



Brussels, 11.6.2020  
SWD(2020) 111 final

PART 3/6

**COMMISSION STAFF WORKING DOCUMENT**

**Digital Economy and Society Index (DESI) 2020**



# Digital Economy and Society Index (DESI) 2020

## Country reports

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## About the DESI

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*The European Commission has been monitoring Member States' digital progress through the Digital Economy and Society Index (DESI) reports since 2014. The DESI reports include both country profiles and thematic chapters. In addition, an in-depth telecoms chapter is annexed to the reports for each Member State.*

*The DESI country reports combine quantitative evidence from the DESI indicators across the five dimensions of the index with country-specific policy insights and best practices.*

*The current COVID-19 pandemic has shown how important digital assets have become to our economies and how networks and connectivity, data, AI and supercomputing as well as basic and advanced digital skills sustain our economies and societies by allowing work to continue, tracking the spread of the virus and accelerating the search for medications and vaccines.*

*Member States have put in place specific measures to mitigate the impact of the pandemic. A dedicated section in each country details them. Digital will also play a key role in the economic recovery as the European Council and the Commission have undertaken to frame the support to the recovery along the twin transition to a climate neutral and resilient digital transformation. In this framework, the deployment of 5G and very high capacity networks (VHCNs), digital skills, the digitisation of companies and the public administration are crucial for a robust recovery. The DESI monitors their progress in each Member State.*

*As regards the thematic chapters, the DESI 2020 report includes a European-level analysis of broadband connectivity, digital skills, use of the internet, digitisation of businesses, digital public services, emerging technologies, cyber security, the ICT sector and its R&D spending and Member States' use of Horizon 2020 funds.*

*To improve the methodology of the index and take account of the latest technological developments, a number of changes were made to the 2020 edition of DESI, which now includes Fixed very high capacity network (VHCN) coverage. The DESI was re-calculated for all countries for previous years to reflect the changes in the choice of indicators and corrections made to the underlying data. Country scores and rankings may thus have changed compared with previous publications. As the figures refer to 2019, the United Kingdom is still included in the 2020 DESI, and EU averages are calculated for 28 Member States. For further information, please consult the DESI website: <https://ec.europa.eu/digital-single-market/en/desi>.*

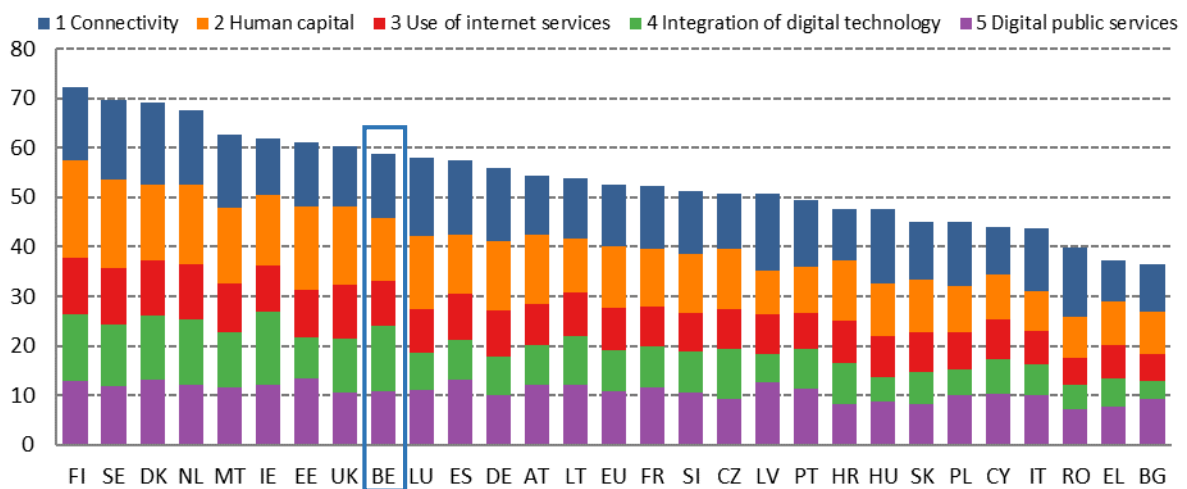
*It is noted that statements regarding planned or potential State aid measures record intentions declared by Member States and do not pre-judge or pre-empt the assessment of such measures by the Commission under the relevant state aid rules. The DESI report is not meant to provide any assessment of the compliance of such measures with state aid rules and procedures.*



## Belgium

	Belgium		EU
	rank	score	score
<b>DESI 2020</b>	<b>9</b>	<b>58.7</b>	<b>52.6</b>
DESI 2019	11	53.0	49.4
DESI 2018	11	50.1	46.5

**Digital Economy and Society Index (DESI) 2020 ranking**



Belgium ranks 9<sup>th</sup> out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020.

Based on data prior to the pandemic, Belgium shows a mixed performance in connectivity. While the country performs well in deploying fast and very high capacity networks, it is lagging behind in 5G readiness.

The Belgian authorities, both at federal and regional level, have made clear efforts to tackle the wide digital skills gap – both in the education systems and in the labour market. Despite the initiatives put in place and the success of several smaller scale projects, the numbers still do not really show a significant improvement in this very important area.

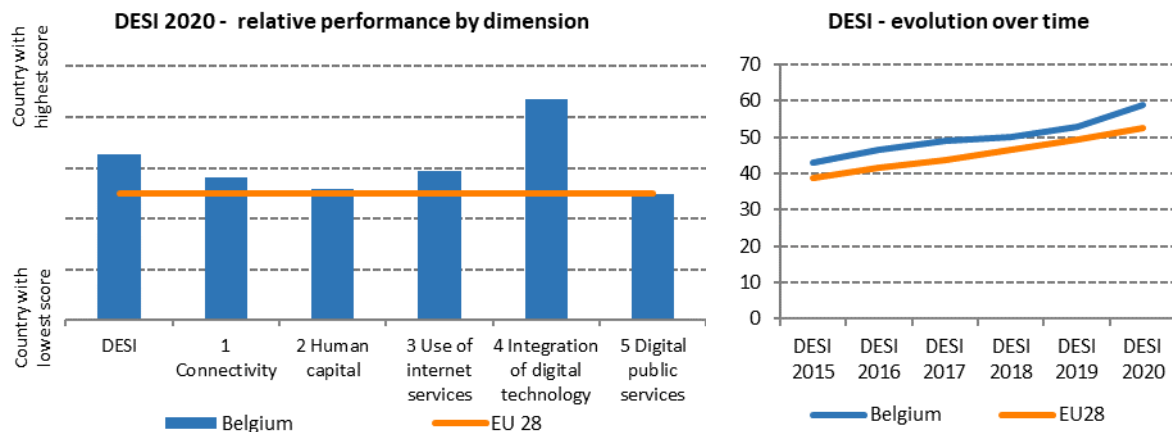
The number of citizens in Belgium who have never used the internet continued to fall in 2019. There is a slow but steady improvement in relation to online activities – both for work and leisure.

Belgium is among the leading EU Member States when it comes to using digital technology for business. Initiatives both at federal and regional level have helped companies to become more and more digital.

The DESI figures measuring progress in e-government show varied results. The Belgian authorities have been promoting digital public services resulting in Belgium being on a par with other Member States. However, the uptake of these services by citizens is definitely below the potential. There was a modest improvement in most of the indicators in 2019.

In 2019, new strategies and policy goals were adopted (e.g. DigitalWallonia4AI; the policy notes 2019 – 2024 of the new Flemish government) and existing ones were updated. Managing digital transformation ranks high on the policy agenda both at federal and regional level and detailed policy

(strategies, action plans, initiatives, etc.) and financial instruments have been adopted and put in place to frame and promote a wide range of actions all over the country.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

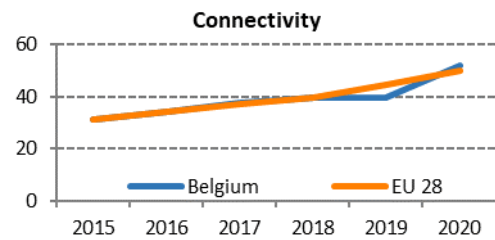
The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Belgian authorities have taken several policy measures to deal with the COVID-19 and mitigate its effects on economy and society with the help of technology. Public health related initiatives include support to the « Pan-European Privacy-Preserving Proximity Tracing » mechanism or using the supercomputer BrENIAC to help research against the virus. Several initiatives provide information to SMEs and entrepreneurs to help them in making business on the internet. Digital platforms are in place for citizens for the submission of requests for compensations online, or to support volunteerism and solidarity.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Belgium scores well on Very High Capacity Networks and on the digitisation of businesses. On the other hand, it has not yet assigned any 5G spectrum and has a relatively weak performance in digital public services.

# 1 Connectivity

1 Connectivity	Belgium		EU
	rank	score	score
<b>DESI 2020</b>	<b>13</b>	<b>52.0</b>	<b>50.1</b>
DESI 2019	23	39.9	44.7
DESI 2018	17	39.8	39.9



	DESI 2018	Belgium	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
		value		value
<b>1a1 Overall fixed broadband take-up</b> % households	<b>81%</b> 2017	<b>NA</b> 2018	<b>79%</b> 2019	<b>78%</b> 2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	<b>42%</b> 2017	<b>40%</b> 2018	<b>45%</b> 2019	<b>26%</b> 2019
<b>1b1 Fast broadband (NGA) coverage</b> % households	<b>98%</b> 2017	<b>99%</b> 2018	<b>99%</b> 2019	<b>86%</b> 2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	<b>1%</b> 2017	<b>1%</b> 2018	<b>66%</b> 2019	<b>44%</b> 2019
<b>1c1 4G coverage</b> % households (average of operators)	<b>97%</b> 2017	<b>100%</b> 2018	<b>100%</b> 2019	<b>96%</b> 2019
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	<b>72</b> 2017	<b>75</b> 2018	<b>78</b> 2019	<b>100</b> 2019
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	<b>NA</b>	<b>0%</b> 2019	<b>3%</b> 2020	<b>21%</b> 2020
<b>1d1 Broadband price index</b> Score (0 to 100)	<b>NA</b>	<b>NA</b>	<b>52</b> 2019	<b>64</b> 2019

With an overall connectivity score of 52.0 Belgium improved its ranking and it ranks 13<sup>th</sup> among EU countries. Belgium is very close to achieving the 2020 targets. Almost all households are covered by fixed networks capable of providing services of 30 Mbps (99% since 2019) and 4G coverage has reached 100% of the households already in 2019. In terms of fixed broadband take-up, 79% of all households subscribe to any kind of fixed internet access, slightly above the EU average of 78%. Belgium's strength comes from the very high take-up of at least 100 Mbps broadband and the VHCN coverage which was achieved through upgrade to DOCSIS.3.1. With 45% of its households subscribing to offers of at least 100 Mbps, Belgium stands 6<sup>th</sup> in the EU. Its weak point is the low mobile broadband take-up (78 subscriptions per 100 people) comparing to the EU average (100). The prices in Belgium are consistently higher than the EU average and this is reflected in the broadband price index 52 ranking 23<sup>rd</sup>.

Belgium is highly likely to reach the 2020 targets of its national plan 'Digital Belgium – Plan for Ultrafast Internet in Belgium 2015–2020', despite the persistence of a few white spots (50% of the households having access to Gbps broadband speed). However, the country lags behind in terms of very-high speed network deployment. There is currently no public funding to meet the national broadband plan objectives, the achievement of which relies on private investment only. The copper incumbent has started a €3 billion fibre rollout plan in 2017 in order to cover 85% of businesses and 50% of households by 2027. Alternative operators plan to expand their own fibre networks in business zonings. In September 2019, one of the operators commercially launched 1 Gbps offers

throughout Flanders and Brussels (available to more than 3 million households and businesses) and was planning to upgrade its hybrid fibre-coaxial HFC network to DOCSIS <sup>(1)</sup> 3.1 protocol in the beginning of 2020. Another operator also launched its new DOCSIS 3.1 modem at the end of 2019.

Belgium scores 0% in the 5G readiness indicator <sup>(2)</sup>. In Belgium, only 27% of the spectrum harmonised at EU level for wireless broadband has been assigned. Timely deployment of 5G is expected to be challenging. A simultaneous multiple round auction (SMRA) multiband auction for the bands 700 MHz, 900 MHz, 1800 MHz, 2100 MHz and 3600 MHz is anticipated, but it is not expected to happen before 2021. Whether the auction takes place or not depends on a political agreement being reached between the federal government and the regions on the distribution of the auction's proceeds, and the auction design, including the considerations about reserving spectrum for a new entrant. The timely deployment of 5G networks faces other obstacles, including: i) the strict radiation limits (particularly in Brussels), which are different in each of the three regions; ii) the various deadlines for granting environmental permits to deploy antennae (a regional responsibility); and iii) the taxation of antennae by municipalities, particularly in Brussels, which can go to up to €10,000 per year per antenna. In March 2020, Belgian authorities opened a public consultation for temporary national licenses for the 200 MHz of available spectrum in the band 3600-3800 MHz as a temporary solution.

While Belgium still performs well in the coverage of fixed and mobile broadband, reflecting mainly the wide availability of upgraded legacy networks, it risks lagging behind in 5G deployment due to the 5G pioneer bands not being assigned in good time, and other factors negatively affecting the deployment of wireless networks.

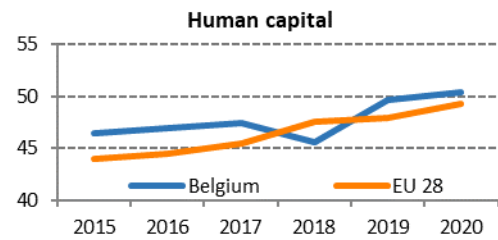
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<sup>(1)</sup> Data over cable service interface specification

<sup>(2)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

## 2 Human capital

2 Human capital	Belgium		EU
	rank	score	score
DESI 2020	12	50.4	49.3
DESI 2019	12	49.6	47.9
DESI 2018	15	45.6	47.6



	Belgium			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b> % individuals	61% 2017	61% 2017	61% 2019	58% 2019
<b>2a2 Above basic digital skills</b> % individuals	31% 2017	31% 2017	34% 2019	33% 2019
<b>2a3 At least basic software skills</b> % individuals	63% 2017	63% 2017	62% 2019	61% 2019
<b>2b1 ICT specialists</b> % total employment	4.2% 2016	4.6% 2017	4.8% 2018	3.9% 2018
<b>2b2 Female ICT specialists</b> % female employment	1.3% 2016	1.8% 2017	1.6% 2018	1.4% 2018
<b>2b3 ICT graduates</b> % graduates	1.1% 2015	1.6% 2016	1.9% 2017	3.6% 2017

As regards human capital, Belgium ranks 12<sup>th</sup> out of 28 EU countries, slightly above the EU average. Having remained unchanged for 4 consecutive years (61%), at least basic digital skills levels remain above the EU average (58%), similar to at least basic software skills (62%). There is a promising small improvement in terms of more advanced skills (34% compared to 31% in the previous survey). The proportion of ICT specialists represent a higher percentage of the workforce compared to the EU average (4.8% compared with 3.9% in the EU as a whole) and this figure is increasing slightly every year. There was a small drop in the percentage of female ICT specialists, although Belgium still scores slightly above the EU average. Despite the very slow improvement measured in the previous years, the number of ICT graduates (1.9% according to the latest figures) is still below the EU average (3.6%) which results in a very low ranking among the EU Member States.

The need for a more digitally skilled workforce remains an issue in Belgium. The findings of the Agoria study from 2018<sup>(3)</sup> remain valid: 4.5 million workers' digital and related skills need to be strengthened. There are several projects and initiatives – either in the pipeline or already in place – promoted by the Belgian authorities to help people to obtain these skills.

- Digitalcity.brussels will be the training and employment centre for digital jobs in the Brussels-Capital Region.
- The #WallCode Digital Wallonia project aims to develop the digital skills of the new generation in the fields of coding, algorithms and robotics.
- The federal programme “Digital Belgium Skills Fund” will fund around 30 digital skills projects for the fourth year in a row. Also, BeCentral, the digital skills learning hub of

<sup>(3)</sup> <https://www.agoria.be/nl/Agoria-Zonder-aangepast-beleid-zijn-er-584-000-openstaande-vacatures-in-2030>

Brussels, had drastically increased its size and programmes, becoming the largest digital skills learning hub in Europe.

- VDAB, the Flemish Public Employment Service, organises training courses on digital skills and also adjusts them to the needs of the labour market. They also launched a massive open online course (MOOC), on Artificial Intelligence (AI) to help employers learn more about this subject in order to tackle existing prejudices.
- Agoria has developed a MOOC on AI, dedicated to the upskilling of workers and the uptake of AI in companies. Other smaller-scale initiatives have also been launched, such as the AI Black Belt and the PhD AI Seminars, both at BeCentral.

While Belgium has not yet adopted a nationwide, comprehensive digital skills strategy, every community and region has specific policy instruments in place, which aim to address the digital skills shortages at various levels of education. While the more recent ones <sup>(4)</sup> still need more time to have an impact, more mature ones such as the Digital School in Wallonia or the Action Plan for Science, Technology, Engineering and Mathematics (STEM) in Flanders show promising results: schools in the French speaking community are better supplied with digital equipment and, since the STEM action plan was implemented, 1300 more pupils in Flanders follow STEM courses, with more and more girls getting involved in STEM as well. Furthermore, Belgium was active in EU Code Week with 265 events in 2019.

There are clear efforts to promote inclusion and a better gender balance in the digital sector. In April 2019, Belgium signed the European declaration on 'promoting greater participation of women in digital' and it also launched the national 'Women in Digital' Action Plan where the federal and regional authorities work together to achieve their goals. Furthermore, in 2019, the government of the Brussels-Capital Region hired a digital inclusion coordinator.

Despite the abovementioned efforts, it remains important that there is a more coordinated action from all stakeholder groups – both public and private - to face the specific challenge of a digital skills shortage posed by digital transformation.

#### Highlight 2020: BeCode

BeCode <sup>(5)</sup> teaches young people how to become web developers, free of charge. This intensive 6-month training course can be a turning point in their career. The organisation is a partner in a federation with the Flemish public employment service (VDAB) and a private investor. The private investor funds BeCode, and VDAB pays them a fee for every young person who finds a job through BeCode.

BeCode has opened training centres in Brussels, Charleroi, Genk, Liège, Antwerp and Ghent, partnering each time with local stakeholders.

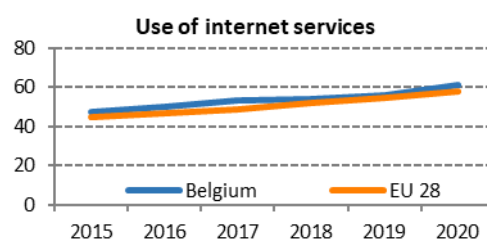
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<sup>(4)</sup> <http://enseignement.be/index.php?page=28101&navi=4540>

<sup>(5)</sup> <http://becode.org/>

### 3 Use of internet services

3 Use of internet services	Belgium		EU
	rank	score	score
DESI 2020	10	61.2	58.0
DESI 2019	10	56.2	55.0
DESI 2018	10	54.3	51.8

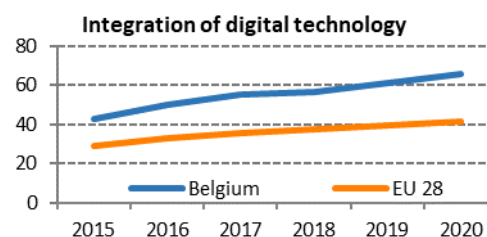


	DESI 2018	Belgium	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
	2017	value	2019	value
<b>3a1 People who have never used the internet</b> % individuals	10%	9%	7%	9%
<b>3a2 Internet users</b> % individuals	86%	87%	89%	85%
<b>3b1 News</b> % internet users	64%	64%	65%	72%
<b>3b2 Music, videos and games</b> % internet users	72%	74%	74%	81%
<b>3b3 Video on demand</b> % internet users	12%	24%	24%	31%
<b>3b4 Video calls</b> % internet users	46%	44%	64%	60%
<b>3b5 Social networks</b> % internet users	82%	82%	84%	65%
<b>3b6 Doing an online course</b> % internet users	9%	9%	10%	11%
<b>3c1 Banking</b> % internet users	76%	78%	79%	66%
<b>3c2 Shopping</b> % internet users	67%	67%	72%	71%
<b>3c3 Selling online</b> % internet users	23%	21%	26%	23%

Overall, the use of internet services in Belgium is slightly better than the EU average: there is a slow constant drop in the number of people who never used the internet, while there is a slow rise in the number of people who use the internet. Interestingly, activities related to online entertainment (news, music, videos, games and video-on-demand services) are below the EU average. However there is a significant increase in the popularity of video calls by internet users. In Belgium, social networks and internet banking are used far more often than in the EU as a whole, while other online activities such as shopping, selling online or taking online courses are around or slightly above the EU average.

## 4 Integration of digital technology

4 Integration of digital technology	Belgium		EU
	rank	score	score
<b>DESI 2020</b>	<b>3</b>	<b>65.9</b>	<b>41.4</b>
DESI 2019	3	61.4	39.8
DESI 2018	5	56.4	37.8



	Belgium		EU	
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>4a1 Electronic information sharing</b> % enterprises	54%	54%	53%	34%
<b>4a2 Social media</b> % enterprises	24%	24%	34%	25%
<b>4a3 Big data</b> % enterprises	17%	20%	20%	12%
<b>4a4 Cloud</b> % enterprises	NA	31%	31%	18%
<b>4b1 SMEs selling online</b> % SMEs	23%	28%	29%	18%
<b>4b2 e-Commerce turnover</b> % SME turnover	15%	13%	14%	11%
<b>4b3 Selling online cross-border</b> % SMEs	12%	12%	15%	8%

Belgium scores very well and is clearly above the EU average, on integrating technology into the activities of businesses. On the other hand, except for social media use and online cross-border sales, with a significant increase of 10 percentage points and modest increase of 3 percentage points respectively, the other indicators levelled off compared to the previous year. Belgian businesses rank very well in the use of technologies of more strategic importance such as cloud and big data. When it comes to electronic information sharing, Belgium maintained its position as the best performing EU Member State.

Belgium is committed to advancing new digital technologies and investing strategically in digital technologies through EU-coordinated initiatives and programmes. For example, the country is a member of the EuroHPC Joint Undertaking and has signed the Declaration on the European Blockchain Partnership, as well as the Declaration on cooperation on Artificial Intelligence. The Brussels-Capital region participates in LUMI <sup>(6)</sup>, a pan-European high-performance supercomputer project. In April 2019, Belgium also joined the new European initiatives on cooperation on advancing digitisation in cultural heritage and the digitalisation of agriculture and rural areas.

The Belgian authorities have been working continuously on implementing several federal and regional strategies put in place over recent years to advance the integration of digital technology in economic sectors. Both EU and Belgian funds are being used for these purposes and innovation hubs in all regions are actively involved in providing support for digital innovation and entrepreneurship.

<sup>(6)</sup> Large unified modern infrastructure



Belgium continues to raise awareness of digital technology to boost the digital transformation of its national and regional economy, taking into account the needs of SMEs and start-ups.

In 2019, major action plans and strategies (e.g. AI4Belgium, DigitalWallonia4AI, Flemish Artificial Intelligence Action Plan) have been adopted to further the development in AI. In the field of cybersecurity, similar initiatives have been put forward (e.g. Flemish Cybersecurity Action Plan), underpinned by financial support measures. Wallonia was active in the Interreg Europe Cyber <sup>(7)</sup> project. Also, the programme 'e-logistics by Digital Wallonia' was launched to help businesses to optimise their supply chain.

The Brussels-Capital region continued to implement the Next Tech Plan <sup>(8)</sup> to help the digital transformation of businesses and the Regional Data Centre has moved to a new site. Flanders has set up the Open Science Board and Wallonia has been active in the areas of 'smart region' and 'smart agriculture'.

The Belgian start-up ecosystem continued to benefit from both financial and professional support from dedicated programmes and bodies (e.g. Flemish Strategic Research Centres, W.I.N.G. <sup>(9)</sup> in Wallonia). Belgian authorities and universities worked together to facilitate collaboration, as well as knowledge and innovation transfer with businesses.

Despite these efforts, skills mismatches still persist and prevent the full range of rewards being reaped from the adoption of digital technologies.

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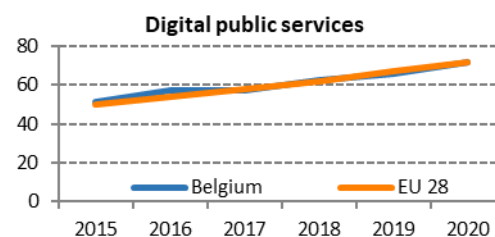
<sup>(7)</sup> <https://www.interregeurope.eu/cyber/>

<sup>(8)</sup> <https://nexttech.brussels/wp-content/uploads/2017/01/PlanNextTech-2017-2020-fr.pdf>

<sup>(9)</sup> <https://www.wing-digitalwallonia.be/>

## 5 Digital public services

5 Digital public services	Belgium		EU
	rank	score	score
<b>DESI 2020</b>	<b>15</b>	<b>71.7</b>	<b>72.0</b>
DESI 2019	14	65.8	67.0
DESI 2018	14	62.4	61.8



	Belgium			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>5a1 e-Government users</b> % internet users needing to submit forms	<b>50%</b> 2017	<b>51%</b> 2018	<b>53%</b> 2019	<b>67%</b> 2019
<b>5a2 Pre-filled forms</b> Score (0 to 100)	<b>68</b> 2017	<b>73</b> 2018	<b>70</b> 2019	<b>59</b> 2019
<b>5a3 Online service completion</b> Score (0 to 100)	<b>85</b> 2017	<b>86</b> 2018	<b>88</b> 2019	<b>90</b> 2019
<b>5a4 Digital public services for businesses</b> Score (0 to 100) - including domestic and cross-border	<b>81</b> 2017	<b>81</b> 2018	<b>93</b> 2019	<b>88</b> 2019
<b>5a5 Open data</b> % of maximum score	<b>NA</b>	<b>NA</b>	<b>65%</b> 2019	<b>66%</b> 2019

Belgium scores close to the EU average in digital public services in two of the indicators: open data and online service completion. The digital public services offered to businesses – both domestic and cross-border – are slightly above the EU average, by 4 percentage points. Despite these relatively average performances, there is an upward trend, especially in e-government services for businesses with an impressive increase of 13 percentage points. The use of pre-filled forms fell compared to DESI 2019, but it does not affect Belgium’s overall ranking. However, despite these achievements, the percentage of e-government users is very low and significantly below the EU average.

The development of digital public services continued in Belgium throughout 2019. The Digital Transformation Office launched the beCEPS e-platform to help contracting authorities in public procurements. According to the Flemish ‘public cloud first’ strategy, a public cloud solution is to be evaluated first before other technical solutions are to be taken into consideration.

The Flemish government continues to develop the digital platform for entrepreneurs <sup>(10)</sup> with more and more useful functionalities and plan to conduct a communication campaign in 2020 to promote the site. Initiatives have been launched or are being tested to improve other e-government features such as the ‘E-box entrepreneurs’ project. The digitalisation of regional government services is being financed through ‘Flanders Radically Digital’, a dedicated investment programme which aims to completely digitise Flemish governmental services.

The IrisBox application <sup>(11)</sup> has been updated with new features <sup>(11)</sup> and the Brussels-Capital region will continue to promote the digitalisation of public services under a new plan between 2019 and 2024.

<sup>(10)</sup> [www.vlaanderenonderneemt.be](http://www.vlaanderenonderneemt.be)

<sup>(11)</sup> [irisbox.irisnet.be](http://irisbox.irisnet.be)

In 2019, there was a significant increase among municipalities in Smart City initiatives in Wallonia and both Wallonia and the Brussels-Capital Region started to address the challenges related to building and urban planning as well as environmental permits. The Brussels-Capital Region has updated its Nova Citizen platform <sup>(12)</sup> to allow citizens to track their planning and environmental permit files. The region also plans to set up a single portal for online permit applications. Wallonia intends to digitise administrative procedures for urban planning, first by testing in a limited number of municipalities. The challenges related to the digitisation of the judiciary remain unresolved.

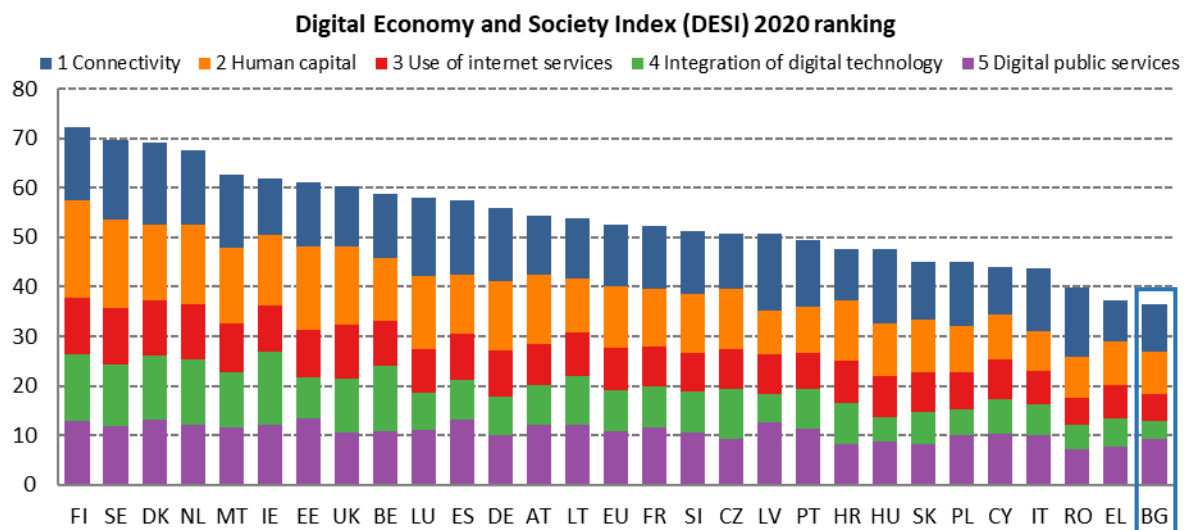
The Belgian authorities – both at federal and regional level – are working hard to develop digital public services in several fields. However, new initiatives may also be required to increase the uptake of e-government services among citizens.

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<sup>(12)</sup> <https://bric.brussels/en/our-solutions/business-solutions/nova-1>

## Bulgaria

	Bulgaria		EU
	rank	score	score
<b>DESI 2020</b>	<b>28</b>	<b>36.4</b>	<b>52.6</b>
DESI 2019	28	33.8	49.4
DESI 2018	27	33.5	46.5



Bulgaria ranks 28<sup>th</sup> out of the 28 EU countries in the European Commission digital economy and society index (DESI) for 2020. Although its overall score has risen to 36.4, it now ranks lower than before on the basis of data prior to the pandemic. This is because the country has not performed particularly well on some DESI indicators, while EU peers have improved their performance on certain indicators. Bulgaria performs relatively well in connectivity, specifically as regards the wide availability of ultrafast and mobile broadband networks. It has made significant improvements in e-government, with rising numbers of users and a high score in providing digital public services for business.

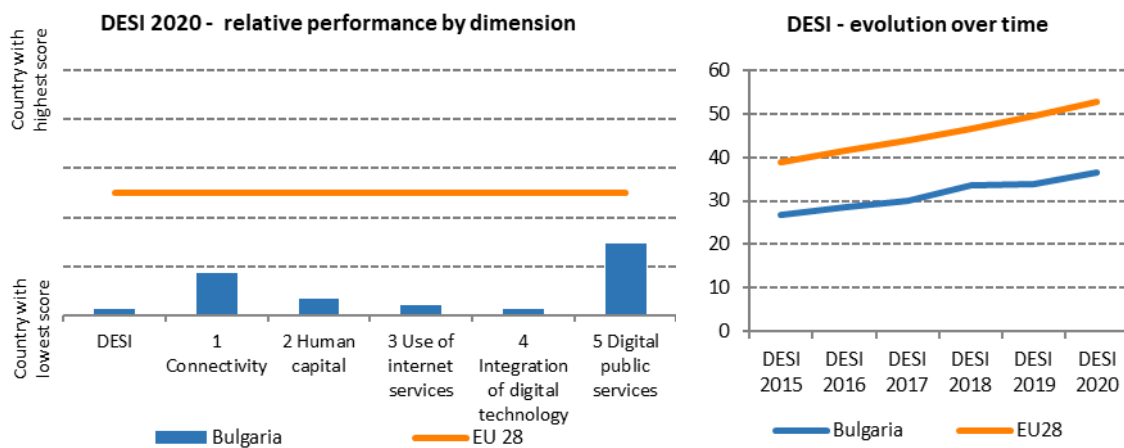
In **human capital**, Bulgaria has moved up two steps in the ranking since last year. However, its level of digital skills is among the lowest in the EU. People with at least basic digital skills account for 29% of the total adult population, against an EU average of 58%, while only 11% have skills above a basic level (just under a third of the EU average). Bulgaria's performance is also well below average as regards the integration of digital technology. Bulgarian firms are not yet taking full advantage of the opportunities online commerce offers: 7% of SMEs sell online (against an EU average of 18%), 3% of total SMEs make cross-border sales, and only 2% of their turnover comes from the online segment.

The priorities of Bulgaria's national programme **Digital Bulgaria 2025** include:

- a new regulatory framework for the electronic communications sector;
- harmonised use of radio spectrum;
- overcoming regional disparities through investment in ICT infrastructure and technologies;
- ICT research and innovation;
- digitising Bulgaria's industrial sectors and developing a data-based economy;
- modernising school and tertiary education in ICT;

- improving the labour force’s ICT competencies;
- increasing the number of qualified ICT specialists;
- upholding children’s rights in the digital environment;
- e-government;
- equal access to digital public services;
- interoperability, network and information security;
- resilience to cyber-attacks;
- govern Bulgarian top-level domains (.bg and .бг ) to become the preferred registration;
- safer internet for children.

The Ministry of Transport, Information Technology and Communications is in the process of drawing up a document entitled ‘Digital Transformation of Bulgaria for 2020-2030’. That will cover the potential of digital transformation for growth, work and prosperity, healthcare, energy policy, equal opportunities and social participation, and government transparency. The technological changes associated with digitisation include the use of ICT in manufacturing (Industry 4.0), big data and artificial intelligence (AI), as well as the Internet of Things (IoT), smart living and smart transport.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

The state of emergency led to new e-services, accelerating the digitalisation of the public administration and the information exchange between the institutions and citizens. The State eGovernment Agency (SEGA) launched a national telephone number for information on e-services. The Employment Agency launched an electronic service for job seekers to file applications and register. The National Social Security Institute offered the possibility to request

and issue an NSSI Personal Identification Code (PIC) digitally. The Ministry of Health launched a National information system for combating COVID-19 with information on all diagnosed and quarantined persons, linking all relevant institutions.

The free mobile app ViruSave allows health status sharing with the National Operational Staff, health authorities and the general practitioner. The Ministry of Health is speeding up the introduction of the National Health Information System. By December 2020 the electronic dossier, prescription and medical referral, registers and the system for drugs monitoring are expected to be ready.

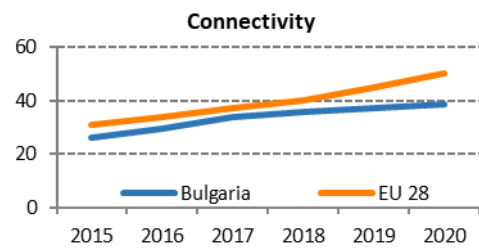
The Ministry of Education and Science developed a National Portal for Digital Education and integrated Teams to support schools and a National digital library. With funding from the budget schools can finance the cost of providing home internet to students who do not have access to it and to distance learning.

Bulgaria approved additional budget expenditure of BGN 7 million and redirected €20 million from the Operational Program "Regions for Growth" 2014-2020 for the purchase of equipment and materials. Through the operational programmes for cohesion policy, the authorities are mobilising another €495 million for measures alleviating the socio-economic consequences of the pandemic.

With regard to the DESI indicators relevant to the economic recovery after the COVID-19 crisis, Bulgaria is lagging behind in the 5G, the digital skills and the digitisation of businesses indicators. In the deployment of VHCN it ranks 20<sup>th</sup>, and its performance in digital public services is relatively weak.

# 1 Connectivity

1 Connectivity	Bulgaria		EU
	rank	score	score
DESI 2020	26	38.5	50.1
DESI 2019	26	37.2	44.7
DESI 2018	24	35.6	39.9



	Bulgaria			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>1a1 Overall fixed broadband take-up</b> % households	59%	58%	58%	78%
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	7%	10%	11%	26%
<b>1b1 Fast broadband (NGA) coverage</b> % households	75%	75%	77%	86%
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	38%	38%	42%	44%
<b>1c1 4G coverage</b> % households (average of operators)	72%	80%	81%	96%
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	87	98	103	100
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	NA	0%	0%	21%
<b>1d1 Broadband price index</b> Score (0 to 100)	NA	NA	72	64

With an overall connectivity score of 38.5, Bulgaria ranks 26<sup>th</sup> among EU countries. Fast broadband coverage (NGA) improved from 75% in 2018 to 77% in 2019 and VHCN coverage from 38% in 2018 to 42% in 2019. Bulgaria still has a gap to fill in fixed broadband network deployment to reach the EU average. It ranks at the bottom in overall broadband take-up with only 58% households subscribing and 25<sup>th</sup> on take-up of high-speed fixed broadband of at least 100 Mbps, with only limited progress year after year: from 7% in 2017, 10% in 2018 and 11% in 2019. The mobile broadband indicators, on the contrary, are relatively good, having further improved average 4G coverage from 72% in 2017, to 80% in 2018 and to 81% in 2019, with a high take-up steadily increasing from 87 subscriptions per 100 people in 2017, to 98 in 2018 and 103 subscriptions per 100 people in 2019. This places Bulgaria slightly above the EU average. Bulgaria ranks 10<sup>th</sup> in the broadband price index with prices lower than the EU average mainly for fixed services.

As of September 2019, the Bulgarian National Broadband Plan (NBP) for 2014-2020 had an implementation rate of 60%. Bulgaria does not seem to be close to reaching the 2020 targets due to poor high-speed network coverage in rural areas (missing 25% 100 Mbps coverage). However, the country aims to tackle the missing 25% of 100 Mbps by 2023 with €30 million from the European Agricultural Fund for Rural Development (EARD), attributed to the State eGovernment Agency. Bulgaria is considering a state-aid measure aiming to finalise its design by mid-2020.

