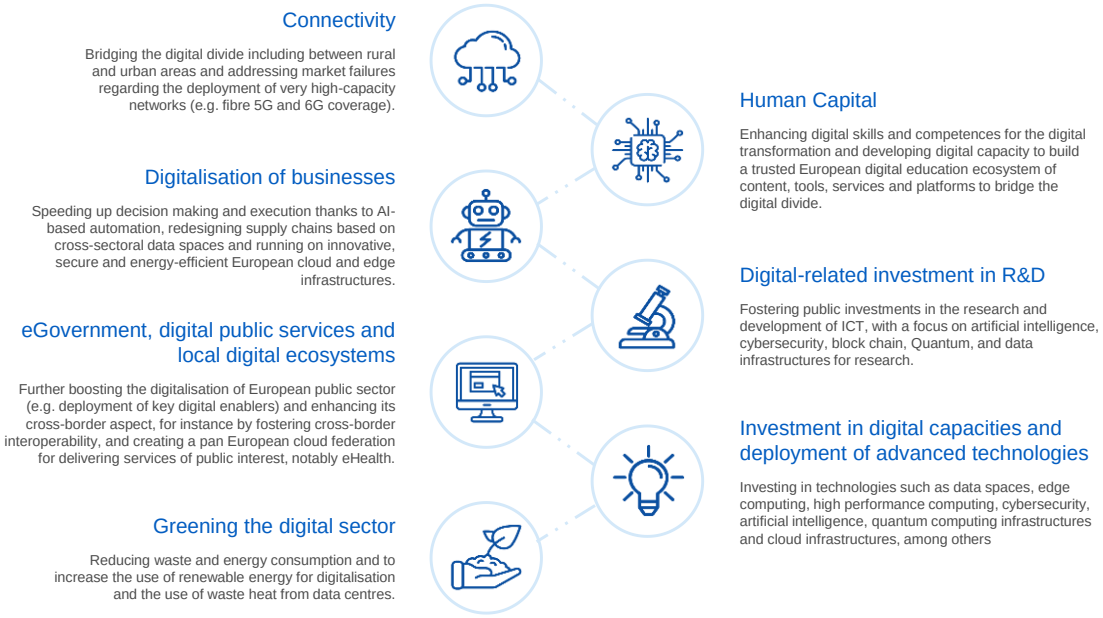
Step 1 – Data gathering

This first step aims to gather the necessary information to answer RQ1. To do so, the following sources were used:

- **The national Recovery and Resilience Plans**: The Plans set out a comprehensive and coherent package of reforms and investments within the scope of the Facility and in pursuit of its objectives. The documents are submitted by each Member State and then assessed by the European Commission.
- **The Commission Staff Working Document: Analysis of the recovery and resilience plan of the country**: The Commission assesses Member States' Recovery and Resilience Plans within two months after submission and translates their content into legally binding acts. Based on a proposal by the Commission, the Council has as a rule four weeks to adopt the Commission proposal.
- **The role of Digital Government in the European Semester process 2020**: The report, published under the National Interoperability Framework Observatory (NIFO), examines the level of modernisation and digitalisation in Europe's public administrations and analyses the role played by digital government in the 2020 European Semester cycle, identifying the main CSRs in the digital field addressed to Member States.
- **The Digital Public Administration factsheets 2020**: The factsheets provide a country-level, yearly overview on the latest developments and advances on digital public administration and interoperability matters in 35 European countries.
- **Digital Economy and Society Index (DESI) 2020**: Data coming from the Digital Economy and Society Index (DESI) 2020, which summarises indicators on Europe's digital performance and tracks the progress of EU countries, were used to set the scene and better contextualise the investment choices made by the EU Member States in the National Recovery and Resilience Plans.

At this stage, all relevant investments related to digital transformation contained in the Plans are clustered according to the categories presented in Figure 9, in line with the Commission Staff Working Document providing guidance to the Member States in drafting their Plans and consistent with Annex III of the Regulation establishing the Facility.

Figure 9. Investments categories for digital transition



Source: Categories for investments put forward in the Commission SWD(2021) 12 final, summarised by Wavestone, Oct 2021.

For the purpose of this study, the investment category "Greening the digital sector" is not considered in our analysis. When possible, links to higher level reforms, that these investments are contributing to, are also provided, to give insights on the long-term national policy priorities.

Step 2 – Data analysis

This step aims at answering RQ2. While the Plans reflect the specific situation of each Member State, there are some common challenges that call for coordinated investments and reforms. The Recovery and Resilience Facility is an opportunity to identify European flagships with tangible benefits for the economy and citizens across the EU. These flagships address issues that are common to all Member States, need significant investments, create jobs and growth and are needed for the twin transition. For these reasons, the Commission strongly encourages Member States to include in their Plans investments and reforms in seven areas: Power up, Renovate, Recharge and Refuel, Connect, Modernise, Scale-up and Reskill and upskill[40]. Pursuing these flagships will ensure the success of the recovery of Europe and make Europe a digital and greener continent as well as increase the cohesion among its Member States. The EU-wide analysis provided in Chapter 3 tries to shed light on the contribution that MS' national recovery and resilience plans play with regards to four of the flagship areas strongly related to digital. These are:

- **Connect**: Citizens and businesses in Europe should have access to **rapid broadband services**. Today only 44% of households has access to very high-capacity networks, capable of providing at least gigabit connectivity, with significantly reduced coverage in rural areas. Fast rollout of rapid broadband services to all regions and households, including fiber and 5G networks as well as

[40] More information on the seven European Flagships can be found in the Annual Sustainable Growth Strategy 2021, accessible here.

developing quantum encryption communication, will be essential to ensure the widest possible territorial coverage in areas not served by the market while at the same time preserving the open strategic autonomy of the EU. While urban areas and major terrestrial transport paths are expected to be covered more rapidly through private financing, the Recovery and Resilience Facility should ensure that by 2025 there is the **widest possible uninterrupted 5G coverage** for all areas.

- **Modernise**: **EU-ID and key digital public services** should be modernised and accessible to all. Secure and EU-wide electronic identification and authentication vis-à-vis governments and private actors and access to their services, will provide citizens with control over their online identity and data as well as enable access to online digital services. The **digitalisation of public administration and services** will increase the effectiveness of both. This includes also the **justice and healthcare** system. By 2025, Member States should ensure the provision of a European digital identity (e-ID) and public administrations should be providing interoperable, personalised and user-friendly digital public services.
- **Scale-up**: The EU digital transition depends on increasing European industrial data cloud capacities and on ability to develop the most powerful, cutting edge, and sustainable processors. By 2025, the flagship will aim to double the production of semi-conductors in Europe, to produce 10 times more energy efficient processors. This allows for instance the rapid take up of connected cars and to double the share of EU companies using advanced cloud services and big data (from 16% today).
- **Reskill and upskill**: Unprecedented investments in re- and upskilling are central to supporting the green and digital transitions, enhancing innovation and growth potential, fostering economic and social resilience and ensuring quality employment and social inclusion. Investments and reforms should focus on digital skills and educational and vocational training for all ages. In 2019, still 42% of Europeans do not have at least basic digital skills. By 2025, the share of Europeans aged from 16 to 74 with basic digital skills should increase to reach 70%. Education systems needs to be further adapted to the challenges of the 21st century. Member States should ensure that pupils' digital competence is significantly improved, in order to reduce the share of 13–14-year-old students who underperform in computer and information literacy to under 15%. Member States should pay special attention to disadvantaged groups, women and in particular young people entering the labour market, by creating quality employment opportunities, and supporting adequate offer of apprenticeships and strengthening vocational education and training (VET). By 2025, at least four in five VET graduates should be employed and three in five should benefit from on-the job-training.

Having these in mind, the data gathered in the previous step will be aggregated and analysed at EU level to be able to identify main trends in the digital realm in the future.

Step 3 – Identification of synergies

This third and final step aims at answering RQ3. Building upon the results of the in-depth content analysis in the previous two steps, this chapter provides an account of how the Commission is going to support the digital transition of the EU Member States. in particular, it aims at identifying the potential synergies between the initiatives put forward by the Digital Europe Programme and the main national investment trends identified at EU level.

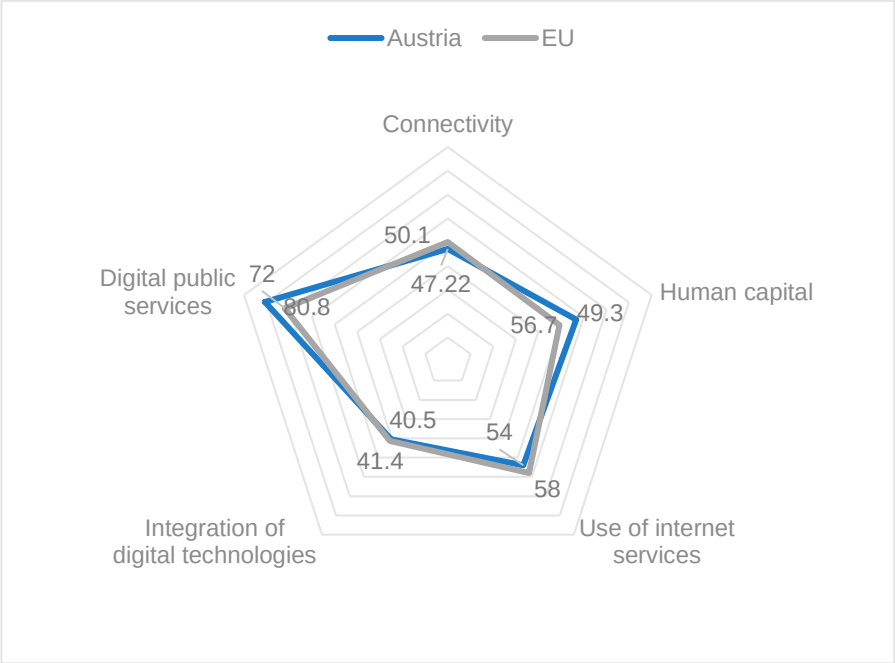
Annex II – An analysis of the national Recovery and Resilience Plans

4.1 Austria

4.1.1 Country digital outlook

According to the Digital Economy and Society Index (DESI), in 2020 Austria scored slightly above the EU average, placing itself 12th in the overall ranking of all EU28 Member States. Figure 10 shows the performance of the country in 2020, based on 2019 data across DESI five main dimensions. While Austria scored above average in two dimensions, namely digital public services and human capital, it scored below average in connectivity, the use of internet services and the integration of digital technologies. In the same year, Austria received two Country Specific Recommendations in the context of the European Semester calling the country to take action to guarantee equal access to education and foster digital skills across the population, as well as to enhance digitalisation within the private sector by increasing the investments on digital innovation projects. Against this background, it must be said that Austria keeps up the effort to foster the digital transformation of its economy and society in the last five years, as also demonstrated by the strong focus on digital matters in its National Recovery and Resilience Plan, detailed in the following sections.

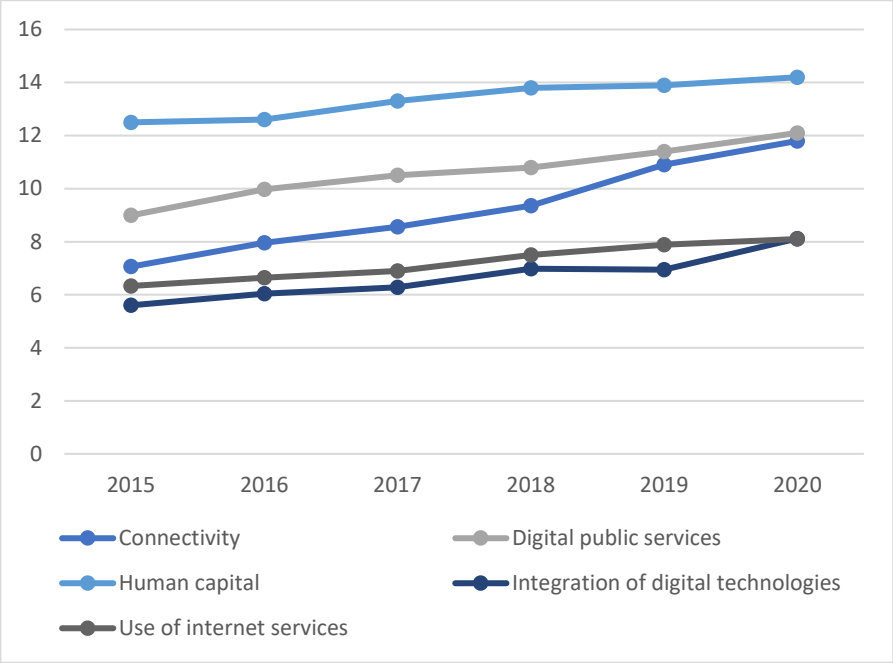
Figure 10. Performance on DESI 2020 - Austria



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Figure 11 below indicates the constant improvement of Austria's performance in the main dimensions of DESI since 2015.

Figure 11. DESI indicators over the years - Austria



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

The **connectivity** dimension has been improving since 2015 thanks to the increased provision of fixed broadband with speeds of at least 100 Mbps.[41] The trend of catching up with the EU average in broadband connectivity is continued with the investments planned under the National Recovery and Resilience Plan with EUR 891.3 million to be invested in the extension of broadband physical infrastructures across the country.

Looking at the **human capital** dimension, Austria ranked well above the EU average as the country works towards providing training to its citizens as well as giving employers the possibility to train their own employees.[42] The development of the Human capital dimension can be regarded as a key focus of the Austrian National Recovery and Resilience Plan as various investments are planned to improve the training offer and equipment provision at schools as well as the re- and up-skilling of unemployed people.

In relation to the **use of internet services**, according to DESI 2020 figures, Austria improved slower than that of other Member States, placing Austria in 18th rank, despite the improvement been made since 2015, as shown in Figure 11.

When it comes to the **integration of digital technologies** Austria scored slightly below the EU average mainly due to a very low use of cloud technologies as well as a low uptake of big data. Nevertheless, with the renewal of the SME digital programme and other existing programmes such as the Global Incubator Network Austria, the country is putting effort into improving this dimension. This trend can also be seen in Figure 11, indicating improvement of the dimension between 2019 and 2020. Additionally, the Research, Technology

[41] https://digital-strategy.ec.europa.eu/en/policies/desi-austria
[42] https://digital-strategy.ec.europa.eu/en/policies/desi-austria

and Innovation (RTI) strategy under the National Recovery and Resilience Plan and the related investments tap into further promoting this effort to boost the integration of digital technologies in Austria.

Lastly, the dimension of **digital public services** is the area in which Austria scores best and well above EU average. The Once-Only principle has been introduced to reduce administrative burden and the Austrian One-Stop eGovernment Portal provides several services for companies and citizens[43]. Austria's ambition to join the top five in this DESI dimension is observable in the National Recovery and Resilience Plan, which puts forward several eGovernment initiatives to improve the delivery of digital public services.

4.1.2 Reforms and investments

The Austrian Recovery and Resilience Plan, which was submitted for assessment to the European Commission in April 2021, is officially called *Österreichischer Aufbau- und Resilienzplan 2020-2026*. The Plan is subdivided into four main components[44] and includes overarching reforms, which are supported by specific investments. The digital part of the Austrian Plan focuses on the digitalisation of public services and businesses as well as on providing access to digital tools for all citizens. Overall, the digital transition is a major aspect of the Austrian Plan and about 53% of the Plan's total allocation (corresponding to EUR 1.86 billion out of EUR 3.5 billion) champions digital objectives. Investments and reforms have been grouped into six categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Under the Austrian Plan, nearly half of its total amount, corresponding to approximatively EUR 891.3 million, is allocated to measures targeting connectivity[45], which are described below:

Establishment of new symmetrical Gigabit connections in underserved, disadvantaged and rural areas: This investment will provide equal Gigabit access points for all households, businesses and public institutions across Austria, and in turn improving Austria's overall. The investment will be implemented through two initiatives: Broadband Austria 2030: Access and Broadband Austria 2030: OpenNet. While the first aims at improving broadband availability in under-served regions, the second intends to support the construction of nationwide open access networks.

[43] https://digital-strategy.ec.europa.eu/en/policies/desi-austria
[44] The Plan includes four main components under which reforms and investments are classified: (1) Sustainable recovery; (2) Digital recovery; (3) Knowledge-based component; and (4) Just recovery.
[45] The Connectivity aspect is particularly covered under **Subcomponent 2** of the Austrian Plan, which focuses on broadband expansion.

Policy priority

The above-mentioned investment accompanies the reform **Creation of the platform *Internetinfrastruktur* Austria 2030 (PIA 2030)** which targets creating a taskforce made up of representatives from the federal government, the federal states, municipalities and regions to coordinate their work and further develop legal, regulatory and technical measures in the context of broadband expansion and of implementing the recommendations of the Connectivity Toolbox. While the platform was launched in March 2021, the aim is to support the achievement of the Broadband Strategy 2030 targets.

eGovernment, digital public services and local digital ecosystems

This aspect is covered by several measures under the Austrian Plan. While not all initiatives have yet specified amounts of money allocated under the RRF, at least EUR 176.5 million will be spent to enhance eGovernment and digital public services under the Austrian Plan[46].

Digitalisation fund for public administration: The objective of this investment is to create a fund, which will support the development of a 'close to the citizen', service-oriented digital public administration to ensure higher efficiency of administrative processes and better service provision. This investment amounts to EUR 160 million, which will be fully funded by the RRF.

Policy priority

The above-mentioned investment accompanies a reform put forward in a legislative proposal **for the Once-Only principle, including an amendment of the law for the business service portal (*Unternehmensserviceportalgesetz*)**, which will reduce the bureaucratic burden of administrative processes for economic operators and citizens. Further, it includes an institution-wide interoperable use of the data, which implies that data needs to be provided only once and is afterwards exchanged by the different authorities and government units under data safety regulations.

Further digitalisation of health services for mothers and children: This investment contributes to the digitalisation of the health services for mothers and children by, among other things, by fostering the use of electronic documentation and developing a dedicated communication platform to provide useful information and facilitating access to examination results for both doctors and citizens.

Human Capital

When it comes to the human capital dimension[47], Austria intends to develop digital skills of its citizens, especially students, and to finance upskilling and reskilling initiatives.

[46] Particularly, **Subcomponent 2.C** which focuses on the digitalisation of public administration under **Component 2** on the digital recovery.

Provision of digital devices for students: This investment will ensure the provision of and equal access to digital tools and technologies to all students. A total amount of EUR 171.7 million is foreseen for this investment.

Policy priority

The above-mentioned investment complements the reform **Fair and equal access to basic digital skills for all secondary school students,** providing equal access for all secondary school students to modern and digital education. It consists of several key measures, namely: i) re-training efforts for all teachers, ii) expanding basic IT infrastructure within schools, iii) developing the Digital School Portal to coordinate all application for education and administration via a single-sign-on hub, iv) enhancing the Eduthek platform and the implementation of a seal of quality for learning applications to ensure a structured and high-quality offer of digital education.

Funding of reskilling and upskilling initiatives: The EUR 277 million investment will continuously finance the improvement of skills and competences of the unemployed and to complement the knowledge gained through education and university through life-long learning. Overall, around 40 000 unemployed are expected to benefit from the education bonus and around 94 000 people from re-training and further training measures. The initiative intends to increase the human capital of the Austrian working age population.

Policy priority

The above-mentioned investment complements the ***Bildungsbonus*** **(Education bonus)** reform targeting the improvement of incentives for unemployed to participate in an at least a 4-month training or another qualifying measure as well as to reduce the risk/degree of dropouts from trainings and qualifying measures.

Investment in digital capacities and deployment of advanced technologies

Austria's Plan included one investment on digital capacities and the deployment of advanced technologies[48], which is focused on the development of quantum technology.

Quantum Austria: This investment funds research infrastructures - including software development - and research cooperation to expand the knowledge-based development of technological concepts for quantum computing, simulation and communication and to further establish technologies for the entire field of quantum sciences (i.e. hardware and software). An expected amount of EUR 107 million is allocated for this investment, of which all will be drawn from the RRF.

Policy priority

The above-mentioned investment complements the **RTI Strategy 2030,** which's goal is to set the overall strategical direction for the upcoming 10 years in order to i) catch-up with the international leading countries in RTI, ii) focus on effectiveness and excellence, iii) promote knowledge, talents and skills.

[47] Human Capital is the focus of **Subcomponent 2.B**, aimed at fostering digitalisation in schools under the digital recovery, and **Subcomponent 3.B** focusing on the re- and up-skilling under knowledge-based recovery.
[48] The **subcomponent 3.A** Research under the knowledge-based recovery of the Austrian Recovery and Resilience Plan covers the dimension related to digital capacities and the deployment of advanced technologies.

Digital-related investment in R&D

The digital-related investment in R&D in the Austrian Plan is being covered by several measures amounting to a total sum of EUR 105 million being spent on the advancement of this dimension. Priorities under this dimension relate to the set-up of research centres and facilities in the context of digital innovation[49].

Austrian Institute of Precision Medicine: The investment will finance the development of a medical research centre focusing on disease monitoring and prevention as well as on biomedical research. Additionally, the initiative includes the construction, development of infrastructure and provision of digital equipment for research. The centre is planned to be completed by 2026 and the investment, worth EUR 75 million, is entirely covered by the RRF.

Digital Research infrastructures for the sustainable development of universities in the context of digitalisation: This investment will support the achievement of the goals identified under the RTI strategy and includes the provision of all necessary infrastructure to make Austria a leading country in the research and development field and promote it as an European and international research hub. The estimated budget of this amounts to EUR 30 million, which will be fully funded by the RRF.

Policy priority

The above-mentioned investments complement the **RTI Strategy 2030** whose goal is to steer the country's strategic direction for the upcoming 10 years in order to: catch-up with the international leading countries in RTI; focus on effectiveness and excellence in these fields; and promote knowledge, talents and skills.

Digitalisation of businesses

The Austrian Plan includes one investment and one reform supporting the digitalisation of businesses[50], and more specifically the digitalisation of cultural heritage and cultural and artistic industries.

Development of a national strategy for digitalisation of the cultural heritage: This investment focuses on the digitalisation of archives, to make them accessible and available to a broader public. Additionally, the second objective of this investment will be to increase the connection between culture, art and education through specific activities realised in cooperation with educational institutions. The amount of this investment is approximated to EUR 16.5 million, of which all will funded by the RRF.

[49] This dimension is covered by **Subcomponent 3.A**, which focuses on research, and **3.D** focusing on digital and ecological transformation of enterprises.
[50] The digitalisation of businesses-related aspects of the Austrian Plan are addressed in **subcomponent 4.C**, focusing on art and culture under **Component 2** named 'the Just Recovery'.

Policy priority

The above-mentioned investment accompanies the implementation of the **National Strategy for the digitalisation of the cultural heritage,** safeguarding the existing cultural heritage and to further develop it to make *Austriabetter* an innovative international platform for the fusion of art, culture, technology, and the digital world. The cultural and arts industry shall be supported in their digitalisation process with this reform to complete the digitalisation of cultural heritages.

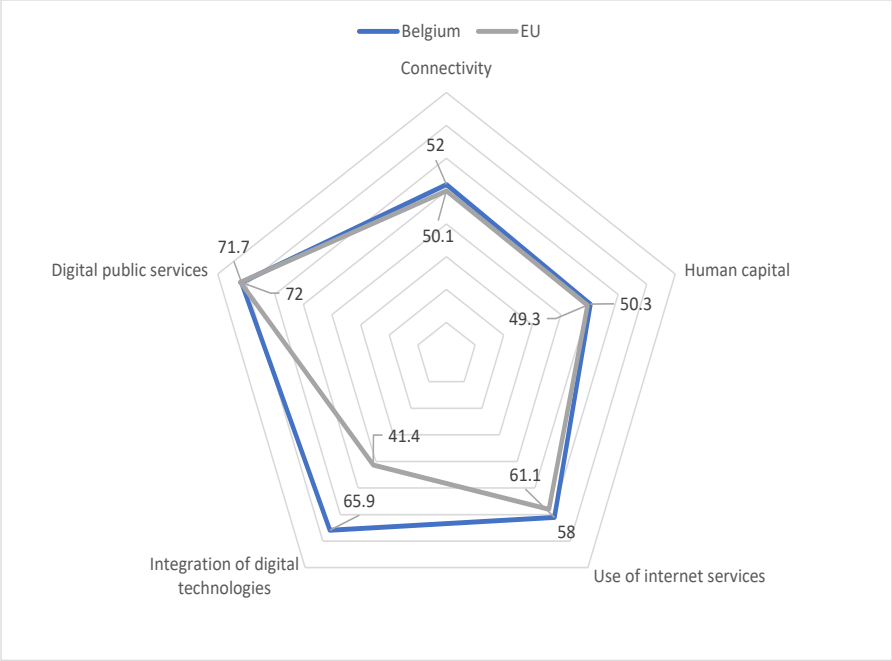
4.2 Belgium

4.2.1 Country digital outlook

In Belgium, the digital transformation is already well underway, and many investments have been made in this sector in the last five years to enhance economic growth and productivity, while fostering innovation. According to the 2020 edition of the Digital Economy and Society Index (DESI), Belgium ranked above the European average and scored the 9th place in the overall ranking of all EU28 Member States. Figure 12 below displays the performance of Belgium on the five DESI dimensions in 2020, based on data from 2019. Belgium ranked above the European average in all dimensions, except for the digital public services one.

Considering these challenges in the digital sphere, in 2020 Belgium also received one Country Specific Recommendation in the context of the European Semester, calling the country to take action mainly in the field of emerging technologies, to focus its future investments on the digital transition by ensuring that a particular emphasis is placed on 5G and Gigabit Networks. Against this background, it must be said that Belgium is planning to continue the digital transformation of its economy and society, as demonstrated by the strong focus on digital matters in its Recovery and Resilience Plan, detailed in the following sections.

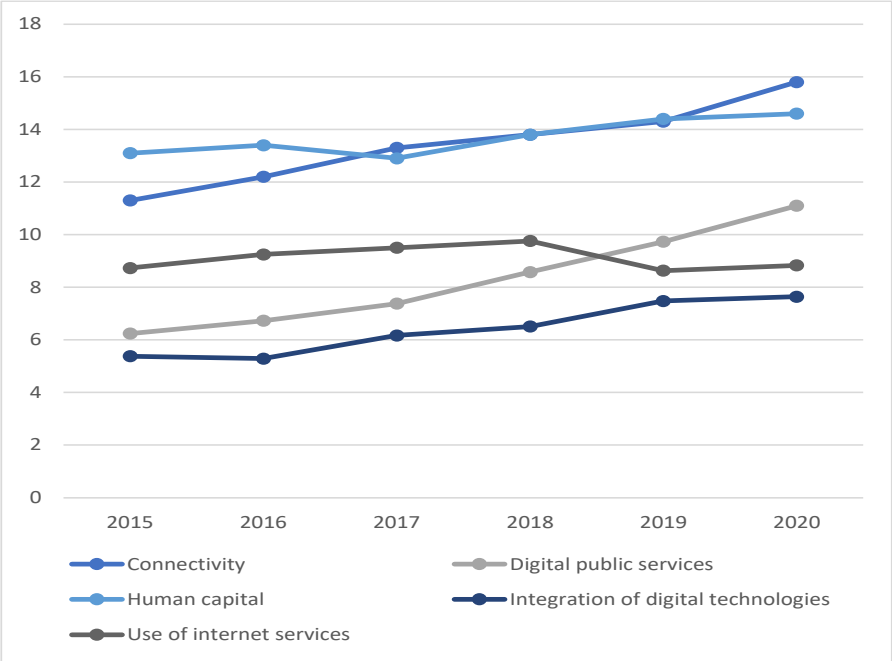
Figure 12. Performance on DESI 2020 - Belgium



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Figure 13 below shows the evolution of Belgium's performance in the five main DESI dimensions since 2015. Belgium has made significant progress in the digital sector, in particular in connectivity, in the integration of digital technologies and in digital public services.

Figure 13. DESI indicators over the years - Belgium



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Through the Digital Belgium - Plan for Ultrafast Internet in Belgium 2015-2020, **connectivity** has been one of the focus points in the last five years. While Belgium was performing well in the coverage of fast and very high-capacity networks, it was lagging behind other countries in terms of 5G readiness in 2020. To address this challenge, the Belgian Resilience and Recovery Plan includes both an investment and a federal reform on the deployment of 5G.

Through the adoption of several federal and regional initiatives and programmes related to emerging technologies, such as the DigitalWallonia4AI programme, AI4Belgium, the Flemish Cybersecurity Action Plan, among others, demonstrate Belgium's commitment to invest strategically in the **integration of digital technologies** by businesses, such as cloud, big data and AI. Additionally, Belgium is also a member of the EuroHPC Joint Undertaking and has signed in 2018 the Declaration on the European Blockchain Partnership, as well as the Declaration on cooperation on Artificial Intelligence. Beyond good results in this dimension, Belgium intends to further develop the integration of digital technologies for businesses, notably with a regional data exchange platform and a new AI Institute in Brussels.

Regarding **digital public services**, Belgium ranked close to the EU average in 2020, placed in 15th position out of 28 EU members for this dimension. In 2020, Belgian scored above the European average for the use of pre-filled forms and digital public services offered to businesses, while the percentage of eGovernment users was very low (53% compared to 67% for the EU average). To increase the uptake of eGovernment services among citizens, Belgium put forward various investments and reforms in its Recovery and Resilience Plan - both at the federal and regional level - on the modernisation of digital public services in different sectors such as, among others, health, and employment.

As in other European countries, the number of **internet users** in Belgium increased over the years. Despite a decrease observed in 2019, the use of other online activities such as shopping or selling online, as well as taking online courses, was around or slightly above the EU average due mostly to the impact of the COVID-19 crisis. To facilitate the use of internet services for all citizens, Belgium has planned investments in its Plan

related to eInclusion and the development of online courses included in a global strategy on the digitalisation of education.

Lastly on the **human capital** dimension, the need for a more digitally skilled workforce remained an issue in Belgium despite clear efforts to promote digital inclusion and close the digital divide. According to data from DESI 2020, the number of ICT graduates was particularly low compared to the EU average (1.9% versus 3.6% for the European average). In order to tackle this challenge, Belgium's National Recovery and Resilience Plan includes multiple investments, mainly regional ones, to strengthen the digital skills of Belgian citizens at different levels of education and to decrease the risk of digital exclusion, especially of the most vulnerable groups.

4.2.2 Reforms and investments

The Belgian Plan, officially named *Plan National pour la Reprise et la Résilience de la Belgique*, is subdivided into six strategic axes and 17 components, each covering one or many reforms and investments. Most investments and reforms related to the digital transition are gathered in the second axis of the same name, but investments in this sector can be found in Axis 3 (Mobility), Axis 4 (Social and living together) and Axis 5 (Future economy and productivity). Investments and reforms are also divided and distributed according to the level of power in charge of the political matter: federal, regional or community entities. The Plan, submitted in June 2021, is specifically aimed at supporting the country's growth, employment, social cohesion and public finances, as well as catching up on a significant structural backlog of public investments.

The Belgian Plan's contribution to the national digital transition amounts to 26.6% of its total allocation of EUR 5.9 billion in grants, which will support the implementation of the crucial investments listed below by 2026. These have been grouped into five categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Investments in the area of connectivity[51] will aim to improve the overall national connectivity by continuing the development and deployment of very high-speed fibre optic networks, as well as the deployment of 5G corridors. Indeed, Belgium will invest EUR 89.8 million into the construction of high-speed networks, as further detailed here below:

5G – FED[52]: Belgium is investing EUR 8.26 million to develop 5G corridors, which will allow universal and affordable access to connectivity in all Belgian urban and rural areas.

[51] The connectivity aspect of the Plan is covered by **Axis 2** on digital transformation, and particularly through its **Component 3** on optic fibre, 5G and new technologies.
[52] Federal Government.

High-speed networks – DG[53] and WAL[54]: Investments are planned in this area to facilitate the deployment of high-speed networks throughout the country, and more specifically in the German-speaking community, to develop a digital infrastructure capable of meeting the expectations and needs of current and future digital societies. In Wallonia, it is also planned to improve the internal (via Wi-Fi) and external (via high-speed networks) connectivity of schools, as well as in the 35 business parks in the region, to implement the digital education strategy on the one hand, and to reduce the social divide on the other.

Policy priority

The above-mentioned investments accompany the Federal reform **Introduction of 5G - National plan for fixed and mobile broadband**, increasing the national connectivity by further developing very high-speed fibre optic networks and 5G corridors, as well as to take advantage of the development of new technologies such as Artificial Intelligence (AI).

eGovernment, digital public services and local digital ecosystems

The development of eGovernment, digital public services and local digital ecosystems[55] is an essential part of the Belgian Plan, given the importance of the overall digitalisation of the Belgian public administrations. Several investments, worth EUR 662.6 million, are planned by federal and regional institutions to support the digital transformation of various ministries and their processes, but also to modernise public services such as public social security or eHealth services. In addition, three investments are planned to modernise mobility in Belgium.

Cyber-secure and resilient digital society - FED: The Cyber Secure and Resilient Digital Society project, supported by an investment of EUR 52.3 million, will address cybersecurity and cyberthreats for citizens and businesses as phishing attempts, as well as strengthening the cyber capacity of the Belgian Defence and the cyber resilience of the Ministry of Foreign Affairs, both of which are prime targets for cyber-attacks.

Policy priority

The above-mentioned investment accompanies the Federal reform called **Lawful interception reform included in the NTSU/CTIF-IT project**[56], which will combat cyber threats through projects that strengthen resilience and the Belgian capacity to deal with new cybercrime phenomena.

Digitalisation of public social security institutions - FED: Belgium will invest EUR 60 million to improve its social security portal and transform it into an efficient digital ecosystem, as well as for the creation of a new digital social security platform. Cooperation, interoperability and reuse will be central aspects of this platform.

[53] Government of the German-speaking Community.
[54] Walloon Government.
[55] The aspect of the Belgian Plan related to eGovernment, digital public services and local digital ecosystems is mainly addressed in **Axis 2** (digital transformation), and more specifically under **Component 2.2** (public administration).
[56] The 'NTSU/CTIF-IT project' is a 5G project of the Federal police.

Digitalisation of Federal Public Services - FED: To amplify a holistic digitalisation strategy for the various Federal Public Services (FPS), many projects will modernise internal management processes and support the digitalisation of the services they offer. This investment, worth EUR 217.72 million, includes 12 main projects:

(1) Digital Transformation of the FPS Justice;

(2) Digitalisation of court proceeding;

(3) Support for exports through the development of digital tools and further digitalisation of the Foreign Trade Agency;

(4) Crisis management and security;

(5) Digital Bozar;

(6) Digital government for citizens and businesses;

(7) Digitalisation of Asylum and Immigration management processes;

(8) Digitalisation of AFSCA services for operators and consumers;

(9) Investment in the digitalisation of the FPS Foreign Affairs and its services;

(10) Single Digital Gateway;

(11) Liberating government data;

(12) Digitalisation of FPS Employment.

Policy priority

The above-mentioned investments accompany two federal reforms that will increase the **simplification of administrative procedures** and develop the **data governance strategy**, as well as to optimise **eGovernment for businesses** and **tendering procedures**.

eHealth Services and Health Data - FED: Belgium will invest EUR 40 million to increase the quality, speed, and agility of healthcare through the digitalisation of healthcare processes, by stimulating innovative digital systems and ensuring the administrative and technical means and availability of well anonymised and secure health data.

Digitalisation of the Birth and Children's Office - FBW[57]: This investment of EUR 31.40 million will develop the digital transformation and governance of the Birth and Children's Office, a public body of reference in the Wallonia-Brussels Federation for all issues related to childhood policies, mother and child protection, medical and social support, childcare outside the family environment and support for parenthood. Its goal is to simplify the Office's administration and user orientation.

Digitalisation of the Flemish Government - VLA[58]: This investment, worth EUR 120.56 million, will increase the digitalisation of the Flemish Government. It has four main objectives:

- Move towards semi-automated public services for citizens, companies and associations,
- Enable fast and efficient decisions through data,
- Ensure a reliable basic infrastructure by strengthening the common basic information and ICT modules and providing support,
- Providing a hybrid workplace of the future for every Flemish civil servant.

[57] Wallonia-Brussels Federation.
[58] Flemish Government.

Digitalisation of regional administration processes and support for the digitalisation of local authorities - WAL: This project, worth EUR 47.96 million, will help the Walloon public sector to make a leap in the digital transformation by investing massively in the overhaul of the architecture and IT solutions in place, based on a target vision and a common and transversal strategy.

Smart traffic lights – WAL: Through an investment of EUR 26.64 million, developing smart traffic digital tools in Wallonia will ensure better management of traffic conditions and prioritisation of public transport and active users (pedestrians, cyclists, etc.).

Smart mobility in rail – FED: Belgium will invest EUR 15 million to stimulate the use of public transport and in particular its national trains (SNCB) and to develop digital tools that will facilitate and promote door-to-door intermodal travel by public transport.

Smart Move – RBC[59]: The Smart Move project, supported by an investment of EUR 51 million, will reduce road traffic and thus generate significant gains in terms of time and the environment. It foresees the implementation of a free mobile application (SmartMove) which allows, among other things, the implementation of an intelligent kilometre tax in the Brussels Capital Region.

Human Capital

As mentioned above, the Human Capital[60] dimension of the Plan will be a key focus for Belgium in the coming years as the country aims to reinforce its population's digital skills and further promote eInclusion.

Digisprong - VLA: This project, supported by an investment of EUR 318.16 million, will provide schools with a digital device for all pupils, to provide teachers with learning tools and training and to support schools in digitalising their teaching methods through the establishment of a knowledge and advice centre called Digisprong.

Policy priority

The above-mentioned investment accompanies a regional reform of the same name (**Digisprong**), reforming the school curriculum to improve knowledge of ICT, to promote a more effective framework for school ICT policy, to improve teachers' digital skills and to set up a knowledge and advice centre on ICT in education.

Digital strategy for higher education and social promotion education - FWB: This investment, worth EUR 32 million, will increase the resilience and adaptability of communities of teachers and learners by using a variety of teaching/learning modalities through digital facilities regardless of location (presence, distance, mixed) and temporality (synchronous or asynchronous).

[59] Government of the Brussels-Capital Region.
[60] The human capital-related aspects in the Belgian Plan are mostly addressed in **Axis 4** (Social and living together), and more specifically under **Component 4.1** (Education 2.0) and **4.2** (Training and Employment for Vulnerable Groups), as well as in **Axis 5** (Future economy and productivity) under **Component 5.1** (Training and labour market) and **5.2** (Supporting the economic activity).

Digital transition of Brussels schools - RBC: Through an investment worth EUR 5.2 million, the region of Brussels-Capital plans to accelerate the digital shift of schools so as to help reduce educational inequalities, which have been aggravated during this COVID-19 crisis. The objective is to respond to this challenge in a comprehensive manner by providing integrated solutions for internal connectivity and mobile equipment to schools in Brussels with a high proportion of pupils in vulnerable situations.

Digital transformation of education in the German-speaking community - DG: This project, supported by an investment of EUR 5.5 million, will standardise and consolidate the IT environment of education in the country's German-speaking Community in a sustainable way. The main challenges lie in the standardisation, centralisation, security and general professionalisation of its entire IT environment. Particular attention will be paid to the administrative management of students and teachers, as well as to the promotion of the use of technology in schools and the sustainable transmission of ICT skills.

eInclusion for Belgium - FED: Belgium will invest EUR 30 million to create a federal project incubator with resources dedicated to the funding and development of sustainable digital inclusion initiatives, providing project teams with a multitude of services to help them get started in the best possible conditions.

Digital platforms for inmates - FED: The project, supported by an investment of EUR 12.4 million, will allow the development of a digital platform to be used within Belgian prisons. Through this tool, all prisoners will have access to numerous services allowing the implementation of a more human and meaningful detention, with the overall objective of significantly reducing recidivism through improved reintegration and a clear reduction in social exclusion linked to incarceration.

Policy priority

The above-mentioned federal investments accompany a reform on **Combating discrimination in the labour market**, breaking down some of the mechanisms of structural discrimination. To achieve this, it will be necessary to identify and pinpoint the sectors where discrimination persists.

Digibanks - VLA: Through the Digibanks project, the Flemish government will invest EUR 50 million to reduce the risk of digital exclusion and ensure the participation of vulnerable groups in the global digitalisation of the country by pursuing three objectives:

- Ensuring equal access to digital technology through the provision of digital equipment,
- Strengthening digital skills,
- Providing better digital access to essential services.

Policy priority

The above-mentioned investment accompanies a regional reform on **A more inclusive labour market**, enabling the integrated intake of newcomers into the labour market and to strengthen sectoral non-discrimination policies.

A6KE6K – Digital and technological innovation and training hub - WAL: To offer a digital and technological training pathway to Wallonia's population, this EUR 86.8 million investment will finance innovation projects related to the themes of energy transition, industrial communication and promoting the operational transformation of business processes (Industry 4.0).

Digital skills - VLA: This project, supported by an investment of EUR 43.21 million, will remove barriers to a future-ready labour market, while monitoring inclusiveness and paying special attention to people in vulnerable situations.

Policy priority

The above-mentioned investment supports a regional reform named **Life-long learning**, which will accelerate the transition to a culture of life-long learning and career reflection, and which is part of the further development of a comprehensive digital career platform.

Life-long digital training - WAL: This investment, worth EUR 42 million, includes the promotion of equal access to digital and the reduction of the digital divide, as well as the strengthening of digital training in Wallonia. This innovative digital education strategy will make it possible to develop ten new digital courses per year and to train 3 300 jobseekers and 800 workers per year.

Policy priority

The above-mentioned investment complements a regional reform on **Jobseeker support**, allowing the development of a new coaching model including the following services: digital support (online tools and services) and digital-HR support (eConsulting).

Investment in digital capacities and deployment of advanced technologies

Investments in digital capacities and in the deployment of advanced technologies[61] will complement the overall transformation and digitalisation of the public administration. Focused on the region of Brussels, the two investments of this category target the development of regional data exchange and AI.

Regional data exchange platform - RBC: This project, supported by an investment of EUR 17.67 million, will exploit the data available in the Region of Brussels for the benefit of Brussels citizens and businesses. The objective is to be able to exploit the large amount of data held by the administrations in order to improve the lives of citizens and businesses and to develop a Brussels platform for data exchange.

Development of an AI institute to use this technology to address societal challenges – RBC: This investment, worth EUR 9.91 million, will create a cluster of economic activity in the field of artificial intelligence by encouraging existing players to become sustainable and digital, and by developing new technology companies in Brussels. The AI Institute for the Common Good - FARI will also focus investment-related economic policies on sustainable research and innovation, in particular in the field of digitalisation, while taking into account regional differences.

Digitalisation of businesses

The Belgian Plan includes three investments supporting the digitalisation of businesses[62], especially the tourism, cultural and mediatic sectors, as well as the digitalisation and simplification of procedures involving citizens and businesses.

[61] Investments in digital capacities and in the deployment of advanced technologies are found in **Axis 2** (Digital transformation), and more specifically in **Component 2.2** (Public administration) and **2.3** (Optic fibre, 5G and new technologies).

Digitalisation of citizen-business processes - RBC: This investment, worth EUR 33.14 million, will achieve greater operational efficiency in these processes through a reduction of manual activities related to materialised procedures, a clear improvement in meeting the deadlines thanks to digital transmission and better transparency on the follow-up of files.

Digitalisation of the tourism sector – WAL: The goal of this investment of EUR 3.29 million is to strengthen the resilience of the sector through enhanced digitalisation, by leveraging the development of the PIVOT database as an effective authentic source of Walloon tourism products and to promote its use within the Walloon tourism sector.

Digitalisation of the culture and media sector - FBW: This investment, worth EUR 16 million, will strengthen access to digital technological tools allowing cultural and media operators to better position their content in the digital environment by working on the issue of discoverability.

4.3 Bulgaria

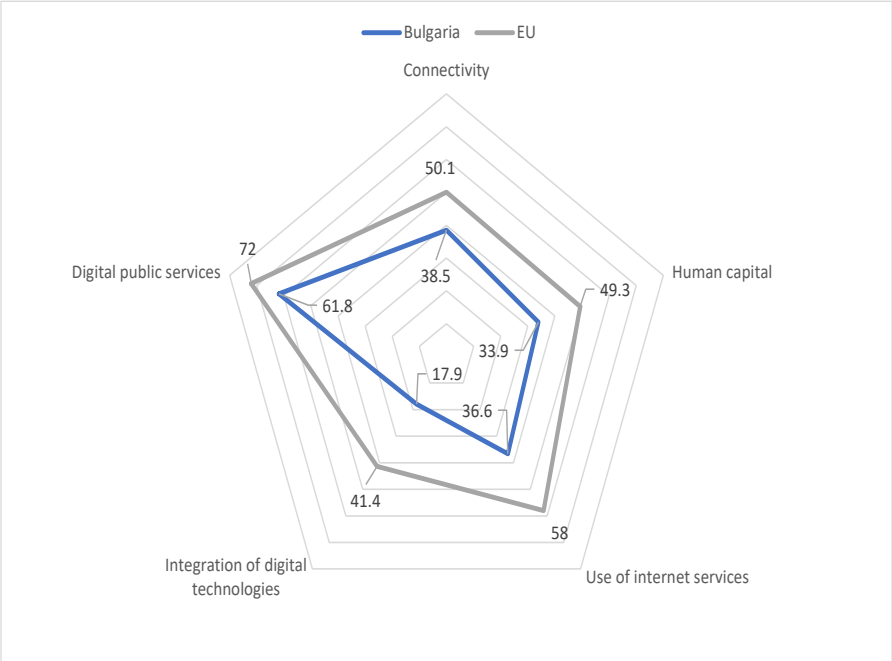
4.3.1 Country digital outlook

In Bulgaria, progress have been made in the digital sector in the last five years to foster economic growth and productivity, while boosting innovation. A national strategy named Digital Bulgaria 2025, adopted in 2019, have particularly highlighted digitalisation as a key concern for Bulgaria for the following six years. However, this country had still a low advanced digital economy according to the Digital Economy and Society Index (DESI) in 2020, placing itself at the 28th place in the overall ranking of all EU28 Member States. Figure 14 below shows the performance of Bulgaria on the five DESI dimensions in 2020, based on data from 2019. As illustrated in this figure, Bulgaria scored below the EU average for all five dimensions, especially on the integration of technologies by businesses.

Considering these challenges in the digital sphere, in 2020 Bulgaria also received two Country Specific Recommendations in the context of the European Semester. The first recommendation was calling the country to further promote digital skills among the population, especially among the youth, to allow them to adapt to the labour market changes caused by the digitalisation and the potential increase in digital remote work in the near future, as well as to improve students' digital skills in all schools across the country, through a dedicated curriculum focusing on digital learning and literacy. The second recommendation was focused on minimising the administrative burden that companies were facing by improving the effectiveness of its public administration and reinforcing digital government. Against this background, Bulgaria has shown great commitment to enhance its digital transformation process, as also demonstrated by the strong focus on digital matters in its Recovery and Resilience Plan, detailed in the following sections.

[62] The digitalisation of businesses-related aspects of the Belgian Plan are addressed in **Axis 2** (Digital transformation) **under Component 2.2** (Public administration), as well as in **Axis 5** (Future economy and productivity) under **Component 5.2** (Supporting economic activities).

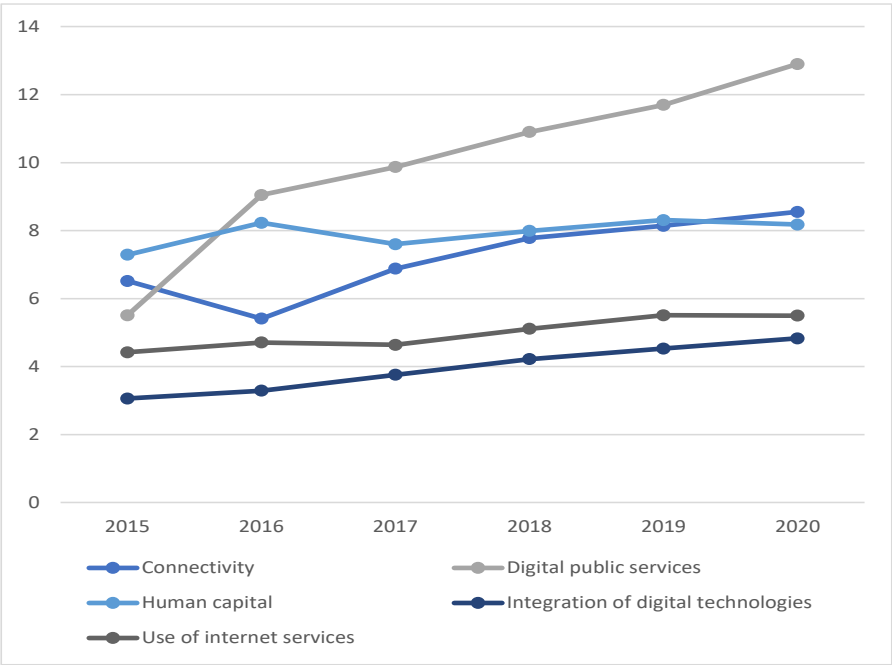
Figure 14. Performance on DESI 2020 - Bulgaria



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Figure 15 below illustrates the evolution of Bulgaria's performance in the five main DESI dimensions since 2015. The increase of its digital performance through the years is particularly visible in two dimensions: connectivity and digital public services.

Figure 15. DESI dimensions over the years - Bulgaria



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

According to DESI 2020, Bulgaria ranked 26th on the **connectivity** dimension among European countries, scoring below the European average. Despite the improvement on several indicators such as the fast broadband and fixed very high-capacity network (VHCN) coverages, Bulgaria ranked at the last place regarding the overall broadband take-up and 25th on the take-up of high-speed fixed broadband of at least

100 Mbps, showing only limited progress throw-out the years. To tackle this issue, Bulgaria adopted a new digital strategy, the Digital Transformation of Bulgaria for the period 2020-2030 approved in July 2020 and aimed at deploying networks with a very-high capacity. Bulgaria's Recovery and Resilience Plan intends to enhance the national connectivity in rural areas, while supporting the implementation of a new national broadband strategy.

On the **human capital** dimension, Bulgaria ranked 26th among the 28 European countries in 2020, gaining two places from the DESI ranking of 2019. Regardless of this improvement, the overall level of basic digital skills in Bulgaria was still among the EU's lowest (29% compared to 58% for the EU average). In order to modernise its education system, Bulgaria adopted various programmes and plans to raise the basic digital skills level of its population and develop new curricula and trainings in STEM and ICT (e.g. the Education for tomorrow project). In addition to these strategies, Bulgaria's Recovery and Resilience Plan includes several investments and reforms to modernise education and promote the development of Bulgarians basic digital skills.

Regarding the **use of internet services**, Bulgaria continues to score the 27th place in 2020 for the third consecutive year, ranking below the EU average. According to DESI 2020, 24% of Bulgarians had never used the Internet in 2019, the highest percentage in the EU for this indicator. The use of online banking and online news reading are also below the EU average. However, Bulgarians are particularly keen to use video calls (85% versus 60% for the EU), as well as social media for a personal use (78% versus 65% for the EU).

Bulgaria ranked 28th on the **integration of technologies** by businesses on DESI 2020, scoring well below the EU average again for the third consecutive year. While the population is keen to use social media, only 7% of Bulgarian SMEs sold their products or services online and only 10% of businesses are using social media for promotional activities. To counter this performance, Bulgaria established guidelines since 2018 as part of the Digital Bulgaria 2025 and drafted a strategy paper named Concept of Digital Transformation of Bulgarian Industry in 2017, aiming to guide Bulgaria's participation in the fourth industrial revolution. Bulgaria's Plan will further support these initiatives through the inclusion of multiple investments focused on the digitalisation of businesses, including SMEs and in key economic sectors as construction and culture.

Finally, Bulgaria scored 23rd among EU Member States on **digital public services** according to DESI 2020. The number of eGovernment users, so as the use of pre-filled forms, were below the EU average in 2019. Nonetheless, Bulgaria sored well on the provision of digital services for businesses on DESI 2020, performing above the EU average for this indicator (93 versus 88 for the EU average). In line with its Strategy for the Development of eGovernment in the Republic of Bulgaria 2019 – 2023 adopted in 2019, the country continues the transformation of its administration and public institutions into digital and user-oriented electronic administrative services. The introduction of the new identity documents with electronic identification and electronic signatures will also participate to improve Bulgaria's performance on this DESI dimension. In addition, Bulgaria's Plan includes several investments and reforms aiming to further digitalise its public services, especially through the development of eJustice, eID and eAuthentication, as well as the digitalisation of health.

4.3.2 Reforms and investments

Bulgaria's Recovery and Resilience Plan, whose official name is *Национален план за възстановяване и устойчивост*, is subdivided into four pillars, each covering one or many reforms and investments. Investments and reforms related to the digital transition, which represent 28% of the Plan's total allocation,

can be found into three pillars[63]. Through this Plan, Bulgaria aims, among other things, to extend its high-speed networks coverage in rural areas, to digitalise judiciary processes and promote eJustice, to reform and modernise educational environments and create new trainings focused on digital skills for adults, as well as to enhance the digitalisation of businesses, especially in the construction sector.

A total of EUR 1.848 billion, equivalent to 28% of Bulgaria's EUR 6.6 billion Recovery and Resilience Plan, all in grants, will support the implementation of the following crucial investments by 2026. These have been grouped into five categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Bulgaria will invest EUR 513.5 million to enhance its connectivity[64] through an investment focused on the development of its connectivity digital infrastructure, especially in rural areas.

Large-scale deployment of digital infrastructure: This investment, worth EUR 513.51 million, will provide high-speed mobile connectivity along key transport corridors, to improve the coverage in settlements with a focus on peripheral, sparsely populated and rural areas and to develop a state support network by building optical connectivity in municipalities and by increasing its transmission capacity.

Policy priority

The above-mentioned investment complements two reforms liked to the connectivity dimension:

- The first reform, named '**Developing and implementing an effective policy and regulatory framework'**, will enhance connectivity and allow possible needed changes or amendments in the updated National Plan for Broadband Access, the strategic document Digital Transformation of Bulgaria for the period 2020 – 2030, as well as amendments in the Electronic Communications Act.
- The second reform, named **'Efficient use of radio frequency spectrum**', addresses the challenges posed by the readiness to enter 5G and will aim at the reduction of spectrum charges and at an accelerated spectrum allocation process.

eGovernment, digital public services and local digital ecosystems

The development of eGovernment, digital public services and local digital ecosystems[65] seems to be an essential aspect of the digital part of the Bulgarian Plan as it represents a total of EUR 300 million of the Plan's investments. Through the further digitalisation of its public services and institutional processes, Bulgaria will modernise its public sector and enhance the development of eJustice, eID and eAuthentication, as well as the digitalisation of health.

[63] Namely, Pillars A, C and D.
[64] The connectivity aspect of the Plan is covered by **Pillar C** (Connected Bulgaria) under **Component 1** (Digital connectivity).
[65] Investment related to eGovernment, digital public services and local digital ecosystems are covered by **Pillar D** (Fair Bulgaria) under **Component 1** (Business environment) and **Component 3** (Health).

Strengthening, further development and upgrading of the Unified Information System of the Courts: Bulgaria will invest EUR 14.05 million to expand the functionalities of the Unified Court Information System (UCIS), which is a key tool to introduce eJustice in the country. The system integrates all electronic cases and ensures their management, while reporting the workload of the courts and collecting and processing statistical information on the activities of the courts.

Further development of the information systems of the courts for access of citizens and legal entities to eServices and eJustice: The main purpose of the investment, worth EUR 0.66 million, is to further develop the Single Portal for eJustice to improve its main activities: making certification statements in electronic form, performing procedural actions in electronic form, service of notices and summons. The portal, which has the task of providing participants in court cases with access to electronic case files, electronic summons and participation in online court hearings, is one of the two pillars of eJustice in Bulgaria.

Digitalisation of key court proceedings in the system of administrative justice: Main activities envisaged by this EUR 3.68 million investment are the elaboration and implementation of an information system for the digitalisation of the files on administrative cases and exchange of information between administrative courts, as well as between them and the Supreme Administrative Court, with integrated modules for electronic summoning of the parties in administrative cases of remote closed court hearings of the court panels, as well as for conducting remote open court hearings.

Policy priority

The three above-mentioned investments accompany the **Reform of the legal framework of eJustice**, which introduces rules for the service of notices and summonses via e-mail. When documents are submitted electronically, fees should be reduced by 15%, which will facilitate access to justice for both citizens and businesses.

Unified information system for spatial planning, investment design and construction permitting: This investment, worth EUR 1.79 million, will create a unified information system as a platform for providing electronic administrative services for spatial planning and construction permits. The project will alleviate the administrative burden on citizens and businesses by significantly reducing the technological time for providing services in the sector of spatial planning, investment design and commissioning of completed constructions, creating opportunities for complex electronic administrative services.

Establishment of a national scheme for electronic identification and its personalisation in the Bulgarian personal documents: Bulgaria will invest EUR 62.59 million to build a system for electronic identification and its personalisation for the Bulgarian personal identity documents. The implementation of this project will allow the population to effectively benefit from the electronic public services offered by the administration.

Digitalising of the information files in the administration containing registry data and eAuthentication from registers: The main purpose of the investment, worth EUR 65.14 million, is to create prerequisites for the widespread provision of electronic and internal electronic administrative services. The project foresees the digitalisation of information arrays, containing register data of key administrations – the Registry Agency and the National Social Security Institute, as well as the digitalisation of the civil status acts, kept by municipal administrations.

Policy priority

The above-mentioned investment supports the **Register reform to unleash the potential of eGovernment to improve the business environment,** which will optimise the organisation of the registers in the state administration to ensure their maintenance with the lowest possible costs, the official exchange of information and data for the provision of public services, the possibility to provide services based on registers kept by other administrative bodies and finally, the quality, completeness and security of data.