Bulgaria has delayed the adoption of its new broadband plan. Nevertheless, the development and

deployment of high-speed networks is set as a priority in Bulgaria's National Development Programme (NDP) Bulgaria 2030. In line with the national priorities set in NDP, the new plan will focus on: deploying high-speed networks, especially broadband in rural areas; effective assignment of the spectrum for wireless broadband and 5G; accelerated development and take-up of broadband-dependent services such as cloud, IoT, etc.; and the development of digital skills and services. In addition, a mapping project based on 30 Mbps coverage at municipality level was completed in 2019. Private investments for the deployment of fibre broadband networks are estimated to around € 36.15 million in 2019. The WiFi4EU initiative and the possibilities of building free high-speed and high-quality wireless internet connection in public spaces was quite successful. It led to 227 municipalities (86% of all municipalities in the country) winning a voucher, compared to 113 in 2018. In 2019, Bulgaria adopted a new legal framework aiming at simplifying the investment process rules and implement cost-reduction measures, including the introduction of a Single Information Point.

Bulgaria scores 0 on the 5G readiness indicator. Overall, it has assigned only 14% of the spectrum for wireless broadband<sup>(13)</sup>. Assigning this spectrum has been challenging due to military use and aircraft communications use of parts of the 700 MHz and 800 MHz bands. Insufficient spectrum assigned could negatively affect coverage and timely 5G deployment. However, Bulgaria has taken preparatory steps for the deployment of spectrum for 5G networks with the update of the National Radio Spectrum Allocation Plan in September 2019, a prerequisite to release radio spectrum in the 700 MHz and 26 GHz bands for 5G networks, and the adoption of a roadmap for the 700 MHz band. In addition, the Communications Regulation Commission (CRC) was successful in its efforts to reduce the high annual spectrum use fees (2G, 3G and 4G) as the Council of Ministers approved it in March 2020.

The CRC has the conditions in place to plan and organise public consultations preceding competitive procedures for granting spectrum. The first auction of available spectrum in the 2.6 GHz and 3.4-3.8 GHz bands was scheduled for the second quarter 2020. The auction of the 700 MHz band was also scheduled for the second quarter of 2020, while the auction for the 26 GHz band is scheduled for 2021. Despite uncertainties regarding the 5G roll-out, three operators are already conducting successful 5G trials in two main directions: connection of major transport arteries and fully functional 5G communities. Support from the next operational programme, as needed, could contribute to further progress in these areas.

Bulgaria needs to take additional measures to achieve the NBP's objectives, including deploying the funds earmarked for high-speed broadband deployment. 5G tests and trials demonstrate commercial interest in investment, the lack of sufficient spectrum remains an obstacle to timely 5G deployment.

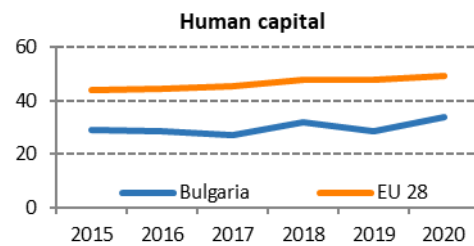
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<sup>(13)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.



## 2 Human capital

2 Human capital	Bulgaria		EU
	rank	score	score
DESI 2020	26	33.9	49.3
DESI 2019	28	28.5	47.9
DESI 2018	26	31.7	47.6



	Bulgaria			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>2a1 At least basic digital skills</b>	<b>29%</b>	<b>29%</b>	<b>29%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>11%</b>	<b>11%</b>	<b>11%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>31%</b>	<b>31%</b>	<b>31%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>2.7%</b>	<b>2.3%</b>	<b>3.0%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>1.7%</b>	<b>1.3%</b>	<b>1.8%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>3.1%</b>	<b>2.9%</b>	<b>3.7%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

Bulgaria ranks 26<sup>th</sup> out of 28 EU countries in human capital, having climbed two steps up from 2019. Nevertheless, its score of 33.9% remains well below the EU average of 49%. The overall level of basic digital skills in Bulgaria is among the EU's lowest. People with at least basic digital skills account for 29% of the total Bulgarian population aged 16 to 74, against an EU average of 58%. Only 11% of people have above basic skills, equivalent to a third of the EU average. ICT specialists now account for 3% of total employment marking an increase, although this figure remains a small proportion of the workforce given the labour market shortages. Female ICT specialists account for 1.8% of total employment, slightly above the EU average.

The education system is currently being modernised. Although reforms do not fully capture the magnitude of the digital transformation, there is greater focus on improving digital skills levels. Government support for training in STEM and ICT faculties has brought about a revised school curriculum. Computer modelling was introduced in the third year of school, starting in the 2018-2019 school year. There are now more classes with IT profiles in upper secondary school, such as the national programme 'Education for IT careers'.

In the context of the higher-education reform, there are measures to increase cooperation between education institutions and businesses. The European Social Fund supports specific action to update university curricula in line with labour market needs. Student numbers in ICT show a slight increase, but remain low in science, mathematics and physics.

The national programme entitled 'Ensuring a contemporary educational environment' is investing in specialised equipment for study rooms, laboratories and workshops for both science education in general education and specialised training of students in physics, astronomy, chemistry, environmental protection, biology and health education.

The national programme called ‘Information and communication technologies (ICT) in pre-school and school education’ provides €5,624,000 (2019) to improve the quality of e-learning, access to ICT, innovative teaching methods and training of teachers. Funds from the operational programme ‘Science and education for intelligent growth’ for building a modern, protected educational environment in schools and kindergartens, including display equipment and ICT teaching materials, provided €11,660,000 under the ‘Education for tomorrow’ project (2019 – 2022).

There are several activities designed to develop digital skills, involving a variety of stakeholders. Examples include private companies providing free training in coding or an online course in cyber hygiene for schoolchildren, developed in collaboration with the State eGovernment Agency. The Bulgarian Digital National Alliance organises activities designed to boost digital skills among the general public. In 2019, EU Code Week Bulgaria organised 615 events with around 47,000 participants. Bulgaria also has a national jobs and skills coalition.

Performance-based funding for Vocational Education and Training (VET) will target occupations that are in short supply on the labour market. VET schools providing training for these occupations will receive financial incentives.

Negative demographic trends and rising skill shortages suggest that Bulgaria needs more investment in the skilling, upskilling and reskilling of its current and future labour force. The need to upskill and reskill the adult population is high, while participation in adult learning is low. A high level of even basic digital skills is a prerequisite for the uptake of technology. The national programme ‘Digital Bulgaria 2025’ mentions improving ICT competencies of the labour force and boosting the number of qualified ICT specialists. Other strategic documents also single out improving digital skills in the general public as a priority among Bulgaria’s digital transformation policies. Targeted, specific policies should follow in the short term to alleviate skills shortages.

#### **Highlight 2020: EU-funded support for continuing professional development**

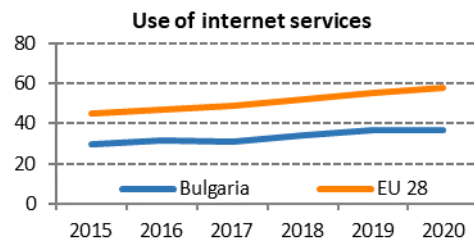
‘Qualification of Pedagogical Specialists’ is a project co-financed by the European Social Fund. With a budget of almost €10 million, it will provide training to 52,900 teachers aiming for qualification levels 1-3, and to 48,000 teachers seeking to gain qualification levels 4-5. The aim is to improve professional and career development and upgrade teachers’ competencies in digital skills, modern pedagogy and student evaluation. The project started in October 2018.<sup>(14)</sup>

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<sup>(14)</sup> [Education and training monitor 2019, chapter on Bulgaria.](#)

### 3 Use of internet services

3 Use of internet services	Bulgaria		EU
	rank	score	score
DESI 2020	27	36.6	58.0
DESI 2019	27	36.7	55.0
DESI 2018	27	34.1	51.8

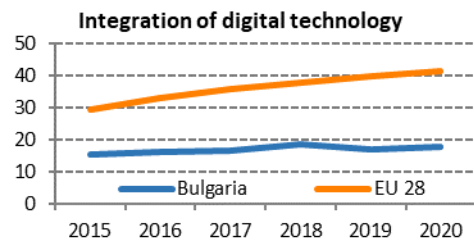


	Bulgaria			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>3a1 People who have never used the internet</b> % individuals	30%	27%	24%	9%
<b>3a2 Internet users</b> % individuals	62%	64%	67%	85%
<b>3b1 News</b> % internet users	74%	74%	66%	72%
<b>3b2 Music, videos and games</b> % internet users	64%	64%	64%	81%
<b>3b3 Video on demand</b> % internet users	8%	9%	9%	31%
<b>3b4 Video calls</b> % internet users	85%	83%	85%	60%
<b>3b5 Social networks</b> % internet users	79%	79%	78%	65%
<b>3b6 Doing an online course</b> % internet users	3%	3%	3%	11%
<b>3c1 Banking</b> % internet users	9%	11%	13%	66%
<b>3c2 Shopping</b> % internet users	27%	31%	31%	71%
<b>3c3 Selling online</b> % internet users	8%	13%	9%	23%

Bulgaria continues to rank 27<sup>th</sup> in the use of internet services with an overall score well below the EU's: 67% of Bulgarians use internet against an EU average of 85%, while 24% have never used it - the highest level of non-use in the EU. Bulgarian internet users make more use of video calls than users elsewhere in the EU. They are also well above the EU average when it comes to social network activities (78% vs 65%). 66% of internet users read news online, a figure which is below the EU average. Bulgarian internet users are less keen to use other online services, especially online banking. Although use of e-banking has risen slightly, only 13% of internet users take advantage of it compared with the EU average of 66%. Only 31% of internet users shop online, against an EU average of 71%.

## 4 Integration of digital technology

4 Integration of digital technology	Bulgaria		EU
	rank	score	score
<b>DESI 2020</b>	<b>28</b>	<b>17.9</b>	<b>41.4</b>
DESI 2019	28	16.9	39.8
DESI 2018	28	18.3	37.8



	Bulgaria			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>4a1 Electronic information sharing</b>	<b>23%</b>	<b>23%</b>	<b>23%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>9%</b>	<b>9%</b>	<b>10%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>7%</b>	<b>7%</b>	<b>7%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>6%</b>	<b>6%</b>	<b>6%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>7%</b>	<b>6%</b>	<b>7%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>4%</b>	<b>2%</b>	<b>2%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>3%</b>	<b>3%</b>	<b>3%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

Bulgaria ranks 28<sup>th</sup> among EU countries on the integration of digital technology, well below the EU average. Bulgarian companies struggle to take advantage of the opportunities offered by online commerce: only 7% of SMEs sell online (against 18% of the EU average), 3% of total SMEs sell cross-border, and only 2% of their turnover comes from the online segment. Although Bulgarians make intensive use of social media for personal purposes, only 10% of firms use it to promote their business, against an EU average of 25%. Finally, firms with a high intensity index account for only 10.9% of the total. On a more positive note, 23% of businesses share information online against an EU average of 34%.

Bulgaria's Council of Ministers approved the strategy paper 'Plan for Digital Transformation of Bulgarian Industry (Industry 4.0)' as a precursor for the strategy for Bulgaria's participation in the fourth industrial revolution up to 2030. A working group with representatives from the Ministry of Economic Affairs, the employers' organisations and the ICT sector is finalising the document. Its measures and objectives will provide a basis for developing the SME strategy and the RIS3 strategy, with digitalisation a cross-cutting priority in both strategic documents. The strategy paper sets out three priorities:

1. strengthening the science-industry link and speeding up integration into European and international programmes, in line with developing and implementing Industry 4.0,
2. promoting technological innovation in the Bulgarian economy,
3. building human, scientific, organisational and institutional capacity for the development of Industry 4.0 in Bulgaria.

Digitising Bulgaria's industrial sectors and developing a data-based economy is one of the goals in the national programme 'Digital Bulgaria 2025'. Supported by EU structural funds, the programme outlines measures to encourage the digitisation of businesses. EU funds are allocated to four centres of excellence and nine centres of competences specialised in areas including mechatronics, clean technology and informatics. In parallel, another EU-funded project will support the creation of regional innovation centres for cooperation between businesses and research centres. These projects' sustainability and performance are vital for future investment in terms of infrastructure and soft measures.

The Ministry of Education and Science has recognised the laboratory complex at Sofia Tech Park as nationally significant infrastructure. Accordingly, it has allocated €485,000 for 2019-2020 to its 11 high-tech labs, which work in areas including AI, HPC and biotech.

Bulgaria is a founding member of the EuroHPC Joint Undertaking. Sofia Tech Park will be hosting a Petascale supercomputing system with the support of the Ministry of Economic Affairs. A 6 petaflops supercomputer will be positioned in Sofia Tech Park following EuroHPC project implementation, one of the five petascale supercomputers to boost Europe's computing power. After its launch, Bulgaria will become a regional digital hub.

In May 2019, Bulgaria adopted a strategy for the digitisation of agriculture and rural areas including measures based on AI and Blockchain. The strategy envisages the use of AI to track production, protect against pests, create a continuous farm-to-table chain, and ease farmers' administrative burden. In 2019 the Bulgarian Academy of Sciences drew up a framework for a national strategy for AI in Bulgaria by 2030 and submitted it to the Council of Ministers in July 2019. It identifies healthcare, public services, smart agriculture, animal husbandry and environmental protection as areas for AI implementation in Bulgaria. The technological areas with potential for the development of AI-based products and services include:

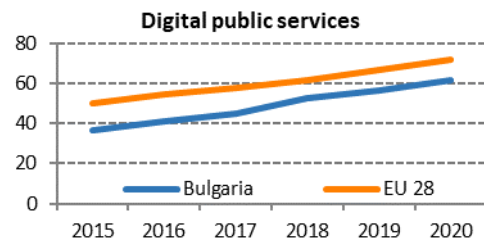
- robotics,
- AI in developing (and testing) software,
- human-machine interfaces in natural language,
- security systems,
- critical resources and infrastructure.

Bulgaria is a signatory to the Declaration of Cooperation on Artificial Intelligence.

Bulgaria has drawn up a number of strategic documents that consolidate the state's priorities and measures in the digitisation of industry as one of the many aspects of digital transformation. However, more targeted, sector-specific policies at all levels and in all territories should follow promptly to ensure that these strategies materialise in all spheres of the economy, including businesses of all sizes. It needs to communicate the benefits of digital transformation more effectively and facilitate cooperation between business, industry and academia. The level of qualification of the labour force is a major obstacle for Bulgarian business in making more extensive use of digital technologies.

## 5 Digital public services

5 Digital public services	Bulgaria		EU
	rank	score	score
<b>DESI 2020</b>	<b>23</b>	<b>61.8</b>	<b>72.0</b>
DESI 2019	23	56.5	67.0
DESI 2018	23	52.5	61.8



	Bulgaria			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>5a1 e-Government users</b>	<b>58%</b>	<b>61%</b>	<b>61%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>25</b>	<b>26</b>	<b>34</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>73</b>	<b>75</b>	<b>79</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>89</b>	<b>93</b>	<b>93</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>57%</b>	<b>66%</b>
% of maximum score			2019	2019

Although Bulgaria has made some progress on digital public services, it remains in 23<sup>rd</sup> position with a score of 62. The number of e-government users has stagnated since the previous year, with 61% of internet users submitting forms online, close to the EU average of 67%. The outdated legal framework remains the major obstacle to its widespread use.

Bulgaria is continuing to perform well in providing digital public services for businesses where it scores 96%, well above the EU average of 89%. However, the number of e-government users has stalled at last year's level with 61% of internet users submitting forms online. The gap with the EU average which has climbed to 67%, has thus widened.

Bulgaria has made significant progress in implementing its strategy to develop e-government. The strategic framework is in place. The state e-government agency provides financial support for implementing the 2019-2023 updated strategy for electronic governance in Bulgaria. Three types of infrastructure services are provided to central and local administrative bodies:

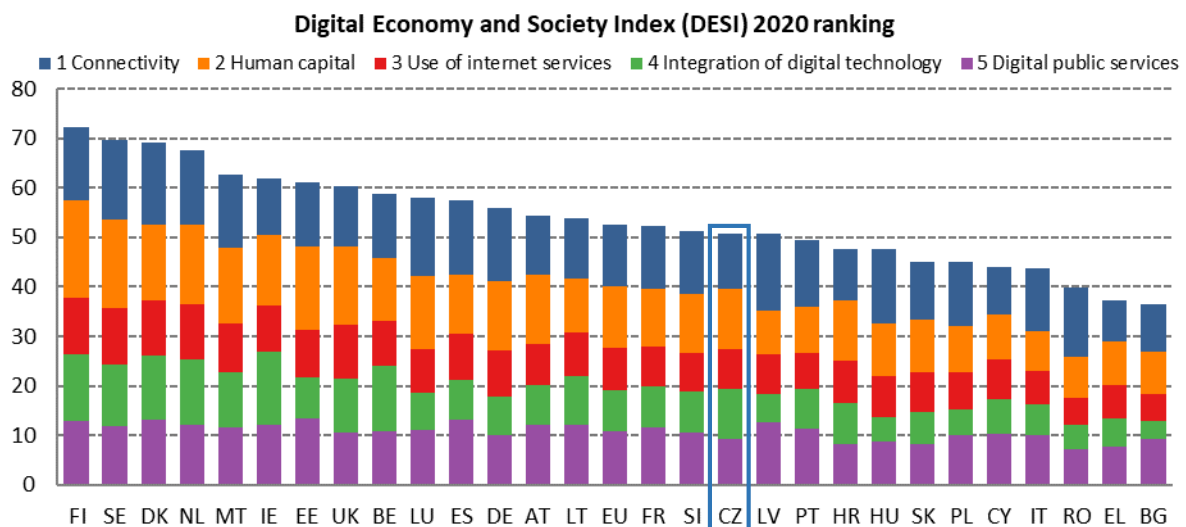
- communication connectivity with the unified electronic communications network,
- communication and information infrastructure as a cloud service in the state hybrid private cloud, and
- joint leasing of communication and information equipment in state e-government agency data centres.

RegiX, Bulgaria's registry information exchange system, enables administrative bodies to access data in the registers and databases of other public sector services. However, the outdated legal framework is a major hurdle to its widespread use. Digital public services for businesses improved significantly in 2019. There has been a delay in introducing the new identity documents with electronic identification and electronic signatures, and little progress has been made over the past year.

Overcoming delays in the reform process associated with the implementation of the strategy could help achieve significant improvements in digital public administration.

## Czechia

	Czechia		EU
	rank	score	score
<b>DESI 2020</b>	<b>17</b>	<b>50.8</b>	<b>52.6</b>
DESI 2019	18	47.3	49.4
DESI 2018	19	44.7	46.5



Czechia improved its score and ranks 17<sup>th</sup> in the DESI 2020. The country improved in three dimensions: human capital, integration of digital technology and in the use of internet services.

Based on data prior to the pandemic, Czechia's strongest dimension is the integration of digital technologies where the country scores above the EU average. The score is high thanks to a solid performance in e-commerce. The proportion of people employed as ICT specialists and the proportion of ICT graduates grew significantly. However, Czech companies still report difficulties in finding digital experts. The government is rolling out new digital public services but take-up remains limited. Connectivity is not improving fast enough especially due to insufficient coverage of Fixed Very High Capacity Networks. A large proportion of the population reads news online and uses online banking, but the high prices of mobile broadband subscriptions continue to limit wider use of internet services.

Czech authorities are starting to deliver the steps planned in the national strategy for digitisation - Digital Czechia (Digitální Česko)<sup>(15)</sup>. The implementation plans adopted in 2019 included 808 actions and an annual budget of CZK 115 million (€4.5 million). The majority of these actions related to the digitisation of public administration and public services.

The country has introduced a new national strategy for artificial intelligence (AI)<sup>(16)</sup>. It is intended to support research, stimulate international cooperation, help industry, businesses and public administration to integrate AI solutions, provide relevant skills to people and assess the impact of AI

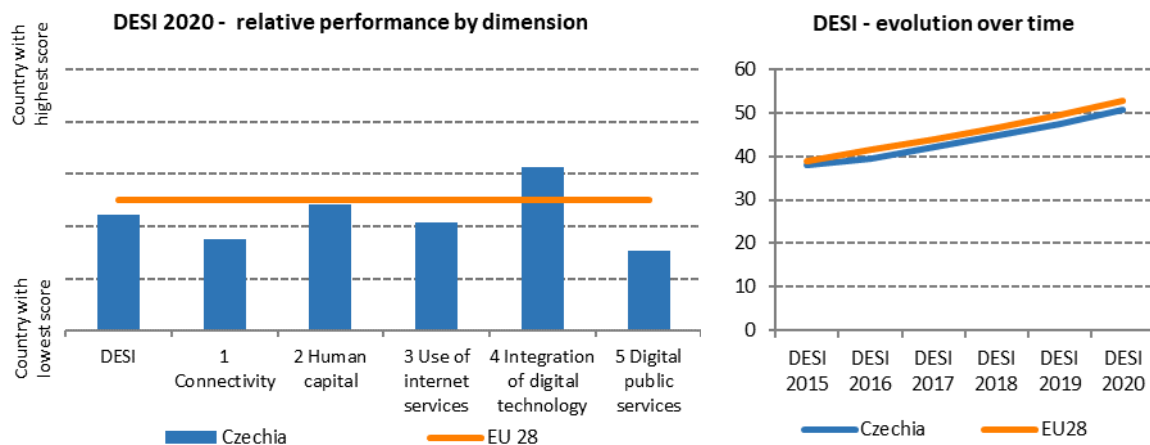
<sup>(15)</sup> <https://www.digitalnicesko.cz>

<sup>(16)</sup> [https://www.vlada.cz/assets/evropske-zalezitosti/umela-inteligence/NAIS\\_kveten\\_2019.pdf](https://www.vlada.cz/assets/evropske-zalezitosti/umela-inteligence/NAIS_kveten_2019.pdf)



on the economy and society. The strategy deals with ethical, legal, security and social aspects of the AI as well. The overall objective is to make Czechia a model European country for AI.

In late 2019, the Czech Parliament adopted a law giving the public the right to access nearly all public services electronically. The government has proposed introducing a 7% digital tax on revenues of global tech companies generated in Czechia. This bill is being discussed in the Parliament and is likely to lower the value of the tax.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Public institutions, companies and population in general used digital technologies to overcome the COVID-19 crisis. The Ministry of industry and trade launched programmes<sup>(17)</sup>, partially funded through ERDF, to support innovative production of healthcare materials, to improve broadband connectivity in regions<sup>(18)</sup> and to encourage tech start-ups to find smart ways of fighting the virus. Innovative ideas and solutions can be submitted via a new online portal<sup>(19)</sup>. The authorities offer a tracing app “e-Rouska” and work with the portal Mapy.cz to better detect the spread of the virus. The Ministry of interior upgraded the national e-Delivery system and the Ministry of health offered an online chatbot for most frequent questions. The authorities also rolled-out new digital services to simplify border crossing of goods and freight

<sup>(17)</sup> The programmes Technologie COVID-19, Czech rise up and a new section of the programme The Country for the Future: <https://www.mpo.cz/cz/rozcestnik/pro-media/tiskove-zpravy/mpo-podporuje-ceske-firmy-v-boji-s-covid-19--schvaleny-nove-programy--253656/>

<sup>(18)</sup> <https://www.mpo.cz/cz/podnikani/dotace-a-podpora-podnikani/oppik-2014-2020/vyzvy-op-pik-2020/vysokorychlostni-internet-iii--vyzva- -vznik-a-rozvoj-digitalnich-technickyh-map-kraju--254036/>

<sup>(19)</sup> <http://hackthecrisis.cz>

transport. Czech Digital Coalition worked closely with the Ministry of education, companies and relevant stakeholders to help teachers and schools. The Ministry's new dedicated website<sup>(20)</sup> gives practical tips on remote learning. The public TV launched a new channel with primary school classes and sport activities for kids.

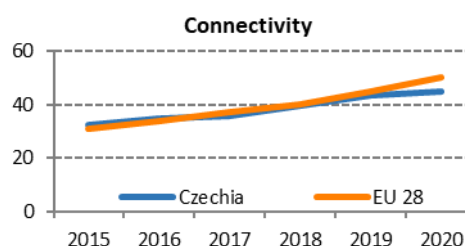
Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Czechia is lagging behind in connectivity, particularly in the Very High Capacity Networks (VHCN) and the general 5G deployment could face delays despite promising local initiatives. On the other hand, the level of digital skills is improving and the proportion of ICT specialists who can help companies to digitise, is growing. The popularity of e-commerce can help SMEs to sell more products and services online.

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<sup>(20)</sup> <https://nadalku.msmt.cz/cs>

# 1 Connectivity

1 Connectivity	Czechia		EU
	rank	score	score
DESI 2020	24	44.9	50.1
DESI 2019	19	43.5	44.7
DESI 2018	19	39.4	39.9



	Czechia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>1a1 Overall fixed broadband take-up</b> % households	73%	74%	74%	78%
	2017	2018	2019	2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	16%	18%	20%	26%
	2017	2018	2019	2019
<b>1b1 Fast broadband (NGA) coverage</b> % households	89%	90%	92%	86%
	2017	2018	2019	2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	26%	28%	29%	44%
	2017	2018	2019	2019
<b>1c1 4G coverage</b> % households (average of operators)	99%	99%	100%	96%
	2017	2018	2019	2019
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	81	82	96	100
	2017	2018	2019	2019
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	NA	17%	17%	21%
		2019	2020	2020
<b>1d1 Broadband price index</b> Score (0 to 100)	NA	NA	57	64
			2019	2019

With an overall connectivity score of 44.9, Czechia ranks 24<sup>th</sup> among EU countries. Overall fixed broadband take-up has stayed the same (74%) as in previous year, slightly below the EU average. Czechia's fast broadband (NGA) coverage is stable (covering 90% in year 2018 and reaching 92% in 2019), still below the 2020 target of 100%. Fixed VHCN coverage (covering 28% of households in 2018) has improved insignificantly to 29%, exclusively thanks to new FTTP deployment, but remains still below the EU average of 44% which includes also cable networks upgraded to DOCSIS 3.1. The number of households subscribing to at least 100 Mbps fixed broadband has also seen only slight progress (20% from 18%) and Czechia still ranks relatively low (19<sup>th</sup>) on this indicator. The country shows complete average 4G coverage – 100% of households in Czechia are now covered by the technology. Mobile broadband take-up (96 subscriptions per 100 people) has also seen progress and is close to the EU average. The retail prices in Czechia are higher than the EU average - Czechia scored 57 on the broadband price index against the EU average of 64, putting it 21<sup>st</sup> among all EU Member States in terms of broadband prices. Despite relatively high prices, particularly in the mobile segment, the broadband take-up in Czechia is only slightly below the EU average.

In November 2019, Czechia adopted its action plan 2.0 on non-subsidy measures to help plan and construct electronic communications networks. The ultimate aim is to remove barriers to building and operating these networks. The two priority measures are: (i) to use newly established or significantly renovated line constructions for building electronic communications networks; and (ii) to significantly reduce the cost of laying electronic communications infrastructure on land owned by

the state or municipalities. The country also adopted a strategic document on the basis of which a new Broadband Competence Office Czech Republic (BCO) started to operate in February 2020. The Office has been tasked with coordinating and supporting the regions in developing VHCNs. Czechia also intends to adopt a new national plan for developing VHCNs, and studies are under way to inform the plan.

Public funding to support the objectives of the current national plan (e.g. increasing coverage of rural areas) is provided through the 2014-2020 Operational Programme Enterprise and Innovation for Competitiveness (OPEIC), especially through relevant calls (announced or planned). OPEIC support for broadband roll-out has been reduced from the initial budget of €521 million down to €281 million, owing to a reduction in the intervention areas (areas without NGA coverage) and lower operator demand for funding than initially expected.

Czechia ranks 15<sup>th</sup> in the 5G readiness indicator<sup>(21)</sup>. 42% of the spectrum harmonised at EU level for wireless broadband in the country has been assigned. Following the '5G for 5 Cities' contest supported by the Czech government, five Czech cities were selected for the earliest 5G tests in the country. A public consultation on the upcoming 5G auction for the 700 MHz and 3.4-3.6 GHz bands ended in 2019, and in January 2020 the government approved a strategy for developing 5G networks. In January 2020, however, the Czech government decided to take a different approach to the original auction design that the national regulatory authority (NRA) put forward for public consultation the previous year. As a consequence, while the launch of the 5G auction is planned for 2020, it risks being delayed beyond 30 June 2020, which is the deadline for allowing the use of the 700 MHz band. The public consultation on the auction design closed on 4 May 2020, and the authorities are analysing the comments. Czechia intends to build - together with Germany - a Prague-Munich 5G network corridor, for which it would like to benefit from financing from CEF 2 for 2021-2027.

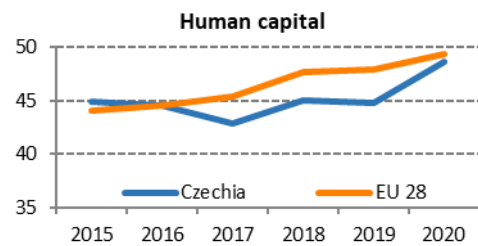
Once adopted, the new national broadband plan for developing very high capacity networks is expected to introduce measures to accelerate the development of infrastructure, to target the persistently high number of white spots, and to address the country's still below average broadband penetration. The upcoming 5G spectrum auction is unlikely to be carried out on time, at least for the 700 MHz band (deadline: 30 June 2020).

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<sup>(21)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

## 2 Human capital

2 Human capital	Czechia		EU
	rank	score	score
DESI 2020	14	48.6	49.3
DESI 2019	16	44.8	47.9
DESI 2018	16	45.0	47.6



	Czechia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	Value	value
<b>2a1 At least basic digital skills</b>	<b>60%</b>	<b>60%</b>	<b>62%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>24%</b>	<b>24%</b>	<b>26%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>62%</b>	<b>62%</b>	<b>64%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>3.5%</b>	<b>3.6%</b>	<b>4.1%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>0.9%</b>	<b>0.7%</b>	<b>0.9%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>3.9%</b>	<b>4.0%</b>	<b>4.5%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

As regards human capital, Czechia has climbed to the 14<sup>th</sup> position, with a score just below the EU average. The proportions of the population with at least basic (62%) and above basic (26%) digital skills have increased. The proportion of people employed as ICT specialists has increased to 4.1%, above the EU average (3.9%). The biggest concentration of ICT specialists is in Prague, where they account for 7.9% of total employment<sup>(22)</sup>. The ICT segment is heavily dominated by men. Only 10% of all ICT specialists are women<sup>(23)</sup> – the second lowest score in the EU.

The national digitisation strategy, Digital Czechia<sup>(24)</sup> adopted in 2018, focuses on the need to develop relevant digital skills and knowledge among people and to create a modern labour market. The related implementation plan<sup>(25)</sup> lists eight objectives, covering basic and supplementary digital education, support for the adaptation of the labour market and the improvement of teachers' digital skills. The government is preparing a new national Education Strategy 2030+<sup>(26)</sup> that is intended to foster life-long learning and update the school curricula to help people acquire relevant competences.

According to a government report<sup>(27)</sup>, within 5 years, automatic technologies and AI could replace 1.3 million Czech employees, in particular in routine tasks. To address this trend, the national AI

<sup>(22)</sup> <https://www.czso.cz/documents/10180/123719703/063010-19.pdf/8efe77a4-937b-4eea-904d-acc5b729fda3?version=1.0>

<sup>(23)</sup> [https://ec.europa.eu/eurostat/statistics-explained/index.php/ICT\\_specialists\\_in\\_employment#ICT\\_specialists\\_by\\_sex](https://ec.europa.eu/eurostat/statistics-explained/index.php/ICT_specialists_in_employment#ICT_specialists_by_sex)

<sup>(24)</sup> <https://www.digitalnicesko.cz>

<sup>(25)</sup> <https://www.mvcr.cz/soubor/digitalni-ekonomika-a-spolecnost-ip3.aspx> (pdf)

<sup>(26)</sup> <http://www.msmt.cz/vzdelavani/skolstvi-v-cr/konference-predstaveni-hsvp-2030-dne-7-11-2019>

<sup>(27)</sup> <https://www.vlada.cz/assets/evropske-zalezitosti/aktualne/AI-souhrnna-zprava-2018.pdf> (pdf)

strategy<sup>(28)</sup> aims to offer reskilling programmes, support start-ups and small businesses and introduce measures for flexible forms of work. The strategy also plans to expand university courses in AI and in particular to support masters and postgraduate programmes on the impact of automation on society.

With almost full employment, the Czech job market lacks ICT specialists. Companies struggle to find qualified workers, especially in areas such as automation and data analytics. Paradoxically, salaries in the ICT sector are not increasing fast enough. In 2016, the median salary in ICT represented 164% of the median salary in the economy as a whole. In 2018, this metric had fallen to 157%.

Czechia has increased its involvement in EU Code Week. The number of registered activities grew by 54% to 232, and more than 13,000 people participated. 49% of the participants were girls or women. The majority of activities took place in the two biggest cities and 65% took place in schools. The Czech Digital Coalition brings together 204 members who meet regularly and manage initiatives that provide training and education opportunities for young people, employees, senior citizens and job seekers.

Czech schools lack teachers with the right qualifications in digital skills<sup>(29)</sup>. Despite an existing strategy for digital education, the Supreme Audit Office<sup>(30)</sup> and the Czech School Inspectorate<sup>(31)</sup> report that the education system is not adapting to the digital transformation fast enough. Many teachers lack materials and are not confident to teach digital skills. Schools do not have access to appropriate digital infrastructure. 80% of computers available for pupils are more than 3 years old<sup>(32)</sup> and schools lack funds to invest in modern digital equipment. The Ministry of education offers EU-funded projects such as Ucitel21<sup>(33)</sup> that helps teachers to assess their digital skills or projects iMysleni<sup>(34)</sup> and Digigram<sup>(35)</sup>. These and similar initiatives could bring the necessary competences to more schools.

The government acknowledges the need to adapt the education system and to equip the population with relevant digital skills. However, the digital transformation is already affecting businesses and society. An implemented updated educational framework would help schools to teach digital skills more effectively. It will be vital to find funds for all the foreseen initiatives and implement them without delays.

#### **Highlight 2020: Czechitas from Brno bring (not only) women to technology**

Four women launched this initiative in 2013 to identify and empower new talent to improve diversity and competitiveness in tech. Since then, the organization has spread into 8 regions and organized over 450 events. Czechitas has educated more than 12,000 women and helped hundreds of them with their professional transit to IT field. Their events focus on topics such as coding, data analytics, graphic design and digital marketing. In 2018, Czechitas extended their target group and launched a dedicated initiative for children and adolescents. They also offer webinars, and are planning training for teachers. In December 2019, the NGO opened a new

<sup>(28)</sup> [https://www.vlada.cz/assets/evropske-zalezitosti/umela-inteligence/NAIS\\_kveten\\_2019.pdf](https://www.vlada.cz/assets/evropske-zalezitosti/umela-inteligence/NAIS_kveten_2019.pdf) (pdf)

<sup>(29)</sup> <http://www.msmt.cz/ministerstvo/novinar/ministerstvo-zjistovalo-stav-ucitelu-v-regionalnim-skolstvi>

<sup>(30)</sup> <https://nku.cz/cz/pro-media/tiskove-zpravy/digitalizace-vzdelavani:-skolam-chybi-penize-a-msmt-neplni-klicove-ukoly-id10670/>

<sup>(31)</sup> <https://www.csicr.cz/cz/Aktuality/Tematicka-zprava-Vyuzivani-digitalnich-technologii>

<sup>(32)</sup> <https://nku.cz/cz/pro-media/tiskove-zpravy/digitalizace-vzdelavani:-skolam-chybi-penize-a-msmt-neplni-klicove-ukoly-id10670/>

<sup>(33)</sup> <http://ucitel21.rvp.cz/>

<sup>(34)</sup> <https://www.imysleni.cz/>

<sup>(35)</sup> <https://digigram.cz/>

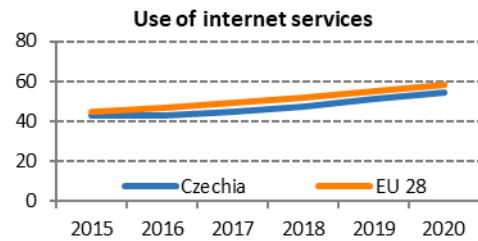
educational space in its home city of Brno. This new 'Czechitas House' offers workshops for schools, meet-ups of the tech community and a digital fablab with 3D printers and programmable machines for makers.

At the core of its success is an approach based on three pillars: (i) popularisation of technical education, (ii) actual education in technical skills: programming, coding, data analytics, etc., (iii) education in soft skills and helping people on the job market.

Czechitas has received multiple awards in Europe and beyond and they follow their long-term vision to become the most relevant institution for informal education and applicability in IT professions in Czechia.

### 3 Use of internet services

3 Use of internet services	Czechia		EU
	rank	score	Score
<b>DESI 2020</b>	<b>17</b>	<b>54.1</b>	<b>58.0</b>
DESI 2019	18	51.3	55.0
DESI 2018	21	47.7	51.8



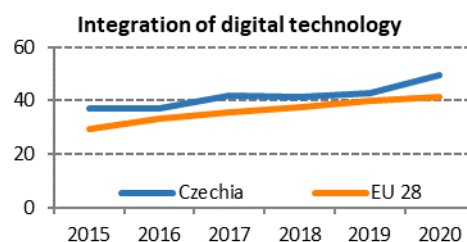
	Czechia		EU	
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	Value	value
<b>3a1 People who have never used the internet</b>	<b>11%</b>	<b>10%</b>	<b>9%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>81%</b>	<b>84%</b>	<b>85%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>91%</b>	<b>91%</b>	<b>92%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>72%</b>	<b>70%</b>	<b>70%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>4%</b>	<b>5%</b>	<b>5%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>42%</b>	<b>49%</b>	<b>52%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>57%</b>	<b>64%</b>	<b>68%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>4%</b>	<b>4%</b>	<b>7%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>67%</b>	<b>72%</b>	<b>78%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>65%</b>	<b>67%</b>	<b>73%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>13%</b>	<b>16%</b>	<b>14%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

Czechia continues to climb the rankings for the use of internet services. The country is now in 17<sup>th</sup> position, with a higher score than in 2019 but still below the EU average. The digital gap in society is narrowing as the proportion of people who have never used the internet has fallen to 9% (the same as the EU average). 92% of Czech internet users read newspapers and news magazines online. This is the highest score in the whole of the EU. Czechs are also above the EU average for online shopping, social networks and the use of online banking. However, the proportion of users who sell online has declined and the proportion of individuals who watch commercial video-on-demand services is the lowest in the EU. This could be related to the high price of mobile broadband subscriptions. As a result of which consumers may limit their use of internet services on their phones and tablets.



## 4 Integration of digital technology

4 Integration of digital technology	Czechia		EU
	rank	score	score
<b>DESI 2020</b>	<b>9</b>	<b>49.6</b>	<b>41.4</b>
DESI 2019	10	42.7	39.8
DESI 2018	10	41.5	37.8



	Czechia		EU	
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	Value	value
<b>4a1 Electronic information sharing</b>	<b>NA</b>	<b>NA</b>	<b>38%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>13%</b>	<b>13%</b>	<b>20%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>9%</b>	<b>8%</b>	<b>8%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>14%</b>	<b>16%</b>	<b>16%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>23%</b>	<b>23%</b>	<b>28%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>16%</b>	<b>18%</b>	<b>21%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>12%</b>	<b>12%</b>	<b>15%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

Czechia climbed to the 9<sup>th</sup> position, with a score above the EU average for the integration of digital technology. E-commerce continues to be the main driver in this dimension. 28% of Czech SMEs sell online and the turnover from e-commerce already represents more than a fifth of their revenue. This is the second highest score in the EU. Czechia also has the third highest percentage share of SMEs that sell online across borders to other EU countries, and the seventh largest proportion of companies with a high and very high level of digital intensity. However, in terms of the adoption of concrete digital technologies such as big data analysis or cloud, Czech companies are still below the EU average.

In 2019, the Czech government announced a new innovation strategy<sup>(36)</sup> to widen the use of digital technologies among companies. The document is built around nine pillars and incorporates the existing strategy for digital transformation – Digital Czechia. The actions range from reforming education, protecting intellectual property, supporting innovation hubs and digitising the economy and society. Among the first concrete actions, the government launched a new funding programme with three pillars:

1. support of high-tech start-ups
2. development of infrastructure and delivery of digital services with a focus on artificial intelligence

<sup>(36)</sup> [https://www.vlada.cz/assets/urad-vlady/poskytovani-informaci/poskytnute-informace-na-zadost/Priloha\\_1\\_Inovacni-strategie.pdf](https://www.vlada.cz/assets/urad-vlady/poskytovani-informaci/poskytnute-informace-na-zadost/Priloha_1_Inovacni-strategie.pdf)

### 3. implementation of innovative solutions in the economy

The programme is intended to last from 2020 to 2027 and the budget is €361 million. This initiative aims to increase the global competitiveness of Czech companies, stimulate cooperation between universities and businesses and facilitate the take-up of innovative solutions.

In the future, the national innovation strategy aims to match the Digital Europe programme in co-financing the digital innovation hubs that help introduce digital technologies in factories and businesses. Currently, there are seven of these hubs based in Prague, South Moravia and Ostrava.

Czechia is the world's 15<sup>th</sup> biggest end user of industrial robots. According to the Confederation of Industry<sup>(37)</sup>, more than half of companies plan to increase investment in Industry 4.0 applications over the next 5 years. In this regard, bigger companies are more active than SMEs. The main reasons for introducing elements of Industry 4.0 are to increase productivity and lower the unit costs per employee.

A major obstacle to the digitisation of companies is the lack of experts on the job market. According to PwC, the shortage of skilled labour cost Czech companies over €11 billion in 2019<sup>(38)</sup>

Czechia contributes to major European initiatives in technology. It has signed the declarations on quantum communication infrastructure, EuroHPC, AI and cooperation on a smart and sustainable digital future for European agriculture and rural areas.

For an economy that relies on engineering, the automotive industry and metallurgy it is vital to help businesses, especially SMEs, to adapt to technological change. Czechia is closely aligned with all the key European initiatives that support integration of digital technologies. Czech companies are responding to the digital transformation and the government is keen to provide relevant support. Measures to further stimulate e-commerce and support small e-shops in particular would help the country to maintain its leading position in this domain. The roadmap of actions described in the strategic documents is likely to increase Czech competitiveness provided that the government allocates sufficient funds for the initiatives planned.

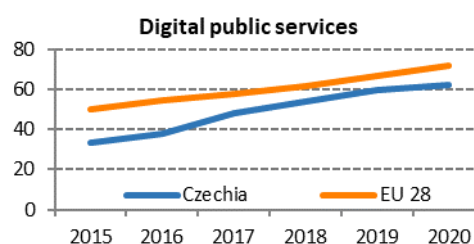
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<sup>(37)</sup> <https://www.spcr.cz/aktivity/z-hospodarske-politiky/13110-vysledky-pruzkumu-sp-cr-o-zavadeni-prumyslu-4-0-ve-firmach>

<sup>(38)</sup> [https://blog.pwc.cz/pwc\\_ceska\\_republika\\_news/2019/07/nedostatek-zam%C4%9Bstnanc%C5%AF-bude-%C4%8Desk%C3%A9-soukrom%C3%A9-firmy-letos-st%C3%A1t-p%C5%99es-280-miliard-.html](https://blog.pwc.cz/pwc_ceska_republika_news/2019/07/nedostatek-zam%C4%9Bstnanc%C5%AF-bude-%C4%8Desk%C3%A9-soukrom%C3%A9-firmy-letos-st%C3%A1t-p%C5%99es-280-miliard-.html)

## 5 Digital public services

5 Digital public services	Czechia		EU
	rank	score	score
<b>DESI 2020</b>	<b>22</b>	<b>62.4</b>	<b>72.0</b>
DESI 2019	21	59.9	67.0
DESI 2018	21	54.1	61.8



	Czechia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>5a1 e-Government users</b>	<b>33%</b>	<b>52%</b>	<b>51%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>49</b>	<b>51</b>	<b>53</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>82</b>	<b>82</b>	<b>82</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>81</b>	<b>80</b>	<b>80</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>64%</b>	<b>66%</b>
% of maximum score			2019	2019

In the domain of digital public services, Czechia has dropped in the EU ranking to the 22<sup>nd</sup> position, with a score significantly below the EU average. The country is increasing the volume of public services that people and businesses can use online. However, none of the indicators exceeds the EU average and only half of individuals who need to submit official forms to public administrations do so electronically (the EU average is 67%).

The country is pursuing its e-government plan included in the Digital Czechia strategy<sup>(39)</sup>. Since February 2020, Czechia has a new 'digital constitution'. This law introduces the right for citizens to access nearly all public services electronically. Despite the government's effort to promote the digital use of public services, the number of e-government users is growing at a slower pace. At the end of 2019, the central Citizen's Portal was already offering 120 services online, but it had only 45,000 registered users<sup>(40)</sup> (0.7% of the Czechs aged 15-64).

In October 2019, the government formed a working group for human rights and modern technologies. This team, composed of academics, policy-makers and representatives of the private sector is to recommend action to strengthen the protection of human rights in the digital era. In particular, the group will focus on the spread of disinformation, the role of online platforms and the use of digital technologies in healthcare.

While the national digitisation strategy aims to centralise procurement of ICT systems and services, public procurement in this area remains a major budgetary issue. For example, in early 2020, after intense public pressure, the government cancelled the €16 million procurement of a new e-shop for electronic highway vignettes. A group of ICT experts organised a hackathon<sup>(41)</sup>, developed a beta

<sup>(39)</sup> <https://www.digitalnicesko.cz/informacni-koncepcie-cr/>

<sup>(40)</sup> <https://www.mvcr.cz/soubor/portal-obcana-a-datove-schranky-pdf.aspx>

<sup>(41)</sup> <https://www.lupa.cz/aktuality/dobrovolnici-za-vikend-naprogramovali-e-shop-pro-dalnicni-znamky/>

version of the e-shop<sup>(42)</sup> and offered it free to the government, to demonstrate an alternative approach to public procurement in IT.

The country's strategy for electronic healthcare will end in 2020. It introduced the National Contact Point for Electronic Healthcare that is able to securely transfer selected patient information across borders. E-prescriptions are mandatory from 2018. Initially, this project was criticised on account of certain technical issues. However, the use of e-prescriptions has grown and, in 2019, doctors and healthcare providers issued on average 6 million per month. The Ministry of healthcare hosts the National e-Health Centre<sup>(43)</sup> responsible for the strategic and conceptual development of e-Health. In 2019, the government adopted a strategic framework for healthcare until 2030. Digitisation is one of its specific goals and one of its main features is a new e-health law, which is expected to be presented to parliament in the course of 2020. As of January 2020, employers, healthcare providers and patients are obliged to use certificates of work incapacity only in electronic form. After the first month, the system had already registered over 22,000 healthcare providers and more than 200,000 patients.

Czechia is pursuing its e-government strategy with a view to delivering more public services electronically and in a user-friendly way. However, take-up remains low and a large proportion of the population still prefers to interact with the public administration through traditional means. Increasing the number of users is key for the success of the new digital public services. An open-source approach could allow more providers to offer new services that will attract more people to the systems that already exist. Failed and over-priced procurements for ICT services in public administration continue to be a burden.

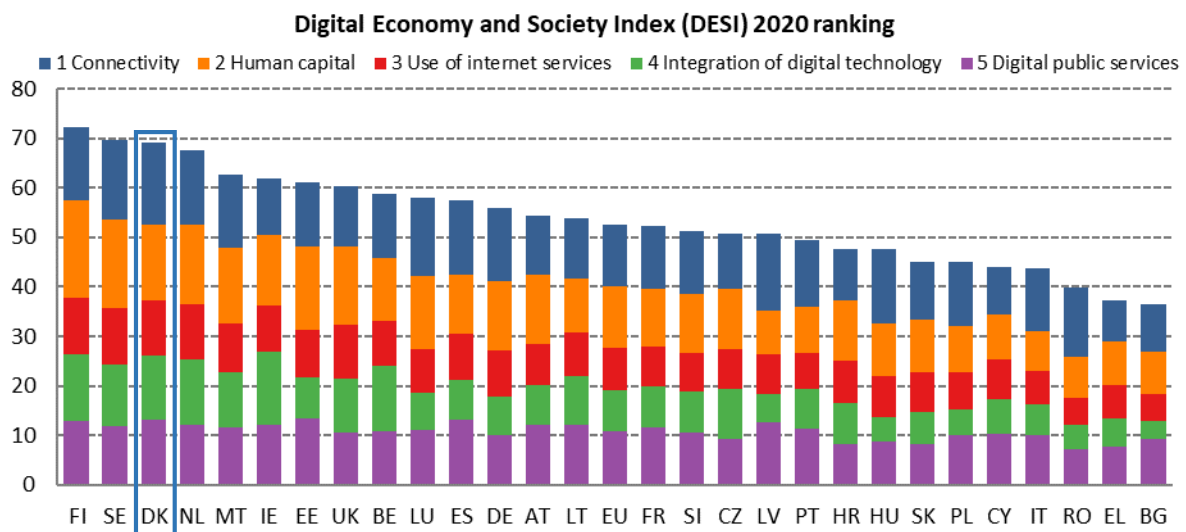
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<sup>(42)</sup> <https://fairznamka.cz/>

<sup>(43)</sup> <http://www.nsez.cz/>

## Denmark

	Denmark		EU
	rank	score	score
<b>DESI 2020</b>	<b>3</b>	<b>69.1</b>	<b>52.6</b>
DESI 2019	3	66.0	49.4
DESI 2018	3	62.5	46.5



Denmark ranks 3<sup>rd</sup> out of the 28 EU Member States in the European Commission’s 2020 edition of the Digital Economy and Society Index (DESI).

Based on data prior to the pandemic, Denmark has improved its results (scores) on all DESI dimensions, but the use of internet services. The country has made most progress in connectivity improving its last year’s position (1<sup>st</sup> in 2019 against 3<sup>rd</sup> in 2018).

In particular, Denmark’s coverage of 4G and NGA is 100%, far above the EU average. Fewer than 2% of individuals have never used the internet and only three out of ten still lack basic digital skills. Danish SMEs are transforming their business and transitioning into the digital economy. This translates into leading performance for SMEs that sell online and a good performance in terms of e-commerce turnover.

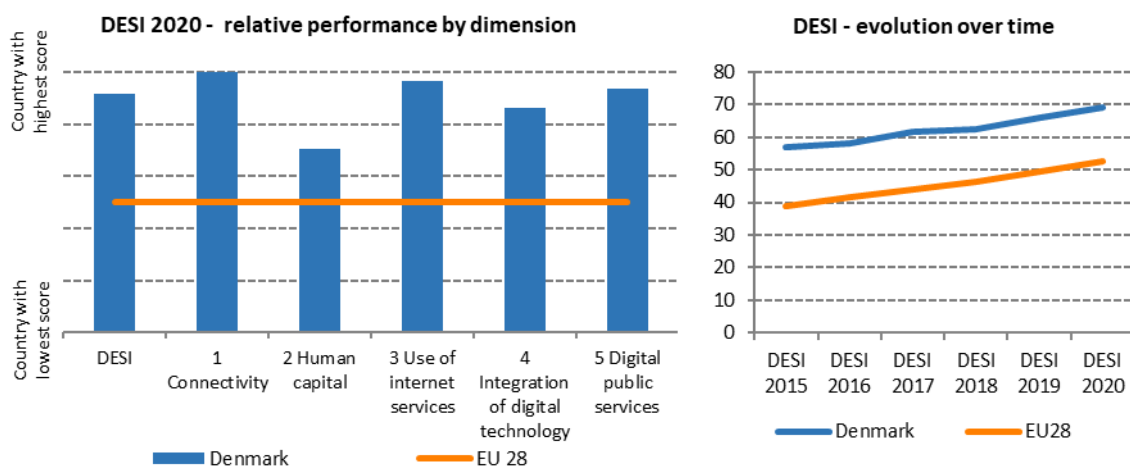
The ‘Strategy for Denmark’s Digital Growth<sup>(44)</sup>’ consists of 38 initiatives through which the government aims to integrate the use of new technologies, enhance the digital skills of Danes to be equipped for the future digital economy and to improve growth and prosperity in Denmark. With a political agreement from February 2018 called ‘Initiatives for Denmark’s Digital Growth’, the government has allocated almost DKK 1 billion (approximately €134 million) until 2025 to the implementation of the strategy. The government continuously monitors the status of the initiative’s threefold objectives: to support the digitisation of trade and industry, to provide the best conditions for the digital transformation of businesses and to ensure that Danes are the most digitally prepared and secure citizens in the European Union.

<sup>(44)</sup><https://eng.em.dk/news/2018/januar/new-strategy-to-make-denmark-the-new-digital-frontrunner/>

The ‘Digital Strategy 2016-2020<sup>(45)</sup>’ (e-government strategy) has steered the work on public sector digitisation and contacts with businesses and industry. In December 2019, the Business Authority<sup>(46)</sup> launched a new action plan on digital public services.

Since May 2018, Denmark has its own ‘Danish Cyber and Information Security Strategy 2018-2021<sup>(47)</sup>’. The aim of the strategy is to improve cyber and information security in a number of sectors, including telecommunications, healthcare and transport. In January 2019, Denmark published a set of sectoral specific sub-strategies based on the NIS directive<sup>(48)</sup>. The sub-strategies aim to improve technical and organisational resilience and protection against cyber-attacks.

In March 2019, the government launched the ‘National Strategy for Artificial Intelligence<sup>(49)</sup>’. The aims of the strategy is for Denmark to be a front-runner in the responsible development and use of Artificial Intelligence (AI), to benefit individuals, businesses and society as a whole.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Denmark has taken a number of targeted measures in digital to deal with the COVID-19 crisis and the work on a recovery plan for the economy. Initiatives to minimise contagion and to support the health system are on the top of the agenda for the country. There is a dedicated

<sup>(45)</sup> [https://en.digst.dk/media/14143/ds\\_singlepage\\_uk\\_web.pdf](https://en.digst.dk/media/14143/ds_singlepage_uk_web.pdf)

<sup>(46)</sup> <https://danishbusinessauthority.dk/>

<sup>(47)</sup> [https://en.digst.dk/media/17189/danish\\_cyber\\_and\\_information\\_security\\_strategy\\_pdf.pdf](https://en.digst.dk/media/17189/danish_cyber_and_information_security_strategy_pdf.pdf)

<sup>(48)</sup> <https://ec.europa.eu/digital-single-market/en/network-and-information-security-nis-directive>

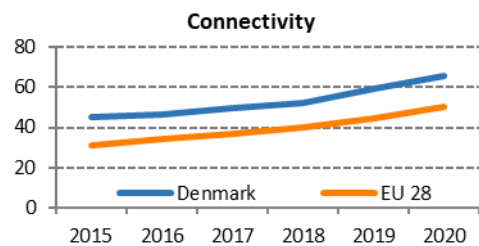
<sup>(49)</sup> [https://en.digst.dk/media/19337/305755\\_gb\\_version\\_final-a.pdf](https://en.digst.dk/media/19337/305755_gb_version_final-a.pdf)

web page ([www.coronasmitte.dk](http://www.coronasmitte.dk)) informing the public about measures taken to combat COVID-19 and providing updates on the status of patients infected with the virus. Citizens can voluntarily report whether they have had COVID-19 symptoms via a digital solution (COVIDmeter). Online video consultations have been extended nationally, namely through the “MinLaege” application to ensure that patients can contact their general practitioners without exposing themselves or the general practitioner to COVID-19. In addition, national information campaigns on various media, including social media such as YouTube, and Facebook provide the public guidance and reminders regarding considerate behaviour.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Denmark is very advanced on 5G and is above EU average in the digital skills, digitisation of businesses and digital public services indicators.

# 1 Connectivity

1 Connectivity	Denmark		EU
	rank	score	score
DESI 2020	1	65.8	50.1
DESI 2019	3	59.2	44.7
DESI 2018	4	52.3	39.9



	Denmark			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>1a1 Overall fixed broadband take-up</b> % households	86%	82%	85%	78%
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	19%	28%	34%	26%
<b>1b1 Fast broadband (NGA) coverage</b> % households	95%	95%	96%	86%
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	63%	64%	93%	44%
<b>1c1 4G coverage</b> % households (average of operators)	97%	99%	100%	96%
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	128	134	139	100
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	NA	33%	33%	21%
<b>1d1 Broadband price index</b> Score (0 to 100)	NA	NA	61	64

Denmark is the leader in the connectivity dimension, improving its score at a pace faster than the EU average. Average 4G and fixed very high capacity network coverage, mobile broadband take-up and 5G readiness are among the best in the EU. The take-up of fixed broadband focusses on high bandwidths (plus 6 percentage points in 2019 for speeds of 100 Mbps and above) and mobile broadband services (plus 5 percentage points in 2019). There were 139 subscriptions to mobile broadband services per 100 people, against an EU average of 100. As fibre roll-out continues, twice as many households are covered with FTTP (fibre-to-the premises) in Denmark (67% of households) compared to the EU average (34% of households). While take-up of fibre is increasing, the market shares of cable, DSL and fibre subscriptions as a percentage of all fixed broadband subscriptions are now almost identical (approximately one third each). Rural fast broadband coverage has improved, but with 77% coverage these remote areas are still lagging a long way behind total coverage which stands at 96%. Price index levels (taking account of purchasing power parity) for broadband access (both mobile and fixed) are relatively high.

The national broadband target for 2020 is for all households and businesses to have coverage with speeds of minimum 100 Mbps download / 30 Mbps upload. By 2019, this was achieved for 93% of all households and businesses. Work on a new broadband strategy started in early 2020, and focusses mainly on rolling out fast broadband to the remaining 7% of households and businesses and preparing Denmark for the internet services of the future. The investment climate in Denmark has improved, with actual investment both in fibre and 5G increasing and more being announced. Fibre



roll-out by (regional) energy utilities (typically owned by their users) continues, with the aim of first connecting all co-owners and then entire regions. One consortium alone has announced investment of an additional DKK 4.6 billion (€0.62 billion) in fibre between 2019 and 2023. The incumbent telecoms operator, TDC Group, increased its investment budget in 2019 from DKK 3.5 billion to DKK 4.5 billion (€0.47 billion to €0.6 billion) and announced an ambitious investment programme for its network company (TDC NET) to connect one million addresses to fibre by 2025. The current roll-out of fibre and the roll-out plans of the utilities mean that there will be overlap, so a number of households will have the choice between different fibre infrastructures. In the course of 2019, TDC completed the separation (functionally and legally) into TDC NET and a retail company (Nuuday). Both companies are 100% owned by TDC Group. The investors (50% Macquarie and 50% Danish pension funds) are interested in keeping TDC NET, as its assets are considered to be long-term and low-risk. TDC's revenues are concentrated in retail, whereas investment is concentrated in the network.

Denmark ranks 4<sup>th</sup> in the 5G readiness indicator. It has assigned 32%<sup>(50)</sup> of the total 2090 MHz spectrum harmonised at EU level for wireless broadband<sup>(51)</sup>. The roll-out of 5G has started with the installation of macro cells on existing sites, and is due to be extended to 10-15% more sites. Small cell roll-out is not part of the current schedule. The next 5G spectrum auction is planned for the fourth quarter of 2020, and will include the 1.5 GHz, 2.1 GHz, 3.5 GHz, 26 GHz bands and the remaining part of the 2.3 GHz band. This will be an important auction since it will include the last wireless broadband spectrum bands to be made available for the next 8 years. To enable further network roll-out, it is important for industry to have the necessary contracts with landowners for the use of existing and new sites. The aim is to have contracts with full flexibility regarding technology. Using street furniture will also be important. Many Danish municipalities see 5G as an opportunity.

Fixed broadband and mobile network coverage are significantly above the EU average. As Denmark overwhelmingly relies on private investment, decisions about regulated access to fibre networks resulting from the market reviews under preparation will be significant for investors.

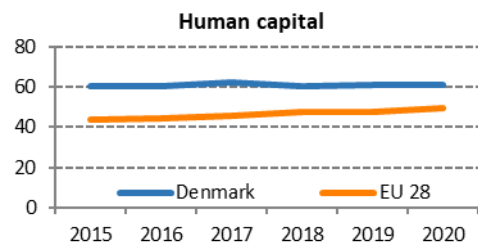
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<sup>(50)</sup> This figure does not take into account an assignment of 20 MHz of supplementary downlink spectrum in the 700 MHz band.

<sup>(51)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

## 2 Human capital

2 Human capital	Denmark		EU
	rank	score	score
<b>DESI 2020</b>	<b>7</b>	<b>61.3</b>	<b>49.3</b>
DESI 2019	6	61.1	47.9
DESI 2018	5	60.6	47.6



	Denmark			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>2a1 At least basic digital skills</b> % individuals	<b>71%</b> 2017	<b>71%</b> 2017	<b>70%</b> 2019	<b>58%</b> 2019
<b>2a2 Above basic digital skills</b> % individuals	<b>47%</b> 2017	<b>47%</b> 2017	<b>49%</b> 2019	<b>33%</b> 2019
<b>2a3 At least basic software skills</b> % individuals	<b>72%</b> 2017	<b>72%</b> 2017	<b>70%</b> 2019	<b>61%</b> 2019
<b>2b1 ICT specialists</b> % total employment	<b>4.2%</b> 2016	<b>4.4%</b> 2017	<b>4.3%</b> 2018	<b>3.9%</b> 2018
<b>2b2 Female ICT specialists</b> % female employment	<b>1.8%</b> 2016	<b>1.8%</b> 2017	<b>1.8%</b> 2018	<b>1.4%</b> 2018
<b>2b3 ICT graduates</b> % graduates	<b>4.4%</b> 2015	<b>4.5%</b> 2016	<b>4.8%</b> 2017	<b>3.6%</b> 2017

Denmark ranks 7<sup>th</sup> in the EU on human capital well above the EU average. Denmark performs very well and above the EU average on digital skills, while the proportion of ICT specialists and female ICT specialist has stabilised since 2018. Denmark recorded a slight drop as regards the basic software digital skills, but still scores better than the EU average. ICT specialists represent 4.3% of the total employment, while female ICT specialists account for 1.8% of female employment. ICT graduates account for 4.8% of total graduates Denmark.

Both, the ‘Digital Strategy 2016-2020’ and the ‘Strategy for Denmark’s Digital Growth’ include initiatives to enhance digital skills and digital literacy of citizens. ‘Digital skills for all’ is one of the strategic focus areas of the digital growth plan. Under the ‘Initiatives for Denmark’s Digital Growth’, the government allocated DKK 181 million (approximately €24 million) for initiatives under ‘Digital skills for all’.

In April 2019, the Ministry of Higher Education and Science launched a ‘National Action Plan for digital skills’ based on ideas and experiences from higher education institutions. The initial vision was to introduce and familiarise all students with digital technologies relevant to their field, and to increase and improve the use of digital learning technologies among educators in order to improve student learning and the quality of the educational system. Despite the fact that the majority of the initiatives in the Action Plan have yet to be activated, all higher education institutions have incorporated digital skills and literacy in their education programmes.

The ‘Danish Technology Pact’, one of the initiatives included in the national growth plan, provides initiatives designed to improve Science, Technology, and Engineering & Mathematics (STEM) skills. It was established in April 2018, based on a similar Dutch initiative. It is a voluntary collaborative partnership between the government, educational institutions and the business sector. The main objective is that 20% more Danes will complete non-dimensioned higher STEM education, and that

20% more will complete a STEM vocational education in ten years. The demand for STEM is projected to increase in the future. Progress seems to be on track. Over a ten-year period, the number of students commencing relevant STEM education has increased, however, this growth has not continued at the same rate in recent years, and a continued focus and targeted efforts are needed in the years to come. The government will keep supporting implementation of the initiative.

The Vocational Education and Training (VET) sector continues to create the right links with the market and industry in terms of digital skills. In the spring of 2019, the government established the 'Centre for Use of IT in Education on Vocational Training', followed by the 'VET Informatics' over the summer. The government also brought in an experimental programme in public primary and lower secondary schools for the period 2018-2021. The programme tests how technological understanding (i.e. 'technology comprehension') can be taught. As of 2022, schools can make the programme compulsory.

The Danish national coalition for digital skills and jobs<sup>(52)</sup> engages in digital skills development with main responsibility to bring together companies, organisations, academia and ministries to boost digital skills in Denmark. The coalition has close collaboration with Denmark's counterparts in Sweden and Finland. The three countries aim to develop a joint initiative on lifelong learning for ICT professionals. They are planning to hold a conference, possibly in autumn 2020, for professionals to present their vision and plans for digital skills development.

Denmark participated in the 2019 edition of EU Code Week<sup>(53)</sup>, a grassroots initiative that saw a total of 4.2 million people participate in over 72.000 activities in over 80 countries around the world. Denmark organised only eight activities (21 in 2018) and attracted 187 participants.

In 2019, the Danish Agency for Digitisation established a common central government digital academy in order to raise the level of digital skills throughout the Danish central government. The academy is an initiative from the government strategy 'A Solid ICT Foundation – Strategy for ICT Management in Central Government' from 2017<sup>(54)</sup>.

In order to further advance, it is of great importance that Denmark continues to take measures to raise awareness and step up its work to advance digital skills and increase ICT graduates, notably women. In addition, it would be beneficial to raise awareness of the benefits of digital skills and support related initiatives (e.g. EU Code Week).

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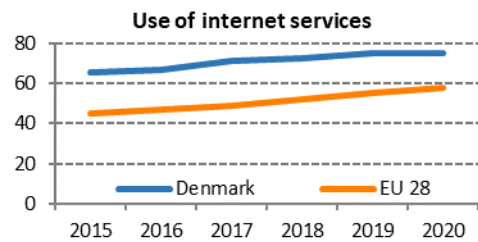
<sup>(52)</sup> <https://dit.dk/dsjc>

<sup>(53)</sup> <https://codeweek.eu/>

<sup>(54)</sup> <https://digst.dk/styring/statens-digitaliseringsakademi/>

### 3 Use of internet services

3 Use of internet services	Denmark		EU
	rank	score	score
<b>DESI 2020</b>	<b>4</b>	<b>75.2</b>	<b>58.0</b>
DESI 2019	1	75.2	55.0
DESI 2018	2	72.9	51.8

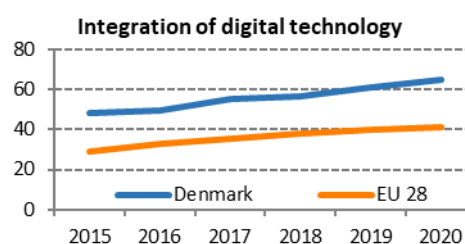


	Denmark			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>3a1 People who have never used the internet</b> % individuals	<b>2%</b> 2017	<b>2%</b> 2018	<b>2%</b> 2019	<b>9%</b> 2019
<b>3a2 Internet users</b> % individuals	<b>95%</b> 2017	<b>95%</b> 2018	<b>95%</b> 2019	<b>85%</b> 2019
<b>3b1 News</b> % internet users	<b>86%</b> 2017	<b>86%</b> 2017	<b>85%</b> 2019	<b>72%</b> 2019
<b>3b2 Music, videos and games</b> % internet users	<b>90%</b> 2016	<b>90%</b> 2018	<b>90%</b> 2018	<b>81%</b> 2018
<b>3b3 Video on demand</b> % internet users	<b>49%</b> 2016	<b>56%</b> 2018	<b>56%</b> 2018	<b>31%</b> 2018
<b>3b4 Video calls</b> % internet users	<b>62%</b> 2017	<b>69%</b> 2018	<b>58%</b> 2019	<b>60%</b> 2019
<b>3b5 Social networks</b> % internet users	<b>78%</b> 2017	<b>81%</b> 2018	<b>83%</b> 2019	<b>65%</b> 2019
<b>3b6 Doing an online course</b> % internet users	<b>9%</b> 2017	<b>9%</b> 2017	<b>12%</b> 2019	<b>11%</b> 2019
<b>3c1 Banking</b> % internet users	<b>92%</b> 2017	<b>92%</b> 2018	<b>94%</b> 2019	<b>66%</b> 2019
<b>3c2 Shopping</b> % internet users	<b>82%</b> 2017	<b>86%</b> 2018	<b>86%</b> 2019	<b>71%</b> 2019
<b>3c3 Selling online</b> % internet users	<b>30%</b> 2017	<b>30%</b> 2018	<b>29%</b> 2019	<b>23%</b> 2019

Overall, the use of internet services in Denmark is significantly above the EU average. Although Denmark fell a few places in the ranking, it recorded slight progress with the only exception being the use of video calls. Denmark has more internet users than any other EU country. Danes are keen to do a range of activities online, as internet users are elsewhere in the EU. The most popular activities are listening to music, watching videos and playing games (90%) and online banking (94%). Danes go online to read news (85% of internet users, much higher of 72% in the EU). Danes are active internet users, with the least popular activities being doing an online course (12%), and making video calls (56%). The number of users selling online is widespread in Denmark and above the EU average.

## 4 Integration of digital technology

4 Integration of digital technology	Denmark		EU
	rank	score	score
<b>DESI 2020</b>	<b>5</b>	<b>65.1</b>	<b>41.4</b>
DESI 2019	4	61.2	39.8
DESI 2018	4	56.7	37.8



	Denmark			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>40%</b>	<b>40%</b>	<b>50%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>29%</b>	<b>29%</b>	<b>32%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>12%</b>	<b>14%</b>	<b>14%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>38%</b>	<b>41%</b>	<b>41%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>28%</b>	<b>31%</b>	<b>33%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>14%</b>	<b>17%</b>	<b>18%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>9%</b>	<b>9%</b>	<b>10%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

Denmark ranks 5<sup>th</sup> in the EU on the integration of digital technology in business activities. Danish businesses take advantage of the opportunities presented by e-commerce with 33% of SMEs selling online (significantly above the EU average of 18%). In addition, 10% of SMEs sell across border to other EU countries, with 18% of their turnover generated online. 32% of businesses use social media, 41% use cloud services and 14% use big data services. Denmark leads the EU in terms of the level of digitisation of business, with 53% of businesses being highly digitised<sup>(55)</sup> (26% in the EU). Danish businesses increasingly seek opportunities online, but 60% of businesses that recruited ICT specialists had difficulties in finding these specialists (57% in the EU).

Under the 'Strategy for Denmark's Digital Growth', the government set an ambitious objective for Denmark to be a digital frontrunner. 'SMEs: Digital', which is one of the initiatives included in the strategy, provides support to SMEs for exploiting new digital technologies to create growth and jobs in Denmark. Through [www.smvdigital.dk](http://www.smvdigital.dk), SMEs can get private procurement grants to help them clarify how the company can be digitised further and to identify the economic and business potentials. More than 900 enterprises benefitted from the programme in 2019 and more than 700 enterprises are expected to join the programme in 2020.

Local public funded business development centres and clusters support the adoption of digital technologies. A reform of the clusters will take place in 2020 resulting in three, larger clusters, within IT, robotics and automation. To prepare to set up the future European Digital Innovation Hubs,

<sup>(55)</sup> [https://digital-agenda-data.eu/datasets/digital\\_agenda\\_scoreboard\\_key\\_indicators/visualizations](https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/visualizations)

Denmark is examining the scope to use and consolidate existing structures to maximise impact. The arrangements for setting up the hubs are currently under negotiation, and specific implementation plans will be developed with support provided by the Digital Europe Programme.

The 'National Strategy for Artificial Intelligence' comprises 24 initiatives across the public and private sector following four principles: (i) a responsible foundation for AI; (ii) more and better data; (iii) strong competences and new knowledge; and (iv) increased investment. The main initiatives on AI are: (i) principles for responsible development and use of artificial intelligence; (ii) establishment of a common Danish language resource; (iii) implementation of signature projects within the health, social and employment sectors; and (iv) identification of public datasets, which can be made available for businesses, researchers and public authorities and contribute to the development of AI. 15 signature projects<sup>(56)</sup> within health, social affairs, employment, and cross-sector case processing were launched. The projects are financed through an investment fund totalling DKK 200 million (€26.76 million) in 2018-2022.

In early 2019, the government presented the report: 'Prepared for the Future of Work'<sup>(57)</sup>. The report sets out a number of conclusions on the future growth and education in Denmark.

To further boost the digital transformation of the Danish economy, it is important to raise awareness among SMEs of the relevance of digitisation and of their needs. This will enable SMEs to reap the full range of benefits from adopting digital technologies.

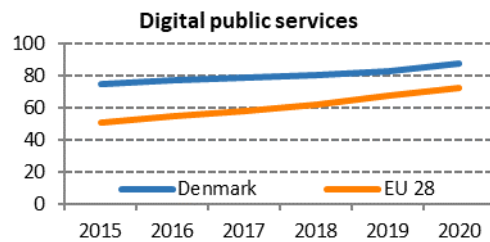
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<sup>(56)</sup> <https://digst.dk/strategier/kunstig-intelligens/signaturprojekter/>

<sup>(57)</sup> [https://www.regeringen.dk/media/6332/regeringen\\_disruptionraadet\\_uk\\_web.pdf](https://www.regeringen.dk/media/6332/regeringen_disruptionraadet_uk_web.pdf)

## 5 Digital public services

5 Digital public services	Denmark		EU
	rank	score	score
<b>DESI 2020</b>	<b>3</b>	<b>87.1</b>	<b>72.0</b>
DESI 2019	2	82.7	67.0
DESI 2018	2	80.0	61.8



	Denmark			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>5a1 e-Government users</b>	<b>86%</b>	<b>90%</b>	<b>91%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>71</b>	<b>69</b>	<b>69</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>95</b>	<b>95</b>	<b>99</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>78%</b>	<b>66%</b>
% of maximum score			2019	2019

In digital public services, Denmark ranks 3<sup>rd</sup>, well above the EU average. The share of citizens interacting with public authorities online and submitting online forms (e-government users) is well above the EU average. Denmark is in the lead on digital public services provided for businesses (100 against 88 in the EU). Denmark shows a high level of maturity on open data, scoring (78%) significantly above the EU average (66%).

With the sixth generation of the Danish e-government strategy ('Digital Strategy 2016-2020'), the local (KL<sup>(58)</sup>), regional<sup>(59)</sup> and central government levels have set the course for a cohesive digitisation of the Danish public sector. In March 2019, they signed the 'digitisation pact' that includes a commitment to create digital guidance for businesses and citizens for better user experience. The pact also aims at enhancing citizens' and businesses' overview of the public sector's processing and handling of their data (*Mit Overblik*)<sup>(60)</sup>.

The government signed off on a new digital identity solution (eID), MitID<sup>(61)</sup>, which will replace the NemID solution in 2021. The solution will be developed under a partnership between the State and the banking sector.

A robust information security across the sector is a crucial element in reaping the benefits of digitisation and ensuring that the healthcare service is future-proof. With the 'Danish Cyber and Information Security Strategy 2018-2021', operators in the Danish healthcare sector aim to step up joint and coordinated actions to predict, prevent, detect and respond to cyber and information

<sup>(58)</sup> <https://www.kl.dk/english/kl-local-government-denmark/>

<sup>(59)</sup> <https://www.regioner.dk/>

<sup>(60)</sup> <https://digst.dk/digital-service/mit-overblik/om-mit-overblik/>

<sup>(61)</sup> <https://financedenmark.dk/hard-figures/financial-institutions-branches-employees/payments/nemid-future-mitid>

security incidents. This will be carried out through a holistic and risk-based approach. As part of the strategy, the sector has also established a decentralised cyber and information security unit (DCIS) in the Danish Health Data Authority<sup>(62)</sup> to coordinate the work.

Welfare technology has been for many years a strategic focus in Denmark. This was reaffirmed in the 'Digital Health Strategy 2018-2022'<sup>(63)</sup>. Denmark's nationwide implementation of tele-health relies on a well-developed national infrastructure based on international standards that facilitates data sharing and integration across the healthcare system.

The law on 'Better Digital Cooperation in the Health Care System' from 2019 facilitate the use of primary sector health data. Further work is being carried out to create a one-stop-shop for researchers to access and get guidance on how to use health data.