Establishment of a national register for prevention and monitoring of oncological diseases: The objectives of this EUR 2.04 million investment is to design a national register for the prevention and monitoring of oncological diseases, the analysis and prevention of risk factors, as well as promote the inclusion of Bulgaria in a pan-European cancer control centre.

Policy priority

The above-mentioned investment complements the reform on the **Complete implementation of the National Health Information System.** This reform envisaged changes in the legal framework that will contribute to the development of eHealth:

- Phase 1 – Implementation of modules in the National Health Information System: electronic direction for medical-diagnostic examinations; electronic prescription; electronic health record of citizens; national health information standards for the real-time exchange of medical data; the basic functionality of the core of the National Health Information System; health information portal; the necessary registers for the functioning of the electronic prescription and the electronic direction.
- Phase 2 - Update of the Ordinance of the Minister of Health on the creation and maintenance of electronic health records of citizens and the conditions and procedure for keeping registers.

Human Capital

The human capital dimension[66] is another key aspect of Bulgaria's Plan. Indeed, this country will enhance the modernisation of education and the development of Bulgarians basic digital skills, which are essential to the national economic growth and productivity, through the elaboration of new trainings for job seekers and employees.

Creating a national STEM environment for skills of tomorrow: The ambition of this investment, supported by a budget of EUR 282 million, is to build a comprehensive educational STEM environment, including laboratories for acquiring new skills and modern equipment for experimental work in all STEM areas. The goal is also to introduce digital technologies in these environments, including ones enabling interdisciplinary, synchronous and asynchronous work, mainly with the goal to improve digital literacy and students' motivation to learn digital skills.

Modernisation of the educational institutions to create a more attractive and quality environment for learning and innovation: This EUR 308.89 million investment will provide conditions for equal access to education by creating a favourable, inclusive, innovative, supportive and motivating educational environment.

[66] Human capital-related aspects are covered by **Pillar A** (Innovative Bulgaria) under **Component 1** (Education and skills).

Policy priority

The above-mentioned investments complement two reforms on the modernisation and digitalisation of education:

- **Comprehensive educational reform in pre-school, school education and life-long learning:** This reform will support the digitalisation of the learning process, the development of innovative activities, the promotion of life-long learning, the formation of highly qualified pedagogical specialists, the development of modern and innovative educational environments, as well as new educational trainings that are relevant to labour market needs.
- **Reform in higher education:** This second reform will provide changes in the regulatory and strategic framework of higher education, including focus points such as the accelerated modernisation and digitalisation of educational approaches, and new methods and practices supporting personal development and professional career. Furthermore, it provides for enhanced role of research and applied research, innovation, and entrepreneurial skills.

Trainings for digital skills and building a national online platform for adult learning: This project, supported by a EUR 142.8 million investment, will be implemented in two components envisaging, on one hand, the provision of training intended to the workforce for acquiring and validating basic digital skills and competences tailored to the new labour market needs and the penetration of digital technologies in the economic processes, and, on the other hand the design and implementation of a new virtual online learning platform.

Digital-related investment in R&D

Although the Bulgarian Plan only put forward two investments and one reform in digital-related R&D[67], these are worth EUR 186.7 million of the overall budget and are described here below:

Enhancing the innovation capacity of the Bulgarian Academy of Sciences in the field of green and digital technologies: Bulgaria will invest EUR 24.22 million to enhance the innovation capacity of the Bulgarian Academy of Sciences (BAS) and its active participation in the national research and innovation ecosystem towards supporting and accelerating the country's economic transformation, with a main thematic focus on the areas related to the double green and digital transition.

Programme to accelerate economic recovery and transformation through science and innovation: This programme, supported by an EUR 162.47 million investment, will fund the creation of a mechanism to encourage public and private investment in research and innovation through the coordination of government efforts and policies to optimise and strengthen the transfer of research results and technologies.

[67] The digital-related investment of Bulgaria's Plan can be found in **Pillar A** (Innovative Bulgaria) under **Component 2** (Research and innovation).

Policy priority

The above-mentioned investment accompanies the reform on **Implementing a common policy for the development of research, innovation, and technology towards improved economic and social development,** which will increase the capacity of research organisations and higher education schools to developed applied research and innovation and to implement joint projects with the industry. An additional goal of this reform is to strengthen the relationship between research and higher education, as well as to increase the capacity for technology transfer from research organisations to the private sector.

Digitalisation of businesses

The digitalisation of businesses[68] is another focus point of the Bulgaria's Plan, which aims not only to the digitalisation of business processes and the adoption of advanced technologies, but also to the digitalisation of the construction sector and the development of a digital cultural heritage.

Economic transformation programme: Bulgaria will invest EUR 883.1 million into the provision of targeted support to Bulgarian small and medium enterprises in the main problematic areas which are slowing down the national transformation to a digital, low-carbon and resource-efficient economy. This goal is to be reached through the implementation of new technologies and the technological renovation of production processes with know-how, new software and next-generation machines.

Introduction of a construction information modelling (CIM) in investment design and construction as a basis for the digital reform of the construction sector in Bulgaria: The purpose of the investment, worth EUR 4.04 million, is to enhance the capacity of the CIM community in the country to provide knowledge and experience related to the implementation of a CIM and build a national digital platform for construction. The planned activities include conducting of specialised trainings, technical support for experts from the municipal, regional, and state administration, as well as providing logistical support to SMEs for the implementation of CIM.

Policy priority

The above-mentioned investment will support the **Digital reform of the Bulgarian construction sector**, which is a large-scale reform on the digitalisation of the construction sector that covers the regulatory framework, central and regional administrations, education, entrepreneurs, and the construction business, as well as the IT sector.

[68] Investments and reforms related to the digitalisation of businesses are found in **Pillar A** (Innovative Bulgaria) under **Component 3** (Smart industry), as well as in **Pillar D** (Fair Bulgaria) under **Component 1** (Business environment) and **Component 2** (Social Inclusion).

Digitalisation of the museum, librarian and audio-visual funds: The main objective of this EUR 34.08 million investment is to enhance the digitalisation, protection and preservation of the cultural heritage and ensure equal free access for all interested parties to the cultural wealth of the country, without any restrictions. Single standards shall be introduced for the digitalisation of the funds of the museums, libraries, the Bulgarian National Film Library, the Bulgarian National Television and the Bulgarian National Radio. In addition, a single methodology will be developed for the process of digitalisation at the national level and a centralised electronic platform will be created.

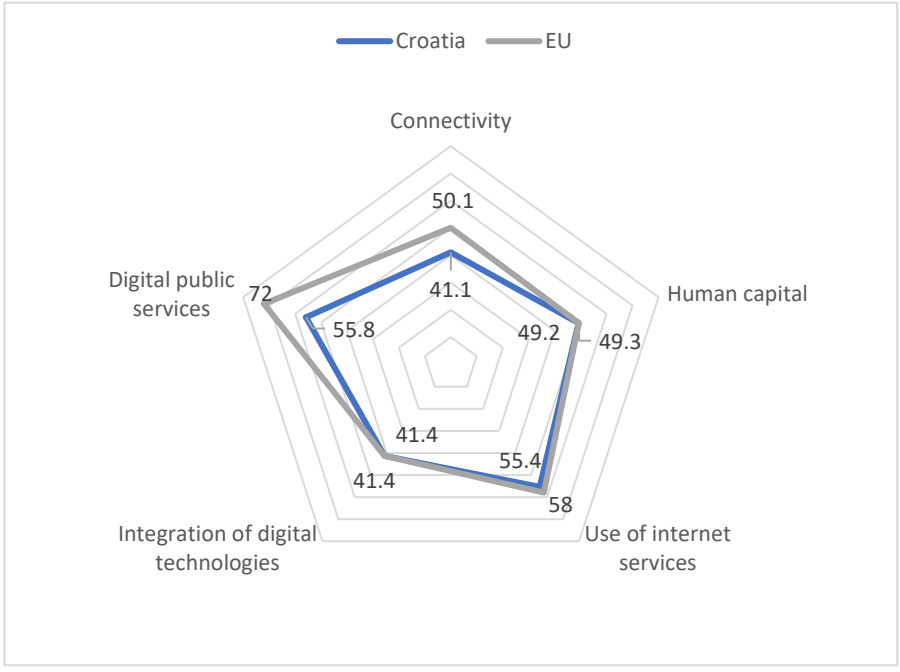
4.4 Croatia

4.4.1 Country digital outlook

In 2020, Croatia scored below the EU28 average on four out of the five dimensions of the Digital Economy and Society Index (DESI). Indeed, as demonstrated by Figure 16 below, in 2020, Croatia scored at the EU28 average on the Integration of digital technologies but below the EU28 average on the other four dimensions. The country ranked 20th and has, since 2015, been shifting between the 19th and 20th position on DESI.

In the same year, the country received two Country Specific Recommendations aimed at, firstly, enhancing the resilience of the health system and improve the quality of healthcare services, through investments in eHealth. Secondly, the country was also encouraged to focus its future investments on fostering the country's digital transition, especially through the deployment of highspeed broadband connectivity. Against this background it needs to be said that Croatia is taking significant efforts to advance its digital transition and close the gap to the EU28 average across the five DESI dimensions, as it can be seen through the various digital-related investments planned in its National Recovery and Resilience Plan, which are further detailed in the following sections.

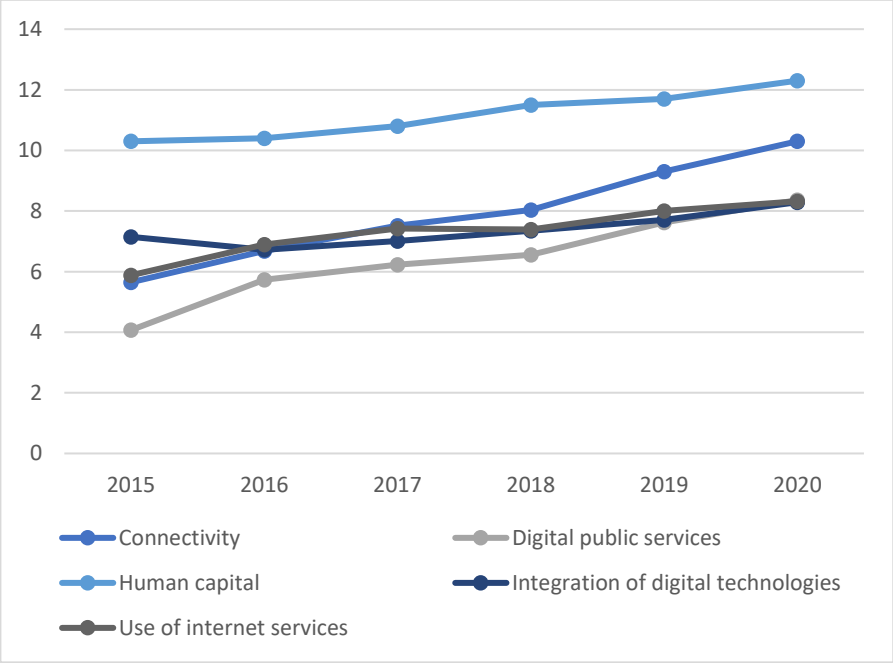
Figure 16. Performance on DESI 2020 - Croatia



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

The efforts taken by Croatia during the last years to boost and invest in its digital transformation can also be discerned in the Figure 17 below, which provides an overview of Croatia's scores across the five main DESI dimensions since 2015 through 2020. A significant increase in the connectivity dimension can be perceived, as it registered 4.4 points increase since 2015.

Figure 17. DESI indicators over the years - Croatia



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

As we have just seen, Croatia steadily improved its **connectivity** over the last five years, but it nonetheless ranked below the EU28 average in 2020 on the DESI index. Despite improvements particularly with regard to fast fixed broadband coverage, fixed very high-capacity network coverage and 4G coverage, Croatia still lacks 5G readiness, and no dedicated strategy has been developed to overcome this so far. However, the investments planned under the National Recovery and Resilience Plan provide hope for improvement regarding the country's connectivity, as broadband coverage will be further enhanced and the construction of passive electronic communication networks is planned, including 5G coverage.

Human capital was one of the strongest dimensions of Croatia on DESI 2020, and several initiatives have been taken in the last five years in this regard, such as the School for life programme focussing on the improvement of education and teaching in all primary and secondary schools of the country, or the e-Schools programme introducing ICT within the school system and aimed at raising digital literacy among students for further education and jobs. Under Croatia's Plan some investments are also dedicated to the improvement of employees' digital skills in the public sector.

Data from DESI suggests that the **use of internet services** was steadily increasing in Croatia since 2015, very much in line with the EU28 average, although since 2017 the gap between Croatia and the EU average has slightly been increasing.

Concerning Croatia's strongest dimension on DESI, the **integration of digital technologies**, an increase of 5 points from 2019 to 2020 can be seen from Figure 17. DESI indicators over the years - Croatia above, which demonstrates the country's efforts and commitment to invest in this dimension. Indeed, Croatia was already part of the EuroHPC Joint Undertaking, it joined the European Blockchain Partnership and also

signed the Declaration on Cooperation on AI. Additionally, national strategies have been implemented, focussing on the digital transformation of the economy, the development of a national platform for the digitalisation of industry and the development of AI, as well as several initiatives to enhance the uptake of AI[69]. The country's Recovery and Resilience Plan also provides several initiatives supporting the uptake of innovation and new technologies into businesses, with a particular focus on how to better support SMEs in this transition.

The **digital public services** dimension was one of the weakest in Croatia compared to the other dimensions. Despite efforts to improve it, the country still scored below the EU28 average in this dimension in 2020. Efforts have already been taken to improve this situation in the country since 2015 with the creation of an e-Citizen platform by the Shared Services Centre, for the provision of digital public services. The centre aims to consolidate information and ICT resources available to citizens and users into one single platform so as to enhance interoperability and facilitate the sharing of data across public bodies. In line with these efforts, the majority of Croatia's digitally related initiatives put forward by the National Recovery and Resilience Plan are aimed at improving and advancing digital public services in the country. Indeed, 24 investments are proposed in Croatia's Plan which would help the country address this challenge.

4.4.2 Reforms and investments

The Croatian National Recovery and Resilience Plan, submitted in May 2021 and whose official name is *Nacionalni plan oporavka I otpornosti 2021-2026* is divided into five main focus areas.[70] Each of these areas is made of several, overarching reforms which are accompanied by specific investments. Digital-related investments and reforms, which represent 20.4% of the Croatian Plan, will support, among other things, the development of the national broadband coverage, the modernisation and further digitalisation of public services and the adoption of new infrastructures in the public sector and innovation in the private sector.

A total of EUR 1.285 billion, equivalent to 20.4 % of Croatia's EUR 6.3 billion Recovery and Resilience Plan, all in grants, will support the implementation of the following crucial investments by 2026. These have been grouped into five categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes):

Connectivity

Two investments and one reform will improve the Croatian connectivity[71], and more specifically the citizens' access to the broadband and the availability of electronic communication infrastructures in order to bridge the digital divide in the country. Overall, EUR 126.2 million are allocated to enhance progress in this area.

[69] https://digital-strategy.ec.europa.eu/en/policies/desi-croatia
[70] i) Economy, ii) Public Administration, Justice and State Property, iii) Education, Science and Development, iv) Market for advice and social protection, and v) Health.
[71] The connectivity aspect of the Plan is covered particularly under **area 2** focusing on public administration, justice, and state property.

Investments to ensure access to broadband coverage for all: The goal of this investment is to reduce the digital divide in Croatia by increasing the national broadband coverage in all remote areas. The roll-out of this investment will be necessary to ensure equal access to very large networks at speeds of at least 100 Mbit/s for households for all Croatian citizens. Additionally, this investment will also promote the set-up of 5G networks in rural areas. The total budget of this investment is of EUR 133.3 million, of which EUR 106.6 million will be provided under the RRF.

Construction of passive electronic communication infrastructure: Similarly, this investment will ensure the availability of Gigabit networks (such as very high-capacity networks and 5G networks) in rural areas where there is no commercial interest in building 5G networks. By doing so, this investment will decrease the digital divide between urban and rural areas that prevails in Croatia. Overall, EUR 19.6 million are allocated to this investment from the RRF.

Policy priority

The above-mentioned investments complement the reform **Strengthening connectivity as the basis of the digital transition of society and the economy** which is meant to ensure i) the timely and comprehensive implementation of the regulatory framework for electronic communications, ii) the availability of very large capacity networks for Croatian households, including access to broadband with at least 100Mbit/s for downloads, iii) access to very large capacity network for households with symmetric broadband speeds of at least 1Gbit/s, and iv) a favourable environment for investments related to the deployment of 5G networks.

eGovernment, digital public services and local digital ecosystems

Most measures put forward by the Croatian Recovery and Resilience Plan are targeted at improving digital public services in the country[72] with a total budget of EUR 300.76 million allocated to this specific objective.

Digitalisation of state and public administration services (Government to Business (G2B)): This EUR 4.66 million investment targets the digitalisation of G2B services to improve the availability, transparency, and efficiency of the government's provision of services to Croatian businesses. It will also upgrade the horizontal coordination between different departments of the ministries and vertically between the central government and local authorities. The goal is to implement fully digital, contactless, and paperless G2B services in defined priority areas such as business registration and licensing.

Policy priority

The above-mentioned investment accompanies the **Continuation of business and regulatory reform**, which will implement activities that will improve the Croatian business environment through two pillars:

- Digitalisation of services provided by state and public administration to entrepreneurs;
- Improvement of regulatory conditions for businesses, and continuation of administrative and fiscal relief.

[72] Investments and reforms related to eGovernment, digital public services and local digital ecosystems can be found in the **area 2** focussing on public administration, justice and state property, in the **area 1** on the economy, in the **area 4** on the market for advice and social protection as well as in the **area 5** focussing on health.

Establishment of digital public services: The goal of this investment is the digital transformation of at least 30 public services in agriculture and funded through the National Recovery and Resilience Plan. Their digitalisation will reduce the number of physical visits of users in the government premises for public services. In total, this investment will consist of approximately EUR 1.9 million.

Policy priority

The reform **Digital transformation of the countryside** complements the above-mentioned investment and focusses on making public services more accessible to farmers through digitalisation in order to reduce their administrative burden. Additionally, the aim is to develop a smart agriculture system to provide farmers a central place with available data needed for business planning and production improvements.

Development of a national archival information system and strengthening of the national network of archives: This EUR 35.3 million investment will further advance the documentation management of public authorities through digitalisation, and thus make the archival process of documents more transparent and available for all.

Policy priority

The above-mentioned investment accompanies the reform **Digital transformation of conservation bases and archival records** which aims at establishing a national archival information system which complies with the minimum requirements of the INSPIRE Directive[73].

Establishment of a central interoperability system: This investment, worth EUR 14 million approximately, will consolidate basic registries, their integration into the state's one-stop shop system and the establishment of a central interoperability portal in line with the European Interoperability Framework (EIF), as well as the creation of standards and policies related to interoperability, harmonisation of legal frameworks and a full application of the Once-Only principle by 2023.

Policy priority

The two above-mentioned investments complement the reform **Improving the interoperability of information systems**, aimed at establishing, and upgrading basic registers and connecting them to the Croatian central interoperability system. It will enable easier and faster management of the information that state bodies need in their day-to-day decision-making.

Upgrade of the Shared Services Centre: The goal of the project is to expand capacity of and further upgrade the existing shared services centre and the state cloud, as well as to create new functionalities. Approximately EUR 39.5 million are allocated from the RRF to achieve this.

Establishment of a single contact centre for all public eServices: This EUR 4.2 million investment will finance the establishment of a system aimed at providing information and customer support to citizens and business entities through one centralised location. It will transform the way public officials interact with citizens and ensure full transparency in the way citizens will be able to assess the quality of their interaction with public officials.

[73] The INSPIRE Directive entered into force in May 2007 and established an infrastructure to promote spatial information in Europe to support environmental policies, as well as policies which may impact the environment.

Consolidation and improvement of the Central Information Health System of the Republic of Croatia (CEZIH): This investment, worth EUR 13.4 million, sets out to achieve the following objectives: (i) enabling continuous, reliable and safe running of the central health information system; (ii) establishment of primary and secondary location to meet TIER 3 reliability standards and availability[74]; (iii) data backup and system monitoring. The implementation of this investment will ensure the smooth operation and further development of the health information system in which all health data generated in Croatia are merged, which is crucial given the current sanitary situation.

Introduction of a digital identity card: The objective of this investment is to increase the number of eID users and related services such as the mobile application and electronic signatures. EUR 0.9 million are allocated to this investment.

Investments in state information networks: This investment aims at: i) establishing a secure network infrastructure for existing and new services provided by public institutions to citizens and / or businesses, ii) ensuring network capacities adequate for the current needs of society, and iii) increasing security of the entire state information infrastructure. In total, the costs for this initiative will be of around EUR 45.6 million, of which approximately EUR 31.5 million will be provided through the RRF.

Development of a mobile platform to access digital public services: This EUR 4.3 million investment will ensure that citizens can easily and quickly access public services through their smartphones, anytime and anywhere. The aim is also to create preconditions for the integration of existing and future services of public administration bodies (eServices) in a simple and standardised way available to all citizens.

Establishment of a new platform of the Electronic Public Procurement Notice: The ultimate goal of the investment is to reduce the workload of staff engaged in public procurement by reengineering and digitalising business processes that will support the work of employees and at the same time provide administrative relief. Approximately EUR 1.5 million are allocated to this investment under the RRF.

Digitalisation and informatisation of the Croatian Employment services centre (CES): The goal of this investment is to digitalise and redefine business processes of the Croatian Employment centre so to increase the level and of quality of the services provided to its end users (unemployed persons, employees and employers). Approximately EUR 7.7. million are provided from the RRF to this investment.

Modernisation of ICT support of the Croatian pension insurance institute (HZMO): This investment, worth EUR 17.2 million, will increase the level of quality of services for pensioners provided by HZMO, as well as to ensure the efficiency of HZMO through the modernisation of the information system and basic business processes.

Digital transformation of the tax administration: The objectives of this investment are i) to modernise the information system of the tax administration, ii) to ensure long-term sustainability of the Tax Administration Information System in accordance with future technological advances, iii) to increase the efficiency of business processes of the tax administration, iv) to increase the efficiency of communication and interaction with taxpayers, v) to improve electronic services for taxpayers, vi) to ensure business continuity in crisis situations, vii) to raise the level of security of ICT infrastructure, viii) to consolidate and optimise the ICT infrastructure of the tax administration. About EUR 56.8 million of the RRF are allocated for this investment.

[74] The TIER rating outlines the reliability and performance of a data centre. The TIER rating goes from 1 (lowest, 99.671% reliability) to 4 (highest, 99.995% reliability). A TIER 3 rating implies a reliability of 99.982%.

Implementation of non-cash payment system: This investment will establish a system for fiscalising invoices issued to administrative bodies with the implementation of a non-cash payment system via eInvoice with integrated online bookkeeping in the VAT system, in order to provide a full range of benefits for all stakeholders and businesses. Approximately EUR 14.3 million will be allocated from the RRF to this investment.

Policy priority

The eleven above-mentioned investments relate to the reform **Modernisation and further development of the state information infrastructure as a basis for safe and financially efficient interaction of public administration bodies.** It is the main reform supporting the eGovernment aspect in the Croatian Plan. It targets the consolidation and upgrade of the State Information Infrastructure and Services[75], the cost reduction and the optimisation of public processes, and the establishment of a more efficient communication between the public administration and citizens.

Development of a web application integrating social benefits into the social protection system: This investment will finance the creation of a web application that integrates social benefits into the social protection system at national level. Approximately EUR 0.4 million are allocated under the RRF to this investment.

Policy priority

The investment detailed above is initiated in accordance with the reform **Transparency and adequacy of social benefits in the social protection system,** which has the objective of increasing the adequacy of the social benefits targeted at the most vulnerable groups of society and enable the reduction of inequalities.

Connecting centres for social welfare and social service providers: The goal of this EUR 0.5 million investment is to partly develop a digital platform for social care homes, in order to monitor and analyse data on users and services in the social welfare system.

Improving the digitalisation of the social welfare system and implementing the system for methodology for calculating the prices of social services: This investment will enable automated data collection, quality analysis and calculation of social services prices via a new data management solution by all social service providers that are financed through the state budget. Approximately EUR 0.7 million are allocated to this investment under the RRF.

Policy priority

The above-detailed investments accompany the reform **Development of community services to prevent institutionalisation.** The goal of this reform is to enable better availability of digital public services to all citizens, including the elderly.

[75] Developed since 2013, the Croatian State Information Infrastructure and Services System establishes and manages the public register system and the conditions which the state information infrastructure has to provide regarding public registers, as well as the use of a common base for a secure data exchange within the state information infrastructure system, a common identification and authentication system, a single point of interaction with the citizens and other users.

Digital integration of operating theatres and robotic surgery in KBC Split[76]: This EUR 8 million investment targets the digitalisation and integration of operating rooms to optimise planning, documenting, storing and exchanging patient data, types and methods of surgical treatment. Additionally, robotic surgery will increase the number of operations performed in a minimally invasive way, and the availability of this most advanced method of surgical treatment which will affect the change treatment outcomes, hence, patients' chances of cure will increase.

TELECORDIS: This EUR 0.6 million investment will fund the provision of telemedicine services to patients in remote and rural areas and aims to increase the availability of specialist healthcare services in local outpatient centres, as well as to reduce waiting lists and the cost of providing health services.

Digitalisation and integration of operating rooms equipped with robotic surgery in one hospital: This investment, worth EUR 7.7 million, will digitalise and integrate operating rooms to enhance the planning, documenting, storing and exchanging patient data and methods of surgical treatment. It sets out to improve the quality of healthcare and the monitoring of healthcare outcomes, to prolong the life of patients being treated for malignant diseases, and to enable faster recovery of patients which have undergone surgery.

Digitalisation and equipping of diagnostic units of the hospital KB Merkur[77]: This investment will reduce the waiting list of patients for medical treatments as well as improving the monitoring of healthcare outcomes. Availability in the hospital is expected to increase as well as the quality of healthcare for all categories of patients, and thus improved clinical outcomes. Approximately EUR 3.3 million from the RRF are allocated to this investment.

Policy priority

The four investments mentioned above complement the **eHealth reform,** which will enhance the health and care management capacity of Croatia through more efficient use of data and by encouraging innovative solutions in the healthcare sector.

Human Capital

Enhancing human capital by further boosting and developing digital skills will be essential to ensure the future of the Croatian economic growth and productivity. In total EUR 0.34 million are allocated under the Plan to enhance this dimension.

Optimisation, standardisation, and digitalisation of procedures for strategic planning and assessing the effects of public policies: This investment will strengthen the appropriate competences of employees in the Croatian public administration through the implementation of certified training programmes and life-long learning, ensuring a long-term sustainable system for strategic planning, public policy management and better regulation. In total EUR 0.34 million are allocated to this investment under the RRF.

[76] A governmental hospital in the city of Split, Croatia.
[77] A clinical hospital in the city of Zagreb, Croatia.

Policy priority

The above-mentioned investment accompanies the reform **Strengthening mechanisms for integration and management of public policies.** The reform will ameliorate the mechanisms of coordination and integration of public policies, by connecting separate processes and procedures and by expanding the scope and application of public impact assessment procedures, policies, and regulations.

Investment in digital capacities and deployment of advanced technologies

Investing in digital capacities and the deployment of advanced technologies[78] is an essential element of the country's digital transition and innovation potential. In total EUR 79.3 million have been allocated under the RRF to this support this dimension.

Establishment of a central data repository and business analytics system: This EUR 16.7 million investment sets out to introduce data storage systems specific to the different types of data designs, in order to create an ecosystem that will allow extraction, charging, transformation, storage, analysis, visualisation and analytics of data as well as the introduction of an analytical organisational culture as a source for reliable summary data, which is required for decision making processes. The platform will enable real-time data analysis which will improve data-based decision making.

Preparation and implementation of the innovation plan: The purpose of the investment is to support the development and implementation of a new innovation financing plan by providing expertise in management and control, programming, monitoring and evaluation, and state aid. This investment is supported with about EUR 0.8 million from the RRF.

Commercialising innovation: The investment, worth EUR 50.6 million, will encourage the commercialisation of innovation projects between scientific institutions and businesses. It will also increase exports of innovative products (e.g. technologies), services[79] (e.g. organisational or marketing innovations) and distribution channels in foreign markets, as well as increase the innovative capacity of SMEs.

Policy priority

The reform **Innovation funding** will improve the efficiency and effectiveness of public financial support (e.g. existing funding and investment schemes) granted to the private innovation sector by adopting a new plan for the composition and implementation of innovation support programs.

Intelligent land management: This EUR 6.7 million investment targets the transformation and advancement of Croatian agriculture through the implementation of a smart agriculture system and the establishment of a platform to manage resources and production for farmers.

[78] This aspect is covered by two different areas and three reforms of the Croatian Recovery and Resilience Plan. **Area 1** on economy inherits two reforms, and **area 5** on health provides one reform targeting this aspect.
[79] Innovative products and services as defined by the European Scoreboard.

Digitalisation of the drug pathway: This investment, worth EUR 2.5 million, foresees contributions to enable the Croatian healthcare system to develop a fully transparent and complete monitoring system of drug consumption to enable the creation of pharmaco-epidemiological data to ensure systematic planning, monitoring and evaluation of healthcare processes.

Development of a system for monitoring and preventing drug shortages in Croatia: This EUR 1.4 million investment will finance the introduction of a precise system for monitoring and analysing the trade of certain drugs, allowing the development of a model for predicting and preventing drug shortages.

Introduction of a system for monitoring the outcome of outpatient treatment: This investment targets the implementation of a fully transparent system to monitor the treatment outcomes of patients. In addition, this investment will also be dedicated for the creation of an interoperable database of valuable pharmaco-epidemiological data enabling the systematic planning, monitoring and evaluation of the profitability of investing in pharmacotherapies. This initiative is provided with approximately EUR 0.6 million from the RRF.

Policy priority

The above-mentioned investments complement the reform **Ensuring the financial sustainability of the health system,** whose goal is to achieve a financially sustainable public health system through the implementation of unified standards and interoperability of data.

Digitalisation of businesses

Investments in the digitalisation of businesses[80] will promote the digital transition of the complete country and ensure competitiveness within the country and internationally. In total EUR 37.8 million are planned to be spent on this area.

Preparation of strategic documents for the digital transformation of the economy and artificial intelligence: This EUR 0.4 million investment will support Croatian companies in their digitalisation and enabling them to enter into the digital ecosystem by introducing digital tools and skills among the workforce, and by developing new digital business models.

Vouchers for digitalisation: The goal is to strengthen the digital transformation process of SMEs. Vouchers will be available for Croatian companies to be used for specialised training, digital marketing and other services focused on building digital capacity and maturity among the Croatian businesses. A total of approximately EUR 10 million will be provided from the RRF to implement this initiative.

Reimbursable resources for digitalisation: This investment's target is to financially support Croatian companies into their digital transformation and the acquisition of digital solutions. This investment is funded with approximately EUR 27.4 million from the RRF.

[80] Measures related to the digitalisation of businesses can be found under the **area 1** focussing on economy in the Croatian Recovery and Resilience Plan.

Policy priority

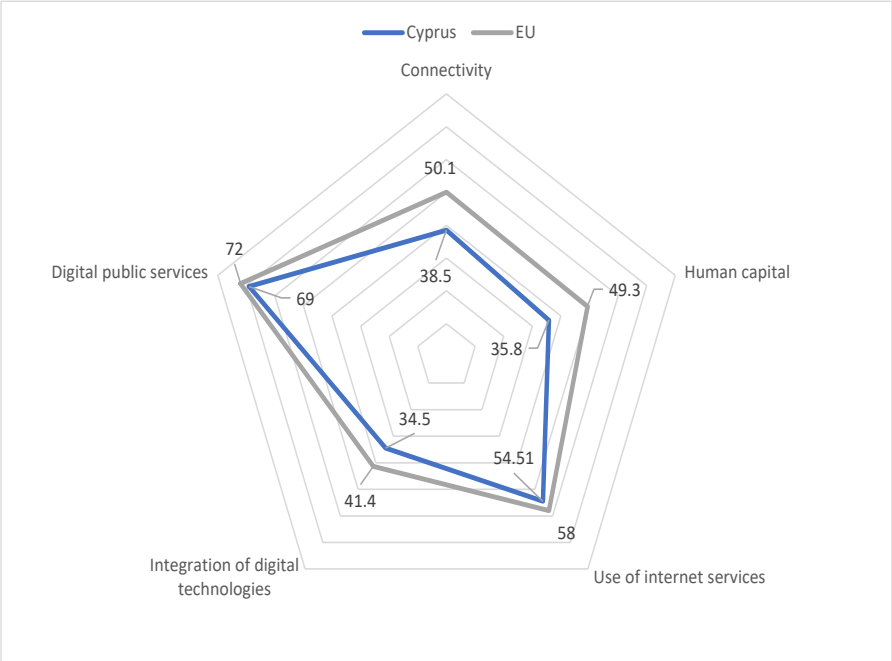
The above-mentioned investments are meant to support the reform **Building a strategic and operational framework for digital transformation of the economy and artificial intelligence** set out to build a strategic framework for the digitalisation of the Croatian business sector. This will help increase the digital capacity of enterprises and especially the ability of SMEs to digitalise and start applying artificial intelligence.

4.5 Cyprus

4.5.1 Country digital outlook

Digital transformation represents a huge opportunity for Cyprus to increase its productivity, innovation and employment. While Cyprus already invested substantial efforts into the enhancement of its digital transformation, the country scored below the EU28 average on all the dimensions of the Digital Economy and Society Index (DESI) of 2020 (based however on data from 2019) as can be seen from Figure 18 below. Cyprus, together with Italy, Romania, Greece and Bulgaria, had one of the lowest rankings regarding its digital economy, scoring 23rd out of the EU28 Member States. Cyprus' performance was particularly low in the human capital dimension, the connectivity one, as well as the one related to the integration of digital technologies by businesses. Considering these challenges in the digital sphere, Cyprus also received two Country Specific Recommendations in the context of the European Semester in 2020, calling the country to take action mainly in the field of emerging technologies to guarantee the efficiency of its public services, as well as in the field of eJustice to improve the efficiency and digitalisation of its judicial system. Against this background, it must be said that in recent years Cyprus has shown great commitment to overcome this digital gap, as also demonstrated by the strong focus on digital matters in its Recovery and Resilience Plan, detailed in the following sections.

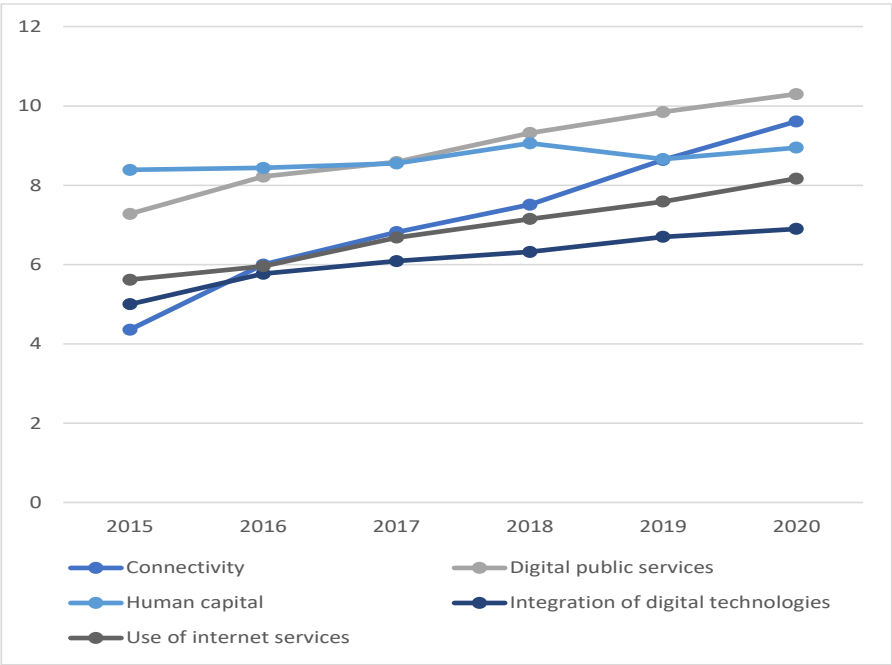
Figure 18. Performance on DESI 2020 - Cyprus



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Figure 19 below illustrates the evolution of Cyprus' performance in the five main DESI dimensions since 2015. Cyprus has made significant progress over the last five years in the digital sphere, particularly in the area of connectivity, in the use of internet services and in digital public services.

Figure 19. DESI dimensions over the years - Cyprus



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Despite recent efforts, Cyprus ranked 27th on the **connectivity** dimension among the 28 EU countries in 2020. While Cyprus performed well in fast broadband (NGA) coverage and in fixed and mobile broadband take-up, it still lagged behind and hits the bottom of the European rankings for fixed broadband take-up of at least 100 Mbps (where it ranked 26th) and very high capacity fixed network (VHCN) coverage (where it ranked 27th). However, Cyprus has made progress in the last five years in deploying very high-capacity networks as part of its 2016-2020 National Broadband Plan. As stated in its Recovery and Resilience Plan, which includes several investments focused on the deployment of 5G and Gigabit connectivity, the government published in 2021 the update the National Broadband Plan for the period of 2021-2025.

On the **human capital** dimension, Cyprus ranked 23rd among the 28 European countries in 2020, as it continued to face shortcomings in its population's digital skills and in the share of ICT specialists in its workforce. To improve this situation, Cyprus has taken various initiatives such as the launch of the Cypriot National Coalition Plan for Digital Skills and Jobs, focused on fostering digital entrepreneurship, digital skills and women in digital, or the provision of digital skills-building trainings by the Human Resource Development Authority of Cyprus (HRDA), intended for employees and job seekers. In addition, the Cypriot Plan includes two investments and multiple reforms to enhance and promote the development of eSkills in education, as well as in the private and public sectors.

Regarding the **use of Internet services**, data showed that Cypriots were keen to use internet services, especially social media (83% of the population). The percentage of eCommerce users was very low compared to the European average (4% versus 23%), which can be partially explained by the low intake of ICT by Cypriot companies. However, as for the other EU countries, the number of Internet users in Cyprus slowly started to increase in 2020, a trend stimulated by the COVID-19 pandemic and the increase of teleworking conditions.

The development of **digital public services** has been a key priority for Cyprus in the last years. In spite of significant improvements in the provision of these services, the demand and the number of eGovernment users was still lower than the European average in 2020. However, it should be noted that Cyprus invested heavily in the digitalisation of public services since 2018, by making these available to citizens on the Ariane platform created to centralise all public services and provide a Single Sign-On (SSO) to access them. Many investments are foreseen in Cyprus' Plan to continue the development of digital public services, especially eHealth, eJustice and in the field of transport, but also to promote their use by citizens.

Finally, Cyprus ranked 20th among the EU28 countries on the **integration of digital technologies** in 2020. Despite it being lower than the EU average, enhancing the digitalisation of businesses has also been a priority for Cyprus in the last years as it can be observed in Figure 19. For instance, part of the actions conducted under Cyprus' holistic and integrated national industrial strategy 2019-2030 aim to gradually raise the digitalisation of companies to support the economic growth and productivity by 2030. Additionally, the country is also a member of the EuroHPC Joint Undertaking and has signed both the Declaration on the Cooperation Framework on HPC and the Declaration of European Blockchain Partnership. Lastly, the country is developing a new national strategy on Artificial Intelligence (AI) and its Recovery and Resilience Plan includes several investments on the further integration of digital technologies by businesses and their use of eCommerce.

4.5.2 Reforms and investments

Cyprus' Recovery and Resilience Plan, whose official name is *Σχέδιο Ανάκαμψης και Ανθεκτικότητας της Κύπρου 2021-2026*, has been submitted in May 2021. It is subdivided into five main policy axes and 13 components, each covering multiples reforms and investments. Most investments and reforms linked to the digital transition, which represent 23% of the Plan's total budget allocation, are gathered in the fourth axis named 'Towards a digital era', but investments related to this sector can be found in every other axis of the plan. Through its Plan, Cyprus aims, among other things, to improve its connectivity, to modernise its health services and to reduce the backlog in the digital transformation of its private and public sectors. This last point is one of the main overall objectives of Cyprus' Plan, as its labour market is often characterised by skill shortages and a large digital and entrepreneurship skills gap.

A total of EUR 276 million, equivalent to 23% of Cyprus' EUR 1.2 billion Recovery and Resilience Plan, which is split into EUR 1 billion in grants and EUR 200 million in loans, will support the implementation of the below crucial investments by 2026. These have been grouped into seven categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Investments in connectivity[81] will improve the nation's overall connectivity by ensuring 5G and fibre coverage for 100% of the population, including the deployment of 5G along the main terrestrial corridors and by enabling universal and affordable access to Gigabit connectivity in all urban and rural areas. Indeed, Cyprus will invest EUR 52.5 million into the category of investments, as further detailed here below:

Enhance building cabling to be 'Gigabit-ready': Cyprus will invest EUR 10 million to support end-users to connect with very high-capacity networks (VHCN) deployed close to their residence, through the reduction of the cost of the required new internal cabling.

Submarine link to Greece: Through an investment of EUR 7.5 million, the deployment of a new separate backbone route between Cyprus and Greece will allow higher connectivity performance (in terms of resilience, security, redundancy and latency) compared to existing cables.

High-speed networks in underserved areas: This investment, worth EUR 35 million, addresses territorial disparities of broadband availability, fostering the digital transition of all vertical sectors (including all major socio-economic drivers) in underserved areas.

[81] The connectivity aspect of the Plan is covered by the **Axis 4** on digital transformation, and particularly through its **Component 4.1** on the upgrade of Cyprus's infrastructure for connectivity.

Policy priority

The above-mentioned investment accompanies two reforms on the **Empowerment of the National Regulatory Authority (OCECPR) and the National Broadband Competence Office (DEC)**, which will increase the capacity of both OCECPR and DEC, with a focus on adopting the relevant EU legislation and providing for all secondary legislation instruments and tools. The global objective of these reforms is to facilitate and accelerate investments in very high-capacity networks.

eGovernment, digital public services and local digital ecosystems

The development of eGovernment, digital public services and local digital ecosystems[82] is an essential part of the Cypriot Plan worth EUR 122.52 million. Through a global digitalisation strategy of public services and institutional processes, Cyprus aims to modernise its public sector, in particular its public services in the justice, health, and transport sectors.

Digitalisation of Federal Public Service: To amplify a holistic digitalisation strategy for the various public services, the country is putting forward various projects supported by an investment worth EUR 13.10 million. These projects will modernise internal management processes and support the digitalisation of the services they offer. This investment includes five main projects:

- The development of a new integrated information system for the Road Transport Department;
- The digital transformation of the Deputy Ministry of Shipping;
- Boosting digitalisation in the Ministry of Foreign Affairs;
- The development of an Information System for the Monitoring of the Cyprus Recovery and Resilience Plan in the Directorate General for European Programmes, Coordination and Development and RRP Communication Strategy;
- The digitalisation of Architectural Heritage of the Department of Town Planning and Housing of the Ministry of Interior.

Policy priority

The above-mentioned investment accompanies the reform on the **Digital Services Factory (DSF)**, building a new delivery model for the development of end-to-end quality digital services. The DSF will develop advanced digital services following an Agile/Scrum methodology, through the redesigning and reengineering of procedures, by following a citizen journey that provides adaptability, response to change and is based on user experience.

Digital transformation of Cyprus' Ports Authority: Cyprus will invest EUR 3.28 million to ensure that the operations of its Ports Authorities are performed efficiently and effectively and communications between the vessels and the relevant competent authorities are executed seamlessly and digitally.

[82] Reforms and investments of the Cypriot Plan related to eGovernment, digital public services and local digital ecosystems can be found in **Axis 1** (Public health, civil protection and lessons learned from the pandemic), **Axis 3** (Strengthening the resilience and competitiveness) and **Axis 4** (Towards a digital era).

Cyprus Innovative Public Health ICT System (CIPHIS): The proposed project, financed by an EUR 5.7 million investment, will establish a well-functioning, capable and resilient national public health ICT system.

Deployment of generic cross border eHealth services in Cyprus: This investment, worth EUR 1.94 million, will support Cyprus' efforts to be part of a secure peer-to-peer network between European healthcare systems, allowing for instance the exchange of Patient Summaries and ePrescriptions.

Policy priority

The above-mentioned investments related to health accompany a reform on the **Design of an Electronic platform for the surveillance of Antibiotic Consumption and Healthcare – Associated Infections**, which aims to support the digital transition of the healthcare sector and strengthen the health system's effectiveness and resilience.

Rationalisation of the shift system in the public sector through the implementation of a Roster Planning System: The implementation of a roster management system, supported by a EUR 0.55 million investment, will meet the organisational needs of public sector organisations that provide services in different time zones in order to ensure optimised shift patterns and deliver productivity and efficiency gains long into the future.

Policy priority

The above-mentioned investment accompanies four reforms on the modernisation of the public sector:

- **Enhancing the administrative capacity, and improving the functioning of public administration for better policy making and implementation**;
- **Regulate flexible working arrangements in the public sector;**
- **Introduction of a new framework for the evaluation and selection process of public service vacancies and new regulations for the evaluation of employees**;
- **Strengthening administrative capacity and transparency through the professionalisation of public procurement and further digitalisation of its process**.

These four reforms will allow for more flexibility in working conditions and to substantially contribute to the efficiency of the public administration in creating a truly stimulating environment for the staff.

Digitalisation of the law-making process: This investment, worth EUR 1.69 million, will further improve the quality of legislation and regulation by enabling easier consolidation of laws and regulations. Moreover, digital and easier access to them is expected to enhance legal certainty and transparency. This would affect various policy areas that relate to transparency, efficiency and legal certainty for both government and businesses.

Policy priority

The above-mentioned investment accompanies two reforms on the digitalisation of justice in Cyprus. On the one hand, the reform on the **Enhancement of the digital capacity of the Law Office** will increase its efficiency and effectiveness, as well as the productivity, quality of work and working conditions of the employees of the Law Office. On the other hand, the reform on the **Digital transformation of courts** supports the adoption of a holistic system of eJustice, as well as the needed cultural change for all stakeholders.

Economic Policy Modelling Hub: Developing current state-of-the-art models/tools for the evaluation of economic policies/reforms and their impact is essential for the modernisation of the government and the public sector. This project involves the development of big data and data analytics for informing and monitoring economic policies, also useful for modelling, nowcasting and forecasting.

Enhancing eSystem for issuing building permits: The eApplication environment of the Hippodamos System for the acceptance of applications for Planning and Building Permits needs further development and should be expanded to support all the Planning and Building Authorities.

Smart Cities: Cyprus will invest EUR 35 million in the CY Smart City platform that will bridge and connect devices, people, processes and applications with a broad and open approach. Its architecture and technical specifications will also define the interconnection and configuration of sensors and other equipment to implement smart parking, smart lighting and smart waste management solutions.

Policy priority

The digitalisation of public services is complemented by several additional reforms that are not linked or indirectly linked to the investments mentioned above:

- **Social Insurance System and Restructuration of the Social Insurance Services:** This reform will finance the establishment of a new integrated digital Social Security's System including payment module, benefits administration module, data analytics and interoperability with other systems.
- **Improving Tax collection and effectiveness of the Tax Department:** This reform has two main objectives: to support the creation of the Integrated Tax Information System and the Online Fiscalisation project which involves connecting businesses to a server held within the Tax Department, informing it of real time (online) transactions that take place, and secondly, to increase the scanning and electronic storage of all documents that exist in paper taxpayer files regarding the real estate and capital gains sectors.
- **Digitalisation of the Cyprus Stock Exchange:** This reform will, as its name suggests, enhance the global digitalisation of the Cyprus Stock Exchange processes.
- **Police Procedures Digitalisation (DigiPol project):** The reform will allow the development and implementation of several digital technologies that are tailored to the needs of Cyprus Police with a view to digitally transform and prepare its services for the Next Generation of Law Enforcement.

Human Capital

Investments related to human capital[83] are focused on the development of Cypriots' digital skills, supporting a larger plan named eSkills Action Plan, to be developed by the Deputy Ministry of Research, Innovation and Digital policy (DMRID).

Skilling, Reskilling and Upskilling: This investment, worth EUR 8.42 million, will have two main goals:

- To strengthen digital skills of the Cypriot workforce, in line with the future eSkills Action Plan to be developed by the DMRID.
- To tackle digital exclusion among the elderly by improving their digital skills and building their confidence in using ICT tools.

[83] The human capital-related aspects of Cyprus's Plan are mostly addressed in **Axis 5** (Labour market, social protection, education and human capital) under **Component 5.1** (Educational system modernisation, upskilling and retraining) and **Component 5.2** (Labour market, social protection, social welfare and inclusion).

Policy priority

The above-mentioned investments accompany three reforms on the development of digital skills in Cyprus:

- **Digital transformation of school units with the aim of enhancing digital skills and skills related to STEM education:** It will support the digital transition of the education system through a transformation of the curriculum and the modernisation of the educational material.
- **Implementation of the eSkills Action Plan:** This reform will promote the enhancement of digital skills across the whole spectrum of society, enabling all citizens to reap the benefits of digital technologies and facilitate the successful implementation of the digital transformation agenda.
- **Flexible Work Arrangements in the form of Telework:** This reform will enhance work-life balance and increase employment.

Investment in digital capacities and deployment of advanced technologies

Investment in digital capacities and the deployment of advanced technologies[84] represents a smaller part of the Cypriot Recovery and Resilience Plan. Cyprus' Plan includes a single investment and three reforms on this area, as described below:

Enhancement of the Supervisory Function of the Cyprus Securities and Exchange Commission (CYSEC): This EUR 0.25 million investment will fund the creation of an advanced IT system, based on cloud architecture, to cover the need for supervision of the CYSEC under the European Market Infrastructure Regulation (EMIR) and Securities Financing Transactions Regulations (SFTR).

Policy priority

The investment in digital capacities and the deployment of advanced technologies mentioned above is complemented by several additional reforms:

- **Definition and implementation of a new cloud policy regarding Government IT systems and services**: This reform supports the elaboration of a new cloud policy that will include criteria regarding data classification, data residency as well as the hosting and operation of the government IT systems either in a public cloud or a government private cloud (G-Cloud) environment.
- **Move agricultural practices from the 20th century to the 21st century by investing in a national centre for excellence in Agri-tech**: Establishing a nationally organised and centralised operating model will provide a common mechanism for farmers and the agriculture sector to access relevant information, services, technologies, and funding options.
- **Online cloud-based platform for improving the trade and information symmetry in the fresh produce supply chain**: This reform will promote the use of innovative cloud-based information technologies to develop an online trading platform that will record fresh produce entering the local market and moving along the supply chain.

[84] The only investment and other reforms in digital capabilities and in the deployment of advanced technologies are found in the **Axis 3** (Strengthening the resilience and competitiveness of the economy), and more specifically under **Component 3.5** (Safeguarding Fiscal and Financial Stability), as well as in **Axis 4**.

Digital-related investment in R&D

Investments in digital-related R&D[85], which represent an important part of Cyprus' Plan, will strengthen the national research infrastructure to further boost innovation in order to support the country's economic competitiveness and growth.

Set up and operate a central knowledge transfer office: To counter the currently limited technology transfer in Cyprus, a central knowledge transfer office will be created to provide a cost-efficient solution to this challenge, built on the principles of acquiring a critical mass of research output and economies of scale.

Innovation funding programmes and funding schemes for the enhancement of growth & competitiveness of start-ups, innovative companies, and SMEs: This investment will finance innovation programmes (e.g., Fast-Track Innovation, Pre-Seed, Seed, Innovate) as a measure to improve access to funds for innovative SMEs and start-ups.

Policy priority

The above-mentioned investment complements two reforms on the development and the facilitation of R&D investments in the private sector:

- **Incentives to encourage and attract investments and human capital in Research and Investment (R&I)**: This reform will promote the R&I culture to the whole spectrum of the economy, which will create the conditions and opportunities for training and employment of new researchers.
- **Introduction of policies and incentives to facilitate and foster access to publicly funded Research Infrastructures and laboratories:** This reform will enhance collaborations and linkages between research/academic organisations and industry.

Supporting R&D activities on dual technologies, including the creation of new or upgrade of existing laboratories: The funding schemes will enable the upgrade of the research and investment capabilities and capacity of the Research Centres of Excellence in Cyprus, as well as academic institutions, research organisations and companies engaged in R&D on 'dual use technologies'[86].

Policy priority

Digital-related investments in R&D accompany the reform on **Comprehensive national R&I Policy supported by data-driven policy tools to enhance links between policy making and implementation**, supporting the operation of the new R&I Governance System and to update the national R&I Strategy. This reform will ameliorate the system's organisation, to address the needs and to minimise fragmentations and challenges of the Cypriot R&I ecosystem.

Digitalisation of businesses

[85] Digital-related investments and reforms are found in **Axis 3** (Strengthening the resilience and competitiveness of the economy), and more specifically under **Component 3.2** (Enhanced Research and Innovation).
[86] The term 'dual use technology' refers to technology that can be used for both peaceful and military aims.

Investments in the digitalisation of Cypriot businesses[87] will be essential to promote their productivity, modernisation, and competitiveness. Indeed, the Plan puts forward the following investment to support the digital transformation of its businesses:

Developing a Blockchain platform to ensure the identity of Cypriot local traditional food/drinks: The investment, worth EUR 1 million, addresses the issue of harmonisation of the authenticity of Cypriot products as well that of European food in general, by using stable isotopic databases.

Scheme for the digitalisation of enterprises engaged in manufacturing and trading of agricultural products: The proposed investment will directly incentivise investments towards the setting up of a new business or the technological advancement of existing businesses. This investment's objective is to help them bring to the market significantly improved products, to increase productivity and strengthen their growth prospects, to create local jobs and to provide the base for sustained growth of the overall economy.

Integrated Information System for the Registrar of Companies and Official Receiver: The overall objective of this EUR 6.58 million investment is the design, development, implementation, maintenance, and operation of an Integrated Registry Platform supporting the processes and services of the Companies' Section and Intellectual & Industrial Property Section of the Department of Registrar of Compagnies and Official Receiver (DRCOR).

Policy priority

The above-mentioned investment complements a reform on **Enhancing the Fast-Track Business Activation Mechanism**, which will simplify administrative procedures for businesses, while fostering the digitalisation of governmental services and the operation of a Business Support Centre that will provide all necessary and supportive information and services to compagnies.

Creation of a Regulatory Sandbox to enable FinTech: With an investment of EUR 0.4 million, the regulatory sandbox is expected to facilitate innovation in the Financial Technology (FinTech) area, including alternative finance platforms and solutions.

Scheme for the digital upgrade of enterprises: The main objective of this investment, worth EUR 10 million, is to enhance the integration of digital technologies in existing and future SMEs established in Cyprus, and more specifically, to enhance the digital identity of businesses, to increase the amount of small and medium-sized enterprises that use ICT in the country, particularly in the eCommerce sector, and finally, to promote digital entrepreneurship.

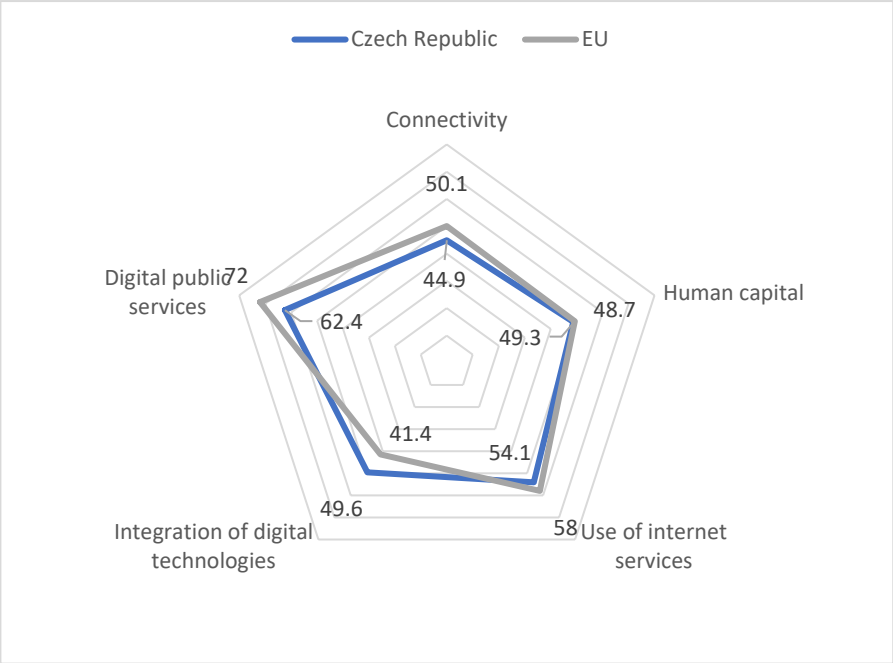
[87] The digitalisation of businesses-related aspects of Cyprus's Plan is addressed in **Axis 3** (Strengthening the resilience and competitiveness of the economy), under **Component 1.1** (New growth model and diversification of the economy) and **Component 3.3** (Business support for Competitiveness).

4.6 Czechia

4.6.1 Country digital outlook

Czechia has demonstrated a strong willingness to enhance its digital transformation, as indicated by its overall good performance on the Digital Economy and Society Index (DESI) 2020, as seen in Figure 20 below. Indeed, although Czechia scored slightly below the EU28 average in 2020, it ranked 16th in the overall ranking and scored above the EU28 average on the integration of digital technologies by businesses. Over the past five years, its position on DESI has been stable between the 17th and 16th rank. Nonetheless, the country still lagged behind other EU28 countries in the digital public services and connectivity dimensions of DESI. In light of these challenges, the country received one Country Specific Recommendation in 2020 in the context of the European Semester, to ensure that the country places enough effort to support employment through labour market policies, including the up- and re-skilling of workers. Further to this, Czechia will also further improve its digitalisation through the initiatives and measures put forward in its National Recovery and Resilience Plan, as detailed in the following sections.

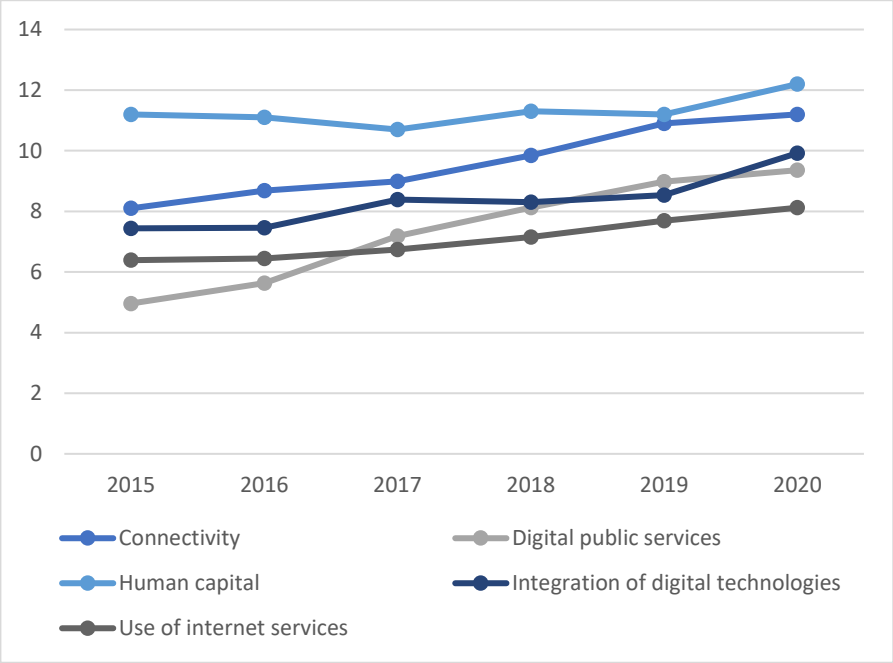
Figure 20. Performance on DESI 2020 – Czechia



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Such commitment to further digitalisation also emerges from Figure 21 below, which provides an overview of the evolution of Czechia's performance on the five main DESI indicators since 2015. Particularly, the country improved its scores on digital public services as well as connectivity.

Figure 21. DESI indicators over the years - Czechia



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

While Czechia improved its score since 2015 concerning **connectivity**, the country lost speed to the EU28 average in 2020 as its rank decreased from 19th in 2019 to 24th in 2020. To overcome this, the country adopted several initiatives aimed at improving its broadband connectivity as well as to construct electronic communications networks through the Action Plan 2.0 adopted in November 2019 and the National Broadband Plan approved in March 2021. Similarly, under the country's Recovery and Resilience Plan, several initiatives are expected to further improve the country's 5G readiness, to build communication networks and improve broadband connectivity.

Czechia's scores in relation to DESI's **human capital** dimension improved over the years. The National Digitalisation Strategy adopted in 2018 put an emphasis on the need to further develop digital skills and knowledge among the Czech citizens. Additionally, the Education strategy 2030+ intends to foster life-long learning and upgrade school curricula by including digital competences. Similarly, the National Recovery and Resilience Plan intends to further strengthen this dimension by increasing the digital capabilities of teachers, as well as providing digital education in all schools.

Data suggests that the **use of internet services** has increased throughout the last years and is getting closer to the EU28 average in 2020. This is in line with the decrease in the digital gap within the Czech society, indicated by the proportion of people who have never used the internet, which fell to 9% and hence equalled the EU28 average in 2020.

The **integration of digital technologies** by businesses was the strongest dimension of Czechia in 2020 and the country scored above the EU28 average, ranking 9th out of 28 EU countries. This improvement was a result of the Czech innovation strategy published in 2019, which managed to widen the use of digital technologies in Czech businesses, particularly within start-ups and SMEs. The National Recovery and Resilience Plan also indicates several initiatives aimed at promoting the digitalisation of businesses, including SMEs as well as large enterprises.

Concerning the **digital public services** dimension, the Czech performance has been improving over the years but seemed to be slowing down in 2020. Indeed, while the country has been implementing its eGovernment plan as part of the Digital Czechia strategy since 2018, the number of users of eGovernment services was growing at a slower pace, and the uptake remained low despite the government's efforts. However, the National Recovery and Resilience Plan also put forward several investments and reforms aimed at further increasing the offer of digital public services for citizens and businesses.

4.6.2 Reforms and investments

The Czech Recovery and Resilience Plan, originally called *Narodni plan obnovy,* was submitted to the European Commission in June 2021 and includes 26 components grouped into six areas. Each component includes several overarching reforms, accompanied by various investments. Digital-related investments and reforms, which represent 22.1% of the Czech Plan, will support, among other things, the adoption of 5G in the country, the further development of digital public services, the promotion of digital skills and the digitalisation of education, research and development in AI and the digitalisation of the private sector, especially regarding the use of emerging technologies and digital tools by businesses.

A total of EUR 1.569 billion, equivalent to 22.1% of Czechia's EUR 7.1 billion Recovery and Resilience Plan, all in grants, will support the implementation of the following crucial investments by 2026. These have been grouped into six categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Connectivity[88] plays an important role in the Czech Plan, as all the reforms and investments, worth EUR 202 million, put forward will ensure the good implementation and success of the country's digital transition through the development of 5G, quantum communication and high-capacity networks.

5G application projects for cities and industrial areas: This investment will finance the development and deployment of vertical ecosystem applications[89] of 5G networks for cities (including municipalities or regions) with the aim of supporting the Smart Cities concept. This investment receives EUR 43.3 million from the RRF. Local authorities, large enterprises and SMEs will also participate financially with 15%, 30% and 40% of this amount respectively.

Building quantum communication infrastructure: The objective of this investment of EUR 7.1 million is to allow the creation of a backbone optical quantum network in Czechia, which will connect to the surrounding countries and be a part of the European quantum communication infrastructure. This will enable testing and operation of the pan-European quantum communication system and its integration into existing telecommunication technologies in Czechia.

[88] The connectivity dimension of the Plan is addressed in **Pillar** 1 on digital transformation, under **Components 1.3 and 1.4**.
[89] Vertical ecosystem applications of 5G networks refer to 5G applications specifically designed for vertical ecosystems. Vertical ecosystems are business sectors which involve one specific industry and encompasses a group of producers, customers and actors which are all interconnected in relation to the specific industry.

Building a high-capacity connection: This investment will increase of access points to high-capacity networks in the country. A total of 23 000 address points shall be provided access to high-capacity connections by the end of Q1 2026. This investment receives EUR 112.3 million under the RRF.

Covering 5G corridors and supporting the development of 5G: The objective of this EUR 27.6 million investment is to increase the coverage of rail corridors with increased signal level of 5G by 2025. Additionally, it sets out to equip at least 350 rail wagons with repeaters for 5G signals and to develop building and testing intelligent transport system for corridors (C-ITS) in 5G networks.

Supporting the development of 5G mobile infrastructure in rural areas: This investment targets the construction and commissioning of 120 base stations (BTS) for 5G network signals in investment-intensive white areas[90] in the Czech countryside. This investment is allocated EUR 11.8 million under the RRF.

eGovernment, digital public services and local digital ecosystems

The development of eGovernment and the further deployment of digital public services play an essential part of the Czech Recovery and Resilience Plan[91]. Four investments, worth approximately EUR 180 million, will support the use of eForms and eGovernment by citizens, while developing new digitalised public services and information systems for the public sector.

Digital services for end users: This investment will increase the number of electronic submissions of forms and documents by citizens to state authorities and organisations to reach 100% of the submissions by March 2026. EUR 40.15 million are dedicated to support this investment under the RRF.

Digital services in the justice sector: The purpose of this investment is to increase the transparency of court hearings and the availability of information in the field of justice through the user-friendly Justice.cz web portal, which is a prerequisite for the secure provision of basic information and digital services (such as various submissions, access and consultation of records, etc.) to interested parties and the general public.

Building and developing basic registers and facilities for eGovernment: This EUR 101.8 million investment sets out to develop and modernise basic registers (such as the register of persons, of rights and obligations, among others), and to expand them in accordance with new requirements for the scope of their reference data. It also aims at the construction of a Shared Service Information System, which connects data from individual agenda systems of different public authorities. Lastly, it targets the development of the technological infrastructure of the public administration, including a radical increase in its transmission capacity in connection with the development of next-generation networks, the implementation of new customer and high-capacity services and infrastructures.

[90] Investment-intensive white areas describe rural areas, for which high investments would need to be made in order to connect them to the existing networks.
[91] This aspect of the Plan is mainly covered in **Pillar 1** (Digital transformation**)** under **Component 1.1** (Digital Services for citizens and businesses) and **Component 1.2** (Digital public administration systems).

Building and developing individual information systems: The objective of this investment, worth EUR 36.7 million, is to build modern information systems within public administrations, built on modular architecture supporting the easy interconnectivity of individual systems and thus allowing the mutual transfer of data.

Human Capital

Enhancing the human capital by further boosting and developing digital skills, while supporting the digitalisation of schools, will be essential to ensure the future of Czechia's economic growth and productivity[92].

Development of skills needed for the digital transition: This investment, worth EUR 275.7 million, targets the development of digital skills through the provision of reskilling and further vocational training for workers, the development of workers' skills for smart specialisation, industrial transition, entrepreneurship, and adaptability of enterprises to change, which will support the development of skills needed for the digital transition.

Policy priority

The above-mentioned investment complements the reform **Development of labour market policies**, supporting life-long learning in Czechia. The reform includes several systemic initiatives to foster digital skills within the labour market, such as the establishment of a tripartite mechanism for training provision, the creation of a database of retraining and training courses, the creation of 14 regional training centres and legislative changes to increase the flexibility and effectiveness of retraining courses, among others.

Implementation of the revised curriculum DigCompEd and digital skills of teachers: The objective of this EUR 22.14 million investment is to implement the revised DigCompEd curriculum and framework in the country by supporting at least 4 000 schools by directly supporting and educating teachers in computer science and digital literacy by the end of 2025 and by creating a digital ecosystem to effectively share educational resources with educators by the end of 2024.

Digital equipment for schools: This investment, worth EUR 275.7 million, will decrease the digital divide in the country and to improve the overall level of digitalisation in schools by:

- Creating a mobile digital device pool for disadvantaged pupils in order to allow all students to have access to mobile digital devices for regular and remote teaching in at least 80% of schools in the country;
- To equip at least 9 260 schools with basic and advanced digital technologies (AI, VR, robotic aids, etc.) to teach new informatics and develop digital literacy;
- To provide support to at least 1 120 schools regarding the purchase of digital technologies and the settings of their IT management and internal infrastructure.

Investment in digital capacities and deployment of advanced technologies

[92] The human capital aspect of the Czech Plan is particularly covered by **Pillar 3** under **Component 3.1** (Innovation in education in the context of the digitalisation) and **3.3** (Modernisation of employment services and labour market development).

Digital capabilities and the deployment of advanced technologies[93] represents a smaller part of the Czech Plan. Two investments focused on open data and cybersecurity are supporting the deployment of advanced technologies in Czechia.

Development of open data and a public data pool: This investment plans to increase the number of entities providing open data from 23 in 2021 to 100 by the end of 2024, with a view to improving the quality of the datasets provided and the quality of metadata records registered in the National Open Data Catalogue. The investment receives EUR 6.4 million from the RRF.

Cybersecurity: The goal of this initiative, supported by a EUR 106.12 million investment, is to increase the level of cybersecurity of central authorities, institutions, health service providers, and other entities under the Cybersecurity Act and related regulations.

Digital-related investment in R&D

An important focus of Czechia's Plan has been dedicated to the further development of digital-related R&D[94]. Investments in this area, worth EUR 69 million, will be focused on the research and development in advanced technologies or specific economic sectors such as the aerospace industry, as well as on the creation or further development of new or existing research infrastructures.

Enhancing research in Artificial Intelligence (AI): This investment will ensure sufficient research capacity in the field of AI through the establishment of a European Centre for Excellence in AI, enabling various stakeholders to deploy and test new AI applications. The development of AI technologies contributing to a safer society will be one of the main national projects on the Czech digital agenda. This investment receives EUR 9.4 million under the RRF.

Europe Digital Media Observatory Hub (EDMO): The objective of this EUR 1.7 million investment is to support the creation of a regional hub/research centre of the CEDMO (Central European Digital Media Observatory) project, which has already been approved by the European Commission and is led by the Charles University (Prague). This research centre will increase the country's research capacities and provide AI tools and methodology to combat fake news in the digital space in an impartial manner.

Transfer of foreign best practices and know-how for digital transformation, monitoring and research on the socio-economic effects of the COVID-19 crisis: This investment sets out to build capacity to ensure the adequate monitoring of impacts from the digital transformation, their evaluation as well as the design of solutions to promote benefits resulting from it. This investment will also mitigate the economic and social impact of the measures taken against the coronavirus pandemic on citizens and businesses. This investment receives EUR 6.7 million under the RRF.

Scientific research activities related to the development of 5G networks: This investment, worth EUR 11.8 million, will finance 20 scientific research activities and projects related to the technological development of 5G networks, including support for the development of 5G applications for vertical ecosystems.

[93] Two investments related to digital capabilities and the deployment of advanced technologies are found in **Pillar 1 ((**Digital transformation) under **Component 1.4** (Digital economy and society, innovative start-ups and new technologies).
[94] This aspect of the Czech Plan is mainly covered in **Pillar 1** (Digital transformation) under **Component 1.4** (Digital economy and society, innovative start-ups and new technologies).

Support to R&I in the aerospace industry: This EUR 39.4 million investment will build the infrastructure needed for the further development of the aerospace industry. This objective will support the development of quantum technologies in the country, including the possibility of dramatically increasing the quality and speed of communication.

Policy priority

The above-mentioned investment complements the **Reform on joint strategic technologies support,** which will support the creation of a network of accredited laboratories with testing capacity on quality and process management certifications for the private sector. It includes the provision of qualified personnel for the certification and the implementation of administratively demanding products and management systems standards.

Digitalisation of businesses

Investments in the digitalisation of Czech businesses[95] will be essential to promote their productivity, modernisation, and competitiveness. Indeed, the Plan set out the following four investments and two reforms to further advance the digitalisation of Czech businesses, as described below:

SMEs management training platform: This investment, worth EUR 4.33 million, will fund the creation of a digital transformation platform project, the purpose of which is to create an interactive one-stop-shop, available 24/7/365, which companies will be able to access from anywhere. This platform will help them answer any question about the uses of advanced technologies (e.g. AI, blockchain, cloud computing), the digitalisation of their processes, and the implementation of selected solutions.

Policy priority

The above-mentioned investment is meant to support the **Institutional reform of the coordination and support system for the digital transformation of the economy,** which intends to develop the country's digital ecosystem and support the creation of physical infrastructures for the digital transformation of businesses (e.g. infrastructure for networks, fast broadband connection). In addition, another goal of this reform is to raise awareness not only within businesses and companies, but also within the Czech population, on the possibilities of using new technologies and the gradual digitalisation of all processes.

Czech Rise-Up programme: This investment, worth EUR 23.6 million, will focus on combating economic and social impacts of the COVID-19 pandemic and the challenges it brought on to businesses. It will thus support the technological transformation of the most affected sectors, by allowing the development of specific technological tools and of strategic technologies in order to increase the resilience of the private sector.

[95] The digitalisation of businesses is covered in **Pillar 1** (Digital transformation) under **Component 1.4.** (Digital economy and society, innovative start-ups and new technologies) and **1.5** (Digital transformation of enterprises) of the Czech National Recovery and Resilience Plan.

European and national Digital Innovation Hubs: This EUR 8.7 million investment will finance Czechia's contribution to a fully functioning network of European and national digital innovation hubs, meant to support the digital transformation of businesses, and particularly SMEs.

Digital transformation of manufacturing and non-productive companies and increase of their resilience: The objective of this investment of EUR 182.2 million is to launch individual projects for the digitalisation of manufacturing and non-productive enterprises, with the aim of increasing digital processes in Czech enterprises within these sectors. An additional goal is to support innovative Important Projects of Common European Interest (IPCEI).

Policy priority

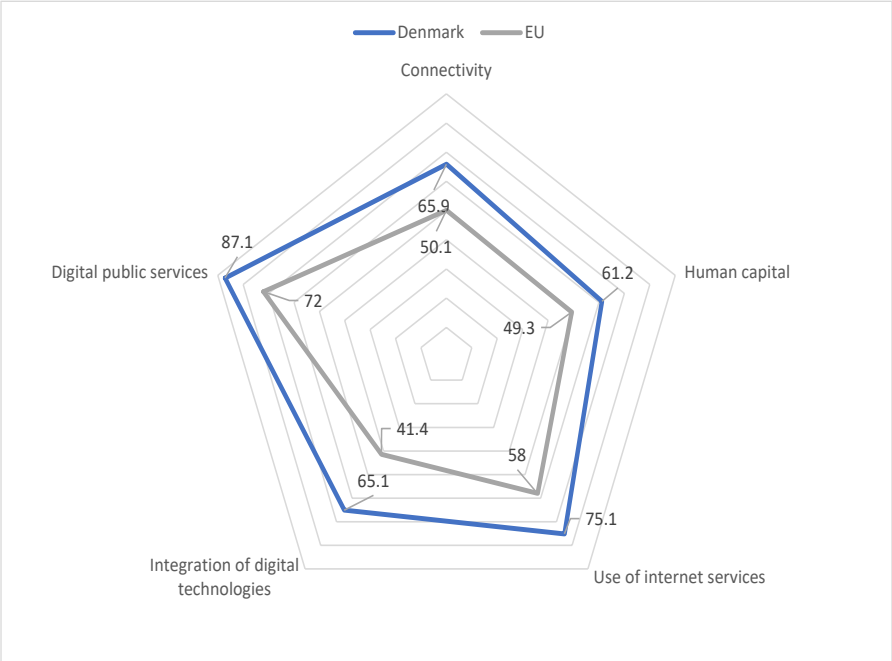
The above-mentioned investments complement the **Reform on the creation of a platform for the digitalisation of the economy,** whose objective is to create a fully functioning, long-term sustainable and connected ecosystem, which connects different actors and value/supply chains in order to meet market needs. All actions will be coordinated by the Digital Transformation Committee, which will be established through this reform.

4.7 Denmark

4.7.1 Country digital outlook

In 2020, together with Finland and Sweden, Denmark had one of the most advanced digital economies in the EU, according to the Digital Economy and Society Index (DESI), where it ranked third among the EU28 member states. Figure 22 below displays the scores of Denmark on the five DESI dimensions in 2020 based on data from 2019. The country scored well above the EU28 average on all dimensions, particularly with regards to the use of internet services and the integration of digital technologies by businesses. In 2020, Denmark also received one Country Specific Recommendation in the context of the European Semester calling the country to focus its future investments on its digital transition and to invest in digital infrastructures, particularly in the educational sector, which was lagging behind in terms of digital tools and trainings. Keeping this objective in mind, Denmark has shown great commitment to continue improving its digital transformation, as also demonstrated in its Recovery and Resilience Plan, detailed in the following sections.

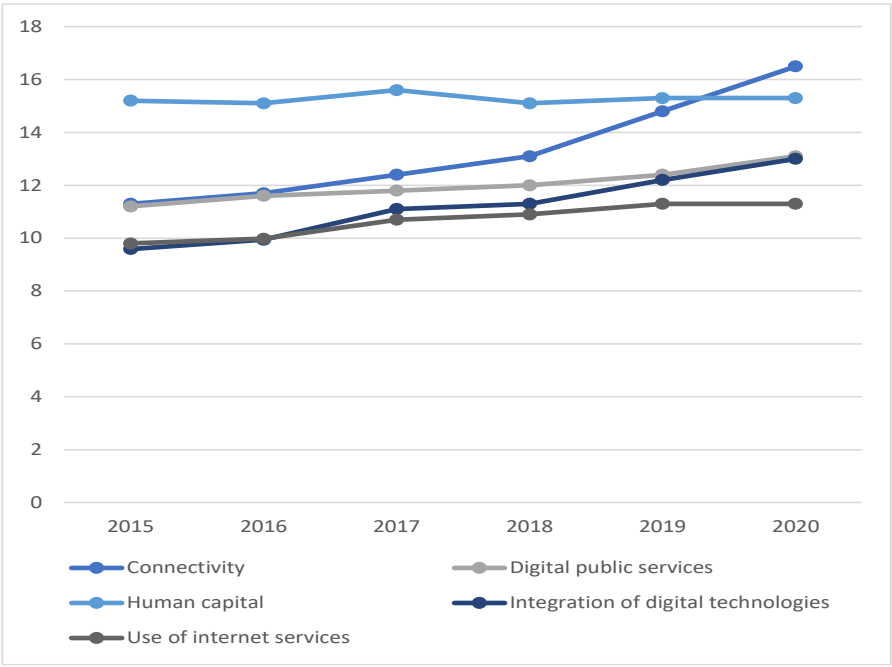
Figure 22. Performance on DESI 2020 - Denmark



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Figure 23 below illustrates the evolution of Denmark's performance in the five main DESI dimensions since 2015. As shown in this figure, Denmark has made significant improvements in the digital sphere, particularly with regards to connectivity.

Figure 23. DESI dimensions over the years - Denmark



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

In 2020, Denmark ranked first on the **connectivity** dimension. Danish 4G coverage, mobile broadband take-up, fixed very high-capacity network (VHCN) coverage and 5G readiness ranked among the best in the EU. The national broadband goal for 2020, which was part of the National Digital Strategy 2016-2020, was for all citizens to have coverage with speeds of minimum 100 Mbps download / 30 Mbps upload. In 2019, this target

was met at 93%. The work on a new broadband strategy, which is included in the Danish National Recovery and Resilience Plan, focusses mainly on rolling out fast broadband to the remaining 7% of citizens, households and companies in rural areas across the country that still do not have access to it. To encourage the research and use of 5G, Denmark published its 5G Action Plan for Denmark in 2020.

According to DESI, the **use of internet services** in Denmark was significantly above the EU average in 2020, except for the use of video calls (58% compared to 60% for the EU average). Denmark also recorded the highest number of internet users than any other EU country (95% versus 85% for the EU average).

Concerning the **integration of digital technologies**, all Danish scores for this dimension were above the EU28 average. In 2020, Denmark led the European ranking in terms of digitisation of business, with 53% of businesses being highly digitalised in the country (compared to 26% for the EU28 average). Under the Strategy for Denmark's Digital Growth launched in 2018, the government set the direction of how the country could create the best framework to enable businesses, and especially SMEs, to utilise digital technologies. A new National Strategy for Artificial Intelligence has also been designed in 2019 in order to explore the opportunities of this technology and its adoption by businesses. In addition, the Danish Plan also includes investments to support SMEs in their digitalisation process and the creation of a data-driven society.

In 2020, Denmark ranked third on the DESI **digital public services** dimension. The development of performing digital public services has been supported by several strategies and plan in the last five years such as the national eGovernment strategy, named Digital Strategy 2016-2020 or the Danish Cyber and Information Security Strategy 2018-2021. One of Denmark's main focuses of these plans regarding digital public services is eHealth. In addition to the Digital Health Strategy 2018-2022, the Danish Plan includes a reform named Digital solutions in the healthcare sector which aims at a strategic digitalisation effort that would ensure that new technologies and digital solutions developed during the COVID-19 pandemic are used to create a more resilient and sustainable healthcare system.

Finally, Denmark performed very well on the **human capital** dimension, particularly on digital and software skills, while the proportion of ICT specialists and female ICT specialists in the country remained a constant since 2018. In the last five years, Denmark has taken measures to raise awareness and to develop the digital skills of Danish citizens, students and businesses while increasing the number of ICT graduates, notably women. The Danish Recovery and Resilience Plan also includes a reform centred around the digital professions and jobs of the future aimed at strengthening the digitalisation and digital readiness of Danish companies, support their access to employees with adequate digital and technological skills, as well as their use of advanced technologies.

4.7.2 Reforms and investments

Denmark's Recovery and Resilience Plan, whose official name is Denmark's Recovery and Resilience Plan: Accelerating the green transition, is subdivided into seven main components. As demonstrated in the section above, Denmark is already well advanced with regards to digitalisation, so digital investments represent a limited part of the Plan, which counts mostly digital-related reforms. Measures to further advance the Danish digital transition are focused on the development of a new national digital strategy, the rollout of broadband in less populated areas, the further deployment of eHealth and the increased use of telemedicine, as well as digital business development.

The Danish Plan's contribution to the digital transition amounts to 25% of its total allocation of EUR 1.5 billion in grants. It will support the implementation of the below crucial investments by 2026. These have been

grouped into five categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

The only investment on the connectivity dimension[96] included in Denmark's Plan will improve the country's overall connectivity by ensuring high-speed internet coverage for 100% of its population, living in both urban and rural areas. Indeed, Denmark will invest EUR 13.44 million into the construction of high-speed networks, as further detailed here below:

Broadband pool: This investment will promote very-high speed (min. 100 Mbps coverage) internet access for citizens, households and companies in rural areas across the country. The Broadband pool is a demand-oriented (applicant-based) funding scheme that will provide grants for broadband projects in rural areas with poor coverage where there is no prospect that the market itself will provide fast broadband.

eGovernment, digital public services and local digital ecosystems

As Denmark is in the process of designing a broad new digital strategy, the development of eGovernment, digital public services and local digital ecosystems[97] plays a significant role in the digital part of Denmark's Plan. Three reforms will support this new digital strategy and will essentially focus on the modernisation of digital public infrastructures in general as well as on eHealth.

Policy priority

Denmark's Plan includes three reforms related to this category, which will aim to support the new digital strategy for 2022-2025 which is currently designed:

- **Digital solutions in the healthcare sector**: A strategic digitalisation effort would ensure that new technologies and digital solutions developed during the COVID-19 pandemic are used to create a more resilient and sustainable healthcare system, which is more coherent and closer to the citizen.
- **Strategy for the digital public sector and services of the future**: The objective of this sub-reform will be on improving the digital infrastructure and solutions that citizens, businesses and authorities use across the public administration at the central, regional, and municipal government level. The modernisation of the national digital infrastructure in Denmark will also support the development and implementation of cross-border and interoperable digital services, e.g., eID gateway and Single Digital Gateway.
- **Framework for Denmark fit for a digital future:** This reform includes recommendations for a "good and responsible" digital society, as well as how to benefit from the technological development and digitalisation of society in accordance with Danish democratic core values of coherence, transparency, trust, equal opportunities.

[96] The connectivity aspect of the Plan is covered by the **Component 6** on digitalisation.
[97] Reforms of the Danish Plan related to eGovernment, digital public services and local digital ecosystems are gathered under **Component 1** (Strengthening the Resilience of the Healthcare System) and under **Component 6** on digitalisation.

Human Capital

As mentioned above, Denmark is designing a new national digital strategy, which will also include a human capital aspect[98]. This dimension of the strategy is supported by a reform which focuses on ensuring the accessibility and availability on the labour market of qualified employees with the necessary digital skills and knowledge for companies and especially for SMEs.

Policy priority

As part of its new digital strategy, Denmark's Plan is also putting forward a reform focused on the human capital dimension, named **Strategy for the digital professions and jobs of the future**: This reform will strengthen the digitalisation and digital readiness of Danish companies, in particular the one of SMEs, as well as to increase the number of employees with adequate digital and technological skills as well as use of advanced technologies. This will help ensure that the digital transition is used to support good and well-paid jobs, increase Danish companies' productivity and competitiveness, and ensure a readiness for change and robust business.

Investment in digital capacities and deployment of advanced technologies

Digital capabilities and the deployment of advanced technologies[99] are also key elements of the new Danish digital strategy. Two reforms, focused on innovation and data, support this aspect of the future strategy.

Policy priority

As part of Denmark's new digital strategy, the country's Recovery and Resilience Plan put forward two reforms in the area of digital capacities and advanced technologies with an overall budget of EUR 59 million:

- **Framework for innovation, public-private partnerships and use of new technology:** By encouraging investments in innovation, in the development and up-scale of new technologies and solutions, including artificial intelligence, this reform will contribute to the modernisation of the Danish economy and public administration, to foster its digital infrastructure and to encourage the deployment of digital public services.
- **Framework for a data-driven society:** This reform will create a data-driven society by promoting better access to data, secure and interoperable data infrastructures, and a digital-ready regulatory framework.

[98] The human capital-related aspects of Denmark's Plan are mostly addressed in **Component 6** on digitalisation.
[99] Two reforms related to digital capabilities and the deployment of advanced technologies are found under **Component 6** on digitalisation.

Digitalisation of businesses

Regarding the digitalisation of businesses[100], Denmark will invest EUR 8.74 million into the digital transition of SMEs, as further detailed here below:

SMEs' digital transition and export: The goal of this investment is for Danish companies to take advantage of the business opportunities in the digital domain and in eCommerce. SMEs in particular need help to overcome barriers to invest in and use new and advanced technologies as well as eCommerce solutions in their business models that could help strengthen eBusiness and exports.

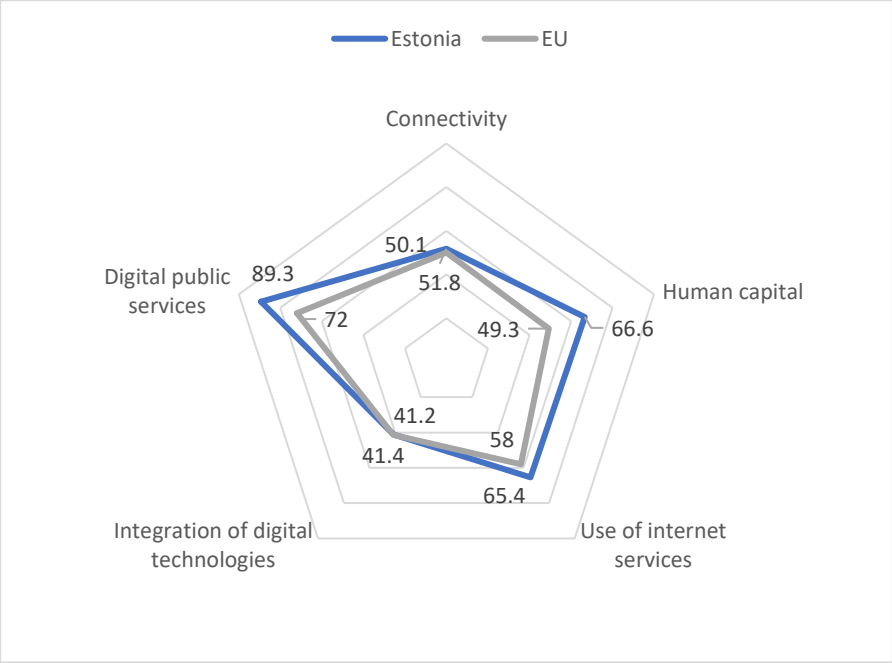
4.8 Estonia

4.8.1 Country digital outlook

While Estonia has already undertaken efforts to foster digital transition across the country in the past years, it is still important to keep up innovation and further advance digital transformation to ensure productivity, innovation and competitiveness for the future. In 2020, Estonia seemed very well advanced in terms of digital transformation as highlighted by the Digital Economy and Society Index (DESI). Figure 24 below shows the performance of Estonia on DESI in 2020 based on 2019 data, which provided the starting point for drafting the National Recovery and Resilience Plan, in relation to its digital objectives. Estonia scored well above average and ranks 7th in the overall ranking of all EU28 Member States, with a slight decrease in ranks as compared to the 5th place enjoyed by the country between 2015 and 2019. While the country scored particularly well in the digital public services, human capital, and use of internet services dimensions, connectivity and integration of digital technologies lined up with the EU average. In particular, when it comes to the latter, the country received one Country Specific Recommendation in 2020 to enhance its investments on the digitalisation of the private sector with the aim to advance the integration of technologies in businesses.

[100] The aspect related to the digitalisation of businesses within Denmark's Plan is addressed in **Component 6** on digitalisation.

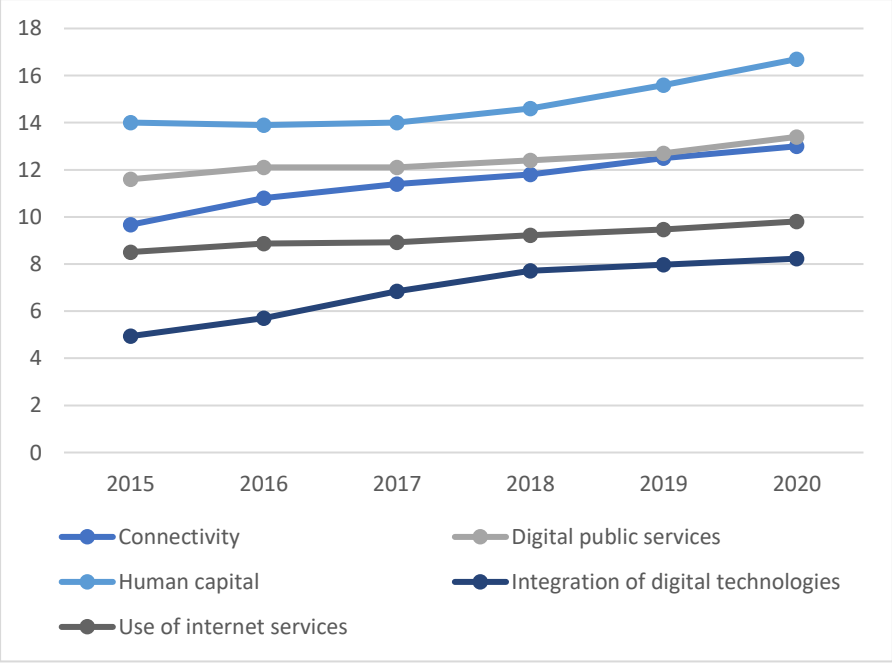
Figure 24. Performance on DESI 2020 – Estonia



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Estonia's commitment to advance digital transformation also appears from Figure 25 below, showing the evolution in the country's performance on the main DESI indicators since 2015. Already starting from a relatively high level in most dimensions, all have then steadily improved over the years.

Figure 25. DESI indicators over the years - Estonia



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Concerning **connectivity**, while Estonia is advancing in deploying broadband infrastructure, it fell short in the deployment of 5G infrastructure. Several strategies have been developed since 2018 to advance Estonian broadband coverage such as the National Broadband Plan, which is part of the 2020 Digital Agenda as well

as the Digital Strategy 2020+ (planned for 2021) to provide minimum speeds of 100 Mbps for all residents. When it comes to 5G technology, a 5G roadmap was published in March 2019 together with the setting up of working group to reach the objective of providing 5G connectivity in major Estonian cities by 2023. In line with these efforts, the National Recovery and Resilience Plan includes one investment to advance connectivity through the provision of ultra-high speed broadband coverage.

The **human capital** dimension is one of the strongest dimensions of Estonia, with the country ranking 3rd in 2020 out of all EU28 countries. While strategies for life-long learning have been developed in the past years such as the Estonian Life-long Learning Strategy, the National Recovery and Resilience Plan still includes a reform to foster the development of ICT skills and life-long learning with particular focus on enterprises.

Data suggests that while the **use of internet services** has been increasing since 2017 across the country and remained high and above the EU28 average, ranking 7th on DESI 20202 with 88% of the population using the internet in 2020. Estonia scored above the average in most of the subcomponents of this dimension such as reading the news, banking or taking courses online.[101] Only in relation to selling online, video calls and video on demand Estonia scored below EU average in 2020.

The **integration of digital technologies** in businesses and, more in general, the digitalisation of businesses is the weakest dimension of Estonia, for which it scores slightly below EU average in 2020. Nevertheless, the country's commitment to progress in this dimension is visible through its participation in several initiatives, such as the EuroHPC Joint Undertaking, the European Blockchain Partnership and the Declaration on Cooperation on AI. Additionally, a national AI strategy was published. In the same vein, the National Recovery and Resilience Plan shows a focus on digitalising Estonian businesses and investing in the deployment and development of new technologies in the country.

Finally, Estonia is the leading country in the **digital public services** dimension since several years and is further developing and modernising its offer on digital public services. An update of the national Digital Agenda 2020 started in 2018 and included a strong focus on cybersecurity, acknowledging that cybersecurity became an inseparable part of the internal and external security of the state. Similarly, the measures planned under the National Recovery and Resilience Plan indicate Estonia's effort to remain the leading country in digital public services and eGovernment by simplifying and modernising existing frameworks to increase the offer of digital public services and make them more user friendly, as well as developing new ones.

4.8.2 Reforms and investments

The Estonian National Recovery and Resilience Plan, originally called *Taaste-ja Vastupidavuskava* was submitted for assessment to the European Commission in June 2021 and consists of six pillars to address the different challenges faced by the Estonian economy, which have been intensified by the COVID-19 pandemic. These pillars include several reforms linked to specific investments which are focused on, among others, the development of the broadband coverage, the digital transformation of public administrations and

[101] Digital Economy and Society Index 2020

enterprises, especially small and medium-sized ones, in sectors where the potential of digital technologies has remained insufficiently exploited.

A total of EUR 212 million, equivalent to 21.5% of the total allocation of Estonia's EUR 969.3 billion Recovery and Resilience Plan, all in grants, will support the implementation of the following crucial investments by 2026. These have been grouped into six categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes).

Connectivity

Connectivity[102] is an important aspect to ensure the success of the digital transition across Estonia and it is covered by one investment under the Estonian Plan, as described below:

Building ultra-high-capacity broadband networks: This investment enables end-users to benefit from ultra-high-speed internet access and addresses the need to increase fixed broadband coverage in rural areas or areas with low coverage due to market failures. The main aim is to ensure that all residents of Estonia will be served by such services, fostering regional equity. In addition, good connectivity in the Estonian households will contribute to better accessibility to services for people with reduced mobility.

eGovernment, digital public services and local digital ecosystems

Although well-developed already, the Estonian plan foresees several investments to further enhance eGovernment and digital public services across the country[103].

Developing an eBuilding platform: This investment, which receives EUR 9 million under the RRF, targets the development of an eBuilding platform for government services, including support actions for the prototyping and development of digital solutions as well as their deployment.

#Bureaucrat platform: This investment will finance the development of a national virtual assistant platform, called #Bureaucrat, which will enable Estonian citizens to enjoy all public services using any of the most common communication devices and leveraging chat rooms or voice-activated artificial intelligence-based virtual assistant. The aim is also to provide this service across borders. This is expected to lead to a reduction in administrative burden and improved users 'satisfaction.

[102] The connectivity aspect of the Plan is covered by one investment under the **Digital Economy pillar** of the Estonian recovery plan.
[103] The eGovernment and digital public services dimension is particularly covered by the **Digital Economy pillar** of the Estonian plan which includes two investments and five reforms targeting the eGovernment and digital public services dimension

Policy priority

The above-mentioned investment will complement the overarching reform **Developing business event services and digital gateway.** This reform will allow businesses to save time in dealing with the public sector by creating a digital gateway to access services. This is expected to create a level playing field for businesses by providing equal opportunities to them and improve the quality of the services provided, with a special focus on services related to business events.

Real-time strategic analysis system: The objective of the investment is to procure the development of an appropriate IT system that will detect and identify in a timely manner potential money laundering schemes and channels across different public institutions.

Policy priority

The above-mentioned investment accompanies the overarching reform **Taking strategic analysis of money laundering and terrorist financing to a new level in Estonia.** The purpose of this reform is to create a Strategic Analysis Function (SAF) centre at the Estonian Money Laundering Bureau (RAB) and build sufficient capacity to systematically assess money laundering and terrorism financing risks, including a better use of data already collected by the state.

Policy priority

Additionally, Estonia's Plan includes three additional reforms complementing the country's efforts to further digitalise its public administrations and public services. They have been detailed below:

- **Developing predictive services for citizens:** This reform will make Estonia the first country in the world able to provide citizens with so called predictive services, meaning right services at the right time, without visiting any office. This will apply to a wide range of services linked to possible events in the life of a citizen (e.g. child birth, marriage). To do that the use of the once only principle will be fostered with an eye to reducing administrative burden and increasing satisfaction from the public.
- **Restructuring the basic services of the Digital State and a secure transition to the cloud:** The reform's goal is to increase the quality of basic IT services and infrastructure, along with their security, thus contributing to the further modernisation of public services. Additionally, the reform aims to advance the used of cloud-enabled technologies, while ensure adequate levels of cybersecurity.
- **Renewing the eHealth Governance Framework:** This reform is planned to modernise the eHealth governance framework by ensuring the availability of the necessary financial and human resources as well as by deploying digital solutions.

Human Capital

Already very well-developed and far ahead of the EU28 average in this area, Estonia has not specified any dedicated investment in human capital under its National Recovery and Resilience Plan, although it put forward a reform intended to foster digital skills in Estonian enterprises[104].

Policy priority

Estonia's Plan put forward a reform focused on the **Skills for the digital transition of enterprises**. The purpose of the reform is to ensure that businesses have sufficient and high-quality skills for the digital switchover, which is the basis for business competitiveness, sustainability, and growth. The focus is on digital business management capabilities to provide the development impetus for the digital turnaround of enterprises and to address the shortage of modern IT-skilled workers. Interventions will be designed based on future business needs and global trend in the ICT, engineering, logistics, manufacturing, and construction sectors, as well as export opportunities.

Investment in digital capacities and deployment of advanced technologies

The Estonian Plan includes a reform supporting digital capacities and advanced technologies[105] in the country, and more specifically data, as described below:

Policy priority

The reform on **Creating and developing a centre of excellence for data management and key data** plans to (I) improve the quality of the data held and collected by the country, (II) make data more available for decision making and (III) increase the availability and quality of open data, as well as its re-use.

Digital-related investment in R&D

The facilitation of digital-related investments in R&D is particularly important to ensure competitiveness and digital transformation in the future. Under the Estonian plan, one investment is targeting this dimension[106].

Green Technology Development Programmes: The investment, worth EUR 8.38 million, will support the development of the Estonian start-up ecosystem with an eye to increase their competitiveness and innovation capacity, also in relation to exported goods and services. Special attention will be given to R&D in the field of new data-driven, green technologies.

[104] This aspect of the Plan is covered by the **Digital Transition of Enterprises pillar**.
[105] The reform related to digital capacities and to the deployment of advanced technologies can be found in the **Digital economy pillar**.
[106] The measure is placed under the **Greening the Enterprise Transition pillar** of the Estonian plan, providing this pillar with a digital objective in addition to its green focus.

Digitalisation of businesses

The digitalisation of businesses[107] is supported by several measures within Estonia's Plan, including two investments and two reforms, which are focused on the digitalisation of businesses internal processes or products and services, as well as the development of eCommerce and the external competitiveness of Estonian compagnies.

Developing an eCommerce service: The objective of this investment, worth EUR 6 million, is the creation of an eCMR data exchange service and interface for transport and logistics operators in order to have more flexible and innovative transport and logistics services, while creating the conditions for a smart and competitive economy.

Digital transformation of enterprises: This investment of EUR 58 million is to support SMEs and micro-enterprises by fostering the introduction of new solutions for R&D and innovation within them. The main goal is to reinforce the digital transformation and increase the digital maturity of SMEs and micro-enterprises, and in turn boost their growth and competitiveness.

Policy priority

The above-mentioned investment is accompanied by an overarching reform, **Supporting the digital economy in enterprises.** This reform builds on the strategy Estonia 2035 and aims to increase productivity and sustainability through the use of new technologies, seen as a key driver of economic growth, and to further integrate digital technologies in the business sector.

Policy priority

Additionally, the Estonian Plan put forward a reform called **Supporting competitiveness of enterprises in external markets, which** aims at (i) developing national and regional strategies to increase the competitiveness of Estonian enterprises, especially on foreign markets, (ii) establishing innovation hubs to stimulate the economy, and (iii) accelerating the export of digital services.

4.9 Finland

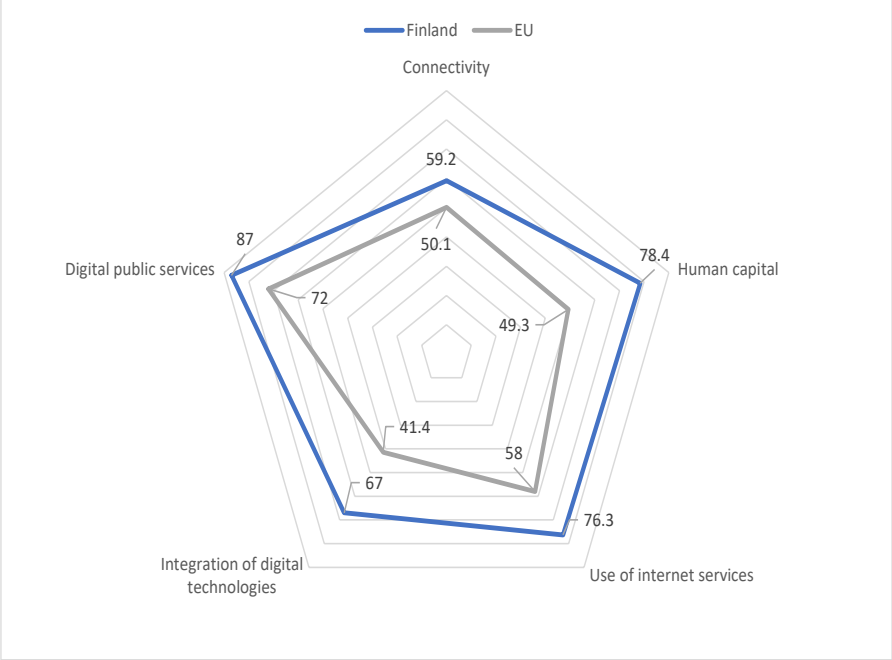
4.9.1 Country digital outlook

In 2020, Finland had the most advanced digital economy, ranking on the 1st place in the EU on the Digital Economy and Society Index (DESI) as seen in Figure 26 below, which shows the scores of Finland on the DESI dimensions in 2020 based on data from 2019. Finland scored above the EU average in all five DESI dimensions, especially in the use of internet services and in the integration of digital technologies by businesses. Despite a good performance on these dimensions, in the same year Finland also received one

[107] All measures aimed at enhancing this aspect within the Plan are grouped under the **Digital Transition of Enterprises pillar**.

Country Specific Recommendation in the context of the European Semester calling the country to focus its future investments in the field of emerging technologies and ICT infrastructure to better support the delivery of business systems and IT-enabled processes. Keeping this objective in mind, Finland has shown great commitment to further enhance its digital transformation, as also demonstrated in its Recovery and Resilience Plan, detailed in the following sections.

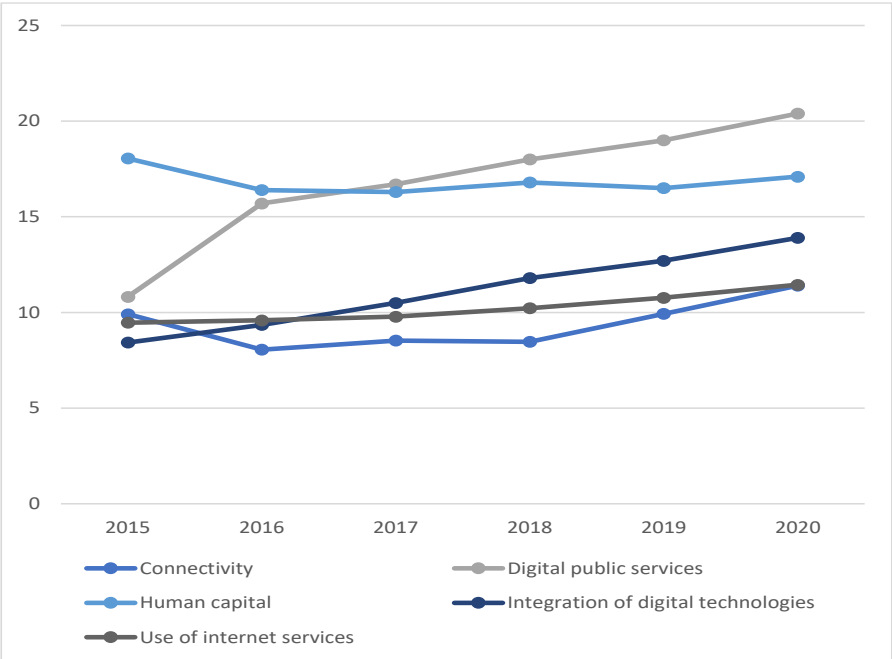
Figure 26. Performance on DESI 2020 - Finland



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Figure 27 below illustrates the evolution of Finland's performance in the five main DESI dimensions since 2015. As shown in this figure, Finland has made significant progress in the digital sector, especially in connectivity.

Figure 27. DESI dimensions over the years - Finland



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

According to DESI 2020, Finland scored the 9th place on the **connectivity** dimension among European countries. In 2019, the 4G coverage and the 5G readiness, were well above the EU average, while the fixed broadband take-up and the fast broadband (NGA) coverage were slightly below the European average. To improve its performance on those indicators, several plan and strategy, such as the Digital Infrastructure Strategy 2025, have been established by the Finnish government since 2016 to enhance the fibre-based network roll-out in the country, with a special focus on and assistance for underserved areas. In addition, the Finnish Plan includes a EUR 50 million investment to improve the national high-speed broadband network.

On the **human capital** dimension, Finland scored the first place in 2020. Since 2015, Finland has made good progress in increasing the proportion of people with above basic digital skills, as well as the number of ICT graduates and specialists, including women. Despite that, 66.2% of companies, which recruited or tried to recruit an ICT specialist in 2020, had difficulties doing so.[108] To meet this demand, Finland's Plan includes several reforms with the common objective to promote life-long learning and to keep modernising education to further develop the digital skills of its population.

Finland also reached the first place on the **use of internet services** on DESI 2020. Finland's population is very keen to use online services and this country scored above the EU average for every online activity (e.g. banking, games, music). In 2019, 93% of Finns were regular internet users and only 3% of the population had never used the internet (compared to 9% for the European average).[109]

On the **integration of digital technologies** by businesses, Finland ranked second among the EU28 countries, well above the European average. In Finland, the national digital agenda Digital Finland Framework established in 2018 guides the adoption of digital technologies in the country, including by businesses. The agenda highlights as priorities the development of digital, data and platform economies, the deployment of AI, the use of cloud computing services in companies and digital economic competitiveness. In addition, Finland is a member of the European High-Performance Computing Joint Undertaking (EuroHPC JU) and a signatory of the Declaration on European Blockchain Partnership and the Declaration on Cooperation on Artificial Intelligence. Several investments included in Finland's Plan will support the integration of digital technologies, such as 6G, quantum computing and the sharing of data.

Finally, Finland scored the 4th position on **digital public services** among the EU countries on DESI 2020, ranking above the EU average. Indeed, the number of eGovernment users is particularly high in Finland (94% versus 67% for the EU average). In 2019, the use and availability of pre-filled forms, online service completion and open data were also above the European average. Through the Productive and inventive Finland: a digital agenda for 2011-2020 state-led programme, the development of digital private and public services has been particularly enhanced over the last decade. In addition, a new national AI programme, named AuroraAI, was launched in 2020 to ameliorate the mismatch between public services and service users and to enable information exchanges and interoperability between different services and platforms.

[108] https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=66912
[109] https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=66912

Additional initiatives for the further deployment of digital public services, such as eHealth, are planned in the Finnish Plan.

4.9.2 Reforms and investments

The Finnish Plan, officially named *Suomen kestävän kasvun ohjelma: Elpymis- ja palautumissuunnitelma,* is subdivided into four pillars, each divided into several components covering one or many reforms and investments. It is important to mention that investments and reforms related to the digital transition are not aggregated into one single pillar or component, but rather spread across different sections[110].Through this plan, Finland aims, among other things, to further improve its connectivity and digital public services, to promote life-long learning and digital skills, as well as the digitalisation of businesses through the use of financial eDocuments and data sharing.

The Plan's contribution to the digital transition of Finland amounts to 27% of its total allocation of EUR 2.1 billion in grants and will support the implementation of the following crucial investments by 2026. These have been grouped into six categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

To keep improving its connectivity[111], Finland will invest EUR 60 million into the construction of high-speed networks and the renewal of its 5G network, as further detailed here below:

6G, AI and quantum computing development facilities[112]: This investment of EUR 10 million plans, among other things, to renew the national 5G testing network and its operating model with reference to the emerging Open RAN and 6G radio technologies and the needs of sector-specific applications.

Enhancement of quality and availability of communications networks: Trough an investment of EUR 50 million, the availability of high-speed connections will be improved in areas where they will not be provided on market terms, thus facilitating the development of a nationwide high-speed broadband network. The aim is to allocate funding to broadband connections of at least 100/100 Mbit/s. to support the national broadband programme, which will be the vehicle for channelling that funding.

eGovernment, digital public services and local digital ecosystems

[110] Mostly under **Pillar 2** (Digitalisation and the data economy will strengthen productivity and make services available to all) and **Pillar 3** (Raising the employment rate and upskilling will accelerate sustainable growth (employment and competence).
[111] The connectivity aspect of the Plan is covered by the **Pillar 2** (Digitalisation and the data economy will strengthen productivity and make services available to all) under **Component 1** (Digital infrastructure) and **Component 2** (Accelerating the data economy and digitalisation).
[112] This investment can also be found below, under the category 'Investment in digital capacities and deployment of advanced technologies'.

The further deployment of digital public services[113] seems to be an essential part of the digital investments and reforms identified in the Finnish Plan, with approximately EUR 210 million dedicated to this area. The digitalisation of the health sector is one of the focus points on this matter.

Digirail project: This project, supported by an investment of EUR 85 million, will be focused on the comprehensive digitalisation of Finland's rail traffic and the introduction of the new European Rail Traffic Management System (ERTMS) system and the related Future Railway Mobile Communication System (FRMCS).

Digital infrastructure to support migration of skilled labour: This investment, worth EUR 20 million, will support several actions, taken with the common goal to modernise the digital infrastructure of the public service in charge of administrative processes for the migration of skilled labour (e.g. new digital structures and functions, renewed data transfer interfaces, system development for filing and processing applications and more).

Introducing digital innovations for social welfare and healthcare services: Through this investment of EUR 100 million, Finland will introduce new digital solutions to improve health and social services that will:

- Increase resource efficiency in service production and improve the availability of services;
- Increase the use of preventive health and social services;
- Facilitate a broader offering of multi-professional services and the sharing of specialist expertise among regions and among service organisers, and finally;
- Contribute to an increase in service efficiency and effectiveness.

Digital healthcare information system on Åland: Finland will invest EUR 4.8 million to develop a new, modern information system for healthcare in Åland, which will be compatible with the needs of municipal social services and with private operators in the region.

Policy priority

The further deployment of public digital services in Finland is supported by three reforms:

- **Nordic model of public employment service:** This reform, which is subdivided in six modules, will promote the introduction of new digital tools to the already existing digital public services dedicated to employment, such as a shared appointment booking system.
- **Virtual Finland:** This reform will allow the creation of a new platform, named 'Virtual Finland', which will gather all national and cross-border services that citizens might need in a user-friendly one-stop shop. The platform is also intended to function as a marketplace where Finnish public sector and private sector bodies can offer their services.
- **Improving the Residential and Commercial Property Information System**: This reform is supporting the establishment of a national system that will contain technical and financial information of housing companies, to allow for digitalisation and the establishment of a positive credit registry in the field.

[113] Investments and reforms related to eGovernment, digital public services and local digital ecosystems are mainly addressed in the **Pillar 2** (Digitalisation and the data economy will strengthen productivity and make services available to all), the **Pillar 3** (Raising the employment rate and upskilling to accelerate sustainable growth) and the **Pillar 4** (Access to health and social services will be improved and their cost-effectiveness enhanced).

Human Capital

The human capital[114] dimension of the Plan will be crucial for Finland in the coming years as the country intends to improve its population's digital skills and to simplify the recruitment of international talents. Thus, an investment and several reforms have been put forward to ensure this:

Civilian competence in cyber security – European cyber security training and action plan: Finland will invest EUR 5 million to finance a research programme to gather data on how European countries have already provided cyber security training to their citizens and to create a European model and platform shared among the Member States for the teaching and improvement of cyber security skills.

Policy priority

Investments related to human capital are supported by four reforms, aiming to promote continuous learning regarding digital skills and the modernisation and digitalisation of education:

- **Streamlining work and education-based immigration and facilitating international recruitment:** The reform will improve the availability of skilled labour, especially on digital skills, and will ease international recruitment in Finland by streamlining the permit processes for work-based and study-based immigration.
- **Continuous learning – digital skills:** This reform intends to reinforce the competence services offered to the working-age population and their provision, to improve the forecasting of changes in working conditions and to provide training and guidance to under-represented groups and to sectors undergoing structural change.
- **Continuous learning - digitalisation programme:** This programme will consist of two mutually complementary projects: a digital public service package for continuous learning, spanning the entire education system, and a digitalisation and flexible learning package for the university level. The changes sought are systemic and will facilitate the revitalisation of digital public services, operating models and processes to support competence renewal.
- **Upskilling and continuous learning reform, digitalisation and modernisation of education in Åland:** This reform will consist of three modules: digitalisation and modernisation of education; improving and updating digital control and leadership systems; and new learning paths in digitalisation, automation and renewable energy in study modules.

Investment in digital capacities and deployment of advanced technologies

[114] The human capital-related aspects in the Plan are located in the **Pillar 3** (Raising the employment rate and upskilling to accelerate sustainable growth) under **Component 2** (Upskilling and continuous learning).

Investments in digital capacities and advanced technologies[115] will be needed to accompany the overall transformation and digitalisation of Finnish public administrations. Because of that, further investments in cybersecurity and in the establishment of centres specialised in the deployment of advanced technologies (e.g. AI, quantum computing) will be necessary to offer citizens and businesses effective, secure, and fully accessible digital public services.

6G, AI and quantum computing development facilities: In addition to improving the connectivity of the country, this investment of EUR 10 million will support the creation of competitive development facilities in Finland (e.g., for AI applying edge computing, future telecommunications technology and quantum computing applications), as well as contribute to the establishment of a European AI testing and experiment facility (AI TEF). In addition, this investment will be used to create a development facility for software needed for quantum computing.