Denmark has a sound foundation on which it can continue digitising public services and health system. However, it is important to continue digitisation of public services that citizens use, like and trust and to continue to raise awareness and improve knowledge of citizens, businesses and authorities, and helps non-digital citizens to use digital public services.

**Highlight 2020: 'Virk'<sup>(64)</sup> Plan of Action 2019-2021: Better digital service for businesses'**

A new action plan for digital services targeted to businesses (especially new and small businesses) was launched in 2019 for supporting them into declaring their information on Virk. Virk is the joint public one-stop shop to the Danish business world allowing companies to handle their reporting obligations towards the public sector. The portal contains more than 1,000 eForms accounting for 97.1% of all business-related reports to the authorities. In 2019, the Danish government decided to digitise the remaining 500 paper forms. In addition and in compliance with eIDAS Regulation<sup>(65)</sup>, companies in the EU to use their national eID to log into 'Virk'.

There are five focus areas and principles for businesses to achieve their goals:

- Easy: it needs to be quicker for businesses to submit information to the authorities by improving the quality of each digital solution;
- Coherence: there needs to be a more coherent procedure for businesses when they need to solve central tasks involving multiple authorities;
- Overview: individual businesses needs to have a better overview of important deadlines and duties that are relevant for them;
- Insight: it needs to be easier and quicker for businesses to gain key-data on business partners and other companies;
- Targeting: individual businesses and their staff need to have a more targeted service that provides them with customised content when they log on to Virk.

The above areas of focuses will increase the use of data to strengthen Virk as a data driven platform, while following the Danish rules on IT and data safety.

<sup>(62)</sup> <https://www.sst.dk/en>

<sup>(63)</sup> <https://sundhedsdatastyrelsen.dk/da/diverse/download>

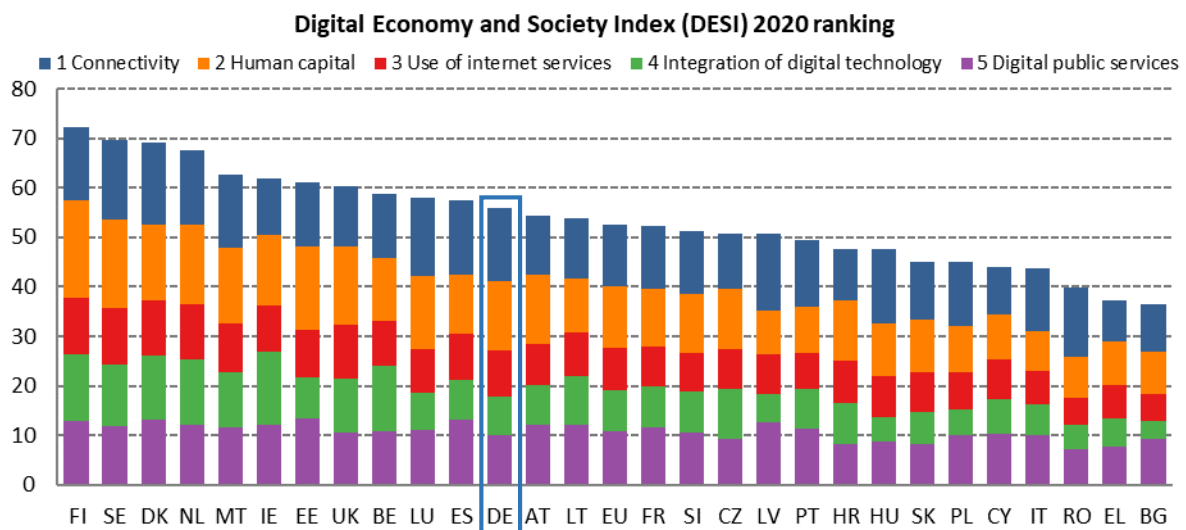
<sup>(64)</sup> <https://indberet.virk.dk/>

<sup>(65)</sup> <https://ec.europa.eu/digital-single-market/en/discover-eidas>



## Germany

	Germany		EU
	Rank	score	score
<b>DESI 2020</b>	<b>12</b>	<b>56.1</b>	<b>52.6</b>
DESI 2019	13	51.2	49.4
DESI 2018	14	47.9	46.5



Germany ranks 12<sup>th</sup> out of 28 EU Member States in the 2020 edition of the Digital Economy and Society Index (DESI).

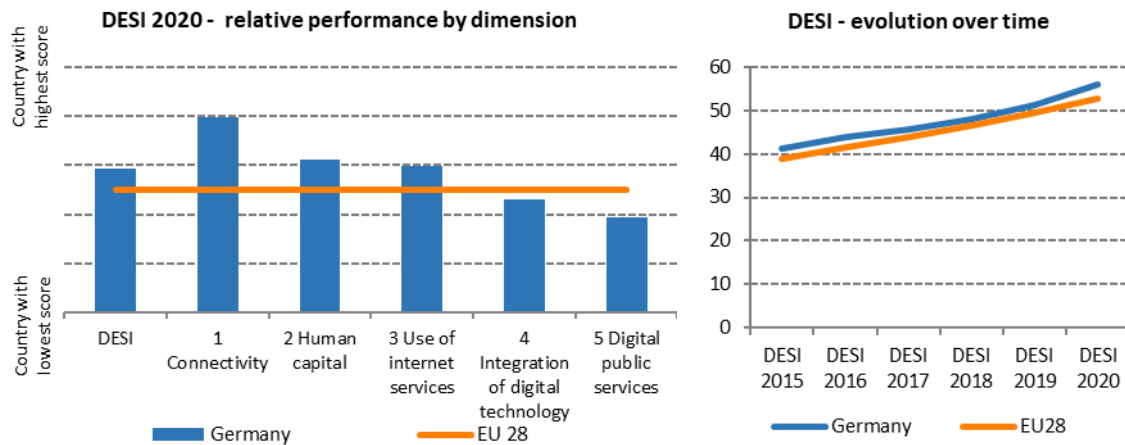
Based on data prior to the pandemic, Germany performs well in most DESI dimensions, except in digital public services, where it ranks 21<sup>st</sup>. On the Connectivity dimension, Germany leads the EU on 5G readiness and has a high take-up of overall fixed broadband. However, performance in fixed very high capacity network coverage is below the EU average, where it ranks 21<sup>st</sup>. The country performs well on the Human capital dimension, ranking fifth both for at least basic digital skills and for at least basic software skills. German companies have increased their use of social media but have not made progress in the level of Integration of digital technologies. Germany ranks ninth in the Use of internet services, as Germans are keen to use online services. Only 5% of Germans have never used the internet and 84% shop online. However, Germany ranks 26<sup>th</sup> in the use of e-government services, with only 49% of internet users going online to access such services. This is the country's greatest digital challenge. The federal government and the federal states have taken several measures to implement the Online Access Act in a bid to improve the situation.

In March 2016, the Federal Ministry for Economic Affairs and Energy presented the Digital Strategy for 2025<sup>(66)</sup>. In March 2018, a new state minister for digitisation was appointed, reporting directly to the Chancellor's Office.

In November 2018, the federal government published its implementation strategy 'Shaping Digitalisation'<sup>(67)</sup>. The objective is to continue improving the quality of life for everyone in Germany,

<sup>(66)</sup> <https://www.de.digital/DIGITAL/Redaktion/EN/Publikation/digital-strategy-2025.html>

while also leveraging economic and ecological opportunities and securing social cohesion. The strategy comprises five specific pillars: (i) Digital competence; (ii) Infrastructure and equipment; (iii) Innovation and digital transformation; (iv) Societal shift towards digitalisation and (v) the Modern state.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

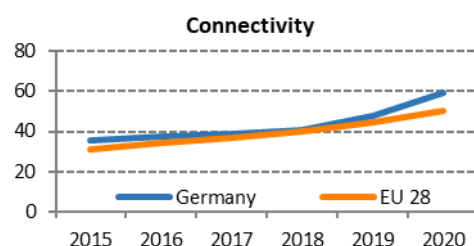
Germany has taken a large number of targeted measures in digital to deal with the COVID-19 crisis. Initiatives to minimise contagion and to support the health system include the development of a contact tracking application, a symptom checker chat bot and an electronic intensive register to monitor and manage intensive station resources. Guidelines for network security measures have been defined so that telecoms operators can take appropriate action in case of network overload. Digitalisation of the public administration is also being accelerated: priority will be given to digitising applications for benefit claims, which are important and vital for people and businesses in this crisis. For the economy, digital platforms have been set up in order to digitise the application process for funds, the networking between traders and to provide advice for SMEs affected by the crisis. As for education, 100 million euros funding is provided from the Digital Pact School for the rapid development of infrastructure and the expansion of digital education in the crisis.

<sup>(67)</sup> <https://www.bundesregierung.de/breg-en/service/information-material-issued-by-the-federal-government/shaping-digitalization-1605330>

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Germany is very advanced on 5G and is above EU average in the digital skills indicators. On the other hand, it lags behind in the deployment of VHCN, and has a relatively weak performance in the digitisation of businesses and in digital public services.

# 1 Connectivity

1 Connectivity	Germany		EU
	rank	score	score
DESI 2020	8	59.4	50.1
DESI 2019	14	47.7	44.7
DESI 2018	16	40.6	39.9



	DESI 2018	Germany	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
<b>1a1 Overall fixed broadband take-up</b> % households	88%	87%	88%	78%
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	11%	15%	21%	26%
<b>1b1 Fast broadband (NGA) coverage</b> % households	84%	88%	92%	86%
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	7%	9%	33%	44%
<b>1c1 4G coverage</b> % households (average of operators)	88%	90%	94%	96%
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	79	81	85	100
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	NA	33%	67%	21%
<b>1d1 Broadband price index</b> Score (0 to 100)	NA	NA	75	64

In 2019, Germany made progress on most connectivity indicators. On the overall connectivity indicator, it made a jump from rank 14 in 2019 to rank eight in 2020. It has 92% coverage of fast broadband. Although rural coverage has significantly improved since 2019, from 66% to 75%, and is above the EU average, Germany still has a clear digital divide between urban and rural areas. Germany performs particularly well on 5G readiness, overall fixed broadband take-up and broadband prices. Fixed VHCN coverage is at 33%, below the EU average of 44%, but it has increased substantially last year, mainly due to the upgrade of cable networks. In the broadband pricing index (based on several fixed broadband offers and on income), Germany ranked eighth in the EU. For mobile broadband prices, it ranked seventh.

Germany currently has approximately 1 million fibre (FTTH/B) subscriptions up and running. Cable operators are investing in DOCSIS 3.1, the incumbent, Telekom Deutschland GmbH (TDG) in a technology mix that still includes super-vectoring. About 80% of the commercial fibre roll-out is based on GPON<sup>(68)</sup> topology.

The German government set the political objective of providing nationwide full gigabit network coverage by 2025. Commercial fibre roll-out has continued. Vodafone took over the cable operator

<sup>(68)</sup> Gigabit passive optical network: It has a point-to-multipoint architecture where passive splitters in the fibre distribution network enable one single feeding fibre to serve multiple subscribers.

Unitymedia in July 2019 and committed to grant Telefonica access to its merged cable network for providing broadband subscriptions to end-users.

In Germany, 52% of the total 2090 MHz spectrum harmonised at EU level for wireless broadband has been assigned. Germany ranks first in the 5G readiness indicator<sup>(69)</sup>. It auctioned spectrum in the 700 MHz band in 2015, which is available for 5G use. A second auction took place between March and June 2019 where the frequencies in the 2 GHz<sup>(70)</sup> and 3.6 GHz bands were assigned. The three incumbents and one future new mobile network operator (MNO), currently operating among others as service provider on incumbent mobile networks, all successfully acquired spectrum. In the 3.7-3.8 GHz sub-band, property users can apply since November 2019 for frequencies to create their own local 5G networks on factory grounds or other types of property for several use cases. These include factory automation and campus networks, but exclude provision of public communication networks. The 24.25 GHz to 27.5 GHz band should be awarded by the end of 2020. This includes the option of assigning directly to industrial users with the possibility of spectrum sharing with other users (such as MNOs) outside industrial sites. All four MNOs have signed an agreement with the government for extended coverage obligations, in exchange for a pay-as-you-use plan for the 2019 auction payments. The three incumbent MNOs have agreed to share new-to-be-built sites in white spots. The government considers several measures to improve mobile infrastructure supply in poorly served areas. These measures may include among others a subsidy programme for areas with no coverage, a strategy on how to streamline permit procedures and how to facilitate access to state-owned real property for extending and for densification of mobile networks. At the regional level, in Bavaria, a state aid scheme funding passive mobile infrastructure had been approved by the Commission in November 2018.

In August 2019, the government launched a 5G competition to promote implementation of the 5G standard. During the concept phase, winning projects will receive €100,000 each and up to €4 million in the implementation phase. 5G is being trialled by MNOs and verticals. TDG and Vodafone have launched commercial offers at their first 5G sites. Various research projects for automated driving (including in urban test fields and on motorways) and for integrating 5G into industrial communications networks are currently ongoing.

Germany continues to face challenges on the fixed and mobile markets. There is still a significant urban-rural digital divide in terms of fixed NGA coverage and the proportion of fibre connections is increasing, but still very low. Although new funding approvals under the federal broadband scheme were granted exclusively to fibre, incumbents rely on a technology mix where the role of fibre could be extended and better defined.

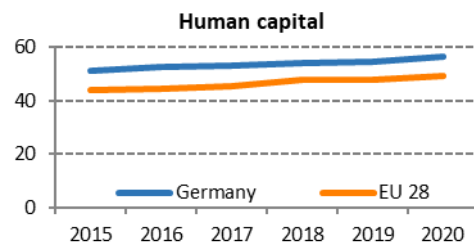
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<sup>(69)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

<sup>(70)</sup> Not taken into account in the 5G readiness indicator, see footnote above.

## 2 Human capital

2 Human capital	Germany		EU
	rank	Score	score
<b>DESI 2020</b>	<b>10</b>	<b>56.4</b>	<b>49.3</b>
DESI 2019	10	54.4	47.9
DESI 2018	10	54.2	47.6



	DESI 2018	Germany		EU
	value	DESI 2019	DESI 2020	DESI 2020
<b>2a1 At least basic digital skills</b>	<b>68%</b>	<b>68%</b>	<b>70%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>37%</b>	<b>37%</b>	<b>39%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>70%</b>	<b>70%</b>	<b>72%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>3.7%</b>	<b>3.8%</b>	<b>3.9%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>1.3%</b>	<b>1.3%</b>	<b>1.4%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>4.5%</b>	<b>4.5%</b>	<b>4.7%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

Under the Human capital dimension, Germany ranks 10<sup>th</sup> out of 28 EU countries, thus above the EU average. Germany has maintained this position for the past three years. Both at least basic digital skills and at least basic software skills levels are well above the EU average, and Germany ranks fifth on these two indicators. The proportion of ICT specialists in the workforce is at the EU average (3.9%). Female ICT specialists account for 1.4% of total female employment, in line with the EU average. The share of ICT graduates in Germany is 4.7% of the total, much higher than the EU average of 3.6%.

In some fields of IT, Germany has a clear shortage of skilled workers. For years, it has had difficulties filling vacancies for software developers with at least four years of computer science studies<sup>(71)</sup>.

Digital education is the joint responsibility of the federal and state governments. On the federal side, the Federal Ministry of Education and Research (BMBF) is responsible and the Federal Ministry of Labour and Social Affairs (BMAS) is also responsible for further training. The task of building digital competence is understood as a cross-departmental task in Germany, and therefore plays an important role in all relevant strategies: in the federal government's implementation strategy for shaping digital change entitled 'Shaping digitalisation'<sup>(72)</sup>, which was adopted in November 2018, in the federal government's Artificial Intelligence strategy<sup>(73)</sup> also adopted in November 2018, in the

<sup>(71)</sup> <https://statistik.arbeitsagentur.de/Statischer-Content/Arbeitsmarktberichte/Berufe/generische-Publikationen/Broschuere-Informatik.pdf>

<sup>(72)</sup> <https://www.bundesregierung.de/resource/blob/975292/1605342/284988700922725d63a0fb95db824024/digitalisierung-gestalten-englisch-download-bpa-data.pdf?download=1>

<sup>(73)</sup> <https://www.ki-strategie-deutschland.de/home.html>

BMBF's digital strategy published in April 2019 'Digital future: Learning. Researchers. Knowledge.'<sup>(74)</sup> and in the MINT action plan<sup>(75)</sup> presented in February 2019.

From 2020, the BMBF will implement the National Continuing Education Strategy<sup>(76)</sup> by taking 10 measures of action, jointly with the BMAS and together with the social and economic partners, the federal states and the Federal Employment Agency. The aim is to formulate answers to the changes in the world of work and to anchor a new culture of further education and lifelong learning in Germany. Digitalisation and digital skills are of great importance.

Germany has also promoted a range of topics under the drive for education for the digital knowledge society as part of the BMBF digital strategy since April 2019. They include in particular the school cloud and the DigitalPact School, and activities related to STEM (*MINT*) education.

On 17 May 2019, the DigitalPact School entered into force for a five-year period with a budget of €5 billion from the federal government and a contribution of €500 million from the federal states' budget. Implementation is carried out by the federal states, which have published their funding guidelines. The DigitalPact School is designed to shape digital change in the school system. The federal government supports states and municipalities by investing in digital municipal educational infrastructure.

Germany has not set up a national digital skills and jobs coalition. The country played an active part in the 2019 EU Code Week<sup>(77)</sup>, putting on 882 events and attracting an estimated 34,371 participants. The average participation of women in these events was 46%.

Although Germany is focusing on including digital skills in all relevant strategies, the results have not yet translated into changes in the indicators tracking progress on this dimension, which have been stable over the last three years. Specific attention is required on advanced digital skills training where there are clear shortages in the workforce.

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<sup>(74)</sup> <https://www.bildung-forschung.digital/de/die-digitalstrategie-des-bmbf-2479.html>

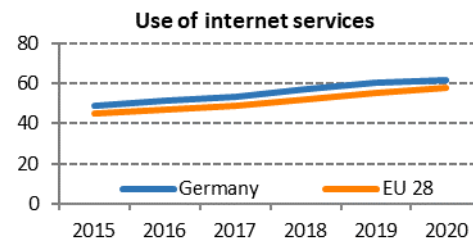
<sup>(75)</sup> <https://www.bmbf.de/de/mint-aktionsplan-10115.html>

<sup>(76)</sup> <https://www.bmbf.de/de/nationale-weiterbildungsstrategie-8853.html>

<sup>(77)</sup> <https://codeweek.eu/scoreboard?edition=2019>.

### 3 Use of internet services

3 Use of internet services	Germany		EU
	rank	score	score
DESI 2020	9	61.6	58.0
DESI 2019	8	60.3	55.0
DESI 2018	9	57.0	51.8



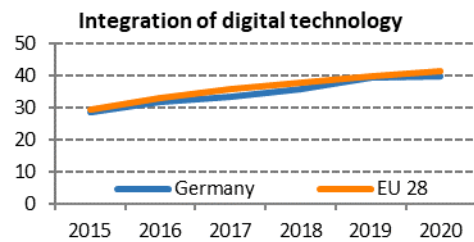
	DESI 2018	Germany	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
		value	value	Value
<b>3a1 People who have never used the internet</b>	<b>7%</b>	<b>5%</b>	<b>5%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>87%</b>	<b>90%</b>	<b>91%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>74%</b>	<b>74%</b>	<b>76%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>78%</b>	<b>82%</b>	<b>82%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>23%</b>	<b>31%</b>	<b>31%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>54%</b>	<b>57%</b>	<b>59%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>56%</b>	<b>57%</b>	<b>56%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>6%</b>	<b>6%</b>	<b>9%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>62%</b>	<b>64%</b>	<b>66%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>82%</b>	<b>82%</b>	<b>84%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>34%</b>	<b>35%</b>	<b>32%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

Overall, the Use of internet services in Germany is slightly higher than the EU average. People in Germany are keen to go online for a range of services, in line with the rest of the EU. Only 5% of Germans have never used the internet. Compared to the EU, the most frequent activities carried out online in Germany are reading news, consuming music, videos and games, shopping and selling online. 76% of German internet users read news online (against the EU average of 72%). Only 56% of Germans use social networks, well below the EU average of 65%, but at 84%, the share of online shopping is much higher than the EU average of 71%. Online sales, at 32%, is significantly above the EU average of 23%. The take-up of online music, videos and games is also more widespread in Germany than in other EU countries, at 82% of internet users.



## 4 Integration of digital technology

4 Integration of digital technology	Germany		EU
	rank	score	score
<b>DESI 2020</b>	<b>18</b>	<b>39.5</b>	<b>41.4</b>
DESI 2019	15	39.2	39.8
DESI 2018	17	35.8	37.8



	DESI 2018	Germany		EU
	value	DESI 2019	DESI 2020	DESI 2020
<b>4a1 Electronic information sharing</b>	<b>NA</b>	<b>NA</b>	<b>29%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>16%</b>	<b>16%</b>	<b>23%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>6%</b>	<b>15%</b>	<b>15%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>NA</b>	<b>12%</b>	<b>12%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>23%</b>	<b>19%</b>	<b>17%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>11%</b>	<b>9%</b>	<b>10%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>11%</b>	<b>11%</b>	<b>10%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

Germany ranks 18<sup>th</sup> in the EU on Integration of digital technology in business activities. Under a third of enterprises (29%) share information electronically. German SMEs do, however, take advantage of the opportunities presented by online commerce: 17% of SMEs sell online (slightly below the EU average of 18%); 10% of all SMEs sell cross-border and 10% of turnover is generated online. 23% of enterprises use social media (up from 16% in 2017) and 12% use cloud services (below the EU average of 18%). 15% of German enterprises use big data analysis, above the EU average of 12%.

The Federal Ministry for Economic Affairs and Energy has launched several measures with the aim of advancing digitalisation: a digital innovation competition for business start-ups, the Digital Hub Initiative, GINSEP, Mittelstand 4.0 Centres of Excellence, 'go digital', the Town-Country-Digital Initiative, IT Security in the Business Sector and Industrie 4.0.

At the Digital Summit in Dortmund on 29 October 2019, the Federal Ministry for Economic Affairs and Energy and the Federal Ministry of Education and Research presented Project GAIA-X, an initiative by representatives of the German Federal Government, business and sciences communities to set up a high-performance, competitive, secure and trustworthy data infrastructure for Europe.

In 2019, Germany took part in the newly established European Joint Undertaking 'EuroHPC'. Germany continues its long-standing commitment to the national supercomputing infrastructure, the Gauss Centre for Supercomputing. For the funding phase 2017-2025, the federal government and participating federal state governments will provide around €850 million. The HPC activities are part of the 'Hightech-Strategy 2025' of the federal government and part of the 'Digital Strategy' of the Federal Ministry for Education and Research. The Federal Ministry for Education and Research

provides German funding for EuroHPC. Germany has earmarked a budget of about €14 million for research and innovation tenders in 2019.

In September 2019, the federal government adopted a national Blockchain Strategy<sup>(78)</sup>. The strategy sets out 44 measures in five fields of action (blockchain in the finance sector; advancing projects and regulatory sandboxes; clear and reliable framework conditions; digitised public-administration services and knowledge, networks and cooperation). The expected outcome of the strategy is to deepen the understanding of its potential use and of the limitations of blockchain technology and its possible applications.

On 15 November 2018, the federal government adopted its Artificial Intelligence (AI) Strategy, in which it sets out a framework for a holistic policy on the future development and application of AI in Germany. In 2019, it launched several funding initiatives to cover work on IT security, autonomous driving and to look into the explainability and accountability of AI systems. Up to and including 2025, the federal government intends to provide around €3 billion to implement the strategy.

The research framework programme on IT security entitled ‘Self-determined and secure in the digital world 2015-2020’ for the first time bundles IT security research activities across departments. The framework programme has a budget of over €210 million and is set to run until 2020. Funding is provided for a broad range of activities such as quantum communication, post-quantum cryptography, artificial intelligence for IT security, IT security for critical infrastructure and hardware security. The QuNET research initiative to develop a highly secure network for the federal government on the basis of quantum communication is particularly worthy of note here.

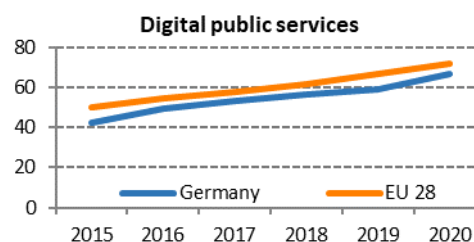
Multiple initiatives taken by the federal government also support the digitisation of SMEs, which is necessary to boost the digital transformation of the German economy.

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<sup>(78)</sup> <https://www.bmwi.de/Redaktion/EN/Publikationen/Digitale-Welt/blockchain-strategy.html>

## 5 Digital public services

5 Digital public services	Germany		EU
	rank	score	score
<b>DESI 2020</b>	<b>21</b>	<b>66.4</b>	<b>72.0</b>
DESI 2019	22	58.8	67.0
DESI 2018	19	56.4	61.8



	Germany			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>5a1 e-Government users</b>	<b>39%</b>	<b>43%</b>	<b>49%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>38</b>	<b>41</b>	<b>41</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>88</b>	<b>88</b>	<b>90</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>84</b>	<b>80</b>	<b>92</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>68%</b>	<b>66%</b>
% of maximum score			2019	2019

Germany ranks 21<sup>st</sup> in the EU on Digital public services. Despite an improvement in digital public services for businesses (up from 80 to 92), Germany still underperforms in this dimension. It performs above the EU average on open data, ranking 13<sup>th</sup>. On online service completion, Germany performs at the EU average with a score of 90. However, the level of online interaction between public authorities and the general public is very low. Only 49% of German online users engage actively with e-government services, compared with an EU average of 67%, with Germany ranked 26<sup>th</sup> for this indicator. On the indicator for pre-filled forms, Germany's score remained the same at 41, well below the EU average of 59.

Germany's Online Access Act (*Onlinezugangsgesetz, OZG*), enacted in August 2017, obliges all federal and state governments to provide online services for citizens and companies by the end of 2022. Two programmes have been set up to reach this goal: a programme for the digitisation of federal services (*Digitalisierungsprogramm Bund*) and a programme for the digitisation of services provided by federal states and municipalities (*Digitalisierungsprogramm Föderal*<sup>(79)</sup>). The two programmes cover 575 services under the Online Access Act, grouped in 14 subject areas, addressed jointly by the federal government, the states and the municipalities. For priority services, digitisation labs are set up to develop user-friendly online solutions.

In 2019, the federal cabinet reorganised the project to modernise the IT infrastructure of the federal public authorities since the project faced considerable delays and cost increases. Implementation is proceeding slowly and it will be a challenge to meet the goal of digitalising all 575 services by the end of 2022.

<sup>(79)</sup> <https://www.onlinezugangsgesetz.de/Webs/OZG/DE/digitalisierungsprogramme/foederal/foederal-node.html>

The budget for the project is allocated by the Ministry of Finance, with every ministry involved. Funds from several EU programmes are being used in different projects. An additional central budget of €500 million is managed by the Federal Ministry of the Interior to fund implementation of the Online Access Act. In addition, the Federal IT Cooperation body (FITKO), which coordinates the digitalisation programmes between the federal level, the federal states and municipalities, is equipped with a dedicated annual budget of approx. €60 million.

Full implementation of the Online Access Act by all public bodies involved – federal, state and local authorities - could generate more significant improvements in digital public administration.

#### **Highlight 2020: Digitisation labs for public services**

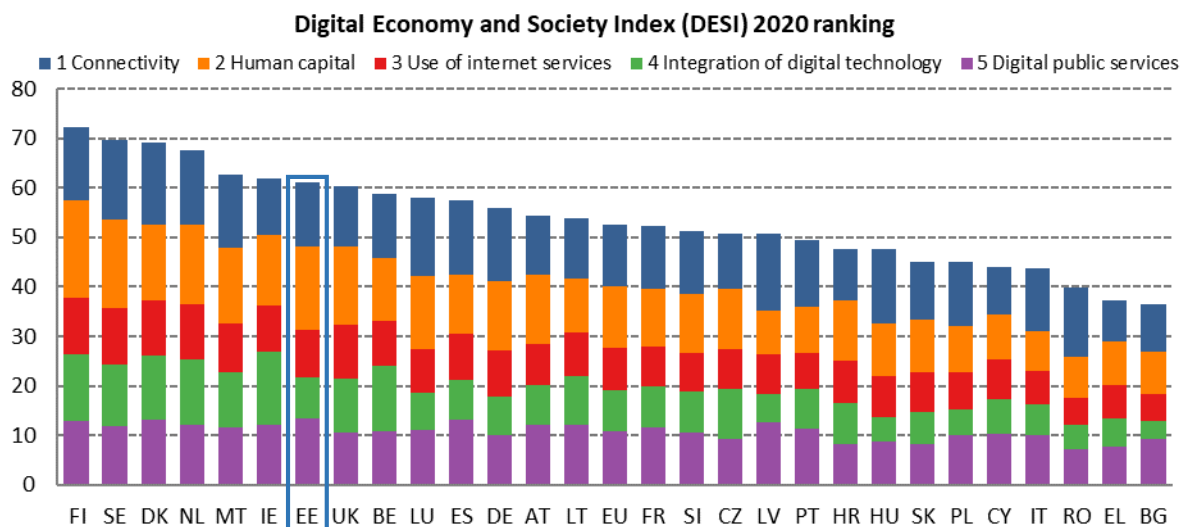
In 2018, the first 'digitisation lab' for the housing benefits service started as a pilot project to test a new method of digital transformation of public services in Germany. The results of the lab – including a clickable prototype, data fields and a process model – formed the basis for the technical implementation of a user-friendly online service. By the end of 2019, the first municipalities could offer an online application system for citizens to apply for housing benefits.

In 2019, the same method was applied to over 30 high priority public services (applications for driving licences, parental benefits etc.). The key advantages are in developing user-friendly services in a short period of time. Core features of the method are agility, user centricity and the use of an interdisciplinary team. After an analysis of the current process, employees from federal and state ministries and agencies came together with user experience designers and real users in design thinking workshops. After the first workshop, a draft version of a user-friendly click prototype of a digital public service is developed and subsequently tested in iterative versions with users, the agencies and ministries.

By the end of 2019, over 20 labs had developed a user-friendly click prototype, with technical implementation already started or due to start soon. Germany plans to set up more labs to work on other important services in 2020.

## Estonia

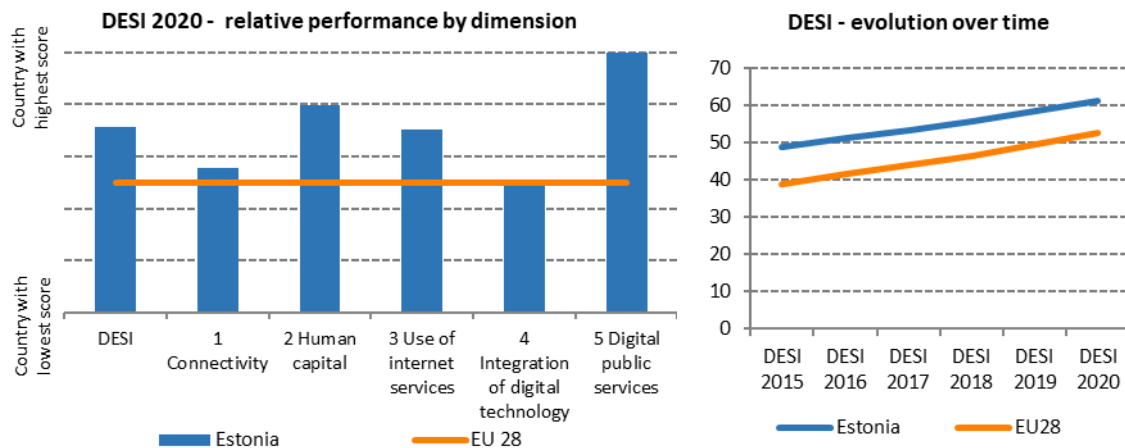
	Estonia		EU
	rank	score	score
<b>DESI 2020</b>	<b>7</b>	<b>61.1</b>	<b>52.6</b>
DESI 2019	5	58.3	49.4
DESI 2018	5	55.7	46.5



Based on data prior to the pandemic, Estonia ranks 7<sup>th</sup> out of the 28 EU Member States in the 2020 edition of the European Commission’s Digital Economy and Society Index (DESI).

Estonia continues to perform well on digital public services and very well on the human capital indicators. However, sustained action by all stakeholders is still important, not least because skills shortages and mismatches are among the main obstacles to business investment. The use of internet services remains consistently high. Estonia continues to invest in the deployment of broadband infrastructure, but the country’s ambitious 5G goals will depend on the timely award of the pioneer bands. A key challenge in the Estonian economy remains the digitisation of companies that do not yet take full advantage of the opportunities offered by digital technology, as well as more generally the integration of digital technology.

Estonia had reviewed and updated its ‘Digital Agenda 2020’ strategy in 2018. This undertaking is anchored in clear and transparent criteria, which will help the country in implementing the necessary measures to achieve its ambitious targets. By end of 2020, the government plans to prepare and adopt the digital strategy for the next 5 years.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

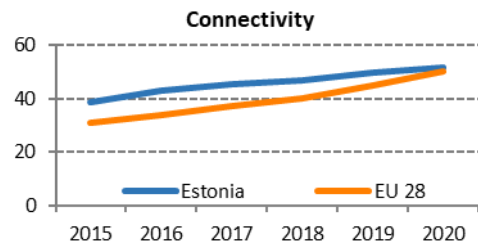
The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Estonia has taken a number of measures in digital to deal with the COVID-19 crisis. Initiatives to minimise contagion and to support the health system include the deployment of an AI-powered chatbot to answer people's questions about COVID-19; the development of a digital platform for monitoring personal protective equipment stocks and forecasts; the inclusion of remote specialist care in the list of refundable services by the national Health Insurance fund. Estonia has also shown great leadership in making available to the general public a number of e-learning solutions via the Education Nation online platform. Many different webinars and support materials have been organised and created to facilitate remote online learning. Digital technologies have been further integrated in the provision of public services, for example via an online trade fair for temporary job offers created by the Estonian Unemployment Insurance Fund, which also moved the provision of active labour market services, if applicable, to digital channels. Supplementary budget has been allocated for high-speed internet in rural areas. Estonia's efforts were also visible in the 'Hack the Crisis' joint digital hackathon organised on 13-15 March 2020, which resulted in many of the above mentioned solutions, and which led to the launch of the 'Global Hack' international hackathon on 9-12 April 2020, with thousands of participants from more than 40 countries.

Looking forward, it is important that Estonia focuses on the digitisation of its businesses across sectors, supports the take-up of fixed broadband reaching speeds of at least 100 Mbps, and takes the necessary steps to meet the country's ambitious 5G goals, which depend on the timely award of the pioneer bands.

# 1 Connectivity

1 Connectivity	Estonia		EU
	rank	score	score
<b>DESI 2020</b>	<b>14</b>	<b>51.9</b>	<b>50.1</b>
DESI 2019	9	49.9	44.7
DESI 2018	7	47.1	39.9



	DESI 2018	Estonia	DESI 2020	EU
	value	DESI 2019 value	value	DESI 2020 value
<b>1a1 Overall fixed broadband take-up</b> % households	<b>78%</b> 2017	<b>81%</b> 2018	<b>83%</b> 2019	<b>78%</b> 2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	<b>9%</b> 2017	<b>11%</b> 2018	<b>14%</b> 2019	<b>26%</b> 2019
<b>1b1 Fast broadband (NGA) coverage</b> % households	<b>80%</b> 2017	<b>83%</b> 2018	<b>84%</b> 2019	<b>86%</b> 2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	<b>51%</b> 2017	<b>54%</b> 2018	<b>57%</b> 2019	<b>44%</b> 2019
<b>1c1 4G coverage</b> % households (average of operators)	<b>98%</b> 2017	<b>99%</b> 2018	<b>98%</b> 2019	<b>96%</b> 2019
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	<b>125</b> 2017	<b>144</b> 2018	<b>152</b> 2019	<b>100</b> 2019
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	<b>NA</b>	<b>0%</b> 2019	<b>0%</b> 2020	<b>21%</b> 2020
<b>1d1 Broadband price index</b> Score (0 to 100)	<b>NA</b>	<b>NA</b>	<b>70</b> 2019	<b>64</b> 2019

Estonia's overall connectivity score has slightly risen since 2018, bringing the country's score to 51.9, ranking 14<sup>th</sup> among the Member States. In very-high capacity networks coverage Estonia ranks 15<sup>th</sup>, with 57% of its households being covered against an EU average of 44%. The country performed very well in the take-up of mobile broadband, with 152 subscriptions per 100 people; the EU average is 100 subscriptions per 100 people. Estonia also scores quite well on fixed broadband take-up, reaching 83%. Estonia's weak spot is the take-up of fixed broadband reaching speeds of at least 100 Mbps, where, despite the very good availability of very-high capacity networks it lies well below the EU average; only 14% of households subscribe to such speeds. Fixed broadband prices in Estonia are lower than the EU average.

The objectives of Estonia's current national broadband plan, the 2020 Digital Agenda, are not aligned with the objectives of the Gigabit Society. The strategy aims to provide all residents with internet access above 30 Mbps and to achieve at least 60% of household subscriptions with a speed of above 100 Mbps. Estonia's new digital strategy for 2020+ has been in preparation since the end of 2019. This strategy will align its connectivity targets to those of the Gigabit Society, including the availability of speeds of 100 Mbps upgradeable to 1 Gbps to all residents).

The Estonian wideband infrastructure network (EstWin) project delivered 7,000 km of backhaul network by January 2020. The Estonian government launched a public consultation in December

2019 in order to map further investment needs with a view to meeting the EU's 2025 Gigabit society objectives.

Concerning investment in broadband infrastructure in Estonia, implementation of a state aid scheme to support last-mile access in next generation access white spots was ongoing in 2019. The project is expected to finish by the end of 2023. Estonia also continues to use the European Regional Development Fund (ERDF) to support backhaul development. It has allocated all the €40.5 million of ERDF funding planned for 2014-2020.

As regards Estonia's ambition on 5G connectivity, Estonia published its 5G roadmap<sup>(80)</sup> in March 2019. The country would like to achieve 5G connectivity in major cities by 2023 and along transport corridors by 2025. A dedicated working group on 5G has been set up at ministry level. Work is ongoing to assess business use and find the best financing model for the 5G deployment. The authorities are also committed to cooperating on 5G corridors with Latvia and Lithuania under the Via Baltica project.