Cyber security exercises: The cybersecurity component of the Finnish Plan, which is represented by this investment of EUR 5 million, will improve operational continuity management in all organisations providing digital solutions and services, and to improve risk management vis-à-vis cybersecurity. The exercises will focus on the organisation's internal processes and on processes of external actors that are connected to them.

Policy priority

The above-mentioned investment complements the reform **Investing in cyber security research and exercises**, which aims to contribute to the implementation of the cybersecurity development programme being prepared in the administrative branch of the Ministry of Transport and Communications.

Enabling data sharing; seamless management and distribution of corporate data, and financial reporting to the authorities: The creation of data sharing structures will enable automatic or almost automatic reporting of financial data from compagnies to the public authorities. Such a structure must be built in collaboration with private-sector operators so that the interfaces and data are standardised and interoperable.

Digital-related investment in R&D

Digital-related investments in R&D[116], worth EUR 33 million, are essential to Finland to support the national research network and boost innovation in the country. As listed below, the Finnish Plan includes different initiatives to support research and R&D in the public and private sectors.

Promoting innovation and research infrastructure – national infrastructures: The goal of this investment, worth EUR 8 million, is to upgrade the research infrastructure of the Academy of Finland, accordingly to the targets of the Strategy for National Research Infrastructures but with a focus on the digitalisation.

[115] Investments in digital capacities and related to the deployment of advanced technologies can be found under the **Pillar 2** (Digitalisation and the data economy will strengthen productivity and make services available to all), under **Component 2** (Accelerating the data economy and digitalisation) and **Component 3** (Digital security).
[116] Digital-related investments in R&D can be found mostly in the **Pillar 2** (Digitalisation and the data economy will strengthen productivity and make services available to all) under **Component 2** (Accelerating the data economy and digitalisation) and in the **Pillar 3** (Raising the employment rate and upskilling to accelerate sustainable growth) under **Component 3** (RDI, Research infrastructure and piloting).

Promoting innovation and research infrastructure – competitive funding for innovation infrastructures: This investment of EUR 25 million will be used to develop testing and experimentation environments, which are needed for designing and testing digital solutions in actual user environments such as research infrastructures of local authorities, universities or other public bodies, or innovation environments jointly created by enterprises and other operators.

Policy priority

The above-mentioned investments accompany the reform **Accelerator programme for spearhead technologies**, which will focus on increasing the effectiveness of R&D investments supporting the digital transformation and on further accelerating new corporate investments and EU collaboration.

Digitalisation of businesses

Regarding the digitalisation of businesses-related aspects[117] of its Plan, Finland intends to foster the digitalisation of business documents to facilitate their exchange, especially with the public sector. In addition, two investments will target the tourism and the use of microelectronic value chain, as further detailed here below:

Sustainable and digital growth in the tourism sector: The development actions under the investment of EUR 20 million will offer the tourism industry concrete, digital tools for boosting sustainability, for evaluating tourism trends and for enhancing sales of tourism services.

Business e-documents: Through this investment, the use of business eDocuments (eReceipt, eInvoice and eProcurement) will be facilitated for compagnies, contributing to the broad digitalisation of the private sector.

Real time economy (RTE) ecosystem design and delivery: This investment, worth EUR 14 million, will fund the development of an automating financial management system within the private sector and between the public administration and the private sector. The project's target is to have a minimum viable ecosystem (MVE) up and running by the end of 2022. The ecosystem will be online, and at least eInvoices and eReceipts will be transmitted through it.

Policy priority

The above-mentioned investments complement the reform **Corporate digital economy – RTE programme**, which will promote the digitalisation in enterprises by facilitating transfer of electronic financial documents and management in enterprises. The project will create a basic infrastructure needed for transitioning to a real time economy, with widespread adoption of eInvoices and eReceipts, and considering the needs of the SMEs in the digital transformation.

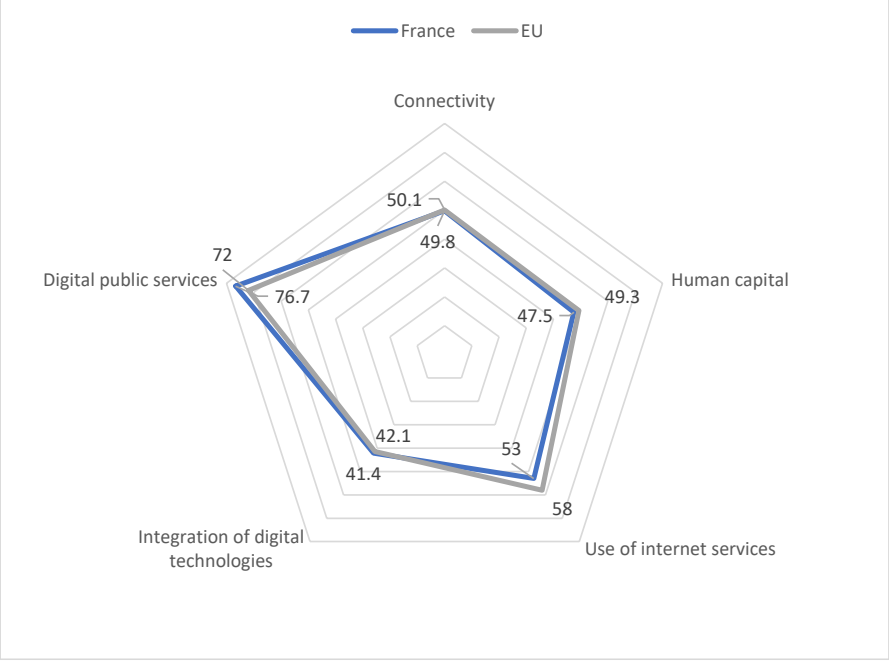
[117] The digitalisation of businesses-related aspects of Finland's Plan are addressed in the **Pillar 2 (**Digitalisation and the data economy will strengthen productivity and make services available to all) under **Component 2** (Accelerating the data economy and digitalisation).

4.10 France

4.10.1 Country digital outlook

In France, many investments have been made in the digital sector in the last three years to foster economic growth and productivity, while boosting innovation. Two national plans, the *Grand Plan d'Investissement 2018-2022* and the *Plan d'action pour la croissance et la transformation des entreprises (PACTE)*, adopted respectively in 2018 and 2019, have particularly highlighted digitalisation as a key concern for France for the following years. However, this country had still a moderately advanced digital economy according to the Digital Economy and Society Index (DESI) in 2020, placing itself at the 15th place in the overall ranking of all EU28 Member States, close to the European average. Figure 28 below shows the performance of France on the five dimensions of DESI 2020, based on data from 2019. As illustrated in this figure, the country scored slightly above the EU average on connectivity, on the integration of digital technologies and on digital public services but still lagged behind on the use of internet services and the human capital dimension. Considering these challenges in the digital sphere, in 2020 France also received one Country Specific Recommendation in the context of the European Semester calling the country to invest in the field of eHealth to strengthen the resilience of its health sector. Against this background, France has shown great commitment to enhance its digital transformation process, as also demonstrated by the strong focus on digital matters in its Recovery and Resilience Plan, detailed in the following sections.

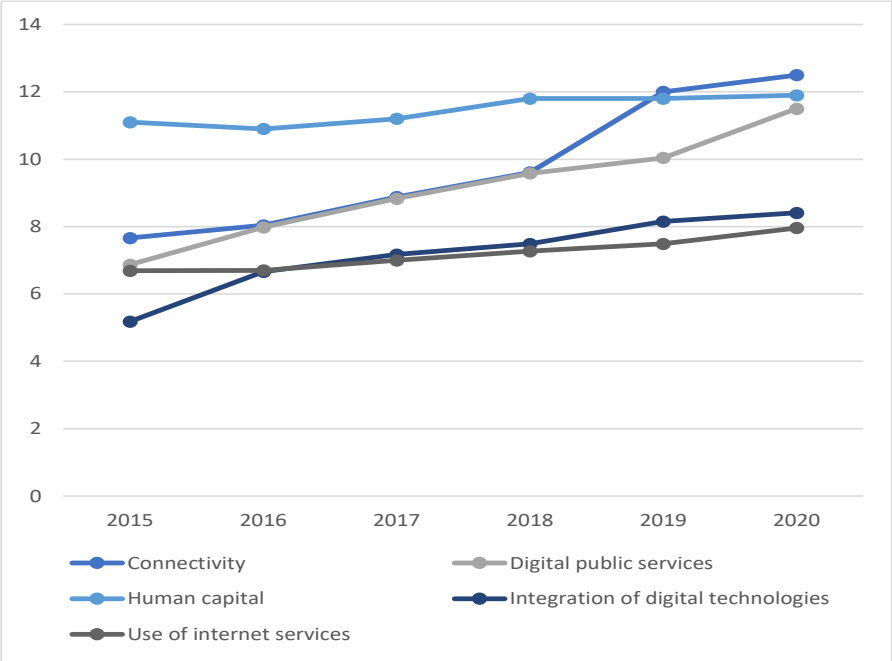
Figure 28. Performance on DESI 2020 - France



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Figure 29 below illustrates the evolution of France's performance in the five main DESI dimensions since 2015. The increase of its digital performance through the years is particularly visible in three dimensions: connectivity, digital public services and the integration of digital technologies.

Figure 29. DESI indicators over the years - France



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Concerning the **connectivity**, France ranked 18th in the European Commission's Digital Economy and Society Index (DESI) for 2020. To improve this performance, France continues to deploy its *France Très Haut debit* plan established in 2013, which aims to expand the coverage of fibre connectivity at home and at work in the whole country by 2025, with speeds of more than 100 Mbit/s and generally exceeding 1 Gbit/s. This plan is supported by an investment of EUR 240 million included into the French Recovery and Resilience Plan.

According to DESI 2020, France ranked 12th out of 28 EU countries in **digital public services**, performing above the EU average in this dimension. France has made continuous progress in the digitalisation of its public services and in the modernisation of its administrations. Despite these efforts, France remains below the European average in some areas, such as eID and eHealth. However, both these points are addressed in the French Recovery and Resilience Plan. In addition, France is in the process of deploying the electronic national identity card (CNIe) and is developing the future digital identity management system. Concerning eHealth, a new digital health space (*Espace Numérique de Santé – ENS*) will be made available to citizens in January 2022, allowing them to access their health data.

Despite great improvements in the **integration of digital technologies** by businesses in the last five years, French companies still had a relatively low rate of adoption of ICT according to DESI 2020. Indeed, the percentage of companies with a high level of digital intensity in France (13.4% in 2020) remained below the EU average (15.4%). To overcome this challenge, France launched in 2021 a renewed national cloud strategy called *Stratégie Nationale pour le Cloud* and is revising its cybersecurity strategy launched in 2015,

with the aim of increasing the adoption of AI tools by businesses. In addition, the French Recovery and Resilience Plan contains several investments to encourage and support companies in the development of digital and innovative projects, as well as in the adoption of advanced technologies, such as robots or production management software.

As elsewhere in Europe, the number of **internet users** and the use of video calls increased significantly in France during the COVID-19 pandemic.[118] Despite this trend, according to DESI 2020 France still had a lower share of internet users on social networks (47%) than the EU average (65%). Following the same tendency, only 8% of French Internet users followed an online course during the same period (versus 11% for the EU average). To reduce this gap, the development of better telecommunications infrastructures will play a key role in the future. In addition, the French Recovery and Resilience Plan aims to ensure the development of a wide range of distance learning courses for schools and job seekers. To this end, the digital equipment of schools should also be expanded.

Finally, France ranked 17th in the EU on the **human capital** dimension in 2020, below the EU average. This ranking was mainly due to the low score in the 'above basic digital skills' indicator (31% versus 33% for the EU average). To counter this trend, France has developed numerous initiatives in the past few years such as the *Cadre de Référence des Compétences Numériques français*, a national framework for digital competences created in 2019. In addition, the French Plan contains several investments aimed at developing French citizens' digital skills through new educational content and the use of digital learning tools and platforms. France will also invest in measures to promote digital inclusion and to maintain and improve the employability of its workforce, while addressing structural labour market problems such as skills shortages in key sectors as AI.

4.10.2 Reforms and investments

The French Plan, officially named *Plan National de Relance et de Résilience,* is subdivided into nine components, each covering one or many reforms and investments. It is important to mention that investments and reforms related to the digital transition are not aggregated into one single component, but rather spread across different components[119]. Through this Plan, France aims, among other things, to improve the digital skills of its population, as well as the digitalisation of businesses, which is particularly weak in this country, and the modernisation of public administrations, with a particular focus on the Ministry of Interior.

The Plan's contribution to the digital transition of France amounts to 21% of its total allocation of EUR 39.4 billion in grants and will support the implementation of the following crucial investments by 2026. These have been grouped into six categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

[118] More information here: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210126-2

[119] Mostly under **Component 7** (Digital upgrading of the State, territories and businesses, Culture), **Component 6** (Technological Sovereignty and resilience), **Component 8** (Safeguarding employment, Youth, Disability, Vocational training), as well as **Component 9** (Research, Health and Dependency, Territorial Cohesion).

Connectivity

To keep improving its connectivity[120], France will invest EUR 240 million into the construction of high-speed networks, as further detailed here below:

Continuation of the *France Très Haut Débit* plan: The massive rollout of new generation network infrastructures throughout the country, particularly in fibre optics, will make it possible to guarantee to all French people, including those living in rural areas, the best digital connectivity at home and at work, with speeds of more than 100 Mbit/s.

eGovernment, digital public services and local digital ecosystems

The further deployment of digital public services[121] seems to be an essential part of the investments, worth more than EUR 2.2 billion, and reforms identified in the French Plan, given the importance of the overall digitalisation of its public administration, including their internal processes. The digitalisation of the health sector is particularly crucial for this country, as it was lagging behind in this area.[122]

Digital upgrade of the state and territories: To offer all French citizens high-quality online services and to provide public servants with adequate tools, France aims to identify any digital innovation approach that can be used as a lever for digitally upgrading the country and in turn improving the relationship between citizens and businesses and the State, as well as the efficiency of public action, and the quality of the working environment of civil servants.

Digital identity: This investment, worth EUR 30.3 million, will make available to all French citizens an electronic means of identification enabling them to prove their identity online in a simple and secure manner, guaranteed by the State. The investment is comprised of two components: the deployment of the electronic national identity card (CNIe) and the development of a regalian digital identity solution, as part of the future digital identity management system (SGIN).

Equipment and infrastructure of the Ministry of the Interior: Through this investment of EUR 22.7 million, the Ministry of the Interior will carry various projects to modernise its technical and IT infrastructures and to strengthen the core system and applications of the Ministry and increase its resilience to cyberattacks, focusing on:

- The resilience of the State's internal network;
- The Information System of the State's territorial administration;
- The resilience of the video-protection plan of the police headquarters;
- Securing the networks of the services of the Senior Defence Official;
- The resilience of data centres and;
- The population alert and information system (SAIP).

[120] The connectivity aspect of the Plan is covered by the **Component 9** (Research, Health and Dependency, Territorial Cohesion).
[121] Investments and reforms related to eGovernment, digital public services and local digital ecosystems are mainly addressed in the **Component 7** (Digital upgrading of the State, territories and businesses, Culture).
[122] Information retrieved from: https://ec.europa.eu/info/publications/2020-european-semester-country-specific-recommendations-commission-recommendations_en

Applications of the Ministry of the Interior: France will invest EUR 76.7 million to develop major applications for the Ministry of the Interior, that are part of the reinforcement of the capacities of the police forces and the global digital transformation of the Ministry of the Interior, in particular its logistical system (LOG MI).

Mobility and telework of the Ministry of Interior: This investment, worth EUR 46.55 million, plans to encourage the development of mobility and teleworking within the Ministry of the Interior: the improvement of the digital environment, the development of teleworking, future radio network, high-speed radio network and the adjustment of the calibration of control terminals for internal security forces.

Administrative continuity: digital upgrading of the administration of the education system: France will invest EUR 35 million to accelerate the digital transformation of the Ministry of National Education, Youth and Sports. Through the evolution of its information systems, which will rely more heavily on data to make them more efficient, more accessible, and more secure, the dematerialisation of procedures and services to users will be enhanced.

Catching up on technical standards for digital health: France intends to invest EUR 2 billion in digital health projects, in particular the shared medical record, the digital health space and secure health messaging. The access by individuals to their own health data must be prepared for the arrival in January 2022 of the *Espace Numérique de Santé* (ENS), a key tool for citizens to take control of their health.

Policy priority

The above-mentioned investment complements the **Health and security at work reform**, which will provide France with a more effective system of occupational health actors focused on prevention, as well as to reorganise the governance and functioning of the institutions in charge of occupational health.

Human Capital

As mentioned in the above section, the human capital[123] dimension of the Plan will be crucial for France in the coming years as the country aims to promote digital inclusion and to improve its population's digital skills. Thus, various reforms and investments have been put forward to ensure this:

Developing access to higher education throughout the country through digital: France will invest EUR 35 million to ensure the development of a range of distance learning courses, eventually covering 100% of higher education training provision, while supporting the development of the infrastructure needed for their delivery. By setting up dematerialised teaching modules accessible online, the measure will contribute to the development of its users' digital skills.

Educational continuity - digital school transformation: Adequate classroom equipment is a prerequisite for developing new hybrid teaching methods. To master the basic digital tools and services, it is also necessary to support and train the entire educational community. This objective will be pursued by an investment of EUR 131 million.

[123] The human capital-related aspects in the Plan are located in the **Component 7** (Digital upgrading of the State, territories and businesses, Culture) and in the **Component 8** (Safeguarding employment, Youth, Disability, Vocational training).

Support for cultural industries and heritage renovations: This investment, worth EUR 702.5 million, will support local cultural heritages, to encourage the revival of performing arts, to consolidate major cultural economic sectors and to implement a strategy for the cultural and creative industries (CCI), as well as to modernise cultural higher education establishments, particularly in terms of energy and digital technology, and to support training.

Supplementing personal training accounts (CPF) to develop digital skills: This measure, supported by an investment of EUR 25 million, aspires to protect individuals against the risk of unemployment by preserving and developing their employability and digital skills, to address structural labour market problems such as skills shortages, and to anticipate long-term economic and social transformations, including the challenges of digital and climate change.

Digitalised educational content and digitalised content platforms: This investment of EUR 304 million will financially support a vast transformation project of available training in France, making it possible to better combine traditional, face-to-face training methods and digital methods (e.g. distance learning modules and Massive Open Online Courses (MOOCs)), while developing new digital tools likely to be used in the context of remote training (e.g. virtual reality).

Distance learning: The purpose of this measure supported by an investment of EUR 160 million is to strengthen the provision of distance learning for jobseekers by doubling the number of offered places and go from 15 000 in 2020 to 30 000 in 2021.

Digital inclusion: France will invest EUR 250 million to promote digital inclusion, which is considered as a necessity to maintain effective access to rights, care, education and information for a large proportion of limited-mobility citizens. It is also an essential asset for accelerating the country's economic recovery, which will be more and more largely based on the digital economy.

Policy priority

Investments related to human capital are supported by the **Transformation of public services** reform, which is focused on the development and modernisation of the social dialogue in the civil service, on the creation of new opportunities for careers, and the correction of inequalities, in particular between women and men or for people with disabilities. The development of digital technologies and the resulting changes in the public work organisation, such as the remote work, will be addressed by that reform.

Investment in digital capacities and deployment of advanced technologies

Investments in digital capacities and advanced technologies[124] will accompany the overall transformation and digitalisation of the public administration. Because of that, further investments in key digital markets and research, as well as in cybersecurity, will be necessary to offer citizens and businesses effective, secure, and fully accessible public services.

[124] Investments in digital capacities and related to the deployment of advanced technologies can be found under three components: under **Component 6** (Technological Sovereignty and resilience), under **Component 7** (Digital upgrading of the State, territories and businesses, media) and under **Component 9** (Research, Health and Dependency, Territorial Cohesion).

Innovating for the resilience of economic models: France will invest EUR 1.8 billion to support the development of key digital markets (e.g. cyber, cloud, quantum, EdTech, AI). The goal of this initiative is to strengthen France's position in strategic sectors in a long-term perspective.

Cybersecurity of State services: The cybersecurity component of the French Plan intends to strengthen significantly and sustainably the security of the State's digital base. All digital systems of central and regional administrations and public institutions are targeted by this investment of EUR 136 million. In addition, the coverage of detection systems will be further increased to deal with cyber-attacks.

Supporting the ecosystems of education, research, valorisation and innovation: France will invest EUR 750 million to support the transformation of the education system (from kindergarten to university) as well as that of research, development and technology transfer organisations. This will increase their ability to face future challenges (e.g. societal, environmental, health, technological), as well as to strengthen the country's international influence, to create demonstration campuses for major societal transitions, and to accompany innovations to the market.

Digital-related investment in R&D

Digital-related investments in R&D[125] are essential to France to support the national digital transformation and further boost innovation in order to support the economic competitiveness and growth. As listed below, the French Plan includes multiple initiatives, worth 1.8 billion, to support research and R&D in the public and private sectors.

Supporting innovative companies: The goal of this investment, worth EUR 750 million, is to encourage innovations, to cross-fertilise R&D approaches by encouraging interdisciplinarity and collaborative projects, and to orient R&D within companies towards a long-term vision of climate and energy.

Innovation in the spatial sector: A specific support of EUR 365 million granted to the space sector should help revitalise companies within this sector, which was deeply affected by the COVID-19 crisis, to invest in innovation and improve their competitiveness.

Preservation of employment in private R&D: This measure, supported by an investment of EUR 300 million, will contribute to maintain and revive R&D in companies through actions in favour of the preservation of jobs and the strengthening of R&D skills by mobilising research and innovation operators in a collaborative approach.

Strategy to boost R&D - *Agence nationale de la recherche*: France will invest EUR 428 million to accelerate the rise of competitive research in the country, including digital projects related to mathematics, cybersecurity, and digital humanities, as well as other themes that strongly involve digital techniques (e.g. sensor networks and remote sensing).

[125] Digital-related investments in R&D can be found mostly in the **Component 6** (Technological Sovereignty and resilience), as well as in the **Component 9** (Research, Health and Dependency, Territorial Cohesion).

Digitalisation of businesses

The digitalisation of businesses[126] and the adoption of advanced industry technologies (e.g. robots, additive manufacturing, sensors, production management software) still needs to be supported to strengthen the competitiveness of the French industry and its capacity to create long-term activity and jobs in the country. Therefore, France included in its Plan an investment to support compagnies in their adoption of digital technologies, as mentioned below:

Digital upgrading of VSEs, SMEs and SMIs: This investment, worth EUR 385 million, will contribute to the digitalisation of businesses of all sizes. It will allow, for instance, an industrial SME to invest in robotisation or additive manufacturing tools, design or simulation software, in order to modernise its production tools and/or its way of producing.

Policy priority

The digitalisation of businesses is supported by two reforms included in the French Plan:

- **Business contribution to economic, social and environmental change in the context of the recovery:** This reform will help companies preparing for the future by investing in innovation and modernisation, as well as in their ecological and digital transitions.
- **Governance of the Future Investment Programme (PIA 4)**: It is a broad reform, covering multiple investments in the French Plan and whose goal is to support economic recovery through innovation, both in the medium and long term.

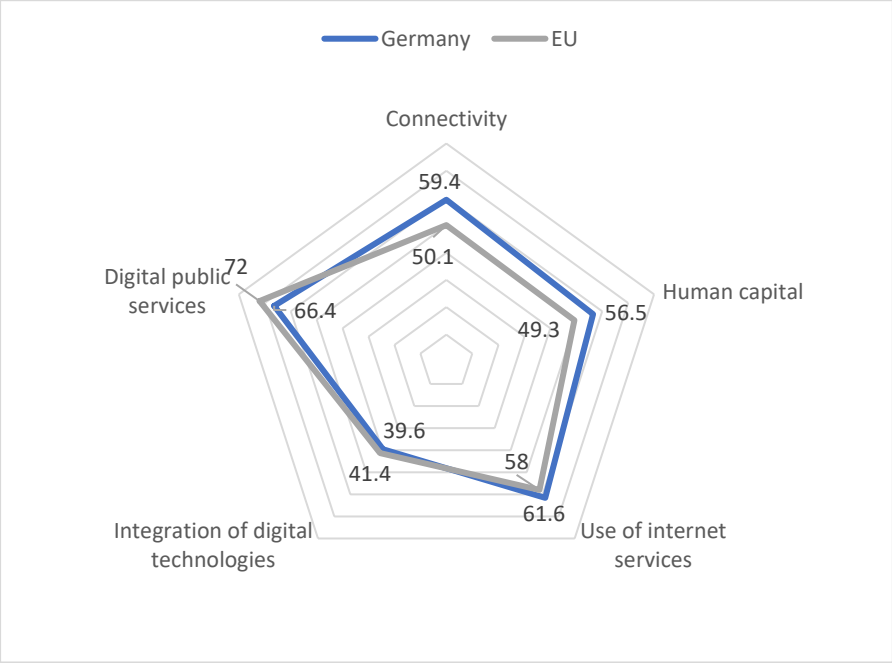
4.11 Germany

4.11.1 Country digital outlook

Germany ranked 12th among EU28 Member States and scored slightly above the EU average on the Digital Economy and Society Index (DESI) in 2020. As it can be seen from Figure 30 below, Germany scored above the EU average on three dimensions (connectivity, human capital and the use of internet services), while scoring below it for the integration of digital technologies by businesses and digital public services. In 2020, the country also received one Country Specific Recommendation which encouraged Germany to continue fostering digital skills through investments in education and training, to improve the provision of digital public services across all levels of government as well as to support particularly SMEs in their digitalisation processes through the provision of investments in businesses' digital infrastructure. Against this background, it must be said that the country has taken on significant measures to increase its digitalisation. This is also demonstrated by the strong focus on digital objectives within the National Recovery and Resilience Plan, as detailed in the following sections.

[126] Investments and reforms related to the digitalisation of businesses can be found in the **Component 5** (Financing of companies) and in the **Component 7** (Digital upgrading of the State, territories and businesses, Culture).

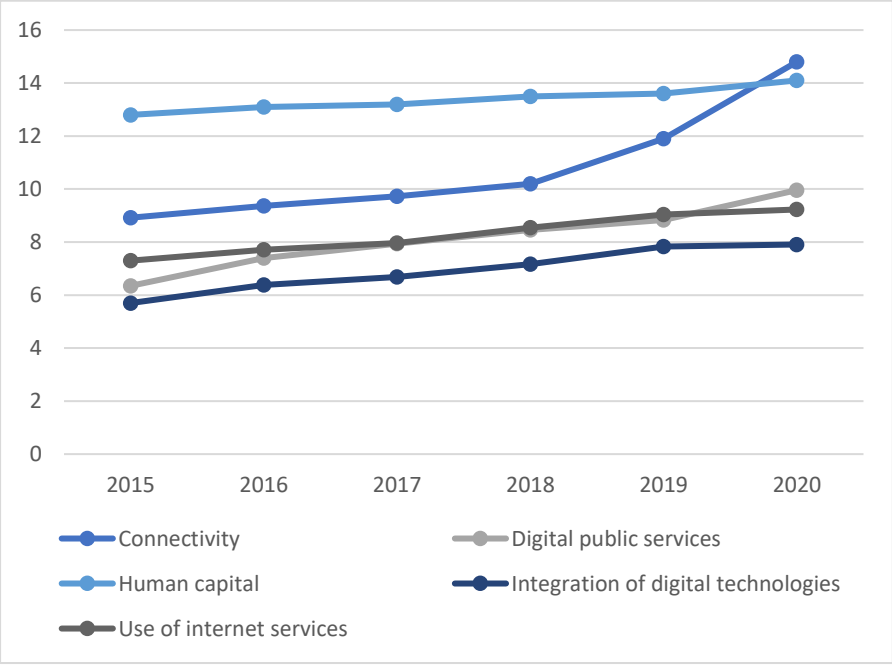
Figure 30. Performance on DESI 2020 - Germany



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Figure 31 below shows how the country significantly improved its connectivity and digital public services dimensions since 2018, demonstrating a strong commitment to digital transformation in Germany overall.

Figure 31. DESI indicators over the years - Germany



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

The **connectivity** dimension significantly improved over the last years (since 2017), climbing the ladder from 14th to 8th within a year (2019 to 2020) compared to the other EU28 Member States. Indeed, Germany scored well above the EU28 average in this dimension, particularly due to its high uptake in 5G readiness. Nevertheless, when it comes to fixed high-capacity broadband Germany still scored below the EU28 average.

While Germany set the aim of ensuring nationwide full gigabit network access by 2025, other dimensions seem to have a higher priority in the country's Recovery and Resilience Plan.

Similarly, concerning the **human capital** dimension, Germany has been scoring above the EU28 average for several years. This trend is expected to continue in the coming years as the development of digital skills and building digital competence across different age groups and sectors is a top priority of the German government as stipulated in the National Recovery and Resilience Plan. In this regard, the country has published various strategies and plans to encourage the uptake of digital skills both in education and businesses such as the MINT (STEM) Action Plan (February 2019) or the Digital future: Learning. Researchers. Knowledge (April 2019).

Concerning the **use of internet services** dimension, data suggests that the uptake and use of internet services in Germany is well in line and slightly above the EU28 average. Germany ranked 9th on DESI 2020 out of all EU countries. The country scores below the EU average in the use of social networks (only 56% against 65% on EU average), while it clearly scores above average on the use of online sales and online shopping, as well as online music, videos and games. Only 5% of the German population have never used the internet, which is clearly below EU average (9%).[127]

Although the score of Germany regarding the dimension on the **integration of digital technologies** increased since 2015, Germany still scored below the EU28 average in this dimension in 2020. Particularly, the country should focus on fostering the use of clouds, of electronic information sharing and the use of social media, as these sub-dimensions appear to still be below the EU28 average in Germany. Nonetheless, several measures have been put in place to improve these components such as the initiative named Go Digital initiative[128] or the Digital Hub initiative[129]. Additionally, Germany is part of the EuroHPC Joint Undertaking, a collaborative initiative of the European Union, Members States, and private sector entities targeting the development and deployment of an European World Class Supercomputing Ecosystem.

Lastly, the **digital public services dimension** appears to be Germany's weakest dimension on DESI and despite improvements over the last years, Germany ranked 20th out of the other EU28 countries in 2020. In this regard, the government invested in several initiatives to promote the provision of digital public services to citizens, firstly through the Online Access Act of 2017 which obliges all governments at federal and state level to provide such administrative digital services by the end of 2022 to enterprises and citizens. Further, several programmes supporting the digitalisation of public services have been implemented in the country since 2017. Germany's ambition to improve this dimension is also driving the initiatives under the National Recovery and Resilience Plan, under which the development of eGovernment and digital public services appears as a key focus area among the digital objectives.

[127] https://digital-strategy.ec.europa.eu/en/policies/desi-germany
[128] Go Digital is supporting SMEs to take on the digital transformation through provision of tailored support and implementation services.
[129] The Digital Hub Initiative is connecting SMEs and corporations with innovators, such as technological research institutes or start-ups.

4.11.2 Reforms and investments

The German National Recovery and Resilience Plan, submitted to the European Commission for assessment in April 2021, and whose official name is *Deutscher Aufbau und Resilienzplan (DARP),* consists of 10 components grouped into six thematic focus areas[130]. Each of these components includes multiple investments and reforms aimed at fostering, among others, the use of key advanced technologies, the digitalisation of the automotive industry, as well as to further digitalise the health sector and develop new eHealth services.

A total of EUR 13.31 billion, equivalent to 52% of Germany's EUR 25.6 billion Recovery and Resilience Plan, financed through grants only, will support the implementation of the following crucial digital investments by 2026. These have been grouped into five categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

eGovernment, digital public services and local digital ecosystems

The advancement of eGovernment, digital public services and local digital ecosystems is a focus area of the German Plan as it is covered by seven investments amounting to a total of approximately EUR 4.5 billion[131].

Promoting rail digitalisation and speed up the roll-out of the 'Digital Rail Germany': This investment has two main goals: i) the short-term strengthening of employment within the rail sector and the future sustainability of the rail sector ii) to speed up the Digital rail Germany initiative and ensuring its implementation by 2026. A total of EUR 500 million is allocated to this initiative.

The digital pension overview: This investment is planned to provide to citizens a single portal for individuals to access their insurance possibilities and to assess whether additional precautionary measures need to be taken to ensure a sufficient coverage during retirement. By doing so, the digital pension overview expands the availability of digital public services in Germany. A total amount of EUR 34.30 million is allocated to support this initiative.

Strengthening a resilient public healthcare system: This investment, worth EUR 814 million, will fund the development of an interoperable digital infrastructure to connect health authorities among each other as well as with other stakeholders of the public health system. Additionally, the exchange of data across national borders will be ensured, particularly to sustainably improve protection against the spread of diseases and the development of pandemics.

[130] The six thematic areas of the German Plan are 1) Climate action and energy transition, 2) Digitalisation of the economy and infrastructure, 3) Digitalisation of education, 4) Strengthening social inclusion, 5) strengthening a pandemic-resilient health system, 6) Modern public administration and reducing barriers to investment.
[131] This aspect of the Plan is covered by the **(sub)components 2.1.1** an innovative data policy for Germany, **component 2.2** digitalising the economy, **component 4.1** strengthening social cohesion and participation, **component 5.1** strengthening a pandemic resilient health system, and **component 6.1** a modern public administration.

Implementation of the online access law *Onlinezugangsgesetzes (OZG)*: This EUR 3 billion million investment will encourage a large-scale and user-friendly digitalisation of the German administration in order to provide a completely digital and user-oriented offer of digital public services at federal, regional and communal level through the development of digital infrastructure to facilitate access to online services for all citizen, such as two platforms (covering state and federal state level public services respectively), as well as a single digital gateway.[132]

Implementation of the modernisation of registries: This investment will create an entry point for all digital public services provided, where users' identity will only be checked once, so as to facilitate the exchange of personal data and avoid redundancies. A total of EUR 275 million are allocated to this initiative.

Human Capital

Investing in human capital seems to be one of the country's main priorities, with five investments amounting to almost EUR 1.5 billion[133]. These measures will support the development of digital skills within the German population and education will be further digitalised.

Development of upskill associations: This federal programme, supported by a EUR 38 million investment, will support SMEs in the planning, organisation and design of professional upskill programmes, which should increase digital skills of their employees. Particularly, the programme aims at fostering SMEs' cooperation and collaboration with other businesses, education and training institutions as well as with state institutions so as to develop a network for upskilling development among SMEs in Germany.

IT tools and equipment for teachers: Digitalising education in Germany will begin by providing teachers with the necessary equipment and tools to digitalise their lessons, and thus improving the learning environments by ensuring largescale digital learning and teaching. EUR 500 million are allocated to support this initiative.

Development of an education platform: This investment, worth EUR 630 million, will finance the development of a digital education platform which will allow users to connect to different regional, national and European education platforms and to start developing a federal network of common rules, interfaces, standards and functions enabling users to freely access and use various educational programmes and facilities.

Modernising education institutions of Bundeswehr[134]: This investment of EUR 100 million is meant to provide digital infrastructures and equipment to the education institutions of the Bundeswehr. In addition, this initiative will foster and ensure interoperability across the different education centres of the Bundeswehr so as to ensure the correct sharing of data and information.

[132]https://www.bmi.bund.de/DE/themen/moderne-verwaltung/verwaltungsmodernisierung/onlinezugangsgesetz/onlinezugangsgesetz-node.html

133 The human capital aspect of the Plan is addressed in **focus area 3** digitalising education with four initiatives under **component 3.1.** digitalising education. Additionally, this aspect is covered by **focus area 6** a modern public administration and reduction of barriers to investments under **component 6.1**. a modern public administration.

[134] The German Army.

Centres of competence/excellence for education: This initiative will provide digital tools and equipment for education in order to build and develop teachers' competences and skills. This would subsequently entail the successful implementation of eLearning in schools. This initiative receives EUR 205 million under the RRF.

Investment in digital capacities and deployment of advanced technologies

One investment in digital capacities and advanced technologies[135], focused on data, will accompany the overall transformation and digitalisation of the German public administration and private sector.

An innovative data policy for Germany: This EUR 516 million investment comprises 14 initiatives, grouped into sub measures, which together are meant to enable a tailored use of data and information across different sectors and industries by developing a digital infrastructure in Germany to increase the uptake of an innovative usage of data, fostering digital competencies in research and development, developing a data strategy and innovative data policy in Germany. This investment will, among others, promote the *Nationale Forschungsdateninfrastruktur* (NFDI)[136], provide incentives for the re-use of data across universities, research centres and public administration research institutions, develop a toolbox for data competence, and foster data competences in the federal administration.

Digital-related investment in R&D

Investments in digital-related R&D, worth EUR 1.45 billion, are important to further boost innovation and productivity in the country. Two investments are envisaged under the German Plan to develop this aspect[137].

Important projects of common European interest (IPCEI) next generation of cloud infrastructure: Closely related to the European data strategy, this initiative is already in place since October 2020 and will increase Europe's digital sovereignty and is supported by eleven Member States. At the national level, this initiative is meant to increase the cooperation and collaboration between science/research centres, and economy/business through various events promoting the digital sovereignty at national level as well. This initiative will receive EUR 750 million from the RRF.

Centre for research on digitalisation and technology (dtect.bw): This investment implies the development and promotion of a centre for university-based research and development in the Bundeswehr in the areas of digitalisation, future and advanced technologies. This initiative will be supported with EU 700 million.

[135] This investment in digital capacities and related to the deployment of advanced technologies can be found in **Focus area 2** (Digitalisation of the economy and infrastructure) under **Component 2.1** (Data as resource of the future).
[136] The National Research Data Infrastructure (NFDI) is an association assessing valuable data from science and research to develop and deploy a network and sustainable use of the data through ought the network of German science and research centres.
[137] This aspect of the Plan is covered by **focus area 2** the digitalisation of the economy and infrastructure under **component 2.1** data as a resource of the future.

Digitalisation of businesses

The digitalisation of businesses[138] and the adoption of advanced industry technologies still needs to be supported to strengthen the competitiveness of the German industry. Therefore, Germany included in its Plan an investment to support the digitalisation of industries supplying and manufacturing vehicles, as mentioned below:

Digitalisation in vehicles manufacturing and supplying industries: This EUR 1.9 billion investment targets primarily the digitalisation and modernisation of the vehicle manufacturing industry and its supply industries through increased research and development for new production sites, production systems as well as the digitalisation of supply and value chains. More specifically the digitalisation of these industries shall facilitate the improvement of the energy efficiency of production systems and sites, the sustainability of value and supply chains as well as their resilience.

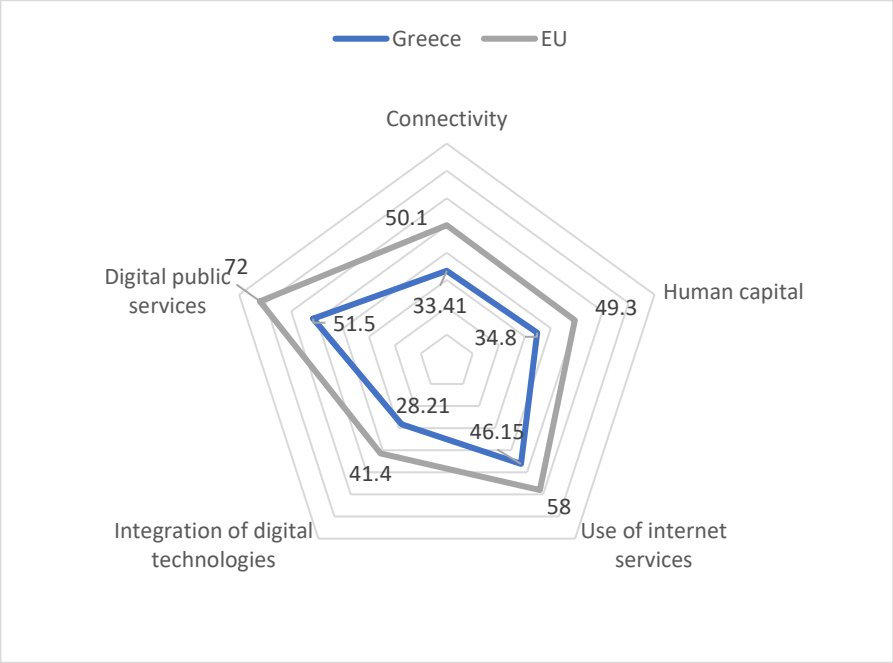
4.12 Greece

4.12.1 Country digital outlook

Digital transformation provides a huge opportunity for Greece to enhance innovation, growth, and productivity, while ensuring wider access to education across society. According to the Digital Economy and Society Index (DESI) of 2020, the country ranked 26th amongst the EU Member States. Indeed, in 2020 the country still lagged behind other EU Member States, as it emerges by Figure 32 below, showcasing that Greece scored below the EU average across all five DESI dimensions. In the same year, the country received one Country Specific Recommendation in the context of the European Semester calling the country to invest to enhance its ICT infrastructures in order to support businesses and citizens, while ensuring connectivity in rural and urban areas. Against this background, Greece has shown efforts over the past five years to improve its digitalisation, as also demonstrated by the initiatives put forward under the Greek National Recovery and Resilience Plan, which is detailed in the following sections.

[138] This investment related to the digitalisation of businesses can be found in **Focus area 2** (Digitalisation of the economy and infrastructure) under **Component 2.2** (Digitalising the economy).

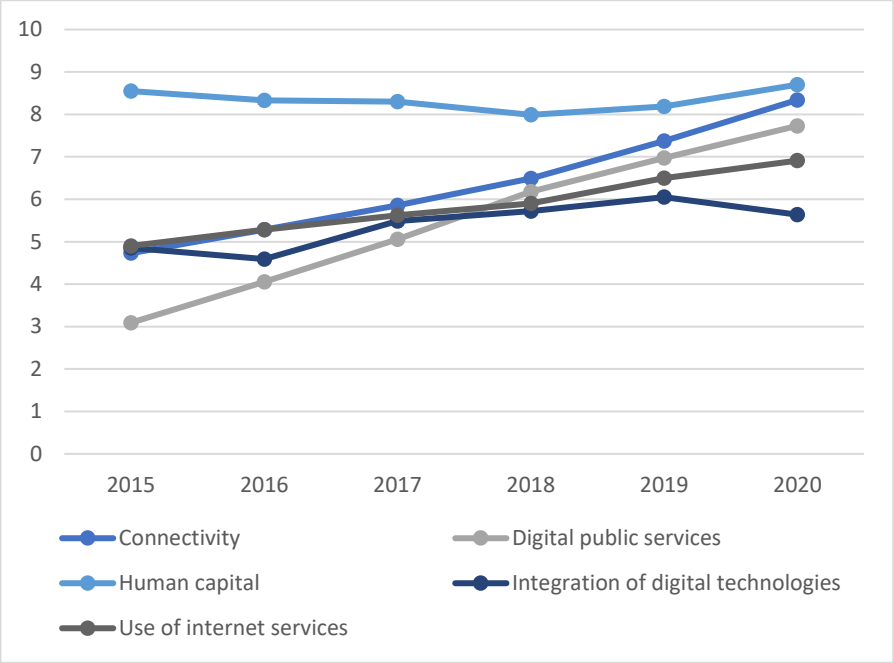
Figure 32. Performance on DESI 2020 – Greece



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Against this background, Greece has shown efforts over the past five years to improve its digitalisation, as also demonstrated by the initiatives put forward under the Greek National Recovery and Resilience Plan, which is detailed in the following sections. Such commitment can be seen in Figure 33 below, showing the evolution over five years of the main DESI dimensions. Greece significantly improved its performance on digital public services, connectivity, and the use of internet services. Progress on the human capital and the integration of digital technologies by businesses has been less stable since 2015, leading to moderate improvements on these dimensions.

Figure 33. DESI indicators over the years - Greece



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

In 2020, Greece ranked last in **connectivity** on DESI. While several public initiatives have been planned and implemented over the five past years, these were often jeopardised by an inefficient management of funds and delays. To tackle these issues, the Greek government plans to create the conditions for incentivising private investments, while putting forward in its National Recovery and Resilience Plan measures to improve the readiness of the country for 5G while providing high speed broadband infrastructure across the mainland and the Greek islands.

Concerning the **human capital** dimension, Greece's performance has started to slowly improve since 2018. This trend seems to be linked to the initiatives of the Greek National Coalition for Digital Skills, launched in June 2018. The initiatives' main objective is to upgrade digital skills and capabilities among citizens, within SMEs and of civil servants[139]. The importance of digital skills and life-long learning is further stated in the National Recovery and Resilience Plan, which includes several investments in this field.

While data suggests that the **use of internet services** was still below the EU28 average in 2020, it has been increasing in the last five years as data demonstrates that Greek citizens are becoming more eager to engage in various online activities and use internet services more easily[140].

When it comes to the **integration of digital technologies**, Greece still scored below the EU28 average in 2020, ranking 21st on DESI 2020. However, several initiatives have been put in place since 2018 to enhance the uptake of digital technologies by businesses and to promote innovation, such as the Greece's National

[139] https://digital-strategy.ec.europa.eu/en/policies/desi-greece
[140] https://digital-strategy.ec.europa.eu/en/policies/desi-greece

Digital Strategy for 2016-2021 and the Digital Transformation Strategy 2021-2025. Additionally, Greece takes part in the EuroHPC Joint Undertaking, participates in the European Blockchain Partnership and signed the Declaration on Cooperation on AI. Looking at its National Recovery and Resilience Plan, Greece plans two major investments in this field, while other investments foreseen in the Plan are likely to have positive spill-over effects on the uptake of new technologies within the country.

While improvement has been made in the **digital public services** dimension, Greece still ranked second-to-last among the EU28 countries on DESI 2020. To improve its performance in this dimension, Greece has launched several initiatives in the last five years, such as the creation of the central government portal Gov.gr, launched in March 2020 and providing over 500 digital public services. The advancement of eGovernment and the provision of digital public services is also a key point addressed in several investments of the Greek National Recovery and Resilience Plan, as detailed below.

4.12.2 Reforms and investments

The Greek Recovery and Resilience Plan, also called *Ελλάδα 2.0*, was submitted for assessment to the European Commission on 27 April 2021. It is subdivided into four pillars[141], each covering one or many reforms and investments[142]. Greece's Plan amounts to EUR 31.164 billion, including EUR 17.77 billion in grants and EUR 12.73 billion in loans. The Plan's contribution to the digital transition of Greece amounts to 23.3%, equalling to EUR 7.26 billion, which will particularly focus on the digitalisation of public administration and of private sector companies as well as in boosting connectivity and enhancing the use of digital skills for all. Greece's EUR 7.26 billion dedicated to digital objectives will support the implementation of the following crucial investments by 2026. These have been grouped into six categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Greece's Plan foresees several initiatives, worth EUR 316 million, to promote broadband connectivity and infrastructure as well as 5G readiness in the country[143].

Fifth generation (5G) wireless networks on the national motorway network: This investment of EUR 130 million supports the deployment of 5G wireless network infrastructure on six Greek motorways, covering 2 011 km. The project will lead to new investments in connected and autonomous mobility, which will in turn improve the competitiveness of the country's supply chain.

141 Namely, i) The green transition, ii) The digital transition, iii) Employment, skills and social cohesion, iv) Private investment and economic institutional transformation.
142 The digital part of the Plan is mostly covered by the second pillar on the digital transition, but digital-related investments and reforms can also be found in other pillars.
143 The connectivity aspect of the Plan can be found in **Pillar 2** (Digital transition) under **Component 2.1** (Connectivity for citizens, businesses, and the government).

Policy priority

The above-mentioned investment is accompanied by the reform on the **Migration to 5G technology and facilitating the deployment of innovative digital services**, which targets the implementation of a coherent plan to prepare and monitor the deployment of 5G networks on Greek motorways. It aims at creating innovative digital infrastructure, enhancing the competitiveness of key economic sectors (e.g. tourism, transport) and reviewing procedures for the development of new innovative initiatives that will harness the benefits of 5G networks.

Submarine cables in the Greek islands: This investment of EUR 89 million targets connecting the mainland with the Greek islands and Cyprus through modern submarine fibre optic cables. This investment will connect regional internet hubs as Athens, Sofia and Chania, as well as build an alternative and backup internet route for Greek islands to ensure their connectivity.

Fibre optic infrastructures in buildings: The goal of this investment, worth EUR 73 million, is the installation of fibre optic infrastructures in residential and private buildings to accelerate the adoption of next-generation infrastructures by citizens and to increase energy efficiency.

Policy priority

The above-mentioned investments are accompanied by the reform on the **Transition to fast broadband connections of 100/200 Mbps**. The reform includes the deployment of an extensive network of high-speed broadband infrastructure, with the installation of fibre optic cables in buildings as well as submarine cables on islands, with the capacity to provide internet connection speeds of at least 100 Mbps and the possibility of upgrading to 1 Gbps, aiming to provide broadband services to approximately 2 400 000 citizens[144]).

Digital transformation of the Hellenic Railways Organisation: This investment of EUR 24 million targets the upgrading of the telecommunications infrastructure of the Hellenic Railways Organisation (OSE) with the installation of special technological infrastructure and antennas for the transmission of signals throughout the railway network, allowing open access to telecommunications services, satisfying the operational needs of trains as well as passengers.

eGovernment, digital public services and local digital ecosystems

The advancement of eGovernment, digital public services and local digital ecosystems is one of the main focus areas of the Greek Plan[145]. Investments, worth approximately EUR 1.3 billion, and reforms of this category will modernise and digitalise internal processes of Greek public administrations, while developing existing and new digital public services for citizens and businesses.

[144] This target was set in the Digital Paper.
[145]This aspect of the Plan is covered by **Pillar 4 (**Private investment and economic institutional transformation) and **Pillar 2** (Digital transition), particularly under **Component 2.2**. (Digital transformation of the state).

Digitalisation of state archives: This investment is supported by EUR 565 million and targets the digitalisation of key archives in various sectors (e.g. justice and urban planning) and their integration into the relevant information systems. This is expected to significantly reduce administrative costs, as well as improve the delivery of digital public services to citizens and businesses.

Design of an integrated citizen and business relationship management system & development of a central licensing hub: This investment, worth EUR 80 million, will fund the design, development, and implementation of an information system to manage all types of interactions between the public administration, citizens and businesses. The system will serve as one-stop shop for different public services, such as the issuance of any permit (e.g. building permits, operating permits, environmental permits, etc.).

Digital transformation of the Citizen Service Centres (CEPTS): This investment, funded with EUR 19 million, supports the digital transformation of the Citizen Service Centres with the two-fold goal of providing public services remotely and deploying innovative tools supporting them.

New public procurement system: This investment, worth EUR 17 million, promotes the redesign and implementation of a new public procurement information system to further ensure interoperability and to better support electronic public procurement. The aim is to increase transparency and speed in the implementation of public works and procurement, while saving public resources.

Digital transformation of the Ministry of Foreign Affairs: The investment of EUR 49 million shall promote the modernisation and simplification of procedures regarding the provision of digital public services by local public authorities. To this end, a single digital portal, interconnected with the central gov.gr portal, will be created. The aim is to ensure secure and faster communication between the Ministry and citizens and other public authorities.

Digital transformation for more efficient provision of universal postal services: This investment targets the digital transformation of the Hellenic Post Services (ELTA) and is funded by EUR 48 million. The aim is to upgrade ELTA's information systems, automate its sorting centres and in turn provide better and more digital postal services to citizens.

Policy priority

The above-mentioned investments complement the reform on the implementation of the **Action plan for the provision of customer-centric digital services by the public administration.** This reform targets the development of an action plan for the provision of "customer-centric" services oriented towards the Greek citizens served by the public administration and develop policies and procedures that will facilitate the implementation of the digital transformation in the public environment.

Upgrading of infrastructure and services of the general secretariat for public administration information systems: This investment will increase the security of the critical infrastructure of the General Secretariat for Public Administration Information Systems (GSSIS), modernising its Interoperability Centre and upgrading the data management methods of the Public Sector Information Systems installed on the G-Cloud.

Interoperability of public sector computer systems and registers & development of web services: This investment, worth EUR 97 million, targets the creation of a centralised infrastructure and related services (Cloud, Enterprise Service Bus) for interoperability and interconnection of systems and registers between public sector bodies. Upgrading the national open data portal by linking it in parallel with the European portal will accelerate the flow of information in the public sector and enable the provision of online services to citizens, which require the automatic collection of information from different ministries and agencies.

Digital transformation of a digital register of tourism business: This EUR 8 million investment shall create a digital platform for the registration of tourism businesses to promote interoperability with public registers and systems.

Policy priority

The above-mentioned investments accompany the reform **Interconnection and interoperability of public sector databases and systems,** which promotes the design of an integrated basis and background for the interconnection and interoperability of systems and individual registers and individual applications between public sector entities. The reform follows the New European Interoperability Framework (EIF).

Smart cities: This EUR 73 million investment targets a comprehensive digital transformation of selected cities on a pilot basis, through the integrated development of digital infrastructure and services of their municipalities that improve the daily lives of citizens. It concerns the digital upgrading of critical sectors such as parking, waste management, traffic, health, water supply, etc. The project will improve the quality of life and enhance the tourism sector.

Ensuring business continuity of the public sector: This EUR 39 million investment sets out to provide a plan for ensuring business continuity in the public administration and the equipment necessary for its implementation. The aim is to enable public sector employees to fulfil their obligations remotely, if necessary, by creating all the necessary secure infrastructure (VPN networks, Cloud, etc.). The investment will increase the efficiency of public services and the quality of service to citizens, particularly in times of crisis.

Telecommunication services for the public sector: This EUR 26 million investment's goal is the extension of the National Public Sector Network (SYZEXIS II) to provide upgraded telecommunication services to all government bodies. The public entities gain access to upgraded telecommunications services and the public sector can plan more rationally the expenditure for its telecommunications needs (fixed, mobile telephony, as well as data/internet and videoconferencing services).

Extension of the central record management system: This investment of EUR 5 million targets the improvement of the central record management system (under implementation since 2019) to include the possibility for both citizens and businesses to get access to relevant services provided by it.

Modernisation of tax administrations: This investment, worth EUR 6 million, will finance an upgrade of the information systems of Greece's Independent Authority for Public Revenue (AADE), leveraging advanced data analysis methods, such as artificial intelligence. By facilitating digital control over financial transactions through the use of large volumes of data, the investment is expected to increase voluntary compliance and in turn public revenues.

Digital transformation of the Data Protection Authority: This investment, funded with EUR 174 million, supports the digital transformation and modernisation of the Greek Data Protection Authority. This includes the redesign and upgrading of the existing information systems (TAXIS, TAXISnet, ELENXIS) and the development of new information systems and infrastructure; the digitalisation of services provided to citizens and businesses, and the upgrading of the working, organisational and logistical framework for officials.

Digital transformation of the deposit & loan fund: This EUR 7 million investment aiming to further digitalise the Deposit & Loan Fund (DBF) includes the digitalisation of loan files and the development of i) a Document Management System (DMS), ii) an Integrated Information System (IIS), including subsystems to support critical business functions, and iii) an Enterprise Resource Planning (ERP) system that will communicate with the DMS and IIS.

Policy priority

The above investment complements the **Digital reform of the public accounting system.** This reform promotes the transition to digitalised public accounting standards and consolidated financial statements. It also includes the design, implementation and operation of a unified information system for the management and planning of public resources (GOV-ERP), including the introduction of electronic invoicing in the GOV-ERP information system and the introduction of a new accounting system for the management of public resources.

Electronic tolls: This investment, for which EUR 65 million are allocated, will fund the development of a reliable, cost-effective, and user-friendly interoperable electronic toll system for all motorways in Greece. The investment is expected to cut expenses for operators while offering a fair and transparent charging mechanism for users.

Policy priority

The Greek Plan also put forward additional reforms that complement the ones listed above and reinforce the need to further invest and work towards better digital public services:

- **Codification and simplification of tax legislation:** This reform promotes the codification and simplification of the tax framework (VAT code, customs code, laws on indirect taxation, customs duties, etc.). It will reduce the administrative burden and compliance costs for taxpayers by facilitating economic growth and investment.
- **State aid platform: T**his reform targets the simplification and support of state aid procedures through the creation of a platform, the provision of digital tools and the promotion of the interconnection of ministries' systems with national and European information systems.
- **Digital transformation of the justice sector: T**his reform supports the development of the National Integrated e-Justice System by upgrading existing systems, developing the Justice Cloud and Artificial Intelligence applications in Justice, homogenising procedures and providing the necessary support services.
- **National strategy for monitoring and addressing private debt establishment of a credit bureau and establishment of a central credit registry:** This reform will establish a private debt monitoring database and to establish and operate a Public Credit Bureau, which will provide information on the creditworthiness of debtors (companies and individuals) based on public data and information and a Central Credit Registry with the aim of enhancing the supply of credit to the Greek financial system.
- **Simplification of procedures of the Ministry of infrastructure and transport:** This reform targets the digital upgrading of the services of the Ministry of infrastructure and transport, simplifying at the same time the procedures for vehicle transfers, issuing and renewing driving licences, managing driving tests, etc. The goal is to reduce bureaucracy, increase transparency and improve the quality of services provided to citizens.

Human Capital

Various reforms and investments have been planned under Greece's Plan addressing the human capital dimension[146], which aim to further digitalise education and VET programmes in the country, as described here below:

Digital transformation of education: This investment, worth EUR 364 million, focuses on the digital transformation of education and includes the digitalisation of educational material and content, the development of digital infrastructures in all schools and universities for interactive digital learning and the upgrade of equipment in laboratories.

Vocational education and training upgrading – purchase of laboratory equipment.: This EUR 92 million investment targets the modernisation of Vocational Education and Training (VET) throughout Greece by upgrading the laboratory equipment for all the Laboratory Centres of Post-secondary Apprenticeship Departments and Vocational Training Schools. The aim is to develop a highly skilled workforce, including digital skills.