Estonia scores 0% on the 5G readiness indicator<sup>(81)</sup>. As of January 2020, the award of 5G pioneer bands in Estonia was still pending. The public offer for the 3.6 GHz band opened in March 2019, but an operator contested the design of the tender, which led to its suspension. The case has since reached Estonia's Supreme Court and the final decision is expected in mid-2020<sup>(82)</sup>. The Estonian authorities anticipate some difficulties in allowing the use of sufficiently large blocks in the 3.6 GHz band due to restrictions stemming from cross-border coordination issues with non-EU countries.

The regulator carried out a public consultation on the 700 MHz at the end of 2019 and is in the process of analysing the submitted comments. The regulatory authority reported no difficulties in migrating broadcasters from the 700 MHz band. However, the Ministry of Interior is assessing whether there is likely to be a future need to reserve a portion of the band for public protection and disaster relief purposes. The authorities aimed to begin the auction in spring 2020.

Regarding the 26 GHz band, the authorities are in the process of analysing comments submitted during the public consultation held at the end of 2019. The government does not anticipate any obstacles in authorising the use of at least 1 GHz of the band by the end of December 2020, subject to market demand.

Estonia continues to invest in the deployment of its broadband infrastructure and uses both public and private funds to do so. The country's ambitious 5G goals will depend on the timely award of the pioneer bands.

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<sup>(80)</sup> Available at: [https://www.mkm.ee/sites/default/files/eesti\\_5g\\_teekaart.pdf](https://www.mkm.ee/sites/default/files/eesti_5g_teekaart.pdf).

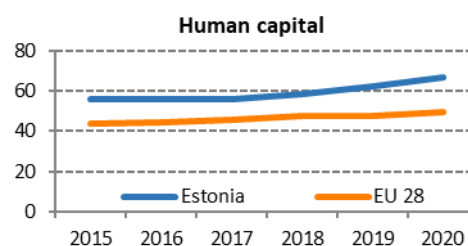
<sup>(81)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

<sup>(82)</sup> In March 2020, Estonia's Supreme Court dismissed the appeal and the Ministry of Economic Affairs and Communications was able to continue with the auction, however the deadline was postponed once again due to the emergency situation. The deadline for participating in the public offer was extended to 18 June 2020.



## 2 Human capital

2 Human capital	Estonia		EU
	rank	score	score
<b>DESI 2020</b>	<b>3</b>	<b>66.7</b>	<b>49.3</b>
DESI 2019	3	62.4	47.9
DESI 2018	6	58.3	47.6



	Estonia		EU	
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>2a1 At least basic digital skills</b> % individuals	<b>60%</b> 2017	<b>60%</b> 2017	<b>62%</b> 2019	<b>58%</b> 2019
<b>2a2 Above basic digital skills</b> % individuals	<b>35%</b> 2017	<b>35%</b> 2017	<b>37%</b> 2019	<b>33%</b> 2019
<b>2a3 At least basic software skills</b> % individuals	<b>61%</b> 2017	<b>61%</b> 2017	<b>62%</b> 2019	<b>61%</b> 2019
<b>2b1 ICT specialists</b> % total employment	<b>5.3%</b> 2016	<b>5.6%</b> 2017	<b>5.7%</b> 2018	<b>3.9%</b> 2018
<b>2b2 Female ICT specialists</b> % female employment	<b>2.0%</b> 2016	<b>2.2%</b> 2017	<b>2.6%</b> 2018	<b>1.4%</b> 2018
<b>2b3 ICT graduates</b> % graduates	<b>4.9%</b> 2015	<b>6.4%</b> 2016	<b>7.4%</b> 2017	<b>3.6%</b> 2017

Estonia ranks 3<sup>rd</sup> in the EU on Human capital. 62% of the population have at least basic digital skills and 37% have above basic digital skills, both above the EU average (58% and 33% respectively). The percentage of ICT graduates (7.4%), ICT specialists (5.7%) and female ICT specialists (2.6%) in Estonia increased in 2019 and is higher than the EU average.

However, businesses have identified skills shortages as some of the main obstacles to investment (84% of firms) but the share of investment in human capital and skills is low<sup>(83)</sup>. This is particularly important, given that the digitisation of many industries and sectors will impact people unevenly, with vulnerable groups at higher risks.

Estonia updated its Digital Agenda 2020 in 2018 and began a review process in 2019<sup>(84)</sup>. Under this agenda, Estonia committed to launching a number of initiatives to ensure the supply of ICT specialists and the acquisition of higher ICT skills in traditional sectors of the Estonian economy<sup>(85)</sup>. The Estonian Lifelong Learning Strategy aims to ensure that 80% of the population acquire digital competences by 2020<sup>(86)</sup>. The strategy has a 'digital focus on lifelong learning' as one of five priorities. The goal is to apply modern digital technology in learning and teaching in a more efficient way and with better results, to improve the digital skills of the general population and to ensure they can access the new generation of digital infrastructure.

<sup>(83)</sup> EIB 2019 ([https://www.eib.org/attachments/efs/economic\\_investment\\_report\\_2019\\_en.pdf](https://www.eib.org/attachments/efs/economic_investment_report_2019_en.pdf)), EIBIS 2019 ([https://www.eib.org/attachments/efs/eibis\\_2019\\_estonia\\_en.pdf](https://www.eib.org/attachments/efs/eibis_2019_estonia_en.pdf)).

<sup>(84)</sup> Not yet finalised at the time of writing.

<sup>(85)</sup> [https://www.mkm.ee/sites/default/files/digitalagenda2020\\_final.pdf](https://www.mkm.ee/sites/default/files/digitalagenda2020_final.pdf).

<sup>(86)</sup> Individuals aged 18-74 with computer skills.

Broadly speaking, the Estonian education system performs well, but the reported skills shortages suggest the link with the labour market remains a challenge<sup>(87)</sup>.

Estonia tops the PISA ranking of EU countries in the mean performance in reading, mathematics and science, and has the lowest shares of low achievers in all three domains. However, an above-average share of pupils leave education and training early and many students drop out from higher education<sup>(88)</sup>. These factors lead to an insufficient share of tertiary graduates, whose skills are not sufficiently aligned with labour market needs. Similarly, the lifelong learning and vocational education systems do not yet meet the changing needs of the labour market. Lastly, the good quality of the education system is endangered by emerging teacher shortages<sup>(89)</sup>. All these factors constitute a challenge for the continuous development of basic and advanced digital skills in Estonia. Initiatives such as EU Code Week, which saw more than 490 grass-root activities in Estonia (up from 355 in 2018), a good level of participation by women (43%) and high engagement in schools (83% of activities) can be a useful tool to tackle this challenge at an early stage<sup>(90)</sup>. Other examples include Progetiiger, First Lego League, Hour of Code, and others<sup>(91)</sup>.

The unmet demand for labour is particularly high in the information and communication technology (ICT) sector. Demand is projected to remain high in the years to come. One of the challenges for tertiary education providers is to significantly reduce the number of drop-outs. In recent years, the estimate of the deficit decreased slightly due to an increase in the number of graduates<sup>(92)</sup>. Efforts such as the higher education reform carried on in 2013 and the implementation of the IT Academy Programme (2016-2020) contributed to this positive development.

Despite the high percentage of ICT specialists, businesses provide only limited skills training to meet the needs of the ICT sector in Estonia. Further increasing the number of ICT specialists, by making it easier for ICT specialists from outside of Estonia to work in the country, maintaining a high number of ICT graduates and financing the upskilling of workers in the public and private sectors will help Estonia tap the full potential of the digital economy. The share of businesses providing their employees with training in ICT skills (17.1%) is below the EU average (23.9%)<sup>(93)</sup>.

In short, Estonia performs well on this chapter of the DESI index, but there is still a need for sustained action by all stakeholders, particularly since skills shortages and mismatches are among the main obstacles to business investment. Fully re-activating the national coalition for digital skills and jobs, on the basis of the on-going collaboration between the public, private and third sectors to update national digital skills strategies, would be an important step.

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<sup>(87)</sup> Source: OSKA, Estonian Labour Market Today and Tomorrow, 2018.

<sup>(88)</sup> Source: Eurostat, LFS.

<sup>(89)</sup> Source: European Semester 2020.

<sup>(90)</sup> Source: EU Code Week, <https://blog.codeweek.eu/post/190418441025/eucodeweek19stats>.

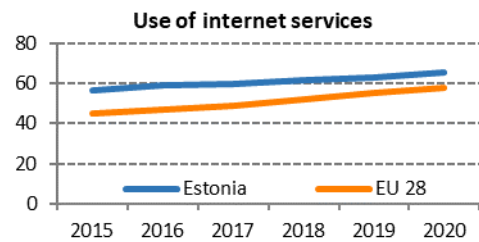
<sup>(91)</sup> See <http://progetiiger.ee/>, <https://www.firstlegoleague.ee/fil/>, <https://hourofcode.com/>.

<sup>(92)</sup> Source: OSKA, Future Trends of Work — Work and skills 2025, 2018.

<sup>(93)</sup> European Commission, Digital Scoreboard.

### 3 Use of internet services

3 Use of internet services	Estonia		EU
	rank	score	score
<b>DESI 2020</b>	<b>7</b>	<b>65.4</b>	<b>58.0</b>
DESI 2019	6	63.1	55.0
DESI 2018	7	61.5	51.8



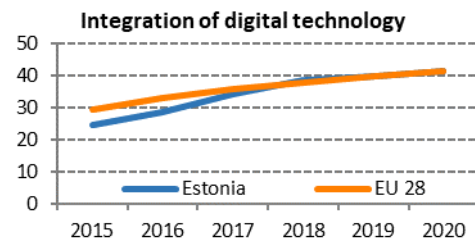
	Estonia		EU	
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>3a1 People who have never used the internet</b>	<b>9%</b>	<b>8%</b>	<b>7%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>86%</b>	<b>87%</b>	<b>88%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>90%</b>	<b>90%</b>	<b>89%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>84%</b>	<b>83%</b>	<b>83%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>24%</b>	<b>27%</b>	<b>27%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>50%</b>	<b>49%</b>	<b>59%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>68%</b>	<b>69%</b>	<b>72%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>13%</b>	<b>13%</b>	<b>15%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>90%</b>	<b>90%</b>	<b>89%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>65%</b>	<b>68%</b>	<b>75%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>21%</b>	<b>27%</b>	<b>20%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

Estonia ranks 7<sup>th</sup> in the EU on the Use of internet services.

Overall, the use of internet in Estonia is high (88% of people). People in Estonia are keen to carry out a range of online activities, the most popular being reading the news (89%, against an EU average of 72%) and banking (89%, against 66% at the EU level). The share of people taking an online course is higher in Estonia (15%) than the EU average (11%). Estonia also performs above the EU average in playing music, videos and games (83%), using social networks (72%), and shopping online (75%). It falls just below the EU average when it comes to selling online (20%), video on demand (27%) and video calls (59%).

## 4 Integration of digital technology

4 Integration of digital technology	Estonia		EU
	rank	score	score
<b>DESI 2020</b>	<b>14</b>	<b>41.1</b>	<b>41.4</b>
DESI 2019	14	39.8	39.8
DESI 2018	13	38.6	37.8



	DESI 2018	Estonia	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
<b>4a1 Electronic information sharing</b>	<b>28%</b>	<b>28%</b>	<b>26%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>13%</b>	<b>13%</b>	<b>16%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>13%</b>	<b>11%</b>	<b>11%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>NA</b>	<b>26%</b>	<b>26%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>15%</b>	<b>16%</b>	<b>17%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>11%</b>	<b>12%</b>	<b>12%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>8%</b>	<b>8%</b>	<b>9%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

Estonia scores slightly below the EU average on the Integration of digital technology — in which it now ranks 14<sup>th</sup>. It made some modest progress in a number of criteria, such as in the use of social media by business (16%, up from 13%), in the share of SMEs selling online (17% up from 16%) and the share of businesses selling online across borders (up from 8% to 9%).

Estonia invested in trainings on e-commerce for new entrepreneurs as well as active businesses, via County Development Centres network, located in each county<sup>(94)</sup>.

Estonia is committed to making progress with new digital technologies and to strategically investing in them through EU-coordinated programmes. For instance, the country is a member of the EuroHPC Joint Undertaking; it has also signed the Declaration of European Blockchain Partnership, the Declaration on Cooperation on Artificial Intelligence, the Declaration of cooperation towards access to at least 1 million sequenced genomes in the European Union by 2022 and the Declaration on the Cooperation framework on HPC. As highlighted in the section on skills, Estonia is also focusing on developing and building digital skills as a tool to foster the digitisation of businesses.

In July 2019, the government of Estonia also adopted the national Artificial Intelligence (AI) strategy for 2019-2021. The goals of this strategy include advancing the uptake of AI by the private sector, including via the use of existing funding measures (e.g. innovation and development vouchers,

<sup>(94)</sup> See <https://www.arenduskeskused.ee/en/>.

product development grants) and by providing practical examples on the use of AI applications to solve specific use cases (so-called ‘Kratts’)<sup>(95)</sup>.

Indeed, to boost the digital transformation of the Estonian economy, it is important that Estonia continues and strengthens its efforts to raise awareness of the benefit of better integrating digital technologies, particularly for SMEs. This objective could be achieved through a cross-sectoral initiative and with an extended focus, not limited to high-growth industries or those that already use digital technologies very intensely, including in the start-up ecosystem.

### Highlight 2020: National Strategy on Artificial Intelligence

In May 2019, an expert group presented proposals on advancing the take-up of artificial AI in Estonia.

The Estonian government adopted the resulting strategy in July 2019. The strategy focuses on the uptake of AI on the basis of clear and practical applications, the ‘Kratts’. In Estonian mythology, a Kratt is a magical creature, a servant built from hay or old household items. The Estonian government uses this character as a metaphor for AI and its complexities: Artificial Intelligence technologies can be a powerful assistant to humans, but only if used properly.

From a legal perspective, Estonia considers that there is no need for substantial changes in the basics provisions of the legal system. Both now and in the foreseeable future, Kratts will remain tools for humans, as they perform tasks as instructed by humans. Still, some smaller legal modifications will be necessary and the Ministry of Justice is tasked to bring forward the relevant draft legal act by summer 2020.

The strategy includes activities in four main areas, covering the span of next two years: increasing uptake of AI in public sector, increasing uptake of AI in private sector, ensuring the relevant skills and R&D base, enhancing the legal environment.

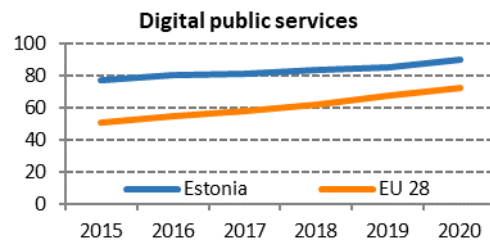
According to the Estonian government, the full implementation of the AI strategy would benefit the public sector, by making services easier to use, improving data analysis, and in general by making digital public services more efficient. AI can also play an important role for industry and attract new investment and innovation activity to Estonia, notably due to global demand for a development and test environment that favours AI solutions<sup>(96)</sup>.

<sup>(95)</sup> Source: <https://www.kratid.ee/>.

<sup>(96)</sup> Source: <https://www.kratid.ee/>.

## 5 Digital public services

5 Digital public services	Estonia		EU
	rank	score	score
<b>DESI 2020</b>	<b>1</b>	<b>89.3</b>	<b>72.0</b>
DESI 2019	1	85.0	67.0
DESI 2018	1	83.0	61.8



	Estonia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>5a1 e-Government users</b>	<b>96%</b>	<b>92%</b>	<b>93%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>88</b>	<b>89</b>	<b>90</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>97</b>	<b>98</b>	<b>98</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>93</b>	<b>94</b>	<b>100</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>67%</b>	<b>66%</b>
% of maximum score			2019	2019

Estonia ranks 1<sup>st</sup> place in the EU on Digital public services. Estonia has well-developed e-government and e-health systems, with all central government services, as well as municipalities providing services online<sup>(97)</sup>. The country is a frontrunner in the digital provision of public services and has one of the highest shares (93%) of e-government users in Europe. Estonia's X-road system, the backbone of its e-government, is a digital information infrastructure that securely connects over 900 organisations daily<sup>(98)</sup>.

In 2020, Estonia performed slightly better than in 2019 in terms of the number of users using pre-filled forms, and reported stable figures on online service completion. Estonia has also established a high-security data embassy in Luxembourg to host critical data and information systems outside Estonia<sup>(99)</sup>. Generally speaking, Estonia performs very well across all indicators of e-government analysis, including the level of digitisation and the penetration of public services<sup>(100)</sup>.

In its updated 'Digital Agenda 2020', Estonia recognises that cyber security is now universally accepted as an inseparable part of the functioning of the state and economy and of both internal and external security. So the primary task is to ensure that vital functions (strategic infrastructure and services) are resilient to cyber threats, which requires having a country-wide strategic overview, interoperability, and well-functioning planning.

<sup>(97)</sup> Statistics of e-government services also available here in the State Services Catalogue: <https://www.mkm.ee/en/service-search>; see also: <http://mkm-itaio.github.io/catalogue/>.

<sup>(98)</sup> <https://www.x-tee.ee/factsheets/EE/#eng>.

<sup>(99)</sup> <https://e-estonia.com/estonia-to-open-the-worlds-first-data-embassy-in-luxembourg/>.

<sup>(100)</sup> Source: eGovernment Benchmark 2019, <https://ec.europa.eu/digital-single-market/en/news/egovernment-benchmark-2019-trust-government-increasingly-important-people>.

Estonia has made significant investment and has made progress on open data. Estonia ranks 14<sup>th</sup> in the overall maturity framework available via the EU Open Data Portal, substantially higher than it ranked in previous years<sup>(101)</sup>. A lack of availability of open data is the key barrier to open data reuse. Currently, only a fragment of all public datasets has been released as open and re-usable data and not all available datasets are linked to the national open data portal. To address this issue, users have been encouraged to post requests for open data via the GitHub issue tracker. In addition, the Ministry of Economic Affairs and Communications and Open Knowledge Estonia is working with individual data holders that wish to publish open data to give them technical and other advice. The public sector working group is used as a platform to encourage data holders to publish open data.

Estonia's national strategy on Artificial Intelligence devotes significant attention to the uptake of AI solutions in the public sector, including via targeted training; technical and financial support for AI pilots in various agencies; creating reusable AI components for public sector AI applications, to accelerate their deployment; and developing guidelines for AI development, including for what concerns the responsible use of data.<sup>(102)</sup> The national AI strategy set the goal of at least 50 live AI applications in Estonian public sector by end of 2020.

As a world leader in digital public services, for Estonia to reach the objectives outlined in the Digital Agenda 2020, it is important to ensure that the full range of online public services is user-friendly and cost effective. Promoting the use of and opening up information gateways, including the Estonian Open Data Portal, would help Estonia achieving those goals.

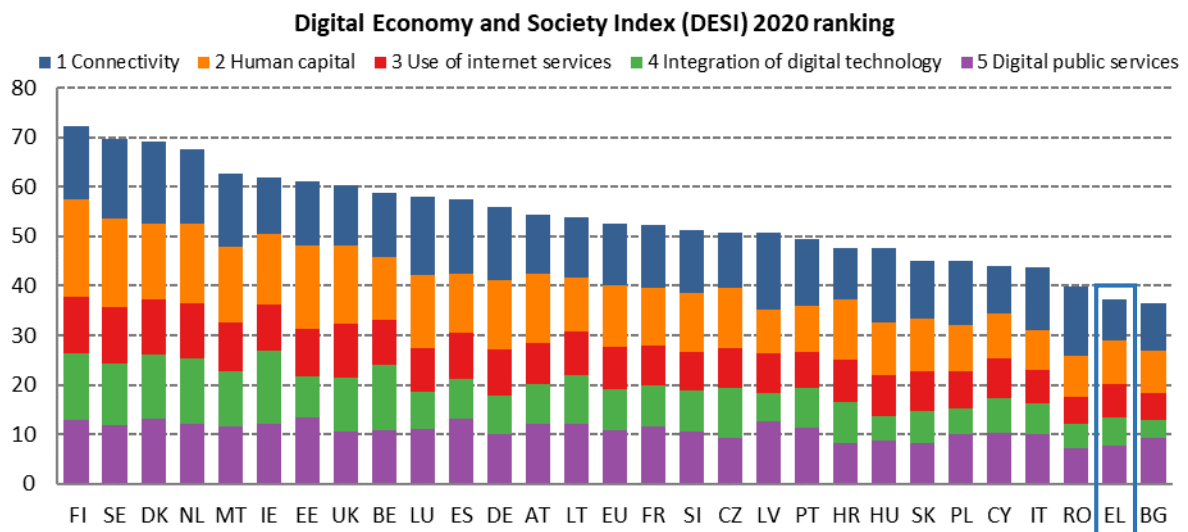
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<sup>(101)</sup> Reference: Open Data Maturity Report 2019, Fact sheet for Estonia, [https://www.europeandataportal.eu/sites/default/files/country-factsheet\\_estonia\\_2019.pdf](https://www.europeandataportal.eu/sites/default/files/country-factsheet_estonia_2019.pdf).

<sup>(102)</sup> Source: <https://www.kratid.ee/>.

## Greece

	Greece		EU
	rank	score	score
<b>DESI 2020</b>	<b>27</b>	<b>37.3</b>	<b>52.6</b>
DESI 2019	27	35.1	49.4
DESI 2018	28	32.3	46.5

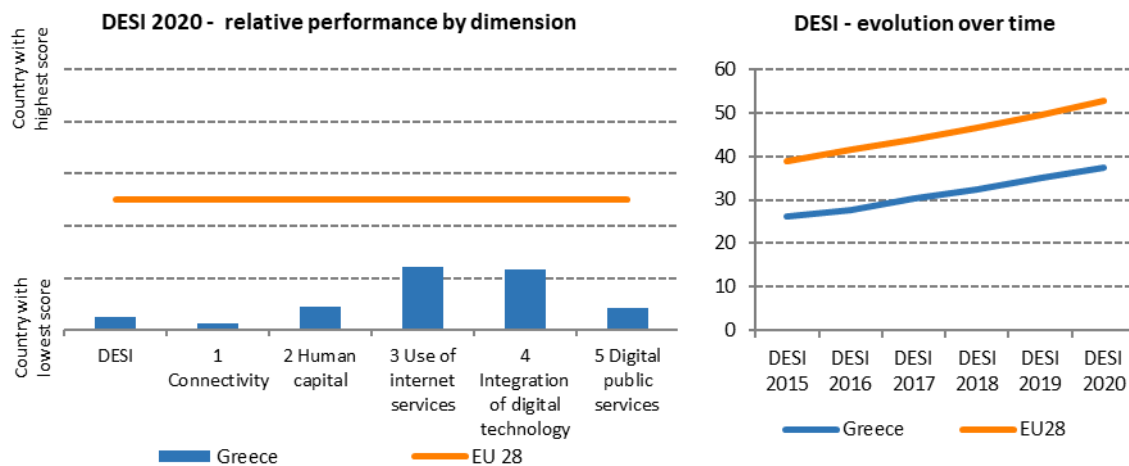


Greece ranks 27<sup>th</sup> out of the 28 EU Member States in the European Commission Digital Economy and Society Index (DESI) 2020.

Based on data prior to the pandemic, over the last year, despite an increase in its overall score, Greece shows limited improvement of its performance in the DESI dimensions measured. However, Greece improved its scores on the human capital chapter making progress in almost all of the related indicators. For the first time, the percentage of individuals with at least basic digital skills is over 50%. On connectivity, Greece is progressing at a very high pace in fast broadband (NGA) coverage showing a substantial progress of 15 percentage-point over last year, but remaining below the EU average. However, it is expected to improve since the Commission has approved the ambitious ultra-fast broadband infrastructure project, which will contribute to achieving Greece's digital ambitions. Overall, the country made the most progress compared to the previous year on the Digital Public Services chapter, but still scores well below the EU average.

Following the elections in July 2019, the new Ministry of Digital Governance gained strategic importance and was given the mandate to design, coordinate and implement the strategy for digital transformation of the country. The ministry is responsible for providing digital services to citizens and businesses based on simplified administrative procedures. It is also responsible for ensuring the interoperability of processes with all other ministries and government agencies. The objective is to transform Greece into 'digital by default' by 2023. The government therefore, revised its national digital strategy 2016-2021. The new strategy, the 'Digital Transformation Bible' is expected to be launched in the first half of 2020. It builds on the five chapters in the DESI report, combined with a strong governance model to coordinate implementation with all entities concerned. It also plans the coordinated implementation of major IT projects, some over the short term, the so-called 'Quick-win' projects; others will need a longer-term preparation.





### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Greece took several digital initiatives to address the challenges and barriers triggered by the COVID-19 pandemic, accelerating the pace of the digital transformation. The sudden shift to digital platforms has strained the infrastructure. The Ministry of Digital Governance ensured a secured access to Virtual Private Network for teleworking of critical public services (up to 10,000 employees); provided a platform for all public bodies to conduct secure and high-quality teleconferences; issued guidelines for cybersecurity, guidance to fight misinformation and avoid online fraud attempts. For distance learning, the Ministry of Education provided a digital platform for live teaching and homework: [mathainoumestospiti.gov.gr](http://mathainoumestospiti.gov.gr). In collaboration with the national broadcasting channel, it also produced educational TV episodes.

The Ministries of Digital Governance, Interior, Health and the National Documentation Center created on-line platforms for supply, solidarity and information for citizens and businesses. The #DigitalSolidarityGR offers free or lower cost digital services and products from institutions, individuals and companies for citizens to access to remote work, education and entertainment. To minimise contagion and support the health system, a platform for information, prevention and treatment of the COVID-19 pandemic has been set up. Further e-health services have been developed such as issuing remotely e-prescription of recurrent drugs for chronic diseases for the most vulnerable groups of the population. The National Documentation Centre provides information related to digital transformation for businesses and funding opportunities for digital solutions. It also created a gateway to the latest scientific knowledge related to COVID-19.

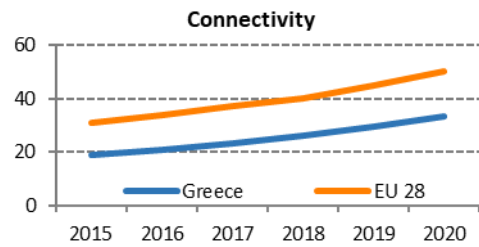
The Ministry of Labor and Social Affairs launched a web-service for the implementation of the special mechanism for supportive measures addressed to employees affected by the crisis.

The digitization of the public services is being accelerated with the launch of the governmental portal “gov.gr” by the Ministry of Digital Governance providing more than 500 e-services; each new service that will be digitized in the future will be integrated there. All services from the organisation for combatting unemployment (OAED) for the unemployed and employees are now provided digitally, from registration to application for unemployment benefits.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Greece has not yet assigned radio spectrum for 5G services. It lags behind in the deployment of Very High Capacity Networks (VHCN) and is below the EU average in the digital skills indicators and digitisation of businesses. The digital public services indicators recorded an increase, but remain below the EU average.

# 1 Connectivity

1 Connectivity	Greece		EU
	rank	score	score
DESI 2020	28	33.4	50.1
DESI 2019	28	29.5	44.7
DESI 2018	28	26.0	39.9



	Greece			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>1a1 Overall fixed broadband take-up</b> % households	69%	74%	76%	78%
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	0%	0%	1%	26%
<b>1b1 Fast broadband (NGA) coverage</b> % households	53%	66%	81%	86%
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	0%	0%	7%	44%
<b>1c1 4G coverage</b> % households (average of operators)	86%	92%	97%	96%
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	66	75	86	100
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	NA	0%	0%	21%
<b>1d1 Broadband price index</b> Score (0 to 100)	NA	NA	49	64

With an overall connectivity score of 33.4 (compared to EU average of 50.1), Greece ranks last among EU countries; there has been no improvement in rank since 2017 (DESI 2018). Overall fixed broadband take-up is still progressing in a slow pace, reaching 76 % (below the EU average of 78 %). This could be linked to prices, which remain relatively high compared with the EU average; as Greece in 2018 ranked last and now ranks 26<sup>th</sup> among EU countries on the broadband price index as well. Moreover, the at least 30 Mbps broadband penetration demonstrates an increase of 6.4 percentage points (from 11.3 in 2018 to 17.7 in 2019). This increase could be attributed to the progressing network deployment and the relevant market campaigns on high speed internet and relevant video streaming products. On the other hand, the broadband penetration of at least 100 Mbps has slightly increased from 0.3% in 2018 to 0.8% in 2019. Greece is progressing at a very high pace in fast broadband (NGA) coverage showing a substantial progress of 15 percentage points in 2019 reaching 81%, only 5 percentage points below the EU average of 86%. Moreover, the country has finally started engaging in the deployment of very high capacity networks and its fixed very high capacity network coverage reached 7% from 0% one year before, still however far below the EU average of 44%. Despite the 11-point increase in mobile broadband take-up, the current figure is 86 subscriptions per 100 people, well below the EU average of 100 subscriptions per 100 people. Greece's 4G performance is better, with average coverage 97%, slightly exceeding the EU average (96%).

Greece is in the process of updating the National Broadband Plan and finalising the 'Digital Transformation Bible', which will result in a structured, actionable and measurable digital strategy for Greece, with announcements expected in 2020. The major broadband infrastructure project and the main priority for Greece is 'Ultra-Fast Broadband' (UFBB), which aims to help the country fill the gaps on very-high-speed connectivity and achieve its gigabit society targets. Greece expects that this project will bring new wholesale-only players to the market and will unlock cross-sector synergies. The ministry plans to sign the contracts in the last quarter of 2020. The project's total budget is estimated at €700 million, of which €300 million is public funding. Further to the Commission's approval of the measure under State aid rules on 31 July 2019, on 31 January 2020, the European Commission approved European financing for the UFBB project totalling €223 million of EU funds, with the purpose of providing modern and fast internet access to users throughout the country. It is expected to benefit almost 11 million people and to become operational as of May 2021.

The three operators to which exclusive areas of NGA deployment have been allocated by the National Regulatory Authority (EETT), have accumulated delays on the initial plan for roll-out due to issues with power supply and permit granting. Although most of the NGA deployment under the vectoring deployment plan concerns implementation of FTTC/VDSL vectoring access networks, operators also deploy FTTH network in other areas. In January 2020, they announced further plans to deploy networks based on fibre outside the vectoring procedure. Greece also considers a 'Submarine Cable Scheme' to work towards its gigabit society targets for the Greek islands, promote digital cohesion, and establish adequate backhauling facilities. The project may cover 43 submarine links running to a total length of 2,400 Km and an international link between Rhodes and Cyprus. The project budget is estimated €100 million.

The superfast broadband project (SFBB), which aims to stimulate demand and support citizens in providing a very high capacity (VHC) network service (at high internet speeds from 100 Mbps upgradable to 1 Gbps) and using it for 24 months, is now progressing effectively, after resolving initial delays in absorption of funding. Greece has issued over 6,500 vouchers and the number of beneficiaries is expected to grow significantly as VHC availability improves. In February 2020, Greece extended the superfast broadband (SFBB) programme to businesses, mainly small and medium-sized, granting a subsidy of €360 per connection. The total budget of the programme is €50 million. Greece is one of the successful Member States in the WiFi4EU first call as it won 117 vouchers (about 40% of applications). The ministry is preparing a complementary project (WiFi for GR), with enhanced technical specifications that aims to extend public WiFi availability. The project budget is €15 million and it will be funded from the ESIF (ERDF).

The ministry launched a new study to prepare a 5G strategy, which will be finalised by mid-2020. Greece scores 0 in the 5G readiness indicator. In Greece, 32% of the total spectrum harmonised at EU level for wireless broadband has been assigned<sup>(103)</sup>. Delays are expected concerning the availability of the 700MHz band, as the final date for its use for broadcasting was 15 December 2020. The challenge is to facilitate the migration of DTT below 694 MHz, with the lowest possible impact to the public. Legal and technical issues may arise during the process of amending the licenses of the two DTT network providers (one private (DIGEA) and one public (ERT)). On 6 February 2020, EETT

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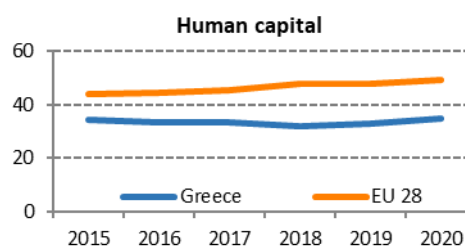
<sup>(103)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

launched a public consultation on the process of granting rights of use in the 700 MHz, 2, 3.4 - 3.8 and 26 GHz bands, due to be completed on 30 April 2020. The Auction is expected to be held in 2020 and the 700MHz spectrum will be available for use by the Mobile Service by mid-2021. The ministry is also assessing the scenario of running one tender for all 5G pioneer bands. A new antenna licensing law voted recently as part of the new Greek Growth Act constitutes an important step towards simplifying the antenna licensing procedure and towards preparing for the 5G roll-out.

Under its new ambitious digital strategy, Greece is working to address the delays in implementing the projects and in absorbing the funds allocated. Timely implementation of the 'Ultra-Fast Broadband' (UFBB) project and creating the right conditions for investment will improve its digital competitiveness. Tackling the significant delays in proceedings for antenna-permit granting under the new law and promoting 5G development will improve the country's digital status. For the 5G roll-out to be a success, it is crucial to implement the 5G strategy and assign the 5G pioneer bands (700 MHz, 3.6 GHz and 26 GHz) without delay.

## 2 Human capital

2 Human capital	Greece		EU
	rank	score	score
<b>DESI 2020</b>	<b>25</b>	<b>34.8</b>	<b>49.3</b>
DESI 2019	25	32.7	47.9
DESI 2018	25	31.9	47.6



	Greece			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>2a1 At least basic digital skills</b> % individuals	<b>46%</b> 2017	<b>46%</b> 2017	<b>51%</b> 2019	<b>58%</b> 2019
<b>2a2 Above basic digital skills</b> % individuals	<b>22%</b> 2017	<b>22%</b> 2017	<b>23%</b> 2019	<b>33%</b> 2019
<b>2a3 At least basic software skills</b> % individuals	<b>52%</b> 2017	<b>52%</b> 2017	<b>56%</b> 2019	<b>61%</b> 2019
<b>2b1 ICT specialists</b> % total employment	<b>1.4%</b> 2016	<b>1.6%</b> 2017	<b>1.8%</b> 2018	<b>3.9%</b> 2018
<b>2b2 Female ICT specialists</b> % female employment	<b>0.4%</b> 2016	<b>0.4%</b> 2017	<b>0.5%</b> 2018	<b>1.4%</b> 2018
<b>2b3 ICT graduates</b> % graduates	<b>3.0%</b> 2015	<b>3.2%</b> 2016	<b>2.9%</b> 2017	<b>3.6%</b> 2017

Greece performs well below the EU average on the human capital chapter, though it continues to make progress. In 2019, 51% of individuals between 16 and 74 had at least basic digital skills (58% in the EU), a good 5 percentage-point increase in one year, well above the average 1 percentage-point rise in the EU. The percentage of individuals with at least basic software skills is also rising well, from 52% in 2018 to 56% in 2019, rising faster than the EU average. The share of ICT specialists in total employment continues to improve at the same pace as the last three years but remains low (1.8%) compared to the EU average of 3.9%. The share of women ICT specialists in total female employment remains very low at 0.5% compared with the EU average (1.4%), though it did rise slightly by 0.1%, an improvement since it had stagnated over the previous three years.

Greece placed the development of digital skills for citizens at the core of the new digital transformation strategy coordinated by the Ministry of Digital Governance. The objective is to facilitate the use of public services by all citizens, and to equip them with the skills needed for future jobs.

Since mid-2019, the Department of Digital Economy and Digital Skills under the General Secretariat of Digital Governance and Simplification of Procedures is responsible for the National Coalition for Digital Skills and Jobs and for digital skills for civil servants, via the National Centre for Public Administration & Local Government.

In February 2020, the government relaunched the Greek National Coalition for digital skills and jobs<sup>(104)</sup> (established in 2018) under the Coordination of the Ministry of Digital Governance to attract further partners and build the synergies needed to address the digital skills gaps. The Coalition's

<sup>(104)</sup> <http://www.nationalcoalition.gov.gr/>

members, already include several ministries as well as the Federation of Hellenic Information Technology & Communications Enterprises. The government encourages participation of other stakeholders from the private sector, including SMEs, universities and research centres, which are currently underrepresented in the Coalition.

One of the Coalition's actions in 2019 was to promote EU Code Week, with positive results. Greek schools participated extensively in the 2019 edition of EU Code Week. Greece put on 891 activities across the country, 2.5 times more than in 2018, for a total of participants of 73,000 of which 47% were girls and women.

In April 2019, Greece signed the EU Declaration on Women and Digital<sup>(105)</sup> to take action to include more women in the digital sector and increase women's visibility and empowerment in the digital economy.

In 2020, the Ministry of Education will work on a digital education action plan covering the revision of curricula and digital education resources for primary, secondary and special-needs children. The ministry also plan to equip students with the tools they need to prepare for the future labour market. In particular, the ministry plans to offer a basic certificate for IT skills for 15-year-old students to have at least basic digital skills.

The shortage of digital skills both, at basic and advanced level, remains a major obstacle for Greece in digitally transforming its society and the economy. The coordinated approach launched in 2019 will boost the impact of existing and new initiatives to equip citizens and workers with digital skills and close the gender gap so that they can all draw benefit from the ongoing digital transformation.

#### **Highlight 2020: ReBrain Greece initiative**

Launched in April 2019 by the Ministry of Labour and Social Affairs, this initiative aims to tackle the brain drain and to accelerate the transition of the Greek labour market to the digital age by designing data driven policies based on the Labour Market Diagnosis Mechanism<sup>(106)</sup>.

In December 2019, a number of pilot initiatives were presented at a conference<sup>(107)</sup>. First is a pilot initiative to encourage highly skilled young Greek talented expatriates who left Greece during the economic crisis to return to high-tech jobs, symbolically called 'Choose ...Greece!'. Second, a series of pilot training courses on digital skills to meet the needs identified in specific areas, for example: 'Agrodigital entrepreneurship' to gain business knowledge related to crops through digital tools such as AI; the 'Dig\_Circular' for education and work in the circular economy and the 'Advanced skills 4 Women'. This initiative addresses young non-employed women and aims to train them in a dynamic sector with good job prospects, such as data analysis and open source data applications for the public or private sector.

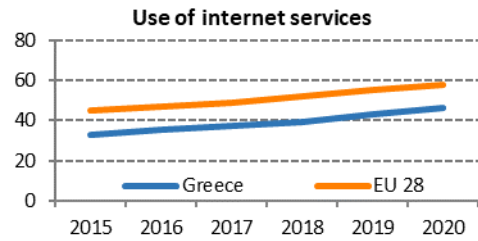
<sup>(105)</sup> <https://ec.europa.eu/digital-single-market/en/news/eu-countries-commit-boost-participation-women-digital>

<sup>(106)</sup> <https://lmd.eiead.gr/Introduction-to-Annual-Report-2019/>

<sup>(107)</sup> <https://conference.rebraingreece.gr/>

### 3 Use of internet services

3 Use of internet services	Greece		EU
	rank	score	score
<b>DESI 2020</b>	<b>25</b>	<b>46.1</b>	<b>58.0</b>
DESI 2019	25	43.3	55.0
DESI 2018	25	39.3	51.8



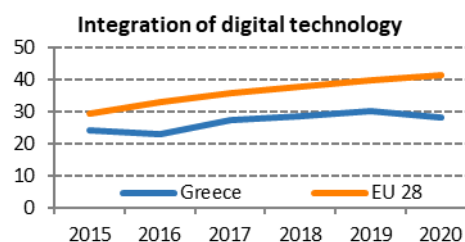
	Greece			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>3a1 People who have never used the internet</b> % individuals	<b>28%</b> 2017	<b>25%</b> 2018	<b>22%</b> 2019	<b>9%</b> 2019
<b>3a2 Internet users</b> % individuals	<b>67%</b> 2017	<b>70%</b> 2018	<b>74%</b> 2019	<b>85%</b> 2019
<b>3b1 News</b> % internet users	<b>87%</b> 2017	<b>87%</b> 2017	<b>88%</b> 2019	<b>72%</b> 2019
<b>3b2 Music, videos and games</b> % internet users	<b>77%</b> 2016	<b>79%</b> 2018	<b>79%</b> 2018	<b>81%</b> 2018
<b>3b3 Video on demand</b> % internet users	<b>12%</b> 2016	<b>11%</b> 2018	<b>11%</b> 2018	<b>31%</b> 2018
<b>3b4 Video calls</b> % internet users	<b>48%</b> 2017	<b>61%</b> 2018	<b>67%</b> 2019	<b>60%</b> 2019
<b>3b5 Social networks</b> % internet users	<b>72%</b> 2017	<b>73%</b> 2018	<b>75%</b> 2019	<b>65%</b> 2019
<b>3b6 Doing an online course</b> % internet users	<b>7%</b> 2017	<b>7%</b> 2017	<b>7%</b> 2019	<b>11%</b> 2019
<b>3c1 Banking</b> % internet users	<b>36%</b> 2017	<b>38%</b> 2018	<b>40%</b> 2019	<b>66%</b> 2019
<b>3c2 Shopping</b> % internet users	<b>45%</b> 2017	<b>49%</b> 2018	<b>51%</b> 2019	<b>71%</b> 2019
<b>3c3 Selling online</b> % internet users	<b>3%</b> 2017	<b>5%</b> 2018	<b>3%</b> 2019	<b>23%</b> 2019

Overall, the use of internet services in Greece is well below the EU average. However, the number of internet users is growing and a large percentage of them are keen to carry out in a range of online activities. The most popular online activity remains reading news, making video calls and using social networks, well above the EU average. 88% of Greek internet users read news online, well above the EU average of 72%. The use of video calls reached 67% in 2019 above the EU average (60% in 2019). The use of online banking (40% in 2019), although it is increased for the third year in a row, remains far below the EU average of 66%. The same applies to shopping online, which is increasing at 51% of internet users, but remains below the EU average of 71%.



## 4 Integration of digital technology

4 Integration of digital technology	Greece		EU
	rank	score	score
<b>DESI 2020</b>	<b>24</b>	<b>28.2</b>	<b>41.4</b>
DESI 2019	22	30.2	39.8
DESI 2018	23	28.6	37.8



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

On the Integration of digital technology by business, Greece ranks 24<sup>th</sup> in the EU. The number of enterprises in Greece that share electronic information sharing continues to rise and remains above the EU average. But the share of enterprises using social media went down slightly in 2019, as did the share of SMEs selling online in 2019 (9%, down 2% since 2018). Their share of turnover generated on line did not fall, though it remains low at a mere 4% of total turnover.

In 2019, Greece's Growth Strategy is still on-going and digitisation remains a high-priority. A project funded by the European Commission under the Structural Reform Programme will deliver conclusions to the General Secretariat for Industry of the Ministry of Development and Investment on a 'Digital Transformation of the Greek Industry' strategy for 2021-2027, primarily focusing on industry and manufacturing.

In 2019, Greece made progress in terms of the digital services provided to start a business. It developed services on the electronic One-Stop-Shop platform significantly reducing the time it takes to set up a business. It made progress on licensing and inspection for all sectors of the economy by passing new legislation, supported and implemented by digital technologies and applications. In 2020, the Ministry of Development and Investment plans to launch an on line self-assessment tool for SMEs to enable them to estimate their stage of digitisation.

The Hellenic Development Bank created two funding schemes that aim to support digital development of businesses: the programme 'Business Innovation Greece' for projects in Green Industry Innovation, Blue Growth and ICT; and the Programme '4th Industrial Revolution' to invest in new or existing SMEs to develop products and services related to digital technology. Another source

of funding for digitising enterprises is the Operational Programme ‘Competitiveness, Entrepreneurship and Innovation’ (EPAnEK) under the European Regional Development Fund.

As at December 2019, Greece continues to show commitment to advancing new digital technologies - in line with the Digital Europe Programme - by signing the Quantum Declaration<sup>(108)</sup> of cooperation to develop and deploy a European Quantum Communication Infrastructure. Following the signature of the declaration on cooperation on Artificial Intelligence (AI) in 2018, Greece is now developing a national strategy on AI, consulting stakeholders, and working on issues related to data collection and quality, ethical dimension of AI and skills for AI.

At the beginning of 2020, Greece has 14 Digital Innovation Hubs (9 fully operational, and 5 more in preparation<sup>(109)</sup>) covering market sectors as diverse as agriculture, fishing, construction, manufacturing, transport and electricity through a wide spectrum of advanced technologies such as additive manufacturing, AI and cognitive systems, cybersecurity and blockchain, big data and photonics.

Greece has acknowledged the need for the country to have a strategy for the digital transformation of the Greek industry. Such a strategy would boost the digital transformation of the Greek economy and capture the full range of benefits from the adoption of digital technologies.

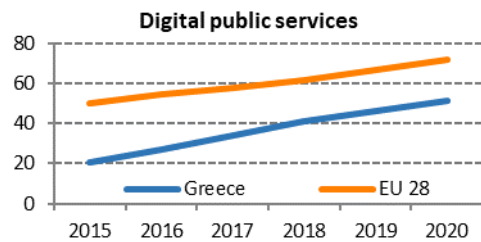
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<sup>(108)</sup> <https://ec.europa.eu/digital-single-market/en/news/nine-more-countries-join-initiative-explore-quantum-communication-europe>

<sup>(109)</sup> <https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool>

## 5 Digital public services

5 Digital public services	Greece		EU
	rank	score	score
<b>DESI 2020</b>	<b>27</b>	<b>51.5</b>	<b>72.0</b>
DESI 2019	27	46.4	67.0
DESI 2018	27	41.2	61.8



	Greece			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>5a1 e-Government users</b>	<b>38%</b>	<b>36%</b>	<b>39%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>14</b>	<b>23</b>	<b>25</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>76</b>	<b>82</b>	<b>84</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>60</b>	<b>60</b>	<b>63</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>66%</b>	<b>66%</b>
% of maximum score			2019	2019

In the Digital public services dimension, Greece ranks 27<sup>th</sup> in the EU well below the EU average, but it recorded 5.1 points increase on the previous year, in line with the EU average progression of 5 points. The open data maturity indicator shows that Greece in 2019 (66%) is at the EU average (66%). On the supply side (in the provision of online public services), Greece continued to progress in 2019, with 25/100 pre-filled forms compared with 23/100 in 2018, though this remains well below the EU average. The number of internet users that are active users of e-government services at 39%, remains well below the EU average of 67%, despite a 3% increase in 2019. The availability of digital public services for businesses increased (to 63 in 2019) but not sufficiently to approach the EU average (88 in 2019).

In 2019, the new Ministry of Digital Governance pursue a wide-ranging legislative reform agenda to accelerate the implementation of new digital processes and services. In particular, the ‘Executive State’ law seeks to streamline the administration by bringing together and reorganising disparate provisions governing the operations of the State to improve cooperation between ministries, including in their implementation of core IT systems. Closely connected to the digital transformation strategy of the country, the national program for administrative simplification is the central intergovernmental framework that aims to reduce administrative burden by simplifying and digitising administrative processes. It created the legal framework governing the interoperability of public registries needed to set up a single interface for the main registries, enabling a continuous update of data and a unique entry of new records. The first step is the simplification and digitisation of a number of procedures related to key life events, starting with the birth certificate. As of February 2020, birth declarations can be completed at the hospital.

Furthermore, the launch of the e-government portal “Gov.gr” due in March 2020 will consolidate and provide all information related to public services and official documents from different public services.

In 2019, Greece continued to develop and integrate modules, such as the Electronic Health Record for Primary Healthcare (EHR4PH), the National Medical Appointment Management System (eRDV), in the e-health public services, which started with the national e-prescription system. In 2019, it was the biggest e-government application handling up to 850,000 transactions per day.

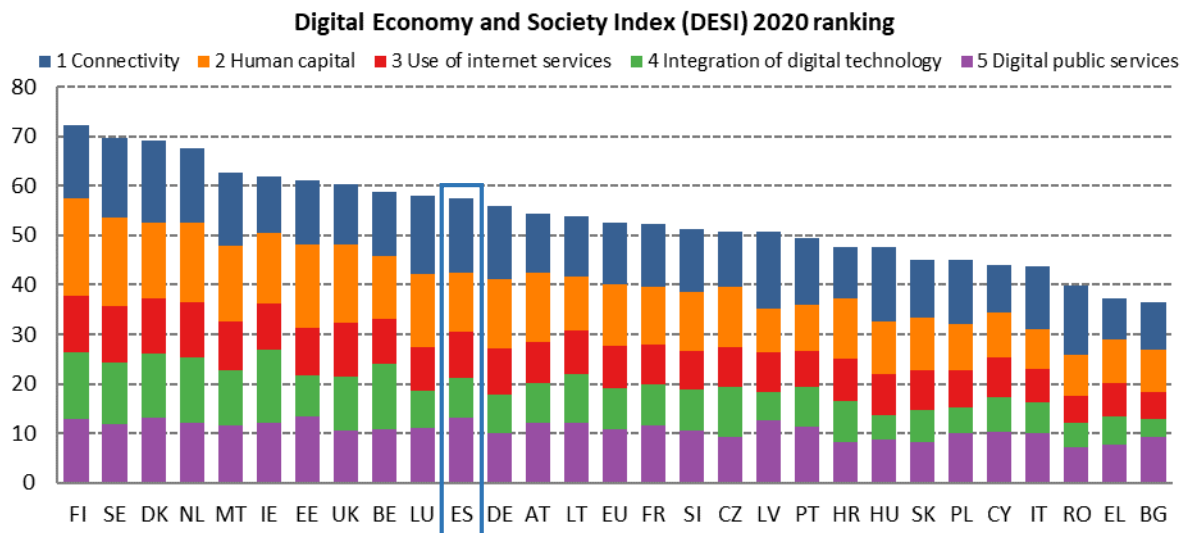
Greece passed a law in 2019 to consolidate its two current e-clouds, with the objective to extend overall capacity and to host all information from the public service on a single government e-cloud by 2022.

In 2019, the National Cyber security authority (established in 2017) became the responsibility of Ministry for Digital Governance which started to upgrade it. During 2020 the National Cybersecurity strategy (first published in 2018) will be updated focusing on the ICT systems security policy for the public sector, cooperation with the competent Independent and Regulatory Authorities, the European Network and Information Security Agency and academics. It will work on adopting uniform security policies within the public administration, promoting training and providing information to staff managing and support critical government systems and infrastructures.

Effective process simplification and reducing administrative burden on citizens, businesses and public administration remains the biggest challenge of the new digital governance of the state. Properly implemented, it will contribute to increase competitiveness, productivity, investment as well as citizen engagement.

## Spain

	Spain		EU
	rank	score	score
<b>DESI 2020</b>	<b>11</b>	<b>57.5</b>	<b>52.6</b>
DESI 2019	10	53.6	49.4
DESI 2018	10	50.2	46.5



Spain ranks out 11<sup>th</sup> of 28 EU Member States in the 2020 edition of the Digital Economy and Society Index (DESI) based on data prior to the pandemic. Spain ranks 2<sup>nd</sup> in the EU on digital public services thanks to its well-timed implementation of a digital-by-default strategy throughout its central public administration. The country performs well also in the area of connectivity. Spain is below the EU average on the human capital indicators. Though it is improving its scores, almost half of the Spanish population still lack basic digital skills and 8% have never used the internet. Spain ranks 13<sup>th</sup> on integration of digital technologies; its score is in line with the EU average, although Spanish SMEs have yet to fully unlock the potential of e-commerce.

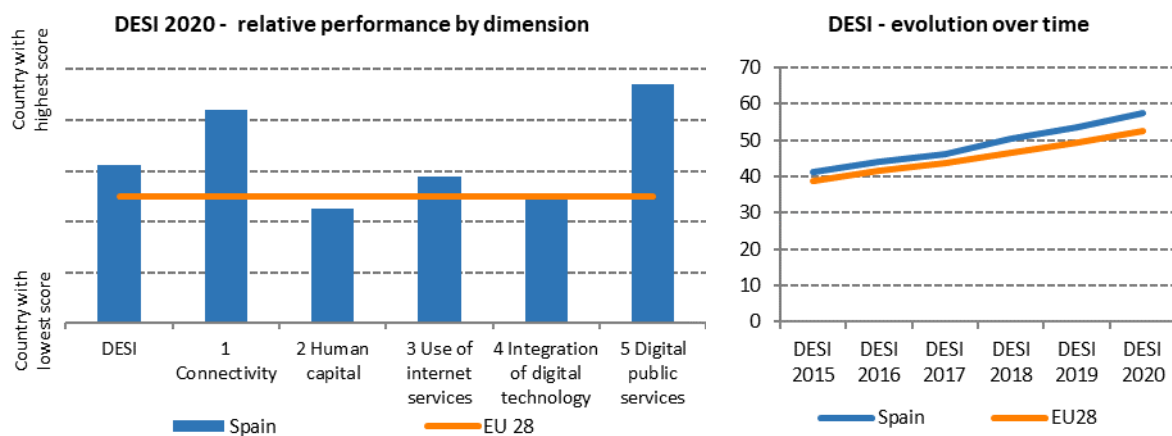
Spain's current digital agenda dates back to 2013. The new coalition government took office in January 2020 and digital affairs are currently under a vice-president in the Ministry for Economic Affairs and Digital Transformation (*Ministerio de Asuntos Economicos y Transformacion digital*). Three state secretaries in that ministry have responsibility for digital matters: one for digitisation and artificial intelligence, a second for telecommunications and digital infrastructure, and a third for Economy and Business Support<sup>(110)</sup>. The government is currently working on a national strategy for digital skills to ensure that all citizens, with a special emphasis on workers, women and the elderly reach the required level of digital skills and have the increasing level of skills needed to conduct their lives and work in today's labour market and society. This strategy is expected to be adopted in summer 2020.

Spain is finalising its national Artificial Intelligence (AI) strategy. In 2019, it published the new 'Strategic framework for SME policy 2030' setting targets for innovation and digitisation. The 2019

<sup>(110)</sup> <http://www.mineco.gob.es/portal/site/mineco/menuitem.b6c80362d9873d0a91b0240e026041a0/?vgnnextoid=3a4d41617b464610VgnVCM1000001d04140aRCRD>

‘Agenda for change towards an inclusive and sustainable economy’ aims to promote education, growth, quality employment, innovation and digitisation, adapted to the specific needs of each economic sector.

In March 2019, Spain adopted the digitisation strategy for the agri-food, forestry sector and rural areas, which aims to foster the adoption of digital technologies in the Spanish agro-food and forestry sector. This strategy is currently being implemented at operational level through an action plan, which sets out specific action to take in 2020<sup>(111)</sup>. This strategy is closely linked to other plans under the remit of several different ministries, such as the national strategy to address the demographic challenge<sup>(112)</sup>, the Spanish strategy for science, technology and innovation 2013-2020<sup>(113)</sup>, the programme for the extension of next-generation broadband<sup>(114)</sup>, the national plan for smart territories<sup>(115)</sup>, and the connected industry 4.0 strategy<sup>(116)</sup>.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Spain implemented several measures in digital to deal with the COVID-19 crisis. Measures were

<sup>(111)</sup> <https://www.mapa.gob.es/es/ministerio/planes-estrategias/estrategia-digitalizacion-sector-agroalimentario/>

<sup>(112)</sup> <https://www.lamoncloa.gob.es/consejodeministros/Paginas/enlaces/290319-enlace-reto.aspx>

<sup>(113)</sup> [http://www.ciencia.gob.es/portal/site/MICIINN/menuitem.26172fcf4eb029fa6ec7da6901432ea0/?vgnextoid=1387571a3db06610VgnVCM1000001d04140aRCRD&lang\\_chosen=es](http://www.ciencia.gob.es/portal/site/MICIINN/menuitem.26172fcf4eb029fa6ec7da6901432ea0/?vgnextoid=1387571a3db06610VgnVCM1000001d04140aRCRD&lang_chosen=es)

<sup>(114)</sup> <http://www.mincotur.gob.es/PortalAyudas/banda-ancha/Paginas/Index.aspx>

<sup>(115)</sup> <https://avancedigital.gob.es/en-us/Novedades/Paginas/plan-nacional-territorios-inteligentes.aspx>

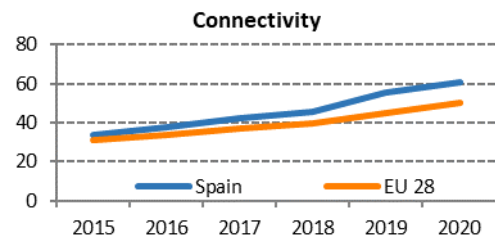
<sup>(116)</sup> <https://www.industriaconectada40.gob.es/Paginas/index.aspx>

first taken to maintain the provision of the electronic communication services for the population and to ensure these services were running smoothly during the disruption caused by the pandemic. Major telecommunications companies in Spain also pledged to ensure connectivity, networks operation and supervision, as well as to ensure a responsible use of communication service to avoid jeopardizing the integrity of networks. Spain also made an important effort to tackle online misinformation with the national website [covid19.gob.es](https://covid19.gob.es) and a chat bot for instant messaging apps with trustworthy information. Development of new digital uses was accelerated with a mobile app for self-diagnosis, an analysis of people's mobility to study the impact of the confinement, and a centralized information system to coordinate the needs for staff or equipment in hospitals. As regards digitisation of businesses, and especially of SMEs, Spain will mobilise in the next two years more than €200 million for the recovery.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Spain is very advanced in the provision of digital public services and performs particularly well in the deployment of Very High Capacity Networks (VHCN). On the other hand, it is generally below EU average in digital skills indicators and has a relatively weak performance in the digitisation of businesses, especially of SMEs.

# 1 Connectivity

1 Connectivity	Spain		EU
	rank	score	score
<b>DESI 2020</b>	<b>5</b>	<b>60.8</b>	<b>50.1</b>
DESI 2019	5	55.4	44.7
DESI 2018	8	45.9	39.9



	Spain			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>1a1 Overall fixed broadband take-up</b>	<b>73%</b>	<b>77%</b>	<b>78%</b>	<b>78%</b>
% households	2017	2018	2019	2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b>	<b>18%</b>	<b>30%</b>	<b>53%</b>	<b>26%</b>
% households	2017	2018	2019	2019
<b>1b1 Fast broadband (NGA) coverage</b>	<b>85%</b>	<b>88%</b>	<b>90%</b>	<b>86%</b>
% households	2017	2018	2019	2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b>	<b>71%</b>	<b>77%</b>	<b>89%</b>	<b>44%</b>
% households	2017	2018	2019	2019
<b>1c1 4G coverage</b>	<b>92%</b>	<b>94%</b>	<b>95%</b>	<b>96%</b>
% households (average of operators)	2017	2018	2019	2019
<b>1c2 Mobile broadband take-up</b>	<b>92</b>	<b>96</b>	<b>99</b>	<b>100</b>
Subscriptions per 100 people	2017	2018	2019	2019
<b>1c3 5G readiness</b>	<b>NA</b>	<b>30%</b>	<b>30%</b>	<b>21%</b>
Assigned spectrum as a % of total harmonised 5G spectrum		2019	2020	2020
<b>1d1 Broadband price index</b>	<b>NA</b>	<b>NA</b>	<b>51</b>	<b>64</b>
Score (0 to 100)			2019	2019

Spain's overall connectivity score has further improved but the rank remains 5<sup>th</sup> in the DESI 2020. The country performs particularly well when it comes to VHCN coverage. The deployment of FTTP networks continues to be an important feature of the Spanish digital market, covering 80% of households, above the EU average of 34%. Despite the significant differences between urban and rural areas, rural FTTP coverage in Spain reaches 46% of households, significantly above the rates of both EU rural and total FTTP coverage (21% and 34% respectively). Thanks to extensive fibre deployment and the upgrade of cable networks to DOCSIS 3.1, VHCN covers 89% of households, 12 percentage points above last year and well above the EU average (44%). NGA networks cover 90% of households, above the EU average (86%). 4G coverage reached 95%, 1 percentage point below the EU average (of 96%). Overall fixed broadband take-up increases 1 percentage point (from 77% in 2018 to 78% in 2019). At least 100 Mbps fixed broadband take-up has grown significantly by 23 percentage points, (from 30% in 2018 to 53% in 2019) well above the EU average (26%). Prices in Spain are higher than the EU average, ranking 25<sup>th</sup> in DESI, but do not seem correlated to take-up. On the contrary, take-up of at least 100 Mbps networks grew significantly.

The national programme for the extension of next-generation broadband networks (*'Programa de Extensión de la Banda Ancha de Nueva Generación'*, PEBA-NGA<sup>(117)</sup>), continues to provide financial

<sup>(117)</sup> <http://www.mincotur.gob.es/PortalAyudas/banda-ancha/Paginas/Index.aspx>



support for the roll-out of broadband networks in underserved areas. Spain notified to the European Commission a modification of its PEBA-NGA €400 million scheme for 2020-2022 to include grey areas, by rolling out infrastructure capable of providing speeds of 300 Mbps symmetrical, upgradeable to 1 Gbps symmetrical. On 10 December 2019, the European Commission declared the new Spanish scheme compatible with EU State Aid rules<sup>(118)</sup>, <sup>(119)</sup>. In April 2019, the Government approved the regulation on the functioning of the Single Information Point (SIP)<sup>(120)</sup>, and the SIP<sup>(121)</sup> is currently operational.

Following the publication of the 5G national plan for 2018-2020, the Ministry of Business Affairs and Digital Transformation (*Secretaría de Estado de Telecomunicaciones e Infraestructuras Digitales, SETID*) guaranteed the possibility of using certain frequency bands for 5G pilots and established the regulatory basis for granting subsidies to 5G technology pilot projects. On that legal basis, Red.es awarded two 5G pilot projects using the 3.6 GHz and 26 GHz bands<sup>(122)</sup> in April 2019, and, in October 2019, published a new call for tenders for eleven 5G pilot projects, for a budget of €45 million<sup>(123)</sup>. In Spain, 45% of the spectrum harmonised at EU level for wireless broadband has been assigned. Regarding the 700 MHz band, in June 2019<sup>(124)</sup> the government approved a new national technical plan for Digital Terrestrial Television (DTT technical plan) as well as the adoption of the necessary regulatory measures for the release of the second digital dividend. In June 2019 SETID published a draft proposal for managing the 700 MHz, 1.5 GHz and 26 MHz bands in which general aspects of the auctions were consulted<sup>(125)</sup>. The 700 MHz band was expected to be awarded in May 2020 but due to COVID-19 pandemic the auction process has been delayed. Spain decreased four positions in the 5G readiness indicator<sup>(126)</sup> (from 6<sup>th</sup> to 10<sup>th</sup>), as it has not assigned any additional spectrum in the 5G pioneer bands.

Spain is one of the top performers in the roll-out of very-high capacity networks as well as the take-up of ultrafast broadband connections of at least 100 Mbps. Deployment is driven by commercial investment made by several telecom operators; a regulatory framework focused on supporting deployments through effective regulated duct-access and geographically differentiated access obligations; and an ambitious national strategy that provides subsidies in sparsely populated and rural areas. The ground is being prepared for 5G deployment, with several pilot projects assigned

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<sup>(118)</sup> [https://ec.europa.eu/competition/state\\_aid/cases1/201952/282618\\_2120578\\_133\\_2.pdf](https://ec.europa.eu/competition/state_aid/cases1/201952/282618_2120578_133_2.pdf)

<sup>(119)</sup> <http://www.mineco.gob.es/portal/site/mineco/menuitem.ac30f9268750bd56a0b0240e026041a0/?vgnnextoid=df4985eb8c771710VgnVCM1000001d04140aRCRD&vgnnextchannel=864e154527515310VgnVCM1000001d04140aRCRD>

<sup>(120)</sup> Order ECE/529/2019, of 26 April 2019, <https://www.boe.es/buscar/doc.php?id=BOE-A-2019-6997>

<sup>(121)</sup> <https://sedeaplicaciones.minetur.gob.es/piu>

<sup>(122)</sup> <https://www.red.es/redes/es/que-hacemos/pilotos-5g>

<sup>(123)</sup> <https://www.red.es/redes/es/que-hacemos/pilotos-5g>

<sup>(124)</sup> <https://www.boe.es/buscar/act.php?id=BOE-A-2019-9513>.

<sup>(125)</sup> <https://avancedigital.gob.es/en-us/Participacion/Paginas/Cerradas/modelo-gestion-bandas-frecuencias.aspx>

<sup>(126)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

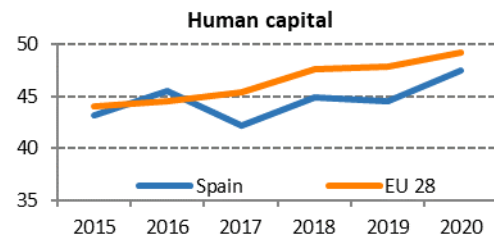
and under way, with pioneer spectrum assignment well under way and with the 700 MHz auction initially expected in spring 2020<sup>(127)</sup>.

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<sup>(127)</sup> As a consequence of the Emergency State Declaration because of COVID-19, the foreseen 700 MHz auction has been postponed.

## 2 Human capital

2 Human capital	Spain		EU
	rank	score	score
DESI 2020	16	47.6	49.3
DESI 2019	17	44.5	47.9
DESI 2018	17	44.9	47.6



	Spain			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>2a1 At least basic digital skills</b> % individuals	55% 2017	55% 2017	57% 2019	58% 2019
<b>2a2 Above basic digital skills</b> % individuals	32% 2017	32% 2017	36% 2019	33% 2019
<b>2a3 At least basic software skills</b> % individuals	58% 2017	58% 2017	59% 2019	61% 2019
<b>2b1 ICT specialists</b> % total employment	3.0% 2016	2.9% 2017	3.2% 2018	3.9% 2018
<b>2b2 Female ICT specialists</b> % female employment	1.0% 2016	1.0% 2017	1.1% 2018	1.4% 2018
<b>2b3 ICT graduates</b> % graduates	4.0% 2015	3.9% 2016	4.0% 2017	3.6% 2017

Spain ranks 16<sup>th</sup> in the EU on human capital, rising in the ranking since the previous year. Basic digital skill levels remain slightly below the EU average. 43% of people between 16 and 74 years of age lack basic digital skills (against the EU average of 42%). The share of ICT specialists in total employment increased and it is now close to the EU average (3.2% against EU average of 3.9%). The share of ICT graduates in Spain also increased and now accounts for 4% of all graduates. The share of female ICT specialists remains stagnant at a mere 1.1% of total female employment. In 2019, Spain signed the European Declaration on boosting the participation of women in digital<sup>(128)</sup>.

The Ministry for Economic affairs and digital transformation is working on a new digital skills strategy with a six-pillar structure: 1) digital skills for citizenship and inclusion; 2) digital skills for education; 3) digital skills for a sustainable employability; 4) digital skills and SMEs; 5) digital specialists (jobs and productivity); and 6) digital skills and gender. This upcoming digital skills strategy will aim to leverage €4 billion and will require support from the 2020 budget, expected by mid-2020.

The 2019-2022 strategic plan for vocational and educational training adopted in November 2019<sup>(129)</sup> aims to make vocational education and training (VET) more responsive to the needs of the economy -including new digital sectors - and to boost participation in VET programmes, particularly at secondary level. The government plans to create 40 new degrees (both vocational and university level) in different ICT fields (such as 3D printing, industrial data, cybersecurity, big data analytics, automotive and self-driving). The strategy also proposes including a module on 'applied digitisation in the productive sector' in all VET programmes at all levels (basic, intermediate and high). These

<sup>(128)</sup> <https://ec.europa.eu/digital-single-market/en/news/eu-countries-commit-boost-participation-women-digital>

<sup>(129)</sup> <https://www.lamoncloa.gob.es/consejodeministros/Paginas/enlaces/221119-fp.aspx>

programmes are responding to the increased demand for highly-skilled workers in manufacturing and sales, that need workers advanced digital skills, including workers with a more traditional engineering profile and others with newer skillsets, notably analysts, programmers, web and multimedia designers<sup>(130)</sup>.

Spain is also running public-private initiatives. For example, the association DigitalES<sup>(131)</sup> has developed VET curricula for a 5G technician module in partnership with private-sector companies (Ericsson, Nokia, Telefonica and Movistar) included in the VET initiative run by the Ministry of Education.

The government has also prepared several funding initiatives on the digital economy: 1) digital enabling technologies (*tecnologías digitales habilitadoras*); 2) video game push programmes, with co-financing from the European Regional Development Fund (ERDF); 3) digital advisers, with over 1,000 SMEs as beneficiaries; 4) smart cities, with co-financing from ERDF; and finally 4) *Desafia* programme, giving access to 8-10 high-potential digital SMEs to a face-to-face immersion programme in digital world hubs, such as San Francisco (USA), Tel Aviv (Israel) or ShenZen (China).

The Spanish National Coalition for Digital Skills and Jobs, run by AMETIC<sup>(132)</sup>, held the second edition of the digital skills awards in 2019 with several categories, in line with the EU's proposal<sup>(133)</sup>. They currently have 19 working parties (*comisiones*) providing input to discussions on digital<sup>(134)</sup>. They organised several events in 2019, such as the second conference on AI<sup>(135)</sup> and the annual summit on the digital economy and telecommunications<sup>(136)</sup>.

Spain ranked 4<sup>th</sup> in the 2019 Code Week Initiative<sup>(137)</sup> with 1,615 events organised. 89% of events were held in schools, attracting close to 200,000 participants with an average female participation of 48%.

Spain needs a sufficient number of medium to high-skilled technicians to increase its innovation capacity and ensure a smooth transition to an increasingly digitised economic environment. Increasing its number of specialists by up-skilling and re-skilling, and narrowing the substantial gender gap, will help Spain move at full speed to join the dynamic digital environment and help prepare all Spanish citizens to embrace the benefits of the digital economy.

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<sup>(130)</sup> *Observatorio nacional de las Telecomunicaciones y para la sociedad de la información.*

<https://www.ontsi.red.es>

<sup>(131)</sup> <https://www.digitales.es/>

<sup>(132)</sup> <http://ametic.es/es/proyectos/digital-skills-jobs-coalition>

<sup>(133)</sup> <https://ametic.es/en/prensa/pedro-duque-senala-que-las-companias-espanolas-necesitan-un-entorno-mejor-para-poder-crecer>

<sup>(134)</sup> <https://ametic.es/es/nuestro-trabajo>

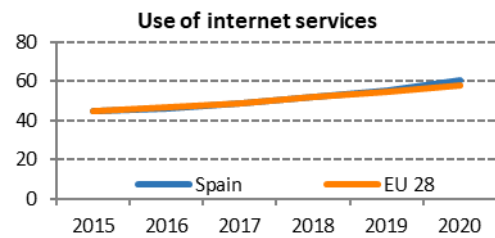
<sup>(135)</sup> <https://ametic.es/es/prensa/la-inteligencia-artificial-cambiara-el-modelo-productivo-de-espana>

<sup>(136)</sup> <https://ametic.es/es/evento/santander>

<sup>(137)</sup> <https://blog.codeweek.eu/post/190418441025/eucodeweek19stats>

### 3 Use of internet services

3 Use of internet services	Spain		EU
	rank	score	score
<b>DESI 2020</b>	<b>11</b>	<b>60.8</b>	<b>58.0</b>
DESI 2019	13	55.1	55.0
DESI 2018	11	52.1	51.8

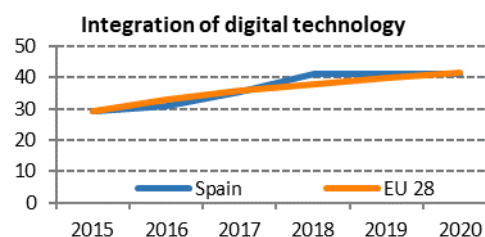


	DESI 2018	Spain	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
<b>3a1 People who have never used the internet</b> % individuals	<b>14%</b> 2017	<b>13%</b> 2018	<b>8%</b> 2019	<b>9%</b> 2019
<b>3a2 Internet users</b> % individuals	<b>80%</b> 2017	<b>83%</b> 2018	<b>88%</b> 2019	<b>85%</b> 2019
<b>3b1 News</b> % internet users	<b>77%</b> 2017	<b>77%</b> 2017	<b>78%</b> 2019	<b>72%</b> 2019
<b>3b2 Music, videos and games</b> % internet users	<b>83%</b> 2016	<b>86%</b> 2018	<b>86%</b> 2018	<b>81%</b> 2018
<b>3b3 Video on demand</b> % internet users	<b>27%</b> 2016	<b>39%</b> 2018	<b>39%</b> 2018	<b>31%</b> 2018
<b>3b4 Video calls</b> % internet users	<b>35%</b> 2017	<b>38%</b> 2018	<b>61%</b> 2019	<b>60%</b> 2019
<b>3b5 Social networks</b> % internet users	<b>68%</b> 2017	<b>67%</b> 2018	<b>65%</b> 2019	<b>65%</b> 2019
<b>3b6 Doing an online course</b> % internet users	<b>15%</b> 2017	<b>15%</b> 2017	<b>16%</b> 2019	<b>11%</b> 2019
<b>3c1 Banking</b> % internet users	<b>55%</b> 2017	<b>57%</b> 2018	<b>60%</b> 2019	<b>66%</b> 2019
<b>3c2 Shopping</b> % internet users	<b>59%</b> 2017	<b>62%</b> 2018	<b>64%</b> 2019	<b>71%</b> 2019
<b>3c3 Selling online</b> % internet users	<b>15%</b> 2017	<b>13%</b> 2018	<b>15%</b> 2019	<b>23%</b> 2019

Overall, the use of internet services in Spain increased since the previous year, with the country performing above the EU average. People in Spain are keen to carry out a range of online activities in line with the rest of the EU, such as making video calls, reading news online or using social networks. Compared to the EU average, the highest ranked activities are taking online courses and playing music, videos and games online. 60% of Spanish internet users use online banking (against the EU average of 66%). 64% of Spaniards shop online, against the EU average of 71%. 15% of Spanish internet users sell online, below the EU average of 23%. These results may indicate a lower perceived level of trust of the internet, which may be holding back Spanish internet users from drawing the full benefits of online services.

## 4 Integration of digital technology

4 Integration of digital technology	Spain		EU
	rank	score	score
<b>DESI 2020</b>	<b>13</b>	<b>41.2</b>	<b>41.4</b>
DESI 2019	12	41.3	39.8
DESI 2018	11	41.1	37.8



	Spain			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>46%</b>	<b>46%</b>	<b>43%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>28%</b>	<b>28%</b>	<b>29%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>8%</b>	<b>11%</b>	<b>11%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>18%</b>	<b>16%</b>	<b>16%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>20%</b>	<b>18%</b>	<b>19%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>10%</b>	<b>10%</b>	<b>9%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>7%</b>	<b>7%</b>	<b>7%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

On the integration of digital technology, Spain ranks 13<sup>th</sup> among EU countries. Spanish businesses take advantage of the opportunities presented by digital technologies in line with the EU average. 43% of businesses have an electronic information sharing system in place (against the EU average of 34%) and 11% of Spanish businesses access big data analysis (against 12%). 16% of companies use the cloud (18% in the EU) and almost one third have at least two social media accounts to promote their products and services. 19% of SMEs sell online (slightly above the EU average of 18%), though only 7% of all SMEs sell across borders to other EU countries and 9% of turnover is generated by online sales.

Spain is committed to advancing new digital technologies and to investing strategically in digital technologies through EU-coordinated programmes. The country has two flagship projects on quantum computing funded by the EU: CiViQ<sup>(138)</sup>, which aims to provide long-term reliable data privacy and 2D-SIPC<sup>(139)</sup>, which aims to explore novel quantum device concepts based on 2D materials.

The Spanish Secretary General for Industry and SMEs (SGIPYME) published in 2019 the 'Strategic framework for SME policy for 2030' setting targets for innovation and digitisation for SMEs.

Regarding emerging technologies, Spain has developed a significant number of coordination measures. The Secretary of State of Digitisation and Artificial Intelligence has created a working

<sup>(138)</sup> <https://ec.europa.eu/digital-single-market/en/content/civiq-providing-long-term-reliable-data-privacy>

<sup>(139)</sup> <https://ec.europa.eu/digital-single-market/en/content/2dsipc-exploring-novel-quantum-device-concepts-based-2d-materials>

group called 'Emerge', composed of all ministries and public bodies, to centralise information on emerging technologies such as blockchain. A new working group is also currently following the European blockchain partnership.