Policy priority

The above-mentioned investments complement the **Reform of vocational education and training.** This reform promotes the upgrading of vocational education and training by accelerating the implementation of the relevant law (4763/2020) passed at the end of 2020. It includes, inter alia: the digitalisation of the European Qualifications Framework (EQF), the development of a digital examination platform and a digital learning platform (eLearning and corresponding digital library), and the certification of 200 professional profiles in the fields of energy, environment, and digital economy.

[146] Investments and reforms related to human capital can be found in **Pillar 3** (Employment, skills, and social cohesion) under **Component 3.1** (Strengthening education and life-long learning), as well as in **Pillar 4** (Private investment and economic institutional transformation) under **Component 4.3** (Improving the efficiency of the justice system).

Policy priority

In its Plan, Greece also put forward additional reforms on human capital, which complement the investments and reforms listed above:

- **Reform and development of the Labour Employment Agency (OAED) learning system**: The reform of the OAED apprenticeship system will strengthen the apprenticeship schools and includes, among others: redesigning curricula to align them with the needs of the labour market, a new system of quality control and monitoring of students' progress in the labour market, as well as the simplification of learning processes and integration of new methodologies and tools, such as eLearning platforms and digital learning content.
- **Modernisation of the OAED 1 LAEK vocational training system:** This reform targets the modernisation of the vocational training system for unemployed persons of the OAED, with a focus on basic and digital skills. Among others, it includes the revision and modernisation of curricula, the improvement of the quality control of OAED vocational training units and the promotion of partnerships with other stakeholders/training providers, in particular universities.
- **Enhancing digital skills of the judiciary:** This reform will strengthen the efficiency of the judicial system through actions and modern training programmes (especially in digital skills) for both judges and judicial staff and reform the curriculum of the National School of Judges.

Investment in digital capacities and deployment of advanced technologies

Investments and reforms in digital capacities and supporting the deployment of advanced technologies[147] in the country are focused on cybersecurity and the integration of new technologies by the public sector, such as cloud computing infrastructures and big data management tools.

Big data management and analysis node: The management and analysis of multidimensional big data is a key new capability offered to countries by the 4th technological revolution. With this investment, worth EUR 16 million, Greece is laying the foundations to use data analytics tools in the planning of its government services.

Policy priority

The above-mentioned investments accompany the **Management and governance of public sector data and ensuring compliance with GDPR** reform. This reform will establish a centralised Data Governance framework to ensure and monitor different aspects (e.g. reliability, privacy and usability) of the data hosted in cloud computing infrastructures in compliance with Law 4727/2020. In addition, a National Documentation Centre (EKT) will be created as the competent body on this matter, as well as the needed infrastructure and capabilities for the provision and re-use of open public data by both the public and private sectors in compliance with GDPR. This reform is funded with EUR 26 million.

[147] This aspect is covered by **Pillar 2** ((Digital transition) under **Component 2.3.** (Digital transformation of enterprises) and by **Pillar 4** (Private investment and economic and institutional transformation) under **Component 4.6**. (Modernising and improving resilience).

T2ORAX: This EUR 50 million investment concerns the creation of a next-generation integrated information system (Trellis Holistic & Hybrid Operational Ruggedized Autonomous exemplary system) for the country, based on AI & machine learning technologies that synthesise different types and forms of collaborative infrastructures with a direct impact on the way institutions make real-time decisions in security, defence and civil protection matters.

Development of a microsatellites network: This investment, worth EUR 161 million, promotes the development of microsatellites, the exploitation of space technologies and their integration into the national economy. Projects supporting telecommunications, mapping, spatial planning services, shipping, agriculture as well as other sectors of the economy, and those providing critical support to investments in new technological solutions will be supported.

Cloud computing infrastructures: This EUR 95 million investment will support the effective digitalisation and interconnection of government services is achieved through the installation of new Cloud Computing infrastructure and services. The investment is essential for the overall digital transition strategy of government services.

Policy priority

The Greek Plan includes two reforms focused on the integration of advanced technologies by the public sector and the development of cybersecurity, as explained below:

- **Long-term integration of new technologies in public administration:** This reform will develop an innovative and solid basis for the integration of new technological developments (e.g. Cloud computing, Business Intelligence-related AI, Artificial Intelligence, Machine Learning) in public administration. Particular emphasis is placed on successful data collection, storage and presentation, as well as adequate maintenance of systems and infrastructure.
- **Improving cybersecurity in the public sector & establishment of a national cybersecurity centre:** This reform sets out to develop and implement a strategy for cybersecurity and protection of systems, data and information as well as to establish a National Cyber Security Operations Centre. It aims to improve cyber-security and corresponding reliability of public systems and information and building citizens' trust in them.

Digital-related investment in R&D

Investments in digital-related R&D[148] represent a smaller part of the Greek Plan. A single investment will support the future development and competitiveness of the Greek economy by sustaining its digital transformation.

Promoting quality, innovation, and internationalisation in universities: This EUR 471 million investment will enhance the quality and internationalisation of Greek universities and to strengthen the research activity in relation to the needs of enterprises and the labour market. Its expected results include the upgrading of the country's scientific potential and the improvement of the international ranking of Greek universities.

[148] Digital-related investments in R&D can be found in **Pillar 3** (Employment, skills, and social cohesion) under **Component 3.2.** (Strengthening education and life-long learning and modernising vocational education and training), as well as in **Pillar 4** (Private investment and economic and institutional transformation) under **Component 4.5** (Promoting research and innovation).

Digitalisation of businesses

Investments and reforms aiming to the digitalisation of businesses are included in Greece's Plan[149]. They will support the digitalisation of internal processes to create better working environment, as well as support the digital transition of specific economic sectors, such as the agri-food industry.

Digital transformation of work systems: This investment, worth EUR 62 million, will finance digital projects implementing the provisions of the Labour Law reform, such as the digital work card, the mechanism for determining the minimum wage, the digital system for health and safety at work, the digitalisation of the Single Euro Payments Area (SEPA). The project will restore a smooth working environment for workers and enterprises and to reduce informal work.

Digital transformation of the tourism and cultural sectors: Through a EUR 8 million investment, the Hellenic Tourism Organisation (EOT) will be modernised with the implementation of a digital tourist map and a digital repository of the country's cultural resources. The innovation will enhance the digitalisation of the cultural sector and provide information to tourists and citizens, based on a system using artificial intelligence technologies. The purpose of this investment is to increase the country's overall visitor numbers.

Digital transformation of the agri-food sector: This investment, funded by EUR 47 million, targets the creation of the technological infrastructure to support the digital transformation of the agricultural sector. This includes: the development of integrated information systems; the purchase and development of technological equipment for agricultural purposes; the support of import and export activities (e.g. the creation of a platform facilitating the issuance of certificates necessary for exports; a Business Intelligence system for imports and exports; a portal for the promotion of Greek agricultural products).

Policy priority

The digitalisation of businesses is supported by a reform on **Strengthening electronic transactions**, which includes measures to enhance electronic transactions, the simplification of communication procedures between businesses and the AADE, the reduction of the administrative burden for businesses through electronic books (myData), among others.

4.13 Hungary

The Hungarian Recovery and Resilience Plan has not yet been accepted by the European Commission. Therefore, the report does not contain the analysis of Hungary's Plan.

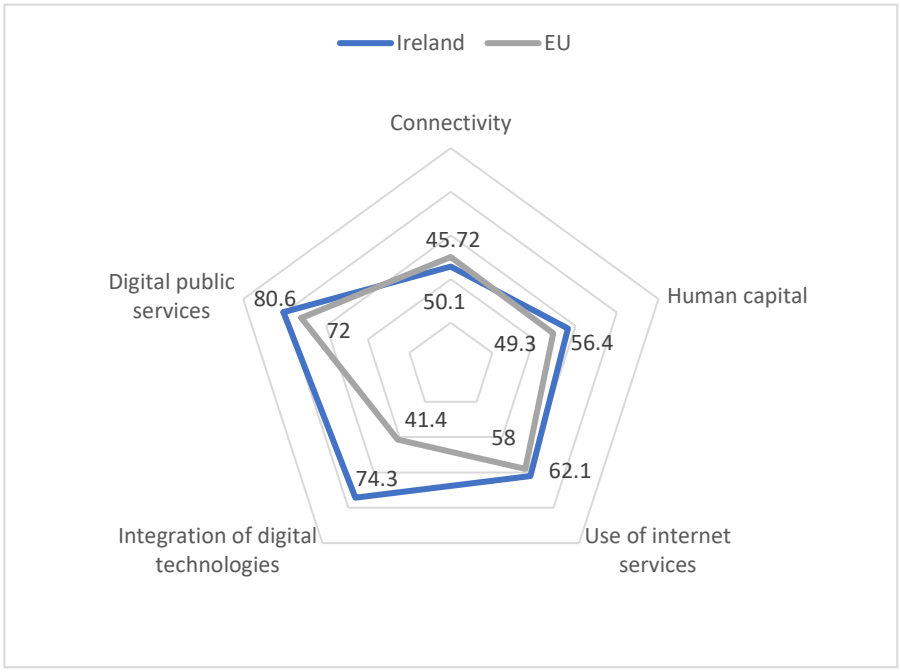
[149] This aspect is covered by **Pillar 2** ((Digital transition) under **Component 2.3.** (Digital transformation of enterprises) and by **Pillar 4** (Private investment and economic and institutional transformation) under **Component 4.6**. (Modernising and improving resilience).

4.14 Ireland

4.14.1 Country digital outlook

In 2020, the country scored 6th out of the EU28 Member States on the Digital Economy and Society Index (DESI), reasserting its strong position and commitment towards digitalisation. Indeed, Figure 34 below shows Ireland's performance on DESI in 2020 across the five main dimensions, compared to the EU28 average. As can be seen, in 2020, Ireland scored above the EU28 average in four of the five main DESI dimensions, except for connectivity. In the same year, the country received one Country Specific Recommendation to ensure better access to quality education and the development of digital skills for all students, so as to combat the risk of the digital divide within the Irish population. Against this background, it must be noted that Ireland has shown great commitment and efforts to improve its digitalisation since 2015 and is continuing to do so as demonstrated by the objectives put forward in its Recovery and Resilience Plan, which are detailed in the following sections.

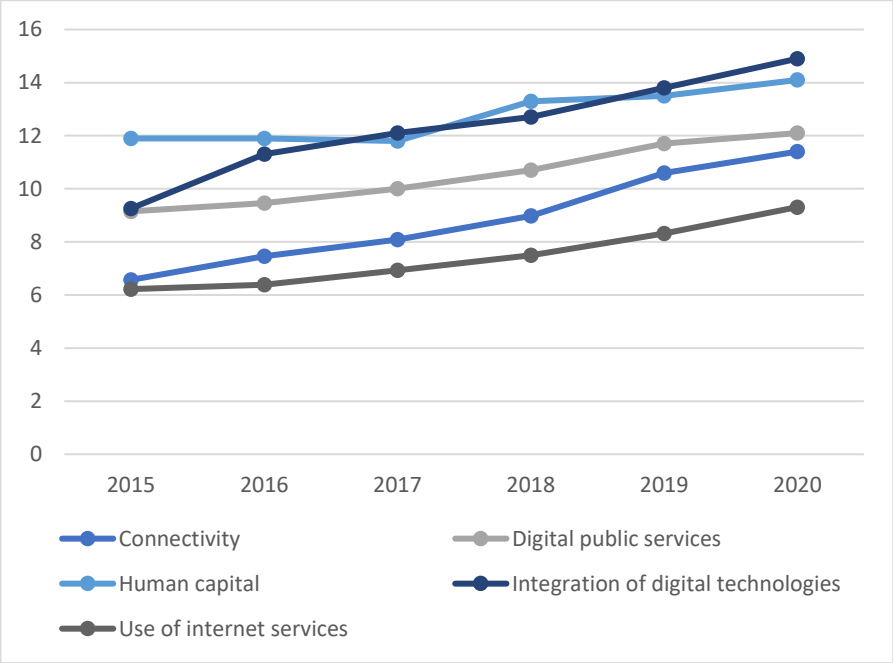
Figure 34. Performance on DESI 2020 - Ireland



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

The country's reinforced commitment to digitalisation can also be seen through Figure 35 below, which indicates an increase of all five main DESI dimensions over the past five years. Particularly, the integration of digital technologies dimension improved significantly since 2015 (+5.56 points) and Ireland is now the leading European nation with regard to this dimension.

Figure 35. DESI indicators over the year - Ireland



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Despite significant improvements (of about 5 points) since 2015, Ireland still scored below the EU28 average in the **connectivity** dimension in 2020. Nevertheless, the country already started to roll out its National Broadband Plan whose objective is to enhance connectivity across the country, particularly in rural areas, where ultrafast broadband coverage is still very low. Additionally, 5G networks are increasingly explored and market players incentivised to invest in the 5G readiness of the country. In this same vein, the country's National Recovery and Resilience Plan includes an investment to further advance Ireland's 5G readiness.

Concerning the **human capital** dimension, Ireland has made progress in this regard with the implementation of the Future Jobs Ireland framework in 2019. This framework provides the country's long-term ambitions for the future of its economy, taking into account the challenges it faces as well as the future needs of the workplace. In line with these efforts, the country's Recovery and Resilience Plan shows commitment to further progress in this dimension by investing in measures aimed at increasing the digital skills of the Irish population.

On the **use of internet services** data suggests that usage has increased since 2015, with Ireland having a higher growth rate per year in this dimension than the EU28 average. Indeed, the country improved its position on DESI by gaining four ranks over the course of a year: going from 12th in 2019 to 8th in 2020.

Ireland remains in its top position in the **integration of digital technologies** and continues to improve in this particular dimension at a faster rate than the EU28 average. Indeed, the Irish Recovery and Resilience Plan includes investments targeted at supporting businesses in their digitalisation processes, with a particular focus on SMEs.

In terms of **digital public services,** Ireland fell back slightly in 2020 compared to previous years, while still scoring well above the EU28 average. The implementation of the Data Sharing and Governance Act 2019 has been a milestone to advance in terms of open data and effective data sharing as it provides the country's legal basis for data sharing across and by pubic authorities and further facilitates the use of digital public services for Irish citizens. Further investments in eGovernment and the delivery of digital public services are

also included in the country's National Recovery and Resilience Plan, as will be specified in the sections below.

4.14.2 Reforms and investments

The Irish Recovery and Resilience Plan whose official name is Europe's Contribution to Ireland's Recovery, submitted to the European Commission on 28 May 2021 for assessment, consists of 16 investments and nine reforms split into three main components[150]. In total, EUR 990 million, in grants, are allocated to support the recovery of the Irish economy. Of these, EUR 291 million are dedicated to digital objectives, amounting to 32% of the total sum allocated to support Ireland[151]. This money will be dedicated to the digitalisation of businesses, particularly of small and medium-sized enterprises in Ireland, which will be encouraged to adopt advanced digital technologies. A big part of the Irish Plan is also dedicated to the further improvement of digital skills among the population, as the percentage of those with basic digital skills remains quite low compared to the EU28 average. Ireland's EUR 291 million dedicated to digital objectives will support the implementation of the following crucial investments by 2026. These have been grouped into five categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

On the connectivity front, the Irish Plan focuses on maximising the benefits from 5G connectivity for both citizens and businesses. In total, EUR 19 million are allocated to improve the connectivity dimension in Ireland, under its Recovery and Resilience Plan.

Using 5G technologies to drive a greener and more innovative Ireland: This investment of EUR 19 million targets the maximisation of the benefits of 5G technologies for public administrations by building, among others, a low latency platform with a high-speed backbone using edge compute nodes that will improve the responsiveness of public administrations.

eGovernment, digital public services and local digital ecosystems

The advancement of eGovernment, digital public services and local digital ecosystems is an important part of the Irish Plan, as a total of EUR 85 million are allocated to it. The three below investments are foreseen:

Provision of an Online Response Option for the census of the population: This investment targets the development of a platform to be used for an online census of the population in Ireland. The platform shall be developed by 2026 and in total EUR 10 million are foreseen to support this initiative.

[150] The Irish Plan's three components are: i) Advancing the green transition, ii) Accelerating and expanding digital reforms and transformation and iii) Social and economic recovery and job creation.
[151] All measures containing digital elements are found under component 2 of the Irish Plan.

Suite of eHealth projects: The objective of this investment is the deployment of new pharmacy systems within hospitals to provide a better overview and ability to plan medications' usage and costs. Ultimately, the system should be extended to ePrescribing, the development of national drug files as well as community eHealth solutions. In total, EUR 75 will be supporting the realisation of this initiative.

Human Capital

Human Capital investments will be essential for Ireland in the coming years to ensure equal access to education across the country. The Irish Plan foresees one investment as well as a separate reform package to increase human capital in relation to digital skills across the Irish population. In total EUR 64 million are spent on this dimension.

Programme to provide Digital Infrastructure and Funding to Schools: This investment focuses on ensuring equal access to high-quality education for all students, by providing the necessary digital tools and digital literacy in all Irish schools. In total EUR 64 million are allocated to achieve the objectives of this investment.

Policy priority

The Irish Plan includes a package of four reforms named **Addressing the Digital Divide and Enhancing Digital Skills**, accompanying the human capital dimension of the Plan. These four reforms will support the digital transformation in Ireland by fostering digital skills across the population at school. Measures within this package are separate but complementary among themselves:

- Reform measure 1: Digital Strategy for Schools;
- Reform measure 2: Ireland's Third ICT Skills Action Plan;
- Reform measure 3: 10 Year Adult Literacy, Numeracy and Digital Literacy Strategy;
- Reform measure 4: Laptops for Disadvantaged Students in Further and Higher Education.

Investment in digital capacities and deployment of advanced technologies

A single investment in digital capacities and advanced technologies will accompany the overall transformation and digitalisation of the Irish public administration, through the elaboration of a national Government data centre, as explained below:

Development of a Shared Government Data Centre: This investment will finance the construction of a new Government Data Centre, with the objective of delivering high-quality Data Centre facilities which are fit for purpose and are capable of meeting the current Government's requirements and those of the future. The Centre will replace the four most essential data centres of the country and will therefore allow for greater integration, standardisation and reduction of administrative processes and procedures. In total, EUR 39 million are allocated to this investment.

Digitalisation of businesses

Essential to the further digitalisation of the Irish economy, the digitalisation of businesses is targeted by one investment under the Irish Plan. EUR 85 million will be allocated to enhance this dimension and support Irish businesses in their digital transition.

Programme to drive the digital transformation of enterprises in Ireland: The investment will foster the digitalisation of businesses across the Irish economy and its various sectors. The investment will support the objectives of the Irish SME and Entrepreneurship Growth Plan, the EU Commission's SME Strategy for a Sustainable and Digital Europe and Ireland's Remote Working Strategy. In total EUR 85 million are allocated to support this initiative.

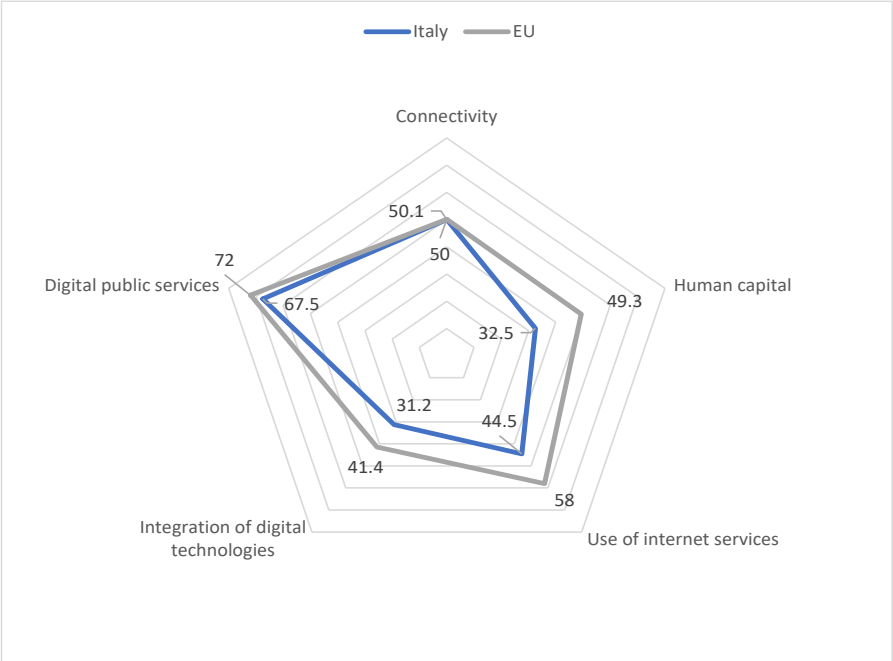
4.15 Italy

4.15.1 Country digital outlook

Digital transformation represents a huge opportunity for Italy to increase its productivity, innovation and employment, as well as to ensure wider access to education for all and diminish territorial disparities between its regions. Nonetheless, despite recent improvements, in 2020 Italy seemed to still be lagging behind other Member States in terms of digital transformation, as highlighted by the Digital Economy and Society Index (DESI)[152]. Indeed, in 2020, Italy, together with Romania, Greece and Bulgaria, had the least advanced digital economy, ranking overall on the 24th place in the EU. Figure 36 below shows that Italy scores below the EU average in three out of five DESI dimensions, namely Human Capital, Use of internet services and integration of digital technologies. Considering these challenges in the digital sphere, in the same year Italy also received two Country Specific Recommendations in the context of the European Semester calling the country to take action mainly in the field of digital education, to bridge the digital divide, and to further invest in infrastructures supporting the provision of digital public services. Against this background, it must be said that in recent years Italy has shown great commitment to overcome this digital gap, as also demonstrated by the strong focus on digital matters in its Recovery and Resilience Plan, detailed in the following sections.

[152] The latest data from DESI is available here: https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2020

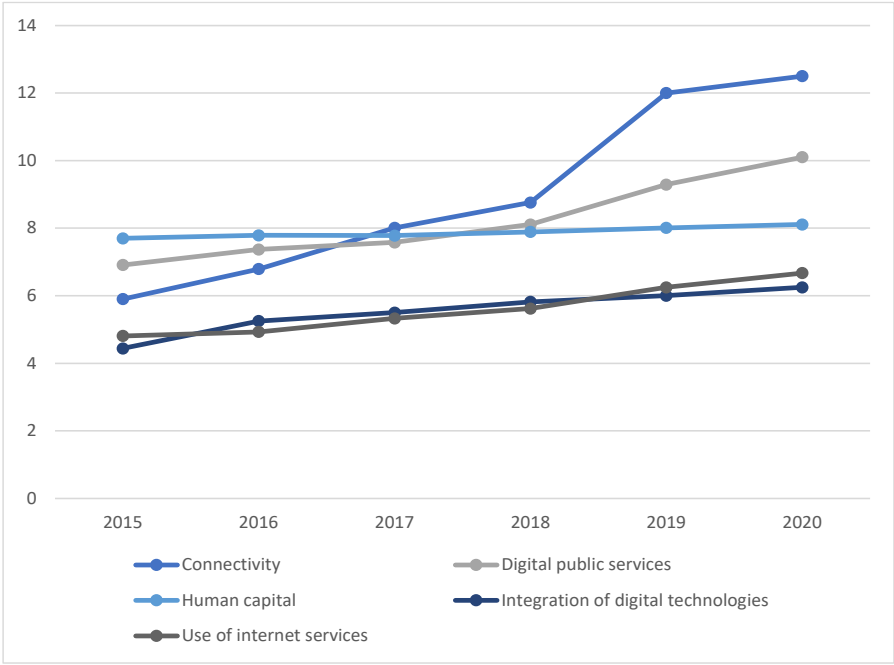
Figure 36. Performance on DESI 2020 – Italy



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Such commitment emerges from Figure 37 below, which shows the evolution of Italy's performance in the five main DESI dimensions since 2015. In particular, significant improvements have been registered in the Connectivity and the Digital Public Services dimensions, with a surge of respectively 7.5 points and 3.19 points over the last five years.

Figure 37. DESI indicators over the years - Italy



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

According to Italy's Plan, the country has, since the launch of its National Strategy for Ultra-Wideband in 2015, already mobilised more than EUR 12 billion to improve the country's overall connectivity. The national Plan aims to continue in this direction with an additional investment of EUR 6.71 billion with the aim of further

reducing the gap in connectivity that still afflicts its population. Indeed, according to 2020 DESI, the country ranks in 17th place in the **connectivity** dimension. For this, in its national Plan, the country has set itself a challenging target: 1 Gbps connectivity for all and full 5G coverage of populated areas by 2026.

Looking at the **human capital** dimension, Italy ranked last among EU countries in 2020, as it continues to face shortcomings in its population's digital skills. Indeed, it appears that only 42% of Italians aged 16-74 years have at least basic digital skills, compared to the EU average set at 57%[153]. To overcome this challenge, Italy launched in 2020 its first ever National Strategy for Digital Competences. The strategy aims at increasing digital awareness among the population, helping public administrations and companies acquire general and specific digital competences, and reorganising the educational system so as to address the need to develop digital competences. In addition, various reforms and investments in the educational and research sectors, detailed in Italy's national Plan, will further improve the country's human capital dimension for the future.

When it comes to the **use of internet services**, data shows an evolution over time of people using the internet in general, or the services it may offer more specifically, such as using the internet to play or download games, to make phone or video calls, or to order goods. The increase in 2020 compared to the previous year is most certainly due to the COVID-19 pandemic, which forced both citizens and businesses to go online. In addition, in 2020, Italy further accelerated the implementation of crucial eGovernment projects such as the Three-Year Plan for Information Technology in the Public Administration 2020-2022.

Integration of digital technologies has been another key priority for Italy for some years now. Indeed, the country is one of the eight hosting sites of a pre-exascale class computer funded by the EuroHPC Joint Undertaking[154] and has launched in 2020 a new National Strategy on Artificial Intelligence. The strategy puts forward several ambitious initiatives which aim to address issues around both competitiveness and sustainability within the European framework for AI. Further investments and reforms in this area will arise, as specified in the national Plan, with a particular focus on cutting-edge technologies.

Lastly, when it comes to **digital public services**, while there has obviously been a reinforcement of existing ones and uptake of new ones to curb the consequences of the COVID-19 pandemic, the level of online interaction between Italian public authorities and the citizens remains considerably low (36%) compared to the EU average (64%). Hence, the Italian Plan foresees more than EUR 2 billion for the improvement of online public services and for the finalisation of key digital platforms such as the National Digital Identity platform, SPID (*Sistema Pubblico di Identità Digitale*).

4.15.2 Reforms and investments

The Italian Plan, submitted to the European Commission on 30 April 2021, and whose official name is *Piano Nazionale di Ripresa e Resilienza*, comprises various types of reforms, although all are meant to improve the effectiveness and efficiency of the Italian public administration and foster productivity and competitiveness of

[153] European Commission, 2021, Commission staff working document: analysis of the Recovery and Resilience Plan of Italy.
[154] The hosting sites will be located in Sofia (Bulgaria), Ostrava (Czechia), Kajaani (Finland), Bologna (Italy), Bissen (Luxembourg), Minho (Portugal), Maribor (Slovenia), and Barcelona (Spain).

its businesses. There are two overarching and horizontal reforms: the reform of public administration and the reform of the judicial system. Complementary to these two overarching reforms there are also enabling reforms, aimed at removing the administrative, regulatory and procedural barriers that continue to affect the quality of public services provided to Italian citizens and businesses. Lastly, the Italian Plan also puts forward sectorial reforms, often accompanied by specific investments, which are divided into specific policy areas or economic activities. Italy received EUR 191.5 billion from the RRF, split into EUR 68.9 billion in grants and EUR 122.6 billion in loans. 25.1% of this funding, equalling to EUR 48.1 billion, will be dedicated to digital objectives aimed at improving the digital skills of the population, at increasing the digitalisation of businesses and at fostering the offer of digital public services provided, among others.

Thus, Italy's EUR 48.1 billion dedicated to digital will support the implementation of the following crucial investments by 2026. These have been grouped into six categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Connectivity[155] plays an important part in Italy's Recovery and Resilience Plan. Indeed, the country knows that, for its digital reforms to be fully effective, they must be accompanied by the development and deployment of a very high-capacity network infrastructure. Indeed, ubiquitous connectivity is a prerequisite for the full realisation of the Gigabit society and for enabling businesses to take advantage of various 4.0 technologies. Hence, Italy aims at filling this gap by dedicating EUR 6.71 billion of its Plan to the deployment of very high-capacity networks, in particular 5G and fibre networks, as detailed below.

Very high-capacity networks: The EU's Digital Compass strategy has set ambitious targets for 2030, including 1 Gbps connectivity for all and full 5G coverage in all populated areas of the Union. Italy's ambition is to reach these targets well ahead of schedule, as it aims to bring 1 Gbps connectivity throughout the country by 2026. In particular, investments are envisaged in market failure areas in order to bring 5G connectivity to all, even to those living in remote islands or areas of the country.

eGovernment, digital public services and local digital ecosystems

[155] The connectivity aspect of the Plan is covered by **Mission 1**, Digitalisation, innovation, competitiveness, culture and tourism, and particularly through its **Component 2**, Digitalisation, innovation and competitiveness of the production system.

The further deployment of digital public services[156] seems to be an essential aspect of the investments and reforms identified in the Plan, given the importance of the overall digitalisation of the Italian public administration. Indeed, the aim is to make the public administration the best ally of citizens and businesses, by offering efficient and easily accessible services. To achieve this, on the one hand, Italy needs to foster its digital infrastructure aspects by pushing the migration of administrations to the cloud, accelerating interoperability between public bodies, streamlining procedures according to the 'once only' principle and strengthening cybersecurity defences, among others.

Investments in the field of eGovernment, digital public services and local digital ecosystems make up around EUR 11 billion of the Italian Plan's budget, and are detailed here below:

Migration to cloud: Italy will dedicate EUR 1 billion on an investment oriented at migrating the data and IT applications of individual administrations to a cloud environment. Administrative bodies will be able to choose from a list of predefined providers, certified according to a selected criteria (security, protection requirements, performance standards). The support to the administrative bodies willing to participate in this programme will be provided in the form of comprehensive packages that will include technical expertise and financial resources.

Policy priority

To accompany the migration of the public administration to the cloud, Italy also introduced a **Reform on cloud first and interoperability guidelines**, aimed at facilitating digitalisation within administrative bodies by simplifying and innovating the regulatory framework. Further to that, these guidelines will help simplify the procedures for data exchange between administrations, which currently require dedicated documents/authorisations. The guidelines will facilitate full interoperability between the various administrative bodies of the country.

Data and interoperability: By investing EUR 0.65 billion in data and interoperability measures, Italy would like to change the architecture and methods of interconnection between its administrative bodies' databases so that access to services is transversally and universally based on the Once-Only principle, making information on citizens available 'once and for all' to the administrations (and vice versa) in an immediate, simple and effective manner, thus reducing the time and costs associated with requests for information that are currently fragmented among several bodies.

Digital public services and digital citizenship: This investment, worth EUR 2.01 billion, is aimed at improving the digital services offered to citizens. These include:

- Strengthening of the adoption of national digital service platforms (e.g. of PagoPA and "IO" app);
- Introduction of new services, such as the single platform of digital notifications, without eliminating the possibility of physical interaction for those who want or cannot otherwise;
- Development of "Mobility as a Service";
- Strengthening of the digital identity system, starting from the existing ones (SPID and CIE);
- Improvement of the user experience of digital services and their accessibility "for all".

[156] The digital public services and eGovernment aspect of the Italian Plan is mainly covered by **Mission 1**, Digitalisation, innovation, competitiveness, culture and tourism, and particularly through its **Component 1**, on Digitalisation, innovation and security in the public administration; but also, by **Mission 6**, Health, and particularly through its **Component 2**, Innovation, research and digitalisation of the national health system.

Digitalisation of central administrations: Italy is investing EUR 0.61 billion into redesigning and digitalising - through vertical interventions - a set of key use-cases in large central administrations, as these play a fundamental role in the provision of public services. These interventions involve various areas of the Public Administration (e.g. Justice, Defence).

Policy priority

The above-mentioned investment is a key pillar of the overarching EUR 0.16 billion **Reform of public administration** aimed at eliminating bureaucratic constraints and making administrative processes more efficient and effective. A team is to be set up consisting of a central team, with project management competences as well as technical competences on the main 'domains' involved supported by various implementation units that are to liaise with local public administration suppliers.

Single portal for recruitment: Italy is also investing EUR 0.02 billion in the launch of a new digital platform (already under construction), which will make the profiles and curricula of candidates available to administrations, speeding up the "pre-selection" activity preparatory to real selection. The platform will also facilitate the management and planning of human resources.

Policy priority

The above-mentioned investment is part of the sectorial **Reform on Access and recruitment**, which is aimed at introducing measures to reform the procedures and rules for recruiting public sector employees.

Task force for digitalisation, monitoring and performance: By putting in place a temporary task force (meant to last three years) of about 1 000 professionals and with a budget of EUR 0.73 billion, Italy aims to support public administrations by screening and producing a complete catalogue of prioritised administrative procedures, re-engineering and simplifying procedures, revising them in a digital perspective, extending tacit consent mechanisms where possible, adopting Certified Notification (SCIA) tools and a simplified communication approach, among others. The task force aims to simplify about 200 procedures by 2023 and 600 by the end of the Plan (i.e. 2026).

Policy priority

The above-mentioned investment complements the **Good administration and simplification Reform** aimed at eliminating bureaucratic constraints and bottlenecks, and make administrative procedures more effective and efficient, particularly by adopting measures aimed at reducing the time needed to manage such procedures.

Homecare as a first point of assistance for citizens: The strengthening of homecare services is a key objective of the Italian Plan. This investment of EUR 4.0 billion will increase the volume of homecare services to 10% of the population aged over 65 by mid-2026 (in line with European best practices). It also aims to further boost the provision of homecare by taking full advantage of the possibilities offered by new technologies (such as telemedicine and digitalisation).

Modernisation of technical and digital equipment within hospitals: Hospital technology and digital infrastructures are significantly outdated and/or lacking in many facilities. This situation poses a risk for the quality of services and the efficiency of the system and can have negative effects on citizens' trust in the healthcare system. Thus, the EUR 4.05 billion investment involves the modernisation and digitalisation of various hospital and medical facilities, through the purchase of 3 133 new pieces of high-tech equipment.

Strengthening of the technological infrastructure and tools for data collection, processing, data analysis and simulation: This EUR 1.67 billion investment includes two different measures: the creation and dissemination throughout the national territory of the electronic health record on the one hand, and the deployment of technological infrastructure for data analysis and simulation, on the other. The latter will be created to strengthen the New Health Information System (NSIS), which is the Ministry of Health's infrastructure and analysis tools for monitoring the levels of care and planning of healthcare services of the population.

Human Capital

As mentioned above, the human capital[157] dimension of the Plan will be crucial for Italy in the coming years as the country aims to bridge the gap of its population's digital skills. Thus, various reforms and investments worth approximately EUR 7 billion of the Italian Plan, have been put forward to ensure this:

Basic digital skills: With an investment worth EUR 0.20 billion, Italy will support those sections of the population who are more at risk of suffering from the consequences of the digital divide. In addition to the traditional measures provided by the educational, instructional and job-placement support platforms, the Italian Plan intends to strengthen the territorial digital support network (building on successful regional experiences) and the Digital Civil Service, through the recruitment of several thousand young people to help about one million of them acquire basic digital skills.

Competences and capabilities in the administrations: To accompany the reform on 'Competences and career', aimed at removing certain regulatory impediments to allow further mobility of civil servants between the various administrations, Italy is to invest EUR 0.49 billion in strengthening the competences and capabilities of its civil servants. Firstly, a wide range of online courses for the reskilling and upskilling of human capital (such as Massive Open Online Courses, i.e. MOOCs) is made available. In addition, communities of practice are introduced to develop and exchange best practices within public administrations on various thematic areas (digital transformation, green transition).

Policy priority

The above-mentioned investment complements the **Good administration and simplification Reform** aimed at eliminating bureaucratic constraints and bottlenecks, and make administrative procedures more effective and efficient, particularly by adopting measures aimed at reducing the time needed to manage such procedures.

Investment in human capital to strengthen the Trial Office and overcome disparities between courts: The reform of the public administration will only be efficient if it is accompanied by a reform of the judicial system. Hence the country plans to disburse EUR 2.30 billion in financing an extraordinary fixed-term recruitment plan to support judges in the processing of pending court cases and ensure the necessary technical expertise required to face its technological and digital transformations.

[157] The human capital aspects of the Plan are mainly covered by **Mission 1**, Digitalisation, innovation, competitiveness, culture and tourism, and particularly through its **Component 1**, on Digitalisation, innovation and security in the public administration and **Component 3**, on Tourism and culture; but also, by **Mission 4**, Education and research, and particularly through its **Component 1**, Strengthening the supply of education services: from kindergartens to universities.

Digital strategy and platform for cultural heritage: With an investment worth EUR 0.50 billion, the country plans to create a national digital repository which will collect, integrate and preserve digital cultural resources, making them available for public use through dedicated platforms. The creation of new cultural content and the development of digital services with high added value by cultural / creative companies and innovative start-ups will also be supported, with the ultimate goal of stimulating an economy based on the circulation of knowledge.

Hub for digital tourism: To sustain and promote the Italian cultural heritage for the next generations, the country is planning investments that will create a digital cultural heritage. In this regard, Italy will dedicate EUR 0.11 billion in the creation of a hub for digital tourism, whose goal will be to create a unique dedicated platform to enhance and promote the Italian tourism ecosystem.

Integrated digital education and training on the digital transition of school staff: This investment of EUR 0.80 billion will promote the development of digital skills of school staff so as to encourage an accessible, inclusive and intelligent approach to digital education. The main purpose is the creation of an ecosystem of digital skills, able to accelerate the digital transformation of schools and of the learning and teaching processes, in line with the European reference framework for digital skills DigComp 2.1 (for students) and DigCompEdu (for teachers).

Policy priority

The above-mentioned investment is meant to complement the **Reform on the Recruitment of school staff**, aimed at improving the quality of Italy's educational system, starting from an increase in the skills and qualifications of its school staff.

School 4.0 - innovative schools, new classrooms and laboratories: With a budget of EUR 2.10 billion, this measure aims to transform school spaces into adaptable, flexible and digital connected learning environments, with technologically advanced laboratories and a work-oriented learning process.

Advanced teaching and university skills: This EUR 0.50 billion project aims to modernise and digitalise university (and doctoral) paths through a set of measures, including: the creation of Teaching and Learning Centres, to improve the teaching skills (including digital skills) of teachers in universities and teachers in schools, and Digital Education Hubs, to improve the capacity of the higher education system to offer digital education to students and university workers.

Investment in digital capacities and deployment of advanced technologies

Investments in digital capacities and in advanced technologies[158] will come complement the overall transformation and digitalisation of the public administration. Indeed, further investments, worth approximately EUR 2 billion, in digital infrastructure, interoperability, platforms and services, and cybersecurity will be necessary to offer citizens and businesses effective, secure and fully accessible services.

[158] Investment in digital capacities and in advanced technologies are mainly covered by **Mission 1**, Digitalisation, innovation, competitiveness, culture and tourism, and particularly through its **Component 1**, on Digitalisation, innovation and security in the public administration as well as its **Component 2**, on Digitalisation, innovation and competitiveness of the production system.

Digital infrastructures: As previously mentioned, the digital transformation of the public administration follows a cloud first approach, oriented towards the migration of data and IT applications of individual administrations to a cloud environment. This EUR 0.90 billion process will make it possible to optimise and strengthen many of the data centres currently distributed throughout the country, which currently lack the minimum requirements for security, reliability, processing capacity and efficiency.

Cybersecurity: Further digitalisation increases the overall level of vulnerability of our societies to cyber threats, on all fronts (e.g., frauds, cyber blackmails). Thus, the digital transformation of the Italian public administration also contains important investments to strengthen its cyber defences, which are organised into four main areas of intervention and a budget of EUR 0.62 billion.

Investments in cutting-edge technologies: Italy has a strong manufacturing sector as well as an export-oriented economy. Hence, this EUR 0.34 billion budget is meant to support investments in machinery, plant and equipment for cutting-edge technological productions, complementary to the Transition 4.0 measures.

Digital-related investment in R&D

Investments in digital-related R&D[159] will be primordial as a major barrier to the development and competitiveness of the Italian economic system is due to the limited availability of skills in R&D and the low number of researchers. Italy thus aims to strengthen its research infrastructure and capital to further boost and support innovation with the below investments worth approximately EUR 19 billion.

Transition 4.0: On the supply side, this strategy provides for the strengthening of basic and applied research and the promotion of technology transfer. These measures are synergistic with the interventions dedicated to applied research, innovation and research-enterprise collaboration. On the demand side, the tax incentives included in the Transition Plan 4.0 are designed to promote the digital transformation of processes production and investment in intangible assets in the post-pandemic recovery phase.

Satellite technologies and space economy: This investment is aimed at strengthening earth observation systems for monitoring territories and outer space and at strengthening national skills in the space economy.

Fund for the National Research Programme (PNR) and Research Projects of Significant National Interest (PRIN): The Fund is aimed at strengthening the support measures for scientific research indicated in the National Research Program (NRP) 2021-2027 to ensure the implementation of strategic lines in the field of scientific research. The main areas of intervention of the NRP reflect the six clusters of the European Research and Innovation Framework Programme 2021-2027.

[159] Investments in digital-related R&D are mainly covered by **Mission 1**, Digitalisation, innovation, competitiveness, culture and tourism, and particularly through its **Component 2**, on Digitalisation, innovation and competitiveness of the production system as well as by **Mission 4**, Education and Research, and particularly its **Component 2**, From research to business.

Strengthening of research structures and creation of national R&D champions on some Key Enabling Technologies: This measure aims to finance the creation of national research centres, selected with competitive procedures, which are able to reach, through the collaboration of universities, research centres and companies, a critical threshold of research and innovation capacity.

Strengthening of thematic and territorial extension of technology transfer centres by industry segments: The objective of the measure, implemented by the Ministry of Economic Development (MiSE), is to support, also through a process of reorganisation and rationalisation, a network of 60 centres (Competence Centres, Digital Innovation Hubs, Digital Innovation Points) in charge of project development, delivery to companies providing advanced technological services and innovative and qualifying technology transfer services. The objective of the simplification and rationalisation process of the centres advocated by the measure is to increase advanced technological services for the benefit of companies by focusing on leading technologies and production specialisations.

Digitalisation of businesses

Investments in the digitalisation of Italian businesses[160] will be essential to promote their development and competitiveness. Indeed, the Plan puts forward the following investment to support internationalisation processes of its businesses:

Industrial policies for internationalisation and supply chain: EUR 1.95 billion will be dedicated to supporting the internationalisation of SMEs, particularly to foster the development of their competitiveness, in terms of innovation and sustainability. At the same time, support to SMEs will also include a focus on supply chains.

4.16 Latvia

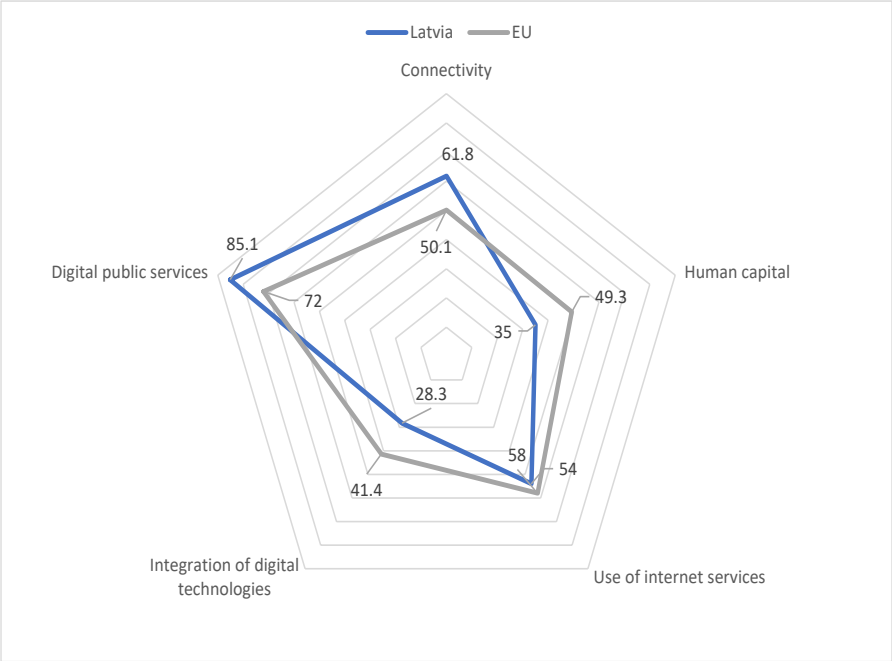
4.16.1 Country digital outlook

For Latvia, it is important to keep up speed of the digital transformation to foster future productivity and innovation, to reduce the digital gap between its citizens, as well as to ensure employment and economic growth for the future decades. In 2020, Latvia scored the 18th place in the overall ranking of all EU28 Member States on the Digital Economy and Society Index (DESI) of 2020, falling of three places compared to DESI 2019. Figure 38 below shows the performance of Latvia on the five DESI dimensions in 2020, based on data from 2019. Latvia had a medium-to-low advanced digital economy and scored below the European average in all dimensions, except for digital public services and connectivity. Considering these challenges in the digital sphere, in the same year Latvia also received one Country Specific Recommendation in the context of the European Semester calling the country to take action mainly in the field of ICT infrastructure to support citizens and businesses by enabling their access to digital public services. Against this background, it must be said that Latvia keeps up the effort to foster the digital transformation of its economy and society in

[160] Investments in the digitalisation of Italian businesses are mainly covered by **Mission 1**, Digitalisation, innovation, competitiveness, culture and tourism, and particularly through its **Component 2**, on Digitalisation, innovation and competitiveness of the production system.

recent years, as also demonstrated by the strong focus on digital matters in its Recovery and Resilience Plan, detailed in the following sections.

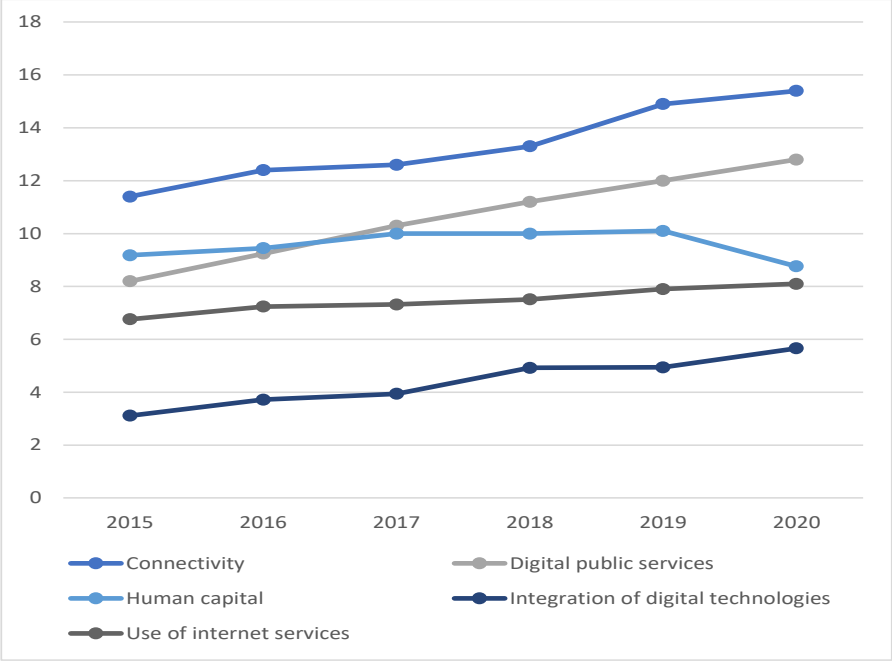
Figure 38. Performance on DESI 2020 - Latvia



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Such commitment emerges from Figure 39 below, which shows the evolution of Latvia's performance in the five main DESI dimensions since 2015. Significant improvements have been registered in the connectivity and the digital public services dimensions.

Figure 39. DESI indicators over the years - Latvia



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Thanks to the National Broadband Strategy for 2013-2020, Latvia's performance on **connectivity** has greatly improved since 2015. According to DESI 2020, the country was particularly well advanced on the Fixed Very

High-Capacity Network (VHCN) coverage (88% versus 44% for the EU) and the Fast broadband (NGA) coverage. The average 4G coverage was also almost complete in 2020 (99%). However, the Latvian results for the overall fixed broadband take-up scored below the EU average and the take-up of 100 Mbps fixed broadband speed remained substantially below the targeted 50% of households included in the strategy mentioned above. Deploying the 'last mile' coverage in several areas that lack connection, in particular rural areas, remains a challenge. Nevertheless, the Latvian Recovery and Resilience Plan intends to respond to these challenges and includes two investments and a reform aiming at improving its connectivity.

On the **human capital** dimension, Latvia ranked 24th among the EU28 on DESI 2020. With several indicators deteriorating in the last years, Latvia was struggling to maintain and improve basic and advanced digital skills of its citizens, despite the introduction of several guidelines and projects on the matter. To face this challenge, Latvia's Recovery and Resilience Plan includes many initiatives related to this dimension, which aim to increase the basic digital skills of students, businesses and civil servants, but also to increase the number of employed ICT specialists, especially women, while bridging the digital divide for vulnerable learners.

According to DESI 2020, the **use of internet services** in Latvia was slightly below the EU average, with a total score of 54 against 58 for the EU average. For instance, 84% of the population used the internet at least once a week (versus 85% for the EU average). The number of users of video calls, social media and banking services, as well as the number of online news readers, were above the EU average. Several investments in the Latvia Plan aim to encourage the use of internet services. However, this objective can only be achieved by improving access to quality networks distributed more evenly across the territory and by strengthening the digital skills of the population and the use of ICT by businesses.

Latvia ranked 23rd among the EU countries regarding the **integration of digital technologies** by businesses, all indicators scoring below the EU average. Latvian businesses have improved their use of electronic information sharing in the last five years but the percentages of compagnies using big data, cloud computing or social media was still significantly low. The use of eCommerce could also be increased as only 11% of SMEs were selling their products or services online according to DESI 2020. The digitalisation of businesses and their integration of digital technologies is a key issue addressed in the Latvian Recovery and Resilience Plan. Several investments and reforms focus on this objective. For instance, the Plan includes the establishment of a European Digital Innovation Hub and regional contact centres, and new financial instruments to enhance innovation in the economic sector.

Finally, regarding **digital public services**, Latvia scored above the EU average for all indicators and ranked 5th among EU countries. The development of these services has been supported by a broad national strategy, the Public Service Development Plan 2020-2023, adopted in 2020. Beyond a good performance on this dimension, Latvia includes several investments and reforms in its Recovery and Resilience Plan, aimed at supporting the transformation of public administration services and their delivery processes through innovative technologies and approaches, including artificial intelligence and machine learning.

4.16.2 Reforms and investments

The Latvian Plan, named *Eiropas Savienības atveseļošanas un noturības plans,* is subdivided into six components, each covering one or many reforms and investments. Latvia received EUR 1.8 billion from the RRF, all in grants. Investments and reforms related to the digital transition represent 21% of the plan's total

allocation and EUR 378 million[161]. This money will aim at, among other things, to improve the low digital skills of its population, to develop the 5G coverage and high-speed networks to enhance its connectivity in rural areas, as well as to promote the digitalisation of businesses in various economic sectors, especially the use of eCommerce and the development of new digital products and services.

Latvia's EUR 378 million dedicated to digital objectives will support the implementation of the following crucial investments by 2026. These have been grouped into six categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Latvia will invest EUR 16.5 million into the development of the 5G coverage and the construction of high-speed networks to further develop its connectivity[162], as further detailed here below:

Construction of a passive infrastructure in the Via-Baltica corridor to ensure 5G coverage.: This investment, worth EUR 12.5 million, represents a significant contribution to the country's goal of developing the 5G corridor, initially focusing on Via Baltica as a pilot project for the development of other road sections in the future. The 5G infrastructure is expected to be a key factor in the development of connected and automated mobility in the region.

Broadband or very high-performance network 'last mile' infrastructure development: Latvia will invest EUR 4 million to develop high-speed networks, especially in rural areas. The biggest challenge regarding this project is the attraction of an electronic communications network operator and the development of services.

Policy priority

The above-mentioned investment complements the **Broadband infrastructure development** reform, which aims to prepare an inventory of the availability and infrastructure of existing and planned broadband access services to perform an analysis of the most appropriate intervention model and to develop a database to plan a broadband state aid policy.

eGovernment, digital public services and local digital ecosystems

Latvia, which already benefits from effective digital public services, aims to further improve eGovernment services in its Plan[163] through several investments, worth EUR 96.5 million, and reforms, as described below:

[161] The digital aspects of the Plan are gathered under two components: Component 2 focused on digital transformation, as well as Component 6 on the Rule of Law.
[162] The connectivity aspect of the Plan is covered under **Component 2** (digital transformation) and more precisely in the **sub-section 2.4**. (transformation of digital infrastructure).
[163] Investments and reforms related to eGovernment, digital public services and local digital ecosystems are mainly addressed in the **Component 2** (Digital transformation) and the **Component 6** (Rule of Law).

Modernisation of administration and digital transformation of services: Latvia will invest EUR 24.5 million to transform public administration services and their delivery processes to achieve an effective digital transformation of the economy through innovative technologies and approaches, including artificial intelligence and machine learning. In addition, introducing a data-based forecasting and decision-making approach in the management of those services and processes will ensure the full implementation of the Once-Only principle.

Development of new analysis systems in taxation: A new taxpayer segmentation system providing online information for taxpayers will be integrated into the publication database. In addition, this investment of EUR 1.88 million will enable the development of a data visualisation tool that will be included in the Electronic Declaration System.

Development of the public administration innovation ecosystem.: To enhance innovation and the development of better public services, this project will be focused on the evolution of a public laboratory for innovation, the #GovLabLatvia. To ensure that the #GovLabLatvia is a sustainable innovation catalyst for public administration and a support centre for other institutions in the public sector, it is necessary to expand the laboratory's activities by establishing a permanent team of laboratory experts working in the laboratory full time.

Centralised management platforms and systems: Latvia will invest EUR 70.1 million to develop shared support services and their delivery processes for public administrations through the implementation of information systems for service provision and management, including the training of users. The overall objective is to ensure the functioning of the administration as a single organisation, which would include the implementation of standardised support functions such as accounting, personnel administration, resource accounting and management, while ensuring the availability of real-time data.

Policy priority

The digitalisation of Latvian public administrations and the development of digital public services are supported by four reforms included in Latvia's Plan:

- **Modernisation and digital transformation of state processes and services:** This reform will modernise public administration and services, while focusing on important public administration functions, processes and services that are not yet digitalised.
- **Increasing the efficiency and interoperability of the use of state ICT resources:** The goal of this reform is to ensure a comprehensive and horizontal approach to ICT infrastructure and institutional support for the implementation of the development of shared competence centres and their services, as well as the implementation of a modern state information system architecture.
- **Establishment of a register of public procurement contracts:** Within the framework of the reform, a publicly accessible register of public procurement contracts will be created.
- **Modernisation of public administration:** The overarching goal of this broad reform is to provide better and more efficient services to society.

Human Capital

The human capital[164] dimension of the Plan will be crucial for Latvia in the coming years as the country aims to bridge the gap of its population's digital skills, not only in the education sector but also among employees of public institutions. Thus, various reforms and investments have been put forward to ensure this:

Ensuring the acquisition of high-level digital skills: The purpose of this investment, worth EUR 17 million, is to significantly increase the number of specialists with high-level digital skills in the next six years, who will be able to use digital technologies in the development of knowledge, as well as new products and services in various economic sectors.

Development of business digital skills: As part of this EUR 20 million investment, the digital skills of entrepreneurs and employees will be improved to at least a basic level and higher, depending on the company's development plans, which will create an opportunity to use eCommerce to increase exports. In addition, the development of digital skills will also be a mean to reduce the impact of the COVID-19 crisis on the national employment.

Development of a self-directed training approach for ICT specialists: Latvia will invest EUR 7.6 million to develop a new approach to the training of ICT specialists by creating a self-directed ICT learning school learning environment.[165] In addition, this project will scale up the existing initiatives for the training of ICT specialists in non-formal education, especially by supporting the involvement of women in ICT work, as well as the implementation of intensive trainings for people who want to change careers and acquire the necessary digital skills.

Policy priority

The above-mentioned investments complement the **Development of a sustainable and socially responsible support system for adult education** reform, which will establish and strengthen a sustainable support system for adult education through the national regulatory framework. The goal is to strengthen the criteria and procedures for incentives and obligations, especially for SMEs, to educate their employees by the end of 2023.

Digital skills for the population, including young people: Latvia intends to invest EUR 12.63 million to provide support to all 42 Latvian municipalities to implement a systemic approach to the development of their citizens' skills, using digital skills development measures and virtual youth centres. Through these centres, municipal and NGO workers will be able to implement digital youth work activities, including non-formal education and eParticipation activities, thus improving and developing young people's digital and technological skills and their practical application.

Development of state and local government digital transformation skills and abilities: This investment, worth EUR 8.25 million, will strengthen the digital capacity of public administrations, moving towards the goal of creating a digitally smart public administration at the state and local government level, including planning both direct training activities for 62,900 public administration employees and developing self-learning and a wide access to online learning, that could also be intended for the general public on topics such as cybersecurity and the use of public services.

[164] The human capital-related aspects of Latvia's Plan are mostly addressed in **Component 2** on the digital transformation, under the **sub-section 2.3** on digital skills.
[165] By 2027, at least 600 new ICT specialists should be trained.

Policy priority

The above-mentioned investment supports the **Digital skills for the digital transformation of society and government** reform, which aims to improve the planning and implementation of measures for the development of digital skills of adults, for more accurate assessment of citizens' learning needs and for better adult education policies related to digital skills.

Bridging the digital divide for vulnerable learners and educational institutions: Latvia will invest EUR 15 million into the development of a management model of “computer libraries” in educational institutions in cooperation with all involved stakeholders. The main objective is to ensure the availability of ICT units for learners who need it most, in order to increase learning efficiency and reduce inequalities in the country.