On cybersecurity, Spain currently has 105 competence centres<sup>(140)</sup>, including the national cybersecurity institute, INCIBE<sup>(141)</sup>. It also has an active cluster of research called RENIC<sup>(142)</sup> and innovation bodies working on cybersecurity.

To encourage the adoption and expansion of cloud computing technology, the public body 'Red.es' has created a plan to stimulate demand for cloud solutions. The programme to promote cloud solutions for SMEs offers companies financial assistance for a fixed period of nine months to adopt different cloud solutions tailored to their business processes. SMEs and freelancers based in Spain and operating in the ICT sector can apply for this assistance, as long as their turnover is below €50 million.

Spain stands to benefit greatly from digital transformation if all SMEs and micro-enterprises see the benefits in their business activities. Measures to include digitisation and embrace AI and other emerging technologies can boost the innovation capacity of the Spanish economy, driven by SMEs.

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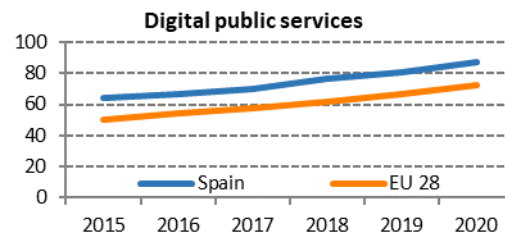
<sup>(140)</sup> [https://www.incibe.es/red-excelencia-idi-ciberseguridad/estudios\\_caracterizacion/catalogo-investigacion](https://www.incibe.es/red-excelencia-idi-ciberseguridad/estudios_caracterizacion/catalogo-investigacion)

<sup>(141)</sup> <https://www.incibe.es/en>

<sup>(142)</sup> <https://www.renic.es/en>

## 5 Digital public services

5 Digital public services	Spain		EU
	rank	score	score
<b>DESI 2020</b>	<b>2</b>	<b>87.3</b>	<b>72.0</b>
DESI 2019	4	80.9	67.0
DESI 2018	4	76.6	61.8



	DESI 2018	Spain	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
		value	value	value
<b>5a1 e-Government users</b>	<b>67%</b>	<b>76%</b>	<b>82%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>72</b>	<b>74</b>	<b>80</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>95</b>	<b>95</b>	<b>96</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>95</b>	<b>93</b>	<b>93</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>90%</b>	<b>66%</b>
% of maximum score			2019	2019

Spain ranks 2<sup>nd</sup> in the EU on digital public services, well above the EU average. Spain rose by two positions in the ranking compared to the previous year, worth highlighting. This is the chapter in which the country performs best. Indicators show a high level of online interaction between public authorities, citizens and businesses. Spain performs very well on the open data indicator, ranking 2<sup>nd</sup> with 90% of the maximum score. 82% of Spanish internet users actively engage with e-government services, 6 percentage points more than the previous year. In 2019, Spain continued to improve its rating on pre-filled forms to reach 80 points, well above the EU average of 59. Spain also scored above the EU average on the availability of e-government services for businesses, with 93 points, ranking 11<sup>th</sup>. Lastly, Spain scored 96 points on online service completion, ranking 8<sup>th</sup> in the EU and 6 points above the EU average.

The country's investment in open government data is an example to follow for large EU economies when making the transition to digital-by-default in the central public administration. Over 98% of all services are digital-ready thanks to timely implementation of the ICT strategic plan for 2015-2020 and the use of sufficient funds to develop the IT architecture. Interoperability with sub-national levels of the administration is now key to ensure a smooth transition to regional and local levels and to avoid overlap.

Spain can amplify its good results on e-Government by reaching a consensus between all public administrations in Spain to develop the same digital-by-default interoperable infrastructure. It is of utmost importance to lead the way and show how the digital-by-default strategy can be applied in large EU economies.



### Highlight 2020: Spain's cybersecurity strategy

Spain published its national cybersecurity strategy (*Estrategia nacional de ciberseguridad*) on 30 April 2019.

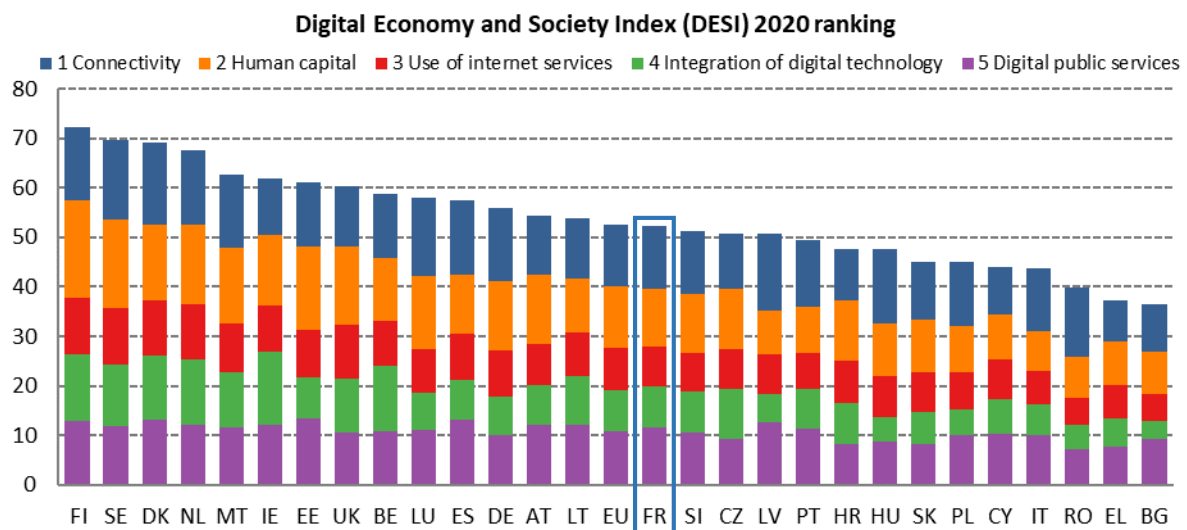
The strategy develops the provisions set out in its 2017 national security strategy (*Estrategia de seguridad nacional*) on cybersecurity.

Building on the experience with the previous cybersecurity strategy from 2013, the new strategy is divided into five chapters:

- 1) Chapter 1 - 'Cyberspace, beyond a common global space' provides an overall understanding of the field of cybersecurity and the rationale for this new strategy.
- 2) Chapter 2 - 'Threats and challenges in cyberspace' examines the main threats and challenges that Spain faces regarding the cyberspace.
- 3) Chapter 3 - 'Purpose, principles and objectives for cybersecurity' translates the governing principles of the 2017 national security strategy into one generic objective and five specific, crosscutting goals (1 - security and resilience; 2 - safe and reliable use of cyberspace against illegal use; 3 - protection of business and social ecosystems; 4 - culture and commitment to cybersecurity and empowerment of human and technological capabilities; 5 - cyberspace in the international arena).
- 4) Chapter 4 - 'Lines of action and measures' sets out a range of action to achieve the objectives.
- 5) Chapter 5 - 'Cybersecurity in the national security framework' sets out how action on cybersecurity will be structured, and led by the Spanish Prime Minister.

## France

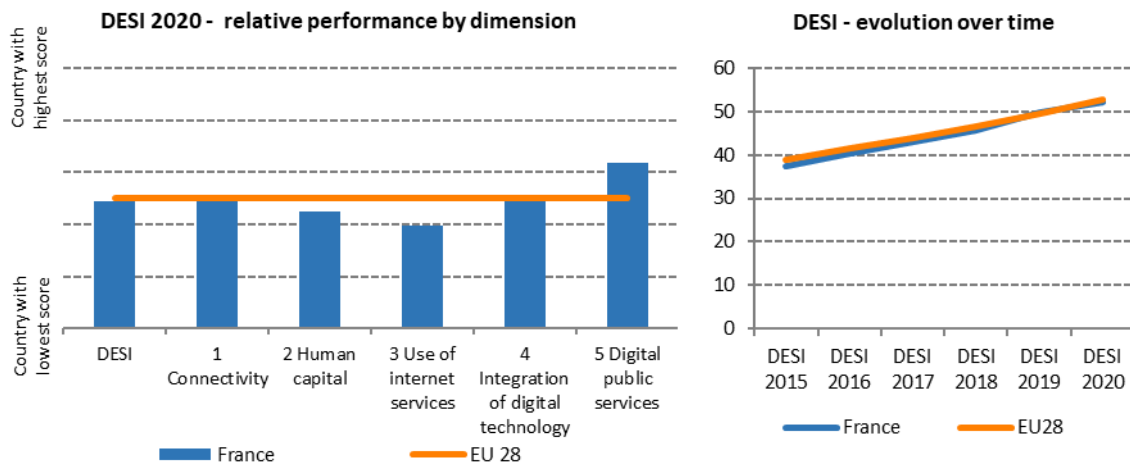
	France		EU
	rank	score	score
<b>DESI 2020</b>	<b>15</b>	<b>52.2</b>	<b>52.6</b>
DESI 2019	16	49.8	49.4
DESI 2018	17	45.7	46.5



France ranks 15<sup>th</sup> out of 28 EU Member States in the 2020 edition of the Digital Economy and Society Index (DESI).

Based on data prior to the pandemic and compared to last year, the country overall scored better but remains far from EU's top performers. France improved significantly in the integration of digital technology dimension, registering good progress in the number of companies using social media and big data and sharing information online. France also performs well in the Digital public services dimension, gaining one position, thanks to the high number of e-government users and showing progress in the provision of digital public services for business. France's position has worsened in the human capital dimension, mainly to the low share of people with "above basic digital skills" and in the connectivity dimension, where despite a good increase in its score, it remained below the EU average.

France has embarked on a comprehensive drive for sustainable and inclusive digital transformation. Underpinning this drive is France's investment plan (*Grand Plan d'Investissement*) 2018-2022, which aims to (i) accelerate the ecological transition, (ii) create a skill-based society, (iii) foster competitiveness and innovation, and (iv) achieve the digital transformation of the public sector. In addition, in May 2019, France adopted a measure to stimulate business creation and growth, including through digitalisation, which is the PACTE law (*Plan d'action pour la croissance et la transformation des entreprises*).



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

France has taken a number of measures to leverage digital technologies in support of the COVID-19 crisis. To ensure the resilience of the digital infrastructure, a reinforced monitoring system has been put in place for maintenance and to avoid overload. In addition, anonymised and aggregated data are used to track population movements and map the evolution of the contagion.

The digitisation of public administration has also been accelerated by strengthening the inter-ministerial networks, facilitating teleworking and providing a number of digital tools for communications. An online data visualisation tool to monitor the evolution of the pandemic and chatbots to answer questions on Covid-19 have been made available. An exit permission form was developed in digital format and citizens could compile it online. To help everyone become familiar with digital tools, a dedicated platform has been developed to link public structures and volunteers during the crisis. Telemedicine consultations have been made fully reimbursable by health insurances, and the use of digital tools is allowed for doctors to get in touch with patients showing Covid-19 symptoms.

Concerning education, the '*ma classe à la maison*' platform has allowed pupils to have access to a curriculum of teaching activities in most of the subjects, by level of education. The platform also allows virtual classes. In addition, the Ministry of National Education has launched the 'learning nation' initiative with public audiovisual players, to broadcast programmes related with school curricula.

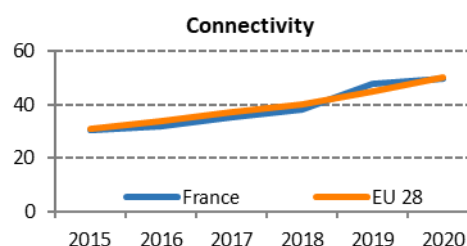
To help companies during the crisis, the government has developed a dedicated guide for VSEs and SMEs on the health security measures to be respected. The *France Num* team disseminates

on the Frenchweb radio information on how digital tools can be useful for businesses. Finally, a one-stop-shop for information on support to businesses has been put at the disposal of the French regions.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, France is relatively advanced as regards the provision of digital services and open data, as well as integration of digital technologies. More efforts are needed to improve digital infrastructure and digital skills.

## 1 Connectivity

1 Connectivity	France		EU
	rank	score	score
<b>DESI 2020</b>	<b>18</b>	<b>49.8</b>	<b>50.1</b>
DESI 2019	13	48.0	44.7
DESI 2018	20	38.4	39.9



	DESI 2018	France	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
<b>1a1 Overall fixed broadband take-up</b> % households	<b>71%</b> 2017	<b>73%</b> 2018	<b>71%</b> 2019	<b>78%</b> 2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	<b>10%</b> 2017	<b>14%</b> 2018	<b>17%</b> 2019	<b>26%</b> 2019
<b>1b1 Fast broadband (NGA) coverage</b> % households	<b>52%</b> 2017	<b>58%</b> 2018	<b>62%</b> 2019	<b>86%</b> 2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	<b>28%</b> 2017	<b>38%</b> 2018	<b>44%</b> 2019	<b>44%</b> 2019
<b>1c1 4G coverage</b> % households (average of operators)	<b>89%</b> 2017	<b>95%</b> 2018	<b>99%</b> 2019	<b>96%</b> 2019
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	<b>87</b> 2017	<b>91</b> 2018	<b>96</b> 2019	<b>100</b> 2019
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	<b>NA</b>	<b>33%</b> 2019	<b>33%</b> 2020	<b>21%</b> 2020
<b>1d1 Broadband price index</b> Score (0 to 100)	<b>NA</b>	<b>NA</b>	<b>80</b> 2019	<b>64</b> 2019

With an overall connectivity score of 49.8, France ranks 18<sup>th</sup> among the Member States and slightly below the EU average of 50.1. Its scores consistently increasing almost in every indicator. Fixed broadband take-up is at 71% slightly behind the EU average of 78% and shows no statistically important variation comparing to the previous year. Despite a 3 percentage point increase, only 17% of households chose to subscribe to fixed broadband of at least 100 Mbps or above, which is below the EU average of 26%. Fast broadband (NGA) coverage has increased as it stood at 62% in 2019 against 58% in 2018. New investments in France are in future proof technology, as the significant increase in fixed very high capacity network coverage from 38% in 2018 to 44% in 2019 shows. Thanks to the agreement reached between the French Government and the mobile operators (New Deal), 4G coverage has increased as it stood at 99% in 2019 against 95% in 2018. France's mobile broadband take-up stands slightly below the EU average which are 96 and 100 respectively (subscriptions for 100 people). France's 5G readiness stands significantly above the EU average as it stood at 33% against 21% for the EU<sup>(143)</sup>. Finally, France's broadband price index stood at 80 against 64 for the EU.

<sup>(143)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this

With the aim of improving its coverage of high-speed connectivity, France is implementing a national broadband plan called '*plan France Très Haut Débit*'. It aims to speed up the roll-out of fibre networks and connect all households to networks running at a speed of 30 Mbps (and above) by 2022. The plan started in 2013 and France will invest an estimated €20 billion in total (of which €3.3 billion of State investment to compensate for the lack of private-sector investment in certain areas). So far, France's national broadband plan does not expressly set the objective of providing internet broadband connections of 1 Gigabit. While fibre deployment reached 90% in very densely populated areas and is close to 60% in the less densely populated areas, it is 15% in rural areas, indicating the need to accelerate the pace of work to reach the 2025 gigabit targets. Although the private sector has already met around 62.5% of its objectives under this plan, public-sector deployment in less densely populated areas has started later, meeting only around 28.4% of objectives by the end of 2019.

Regarding 5G, on 31 December 2019, the government launched the call for tender to award licences to use frequencies in the 3.4–3.8 GHz band. The auction has however been put on hold due to the Covid-19 related crisis. Only 310 MHz of spectrum will be assigned in metropolitan France because the remaining spectrum is to be used by regional authorities for fixed wireless access until 2026. The frequencies will be allocated for a period of 15 years. According to the French Authorities, the licence duration will be extended by five years either with no modification of the licence conditions other than the duration, or with modifications of the licence conditions if such modifications are needed to fulfil objectives related to territorial development, to effective and undistorted competition, to development of investment, of innovation and of competitiveness and to the efficient use and management of frequencies. In both cases, the licence extension conditions are to be notified to the licence holders at least two years before the expiration of their rights and the licence holder can decline this extension. The reserve price (€0.1060/MHz/pop) is the highest set for this band so far in the EU. The award mechanism also sets mandatory and optional obligations. Obligations require each licence holder to achieve 5G coverage in at least two cities by the end of 2020, to keep rolling out 5G to an increasing number of sites until 2025, and to provide increased throughput while achieving ubiquitous 5G coverage. As of 2022, at least 75% of sites must provide services of at least 240 Mb/s each. This obligation will be progressively extended to all sites until 2030. Lastly, the award mechanism sets a number of obligations, especially on road coverage. Two interim reviews are scheduled, one for 2023 and the other before 2028, to verify whether operators are meeting their obligations and the market requirements, notably on mobile network coverage and quality of service.

In parallel, 5G trials have been carried out in the 3.4-3.8 GHz band since 2018 and further 5G trials are being carried out in the 26 GHz band. Indeed, in October 2019, eleven projects were awarded a licence to use 26 GHz band frequencies for 5G experimentation platforms. The selected project owners must have an operational 5G trial network by 1 January 2021 at the latest, and make it available to third parties to perform their own 5G trials.

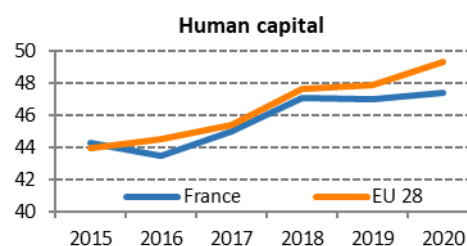
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means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 of the Electronic Communications code are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

With the aim of improving country-wide connectivity in terms of speed and coverage, France continues to implement its national broadband plan. Though it has almost fully met its fibre deployment targets in very densely populated areas, large swathes of less densely populated areas and rural areas still lack coverage. As for 5G coverage, the obligations included in the adopted spectrum award mechanism aim to gradually achieve country-wide coverage between 2020 and 2030.

## 2 Human capital

2 Human capital	France		EU
	rank	score	score
<b>DESI 2020</b>	<b>17</b>	<b>47.4</b>	<b>49.3</b>
DESI 2019	13	47.0	47.9
DESI 2018	12	47.1	47.6



	France			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>2a1 At least basic digital skills</b>	<b>57%</b>	<b>57%</b>	<b>57%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>29%</b>	<b>29%</b>	<b>31%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>60%</b>	<b>60%</b>	<b>60%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>3.8%</b>	<b>3.7%</b>	<b>3.9%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>1.4%</b>	<b>1.5%</b>	<b>1.4%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>3.1%</b>	<b>3.0%</b>	<b>3.0%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

France ranks 17<sup>th</sup> in the EU on human capital indicators, below the EU average. This is mainly due to a low score in the ‘above basic digital skills’ indicator<sup>(144)</sup> compared with other EU countries. Here, France ranks 19<sup>th</sup> with 31% of individuals having digital skills levels ‘above basic’, against an EU average of 33%. France is closer to the EU average regarding basic digital skills, with 57% against an EU average of 58%. In addition, the number of ICT specialists increased slightly to reach 3.9% of total employment, in line with the EU average. By contrast, female employment in ICT professions slightly fell to 1.4% of total female employment.

France has launched a number of initiatives to boost the level of digital skills of its citizens, focusing on different target groups. In 2019, France set up a national framework for digital competences (*Cadre de Référence des Compétences Numériques français, CRCN*)<sup>(145)</sup> using the European Digital Competence Framework, which covers education levels from primary school to university. This adds to the existing PIX platform for digital skills<sup>(146)</sup>. France will revise its certification of digital competences at the end of middle and upper secondary school on the basis of the new framework. In addition, to boost the digital skills of students, France has brought in two new compulsory courses

<sup>(144)</sup> Persons that have been using internet during last 3 months are attributed a score on four digital competence domains: information, communication, content-creation and problem-solving, depending the activities they have been able to do. The scores in each domain are basic, above basic and below basic.

<sup>(145)</sup> EDUSCOL (2019b), ‘*Cadre de référence des compétences numériques*’ (Framework for digital competences) <https://eduscol.education.fr/pid38816/certification-des-competences-numeriques.html>.

<sup>(146)</sup> DESI (2019).



on digital and computer sciences in secondary schools as of 2019<sup>(147)</sup>. According to the Education Ministry, these courses are already taught in over half of France's public schools. However, in some education institutions, opportunities to experiment and learn digital skills related to coding and robotics are available only as optional courses.

To boost the level of digital skills of teaching staff, France created a new inter-university diploma (*Diplôme Interuniversitaire, DIU*) called Teaching ICT in upper secondary schools in 2019. So far, over 2,000 teachers have been trained in 19 universities<sup>(148)</sup>. Other initiatives include putting in place a MOOC for upper secondary school teachers, developed by the French institute for digital sciences (*l'institut national de recherche dédié aux sciences du numérique, INRIA*). Over 13,000 teachers have registered for the course since it was rolled out on February 2019<sup>(149)</sup>.

On adult learning, France is in the process of implementing the *Plan National pour un Numérique Inclusif*, focusing on measures to promote the digital inclusion of all citizens. The plan includes outreach to the most vulnerable, an assessment phase and tailor-made offers. In March 2019, a tender was published for rolling out the *pass numérique*, the online voucher system, and 11 territorial hubs were set up.

To increase the number of digital specialists, France has launched an initiative under its national artificial intelligence (AI) strategy, opening new roles for AI experts and doctoral positions (see below highlight). In addition, to attract more digital talent, France has set up a tech visa system that eases the procedures for tech specialists to relocate to France.

The French Digital Skills & Jobs Coalition is carrying out a number of initiatives to boost digital skills. In 2019, the Coalition organised a competition for young people on the professions of the future. It established a partnership with the Ministry of Labour to support businesses and employees on AI development, and work is ongoing to improve its platform to share information with other European National Coalitions. In 2019, a good number of schools and other organisations took part in EU Code Week, a grassroots movement to encourage people of all ages to code. France held over 500 events that attracted over 90,000 participants.

France's measures to improve the digital skills of its population, both through formal education and inclusion measures, are underway and should produce tangible results over the coming years. More targeted initiatives will be important to upskill the workforce for the digital economy and to promote advanced digital skills development, in AI and in other areas too.

### **Highlight 2020: *Instituts Interdisciplinaires d'Intelligence Artificielle (3IA)***

In the context of the national strategy for AI, France is financing a network of a small number of interdisciplinary institutes for artificial intelligence (3IA). It published a tender in 2018, which identified four sites, focusing on specific AI applications:

- Grenoble — with priority applications in the health, environment and energy sectors;
- Nice — with preferred applications in the health and territorial development sectors;
- Paris — with applications in the health, transport and environment sectors;
- Toulouse — with preferred applications in the transport, environment and health sectors.

<sup>(147)</sup> <https://www.education.gouv.fr/cid133192/le-numerique-service-ecole-confiance.html>.

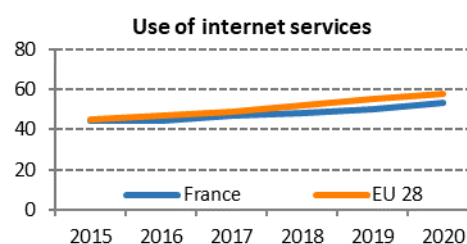
<sup>(148)</sup> 'Le numérique au service de l'Ecole de la confiance' <https://www.education.gouv.fr/cid133192/le-numerique-service-ecole-confiance.html>.

<sup>(149)</sup> Idem.

These four institutes forming the 3IA will be awarded the 3IA label for four years and will operate with public and private-sector funding of at least €225 million. To address the goal of the national AI research programme to attract and develop talent, France has launched two calls for projects to increase the number of high-level chair positions in AI and doctoral programmes. They will be open to the whole scientific community in national AI.

### 3 Use of internet services

3 Use of internet services	France		EU
	rank	score	score
<b>DESI 2020</b>	<b>21</b>	<b>53.1</b>	<b>58.0</b>
DESI 2019	21	49.9	55.0
DESI 2018	19	48.5	51.8

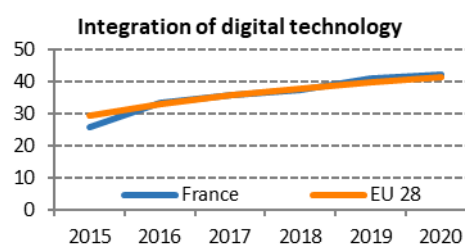


	France			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>3a1 People who have never used the internet</b>	<b>10%</b>	<b>8%</b>	<b>7%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>83%</b>	<b>85%</b>	<b>87%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>61%</b>	<b>61%</b>	<b>60%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>75%</b>	<b>74%</b>	<b>74%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>12%</b>	<b>23%</b>	<b>23%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>33%</b>	<b>35%</b>	<b>53%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>49%</b>	<b>48%</b>	<b>47%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>7%</b>	<b>7%</b>	<b>8%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>72%</b>	<b>72%</b>	<b>73%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>76%</b>	<b>75%</b>	<b>77%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>29%</b>	<b>25%</b>	<b>25%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

The use of internet services in France increased slightly in 2019, but at a slower pace than it did in EU countries, with France ranking 21<sup>st</sup> out of 28 EU countries. Many of the indicators remained stable since the previous year. The use of video calls increased sharply, from 35% to 53% in 2019, though still below the EU average of 60%. The share of people who have never used the internet dropped to 7%, 2 percentage points below the EU average. At the same time, the share of internet users increased from 85% to 87%, surpassing the EU average. French users go online particularly for banking, selling and shopping, the latter being France's highest score in this set of indicators (at 77% of internet users). By contrast, France has the lowest share of internet users on social networks (47%), lower than the share recorded the previous year. Also relatively few French internet users read the news online (60% versus 72% at EU level) or go online for music, videos and games or to take courses.

## 4 Integration of digital technology

4 Integration of digital technology	France		EU
	rank	score	score
<b>DESI 2020</b>	<b>11</b>	<b>42.0</b>	<b>41.4</b>
DESI 2019	13	40.8	39.8
DESI 2018	15	37.5	37.8



	France			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>NA</b>	<b>NA</b>	<b>48%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>16%</b>	<b>16%</b>	<b>22%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>11%</b>	<b>16%</b>	<b>16%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>NA</b>	<b>15%</b>	<b>15%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>16%</b>	<b>15%</b>	<b>15%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>11%</b>	<b>11%</b>	<b>11%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>7%</b>	<b>7%</b>	<b>6%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

France ranks 11<sup>th</sup> in the Integration of digital technology dimension, gaining two positions in the overall ranking and confirming the positive trend of the past years. The share of companies using electronic information sharing solutions is much higher than the EU average, at 48% against an EU average of 34%. 16% of French companies make use of big data solutions, 4 percentage points higher than the EU average. However, despite an increase of 6 percentage points, the number of companies active on social media remains below the EU average. In the same vein, e-commerce uptake levels by French companies is still below the EU average and varies significantly with company size: only 15% of small and medium-sized companies sell online compared to nearly 45% of large companies. Fewer French companies use cloud solutions (15%) than the EU average (18%).

France has begun a comprehensive drive to facilitate the digitisation of business and to develop a dynamic digital ecosystem to foster the emergence of high-growth companies.

France has taken specific measures to support the digital transformation of SMEs, such as the 40% tax amortisation scheme for investment in digital transformation and robotics and financial support to help industrial SMEs deploy digital technologies, transform their business models and modernise production practices, via the initiative Industry of the Future<sup>(150)</sup>. In addition, since July 2018, the National Industrial Council (*Conseil National de l'industrie* — *CNI*<sup>(151)</sup>) has a dedicated branch for digital, the *CNI numérique*, which brings together industrial sectors and the Alliance for Industry of

<sup>(150)</sup> <http://www.industrie-dufutur.org/>

<sup>(151)</sup> <https://www.conseil-national-industrie.gouv.fr/>

the Future, with active support from the government. The aim is to build a shared strategic action plan to support industrial sectors in identifying and taking up digital solutions suited to their sectoral needs. For example, the *CNI numérique* is contributing to the deployment of blockchain technologies in the agri-food sectors and encouraging AI applications in the health sector. Equally, to provide dedicated support to traditional SMEs and VSEs on digitisation, the *France Num* platform was launched in October 2018. At present, *France Num* provides support with the help of a network of actors, among which BPI France and the chambers of commerce; it provides access to online content on the digital transformation, according to the different needs, to a repository of existing financial support measures and to a digital maturity assessment tool. Finally, 1600 public and private advisors, called *Activeurs France Num* are available to help SMEs locally.

In early 2019, France's Public Investment Bank (*BPI France*) launched a landmark deep-tech generation plan (*Plan Génération Deeptech*). With €1.3 billion in funding over five years (2019-2023), the plan will support disruptive innovation. In addition, €800 million will support the creation of start-ups under the 'Investment for the Future Programme' and €550 million will be available via Technology Transfer Acceleration Offices (*Sociétés d'Accélération du Transfert des Technologies*). BPI France will contribute to funding the digital ecosystem and launching projects (*Banque Publique d'Investissement, 2019*).

French Tech<sup>(152)</sup> continues to play a major role in creating the conditions for start-ups to scale-up. In 2018, French tech start-ups raised significant funding totalling €3.6 billion. In only the first half of 2019, funding reached €2.4 billion, possibly leading to a record year with nearly €5 billion of funding projected<sup>(153)</sup>.

France is implementing a comprehensive strategy on AI addressing three main issues: ethics, the uptake of AI in the economy and in the public administration, and targeting a world-class level of expertise by attracting and developing the best talents. The budget allocated is €1.5 billion over five years to tackle these three issues. In addition to the overarching strategy, since the end of 2018, France has announced a research strategy for IA (see highlight), an AI and defence strategy, and an economic strategy.

France is a member of the EuroHPC Joint Undertaking and part of the EuroQCI initiative and Quantum Flagship. France has also recently acquired a new super computer, which is the fastest in the EU. France is one of the main partners in developing the GAIA-X cloud infrastructure, in which the EU plans to co-invest with France and Germany. Its use will focus on AI applications and it will be made available to companies.

France has had a cybersecurity strategy since 2015, coordinated by the French National Cybersecurity Agency.

The above measures are boosting the digital transformation of the French economy. Further measures targeting SMEs will be important to unlock the potential for growth stemming from the adoption of digital technologies.

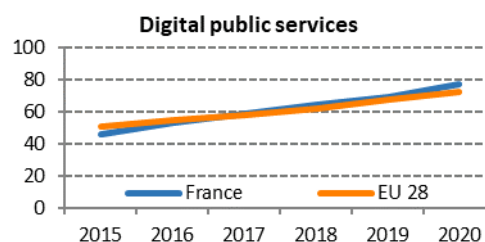
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<sup>(152)</sup> French Tech is the France's start-up ecosystem supported by the French Tech Mission, a government-led taskforce.

<sup>(153)</sup> CB Insights 2019, tech Funding Trends in France Q2 2019.

## 5 Digital public services

5 Digital public services	France		EU
	rank	score	score
<b>DESI 2020</b>	<b>12</b>	<b>76.7</b>	<b>72.0</b>
DESI 2019	13	69.3	67.0
DESI 2018	13	63.8	61.8



	France			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>5a1 e-Government users</b>	<b>67%</b>	<b>71%</b>	<b>76%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>32</b>	<b>36</b>	<b>40</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>89</b>	<b>90</b>	<b>93</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>85</b>	<b>86</b>	<b>93</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>89%</b>	<b>66%</b>
% of maximum score			2019	2019

France ranks 12<sup>th</sup> out of 28 Member States on the digital public services chapter of DESI. It has improved its score over the past year and is now above the EU average. The country performs strongly on the use of open data; it is the third best performer in the EU. France also ranks above the EU average in terms of digital public services for businesses and in online form completion (9<sup>th</sup> and 10<sup>th</sup> out of EU 28 respectively). The number of e-government users has also significantly increased at 76% of internet users choosing to submit forms online, against an EU average of 67%. France's performance is significantly weaker however on the amount of pre-filled data in public services' online forms.

The government has embarked on a process to dematerialise a range of quality services for users, including business services. It focuses in particular on a 'Top 250' group of services and processes that are the most often used by citizens. The extent to which each of these processes is digitalised, their quality and user satisfaction is monitored online and made publicly available in the observatory on the dematerialisation of administrative procedures<sup>(154)</sup>. France therefore prioritises the digitalisation of procedures and the improvement of existing online services on a needs basis and on the basis of user opinion, in particular business users.

The *FranceConnect*<sup>(155)</sup> programme continues. It now comprises five identity providers and a sixth is also joining the programme. According to the French authorities, more than 12 million French citizens now use it for over 600 digital services. Of these digital services, which are mostly provided by the public administration, the share of private-sector services is increasing.

<sup>(154)</sup> <https://observatoire.numerique.gouv.fr/>

<sup>(155)</sup> The digital transformation component of the country's public service modernisation programme ('*Action Publique 2022*') was launched in October 2017 and notably aims to digitise all public services by 2022 (DESI 2019).

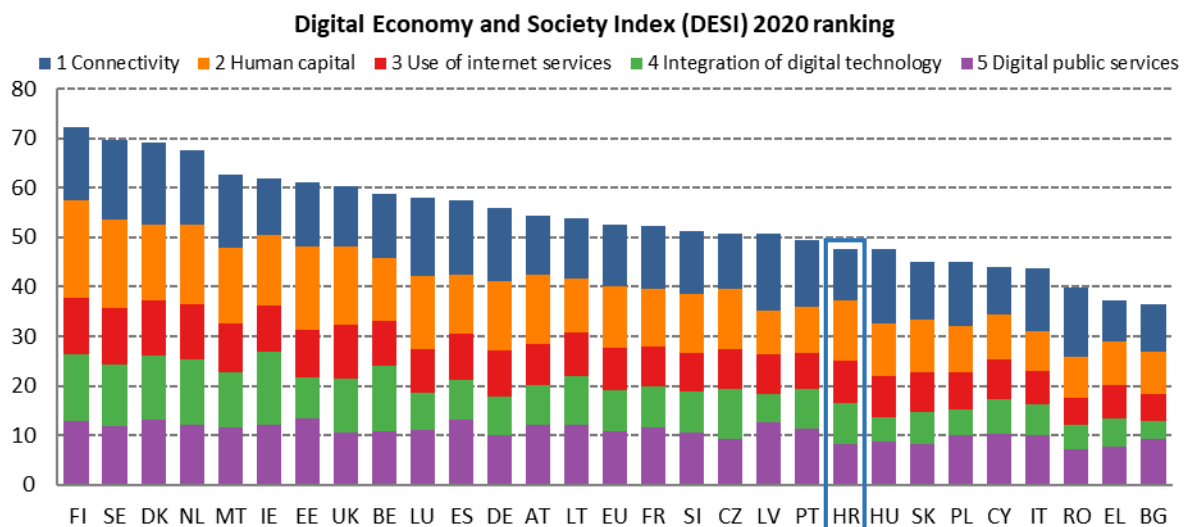
The digital transformation of public services is also supported by the National Investment plan (*Grand Plan d'investissement*) with a budget of €8 billion. This plan aims to support the use of innovative technologies, such as platform computing, big data, and artificial intelligence for public services. This involves financing reform and transformation projects on a multi-annual basis, running trials with a high potential for improving public services, and promoting bold initiatives, including the proliferation of state start-ups. The €700 million Public Action Transformation Fund (FTAP) finances innovative and cost-saving projects run by the government and its operational bodies.

France has strongly encouraged the development of eHealth and telemedicine. The take-up of eHealth, in particular the use of electronic medical records (EMRs) and telemedicine, has grown in recent years. By mid-2019, over 6.4 million people (about 10% of the population) had an EMR.

France has taken steps to position itself at the forefront of digitally enabled public service modernisation. Full implementation of the country's strategy in this area, including through additional measures to increase the pre-filled data available in online forms, is likely to bring further improvements in terms of e-government availability and uptake by people and businesses alike.

## Croatia

	Croatia		EU
	rank	score	score
<b>DESI 2020</b>	<b>20</b>	<b>47.6</b>	<b>52.6</b>
DESI 2019	20	44.3	49.4
DESI 2018	21	40.8	46.5



Croatia ranks 20<sup>th</sup> out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020. Based on data prior to the pandemic, Croatia's score increased slightly thanks to an improved performance in some of the DESI dimensions measured. Among all dimensions, Croatia ranks highest in integration of digital technology by enterprises and SMEs with ninth highest score in selling online cross-border to other EU Member States. Croatian enterprises are progressively integrating digital technologies into their business. With 23% of enterprises at a high or very high level of digital intensity, Croatia is slightly below the EU average of 26%.<sup>(156)</sup>

Regarding connectivity, Croatia continued its steady progress but with no modification to last years' ranking. It significantly improved Fixed Very High Capacity Network coverage from 23% in 2018 to 43% in 2019. Still, relatively high prices of fixed and converged baskets are affecting the score in broadband price index.

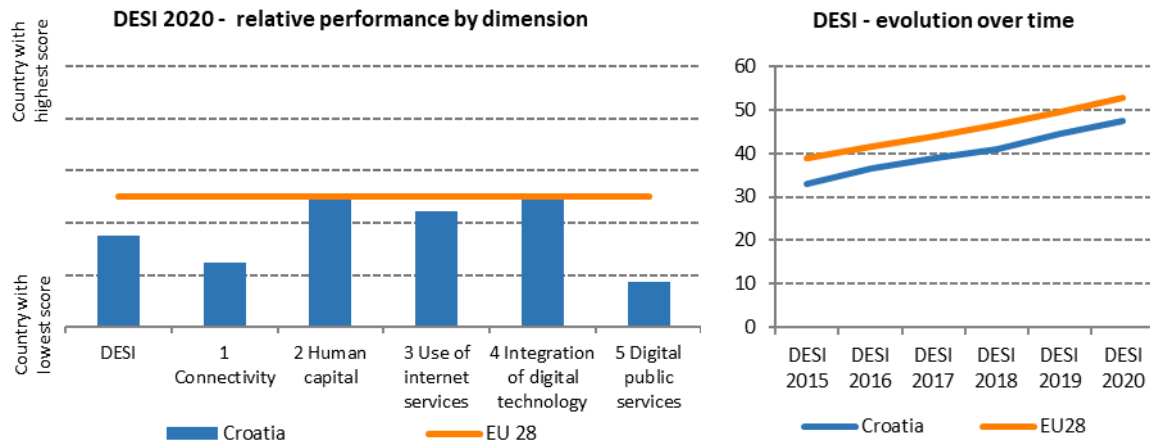
In human capital, Croatia scored 13<sup>th</sup> place, with the sixth-highest share of ICT graduates in the EU. However, 18% of Croatians have never used internet.