Investment in digital capacities and deployment of advanced technologies

Investments in digital capacities and in advanced technologies[166] will complement the overall transformation and digitalisation of the Latvian public administration. Indeed, further investments in the development of centralised platforms, a new federal cloud, and the sharing of data within public administrations and between those institutions and citizens or businesses will increase Latvia’s digital capacities.

Latvia's national federated cloud: EUR 12.5 million will be dedicated to the establishment of the Latvian national federated cloud, which will provide shared computing and data management infrastructures and its services. The cloud is intended for the needs of public administration, including local governments and public institutions (higher education institutions, scientific institutes).

Data availability, sharing and analytics: The investment, worth EUR 21.75 million, will facilitate data sharing both in the public sector and between the public and private sectors. The goal is to facilitate inter-institutional cooperation, the implementation of the Once-Only principle and data sharing at national and European levels.

Policy priority

The above-mentioned investments complement the reform on the **Development of economic data and digital services**, which envisages the establishment of appropriate technological and organisational solutions that will ensure the cross-sectoral circulation and use of data, the availability of state platforms to support the business sector and services development, as well as the possibility of sharing personal data, while ensuring personal control over data transfer.

Digital-related investment in R&D

[166] Investments and reforms in digital capacities and related to the deployment of advanced technologies can be found under **Component 2** (digital transformation), and more precisely in the **sub-section 2.1** (public administration, incl. digital transformation of municipalities).

Investments in digital-related R&D[167] represent a smaller part of Latvia's Recovery and Resilience Plan. Only one investment linked to this category can be found in the Plan, as described below:

Support for the establishment of Digital Innovation Hubs and Regional Contact Points: Latvia will invest EUR 10 million to encourage R&D investments in ICT and increase the level of professional skills required for the development of innovation in the areas identified in the Latvian Smart Specialisation Strategy (RIS3) and to provide support for prototype development, testing and implementation.

Digitalisation of businesses

The digitalisation of businesses[168] is another focus point of the Latvian Plan, which aims not only to the digitalisation of business processes, but also to the development of new digital services and products.

Support for the digitisation of processes in commercial activities: Latvia will invest EUR 40 million to promote the digitalisation of processes in commercial activities and to enhance productivity in the private sector. This support in the digitalisation of businesses will encourage the development of business digital skills, as well as the introduction of new products and services.

Policy priority

The above-mentioned investment is supported by the reform **Creating a full cycle of support for the digital transformation of business with a regional reach,** which aims to establish a European Digital Innovation Hub and a unified and coordinated support ecosystem to promote the digital transformation of business and to help companies become more competitive in their core business processes (production, product offering or service provision) and to support digital research and development.

Support for the introduction of new products and services in businesses: The aim of the investment, worth EUR 24.3 million, is to specifically promote the creation of new digital products and services that would help the Latvian economy recover from the COVID-19 crisis and promote future competitiveness through the introduction of modern automation and robotics tools.

Financial instruments for digital transformation of businesses' promotion: In order to stimulate economic actors to review existing business processes and their use of technologies, a EUR 45.14 million investment is planned to establish a program of financial support instruments. This will promote business development and the turnover growth by supporting large-scale and productivity-oriented investments that facilitate the implementation of 4.0 industrial revolution solutions in production processes through the automatisation or robotisation of traditional business functions.

Promoting the digital transformation of media companies: Latvia will invest EUR 5.7 million to facilitate the adaptation of media companies to current trends in media consumption in the digital environment.

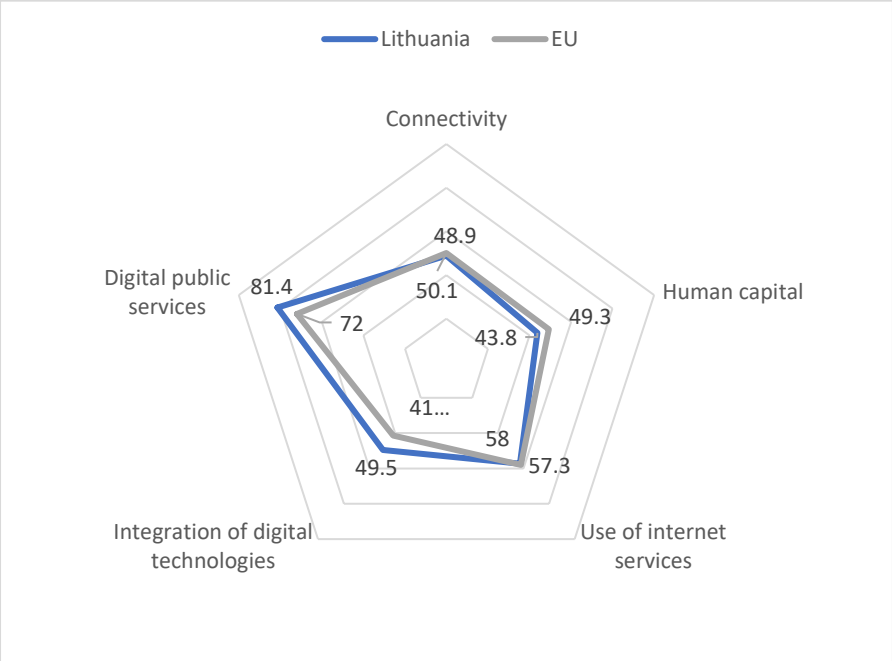
[167] The digital-related investment of Latvia's Plan can be found under **Component 2** (Digital transformation) in the **subsection 2.2** (Digital transformation and innovation of companies).
[168] Investments and reforms related to the digitalisation of businesses are found under **Component 2** (Digital transformation) in the **subsection 2.2** (Digital transformation and innovation of companies).

4.17 Lithuania

4.17.1 Country digital outlook

In 2020, Lithuania scored slightly above the EU28 average according to the Digital Economy and Society Index (DESI) 2020, ranking 13th among the EU Member States. Looking at Figure 40 below, which shows the performance of Lithuania in the five main dimension of DESI in 2020, the integration of digital technologies by businesses, as well as digital public services, were particularly well-developed, scoring above the EU average on these dimensions. However, according to DESI 2020, Lithuania still lagged a bit behind on the human capital dimension compared with the other EU Member States. The same year, Lithuania also received one Country Specific Recommendation, in the context of the European Semester calling the country to take action in the field of connectivity to focus investments and attention to the deployment of the fixed broadband coverage, particularly in the rural areas of the country.

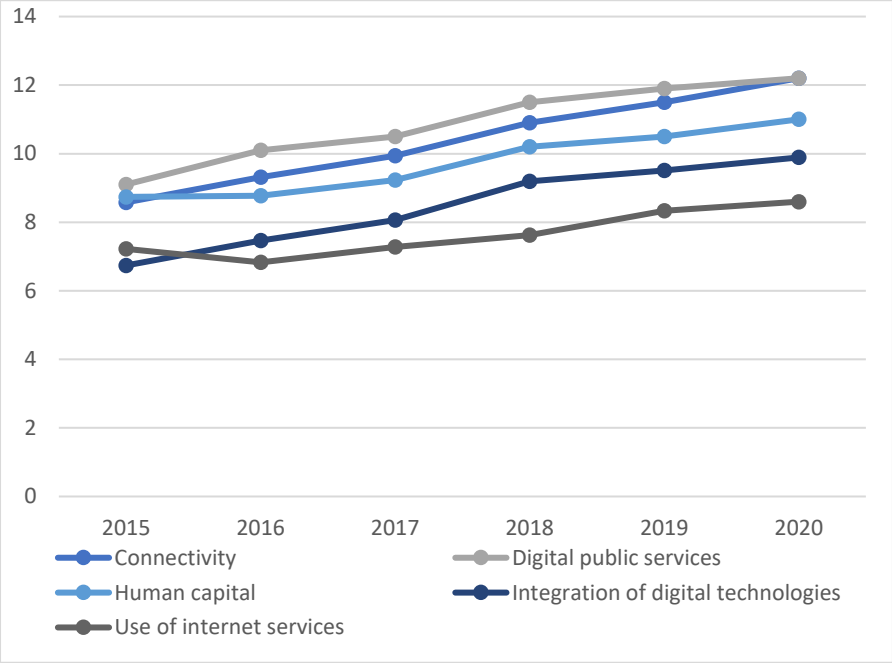
Figure 40. Performance on DESI 2020 - Lithuania



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

The commitment of Lithuania to the digital transformation emerges from Figure 41, outlining the evolution of country across the five main DESI dimensions between 2015 and 2020. The steady improvements on all dimensions registered since 2015 might be linked to the Information Society Development Programme 2014-2020, which covers all aspects in relation to the digitalisation of the country's economy and society, ranging from digital to the use of open public data.

Figure 41. DESI indicators over the years - Lithuania



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Despite the progress made over the years on **connectivity**, Lithuania progressed slower than other EU countries on this dimension, resulting in a drop in ranks from the 11th place in 2018 to the 19th in 2020. While mobile components are relatively strongly covered in Lithuania, the country still lagged behind in fixed broadband. Despite efforts to facilitate the roll-out of 5G, the set-up of a working group on 5G and the mapping of existing infrastructure for the implementation of 5G corridors together with neighbouring states, in 2020 Lithuania still scored zero when it comes to readiness for 5G. For this reason, Lithuania will continue its effort to advance its 5G readiness and plan related investments under its National Recovery and Resilience Plan.

In relation to the **human capital** dimension, Lithuania scored below EU28 average, despite some improvements registered at the national level. Lithuania adopted the Digital Agenda Strategy 2014-2020, which aimed at enhancing digital skills and closing the digital divide[169]. Initiatives planned under the National Recovery and Resilience Plan will aim to further continue advancements on this dimension by enhancing digital skills among teachers and students, as well as young and adult employees through, for instance, improved vocational training.

Concerning the **use of internet**, in 2020 Lithuania scored approximately the same as EU28 average (57.3 for Lithuania as compared to 58 for the EU average). Nevertheless, Lithuania lost two ranks in 2020 compared 2019 and only ranked 13th. This implies that other countries are increasing the use of internet services within

[169] https://digital-strategy.ec.europa.eu/en/policies/desi-lithuania

its population at a faster rate. Similarly, while the proportion of people who have never used internet services was decreasing, it was still above the EU28 average in 2020 (15% vs 9%).

The **integration of digital technology** was one of Lithuania's stronger dimensions, despite some slow-down during the last years which costed a decrease in rank from 8 in 2018 to 10 in 2020. Nevertheless, Lithuania still scored above the EU28 average, and the government is active in adopting strategies and roadmaps to further advance this dimension, including: the Lithuanian Digitalisation Roadmap for 2019-2030, the Cybersecurity Strategy adopted in August 2018 and the National AI Strategy launched in March 2019. Further to that, Lithuania participates in the EuroHPC Joint Undertaking, contributes to the development of digital innovation hubs and supports the promotion of EU collaboration in the development and uptake of new technologies.

When it comes to **digital public services**, in 2020 Lithuania ranked 6th out of the EU28. Indeed, the country showed a significant level of digital maturity in this dimension. For instance, the country offers a central portal for government and public administration services, called *Elektronianiai vartai*, allowing for identification via eBanking. eHealth services are accessible via an online portal. Further to that, the GovTech Lab initiative launched in 2019 aims at strengthening the cooperation between businesses and government to encourage creating and using innovative solutions for the government. Further initiatives are planned under Lithuania's National Recovery and Resilience Plan to enhance the provision of digital public services and strengthen the link between government, business, and society in relation to the provision of digital public services.

4.17.2 Reforms and investments

The Lithuanian National Recovery and Resilience Plan, submitted to the European Commission for assessment in May 2021, is originally called *Ekonomikos gaivinimor ot atsparumo didinimo plana 'Naujos Kartos Lietuva*'. Lithuania's Plan is subdivided into seven main components[170]. The peculiarity of the Lithuanian plan is that, while it includes some investments and a majority of stand-alone or investment-related reforms, no specific amount is directly allocated to any investment or reform. Money is allocated per objective and several initiatives can aim at the same objective. Lithuania received EUR 2.22 billion from the RRF, all in grants. 31.5% of the Plan will be allocated to achieve the country's digital objectives, equalling to approximately EUR 700 million which will, among other things, help the country to enhance its 5G readiness, to increase the quality of its digital public services, while developing the use of open data in the country and develop digital skills of citizens. Another focus point of the Lithuanian Plan is to push the digitalisation in the private sector and the use of electronic documents while communicating with public entities.

Lithuania's EUR 700 million dedicated to digital objectives will support the implementation of the following crucial investments by 2026. These have been grouped into five categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

[170] The plan consists of 30 measures divided into seven main components: 1) A resilient health system to future challenge; 2) Green transformation of Lithuania, 3) Digital transformation for growth, 4) Quality and accessible education for the entire life-cycle, 5) Higher education, a coherent framework, 6) Efficient public sector and preconditions to recover after the pandemic, and 7) More opportunities for everyone to actively build national well-being.

Connectivity

Connectivity plays an important role to further improve the digital transformation of Lithuania and to ensure full effectiveness of the digital reforms across the whole population. In its Plan, Lithuania foresees one investment to enhance the readiness for 5G connectivity and be hence better prepared for the future[171].

A step towards 5G: The investment will ensure the coverage and penetration of high-band width electronic communications networks that meet the needs of digitally intensive businesses[172] and is designed to accommodate the steady roll-out of 5G networks in the country. The investment will enable 5 000 digitally intensive businesses to access Gigabit broadband, with a particular focus on the development and deployment of innovations in the field of transport.

eGovernment, digital public services and local digital ecosystems

The further advancement of eGovernment, digital public services and local digital ecosystems is another focus areas of the Lithuanian National Recovery and Resilience Plan. Four reforms in this area have been put forward and will improve the resilience of the health system, promote digital transformation for growth, ensure quality and accessible education as well as enhance the efficiency of the public sector[173].

[171] The Connectivity aspect of the Plan is covered by **Component 3** (Digital transformation for growth).
[172] Digitally intensive businesses refer to businesses active in digitally-intensive sectors, such as ICT equipment and machinery, wholesale and retail, publishing, audio-visual and broadcasting, defence, arts and entertainment.
[173] This aspect can be found in **Component 1** (A resilient health system to future challenge), **Component 3** (Digital transformation for growth), **Component 4** (Quality and accessible education for the entire life-cycle), as well as **Component 6** (Efficient public sector and preconditions to recover after the pandemic).

Policy priority

Lithuania did not yet specify any dedicated investment to foster the uptake of eGovernment and digital public services in the country, but it put forward the following reforms:

- **Improving quality and access to services and promoting innovation:** This reform will improve digital public services, the integration of digital technologies and the use of internet services in the government, as well as developing new ICT solutions, eServices, and applications in relation to the government.
- **Transforming the management of public information technology of the state information technology management:** This reform sets out to consolidate the State's information resources in their entirety, so that the IT infrastructure, services and processes of public institutions are managed in a centralised, efficient and secure way.
- **Customer-oriented services**: The reform targets the digitalisation of public and administrative services through a complete transformation of national and local government processes, the digitalisation of public services, systems' integration, data re-use, service maturity and user-orientation of public management.
- **Smart tax administration to reduce the VAT gap**: **T**his reform's aim is to modernise the tax administration, and more specifically the data acquisition, analysis, and decision-making processes of the Lithuanian State Tax Inspectorate (STI) and the Lithuanian Customs Department (both part of the Ministry of Financial Affairs) by fostering the use of advanced analytical methods and methods based on the application of artificial intelligence in the workplace.

Human Capital

Enhancing human capital also plays an important role in Lithuania's Plan. In fact, four reforms have been put forward, particularly oriented at the enhancement of digital skills across the population[174].

[174] The human capital aspect of the Plan can be found in **Component 4** (Quality and accessible education for the entire life-cycle).

Policy priority

Lithuania did not yet specify any dedicated investment to foster the uptake of human capital in the country, but it put forward the following reforms:

- **Modern general education as a basis for acquiring basic digital competences:** This reform focuses on enhancing and ensuring the development of digital skills of teachers and thereby contributes to the objective of digitalising the education in Lithuania.
- **A framework for vocational guidance on labour market supply and demand:** This reform is focused on supporting and fostering youth employment and the socio-economic integration of young people through the provision of vocational trainings and guidance, particularly in relation to the development of digital skills.
- **Competences for digital transformation in vocational and education training (VET)**: This reform targets the development of skills across the society related to smart specialisation, industrial transition, entrepreneurship, and adaptability of enterprises to change.
- **Affordable opportunities for competence development and recognition of adults' qualifications:** This reform will provide adults with different professional backgrounds with the opportunity to develop skills in the fields of smart specialisation, industrial transition, entrepreneurship, and adaptability of enterprises to change.

Investment in digital capacities and deployment of advanced technologies

The focus on digital capacities and the deployment of advanced technologies[175] represents a smaller part of the Lithuanian Recovery and Resilience Plan. Indeed, the country only put forward the below reform:

Policy priority

The Lithuanian Plan includes a reform related to digital capacities and the deployment of advanced technologies in the country, called **Ensuring efficiency in data management and open data.** This reform aims to ensure the availability of reliable public sector data, the ability to share data across various sectors of the economy and between the public and the private sectors. The goal is also to ensure the re-use of data and to create the conditions for data-driven decision-making by public authorities and the pursuit of digital innovation by businesses.

Digitalisation of businesses

Supporting the digitalisation of businesses[176] is essential to ensure the competitiveness of the Lithuanian economy and foster its digital transformation. Lithuania focuses on the advancement of this dimension through two investments and one reform, detailed here below.

[175] The only reform aiming at developing digital capacities and the deployment of advanced technologies is included in Component 3 (Digital transformation for growth).

Customer-oriented employment support: This investment will promote entrepreneurship and the acquisition of digital skills and competences for entrepreneurs, employees, and businesses.

Innovative technological solutions for the use of the Lithuanian language in businesses and a digitalised culture: The aim of this investment is to create the necessary infrastructure for businesses to efficiently develop and deploy advanced and innovative tools for communicating, reading, analysing, understanding, and interpreting the Lithuanian language at a basic level, and to create and ensure universal access to digital resources. Six areas of investments have been identified: (i) investment in the development of technological resources for the Lithuanian language; (ii) investment in the digitalisation and accessibility of cultural resources; (iii) investment in the development of digital educational content and resources; (iv) financial incentives for businesses to develop and deploy digital innovations; (v) financial incentives for business service centres to develop and deploy robotic process automation and artificial intelligence solutions; (vi) the establishment of an ICT Centre of Excellence.

Policy priority

The digitalisation of Lithuanian businesses will be supported by an additional reform on **Developing the system of electronic documents,** which will enable businesses to exchange information and data with public authorities in an automated way. This reform would thereby promote the digitalisation of business processes, enable a reduction in administrative costs, and improve the data analytical capacity of competent authorities and the efficiency and sustainability of business accounting. The objective will be achieved by investing in the development of the use of the Electronic Document Ecosystem elements, such as eQuote and eCMR, in business processes.

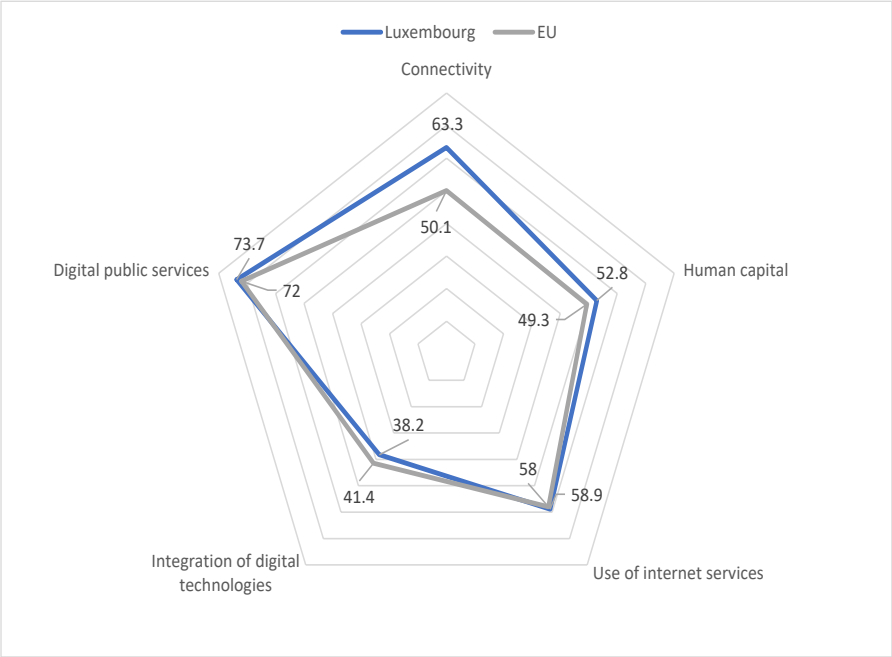
4.18 Luxembourg

4.18.1 Country digital outlook

In Luxembourg, the digital transformation is already well underway, constituting an essential dimension to the country's economic health. In 2020, Luxembourg ranked above the European average and scored the 10th place in the overall ranking of all EU28 Member States in the Digital Economy and Society Index (DESI) in 2020. Figure 42 below shows the performance of Luxembourg on the five dimensions of the DESI 2020, based on data from 2019. Luxembourg scored above the European average in all dimensions, except for the integration of digital technologies by businesses. Considering these challenges in the digital sphere, in the same year Luxembourg also received two Country Specific Recommendations in the context of the European Semester calling the country to take action mainly in the field of eHealth, as well as in innovation and the further digitalisation of its business sector. Against this background, it must be said that Luxembourg keeps up the effort to foster the digital transformation of its economy and society in the last five years, as also demonstrated by the strong focus on digital matters in its Recovery and Resilience Plan, detailed in the following sections.

[176] Investments and reforms related to the digitalisation of businesses can be found in **Component 3** (Digital transformation for growth) and **Component 6** (Efficient public sector and preconditions to recover after the pandemic).

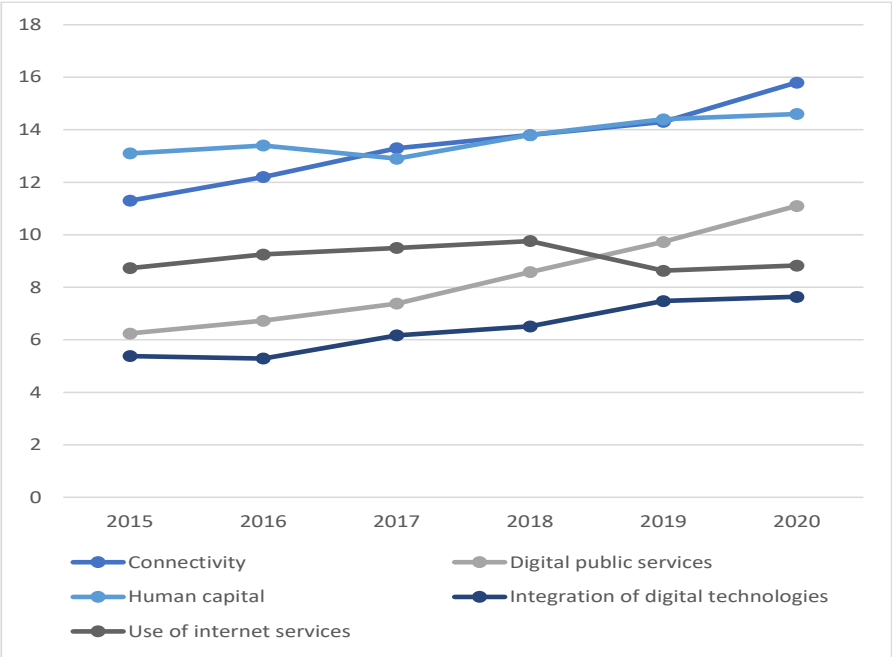
Figure 42. Performance on DESI 2020 - Luxembourg



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Figure 43 below illustrates the evolution of Luxembourg's performance in the five main DESI dimensions since 2015. Luxembourg has made significant progress in the digital sector, particularly in the connectivity and digital public services dimensions.

Figure 43. DESI indicators over the years - Luxembourg



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

According to DESI 2020, Luxembourg was ranking third among the EU Members States in the **connectivity** dimension. Through its national strategy 2010-2020 for very high-speed networks named *L'ultra-haut débit pour tous*, Luxembourg intended to perfect its broadband coverage and penetration to reach the goal of ultra-high-speed rates of 1 Gbps download and 500 Mbps upload for 100% of the population in 2020. In 2021,

Luxembourg has drafted a new broadband strategy for 2021-2025 and a new 5G strategy to prepare its deployment in the country. To further improve its connectivity, Luxembourg's Recovery and Resilience Plan includes a reform and an investment to create a highly secure quantum communication infrastructure.

Concerning **digital public services**, Luxembourg has made major progress since 2017 to reduce its gap in this dimension. According to DESI 2020, the country performed particularly well in the provision of digital public services to businesses, as well as in the use of pre-filled forms and online service completion. However, the number of eGovernment users was still significantly below the EU average (58% versus 67% for the EU). To address this issue, the Luxembourgish Recovery and Resilience Plan includes several investments aimed at modernising digital public services and upgrading existing platforms such as *MyGuichet*, the government's digital services management platform, or creating new ones, such as eADEM, the future platform of the national Employment Development Agency.

On the **human capital** dimension, Luxembourg ranked 8th, well above the EU average but lower than its 2019 ranking. This decrease on DESI 2020 was mainly due to a declining number of ICT graduates, although higher than the European average, accompanied by labour shortages in terms of ICT specialists[177]. In fact, 69% of companies that recruited ICT specialists in 2019 reported difficulties in filling vacancies. To tackle this issue, Luxembourg launched the Digital4Education in 2015, an overarching strategy focused on improving the digital skills of young people and multiple projects have been developed as part of this strategy ever since (such as the Bee Creative programme, the FutureHub label and the eduSphere project). To complement this initiative, the Luxembourgish Recovery and Resilience Plan includes investments aimed at developing the skills of job seekers, employees and citizens in general, while promoting life-long learning.

As shown on Figure 43 above, Luxembourg scored well on the **use of internet services** and ranked 12th on this dimension, but this ranking has been steadily decreasing since 2018 (when Luxembourg was ranked 5th). According to DESI 2020, the percentage of Internet users reached 93%, compared to the European average at 85%. However, percentages of users of online music, video, and game services, as well as the percentage of individuals selling items or services online, were lower than the European average.

Finally, Luxembourg ranked 19th on the **integration of digital technology** by businesses and performed below the EU average on DESI 2020. However, Luxembourg has made progress in terms of the uptake of digital innovation since 2018, especially on the integration of big data. In line with its national digital transformation agenda, Luxembourg has elaborated several initiatives and strategies to promote the integration of digital technologies by compagnies such as the Research and Innovation Smart Specialisation Strategy (RIS3) in 2017, the Data-Driven Innovation Strategy for the Development of a Trusted and Sustainable Economy in Luxembourg in 2019, the AI strategic vision and the Fit4Digital programme.

[177] Information retrieved from: https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=66921

4.18.2 Reforms and investments

The Luxembourgish Recovery and Resilience Plan, whose official name is *Plan pour la Reprise et la Résilience du Grand-Duché du Luxembourg*, is subdivided into three pillars, each covering one or many reforms and investments[178]. Luxembourg received EUR 93.4 million from the RRF, all in grants. Investments and reforms related to the digital transition represent 32% of the plan's total allocation and a total of approximately EUR 30 million. These measures will, among other things, improve the digital skills of the Luxembourgish population, develop a quantum communication infrastructure to enhance its connectivity, as well as modernise some of its digital public services such as eHealth services.

Luxembourg's EUR 30 million dedicated to digital objectives will support the implementation of the following crucial investments by 2026. These have been grouped into three categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Luxembourg will invest EUR 10 million into the creation of a laboratory that will provide the expertise needed to develop and operate a quantum communications infrastructure to enhance its connectivity[179], as further detailed here below:

Development and deployment of a test infrastructure and ultra-secure connectivity solutions: This project consists of creating and developing a research infrastructure that will allow knowledge and experience to be gained in the field of communications based on the quantum technology. The quantum communication network would be based on two components: a terrestrial fibre optic component complemented by a space component which is needed to cover long distance connections.

Policy priority

The above-mentioned investment complements the reform on **Stimulating the creation of a new ecosystem in Luxembourg**, which **will** stimulate the development and implementation of the ultra-secure communication infrastructure based on the quantum technology mentioned above, by encouraging the participation of private sector companies and researchers.

eGovernment, digital public services and local digital ecosystems

[178] The digital investments of the Luxembourgish Plan are gathered in two pillars: Pillar 1 focused on social cohesion and resilience, as well as Pillar 3 on digitalisation, governance and innovation

[179] The Connectivity aspect of the Plan is covered by **Pillar 3** (Digitalisation, governance and innovation) and particularly through its **Component 3A** (Promotion of a data-driven economy).

The development of eGovernment, digital public services and local digital ecosystems[180] is an essential aspect of the digital part of the Luxembourgish Plan with six investments worth EUR 13.04 million. Through the further digitalisation of its public services and institutional processes, Luxembourg aims to modernise its public sector through the centralisation of files and requests management and the development of new digital platforms.

Electronic Document Management and Case Management: Luxembourg will invest EUR 5.04 million to implement a central platform offering all functionalities required for electronic documents and cases management and to deploy specific instances in each of the candidate state entities. This project will fully cover the document management of public administrations, and as such, also all document exchanges between administrations and citizens or companies in Luxembourg.

Evolution of MyGuichet: This investment, worth EUR 0.86 million, will promote the evolution of MyGuichet, the platform for online access to Luxembourg public services. It includes three main projects:

- Virtual appointment booking: The first project will enable public administrations to offer virtual appointment setting and to establish access to a functionality supporting virtual appointments via video conference.
- Various C2G and B2G approaches[181]: The second project will stimulate the provision of digital services and includes several sub-projects.
- Mobile application: The transfer of the functionalities offered by the transactional portal MyGuichet.lu to a mobile application is the central objective of the third project.

eADEM: This EUR 6.4 million investment will support the ADEM (*Agence pour le développement de l'emploi*) in identifying the needs and defining the specifications for the acquisition or development of a centralised management application system specific to the professions of the Luxembourg public employment service that will be called eADEM.

National Platform for Public Inquiry Management: Developing a public enquiry platform will centralise the publication of public enquiries, the consultation of their files on a single website and increase their visibility to facilitate access and visibility of the enquiries for citizens. The project, which is supported by an investment of EUR 0.41 million, will make this process more effective by digitalising all the steps online, even if a physical solution remains available.

Single digital register of health professions: The objective of this investment, worth EUR 0.33 million, is to set up a single digital register for the health professions, collecting all administrative and professional information, in order to better monitor and manage health professionals in Luxembourg.

Telemedicine solution for remote medical monitoring of patients: The adoption of remote monitoring is an essential tool in combating the COVID-19 crisis by minimising the physical movement of people. The integration of digital solutions also responds to the need to decrease the pressure on the health system by modernising and increasing the efficiency of the current system.

[180] Investment related to eGovernment, digital public services and local digital ecosystems are covered by **Pillar 1** (Social cohesion and resilience) under **Component 1B** (Strengthening health system resilience), as well as **Pillar 3** (Digitalisation, governance and innovation) under **Component 3B** (Modernisation of public administration).
[181] The main objectives of this project are the introduction of new procedures, namely three authenticated procedures, three procedures without authentication, three eDelivery projects, and three additional procedures.

Human Capital

The human capital dimension[182] is another key aspect of Luxembourg's Plan. Indeed, this country will invest EUR 6.5 million into the development of digital skills, which are essential to the national economic growth and productivity, through the elaboration of new trainings for job seekers and employees.

Future skills: The ambition of this programme, supported by an investment of EUR 1.5 million, is to train 500 jobseekers.[183] In addition, the course content created through this programme will be made available to a wider audience of job seekers (5 000 – 7 000). The programme consists of a three-month training course in digital skills (focused on digital trends, collaboration and office software, basics of data analysis and programming, basics of cybersecurity and data protection), soft skills and management skills, followed by a six-month practical placement in a public sector institution.

Digital Skills: Through a EUR 5 million investment, the Luxembourgish government will propose educational responses for employees who lack the necessary digital skills in the labour market. The creation of training vouchers will aim to support all employees, especially the ones who were partially unemployed during the COVID-19 pandemic. Depending on the level of digital knowledge, the employee can choose between an initial training that introduces him/her to basic digital tools or a more advanced training to deepen an existing digital knowledge.

Policy priority

The above-mentioned investments complement the ***Skillsdësch*** reform, which will raise awareness of the concept of life-long learning and to develop continuing and professional digital trainings in Luxembourg.

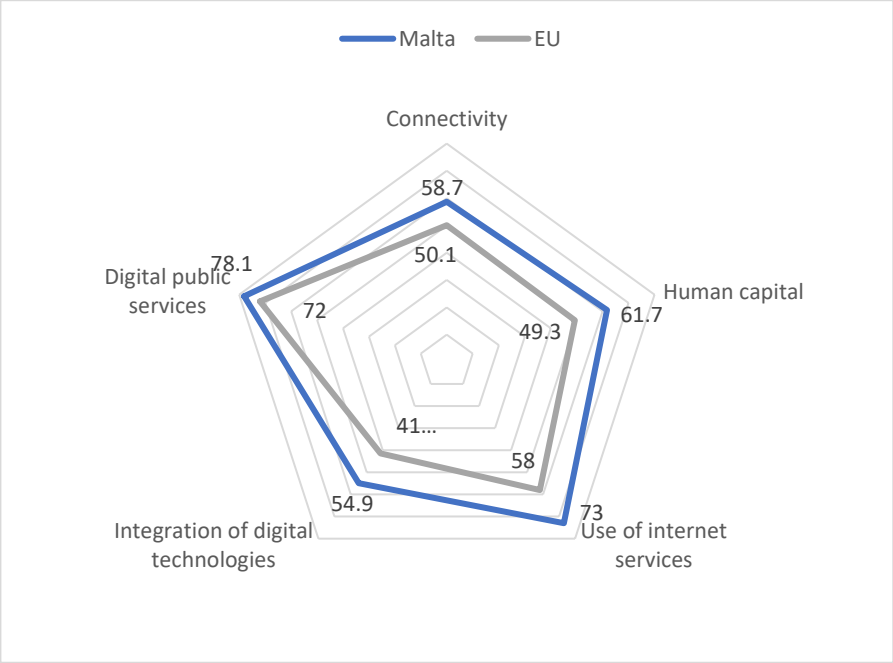
4.19 Malta

4.19.1 Country's digital outlook

In 2020, Malta ranked 5th among the EU28 countries in the Digital Economy and Society Index (DESI). Figure 44 below indicates how well Malta performed on the DESI five main dimensions in 2020 based on 2019 data, scoring above the EU average in all of them. It is therefore not surprising that the country did not receive any Country Specific Recommendation in 2020, as the country already enjoys a well-balanced approach on fostering digital transformation. This also emerges from the National Recovery and Resilience Plan, which provides targeted investments across the different DESI dimensions.

[182] Human capital-related aspects are covered by **Pillar 1** (Social cohesion and resilience) under **Component 1A** (Skilling, Reskilling et Upskilling) in the Luxembourgish Plan.
[183] Of which at least 30% will be from the 45+ age group.

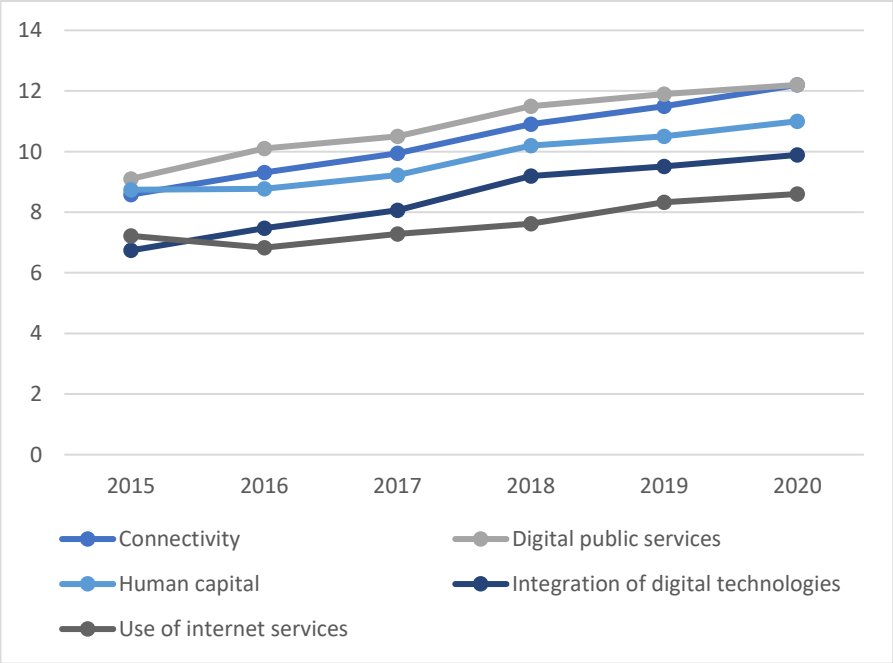
Figure 44. Performance on DESI 2020 - Malta



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Malta's commitment to be a leading nation in the digital transformation across the different dimensions emerges from Figure 45 below as well, indicating a continuous improvement across the five main DESI dimensions since 2015.

Figure 45. DESI indicators over the years - Malta



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Concerning **connectivity**, between 2019 and 2020 the country jumped from rank 17th to 10th. Fixed broadband coverage was very well advanced within the country, however, when it comes to mobile broadband and particularly 5G deployment, Malta still had room for improvement. While the government is

working to promote 5G coverage through discussion papers and engagement with industry[184], no measure is planned to advance the connectivity dimension under the Maltese National Recovery and Resilience Plan.

In relation to the **human capital** dimension, Malta scored particularly well concerning the availability of both male and female ICT specialists, as well as ICT graduates. Digital skills were further enhanced through various initiatives such as the National eSkills Strategy and the eSkills Malta Foundation. To further advance this dimension, the National Recovery and Resilience Plan includes an investment to enhance the digital skills of the population through vocational trainings.

When it comes to the **use of internet services**, data suggest that Malta's performance has been increasing since 2016, improving its ranking from year to year and placing itself 6th among the other EU Member States in 2020.

Looking at the **integration of digital technology**, Malta seemed to advance faster than most EU Member States, ranking 7th in 2020. A new Artificial intelligence strategy was established in 2019 and a regulatory and legislative framework for the use of blockchain and DLT technologies was adopted in 2018 through three legislative acts (MDIA, ITAS and VFA). The country continues this path under the National Recovery and Resilience Plan with different initiatives aimed to enhance the digitalisation of the public sector, advance the uptake, and use of new technologies in different sectors and foster research and innovation.

The advancement of **digital public services** seemed to have lost some dynamic during the last years in Malta, implying a drop of two ranks between 2018 and 2019 and confirming its 11th rank in 2020. However, this was mainly driven by a slower advancement in the use of eGovernment and open data, while Malta's provision of digital public services was well developed, and the country was recognised as leader in digital public administration as well as digital services for businesses. Several projects and initiatives have been launched during the last years to further improve the use of digital public services, such as Mapping tomorrow the new strategic plan to ensure further development of the digital transformation of the public administration. The further advancement of this dimension is also the focus of the National Recovery and Resilience Plan, considering that three of the eight measures containing digital objectives focus on the development of eGovernment and digital public servicers.

4.19.2 Reforms and investments

The Maltese National Recovery and Resilience Plan, submitted to the European Commission on 13 July 2021 for assessment, is originally called Malta's Recovery & Resilience Plan. It consists of six main components[185] and each component includes various reforms and investments[186]. Malta's Recovery and Resilience Plan amount to EUR 316.4 million, all in grants, of which 25.5% of are allocated to reach digital objectives,

[184] https://digital-strategy.ec.europa.eu/en/policies/desi-malta

[185] These components aim at: (1) Addressing climate neutrality through enhanced energy efficiency, clean energy and a circular economy; (2) Addressing carbon-neutrality by decarbonising transport; (3) Fostering a digital, smart and resilient economy; (4) Strengthening the resilience of the health system; (5) Enhancing quality education and fostering socio-economic sustainability; and (6) Strengthening the institutional framework

[186] The Plan does not detail the links between the reforms and investments contained in it, neither the amounts allocated to specific measures, but it provides the amount of money allocated from the RRF to each of the six main components. Three of the components include measures targeting digital objectives: components 3, 4 and 6.

amounting to EUR 80.8 million which will be invested particularly in the digitalisation of the public administration and public services, but also in the digitalisation of more than 300 companies, particularly SMEs. Malta's EUR 80.8 million, dedicated to digital objectives, will support the implementation of the following crucial investments by 2026. These have been grouped into four categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

eGovernment, digital public services and local digital ecosystems

Under the Maltese Plan, four investments are planned to foster eGovernment and improve the provision of digital public services in the country[187].

Improvement of the government digital backbone: This investment will strengthen the resilience, security and efficiency of the government digital backbone and increasing the homogeneity, standardisation and sharing of services across the government. The digital backbone is intended to also serve as the horizontal interoperable foundation to enable the implementation of, for example, the Once-Only principle and sharing of data.

Digitalisation of the Merchant Shipping Directorate: This investment will further digitalise the merchant shipping sector, which is of paramount importance to Malta. The investment in digital services and a cloud-based infrastructure shall help to ensure more efficient regulatory practices and improve the internal operations, customer relations and administration within Malta's Merchant Shipping Directorate, as part of Transport Malta.

Further digitalisation and modernisation of the public administration: Further digitalising the Maltese public sector will provide better customer experience to citizens and business organisations, increase the uptake of online services and ultimately enhance the competitiveness of the Maltese economy. The investment will also further develop remote working solutions for public officers, including by strengthening the Modern Digital Workplace, a remote work platform implemented in Malta since 2019.

Further digitalisation in the justice system: To achieve a more efficient administration of justice, the investment will finance the implementation of several secure digital solutions and tools to support justice sector users through collaboration and integration, increased accessibility to justice and strengthened efficiency, in line with the Digital Justice Strategy. The primary stakeholders are the Law Courts, Malta Police Force, State Advocate, Attorney General, Legal Aid and Asset Recovery Bureau.

Enhancing the resilience of the health system through digitalisation and new technologies: The objective of this investment is to speed up the digital transition of Malta's healthcare system. Digitalisation and reliance on new technologies shall improve the quality of patient care, enhance patient experience by timely and transparent information provision, and reduce waiting time.

Human Capital

[187] Three investments are planned based under the **Component 3** focused on the fostering a digital, smart and resilient economy. An additional investment under the **Component 6** on the strengthening the institutional framework, promotes this dimension as well.

The human capital dimension of Malta's Plan is fostered by three measures, an investment and two reforms, aimed at developing new digital trainings, bridging the digital divide in the Maltese population, as well as modernising work habits in the public sector through the adoption of remote work.[188]

Setting up of a Centre for Vocational Education Excellence (ITS Campus): The investment will allow the country to set up a Centre for Vocational Education Excellence by constructing a new Institute of Tourism Studies (ITS) campus to upskill the tourism workforce. The measure shall be accompanied by the development of up-to-date training programmes reflecting the emerging needs of the industry, including Digital Tourism and Artificial Intelligence in Tourism.

Policy priority

The human capital dimension of Malta's Plan is complemented by two reforms:

- The reform on **Deepening the digital transformation through policy reform,** will reduce the digital divide and promote digital skills to foster a digital, smart and resilient economy.[189]
- The second reform is **Promoting remote working in the public service.** This reform will leverage the use of technologies and online services through the promotion of remote work in the public sector, which will also reduce the number trips on the road network.[190]

Digital-related investment in R&D

This aspect[191] is only addressed by a single reform finalising and implementing Malta's Smart Specialisation Strategy, which has been published in November 2021, as explained below:

Policy priority

The Maltese Plan is supporting investments in R&D through the inclusion of a reform on the **finalisation and implementation of Malta's Smart Specialisation Strategy,** which includes particular focus on fostering business R&I and strengthening public-private cooperation.

Digitalisation of businesses

The digitalisation of businesses[192] is supported by one investment under the Maltese plan, as explained below:

[188] This aspect of the Plan can be found in the **Component 5** focused on enhancing quality education and fostering socio economic sustainability.
[189] The investment is placed under the **Component 5** focused on enhancing quality education and fostering socio-economic sustainability.
[190] The reform is placed under the **Component 2** centred on addressing carbon-neutrality by decarbonising transport.
[191] The aspect related to R&D included in Malta's Plan can be found in the **Component 3** on fostering a digital, smart and resilience economy.
[192] The investment linked to the digitalisation of businesses can be found in the **Component 3** on fostering a digital, smart and resilient economy.

Rolling out measures to intensify the digitalisation of the private sector: The investment will support companies in their digitalisation efforts by addressing gaps in funding opportunities. The investment shall support enterprises in acquiring new digital capabilities and digitalise operational processes such as product and process design, end-to-end procurement, supply chain/distribution and after-sales.

4.20 Netherlands

The Netherlands has not yet submitted its National Recovery and Resilience Plan to the European Commission. Therefore, the report does not contain the analysis of the Dutch Plan.

4.21 Poland

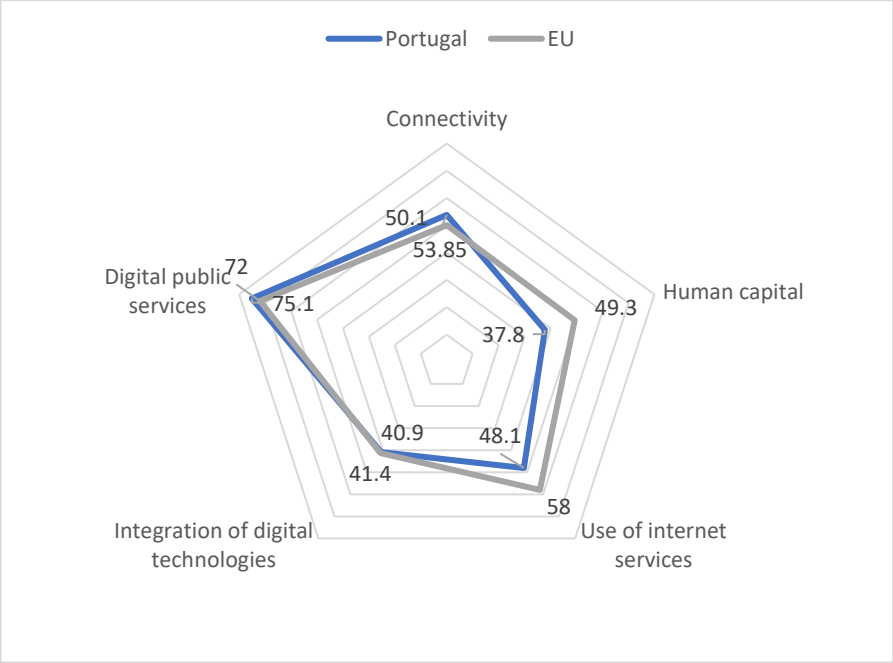
The Polish Recovery and Resilience Plan has not yet been accepted by the European Commission. Therefore, the report does not contain the analysis of Poland's Plan.

4.22 Portugal

4.22.1 Country digital outlook

Although Portugal has made significant improvements with regard to its digital transition in the past five years, it still seemed to be lagging behind other EU Member States in 2020 as it scored below the EU28 average in the 2020 edition of the Digital Economy and Society Index (DESI), based on data from 2019. From Figure 46 below, which indicates Portugal's performance on the five main DESI dimensions in comparison to the EU28 average, it emerges that the country scored particularly well and above the EU28 average in the use of internet services and human capital dimensions. The country also received one Country Specific Recommendation in 2020, to ensure equal access to quality education and training for all Portuguese students through the further integration of digital technologies. Against this background it must be said that the country's commitment to improve its digital transformation translated into its National Recovery and Resilience Plan, where Portugal invested a lot on digital objectives, as outlined in the following sections.

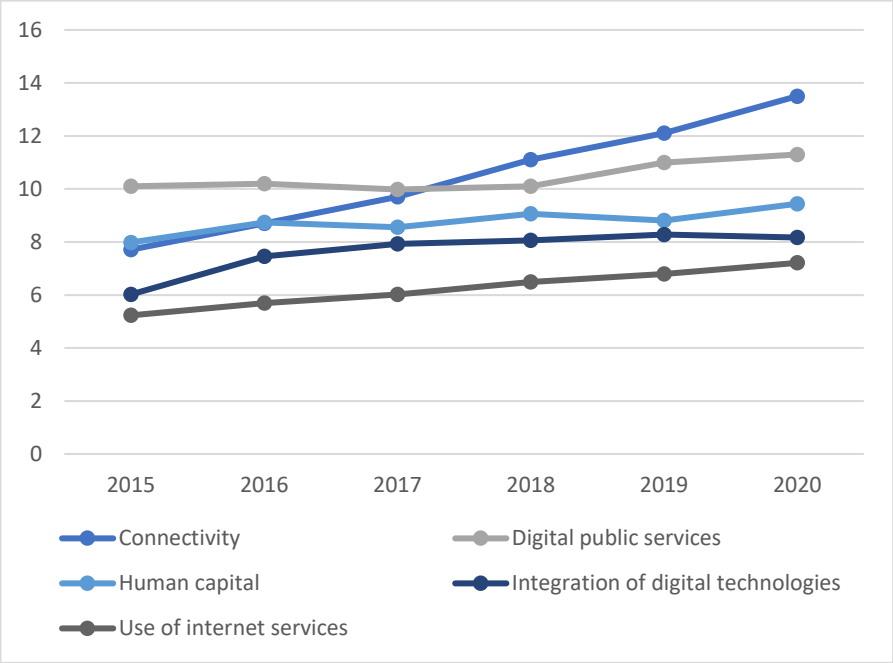
Figure 46. Performance on DESI 2020 - Portugal



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Additionally, such commitment emerges from Figure 47 below which reveals an increase of all five DESI dimensions since 2015, and particularly the connectivity one.

Figure 47. DESI indicators over the years - Portugal



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

In 2020, Portugal performed above the EU28 average in the **connectivity** dimension of the index. Particularly, Portugal scores high when it comes to fixed broadband coverage which provides for the whole country at different speeds. Several projects to modernise and enhance connectivity across Portuguese regions are also planned through the establishment of submarine cable systems. The submarine cable

system will ensure internet connectivity through cables undersea, connecting the Portuguese mainland to the Portuguese islands and even Brazil (Fortaleza). Similarly, initiatives for 5G trials are ongoing in the country. Connectivity plays an important part in Portugal's National Recovery and Resilience Plan and several initiatives have been set out to ensure access and connectivity to all citizens across the country's regions and across the economy's sectors.

In terms of **human capital**, improvements have been registered over the last years, as the country introduced significant measures to increase the digital skills and capabilities of its population such as INCoDe.2030, the national initiative on digital competencies or the launch of the Digital Competence Reference Framework. In line with this, in the country's Recovery and Resilience Plan numerous reforms and investments are put forward to further advance on this aspect, focusing particularly on advancing digital skills through vocational training and digital training for companies and the digitalisation of education.

As data suggests the **use of internet services** has been consistently growing over the last years in Portugal, although the number of people who never used the internet is twice the EU28 average, as shown by data from DESI 2020[193].

The **integration of digital technologies** has slowly improved in Portugal over the last five years as the country has taken several measures to enhance the uptake of digital technologies in businesses, such as the launch of the second phase of Industria 4.0 (i4.0), which aims at generating favourable conditions for digitalising the national industry and services. In addition, the National Recovery and Resilience Plan also introduces several initiatives aimed at enhancing, promoting and supporting the digitalisation of businesses and companies and to catalyse these processes.

The **digital public services** dimension is Portugal's strongest dimension and the country ranked above the EU28 average in 2020. Portugal continues to pursue its efforts to modernise and digitalise public services with the introduction of a new 2021-2026 strategy, aimed at digitally transforming public administration and particularly targets web accessibility of public services, the Once-Only principle, fostering interoperability and open data sharing as well as improving reference architectures such as eID, ICT skills, infrastructures for digital service provision as well as security and trust. Additionally, the development of web portals providing and consolidating public services for businesses and citizens has fostered the digitalisation of public services in Portugal. Along these lines, the National Recovery and Resilience Plan also introduced various initiatives aimed at improving the advancement of eGovernment and digital public services in the country.

4.22.2 Reforms and investments

The Portuguese National Recovery and Resilience Plan was submitted on 22 April 2021 to the European Commission for assessment and was originally called *Plano de Recuperaçao e Resiliência – Recuperar Portugal, Construindo o future.* It is structured into three main pillars and 20 components[194].The total amount allocated to the Portuguese Plan equals to EUR 16.6 billion, consisting of EUR 13.9 billion in grants and EUR

[193] https://digital-strategy.ec.europa.eu/en/policies/desi-portugal
[194] The three pillars of the Portuguese Plan are i) resilience, ii) green transition, and iii) digital transition.

2.7 billion in loans. 22.1% of the Portuguese Plan, equaling to EUR 3.7 billion, are allocated to digital initiatives which will be particularly aimed at developing digital skills for all, further encouraging the use of digital technologies to ensure equal access to education as well as continuing to boost firms' innovation and competitiveness. Portugal's EUR 3.7 billion, dedicated to digital objectives, will support the implementation of the following crucial investments by 2026. These have been grouped into six categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Connectivity plays a crucial role in the digital transformation of Portugal and investments in this area will further expand and consolidate the connectivity networks in the country[195]. In total, EUR 608 million of the Plan are allocated to foster connectivity in the Portuguese regions.

New generation of Equipment and Social Responses: This investment is intended to support and improve the existing equipment and social responses, ensuring the provision of WIFI solutions and IT equipment as well as digital training to facilitate communication and a better inclusion of disadvantaged people in the society (e.g., the elderly, people with disabilities). It will strengthening, adapting, upgrading and innovating social responses aimed at children, the elderly, people with disabilities and families, such as nurseries, elderly residential structures day centres, or activities and training centres for inclusion. EUR 417 million are allocated to this investment under the RRF.

High-speed broadband in the autonomous region of Madeira: The provision of high-speed broadband digital networks in the autonomous region of Madeira is the key objective of this investment in order to enhance the digitalisation of services and businesses in the region. EUR 78 million from the RRF are supporting this initiative.

Policy priority

The above-mentioned investments are complemented, although not directly linked to, a **reform on the expansion and consolidation of the network of interface institutions**. The reform's objective is to deepen the expansion and consolidation of the network of interfaces between academic, scientific and technological institutions. Technological interface systems and centres will be built in order to enhance and maximise the impact of the coordinated network of academic, scientific and technological institutions on technology transfers.

eGovernment, digital public services and local digital ecosystems

The advancement of eGovernment, digital public services and local digital ecosystems is a strong focus area of the Portuguese National Recovery and Resilience Plan with 14 investments and five reforms put forward and a total budget of EUR 1.48 billion[196].

[195] The Connectivity aspect of the Plan is covered by one reform and four investments under the Portuguese plan, falling under **component 3** social responses, **component 5** investments and innovation, **component 7** infrastructure and **component 19** public administration.
[196] This aspect of the Plan is covered under various components (**component 1** national health services, **component 6** qualifications and skills, **component 17** public finances, and **component 19** public administration).

Digital health transition: This investment is meant to improve the provision of health services and the resilience of the information systems available within the national health system to ensure greater security and auditability of health data and technological maintenance as well as the simplification, standardisation and digitalisation of communication channels between citizens and health units. EUR 300 million from the RRF are supporting this initiative.

Digitalisation of health in the autonomous region of Madeira: This EUR 15 million investment is targeted at the implementation of digital technologies to support the monitoring of patients, intensify telehealth, and to strengthen communication and information technologies as well as the use of artificial intelligence for epidemiological surveillance in the autonomous region of Madeira.

Digital Hospital in the autonomous region of the Azores: This investment, worth EUR 30 million, will foster the electronic provision of health records for each citizen to facilitate the sharing of data and clinical information across different providers of healthcare. Additionally, equal conditions for healthcare accessibility for all patients in the Azores shall be reached through this investment.

Public financial management information systems: This investment will improve the quality of public finances in Portugal, within the framework of the implementation of the Budget Framework Law. This translates into the implementation of integrated solutions for management, in a full procedural approach to the revenue and expenditure cycles. This investment receives EUR 163 million from the RRF.

Modernisation of the infrastructure of the property information system of the Tax Authority: Through this investment, the digitalisation of information will be promoted to support building matrices and reinforcing the infrastructure for preserving digitalised building information. Additionally, its target is to develop an information system to support simplified cadastral evaluation of rustic property and a system for registering rural property settlement. Lastly, a public property management

Policy priority

The above-mentioned investments accompany the **reform on modernisation and simplification of public financial management.** It focuses on reforming the budget process, accounting, control systems and management of public finances, on enhancing the efficiency of the management of assets as well as on increasing transparency of the use of public resources and the efficiency of public policies.

Digital transition of social security: The main objective of this investment is the digitalisation of services provided in the context of social security. The planned investment will finance initiatives in five strategic axes: i) reorganising and redesigning the social security system not only in the area of benefits, and contributions but particularly in cooperation, information management and payment channels, ii) developing and implementing a new cooperation model which streamlines and integrates various interaction channels of citizens and businesses with social security, iii) adapting ways of working in relation to telecommuting and communication, including the provision of necessary equipment, iv) implementing cloud based support solutions for social security systems, v) adapting professional processes and qualifications to a digitalised social security system. This initiative is allocated EUR 200 million under the RRF.

Economic justice and business environment: This EUR 267 million investment promotes the development of digital platforms, in particular the following: i) digital platforms of courts to support the development and implementation of procedural processing systems in all courts and instances; ii) digital platforms for the life cycles of citizens and companies, e.g. an integrated registry platform, a citizen card and a platform including a company's lifecycle information; iii) digital platforms for criminal and forensic investigation, iv) knowledge management platforms; among others.

Policy priority

To complement the above-mentioned investment, the reform on **Economic justice and business environment** directly addresses economic justice and will promote the competitiveness of Portuguese businesses, particularly by establishing a strategic framework for the digitalisation of justice as well as enabling the streamlining of licensing processes, the functional interoperability between services as well as the guarantee of compliance with the Once-Only principle.

Reformulate the provision of public services with the creation of a national single digital portal: This investment will materialise into specific projects that will allow the development of digital public services on an omni-channel basis. It will provide a Single Digital Services portal, a contact centre to handle the main services through this channel, expand the network of citizens' shops (*Lojas de Cidadão*), citizen spaces and mobile spaces to reach those who have no access to digital services. This investment receives EUR 188 million through the RRF.

Sustainable eServices based on interoperability and use of data for an increase in transparency and efficiency: This investment will increase interoperability between different public services provided by different public bodies authorities, to ensure the sharing of data between different bodies of the public administration and thus enhance efficiency. EUR 70 million are allocated to this investment from the RRF.

Efficient, secure and shared critical digital infrastructures: This investment targets the reduction of the bureaucratic burden of administrative processes and to digitalise the public administration through the use of efficient digital infrastructures and tools. To do so, it will increase the resilience and digitalisation of the government's IT network, increasing the coverage and capacity of communications network of state emergency, renewing the architecture and processes of information systems in relation to management and border control, asylum and judicial cooperation. This investment receives EUR 83 million from the RRF

Policy priority

The above-mentioned investments set out to accompany the reform on **Digital public services, simple, inclusive, and safe for citizens and companies.** This reform intends to strengthen the relationship between the citizen and the state, by improving their digital experience, by eliminating discrepancies in usability and accessibility when it comes to digital public services and ensuring inclusion.

Modernisation and digitalisation of regional public administrations (Azores): This investment intends to invest in the modernisation and digitalisation of the public administration of the autonomous region of the Azores. Its objective is to turn the public administration into a more proactive, inclusive, and open public administration providing agile and digital public services. This investment receives EUR 25 million from the RRF.

Human Capital

Enhancing human capital, and particularly digital skills, is important to ensure the sustainability and effectiveness of the digital reforms put forward and to ensure that the whole population is participating in the digital transformation. Human capital is one of the main focus areas of the Portuguese plan[197]. In total, EUR 750 million have been allocated to foster human capital across Portugal.

Digital training for companies: This EUR 100 million investment focuses on the provision of two interlinked training programmes, with innovative approaches and that aim to fill the gaps in the digital skills of workers (employees and entrepreneurs) and companies:

- Academia Portugal Digital: This platform and programme allows for the development of large-scale digital skills among the workers, allowing them to produce a self-assessment of their current level of digital skills; to receive a personalised digital skills training plan with concrete goals; to access online training resources to acquire new skills and achieve pre-assigned goals, among others.
  Employment + Digital 2025 training programme in digital technologies: This programme is a specialisation of the above-mentioned Academia Portugal Digital, offering training to build digital skills in face-to-face and mixed formats in sectors which are particularly subject to changes through the digital transformation as well as hurt by the COVID-19 pandemic.

Digital transition in education: This investment will enable the use of digital educational equipment and resources by all students, teachers and management support stuff in order to increase and facilitate the development of digital skills through an increased connectivity of schools to the internet and the Extended Education Network . Additionally, the necessary equipment and resources shall be provided, and digital education laboratories will be build using this investment. In total EUR 500 million are allocated to this investment from the RRF.

Policy priority

The above-mentioned investment complements the **Digital Education reform,** whose objective is the overall strengthening of the population's digital skills. In order to reach this goal, several initiatives are planned such as i) the development of cross-curricular digital skills in different subjects; ii) the update and modernisation of educational spaces, creating conditions for the improvement of schools' successes and the reduction of early school leaving; iii) ensuring that all students and teachers have the equipment and necessary conditions to use the technologies as a pedagogical added value and iv) encouraging equal participation of both sexes and stimulating pathways training of girls in information and communication technologies.

Digital Education (Autonomous region of Azores): This investment will guarantee the same access to the technologies and the development of digital skills in the Azores as in the mainland. EUR 38 million are allocated to this investment under the RRF.

Acceleration programme for the digitalisation of education (Autonomous region of Madeira): This investment will fund the development and the promotion of educational and technological resources in schools. Specifically, this investment will provide innovative learning environments, as well as the provision of tools, equipment and training resources for all students of the region of Madeira. EUR 21 million are allocated to this investment under the RRF.

[197] This aspect is covered under various components (**component 6** qualifications and skills, **component 16** Enterprises 4.0, **component 19** public administration, and **component 20** digital school) under the resilience and the **digital transition pillar** of the National Recovery and Resilience Plan.

New digital solutions for the inclusion of disadvantaged people: This investment will implement new digital solutions to improve the inclusion of disadvantaged people (in particular people with disabilities) through a consultation platform allowing everyone to retrieve information about public and private properties and their accessibility characteristics using GPS. This investment is supported with EUR 3 million by the RRF.

Modernisation of the infrastructure for education and vocational training: This investment will provide schools and professional training centres with the essential equipment to pursue distanced learning, technological intensive trainings as well as adjusting and upgrading physical spaces to the different requirements of courses offered to enhance digital and technological knowledge.

Policy priority

The above-mentioned investment comes complementing the **reform of educational and vocational training**, which will strengthen the responsiveness of the education system to today's challenges and in particularly to provide students with digital skills to respond to the digital transformation processes.

Empowerment of Public Administration - training of workers and management of the future: This investment will ensure that the public administration has the human resources available and trained, namely in terms of management and technologies, to effectively take advantage of the digital transformation, with a view to providing better public services for citizens. In total EUR 88 million are allocated to this investment from the RRF.

Policy priority

To complement the above-mentioned investment, Portugal introduced the **reform on Public administration empowered to create public value**, which will prepare the public administration and its workers for the challenges of the digital transition by i) increasing the level of qualifications and skills (particularly digital ones) of civil servants, ii) creating conditions for the adoption of more agile and adaptive models for providing work in public functions.

Policy priority

Two additional reforms come completing and complementing the initiatives listed above to improve the country's human capital:

- The **reform on the digital transition of business**, which intends to accompany the implementation of the digital transition action plan and aims at (i) strengthening the digital skills of the employed and active population; (ii) transforming companies' business models to make the most of advanced technologies; and (iii) catalysing the integration of technologies in companies through innovation, trust, and security.
- The **reform of cooperation between higher education, public administration and businesses**. It will review the legal and institutional framework that is in force in Portugal and that governs the cooperation of higher education institutions, including all universities and polytechnics, with public administration and companies, with the aim of modernising the incentives for better cooperation and support for the diversification of the training offer and for life-long learning.

Investment in digital capacities and deployment of advanced technologies

The below investment in digital capacities and the deployment of advanced technologies will mostly focus on the strengthening of Portugal's current cybersecurity framework[198]. In total, EUR 47 million are allocated under the National Recovery and Resilience Plan to support the enhancement of this dimension in the country.

Strengthening the overall cybersecurity framework: This EUR 47 million investment focuses on four measures: i) strengthening training in cybersecurity and information security, ii) increasing security in information life cycle management, iii) implementing the national cybersecurity framework and reorganise the model of coordination of cybersecurity and information security in Portuguese public administrations, and iv) creating the physical and technological conditions for the implementation of the new cybersecurity and information security coordination model.

Digital-related investment in R&D

The below investment in digital-related R&D has been put forward by Portugal, and together with the reform on the promotion of research, development and innovation they are meant to support the country's business innovation and boost its economic competitiveness[199].

Renewal of the scientific and technological support network and direction towards the manufacturing sector: This investment focuses on the need to strengthen and empower the research and innovation system in Portugal and specifically to promote its interconnection and collaboration within the industry to ensure an effective transfer of technology and digital knowledge throughout the economy and the society. Its main intention is the extension and enhancement of a new funding model for interface institutions to allow them to focus on their core activities independent of economic value creation. This investment receives EUR 186 million from the RRF.

Policy priority

Portugal put forward a **reform on the promotion of research, development and innovation** which will provide a clustering and prioritisation of collaborative innovation strategies which foster the training and strengthening of the R&D system. These strategies are crucial in the development of applied research to support business innovation, and to ensure the country's future competitiveness through innovation.

Digitalisation of businesses

The digitalisation of businesses is meant to ensure and boost the competitiveness of the Portuguese industry. This aspect is supported by three investments and an amount of EUR 643 million is allocated to them[200].

[198] This aspect of the Plan is covered by different components: **Component 4** (Culture), **Component 5 (**Investments and innovation), **Component 8 (**Forests), **Component 16** (Enterprise 4.0), and **Component 19 (**Public administration) covered under both the resilience and the digital transition pillar of the plan.
[199] This aspect of the Plan is covered by only one reform under **Component 5** investments and innovation under the resilience pillar of the Portuguese plan.
[200] This aspect of the Plan is covered by **component 16**, Enterprise 4.0 under the **Digital pillar**.

Digital transition of companies: This EUR 450 million investment contributes to the transformation of the business models of Portuguese SMEs and to their digitalisation, aiming at greater competitiveness and resilience. It integrates the promotion of business digitalisation through the acceleration and automation of intelligence-based decision making, the redesign of value and supply chains, the optimisation of speed and resilience and the use of cross-sector data spaces.

Catalysing the digital transition of companies: This investment will reduce the use of paper by businesses through the dematerialisation of invoicing, create a safer and more reliable business environment, through a set of certifications, and reduce overall red tape costs structured through i) promote digital innovation hubs and centralising a set of services to support the digital transition of companies ii) dematerialise invoicing by targeting the automation of the process of affixing a qualified electronic signature for issuing invoices, and iii) developing structures for cybersecurity, privacy, usability and sustainability certification seals. This investment will receive EUR 100 million from the RRF.

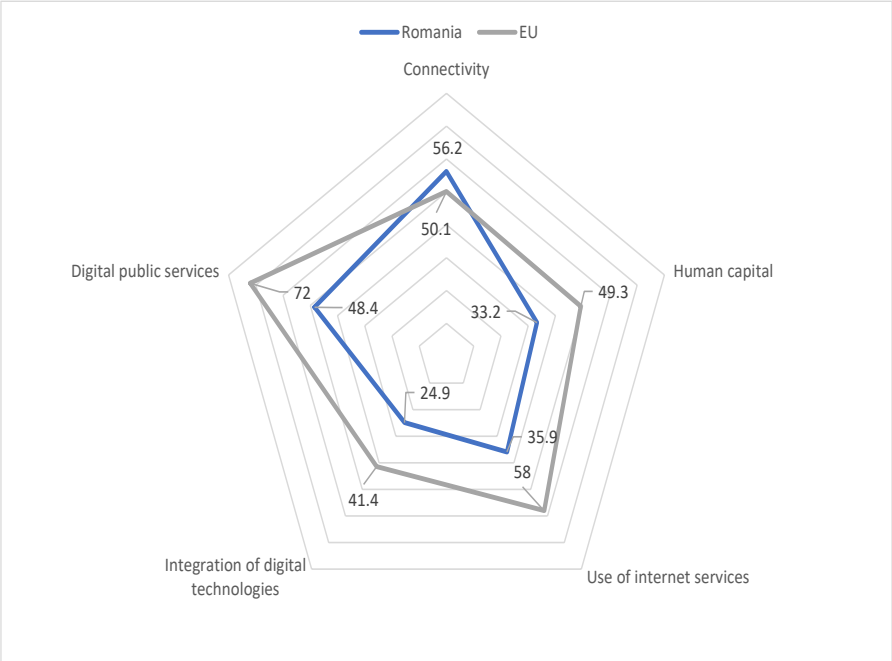
Cultural network and digital transition: This investment, worth EUR 93 million, will primarily finance the digitalisation and modernisation of the technological infrastructure of the network of cultural facilities, such as theatres, cinetheatres, cinematheques, museums, art centres, libraries, conservation and restoration laboratories, and national archives. This investment will create a network of cultural facilities and will support the digital transition of the public cultural facilities.

4.23 Romania

4.23.1 Country digital outlook

Digital transformation represents a huge opportunity for Romania to increase its productivity, innovation and employment, as well as to ensure wider access to education for all. Nonetheless, in 2020 Romania was still lagging behind other Member States in terms of digital transformation, as highlighted by the Digital Economy and Society Index (DESI) in 2020. Indeed, Romania, together with Italy, Greece and Bulgaria, had one of the lowest rankings regarding its digital economy in 2020, scoring 26th in the overall ranking of all EU28 Member States. Figure 48 below shows the performance of Romania on DESI 2020, based on data from 2019. As illustrated in this figure, Romania scored above the EU average on connectivity, but below it on the other four dimensions. Considering these challenges in the digital sphere, in 2020 Romania also received two Country Specific Recommendations in the context of the European Semester calling the country to strengthen skills and digital learning nationwide and to focus investment on the digital transition, and more specifically on the development of very high-capacity ICT infrastructures. Against this background, Romania has shown great commitment to enhance its digital transformation process, as also demonstrated by the strong focus on digital matters in its Recovery and Resilience Plan, detailed in the following sections.

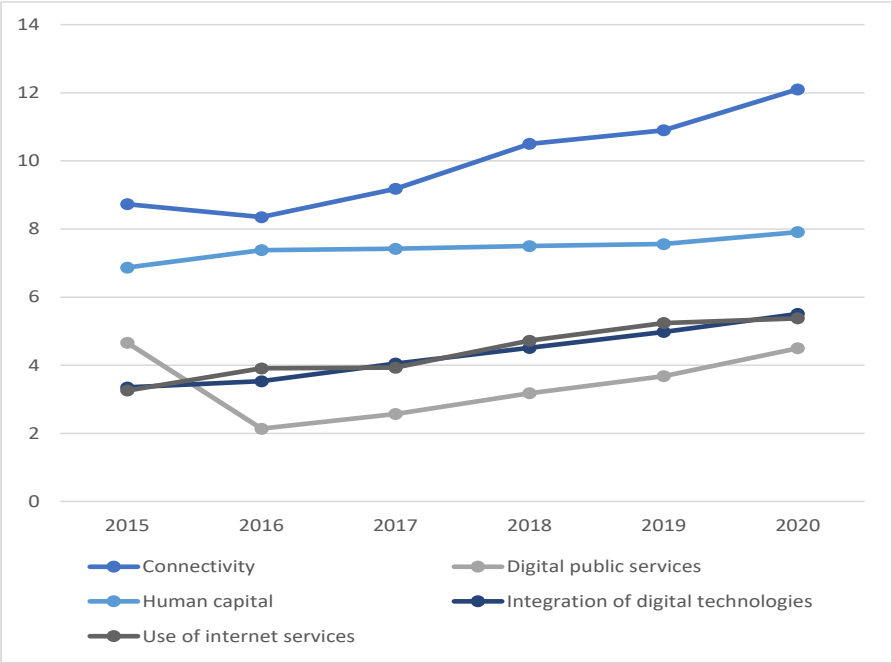
Figure 48. Performance on DESI 2020 - Romania



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Such commitment emerges from Figure 49 below, which shows the evolution of Romania's performance in the five main DESI dimensions since 2015. In particular, significant improvements have been registered in connectivity and digital public services.

Figure 49. DESI dimensions over the years - Romania



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

On **connectivity**, Romania ranked 11th among EU Member States on DESI 2020, scoring above the European average. Romania performed best on this dimension, thanks to the high uptake of ultrafast broadband and the availability of fixed very high-capacity networks, especially in urban areas. However, the digital divide between urban and rural areas was still important in this country. To tackle this issue, the

National Strategy on the Digital Agenda for Romania 2020 adopted in 2015 will be revised to reflect the new Gigabit Society targets. Romania also adopted a new 5G strategy in 2019. In addition, Romania's Recovery and Resilience Plan includes a reform and an investment to develop high-speed networks in rural areas.

Romania scored 27th on the **human capital** dimension on DESI 2020. One out of three Romanians had at least basic digital skills (31% versus 58% for the EU average) and only 10% of the population had 'above basic' digital skills in 2020 (versus 33% for the European average). Even though Romania performed well regarding ICT graduates, the number of ICT specialist part of the national workforce was still under the European average (2.2% versus 3.9%). Despite several initiatives of the government in this field, such as the National Coalition for Digital Skills and Jobs called Skills4IT or the EDULIB project[201], results were still too limited. However, Romania's Plan intends to respond to this challenge through multiple investments and reforms focused on increasing digital skills of all Romanians and the creation of new digital trainings.

Regarding the **use of internet services**, Romania continued to score the 28th place on DESI 2020 for the third consecutive year. Surprisingly, the use of social media and video calls is higher than the EU average and Romania scored 6th among EU countries on those specific online activities. In contrast, Romanians are much less keen to use other online services such as banking or shopping.

Following the same logic, Romania ranked 27th on the **integration of digital technologies** by businesses on DESI 2020, below the EU average. Despite a slight improvement in the share of SMEs selling online, Romania's indicators for this dimension stayed constant over the last three years. This can be partially explained by the fact that Romania is lacking a national strategy for the digital transformation of compagnies. With regards to Romania's Recovery and Resilience Plan, the digitalisation of businesses and their intake on digital technologies is one of the focus points of the Plan, which includes multiple investments and reforms to increase employees' digital skills and support SMEs' digitalisation.

Finally, Romania scored the 28th place on **digital public services**, ranking at the last place on this dimension for the third consecutive year. While Romania ranked 8th in terms of eGovernment users (82% compared to the EU average of 67%), scores for pre-filled forms and completion of online services were still well below the EU average. This disparity seems to be linked to the low usability of eServices and the lack of interoperability between the different digital public services and their IT systems. Romania intends to tackle these issues through the adoption of several initiatives in its Plan, focused on the modernisation of eServices and public administrations' IT infrastructures, as well as the adoption of electronic identification.

4.23.2 Reforms and investments

Romania's Recovery and Resilience Plan, whose official name is *Planul Național de Redresare și Reziliență*, is subdivided into six pillars, each covering one or many reforms and investments. The total amount allocated to the Romanian Plan equals to EUR 29.1 billion, consisting of EUR 14.2 billion in grants and EUR 15.9 billion in loans. Investments and reforms related to the digital transition represent 21% of the Plan's total allocation,

[201] A project centred around the creation of a virtual library of open educational resources presented on a digital platform.

amounting to EUR 6.1 billion, and can be found in four pillars[202]. When it comes to digital objectives, the country particularly aims at extending its high-speed networks coverage, modernising various components of its public administrations and their digital services, as well as developing new trainings for students, teachers, civil servants and employees in order to improve Romanian digital skills and the content of educational programmes.

Romania's EUR 6.1 billion dedicated to digital objectives will support the implementation of the following crucial investments by 2026. These have been grouped into five categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Romania will invest EUR 94 million to enhance its connectivity[203] through an investment focused on the development of its high-speed coverage as further detailed here below:

High-speed coverage, including in underserved areas: This investment, worth EUR 94 million, will improve the coverage with very high-capacity networks and fixed-point Internet access services of approximately 790 rural localities and villages where the market cannot deliver such services.

Policy priority

The above-mentioned investment complements the reform on **Aligning the national digital connectivity strategy with European legislation** through specific measures to achieve the EU 2025 connectivity targets and to stimulate private investment for the development of very high-capacity networks with wide coverage nationally, including in transport networks and areas of environmental interest, by removing barriers in the current regulatory framework.

eGovernment, digital public services and local digital ecosystems

The development of eGovernment, digital public services and local digital ecosystems[204] seems to be an essential aspect of the digital part of the Romanian Plan with eleven investments worth approximately EUR 2 billion. Through the further digitalisation of its public services and institutional processes, Romania aims to modernise its public sector in various aeras such as justice, health, tax, pensions, public procurement and eID.

[202] Namely, Pillars 2, 3, 4 and 6.
[203] The connectivity aspect of the Plan is covered by **Pillar 2** (Digital Transformation) under **Component 1** (Government cloud and digital public systems).
[204] Investment related to eGovernment, digital public services and local digital ecosystems are covered by **Pillar 2** (Digital Transformation) under **Component 1** (Government cloud and digital public systems) and in **Pillar 3** (Smart, sustainable and favourable growth) under **Component 1** (Tax and pension reform).

Development of eHealth and telemedicine system: Romania will invest EUR 400 million to modernise healthcare services by ensuring the cybersecurity of the systems by implementing GDPR[205] norms, by strengthening the capacity of central, regional and local health institutions to digitally manage health data; by improving health institutions digital infrastructures and, finally, by accelerating the adoption of telemedicine solutions and streamlining the needed processes.

Digitalisation of the judiciary: This investment, worth EUR 127.31 million, will promote the use of electronic documents, electronic signatures, and seals, while modernising registers, increasing interoperability between national and EU public authorities and strengthening cybersecurity and IT governance. These measures will improve the access to information and streamline administrative processes across the justice system.

Digitalisation in employment and social protection: Romania will invest EUR 85 million into the digitalisation of eServices related to employment and social protection, through the development of their IT system and a better management, use and availability of digital data.

Implementation of the eForms/electronic forms in public procurement: The main purpose of the investment, worth EUR 0.85 million, is to promote the modernisation of the national public procurement system, both in terms of ensuring efficiency, transparency, and integrity, as well as to facilitate the collection, consolidation, management and analysis of public procurement data.

Digital transformation and automation in public administration: The main objective of this investment is to contribute to achieve massive data processing securely and with adequate processing speed in order to create an optimal space for scalable automation operations. By strengthening its digital channels and redesigning eDelivery, Romania will provide a holistic and easy access to public services with citizen-friendly interactions, while using the potential of advanced technologies such as AI or virtual reality.

Electronic identity card and digital signature: The investment, worth EUR 200 million, will stimulate the voluntary adoption of electronic ID cards for citizens, using qualified digital signature.

Digitalisation of tax eServices and internal processes: Romania will invest EUR 200.8 million in the expansion of remote and digital services for taxpayers and in the simplification of administrative procedures and the promotion of eForms. An additional goal is to create a new procedural and supportive framework for the development, implementation and use of an integrated risk management in the tax administration.

Digital transformation of Ministry of Finance (MF) and the National Agency for Fiscal Administration (NAFA): This EUR 78.5 million investment will modernise the entire MF/NAFA IT system. This measure, which is supporting the investment mentioned above, will accompany the operational digitalisation of the tax administration.

Policy priority

The above-mentioned investment complements a **broad reform on taxation**, which will create a procedural and supportive framework for the development, implementation and use of an integrated risk management in the tax administration for identifying, planning, evaluating, and adapting activities.

[205] General Data Protection Regulation.

Implementation of electronic customs: Romania intends to invest EUR 28.1 million to improve the administrative and operational capacity of the customs authority and moving customs clearance towards a fully electronic environment. Through this measure, information exchanges between economic operators and customs authorities, as well as between customs authorities in the Member States, will be carried out exclusively by electronic data processing and dissemination techniques.

Digitalisation of the pension system: This investment of EUR 61.88 million will support the digitalisation of state processes linked to the pension system and the creation of new eServices for citizens. In addition, the use of historical data analysis (business intelligence) and predictive analysis (AI, machine learning, big data) tools will be promoted to support government decision making in this field.

Policy priority

The above-mentioned investment accompanies a **broad reform of pensions**, which will include a new digital monitoring mechanism based on real and predictable indicators that generate confidence in the system while ensuring real predictability in the evolution of public pensions.

Digital platforms on legislative transparency, 'de-bureaucratisation' and procedural simplification for businesses: Romania will invest EUR 14 million to support the competitiveness of the business environment through the digitalisation of public services for businesses and the creation of a new platform for the business sector in connection with the de-bureaucratisation reform and procedural simplification.

Policy priority

The above-mentioned investment supports the reform **Legislative transparency, de-bureaucratisation and procedural simplification aimed at business environment,** which pursues the same objective than this investment.

Human Capital

The human capital dimension[206] is another key aspect of Romania's Plan. Indeed, this country will invest into the development of digital skills, which will be essential to the future national economic growth and productivity, through the elaboration of new digital trainings for students, teachers, civil servants and employees.

Creation of new cybersecurity skills for the society and the economy: The ambition of this initiative, supported by an investment of EUR 25 million, is to develop a toolkit to increase cybersecurity skills and to develop a portfolio of specific cybersecurity training services for graduates and students.

Advanced digital skills training programme for civil servants: This EUR 20 million investment will train the public administration staff, which will ensure a higher level of digital skills in the Romanian public administration, thus contributing to the success of measures to digitise public services and the internal operations of the administration. This measure will increase institutional efficiency and resilience.

[206] Human capital-related aspects are covered by **Pillar 2** (Digital Transformation) under **Component 1** (Government cloud and digital public systems), as well as **Pillar 6** (Policies for the next generation, children, and youth, such as education and skills) under **Component 1** (Educated Romania).

Policy priority

The above-mentioned investment complements the **Increasing digital skills for public service and digital education on life-long learning for citizens** reform, which aims to promote the increase of digital skills and the concept of life-long learning for civil servants, and more globally, for all Romanian citizens.

Funding schemes for libraries to become digital skills hubs: Projects supported by this EUR 21 million investment will finance the creation of a sustainable and scalable network with national coverage that will become hubs for digital skills development in local communities. Theses hubs will provide accessible training services to a wide range of target groups, by transforming the currently under-utilised library network.

Schemes to upskill/reskill employees in firms: This investment will support SMEs in Romania that have viable plans to digitally transform their business model, through the implementation of smart technologies (4.0) in production, distribution, internal operations, new product development, or new interaction models with customers and suppliers or to retrain their workforce in technical areas (programming/coding, data analytics, cyber-security, computer-assisted design, additive manufacturing). This EUR 36 million investment will increase the competitiveness of the Romanian workforce and firms.

Systemic interventions to support reforms linked to digital education: This investment will standardise funding to schools for both the development of digital skills and the purchase of materials, with particular attention to disadvantaged schools and those with a high drop-out rate. This initiative includes the creation of a new support mechanism for teachers, the Early Warning Mechanism in Education, whose main objective is to reduce the drop-out rate in schools.

National training programme for teachers aligned with the European framework of digital competences for citizens (DigComp): The aim of this training programme is to enable teachers to acquire skills in digital pedagogy, particularly those related to the collection and effective use of digital tools and resources in order to adopt an experimental transdisciplinary pedagogy and an integrative learning mode. This programme is expected to develop digital pedagogy skills for 100 000 employees/teachers by 2025.

Ensuring digital technology equipment and resources for schools: Romania will invest EUR 478.5 million to provide digital technology infrastructure and resources to educational establishments in the pre-university system, particularly to schools in disadvantaged areas. 6176 computer labs will be upgraded to digital educational labs, which will be used as creative learning spaces for digital and technological literacy, and to develop a total of 1175 ‘Smart Labs’ schools.

Online School - Assessment platform and content development: This EUR 78.59 million investment will finance the development of an online digital ecosystem for education to expand the acquisition of digital competences in pre-university education. A second goal is to create the framework for the use of the online environment for national assessments allowing remote testing, by developing a secure remote assessment and testing system.

Digitisation of universities and their preparation for the digital professions of the future — National Board of Rectors: This investment, worth EUR 244 million, is focused on the digitalisation of universities and is subdivided into two main components:

- Redefine university governance, including multi-level functional governance of training both for emerging and future digital professions, with a focus on the territorialisation of training, with emphasis on the regional dimension;
- Support the equipping of higher education institutions with digital eLearning and administrative devices and platforms to respond to the new challenges generated by the COVID-19 pandemic, for the creation of new skills of the future through continuous innovation of curricula.

Policy priority

The digitalisation of education will be supported by an additional reform on the **Adoption of the legislative framework for the digitisation of education**. This reform is focused on adapting schools to the demands of the future, by developing a dynamic and innovative ecosystem of high-performance digital education, by linking flows on hard (equipment) and soft (skills) infrastructures.

Investment in digital capacities and deployment of advanced technologies

Investments in digital capacities and in advanced technologies[207] will complement the overall transformation and digitalisation of the Romanian public administration. Indeed, further investments in cybersecurity and in cloud technologies, including the creation of a new government Cloud infrastructure, will increase Romania's digital capacities, as further described below:

Deployment of the Government Cloud Infrastructure: EUR 374.7 million will be dedicated to the creation of a government cloud infrastructure, using state-of-the-art technologies, highly cybersecure and energy-efficient. This cloud infrastructure is necessary to ensure the hosting of central public IT systems and their interoperability in a unified and standardised way.

Policy priority

The above-mentioned investment accompanies the reform on **Developing and implementing a unitary framework for defining the architecture of a government cloud system**, which will support the framework establishment in defining the architecture of the cloud system, the main services delivered by it, its components, the architecture of its infrastructure and governance components, as well as its design.

Cloud development and migration: Through a EUR 187.05 million investment, technologies currently used in public institutions will be upgraded to become 'cloud-ready'. In parallel, new cloud-native applications will be created to support the migration of public administrations activities to the cloud.

Ensuring cybersecurity protection for both public and private IT infrastructures using smart technologies: Romania will invest EUR 100 million in the promotion of cybersecurity and best practice models in security assurance approaches in order to increase the resilience of private and public IT infrastructures, which is an essential component of successful cybersecurity activities.

Development of security systems for the protection of the government spectrum: Romania will invest EUR 28.86 million to increase the level of protection of public authorities providing digital services to citizens.

[207] Investments and reforms in digital capacities and related to the deployment of advanced technologies can be found in **Pillar 2** (Digital Transformation) under **Component 1** (Government cloud and digital public systems) and **Pillar 3** (Smart, sustainable, and favourable growth) under **Component 2** (Support for business, research, development and innovation).

Increasing the resilience and cybersecurity of Internet Service Provider (ISP) services: This investment, worth EUR 18.39 million, will financially support the resilience and cybersecurity of the ISP services and their infrastructure providing services to public authorities in Romania. This measure will participate to increase the cyber-resilience of digital public services, which will become more secure for citizens.

Policy priority

The above-mentioned investments complement the reform on **Increasing the scope of protection and ensuring cybersecurity of public entities and private entities with critical infrastructures**, which pursuits the same overreaching objective of increasing cybersecurity.

Digitalisation of businesses

The digitalisation of businesses[208] is another focus point of the Romanian Plan, which aims not only to the digitalisation of business processes and the adoption of advanced technologies, but also to the development of new digital services and products. The culture and film sectors are also targeted by these measures.

Financial instruments for the private sector - digitising SMEs: Romania will invest EUR 50 million to support the digitalisation of businesses through five measures:

- Measure 1: Portfolio Guarantee for Resilience
- Measure 2: Climate Action Portfolio Guarantee
- Measure 3 (SMEs): Venture Capital Fund for Recovery
- Measure 4 (Large companies): Fund of Funds for Digitisation, Climate Action and other areas of interest
- Measure 5: Financial Instrument for Energy Efficiency Investments in the Residential and Buildings Sector

Private sector aid schemes: This EUR 630 million investment will finance the digitalisation of SMEs, to help Romanian companies in the process of listing on the stock exchange, to support digital compagnies in particular in the area of innovation and new technologies applied in the production area and to conduct further investments in digitalisation, advanced technologies and cybersecurity.

Development of a digital system for cultural funding processes: This investment, worth EUR 3.75 million, will help the cultural sector to create more effective marketing tools, which will contribute to attract new markets, to increase the accessibility of information about the destination and thus increase the number of tourists and the length of their visit. Accurate data collection is essential to develop evidence-based policies, leading to better implementation of this strategy.

Digitalisation of film production and distribution: The purpose of the investment, worth EUR 5.46 million, is to increase the organisational/business capacity of producers and distributors of films, to increase the competitiveness of Romanian producers and distributors on the international market and to increase the digital skills of the film workforce and their use of digital tools.

[208] Investments and reforms related to the digitalisation of businesses are found in **Pillar 3** (Smart, sustainable and favourable growth) under **Component 2** (Support for business, research, development and innovation) and **Pillar 4** (Social and territorial cohesion) under **Component 2** (Tourism and culture).

Policy priority

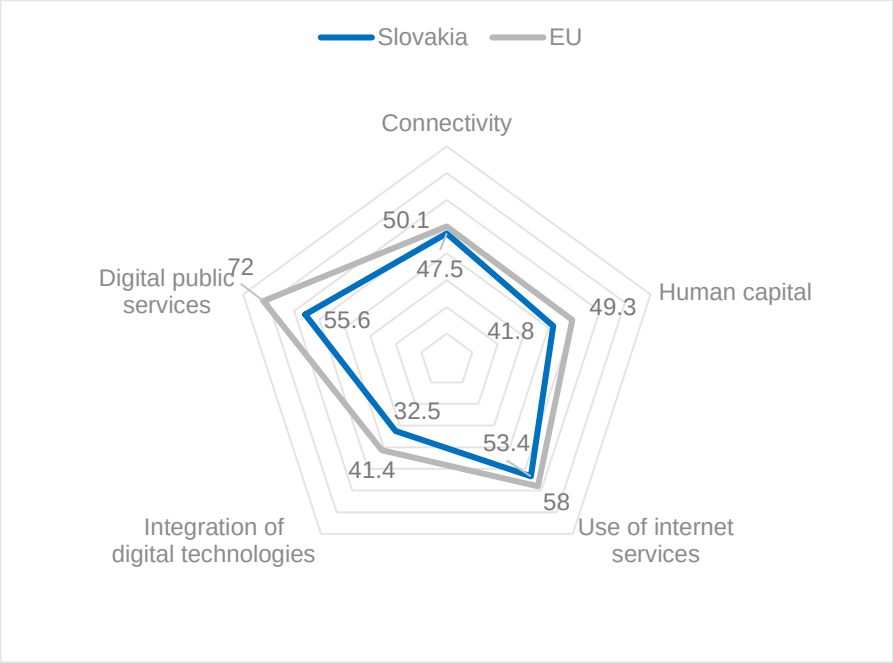
The above-mentioned investment complements the reform **Reforming public co-financing models and the digital transition of the cinema sector**, which aims to build digital capacity in this specific economic sector.

4.24 Slovakia

4.24.1 Country digital outlook

The digital transformation of Slovakia has yielded ample opportunities for the country to increase its competitiveness, productivity and economic growth as well as to ensure long-term employment. However, and despite recent improvements, Slovakia seems to still be lagging behind other EU Member States in relation to its digital transformation in 2020, as suggested by data from the Digital Economy and Society Index (DESI) 2020. Based on data from 2019, the index reveals that Slovakia scored below the EU28 average in 2020 and ranked 21st out of the 28 EU Member States, with only Poland, Cyprus, Italy, Romania, Greece and Bulgaria scoring behind. In particular, the dimensions related to digital public services and the integration of digital technologies seemed to be particularly lower in Slovakia compared to the EU28 average, as indicated by Figure 50 below, which shows the country's performance on the five main DESI dimensions compared to the EU28 average. In the same year, the country also received two Country Specific Recommendations in the context of the European Semester, aimed at ensuring access to quality education and training to enhance digital skills, particularly among the youth and teachers, while also fostering broadband coverage throughout the whole country. Against this background it must be noted however, that, especially in the last three years, significant efforts have been taken by Slovakia to try to close the country's digital gap. This commitment is further reinforced by the digital objectives that the country set out in its National Recovery and Resilience Plan, detailed in the following section.

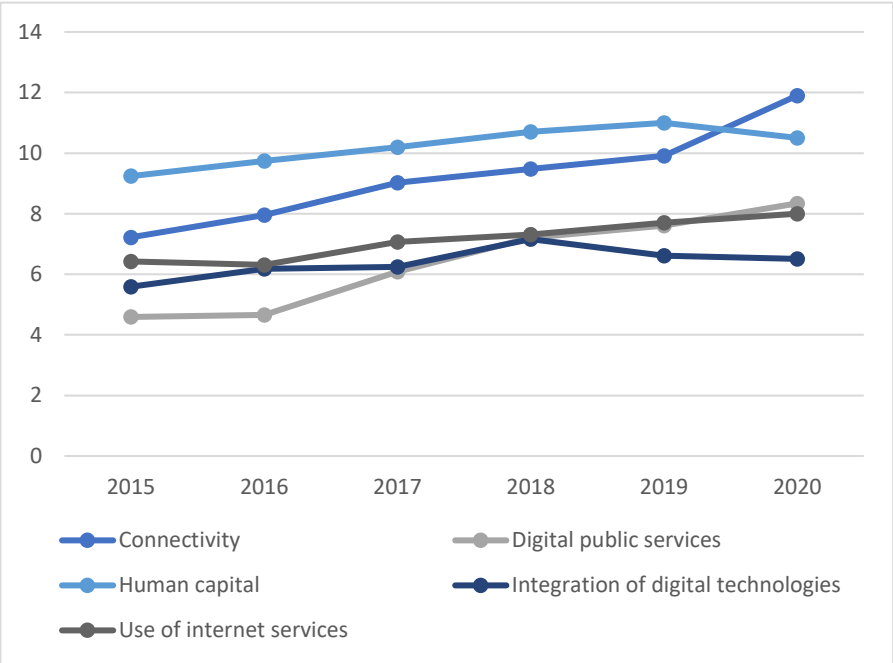
Figure 50. Performance on DESI 2020 - Slovakia



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Additionally, such commitment is also visible through Figure 51 below, which indicates an increase of all five main DESI dimensions since 2015. While improvements were recorded across all dimensions, the connectivity and digital public services dimensions were the ones recording the most significant increases since 2015, with +4.7 points and +1.7 points respectively.

Figure 51. DESI indicators over the years - Slovakia



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Connectivity is the dimension in which Slovakia scored the closest to the EU28 average. This positive and encouraging trend is likely to continue with the implementation by Slovakia of its National Broadband Plan for

2021-2025. Additionally, in 2020 a Broadband Mapping Programme was launched and private investments were made to cover the remaining white spots of high-speed broadband coverage with fast broadband connections. Additionally, the country's National Recovery and Resilience Plan aims to continue improving connectivity by introducing various investments and reforms such as providing access to Internet with a speed of 100 Mbit/s to everyone by 2030.

Concerning the **human capital** dimension, Slovakia has taken significant steps to improve the digital skills of its society and advocated for the improvement of digital skills as a main priority of the Slovak Digital Transformation Strategy 2030 and the accompanying Action Plan in 2019. In the upcoming years, Slovakia will also take further efforts to enhance the digital skills of its population as suggested by the initiatives put forward by its National Recovery and Resilience Plan. The initiatives target all population groups, ranging from primary school pupils to seniors.

Data suggests that the **use of internet services** improved slightly between 2015 and 2020, as the respective index in DESI increased by approximately 1.6 points. Nevertheless, Slovakia scored below the EU28 average in this dimension in 2020 and lost two ranks between 2018 and 2020, falling back to the 20th position in 2020.

Regarding the **integration of digital technologies,** Slovakia adopted several strategies and initiatives since 2019, such as the Slovak Digital Transformation Strategy 2030, supporting the integration of innovative technologies in companies, or the Slovak.AI, a non-profit platform to connect different stakeholders on AI in Slovakia. Continuing on this trend, the country's Recovery Plan provides for several specific initiatives to promote the integration of digital technologies, particularly in relation to eHealth, cybersecurity and the digital economy.

Lastly, although Slovakia improved its score on the **digital public services** dimension over the past four years, it still ranked 26th on the DESI index, out of the EU28 countries analysed. Nevertheless, Slovakia is maintaining its ambition through various initiatives introduced already in previous years, such as the data-driven state concept (initiated through the Action Plan for the digital transformation of Slovakia 2019-2022) or the Once-Only principle (introduced in 2014), as well as through various reforms and investments under the umbrella of the National Recovery and Resilience Plan. In particular, the development of eGovernment and the provision of digital public services is a key focus of the Slovakian Plan and most measures in relation to digital objectives are targeting this aspect.

4.24.2 Reforms and investments

The Slovakian National Recovery and Resilience Plan, submitted for assessment to the European Commission in April 2021 and whose original name is *Plan Obnovy cestovnà mapa k lepsiemu Slovensk,* put forward measures to foster the recovery of the country's economy as well as to promote economic, social, and territorial cohesion. The total amount of funding received by Slovakia equals to EUR 6.575 billion, all in grants. Digital-related investments and reforms represent around 21% of this budget, equaling to around EUR 1.4 billion, which will enhance the connectivity in the country, modernise public entities, especially in the judiciary system, and further promote the development and centralisation of digital public services, while increasing digital skills of its citizens. In addition, several measures will be focused on the development of the country's digital capacities in cybersecurity.

Slovakia's EUR 1.4 billion dedicated to digital objectives will support the implementation of the following crucial investments by 2026. These have been grouped into six categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the colored textboxes.

Connectivity

Connectivity[209] is intertwined to Slovakia's digital transition to ensure the success, sustainability and effectiveness of the digital reforms put forward. The deployment of a functioning and reliable connectivity network is the prerequisite for the advancement of the digital transformation.

Enhancing connectivity: This investment is meant to increase and ensure connectivity throughout the country. Its goal is to provide internet access with at least 100 Mbit/s and the possibility of upgrading the speed to all, urban and rural, households by 2030. Additionally, all major socio-economic stakeholders such as schools, transportation hubs and major public service providers, as well as businesses using digital services, shall have access to gigabit connectivity by 2030.

Policy priority

To accompany this investment, Slovakia also planned an umbrella of **connectivity reforms** aimed at creating an environment to encourage private investment in communications networks. Specifically, these reforms set out to reduce costs and speed up the implementation of individual projects; support the preparation and adoption of the strategy National Broadband Plan as well as to prepare the necessary rules for an efficient construction of communications infrastructure.

eGovernment, digital public services and local digital ecosystems

The digitalisation of the public administration is important to reduce administrative burdens and accompany the overall digital transformation of the country. The advancement of eGovernment, digital public services and local digital ecosystems[210] is a focus area of the Slovakian Plan, as demonstrated by the multiple reforms and investments, worth EUR 487.4 million, in this area put forward and detailed here below:

Professionalisation in public procurement: As part of the professionalisation of public procurement and the development of eProcurement in the country, the Public Procurement Authority will organise workshops, panel discussions, trainings, and expert conferences on interdisciplinary topics in the field of public procurement processes and evaluation. This investment will receive EUR 2.1 million from the RRF.

Policy priority

To accompany the above-mentioned investment, Slovakia also put forward a **Reform on public procurement**, which willsimplify, speed up and streamline public procurement processes. It will also improve data evaluation and the control of public procurement.

[209] The connectivity aspect of the Plan is covered by **Pillar 2** (Effective public administration and digitisation) under the **Digital Slovakia component**.
[210] The eGovernment, digital public services and local digital ecosystem aspects of the Plan are covered by **Pillar 2** (Effective public administration and digitisation) under the **Component named Digital Slovakia**.

Digitalisation of insolvency processes: This investment, worth EUR 6 million, supports the implementation of a new system digitalising insolvency law processes to reduce administrative costs and length of proceedings. The aim is to computerise and unify the trustee file and the court file through the information systems (Register of Insolvency Proceedings and Commercial Gazette) and to develop a digital marketplace for transfers of assets in insolvency proceedings.

Policy priority

The above-mentioned investment accompanies the **Reform on new legislation to unify and computerise the insolvency process** which defines the legislative framework for the introduction of digitalised insolvency proceedings. The changes will affect liquidation, bankruptcy, restructuring, insolvency, resolution of impending insolvency and compulsory realisation of assets.

Judicial map – digitalisation of tools, modernisation of IT equipment and analytical capacity: In support of the reorganisation of the court system, new central judicial information systems will be developed for the digitalisation of processes. To improve the work of the court staff, the hardware and software equipment of the courts will be upgraded, including technologies for online communication and the digitalisation of the collection of documents and court files. A supporting analytical platform for access to case law in courts is planned to be developed as well. EUR 42.9 million are allocated to this investment under the RRF.

Policy priority

Complementing the above-mentioned investment, the **Reform of the judicial map** will consist of several phases of restructuring and increasing the area of the judicial districts, reducing their number and the associated 'court capacity expansion'.

Making the fight against corruption and money laundering more effective: To strengthen the fight against corruption, and money laundering, financial investigations will be reinforced with additional technical support and digital tools. The investment will support the police financial investigation system both materially and professionally. This investment will receive EUR 21.1 million from the RRF.

Policy priority

Complementing the above-mentioned investment, the **Reform to make the fight against corruption and money laundering more effective** prioritises financial investigation capacities through organisational changes and the redeployment of internal capacities. It will entail new legislation for tools that will make the asset tracing system more efficient to detect corruption and financial crime.

Digitalisation in healthcare: This investment of EUR 41 million will fund the establishment of a Shared Services Centre which will ensure a high degree of robotisation and automation of administrative and controlling processes in healthcare facilities. The goal is to build and expand a nationwide system to support telemedicine services in Slovakia to i) build a platform and IT systems with full integration and standards-based digital health services, ii) make telemedicine services safely available for all, iii) design and put into practice a system for the validation of new telemedicine services and their integration into the healthcare reimbursement system, among others.

Policy priority

The above-mentioned investment complements the **Reform centralising the management of the largest hospitals**, which intends to improve the end-to-end management of hospitals, especially of medical and operational processes and management. A central management system will enable rapid sharing of good practices and promote the application of uniform procedures and methodologies in hospitals.

Modernisation of the fire and rescue systems: The investment, worth EUR 65 million, will improve the operational management of rescue services through the development of the newly established Integrated Rescue System (IRS) which serves as the first emergency responder and is composed of the different emergency entities in Slovakia[211]. In addition, the Integrated Safety Centres (ISC) will be equipped with up-to-date information and communication technologies and the interconnection of individual information systems will ensure better and more reliable reception of emergency calls and the coordination of emergency system components in protecting citizens and their health.

Policy priority

The above-mentioned investment complements the **reform on optimising crisis management** which will increase the efficiency of rescue interventions to protect life, health, and property by optimising crisis management. Specifically, procedures for dealing with emergencies and optimally deploying rescue forces and assets to respond to needs will be developed and adjusted.

Better services for citizens and businesses: This investment, worth EUR 179.9 million, will finance the creation of a new platform of IT tools for the public sector to build and deliver user-friendly digital services for citizens. The main objective of this investment is to simplify online services for citizens and entrepreneurs and to build eGovernment services allowing an easy access for citizens to the necessary services, documents, and processes for priority life situations[212].

Digital transformation of the public services delivery: This EUR 129.4 million investment will reduce the time needed to deliver public services to citizens and to foster the digital transformation of public services delivery in Slovakia. This objective will be reached through the optimisation and automation of processes using a central IT resource platform. Additionally, this investment supports the development, completion and launch of functional digital versions of 42 information systems and services[213].

[211] The emergency units involved in the IRS are: Fire and Rescue Service; the Emergency Medical Service; the Mountain Rescue Service; the Mine Rescue Service; the Control Chemical Laboratories, supported by local, corporate and volunteer fire fighting corps; the Armed Forces of the Slovak Republic, the Slovak Red Cross, and other civil protection units.
[212] The nature of 'priority life situations' as well as the criteria defining them need yet to be outlined.
[213] Optimisation measures will focus on elimination administrative shortcomings, such as backlogs, excess input documents and information, data errors, missing information, overproduction in process performance, ie unnecessary outputs and activities, duplications and unnecessary process steps, downtime in the approval process inefficient transfers of staff or information in the performance of processes, lack of support automated document creation, missing data for performance evaluation, insufficient employee substitutability and unclear legislation for the designation of the approver. Optimisation and process automation corresponding to the adjustment of agenda systems will take place using cloud Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS)),

Policy priority

Three additional reforms aimed at reinforcing the country's use of eGoverment, as well as digital public services, have been put forward in Slovakia's Plan:

- **Central management of IT resources:** This reform promotes the creation and deployment of a central procurement platform with available IT resources. In addition, it aims at reducing the time and costs in the design and development of information systems.
- **Building eGovernment solutions for priority life situations:** This reform targets the creation and approval of an investment plan for new eGovernment services for priority living situations that could be available quickly, easily and on any device to citizens and entrepreneurs.
- **Managing the digital transformation of the economy and the society:** This reform will build a new governance model acting as a functional structure for managing the digital transformation of the economy and society. Through this reform, the inter-ministerial coordination and the involvement of the professional community in the digital transition of the country will be enhanced.

Human Capital

Investments related to human capital[214] are meant to foster the digital skills of the whole Slovakian population. Special attention is given to young people and the elderly.

Investing in the digitalisation of schools: This investment, worth EUR 187.2 million, will provide full digital literacy at entry level in all primary and secondary schools in Slovakia. The investment will specifically support the building of digital infrastructures and the installation of digital equipment and software in schools.

Improving the digital skills of seniors: This investment of EUR 69.4 million is targeted at i) improving the digital skills of at least 172 800 seniors and disadvantaged persons through face-to-face and eLearning trainings; ii) providing tablets and other tools to seniors and people from disadvantaged groups to enable and increase motivation to use eServices and eLearning training, among others. Additionally, further digital tools for communication shall be made available for seniors to facilitate their communication with their families or their search for accessible and reliable health information.

[214] The human capital aspect of the Plan is covered by **Pillar 1** (Quality Education) and **Pillar 2** (Effective Public Administration and Digitisation) under the **Digital Slovakia component**.

Policy priority

The human capital aspect of Slovakia's Plan is completed by two additional reforms that are not linked to any specific investment:

- **Strategic approach to digital skills' training:** This reform**,** defined in collaboration with representatives of key stakeholders (e.g. employers), supports the development of a comprehensive national strategy on advancing digital skills, with a focus on all people of working and post-working age.
- **Improving education and ensuring competences in the field of cyber and information security**: The objectives of this reform will be ensured through effective and systematic life-long learning of the professional staff in the cyber and information security sectors.

Investment in digital capacities and deployment of advanced technologies

To ensure the success and sustainability of the digital reforms put forward by Slovakia, the country will also invest in the deployment of advanced technologies[215], as described below:

Supporting projects on advanced technologies and innovation: This EUR 74.8 million investment intends to develop competence centres and platforms focused on specific digital technologies. Building these centres will be a stimulus for the whole Slovak industry as they will provide services that are already in demand but not supplied in Slovakia (e.g. high-performance computing, blockchain). Additionally, this investment will promote the competitiveness of the Slovak industry, especially of technology firms, through an increased demand for innovation. Lastly, this investment will strengthen the capacities of operators within Slovakia in the field of research and development of top digital technologies (e.g. high-performance computing, quantum technologies, artificial intelligence, Internet of Things (IoT), cloud).

Strengthening preventive measures and increasing the speed of detection and resolution of incidents: The investment, worth EUR 35.6 million, will build a network of systems to capture, collect and evaluate information relevant for strengthening cybersecurity and send it to security surveillance centres.

Policy priority

The above-mentioned investment is accompanied by the **Reform on the standardisation of technical and procedural solutions for cybersecurity,** which also implies the adoption of the National Concept of Informatisation of Public Administration for 2021-2030. The long-term goals of the reform are to standardise the solutions in the field of cyber and information security, and to define clear and understandable requirements for the level of ICT provision technologies, among others.

Digital-related investment in R&D

[215] This aspect is covered by **Pillar 2** (Effective public administration and digitisation) under the **Digital Slovakia component**, as well as by **Pillar 5** (Better health) under the **Modern and Affordable health component**.

Investments in digital-related R&D[216] will further boost innovation in the country to ensure the further development and competitiveness of the Slovakian economy.

Research and innovation for the digitalisation of the economy: This investment will promote the research on potential synergies between national and European R&D themes. This targets particularly the improvement in digital themes, which will have a strong place in Horizon Europe[217] and other EU initiatives, and it is meant to prepare Slovak stakeholders for the European challenges of supporting research and innovation and international partnerships.

Fast Grants – Hackathons: This investment, worth EUR 3.8 million, will increase the networking among hackathon researchers to provide means to address societal challenges, such as supporting the economic recovery, reducing administrative burdens, increasing entrepreneurial and employment opportunities in Slovakia, as well as increasing the adoption rate of innovative solutions. Enhancing the networking of hackathon researchers should have a positive impact on the country's research capacities and increase the participation of innovators from different sectors such as enterprises, start-ups, research institutions, universities, and other professionals in hackathons.

Digitalisation of businesses

The digitalisation of businesses[218] is an important component of the Slovakian Plan, that will aim to support the competitiveness and productivity of the whole country.

Engaging in European cross-border projects building the digital economy: This EUR 104 million investment will provide the possibility for Slovakian companies to engage in EU cross-border flagship projects to build common capacities in key digital technologies and to increase the participation of Slovak stakeholders in such projects.

Reducing the regulatory burden on businesses: This investment, worth EUR 3.1 million, will cover the costs related to the implementation of the linked reform (here below) on measures to reduce the administrative and regulatory burden on businesses, such as the preparation of expertise and solution procedures and the training of staff, among others.

Policy priority

The above-mentioned investment complements the **Reform on measures to reduce the regulatory burden on businesses** and introduces a regular assessment of the effectiveness and justification of existing regulations. It will also introduce new rules to ensure effective regulatory reduction processes (the 1in-2out rule[219]).

[216] The digital-related investment in R&D aspect of the Plan is covered by one investment under pillar 3 Science, research and innovation under the component focussing on more effective management and strengthening of research, development and innovation funding.
[217] Horizon Europe is a key research and innovation funding programme of the European Commission. It aims to facilitate collaboration and to strengthen the impact of research and innovation in the European Union to enable the EU to tackle global challenges of today and tomorrow. It has a budget of EUR 95.5 billion and runs until 2027.
[218] This aspect is covered by **Pillar 2** (Effective public administration and digitisation) under the **Digital Slovakia component**.
[219] The 1in-2out rule implies that with every new regulatory burden introduced in Slovakia, the existing regulatory burden should be decreased by the doubled amount of costs. Until Q2 2022, when the new rule will be implemented, the 1in-1out rule is applied, ensuring that for each newly introduced regulatory burden the same burden (in costs) needs to be taken off from the regulatory system. The new rule extends this practice, by doubling the costs to be reduced per additionally regulatory burden introduced.

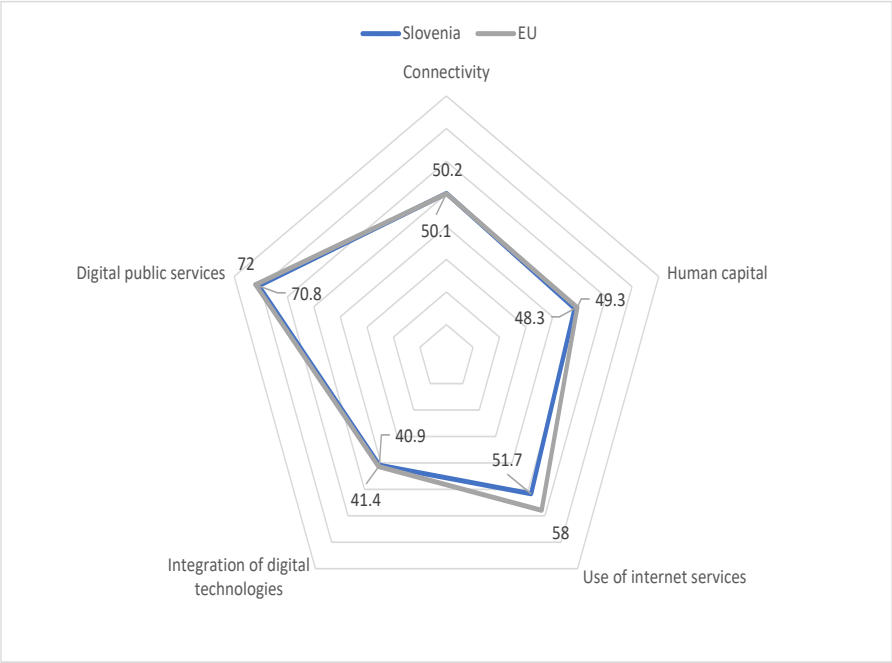
4.25 Slovenia

4.25.1 Country digital outlook

In Slovenia, many investments have been made in the digital sector in the last three years to foster economic growth and productivity, while boosting innovation. The national strategy *Digitalna Slovenija 2020*, adopted in 2016, have particularly highlighted digitalisation as a key concern for Slovenia for the following four years. However, this country had still a moderately advanced digital economy according to the Digital Economy and Society Index (DESI) in 2020, placing itself at the 16th place in the overall ranking of all EU28 Member States, close to the European average. Figure 52 below shows the performance of Slovenia on the five DESI 2020 dimensions, based on data from 2019. As illustrated in this figure, Slovenia scored below the EU28 average for all dimensions, except for connectivity which was slightly above it (50.2 versus 50.1 for the European average).

Considering these challenges in the digital sphere, in 2020 Slovenia also received five Country Specific Recommendations in the context of the European Semester calling the country to promote digital capacities of businesses and support eCommerce, as well as to strengthen digital skills among the Slovene population. In addition, the recommendation also encouraged Slovenia to further advance eHealth and to invest in digital tools and innovative solutions that would help public health services and enable easier and digital follow-up and telemedicine. Against this background, Slovenia has shown great commitment to enhance its digital transformation process, as also demonstrated by the strong focus on digital matters in its Recovery and Resilience Plan, detailed in the following sections.

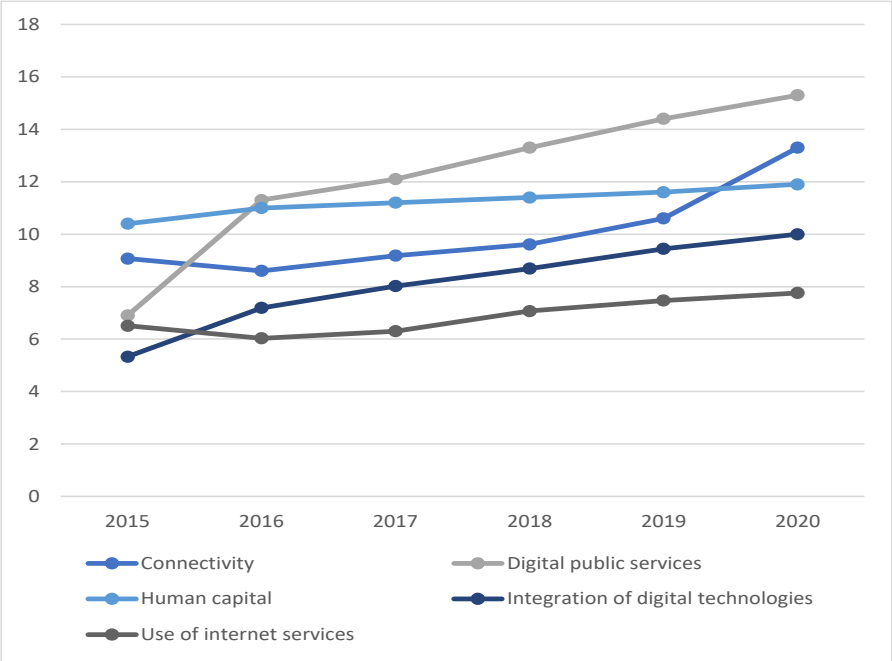
Figure 52. Performance on DESI 2020 - Slovenia



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Figure 53 below illustrates the evolution of Slovenia's performance in the five main DESI dimensions since 2015. The increase of its digital performance through the years is particularly visible in three dimensions: connectivity, digital public services and the integration of digital technologies.

Figure 53. DESI dimensions over the years - Slovenia



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

On **connectivity**, Slovenia scored 16th among the European countries on DESI 2020. Despite a nearly complete 4G coverage (99%), Slovenia still struggled in 2020 to reduce its digital gap between urban and rural areas and to uniformise its broadband and high-speed networks coverages. In order to tackle his issue, Slovenia is renewing the Next Generation Broadband Network Development Plan until 2020 and is designing a new National Broadband Plan 2025. This plan will include Gigabit Society targets and plans for the 5G coverage, as well as the targeted availability of high-speed networks of at least 100 Mbps, upgradable to 1 Gbps, for all citizens by 2025. This new plan, which should be adopted as part of the Digital Slovenia 2030 strategy to be published by the end of 2021, is supported by several investments included in Slovenia's Recovery and Resilience Plan.

According to DESI 2020, Slovenia ranked 15th on the **human capital** dimension, scoring right below the EU average. In 2019, only 55% of Slovenian citizens aged 16 to 74 years had at least basic digital skills (versus 58% for the EU average). To improve its score in this dimension, Slovenia included strategic guidelines for the further implementation of ICT in the Slovenian education system in its Digital Agenda 2020, as well as other measures to improve the connectivity in schools and to promote digital literacy and eInclusion (e.g. the Digital Academy run by the Slovenian Chamber of Commerce). Slovenia's Plan also includes investments and reforms to further digitalise education and enhance digital skills in the private, as well as in the public sector.

Concerning the **use of Internet services**, Slovenia scored again below the European average and came in 22nd place according to DESI 2020. While the Slovenian population is keen to use online services such as reading news, listening to music and playing games, 13% of citizens still have never used Internet in 2020 (versus 9% for the EU average). In 2019, the use of online banking services was also lower than the EU average (57% versus 66% for the EU).

Slovenia ranked 17th among EU countries on the use and availability of **digital public services**, scoring slightly below the European average. While the country performed well on the use of pre-filled forms and open data, only 59% of Slovenian internet users actively engaged with eGovernment services (versus 67%

for the EU average) according to DESI 2020. The use of digital public services for businesses was also lower than the European average, despite the existence of dedicated online services. To improve the situation, Slovenia adopted a new legislation in July 2021 to introduce the national eID card by March 2022, which should result in a more secure and user-friendly online identification. This measure is expected to boost the uptake of digital public services and online transactions by citizens and businesses. In addition, Slovenia is planning to modernise and expand the digitalisation of several Ministries and their eServices, as mentioned in its Plan.

Finally, Slovenia scored once again just below the EU average on the **integration of digital technologies** by businesses, scoring 15th in the EU ranking of DESI 2020. Slovenia's performance on this dimension has slowly increased over time, boosted by the adoption of several plans and strategies in the last decade: the Research and Innovation Strategy of Slovenia 2011-2020, the *Digitalna* Slovenia 2020 strategy and the Smart Specialisation Strategy of the Republic of Slovenia. Additionally, Slovenia will further support the uptake of digital technologies by businesses, especially in SMEs thanks to several investments included in its Plan.

4.25.2 Reforms and investments

Slovenia's Recovery and Resilience Plan, whose official name is *Načrt za okrevanje in odpornost*, is subdivided into four pillars, each covering one or many reforms and investments. Slovenia received EUR 2.5 billion from the RRF, consisting of EUR 1.8 billion in grants and EUR 705 million in loans. Investments and reforms related to the digital transition, which represent 21% of the plan's total allocation and EUR 525 million, can be found in all pillars but mostly in Pillar 2 on digital transparency and Pillar 3 focused on a smart, digital and inclusive economic growth. Through this Plan, Slovenia aims, among other things, to improve the digital skills of its population through the digitalisation of education, to develop its Gigabit infrastructure to enhance its connectivity, as well as to modernise its digital public services such as eHealth or eJustice services.

Slovenia's EUR 525 million dedicated to digital objectives will support the implementation of the following crucial investments by 2026. These have been grouped into six categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Slovenia will invest EUR 30 million to enhance its connectivity[220] through an investment focused on the development of its Gigabit infrastructure as further detailed here below:

[220] The connectivity aspect of the Plan is covered by **Pillar 2** (Digital transparency), under **Component 2** (Digital transformation of the public sector and public administration).

Gigabit infrastructure: This investment, worth EUR 30 million, will bring broadband to 8 500 households in unconnected areas by 2026. The investment will give priority to sparsely populated localities (e.g. 150 inhabitants/km2 or less) and/or geographically difficult areas (for instance due to accessibility problems), where an adequate and efficient ICT infrastructure is not yet available to citizens.

Policy priority

The above-mentioned investment complements the reform on **The transition to a Gigabit society**, which supports the preparation of the new national 'Broadband Network Plan 2025' promoting the use of advanced technologies and ensure the availability of an efficient digital infrastructure.

eGovernment, digital public services and local digital ecosystems

The development of eGovernment, digital public services and local digital ecosystems[221] seems to be an essential aspect of the digital part of the Slovenian Plan with five investments worth EUR approximately EUR 200 million. Thanks to an enhanced digitalisation of its public services and institutional processes, focusing for instance on the upgrade of its IT and information systems, the use of electronic transactions and a more efficient data management, Slovenia will modernise its public sector.

Modernising the digital environment of public administration: Slovenia will invest EUR 60.77 million to upgrade its IT infrastructure, in an effort to optimise existing eServices, modernise the customer support system, raise digital awareness and skills in public administrations, set up a platform for visa applications via mobile devices, create a register of applicable national regulations, as well as implement a comprehensive digitisation of the legislative process (eLegislation).

[221] Investment related to eGovernment, digital public services and local digital ecosystems are covered by **Pillar 2** (Digital transparency) under **Component 2** (Digital transformation of the public sector and public administration), as well as in **Pillar 4** (Health and social security) under **Component 1** (Health).

Policy priority

The above-mentioned investment accompanies three reforms on the modernisation of Slovenia's public administrations:

- **Strengthening the governance of the digital transformation of public administrations:** This reform will support the preparation and adoption of a new Digital Public Services Strategy 2021-2030 and the re-establishment and operations of the Informatics Development Council. In addition, this reform also includes the creation of a portfolio of IT projects and investments and the introduction of business IT standards, as well as the implementation of an IT and business information architecture.
- **Setting up an environment for the use of public administration eServices:** The reform's goal is to create an environment for the use of eGovernment services, aiming to provide citizens and businesses with the basic conditions for doing business with the state electronically.
- **Modernising administrative processes for a successful digital transformation:** This reform will put in place a system for monitoring and measuring the implementation of administrative procedures to improve the management of operational processes, but also to streamline and optimise administrative processes and redefine them. Another objective will be to ensure the conditions for the development of digital services to citizens and businesses at user level in a user-friendly, targeted, standardised, and efficient way.

Digital transition in agriculture, food and forestry: This investment, worth EUR 24.06 million, will finance the modernisation of activities the Ministry of Agriculture and Rural Development and other authorities, with a focus on:

- Establishing a data warehouse of data and geo-information managed by the Ministry of Agriculture and Rural Development with its constituent bodies and stakeholders.
- Building an integrated and modern information system that will provide effective support for the performance of the tasks of the Food Safety, Veterinary and Plant Protection Authority;
- Digitalising the livestock database in order to ensure connectivity between databases at national and international level;
- Digitising public agricultural advisory service;
- Establishing an eForestry information system with a single entry point and subsystems[222] to enable uniform digital data capture and display to increase forest stability, resilience and responsiveness sector.

Digitalisation of the Ministry of Interior: Slovenia will invest EUR 23.63 million into the further digitisation of the Ministry of Interior, its IT systems and the security sector as a whole. The investment includes the creation of a private cloud tailored to the needs of the Police, the development and implementation of a mobile solution for police officers as well as a mobile application for personal security for citizens (ePolice Officer). The introduction of the Automatic Biometric Identification System (ABIS) is also part of this investment.

Digitalisation in the field of justice: The investment, worth EUR 10.31 million, will ensure greater accessibility and openness of justice. Particular emphasis will be paid to the use of electronic transactions in judicial and prosecutorial proceedings. The goal of this measure is to streamline procedures for both the court and the prosecutor, as well as for the other parties in the proceedings.

[222] Namely eCrops, ePlanning, eInventory, eProcedures, eSurveillance and eTechnology.

Health digital transformation: The objective of this EUR 83 million investment is to introduce new digital services and to further digitalise existing one in the health field and to enable faster exchange or access to data on patient records and treatments. In addition, the use of information technology to communicate with patients and other stakeholders in the health system should be increased. This measure will be accompanied by the introduction of a new monitoring mechanism, based on real time data, including the introduction of the monitoring of patient-reported treatment outcome indicators.

Human Capital

The human capital dimension[223] is another key aspect of Slovenia's Plan. Indeed, this country will promote the development of digital skills, which are essential to the national economic growth and productivity, through the elaboration of new trainings for job seekers and employees and further digitalisation of education.

Digitalising education: The ambition of this programme, supported by an investment of EUR 66.73 million, is to support the digitalisation of pedagogical process and the management and governance of institutions at all levels of education (e.g. primary, secondary, post-secondary, higher education, adult education), to develop relevant applications and eServices, as well as to reform educational programmes and curricula, syllabuses and catalogues of skills with the integration of digital competences and the basics of computing and informatics.

Digital education - digital skills of the teaching staff and students: Through the overarching objective to digitalise education, this EUR 27.87 million investment will strengthen digital competences of the teaching staff and students and to reduce the gap with the needs of the labour market. An important part of the ecosystem is a continuously functioning equipment and adequate infrastructure, including broadband connections for education and management and maintenance

Policy priority

The above-mentioned investment complements the **Renovating the education system for the green and digital transitions - Digital skills** reform, aiming at developing digital skills of students and the teaching staff to strengthen the resilience of the education system and to improve the matching of competences with labour market requirements.

Pilot projects to prepare the ground for a higher education reform - Digital skills: Projects supported by this EUR 28.49 million investment will encourage the adaptation of professional study programmes to the professions of the future and to the needs of the labour market through the establishment of new and digitalised curricula.

Policy priority

The above-mentioned investment supports the **Modernisation of training and education including apprenticeships - Digital skills** reform, which will improve the transition between education and labour market.

[223] Human capital-related aspects are covered by **Pillar 3** (Smart, sustainable inclusive growth) under **Component 5** (Strengthening competences, in particular digital skills required by the new professions and the green transition) in the Slovenian Plan.

Policy priority

Another reform related to the human capital dimension and named **Establishing a competence centre and raising the skills of public sector employees** is included in the Slovenian Plan**.** This reform will support the establishment of a new Competence Centre for the public sector, contributing to the creation of a modern and efficient human resources management system in the civil service, with the objective to improve the competences, development, and skills of civil servants.

Investment in digital capacities and deployment of advanced technologies

Investments in digital capacities and in advanced technologies[224] will complement the overall transformation and digitalisation of the Slovenian public administration. Indeed, further investments in the creation of a hybrid cloud to support the activities of the Ministry of Economic Development and Technology and financial participation in cross-border and international projects related to advanced technologies will increase Slovenia's digital capacities.

Establishment of hybrid cloud infrastructure at the Ministry of Economic Development and Technology: EUR 2.5 million will be dedicated to the construction of a hybrid cloud, its IT architecture and related services, which will enable the Ministry of Regional Development to work with public and private partners more efficiently.

Cross border and multi-country projects - European common data infrastructure and services and Low-Power Processors and Semi-conductor Chips: The investment, worth EUR 7.5 million, will financially support, among other things, the development of an European Common Data Infrastructure and to enhance its cybersecurity and services.

Policy priority

The above-mentioned investments complement the reform on the **Development of economic data and digital services**, which envisages the establishment of appropriate technological and organisational solutions that will ensure the cross-sectoral circulation and use of data, the availability of state platforms to support the business sector and service development, and the possibility of personal data sharing, while ensuring personal control over data transfer.

Cross border and multi-country projects - European Blockchain Services Infrastructure: Slovenia will invest EUR 2.5 million in the development of the European Blockchain Service Infrastructure (EBSI), a shared EC infrastructure focused on the use of the Blockchain technology. The main objective is to create a supportive environment to share knowledge, skills, and best practices.

[224] Investments and reforms in digital capacities and related to the deployment of advanced technologies can be found in **Pillar 2** (Digital transparency) under **Component 1** (Digital transformation of the economy).

Policy priority

The further development of digital capacities and the deployment of advanced technologies will be supported by the reform **Ensuring cybersecurity**, which will participle in:

- Assisting private and public sector organisations to achieve a higher level of cybersecurity;
- Raising awareness on the topic of cybersecurity through awareness raising programmes and the inclusion of cybersecurity-related topics in educational programmes at all levels of the education system;
- Accelerating research and the development of quantum technologies to establishing a national quantum infrastructure for the secure transmission of encryption keys for the needs of state authorities and, later, for other critical infrastructure operators;
- Establishing a cybersecurity certification system for ICT products, services and processes.

Digital-related investment in R&D

Investments in digital-related R&D[225] represent a smaller part of Slovenia's Plan. Only one investment linked to this category can be found in the Plan, as described below:

Co-financing of research innovation projects in support of green transition and digitalisation - Digital-related R&I: Slovenia will invest EUR 10 million to support R&D projects and strengthen the cooperation between different stakeholders of the innovation ecosystem at project level, while also ensuring coherence through the integration of the funding at different stages of the technological development.

Digitalisation of businesses

The digitalisation of businesses[226] is another focus point of the Slovenian Plan, which aims not only to the digitalisation of business processes and the adoption of advanced technologies, but also to the development of new digital services and products dedicated to businesses.

Industrial/business digital transformation agenda - Large compagnies and SMEs: Slovenia will invest EUR 44 million to achieve greater efficiency, productivity, and competitiveness in the private sector, while addressing the use of advanced technologies by compagnies[227]. Another objective of this investment is to increase interactions between large enterprises et innovative start-ups to create an open innovation business environment and accelerate the deployment of digital innovation and the transfer of digital competences. The design of new products and services for the digital market, the access to new forms of marketing and the adaptation to market requirements (e.g. eCommerce) will be crucial targets of this measure.

[225] The digital-related investment of Slovenia's Plan can be found in **Pillar 3** (Smart, sustainable inclusive growth) under **Component 1** (Research, Development and Innovation).
[226] Investments and reforms related to the digitalisation of businesses are found in **Pillar 2** (Digital transparency) under **Component 1** (Digital transformation of the economy).
[227] Namely the use of robotics and process automation, Internet of Things, AI and the transformation of decision-making systems (including cybersecurity and blockchain technology.

Policy priority

The above-mentioned investment is supported by the reform **Digital transformation of the economy (business and industry)**, which will encourage the digital transformation of business processes and models to increase efficiency, productivity and added value in enterprises, to adapt business functions to new regulatory requirements, as well as to reduce administrative barriers and the administrative burden on business.

Digitalisation in the field of culture: The goal of the investment, worth EUR 9.9 million, is to develop IT infrastructures and create dynamic eServices and applications to make cultural heritage more accessible. An additional goal is also to accelerate the development of digital processes and solutions to support eArchiving.

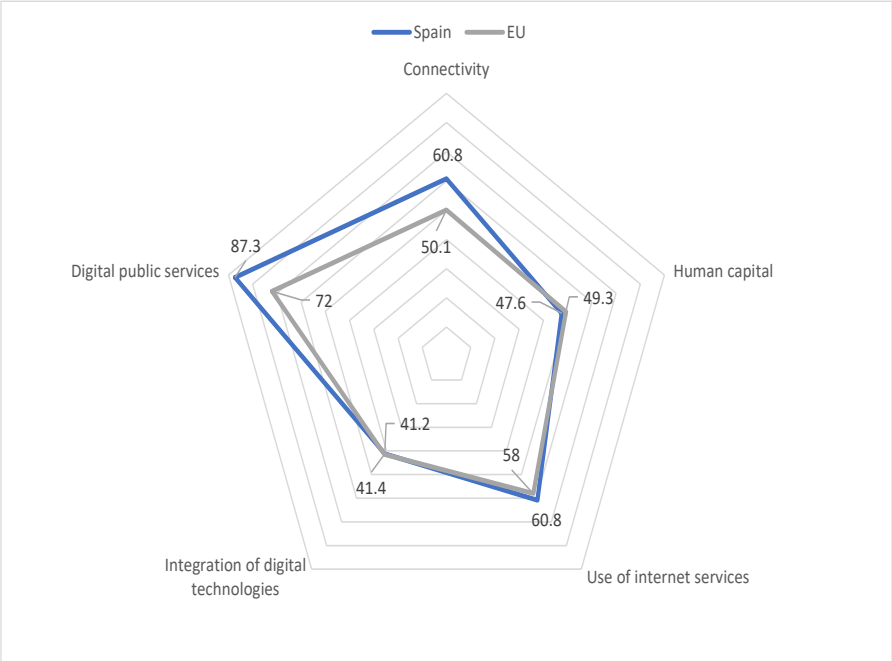
4.26 Spain

4.26.1 Country digital outlook

With the adoption of its Digital Agenda adopted in 2013, Spain have particularly highlighted digitalisation as a key concern for the country for the following seven years.[228] In 2020, Spain had a moderate to advanced digital economy according to the Digital Economy and Society Index (DESI), placing itself at the 11th place in the overall ranking of all EU28 Member States, above the European average. Figure 54Figure 54 below shows the performance of Spain on the five main DESI dimensions, based on data from 2019. As illustrated in this figure, Spain scored above the EU average on three dimensions: digital public services, connectivity, and the use of internet services. When it comes to the other two, namely the integration of technologies by businesses and human capital, Spain scored slightly below the EU average.

[228] Spain adopted in 2020 a new digital agenda, Spain Digital Agenda 2025.

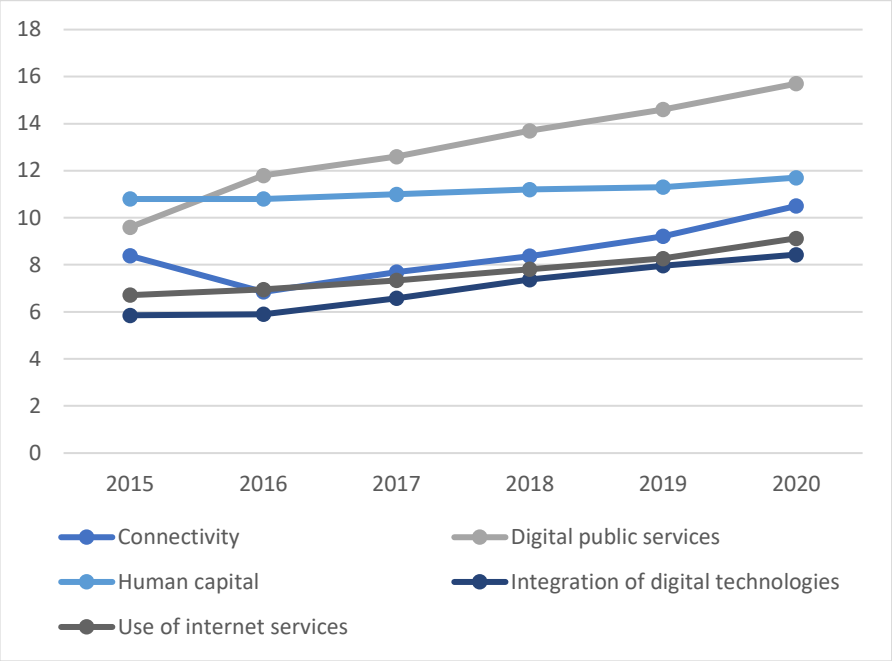
Figure 54. Performance on DESI 2020 - Spain



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Figure 55 below illustrates the evolution of Spain's performance in the five main DESI dimensions since 2015. The increase of its digital performance through the years is particularly visible in three dimensions: connectivity, digital public services, and the integration of digital technologies.

Figure 55. DESI indicators over the years - Spain



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Spain scored the 5th position on **connectivity** according to DESI 2020. In this regard, the country performed particularly well on the fixed broadband take-up of at least 100 Mbps, as well as on the fixed Very High-Capacity Network (VHCN) coverage. Connectivity has been one of the top priorities of the country, which

adopted several national plans and strategies focused on this area , such as the *Programa de Extensión de la Banda Ancha de Nueva Generación* (PEBA-NGA), a national funding programme adopted in 2019 focused on the deployment of ultra-fast fixed networks, including in underserved and rural areas. In order to further advance its performance on the 5G readiness and achieve the broadband objectives incorporated in the new Spain Digital 2025 Agenda, Spain published a connectivity plan and 5G strategy in December 2020. The Spanish Plan will aim to support these objectives through the inclusion of several investments and reforms focused on connectivity.

Regarding **digital public services**, Spain ranked second on DESI 2020, being one of the top performers on this dimension in the EU. According to DESI 2020 data, 82% of Spanish internet users were using eGovernment services to submit forms in 2019.[229] In addition, Spain scored above the EU average for the availability of eGovernment services for businesses, as well as for the use and availability of open data. The Spanish Plan will aim to further digitalise public services and internal processes of various ministries.

Concerning the **use of internet services**, Spain scored the 11th position among EU countries on DESI 2020, performing slightly above the EU28 average. In 2019, Spanish citizens were keen to use internet services, such as video calls, social media and for news reading. However, only 60% of them were using online banking services (versus 66% for the EU average) and 64% of them used internet to shop online (versus 71% for the EU average).[230]

Spain ranked below the EU average on the **human capital** dimension, scoring the 16th position on DESI 2020. Despite moving up one position in the ranking compared to DESI 2019, only 57% of Spanish people had at least basic digital skills (versus 58% for the EU average), and 59% of them had at least basic software skills (compared to 61% for the EU average). To tackle this issue, in 2021 Spain adopted a new National Plan for Digital Skills 2021-2025, addressing a variety of challenges related to digital inclusion, access to technology, and life-long learning for all. The Spanish Recovery and Resilience Plan will also aim to promote the development of digital skills among its population and to digitalise education in the country.

Finally, Spain ranked 13th on the **integration of technologies** by businesses on DESI 2020. In 2019, 43% of Spanish businesses shared electronic information (versus 34% for the EU average) and 29% of them used social media to promote their businesses online (compared to the EU average at 25%). However, Spain remained below the EU average on the use of big data and cloud technologies according to DESI 2020. In the last three years, Spain adopted two strategies to further digitalise businesses in the country: the Strategic Framework for SME Policy for 2030 in 2019 and the Digitalisation of SMEs Plan 2021-2025 adopted in 2021. This objective will also be an integral part of the Spanish Plan, which includes multiple investments and reforms on the digitalisation of businesses.

[229] Information retrieved from DESI 2020: https://digital-strategy.ec.europa.eu/en/policies/desi-spain
[230] Information retrieved from DESI 2020: https://digital-strategy.ec.europa.eu/en/policies/desi-spain

4.26.1 Reforms and investments

Spain's Recovery and Resilience Plan, whose official name is *Plan de Recuperación, Transformación y Resiliencia*, is subdivided into 10 pillars and 30 components, each covering one or many reforms and investments. Spain received EUR 69.5 billion from the RRF, all in grants. Investments and reforms related to the digital transition represent 28% of the plan's total allocation, equalling to EUR 19.46 billion and can be found into eight pillars. Through this plan, Spain aims, among other things, to expand its national connectivity, improve the digitalisation of its public administrations and the accessibility of its digital public services, promote the development of digital skills among its population and digitalise education, while enhancing its digital capacities in cybersecurity, AI and its data infrastructures. Finally, the digitalisation of businesses, and more specifically SMEs, will be a focus point of the Spanish Plan.

Spain's EUR 19.46 billion dedicated to digital objectives will support the implementation of the following investments by 2026. These have been grouped into five categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

Spain will enhance its connectivity[231] through multiple investments, worth EUR 3.3 billion, focused on the reinforcement of broadband coverage in major socio-economic sectors, the development of ultra-fast broadband and 5G, and the creation of connectivity vouchers for SMEs and vulnerable groups, as further detailed here below:

Ultra-fast broadband extension and mobility with a coverage of 30 Mbps: This investment, worth EUR 812 million, will deepen the coverage of ultrafast broadband access networks in underserved areas, aiming to reach 100% of the population. Specific actions will be included for the coverage in historic urban centres that are considered as white zones. Public support programmes for network deployment will be defined to face the demographic challenge of curbing depopulation in rural areas.

Deployment of 5G networks and 5G innovations: Through a EUR 1.4 billion investment, this measure will address the deployment of 5G in Spain, covering the areas of network deployment, the necessary technological change and the innovation processes required to take advantage of and maximise the 5G opportunity for the Spanish economy and society.

Policy priority

The above-mentioned investment is supported by a reform on the implementation of the national **Roadmap on 5G**, which includes the spectrum management and allocation, the reduction of the deployment burden, a new cybersecurity legislation specific to 5G and local authorities' support.

[231] The Connectivity aspect of the Plan is covered by **Pillar 5** (Modernisation and digitisation of the industrial sector and SME, recovery of tourism and boosting entrepreneurship), under **Component 15** (Digital connectivity, boosting cybersecurity and the deployment of 5G).

Reinforcing connectivity in healthcare centres and socio-economic drivers: Spain will invest EUR 480 million on strengthening the connectivity of the country's main socio-economic drivers, understood as industrial estates, data centres, agribusiness, research centres, transport nodes, logistics nodes or data-intensive companies, as well as healthcare centres such as hospitals, training centres and care points throughout the country. Sectorial digital projects supporting the Gigabit society and the deployment of network infrastructures will be part of this investment.

Connectivity vouchers for SMEs and vulnerable groups: Through this EUR 80 million investment, Spain will enable the creation of 'connectivity vouchers' for small and medium-sized enterprises that will finance investments and expenses derived from connectivity, especially for small enterprises starting their business in public digitalisation programmes. Following the same principle, digital vouchers for vulnerable groups will be designed to cover a package of broadband connection with the most appropriate technology for individuals or families identified as vulnerable.

Enhancing connectivity through cross-border digital projects: The objective of this EUR 500 million investment is to improve connectivity of cross-border digital infrastructures. For instance, the participation of Spanish companies in consortia of companies will be promoted and supported with a view to their participation in the funding programme for data infrastructure interconnections and submarine cable of the Connecting Europe Facility (CEF-2 Digital). Another example of cross-border project is the EU Secure Connectivity Initiative, a secure multi-orbital connectivity system, both in low and geostationary orbit, which would complete EU's space capacity, ensuring its digital and technological sovereignty in connectivity.

Policy priority

The connectivity aspect of the Spanish plan is supported by an additional reform, named **Reforming the Telecoms Regulatory Framework: General Law, Regulatory and Implementation Instruments**, that will accompany the development of two new connectivity systems: a reverse 112 system for the delivery of warnings in emergency situations and a new platform, acting as a single point of information on cross-border connectivity and digital infrastructures.

eGovernment, digital public services and local digital ecosystems

The development of eGovernment, digital public services and local digital ecosystems[232] seems to be an essential aspect of the digital part of the Spanish Plan. In addition to several investments targeting the global modernisation and digitalisation of the General State administration and its services, multiple investments and reforms are planned to accompany the digital transformation of individual ministries such as the Ministry of Territorial Policy. A total of EUR 3.6 billion are dedicated to enhancing the development of eGovernment and digital public services in Spain.

[232] Investment related to eGovernment, digital public services and local digital ecosystems are covered by **Pillar 4** (An Administration for the 21st century) under **Component 11** (Modernisation of Public Administrations), **Pillar 6** (Pact for Science and Innovation and strengthening the capacities of the National Health System), as well as in **Pillar 8** (New care economy and employment policies).

Digital transformation and modernisation of the General State administration: Spain will invest EUR 960 million to improve the digital public services provided to citizens and companies, while focusing on usability, utility, quality, and accessibility. This investment has four major objectives:

- The creation of an App Factory, a service for the development of applications that allows bringing digital public services closer to citizens;
- The improvement of the citizen's user experience for more proactive, universal, user-friendly and accessible public services;
- The development of the GovTechLab (Technological Innovation Service of the General State Administration), which allows innovating in services and technologies available to the public sector, as well as developing a business network around it;
- The creation of a new model of digital identity that allows, among others, evolving and promoting the Spanish eIDAS node.

Projects for the digitalisation of the General State Administration: This investment, worth EUR 1.2 billion, will support initiatives that, together, represent a driver for the digital transformation of the Spanish administration, generating synergies and value both for the public and the private sector. Five sectors are particularly targeted: health, justice, employment, social security, and inclusion, as well as consular activities.

Policy priority

The above-mentioned investments accompany a reform on the **Modernisation and digitisation of public institutions,** which will simplify and digitalise public administrative processes and procedures, as well as to reduce the rate of temporary employment in Spanish public administrations. In addition, the evaluation of public policies will be strengthened to improve their efficiency.

Digital transformation of the Ministry of Territorial Policy, the Civil Service and the administrations of the Autonomous Communities and the local authorities: This investment, worth EUR 1 billion, will support modernisation projects aiming to improve both administrative processes and procedures, as well as digital skills and available digital resources in public institutions.

eHealth services and applications: Spain will invest EUR 240 million into the promotion of eHealth and the introduction of home equipment that promotes personal autonomy through the use of advanced telecare, as well as any other technological means to provide support and care in connected homes and inclusive care environments, including in rural areas.

Policy priority

The above-mentioned investment is supported by a reform named **Reforming the public health system**, whose overreaching objective is to develop strategic and operational instruments as the basis for a new, more ambitious, and better integrated public health system. It will be implemented through the following instruments: the Public Health Strategy, the Public Health Surveillance Network and the State Public Health Centre.

Digital transformation of social services: The main purpose of the investment, worth EUR 216 million, is to support comprehensive programmes that will be implemented to introduce new technologies to improve information management systems of social services. The goal is to improve both their effectiveness (e.g. shorter waiting times) and their quality (e.g. better results of social interventions). In addition, this investment will finance pilot projects that promote innovation in the framework of social services.

Policy priority

The above-mentioned investment complements a reform named **Modernise public social services and provide them with a new regulatory framework.** This reform is focused on strengthening the public system of social services in Spain through the approval of a new national framework law, on promoting innovation and improving the training of professionals in the sector. In addition, the implementation of a new information system for social services is part of this reform.

Improving accessibility of websites and mobile applications of public services for persons with disabilities: The objective of this EUR 12 million investment is to improve the accessibility of all communication channels with public administrations, while paying special attention to cognitive accessibility, with tools such as easy reading.

Digitalising the management of asylum seekers: This EUR 14 million investment will finance the design and implementation of a new information system that will facilitate the allocation of places for asylum seekers among the autonomous communities. This investment's goal is to increase the capacity and efficiency of the reception system for asylum seekers.

Policy priority

The above-mentioned investments are completed by four reforms on the modernisation and digitalisation of Spain's public administrations and services:

- **Modernisation and digitalisation of Justice:** This reform will increase the digital efficiency of eJustice. It includes the creation of an interoperable information architecture based on data and meta-data.
- Implementation of the **new National Strategy for Public Procurement:** This reform will (I) enhance the expertise of public buyers and other agents involved in public procurement, (II) improve SMEs' access to public procurement data and information, (III) promote efficiency and improve supervision and control of public procurement.
- **Reinforcement of administrative capacities:** The reform promotes a change in the administrative culture that will contribute to moving towards a modification in the budgeting and control systems of the Spanish public administration. This will be made possible through the adoption of new digital tools.
- **Digitisation of the State Public Employment Services:** The goal of this reform is to improve all employment-related services provided to citizens and companies. Specifically, the reform will focus on improving internal management, the use of statistics and data management as well as the modernisation of workstations and infrastructures to enable reliable and safe teleworking.

Human Capital

The human capital dimension[233] is another key aspect of Spain's Plan. The country will promote the development of digital skills among its population, with a particular focus on students, teachers, women, employees of the public and private sectors and unemployed citizens. The modernisation and digitalisation of education is also targeted by the Spanish Plan, with special attention devoted to vulnerable groups.

Digital skills: This investment of EUR 735 million will finance the development of a network of support centres for digital training (for both basic and advanced digital skills), initiatives for digital inclusion such as awareness campaigns, and the development of a programme to promote digital training for women and STEM vocations at school.

[233] Human capital-related aspects are covered by **Pillar 7** (Education and Knowledge, Life-long Learning and Capacity Building) under **Component 19** (National Digital Skills Plan) and **Component 20** (Strategic plan for the promotion of Vocational Training).

Policy priority

The above-mentioned investment complements a reform supporting the preparation and implementation of the **National Plan for Digital Competences,** which acts as a roadmap to identify the necessary measures to ensure that all citizens have the necessary tools to acquire and develop digital skills, in a context of dual green and digital transition.

Digital Transformation of Education: Through the objective to digitalise education, this EUR 1 412 million investment will provide portable devices and enhance connectivity for at least 300 000 students from centres supported by public funds, reduce the digital access gap for students from vulnerable groups, create interactive digital classrooms and improve teaching digital competence. In addition, a special focus will be given to the development of digital skills demanded by the productive sectors and to the accreditation of digital competences acquired through work experience.

Policy priority

The above-mentioned investment is complemented by a reform on the **design and application of a new curricular model based on key competences, prioritising fundamental learning, and regulation of inclusive academic planning**. This model will pay attention to the development of digital competences of students. This curricular reform will be extended to the pre-school, primary, secondary and baccalaureate stages.

Improvement of digital infrastructure, equipment, technologies, teaching and university assessment: This investment, worth EUR 147 million, will promote the creation of new infrastructures, technological developments, and teaching innovation projects that will improve digital resources of universities. To achieve this objective, the development of centralised infrastructures (RedIRIS) and ICT services will be supported, together with inter-university digital innovation projects of strategic and transversal nature. In turn, this measure aims to support the reduction of the digital divide for academic staff and students and attract digital talents.

Policy priority

The above-mentioned investment accompanies a **Comprehensive Reform of the University System,** based on the following objectives:

- Promote access to higher education;
- Adapt the organisation of university education;
- Promote research, transfer and mobility of teaching and research staff in universities, and;
- Ensure the quality and good governance of university institutions.

Young-Tandem Employment and First professional experience in public administrations programmes: This EUR 67 million investment refers to the establishment of two programmes intended for young workers, including a strong digital component:

- The Young-Tandem Employment programme will follow the model of the workshop schools, although applied to projects of public and social interest related to the digitalisation of public services, social cohesion, the fight against depopulation of rural areas and sustainable development that reinforce territorial cohesion. The training will include digital skills, entrepreneurship, and languages.
- The First experience in public administrations programme will provide first experiences within public administrations, which will benefit young unemployed people and allow them to acquire soft skills and professional skills, including digital skills.

Digital skills for employment: Spain will invest EUR 1 256 million on the qualification and re-qualification of employed and unemployed people, while reinforcing current active employment policies. This investment includes a new programme named Youth Shock Plan 4.0, which will promote job creation and training for unemployed youth through training in digital skills that improve their employability. Specific digital training programmes will also target civil servants and SMEs employees.

Policy priority

The above-mentioned investment is supported by a reform on the **Modernisation of active employment policies,** which will facilitate the return to employment of unemployed persons through seven measures, including a better coordination between career guidance and needs of the private sector (e.g. digital skills), as well as the reinforcement of requalification programmes and assistance to older workers.

Digital Professionals: The objective of this EUR 190 million investment is to adapt the existing vocational training offer and expand it to foster the acquisition of advanced digital skills and promote a program for attracting and retaining talent in the digital field. Digital educational resources on artificial intelligence and cybersecurity will be created, which will be designed both for the general public, and more specific profiles.

Reskilling and upskilling of the labour force linked to professional qualifications: This investment, worth EUR 92 million, includes four differentiated actions, all aimed at maintaining and improving the professional skills of the active population (i.e. population over 16 years of age, employed or unemployed). These actions include the following:

- Evaluation and accreditation of professional skills acquired through work experience,
- Modular digital offer for employed persons associated with units of competence of the National Catalogue of Professional Qualifications (CNCP);
- Flexibility and accessibility of professional training through the creation of 'mentor classrooms' (non-formal training);
- Modular training aimed at reskilling and upskilling of the employed and unemployed.

Digital training for ERTE workers: This EUR 107 million investment focuses on the acquisition and improvement of professional skills, of working people whose employment contract has been suspended or whose working hours have been reduced through a (Temporary) Employment Regulation Expenditure (ERTE/ERE) to alleviate the effects derived from COVID-19.

Digital transformation of vocational training: Spain will invest EUR 256 million into the transformation and modernisation of vocational training offered to citizens with the inclusion, among others, of the necessary digital skills for each productive sector. This measure will be accompanied by the conversion of classrooms into applied technology spaces, the creation of entrepreneurship classrooms in public centres, and the creation of a network of 50 centres of excellence in the country.

Policy priority

The above-mentioned investment is supported by the reform on the **Modernisation Plan for Vocational Training,** which includes the design of new training offers that meet the needs of the market , as indicated in the Strategic Plan for Professional Training 2019-2022, the document guiding this reform.

Digital skills of women in rural and urban areas: Through this investment of EUR 26 million, specific plans will be put in place to improve the training of women in rural and urban areas, focused on these areas: digital, technological, entrepreneurship, social economy, and online commercial activities.

Policy priority

The human capital dimension of the Spanish Plan is also complemented by an additional reform addressing **Remote Work and its Regulation**. This reform supports the implementation of new regulations related to remote working, which must be incorporated into the ordinary dynamics of business operations and the practice of collective bargaining.

Investment in digital capacities and deployment of advanced technologies

Investments in digital capacities and in advanced technologies[234] will complement the overall transformation and digitalisation of the Spanish public and private sector. Indeed, further investments in cybersecurity, AI and data infrastructures will increase Spain's digital capacities, as further described below:

Adopting a new National Artificial Intelligence Strategy: Through a EUR 500 million investment, Spain will coordinate the action of the different administrations and provide a framework of reference for the use of AI in the public and private sector. The objective of this investment is to move towards a reliable, transparent, and inclusive IA that ensures compliance with fundamental rights and national regulations. This investment will fund, among other things, the establishment of a new Spanish network of Excellence in AI, a multidisciplinary Institute of AI and AI Chairs.

Boosting the Spanish cybersecurity ecosystem: Spain will invest EUR 524 million to boost the Spanish cybersecurity ecosystem within the framework of the European digital sovereignty strategy and to finance R&D projects in cybersecurity, enabling the development of high value-added solutions and services. This investment will also develop cybersecurity capabilities of both citizens and companies.

Sectoral data spaces (contribution to transformative projects for the digitalisation of strategic productive sectors): Spain will invest EUR 400 million to promote the creation of data spaces in the main strategic productive sectors of the economy, identified in the Digital Agenda 2025 and in the Plan itself, including the agri-food sector, the sustainable mobility sector, the health sector and the commerce sector.

Data infrastructure renewal and sustainability: This investment, worth EUR 80 million, will improve the equipment of data infrastructures to accommodate in-building telecommunication infrastructures allowing the deployment of next-generation access (NGA) networks in a sustainable and urban-friendly way and contributing to achieve a lower energy consumption.

[234] Investments and reforms in digital capacities and related to the deployment of advanced technologies can be found in **Pillar 5** (Modernisation and digitisation of the industrial sector and SME, recovery of tourism and boosting entrepreneurship) under **Component 15** (Digital connectivity, boosting cybersecurity and the deployment of 5G) and **Pillar 6** (Pact for Science and Innovation and strengthening the capacities of the National Health System) under **Component 16** (National Artificial Intelligence Strategy) and **18** (Renewal and expansion of the capacities of the National Health System).

Creation of a 'Data Lake' for the health sector: This EUR 100 million investment will finance the creation of a healthcare 'Data Lake', which will collect health data in dedicated information systems and provide analysis with a real-time response capacity for the identification and improvement of diagnosis and treatments. This will be enabled by the use of artificial intelligence technology, new scalable system architectures and new processing and model discovery tools. The main goal is to boost innovation when it comes to the processing of health-related information using emerging technologies.

Digitalisation of businesses

The digitalisation of businesses[235] is another focus point of the Spanish Plan, which supports the digitalisation of industries and SMEs in their processes, as well as in the development of new digital services and products. Specific sectors (e.g. agri-food, fishery, culture, tourism, and audio-visual sectors) are particularly targeted by these investments.

Digitalisation of the agri-food and forestry sectors: Spain will invest EUR 38 million to support innovation and the digitisation of the agri-food and forestry sectors to meet social challenges and environmental commitments, strengthen the productive capacities of businesses in rural areas and generate driving capacity for associated businesses. This investment will finance the creation of a Digital Innovation Hub for businesses in the agri-food sector, a technology-based entrepreneurship line and the establishment of an observatory for the digitalisation of the agricultural sector.

Policy priority

The above-mentioned investment complements the reform on the **implementation of the second Action Plan of the Digitalisation Strategy for the agri-food sector and the rural environment,** which includes three main objectives linked to the digitalisation process: reducing the digital divide, promoting the use of data, and boosting business development and foster new business models.

Digitalisation of the fisheries sector: This EUR 11 million investment intends to support the digitalisation of the Spanish fisheries and aquaculture sector and enhance the use of ICTs for fisheries surveillance. This last objective requires a reinforcement of the IT security of the Spanish Fishing Information System (SIPE), through the purchase of new devices and software.

Projects to support the digitalisation and innovation in the industrial sector: This investment, worth EUR 457 million, is directed at the realisation of projects promoting the digitalisation, innovation and sustainability in key areas of the industrial sector (e.g. eco-innovation, improvement of value chains, advanced materials and products, improvement of quality processes and industrial safety).

[235] Investments and reforms related to the digitalisation of businesses are found in **Pillar 1** (Urban and rural agenda, the fight against depopulation and the development of agriculture) under **Component 3** (Environmental and digital transformation of the agri-food and fisheries system), **Pillar 5** (Modernisation and digitisation of the industrial sector and SME, recovery of tourism and boosting entrepreneurship) under **Component 12** (Spain 2030 Industrial Policy),**13** (Promotion of SMEs) and **14** (Plan for the modernisation and competitiveness of the tourism sector). Some investments on this area can also be found in **Pillar 9** (Boosting the culture and sports industry) under **Component 24** (Enhancing the value of the cultural industry) and **25** (Spain, audio-visual hub of Europe).

Support to smaller scale projects for the digitisation of internal processes in industrial companies: The investment, worth EUR 95 million, will fund small-scale digital projects realised by the private sector, which will include:

- Solutions for advanced data processing and AI solutions;
- Industrial simulation projects;
- Industrial augmented reality, virtual reality and machine vision projects;
- Collaborative and cognitive robotics, sensorics.

Policy priority

The above-mentioned investments accompany the reform implementing the **Spanish Strategy for Industrial Impulse 2030**, a comprehensive economic strategy which will strengthen the national industry's resilience, competitiveness, sustainability, as well as its capacity to create quality employment.

Actions to support the digital transition of entrepreneurs: This investment, worth EUR 329 million, includes a series of measures that will boost the entrepreneurial ecosystem, which are addressed under the umbrella of the Strategic Framework for SME Policy 2030, the Spain Entrepreneurial Nation Strategy, and the Spain Digital Agenda 2025. One of the goals of this measure is to promote the creation of accelerators/incubators and sandboxes, with the aim to foster the ecosystem of start-ups that offer innovative products and services to meet the evolving needs and challenges of public administrations.

Digitalisation and innovation of micro-SMEs: Spain will invest EUR 3 548 million to create a set of instruments to incorporate digital tools already available on the market into micro-SMEs, boost the digitalisation of small companies and promote technological innovation. This investment will support the realisation of six projects.[236]

Use of digital tools by the tourism sector: Through this EUR 186 million investment, actions will be undertaken to enhance the use of platforms, websites, apps and other digital tools by actors involved in touristic activities(e.g. municipalities, museums) in order to offer better services (e.g. digital brochures, interactive guides, immersive virtual and mixed reality experience) to tourists and to ease the management of touristic locations (e.g. tools for flow management, capacity control and social distancing, monitoring systems for environmental and health parameters in touristic destinations).

Digitalisation of the tourism sector: This EUR 337 million investment will develop a platform that provides information on public and private services to tourists and that allows all agents to interact with tourists in a digital and scalable way. Furthermore, this platform will be designed in a modular way, so that components can be added progressively and be reused. This will allow the development of new shared solutions, such as cloud services (in SaaS mode[237]).

Digitalisation of cultural industries: Spain will invest EUR 66 million to support the digital transformation of culture and the incorporation of advanced technologies into cultural and creative industries. It will also support projects to digitise intellectual property rights management operators and to promote the digital transition in the book sector.

[236] The Digital Toolkit Programme, the Agents of Change Programme, the Accelerate SME 2.0 project, the SME Digitalisation Intelligence System, the Innovative Business Clusters Support Programme and the programme to support Digital Innovation Hubs (DIH).
[237] Software as a Service.

Promoting culture in rural areas: This EUR 13 million investment intends to expand and diversify the cultural offer in non-urban areas. To do that it will support the modernisation and sustainability of the infrastructures used by the performing and musical arts. It will also include measures for the conservation, restoration and enhancement of the Spanish cultural heritage through the use of digital means and the endowment of libraries (e.g. purchase of licenses for digital books).

Digitalisation of major cultural services: Through a EUR 220 million investment, multiple major cultural services will be digitalised, such as the National Library of Spain, and new tools (e.g. a plan for digital access to the bibliographic heritage, new interoperable archiving systems and an integrated system for the digitisation and cataloguing of National Institute of Performing Arts and Music (INAEM) resources, assets, structures and infrastructures) will be created to support the digitalisation transition of the country.

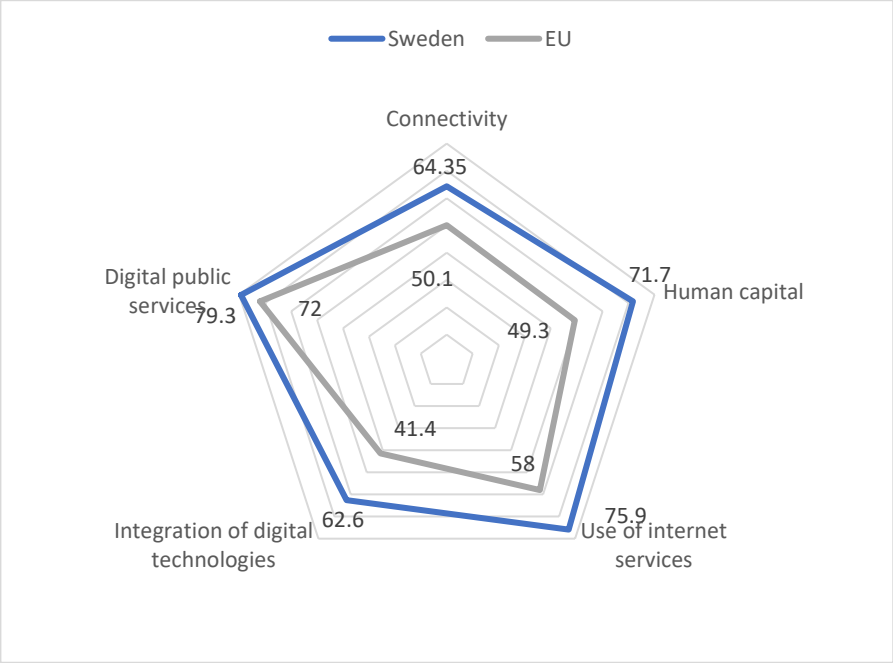
Programme for the promotion, modernisation, and digitalisation of the audio-visual sector: Spain will invest EUR 200 million in the application and integration of digital technologies to the production and promotion of audio-visual content. In particular, the automation of audio-visual production processes will be promoted, as well as innovation in the creation and development of audio-visual and digital content in its various formats (e.g. series, video games and animation).

4.27 Sweden

4.27.1 Country digital outlook

In 2020, Sweden seemed well advanced in terms of digitalisation compared to the other EU28 countries according to the Digital Economy and Society Index (DESI). Indeed, Figure 56 below shows the performance of Sweden on DESI across the five main dimensions in comparison to the EU28 average in 2020. Sweden scored above average in all five DESI dimensions and ranked second in the overall ranking of all EU28 Member States, only outperformed by Finland. In the same year, Sweden received only one Country Specific Recommendation in the context of the European Semester, calling the country to intensify further investments on high-tech and innovative sectors to restore labour productivity growth as well as expanding mobile broadband and 5G coverage in the country's least populated areas. In this context, the Swedish National Recovery and Resilience Plan put forward several measures to further improve across the different DESI dimensions, and it indicates the country's effort and desire to remain a leading actor in terms of digitalisation.

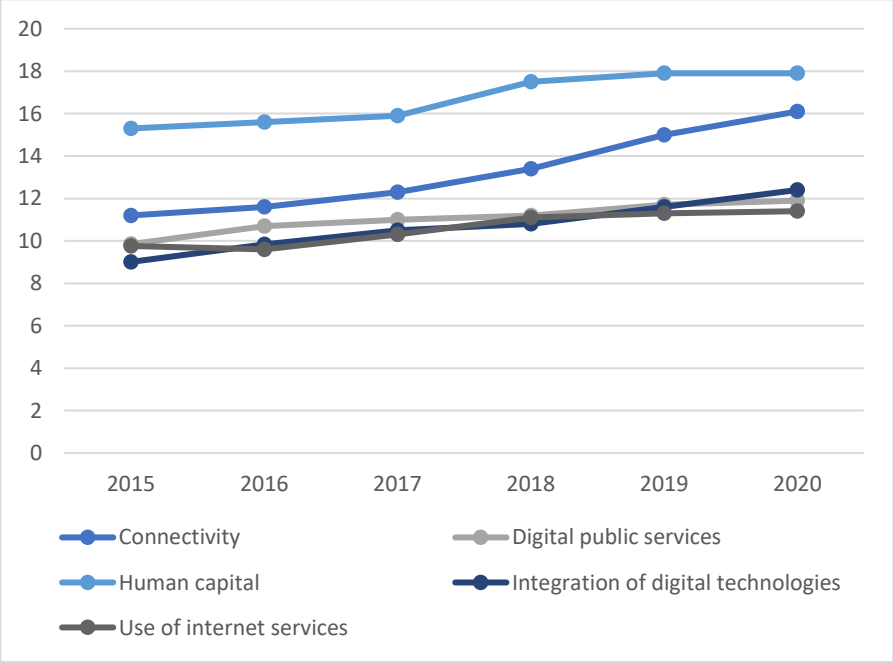
Figure 56. Performance on DESI 2020 - Sweden



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Since 2015 Sweden has been performing very well on DESI and always scored on the top three ranks of the index, in comparison to the EU28 countries. Figure 57 below indicates the country's continuous efforts in advancing its digital transformation as demonstrated by the evolution of all five main DESI indicators since 2015.

Figure 57. DESI indicators over the years - Sweden



Source: Authors' own elaboration based on the Digital Economy and Society Index (DESI) 2020

Concerning **connectivity,** Sweden can be considered a frontrunner compared to the other EU countries. Nonetheless, some sparsely populated areas of the country still faced difficulties in rolling out broadband coverage. Indeed, compared to other sub-components where it outperformed the EU average, Sweden's

scores were equal to the EU average in terms of 5G readiness. The country's national broadband strategy is meant to provide full coverage throughout all regions of the country by 2025.

Similarly, Sweden had high scores on the **human capital** dimension of DESI. Indeed, the Swedish population has in general good and advanced digital skills, also due to the high degree of digitalisation of the Swedish education, ensuring the development of digital skills and the use of digital tools from an early age. In addition, Sweden aims to further develop digital skills in universities, colleges and polytechnics as various investments under the country's Recovery and Resilience Plan suggest.

Data on the use of **internet services** suggested a very high uptake of internet services among the Swedish population. Indeed, Sweden scored well above the EU28 average in this dimension and has always done so since 2015.

Sweden scored above the EU28 average on the integration of **digital technologies** by ranking 6th on the index. The Swedish government particularly aims at supporting SMEs on their road towards digitalisation as demonstrated by large investments undertaken in this direction in the last years.

Lastly, Sweden also scored above the EU28 average on the uptake of **digital services** and ranked 10th. To further improve this position, the Danish Agency for Digital Government has been assigned to enhance the use of open data and new technologies across public sector entities and to establish a national framework for data as well as an interoperable digital infrastructure[238].

4.27.2 Reforms and investments

The Swedish Recovery and Resilience Plan, originally called *Sveriges återhämtningsplan,* was submitted to the European Commission for assessment on 27 May 2021 and is organised into five focus areas.[239] The measures under these five focus areas are split into investments and reforms. The Swedish Plan received approximately EUR 3.2 billion from the RRF, all in grants. Of these, around 24% are allocated to digital objectives, amounting to EUR 796.8 million. These will mostly focus on expanding the digital infrastructure in the country and making public administration more efficient and effective. This will be done through investments in broadband expansion and research in digitalisation, among others.

Sweden's EUR 796.8 million dedicated to digital objectives will support the implementation of the following crucial investments by 2026. These have been grouped into four categories, and whenever possible, they have been linked to their relevant overarching reform, identifiable in the coloured textboxes.

Connectivity

[238] https://digital-strategy.ec.europa.eu/en/policies/desi-sweden
[239] The focus areas are: 1) Green Recovery, 2) Education and Transition, 3) Improving the conditions to meet the demographic challenge and ensuring the integrity of the financial system, 4) Broadband deployment, digitalisation of public administration and research, 5) Investments in Growth and Housing.

As mentioned above, it will be important to ensure connectivity throughout the whole country so as to guarantee the full effectiveness and success of the digital reforms put forward by Sweden in its Recovery and Resilience Plan. One specific investment is dedicated to the advancement of the country's connectivity, and an amount of approximately EUR 200 million will be allocated to it from the RRF, spread over three years[240].

Broadband Expansion: This investment is meant to accelerate the pace of broadband deployment in Sweden, so as to achieve the government's goal of obtaining full coverage of fast broadband across the country by 2025.

eGovernment, digital public services and local digital ecosystems

Sweden, which already counts effective digital public services, will further improve its eGovernment services by putting forward in its Plan an investment, as described below, of approximately EUR 20.9 million[241].

Government-wide digital infrastructure: This investment will allow a more secure and efficient access to public data (basic data) and exchange of information within the public sector. This will be achieved through the establishment of a national digital infrastructure consisting of various digital services, frameworks, and standards. Furthermore, the aim is to promote the interoperable use of digital services across authorities and municipalities, rather than developing their own, and to foster increased interoperability within the public sector. This investment also provides Sweden with a better basis to implement the Once-Only principle.

Human Capital

Investing in Human Capital is meant to ensure that the whole population can reap the benefits of the digital transition and that nobody is left behind. Two investments in Sweden's Recovery and Resilience Plan and worth approximately EUR 167 million are dedicated to foster digital learning and skills of the Swedish population[242].

Provide more training opportunities for students: The purpose of the measure is to increase opportunities for training and retraining of students to meet the needs of the labour market and to raise the level of skills, particularly digital ones, of the labour force.

Resources to meet the demand for training at universities and colleges: This investment will increase funding for universities and colleges to allow more students to be enrolled and thus meet the future needs of the workforce. The investment will promote access to higher education throughout the country and provide increased opportunities for all students. The investment will also promote digital literacy and the development of digital skills in universities and colleges.

[240] The connectivity aspect of the Plan is covered by the **focus area 4** (Broadband deployment, digitisation of public administration and research).
[241] This aspect of the Plan is covered under **focus area 4** (Broadband deployment, digitisation of public administration and research).
[242] The human capital aspect of the Plan is covered under **focus area 2** (Education and Transition).

Digital-related investment in R&D

Digital-related investments in R&D will be of utmost importance in Sweden to continue supporting the country's research network and further boost digitalisation and innovation. This dimension is covered by one investment and receives approximately EUR 241 million of the Plan's budget[243].

Research in digitalisation: This investment will make Sweden one of the world's leading nations when it comes to innovation and research knowledge. Therefore, this investment will foster research on the societal impact of digitalisation, fund the creation of an innovation programme in economics and AI and promote research in information and cybersecurity. The investment also sets out to contribute to meet the needs of Swedes in digital skills provision and life-long learning in an increasingly digitalised world.

[243] This aspect of the Plan is covered by the **focus area 4** (Broadband deployment, digitisation of public administration and research).

NO-07-22-096-EN-N

An action supported by Interoperable Europe

The ISA² Programme has evolved into Interoperable Europe - the initiative of the European Commission for a reinforced interoperability policy.

The work of the European Commission and its partners in public administrations across Europe to enhance interoperability continues at full speed despite the end of the ISA² programme. Indeed, enhanced interoperability will be necessary to unlock the potential of data use and reuse for improved public services, to enable cross-border collaboration, and to support the sector-specific policy goals set by the Commission for the future.

Interoperable Europe will lead the process of achieving these goals and creating a reinforced interoperability policy that will work for everyone. The initiative is supported by the Digital Europe Programme.

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Publications Office of the European Union

ISBN: 978-92-76-48566-7

DOI: 10.2799/507299

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