Croatia made small progress on internet use in the past year. Croats are among the EU's keenest readers of online news, and Croatian businesses make use of social media, big data and e-commerce. Despite growing demand from employers, the supply of ICT specialists in Croatia is below the EU average. In 2019, Croatia performed better in pre-filled forms and online service completion than it did in 2018.

<sup>(156)</sup> Digital Scoreboard 2020



The curricular reform ‘School for life’ was fully rolled out in 2019. It aims to introduce a ‘learning-outcomes’ approach to increase the quality of education and teaching. Progress on this reform is incremental in all primary and secondary schools, but the reform should be fully completed by 2022.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

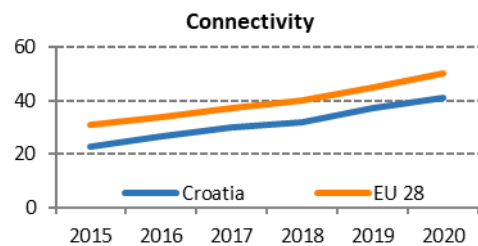
Croatia has taken a large number of targeted measures in digital to deal with the COVID-19 crisis. Several solutions are in the process of being developed to monitor and report persons who are in self-isolation, to minimise contagion and to support the health system. Croatia is also strengthening the e-Health IT systems and e-health solutions. As for education, since mid-March, all regular classes in schools and universities have been discontinued and were moved online using virtual classes. Simultaneously, the elementary school pupils (first three grades) can follow classes through specially created television channels. To enhance teaching methods, pupils and students can use various communication channels to connect with fellow students, teachers and professors. Digitisation of the public administration is also being accelerated by promoting remote working schemes. Citizens can smoothly use digital certificates and e-signatures for signing the official documents, or they can request e-passes online. Croatia launched digital initiatives targeted at agriculture sector to improve communication, cooperation and fund allocations. Digital marketplace platform has been set up in order to facilitate the authorities to find suppliers and enable the sale of domestic agricultural and food products.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis. Croatia is performing well in digitisation of businesses and it

made a significant improvement in the deployment of Very High Capacity Networks (VHCN). On the other hand, Croatia has not yet assigned any radio spectrum for 5G service. The levels of basic digital skills remain low compared to the EU average. While, Croatia has continued to modernise and improve e-government services, it is still scoring relatively weak in this dimension.

# 1 Connectivity

1 Connectivity	Croatia		EU
	rank	score	score
DESI 2020	25	41.2	50.1
DESI 2019	25	37.2	44.7
DESI 2018	26	32.1	39.9



	DESI 2018	Croatia	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
<b>1a1 Overall fixed broadband take-up</b> % households	70%	72%	70%	78%
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	1%	5%	6%	26%
<b>1b1 Fast broadband (NGA) coverage</b> % households	68%	83%	86%	86%
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	18%	23%	43%	44%
<b>1c1 4G coverage</b> % households (average of operators)	73%	94%	98%	96%
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	82	85	89	100
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	NA	0%	0%	21%
<b>1d1 Broadband price index</b> Score (0 to 100)	NA	NA	61	64

Croatia continued its steady progress but with no modification to last years' connectivity ranking. On fixed NGA broadband coverage, Croatia closed the gap with the EU average of 86%. Croatia significantly improved VHCN coverage from 23% in 2018 to 43% in 2019, thanks to both an increase in FTTP coverage and a significant upgrade of its cable networks to DOCSIS 3.1. Take-up of mobile broadband subscriptions improved, but remains 11 percentage points below the EU average. On 100 Mbps and above broadband take-up, Croatia continues to lag behind significantly, with only 6%, compared with an EU average of 26%. Croatia scores 61, lower than the EU average of 64, ranking 18<sup>th</sup> on the broadband price index, mainly due to high prices of fixed and converged baskets.

Croatian authorities are drawing up a national plan for broadband development for 2021-2027, which should be aligned with the gigabit society targets. Although there continue to be delays in implementing two national, EU-co-financed NGN (next-generation network) schemes, Croatia made some progress in broadband infrastructure in 2019. Firstly, 2 out of 3 selection phases were completed in the national programme for the development of broadband-access infrastructure in areas of no commercial interest. There are now 21 pre-selected project proposals for this programme covering 126 municipalities and 903,774 inhabitants. However, the Commission services remain worried about delays in implementing the national backhaul infrastructure project. These delays put at risk the absorption of the available funds. In any event, it is important to monitor developments in improving connectivity across the entire country, to avoid leaving any areas behind.

Market players significantly increased their investments in building fibre to the premises in 2019 compared to previous years. A new wholesale-only market entrant, RUNE, emerged in Istria and Primorje-Gorski Kotar county, rural areas of Croatia that are currently not covered by fibre and where there is no commercial interest. RUNE committed to providing ultra-fast broadband fibre to 110,000 households, financed by the Connecting Europe Broadband Fund.

Croatia scores 0% in the 5G readiness indicator<sup>(157)</sup>. The country still lacks a dedicated comprehensive strategy for 5G deployment, which is a pre-requisite for future assignment procedures. Having already delayed the adoption of a national roadmap including detailed steps to enable the 700 MHz frequency band to be used for mobile broadband by 30 June 2020, Croatia placed the roadmap draft in public consultation<sup>(158)</sup>.

The existing rights of use in the lower part of the band run beyond 31 December 2020, but Croatia does not plan to 'refarm' this lower part of the band. The current roadmap draft does not contain plans for any auction before the second half of 2020. Therefore, the entire band will not be available countrywide by the deadline of 30 June 2020. All three mobile operators acquired rights of use of frequency for two 20 MHz blocks in the 2.6 GHz band at auction.

As in previous years, Croatia continues to make consistent progress. However, this progress has been insufficient to change its 25<sup>th</sup> rank in connectivity. To significantly improve connectivity, it is important for Croatia to have a clear national connectivity strategy, including broadband and 5G. It is also important for this strategy to address country-specific barriers to connectivity, and for all public stakeholders to jointly implement the strategy. Croatia has an opportunity to set ambitious and achievable goals in its new national plan for broadband development. It is important to make further efforts to remove country-specific barriers to investment and to the absorption of EU funds. It would be beneficial to promptly make the 5G pioneer bands available under the 5G specifications, and make better use of the Cost Reduction Directive.

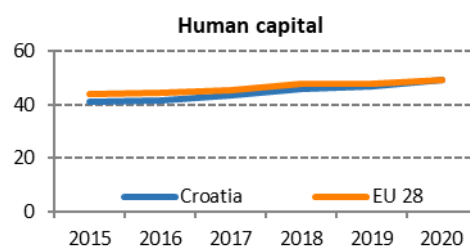
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<sup>(157)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU) 2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

<sup>(158)</sup> Roadmap was finally adopted in May 2020.

## 2 Human capital

2 Human capital	Croatia		EU
	rank	score	score
<b>DESI 2020</b>	<b>13</b>	<b>49.2</b>	<b>49.3</b>
DESI 2019	14	46.8	47.9
DESI 2018	13	45.8	47.6



	Croatia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b>	<b>NA</b>	<b>NA</b>	<b>53%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>NA</b>	<b>NA</b>	<b>35%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>NA</b>	<b>NA</b>	<b>56%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>3.3%</b>	<b>3.3%</b>	<b>3.5%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>0.9%</b>	<b>0.9%</b>	<b>1.1%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>4.1%</b>	<b>4.7%</b>	<b>5.5%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

In Human capital, Croatia ranks 13<sup>th</sup> and is only slightly below the EU average. Levels of basic digital skills remain low compared to the EU average, given that only 53% of people between 16 and 74 years have at least basic digital skills. However, for above-basic digital skills, Croatia is positioned above the EU average. ICT specialists account for a lower percentage of the workforce in Croatia than the EU average (3.5% compared to 3.9% in the EU). Conversely, the number of ICT graduates continues to grow, and Croatian ICT graduates currently account for 5.5% of all graduates in Croatia.

In 2019, the reform of the education curricula (the 'School for life' programme<sup>(159)</sup>) was rolled out after a pilot in 2018. The reform aims to introduce a learning-outcomes approach, increasing the quality of education and teaching. The reform is now being implemented in all primary and secondary schools, and is scheduled to be completed in all grades by 2022.

The e-Schools<sup>(160)</sup> programme aims to introduce ICT into the school system, raising the level of digital literacy to prepare students for the jobs market or further education. The second phase has already started and is building up from the results of an initial pilot programme. Through the project, Croatia will equip schools with specialised computer labs. It will also provide tablets for each student and promote digital textbooks or interactive applications in learning and teaching. The ongoing second phase will focus on e-services, including data-mining information systems, virtual classrooms, and e-resources. There are also extensive training and mentoring sessions for teachers to encourage them to use digital learning materials in the classroom.

<sup>(159)</sup> <https://skolazazivot.hr/>

<sup>(160)</sup> <https://pilot.e-skole.hr/hr/>

The Algebra University College<sup>(161)</sup> is the largest private education institution in Croatia. It focuses on applied knowledge, entrepreneurship and self-employment in the digital sector. It is also a strong supporter of Croatia's start-up ecosystem. In 2020, it will be a partner of MIT's (the Massachusetts Institute of Technology) Innovation & Entrepreneurship Bootcamp<sup>(162)</sup>, a major international event for IT students and entrepreneurs. The bootcamp is an accelerated-learning program for students to learn and practice the leadership and innovation principles taught at MIT.

In 2019, the government has also introduced scholarships in vocational secondary schools to support training in 62 occupations in high demand. Similarly, in higher education, dedicated scholarships also support students in Science, Technology, Engineering and Mathematics (STEM) studies. The 2018-2021 national plan for improving the social dimension of higher education was adopted in January 2019, and aims to further increase the number of scholarships. Under the plan, 3,400 STEM scholarships are rewarded to talented students every school year, and 17,000 scholarships in total are planned over the next 5 years<sup>(163)</sup>.

The National Digital Skills and Jobs Coalition<sup>(164)</sup> cooperates with businesses, educational institutions, and the public and private sectors in Croatia. Croatia actively participated in EU Code Week<sup>(165)</sup> in 2019, doubling the number of Code Week activities to 891 and increasing participation to almost 30,000 people, 47% of whom were women.

The Central State Office for the Development of the Digital Society is leading the coordination of the EU's Declaration of Commitment on Women in Digital. The office organised its first event in 2019 to encourage girls and young women to consider choosing an IT career and enrolling in STEM studies (*Postani i TI, djevojka IT!*<sup>(166)</sup>). Successful women from academia and the IT business sector took part in the event to act as role models. More events are planned in 2020 across the country.

Croatia continues to nurture digital skills through various educational reforms and programmes. There is a growing supply of ICT graduates and ICT specialists. However, 60% of enterprises still report experiencing difficulties in filling vacancies for ICT specialists. It is vital to tackle the existing skills mismatches in companies' workforces. Increasing the number of specialists and focusing strongly on reskilling and upskilling is important if Croatia is to tap the full potential offered by the digital economy.

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<sup>(161)</sup> <https://www.algebra.hr/visoko-uciliste/en/>

<sup>(162)</sup> <https://bootcamp.mit.edu/croatia2020/>

<sup>(163)</sup> <https://stem.mzo.hr/>

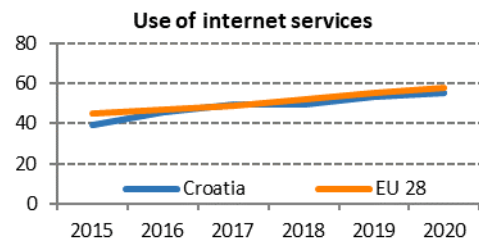
<sup>(164)</sup> <https://digitalnakoalicija.hup.hr/novosti/>

<sup>(165)</sup> <https://codeweek.eu/>

<sup>(166)</sup> <https://rdd.gov.hr/vijesti/postani-i-ti-djevojka-it/359>

### 3 Use of internet services

3 Use of internet services	Croatia		EU
	rank	score	score
<b>DESI 2020</b>	<b>15</b>	<b>55.5</b>	<b>58.0</b>
DESI 2019	14	53.4	55.0
DESI 2018	17	49.2	51.8

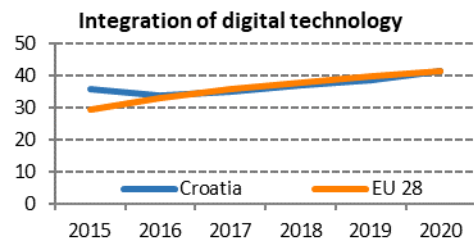


	Croatia			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>3a1 People who have never used the internet</b> % individuals	<b>28%</b> 2017	<b>21%</b> 2018	<b>18%</b> 2019	<b>9%</b> 2019
<b>3a2 Internet users</b> % individuals	<b>NA</b> 2017	<b>73%</b> 2018	<b>77%</b> 2019	<b>85%</b> 2019
<b>3b1 News</b> % internet users	<b>91%</b> 2017	<b>91%</b> 2017	<b>91%</b> 2019	<b>72%</b> 2019
<b>3b2 Music, videos and games</b> % internet users	<b>85%</b> 2016	<b>88%</b> 2018	<b>88%</b> 2018	<b>81%</b> 2018
<b>3b3 Video on demand</b> % internet users	<b>17%</b> 2016	<b>26%</b> 2018	<b>26%</b> 2018	<b>31%</b> 2018
<b>3b4 Video calls</b> % internet users	<b>63%</b> 2017	<b>69%</b> 2018	<b>60%</b> 2019	<b>60%</b> 2019
<b>3b5 Social networks</b> % internet users	<b>70%</b> 2017	<b>72%</b> 2018	<b>73%</b> 2019	<b>65%</b> 2019
<b>3b6 Doing an online course</b> % internet users	<b>4%</b> 2017	<b>4%</b> 2017	<b>6%</b> 2019	<b>11%</b> 2019
<b>3c1 Banking</b> % internet users	<b>50%</b> 2017	<b>54%</b> 2018	<b>59%</b> 2019	<b>66%</b> 2019
<b>3c2 Shopping</b> % internet users	<b>NA</b> 2017	<b>47%</b> 2018	<b>57%</b> 2019	<b>71%</b> 2019
<b>3c3 Selling online</b> % internet users	<b>37%</b> 2017	<b>33%</b> 2018	<b>27%</b> 2019	<b>23%</b> 2019

Overall, the use of internet services in Croatia is broadly comparable with the EU average. Like people in the rest of the EU, Croats are keen to engage in a variety of online activities, such as reading news, listening to music, watching videos, playing games, and using social networks. As many as 91% of Croatian internet users read news online (compared with 72% in the rest of the EU). The number of people who have never used the internet is steadily declining. Croats are also active users of social networks and they widely use the internet for banking (59% against an EU average of 66%) and shopping (57% against an EU average of 71%).

## 4 Integration of digital technology

4 Integration of digital technology	Croatia		EU
	rank	score	score
<b>DESI 2020</b>	<b>12</b>	<b>41.5</b>	<b>41.4</b>
DESI 2019	17	38.5	39.8
DESI 2018	16	36.7	37.8



	Croatia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>26%</b>	<b>26%</b>	<b>26%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>16%</b>	<b>16%</b>	<b>22%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>9%</b>	<b>10%</b>	<b>10%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>22%</b>	<b>22%</b>	<b>22%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>17%</b>	<b>18%</b>	<b>21%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>9%</b>	<b>11%</b>	<b>9%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>8%</b>	<b>8%</b>	<b>10%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

On the integration of digital technology in businesses, Croatia ranks 12<sup>th</sup> among EU countries. Croatian enterprises are taking increasing advantage of the opportunities offered by online commerce, with 21% of SMEs selling online, 10% selling across border to other EU countries, and 22% using cloud solutions. 22% of enterprises actively use social media, while 1 in 4 enterprises (26%) share information electronically.

Croatia is committed to promoting and investing in digital technologies, through EU-coordinated programmes. It is a member of the EuroHPC Joint Undertaking and it signed the Declaration on cooperation on Artificial Intelligence (AI) in 2018. In 2019, Croatia also joined the European Blockchain Partnership and will further adopt and integrate blockchain technology into its day-to-day operations.

The national plan for the development of AI is in draft stage. The plan will tackle challenges, priorities and goals for the further development of AI. Croatia also plans to launch other initiatives in the AI area, including drafting a separate document on applying AI in the economy. In 2019, Croatia set up the Center for Artificial Intelligence (CAI), a research centre for AI, which brings together more than 100 researchers from 18 research laboratories at the Faculty of Electrical Engineering and Computing of the University of Zagreb. The CAI aims to advance the theoretical foundations and applications of AI. It also aims to strengthen collaboration with industry through the transfer of AI technology to develop new, innovative, knowledge-based products and services. Another goal of the CAI is to provide cutting-edge AI education at the undergraduate, graduate and doctoral levels.

Croatia is also preparing both a national plan for digital transformation of the economy and a national platform for the digitisation of industry. The platform aims to: (i) provide supporting



conditions for networking opportunities; *(ii)* help businesses to prepare for Industry 4.0; *(iii)* digitise public administration; and *(iv)* develop technical and security standards.

The Innovation Centre Nikola Tesla<sup>(167)</sup> (ICENT) works to boost Croatia's high-tech economy, focusing on energetics, automation, robotics, biomedical engineering, and ICT. The centre offers various types of support, including: helping develop start-ups' new products; prototype and quality testing; and advising in training and certification.

Several EU funding programmes have supported the growth of Croatian SMEs. The European Regional Development Fund (ERDF) has helped to fund over €1 billion of investments in Croatia since 2014. Nearly half of that was used to fund SMEs with favourable loans and guarantees, promoted by the Croatian Agency for SMEs, Innovation and Investment (HAMAG-BICRO). The European Structural and Investment Funds (ESIF) loans for SMEs were also very popular. In July 2019, another grant scheme for innovative SMEs, Innovations in S3 Areas<sup>(168)</sup> was launched with funding of €85 million.

In January 2019, the European Investment Fund (EIF) and the Croatian Bank for Reconstruction and Development (HBOR) launched the Croatian Growth Investment Programme (CROGIP)<sup>(169)</sup>. CROGIP is a €70 million co-investment programme aimed at fast-growing SMEs. In cooperation with the government and the EIF, a new venture capital provider, Fil Rouge Capital<sup>(170)</sup> launched in 2018. It became the first Croatian venture capital fund dedicated to Croatian start-ups and scale-ups. Start-ups and scale-ups can receive funding, mentoring and support to enter and expand in the market. Fil Rouge Capital has already raised €12.2 million of private funding, on top of the original €35 million from EIF.

To boost the digital transformation of the Croatian economy, it is important to continue to support the digitisation of SMEs and the uptake of advanced technologies. In particular, attention should be paid to start-up ecosystems, businesses in disadvantaged regions, and female digital entrepreneurs.

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<sup>(167)</sup> <https://www.icent.hr/en/>

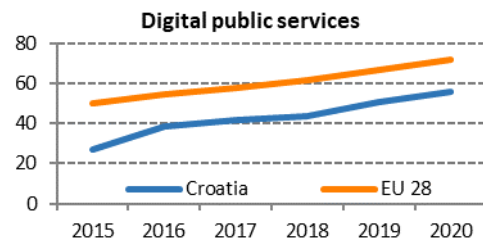
<sup>(168)</sup> <http://investcroatia.gov.hr/en/innovations-in-s3/>

<sup>(169)</sup> <https://www.hbor.hr/en/crogip/>

<sup>(170)</sup> <https://filrougecapital.com/>

## 5 Digital public services

5 Digital public services	Croatia		EU
	rank	score	score
<b>DESI 2020</b>	<b>25</b>	<b>55.8</b>	<b>72.0</b>
DESI 2019	24	50.8	67.0
DESI 2018	25	43.7	61.8



	Croatia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>5a1 e-Government users</b>	<b>66%</b>	<b>75%</b>	<b>65%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>20</b>	<b>30</b>	<b>33</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>62</b>	<b>64</b>	<b>73</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>61</b>	<b>63</b>	<b>65</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>69%</b>	<b>66%</b>
% of maximum score			2019	2019

On digital public services, Croatia ranks 25<sup>th</sup> out of the EU countries. It has a high level of online interaction between public authorities and members of the public. 65% of online users actively use e-government services. In 2019, Croatia performed better than the previous year on pre-filled forms and online service completion; nonetheless, it is still scoring below the EU average. The availability of e-government services for business is on the rise. Croatia scores above the EU average for open data.

Croatia has continued its efforts to modernise and improve e-government services. In 2019, the e-Citizen platform increased the number of services it offers. The Shared Service Center (SSC)<sup>(171)</sup> will consolidate the information infrastructure and enable a joint use of ICT resources across all public sector bodies.

Two new platforms were made available in 2019. eFees represents a horizontal component, which will enable electronic payment of administrative fees and charges, and in later stages the payment of other types of fees (for example court or notary fees) in public electronic services. The platform is currently being set up, and is expected to start using the horizontal components in 2020. eFees will also help to further strengthen the judicial system, as set out in the Ministry of Justice's strategic plan for 2020-2022<sup>(172)</sup>.

eBusiness gives business users a single point of access to electronic services. These services range from document downloading (for tax administration, health insurance, and pensions) to secure

<sup>(171)</sup> <https://vlada.gov.hr/vijesti/centar-za-dijeljenje-usluga-omogucuje-ucinkovitiju-kvalitetniju-transparentniju-i-odgovorniju-javnu-upravu/28285>

<sup>(172)</sup> <https://pravosudje.gov.hr/pristup-informacijama-6341/strategije-planovi-i-izvjesca/strateski-planovi-ministarstva-pravosudja/6727>

electronic communication via business users' mailboxes. First e-services will be integrated into the platform starting from 2020.

From 2 December 2019, entrepreneurs in Croatia can register their businesses via the online e-service platform START, which combines existing processes and systems into a single application. This e-service makes it possible to register a company in the court register, or a craft in the Craft Register. Several simplifications have also been made available to entrepreneurs. These simplifications include: (i) submitting an entry in the register of business entities, register of taxpayers, or VAT register; (ii) receiving a VAT ID number; (iii) submitting a request for a bank account; (iv) registering with the Croatian Pension Insurance Institute; or (iv) electronically paying fees.

In February 2019, the Law on accessibility of web pages and mobile software solutions of public sector bodies<sup>(173)</sup>. The aim of this law is to monitor the compliance with the accessibility requirements of public sector bodies' web sites and mobile software, especially for persons with disabilities.

In 2018 the National CERT<sup>(174)</sup> started implementation of the CyberExchange<sup>(175)</sup> project, and implementation continued in 2019. The CyberExchange project is a response to increasing cyber security threats, and it emphasises the importance of cross-border cooperation. It will last for 2 years and will continue to strengthen cooperation in cybersecurity. Croatia also signed the Declaration on Quantum Communication Infrastructure facilitating Quantum Key Distribution (QKD). QKD aims at securing European communication infrastructure, a backbone for Europe's quantum internet.

In 2019, the Central State Office for the Development of the Digital Society also launched its integrated management system for official documents. The project will build a system for collecting, processing and publishing textual data using data-driven AI applications to manage the government's central catalogue of official documents.

Croatia organised several informative and promotional campaigns in 2019. These included discussions on 5G, where the government teamed up with telecom operators. The government also promoted use of electronic identity cards (eID), the e-Citizen system, and the My Administration portal (see Highlight 2020 below).

Croatia was an early adopter of cross-border e-prescriptions. Croatian doctors can send and receive e-prescriptions across borders, and receive the patient summaries of citizens from other European countries.

e-Services for the public and businesses that are more user-friendly and easier to access could lead the way to even more improvements in digital public administration. Additional measures to promote the use of e-government services could boost take-up of these e-services.

#### **Highlight 2020: Digital Croatia and Digital Bus<sup>(176)</sup>**

Digital Croatia was launched in May 2019 to further promote digitisation of the country. As part of the Digital Croatia campaign, the Central State Office for the Development of the Digital Society was actively involved in dialogues with the public. The Central State Office also helped the public to update their electronic identity cards, log into the e-Citizen system, and access the My Administration portal.

<sup>(173)</sup> [https://narodne-novine.nn.hr/clanci/sluzbeni/2019\\_02\\_17\\_358.html](https://narodne-novine.nn.hr/clanci/sluzbeni/2019_02_17_358.html)

<sup>(174)</sup> <https://www.cert.hr/en/home-page/>

<sup>(175)</sup> <https://www.carnet.hr/en/projekt/cyberexchange/>

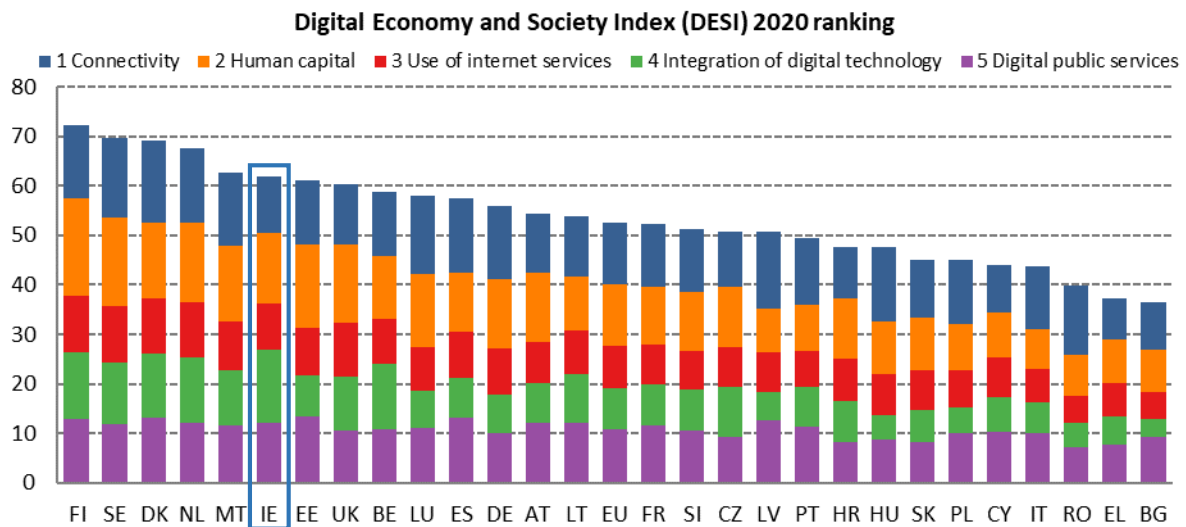
<sup>(176)</sup> <https://rdd.gov.hr/vijesti/digitalni-bus-izazvao-veliko-zanimanje-gradjana-u-zagrebu/1387>

The Digital Bus became a flagship emblem of the initiative. It was a bus equipped with the latest technology, and brought various experts and educators around the country. It toured Croatia in May and September 2019, visiting eight cities and providing one-to-one mentoring sessions. It focused on familiarising the public with digitisation and promoting digital access to public information and services.

Thanks to the Digital Croatia initiative, citizens felt empowered to activate their eIDs and to actively search for information by themselves. Besides getting information and guidance, many Croatians also learnt how to log into the e-Citizen portal or sign documents electronically. The project resulted in a significant increase in new users of e-government services.

## Ireland

	Ireland		EU
	rank	score	score
<b>DESI 2020</b>	<b>6</b>	<b>61.8</b>	<b>52.6</b>
DESI 2019	6	58.0	49.4
DESI 2018	8	53.1	46.5



Ireland ranks 6<sup>th</sup> out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020. Over the last five years, Ireland was the fastest growing Member State in the EU.

Based on data prior to the pandemic, Ireland continues to rank first in the Integration of digital technology dimension, and has maintained a leading position in the use of e-Commerce by SMEs. It entered the 'top 10' on the Use of internet by individuals and recorded a notable increase in the share of internet users. It maintained its top 10 position in digital public services, where it excels in open data and the provision of digital public services for businesses. There was no substantial change in Ireland's position in the Human capital and Connectivity dimensions despite some improvement in key indicators where it has been lagging behind, such as the digital skills of the wider population.

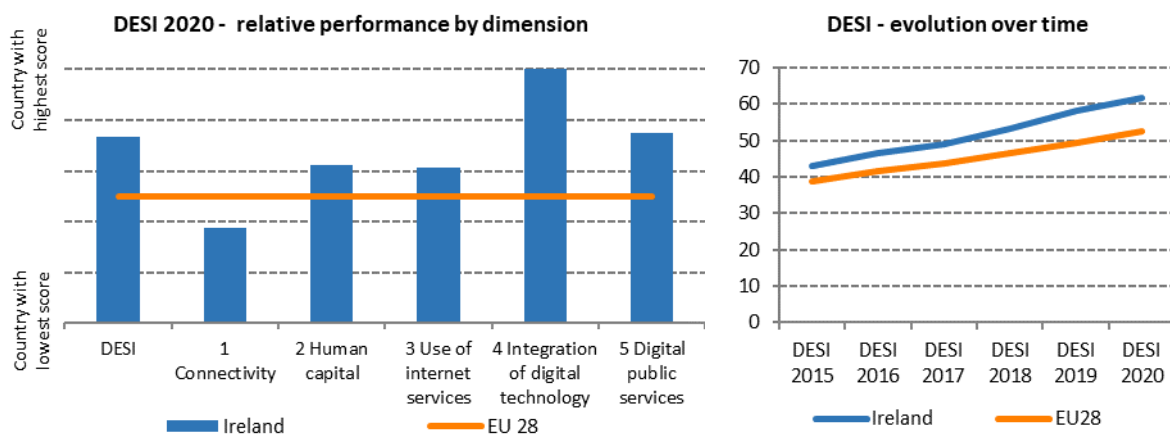
Digital transformation continues to be one of the core economic policy issues in Ireland. This is reflected in the various policy initiatives in 2019. Following the general election in February 2020, it remains to be seen how the new government, once formed, will address digital transformation.

The Irish government set out its vision for the economy in *Future Jobs Ireland 2019*<sup>(177)</sup>, which was intended to be the first in a series of annual reports. The document provides a pathway to make sure that Ireland succeeds in the global economy. Digitisation is addressed under the major pillars of the framework, among other things promoting innovation and embracing technology, increasing the productivity of small and medium-sized enterprises (SMEs) and strengthening and transforming the skills base. As for specific digital strategies, the Irish Industry 4.0 strategy<sup>(178)</sup> was launched in

<sup>(177)</sup> <https://dbei.gov.ie/en/Publications/Future-Jobs-Ireland-2019.html>

<sup>(178)</sup> <https://dbei.gov.ie/en/Publications/Irelands-Industry-4-Strategy-2020-2025.html>

December 2019 and set out the key ambitions for helping the manufacturing sector embrace digital technologies. The development of both an updated national digital strategy and a new artificial intelligence strategy are at an advanced stage. In addition, work is underway amongst local authorities to develop local digital strategies for municipal regions. These overall strategies are complemented and followed up with specific measures and actions, for example the €300 million Human Capital Initiative to increase the supply of high-level ICT skills or €100 million for innovative technological investments under the Disruptive Technologies Fund. Ireland also made progress in critical public infrastructure investments under the National Broadband Plan: in November 2019, the government signed a contract to implement a public investment in future-proof broadband networks in rural Ireland, with an indicative budget of €2.6 billion.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

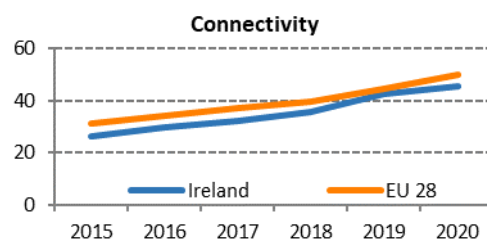
Ireland has taken a large number of targeted measures in digital to deal with the COVID-19 crisis. A joint rapid-response call was launched to fund research, development, and innovation activities to find solutions to the COVID-19 emergency, a contact tracing call-centre was set up and a contract tracing app is being developed. Besides general financial help to enterprises and startups, additional funding has been made available for two targeted existing schemes to help companies trade online. Efforts have been made to help move tertiary (including further) education online. The capacity of online service 'eCollege' has significantly been increased to make available free online courses in computer programming, data science etc. Additional rights of use for radio spectrum have been released on a temporary basis in order to help mobile network operators accommodate the increased demand on their services.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Ireland is below the EU average in connectivity, lagging particularly behind in the deployment of Very High Capacity Networks (VHCN). It scores very high in the digitisation of businesses. On human capital, despite doing well in high level digital

skills, the overall digital skill level of the wider population is still below the EU average.

## 1 Connectivity

1 Connectivity	Ireland		EU
	rank	score	score
DESI 2020	23	45.7	50.1
DESI 2019	22	42.5	44.7
DESI 2018	23	35.9	39.9



	DESI 2018	Ireland	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
		value	value	value
<b>1a1 Overall fixed broadband take-up</b> % households	74%	73%	76%	78%
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	18%	20%	25%	26%
<b>1b1 Fast broadband (NGA) coverage</b> % households	93%	96%	96%	86%
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	8%	13%	21%	44%
<b>1c1 4G coverage</b> % households (average of operators)	92%	96%	99%	96%
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	101	101	103	100
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	NA	30%	30%	21%
<b>1d1 Broadband price index</b> Score (0 to 100)	NA	NA	45	64

Ireland scores 45.7 in connectivity, falling from 22<sup>nd</sup> to 23<sup>rd</sup> position in the ranking. Its best performance comes in fast broadband (NGA) coverage, where Ireland ranks 6<sup>th</sup> with 96%, compared to 86% the EU average. Fixed very high capacity network (VHCN) coverage has jumped from 13% in 2019 to 21% in 2020, but still lags behind the EU average of 44%. On the other hand, it slightly lags the EU average in overall fixed broadband take up (76%, compared to 78% the EU average) and in 100Mbps fixed broadband take up (25%, compared to 26% the EU average). In addition, Ireland is one of the EU's most expensive countries in terms of broadband (ranking 27<sup>th</sup>, with a broadband price index of 45, compared to the EU average of 64).

The implementation of the publicly funded scheme under the National Broadband Plan has started. Following approval by the European Commission under State aid rules (Commission Decision in Case SA.54472 (2019/N) – Ireland, National Broadband Plan), the Irish government signed a contract on 19 November 2019 with National Broadband Ireland following a competitive tendering process. This state intervention targets rural areas where there is no existing or planned commercial network that can reliably deliver at least 30 Mbps download speeds to all premises. With an indicative budget of €2.6 billion, it aims to deliver ultrafast coverage to around 540,000 premises in rural Ireland using mainly fibre. The NBP will see approximately 300 community facilities receive access to free, high speed broadband. The contract involves building, operating and maintaining a subsidised network over a 25-year term as a wholesale provider, offering passive and active wholesale products to all retail and wholesale service providers willing to provide services in the state intervention area during this period.



The scheme complements investment made by commercial operators, who have invested over €2.75 billion in upgrading and modernising their networks over the past 5 years, with further investment planned. Market players, including eir, SIRO and Virgin Media, invest heavily in very high capacity networks. The award of the contract for the National Broadband Plan in November 2019 introduces another player, National Broadband Ireland.

Ireland has been making progress in the deployment of 5G networks and services and has already awarded 5G spectrum in the 3.4-3.8 GHz band. As a result, it scored 30% in the 5G readiness indicator<sup>(179)</sup>. Market players are eager to invest in 5G, and two mobile operators have already announced the launch of 5G services in selected sites. In parallel, Ireland is moving forward with the award of the 700 MHz band (as part of the Multiband Spectrum Award), according to the published timetable. The award process is planned to begin in Q4 2020. Access to sites and public land (and the relevant costs) remains an important challenge for the deployment of 5G networks. At the same time, there are increasing concerns about the potential impact of campaigns against the use of spectrum (especially 5G) that have induced several county councils to pass resolutions against the installation of new antenna systems.

One of the success stories in the Irish has been the establishment of the Mobile Phone and Broadband Taskforce. The Taskforce has worked to address specific issues affecting upon the delivery of mobile phone and broadband services, through committed engagement with a wide range of stakeholders.<sup>(180)</sup> Under the Taskforce, a Broadband Officer has been appointed in every local authority around the country. Their role is to act as local contact points for operators and the public on telecoms issues. The industry recognises that they have helped resolve numerous issues. They are also expected to play a key role in developing local digital strategies as the National Broadband Plan is rolled out.

The award of the contract for implementing the National Broadband Plan is a major development for Ireland. It can help bridge the geographical divide and expand the footprint of ultrafast broadband networks in rural Ireland, helping achieve the gigabit society targets for 2025. Its successful implementation will benefit from the effective monitoring and enforcement of the relevant rules in the Irish electronic communications market. Equally important is the timely award of 5G spectrum.

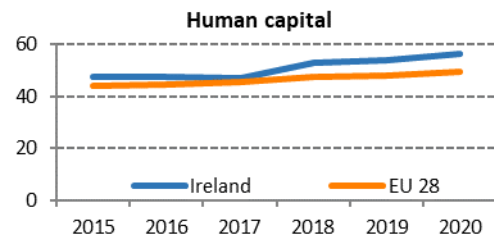
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<sup>(179)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

<sup>(180)</sup> Taskforce Report, 2016, <https://www.dccae.gov.ie/documents/Taskforce%20Report.pdf>

## 2 Human capital

2 Human capital	Ireland		EU
	rank	score	score
DESI 2020	11	56.4	49.3
DESI 2019	11	54.2	47.9
DESI 2018	11	53.0	47.6



	Ireland		EU	
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>2a1 At least basic digital skills</b> % individuals	48%	48%	53%	58%
<b>2a2 Above basic digital skills</b> % individuals	28%	28%	34%	33%
<b>2a3 At least basic software skills</b> % individuals	49%	49%	55%	61%
<b>2b1 ICT specialists</b> % total employment	4.3%	4.4%	4.3%	3.9%
<b>2b2 Female ICT specialists</b> % female employment	1.9%	2.0%	1.8%	1.4%
<b>2b3 ICT graduates</b> % graduates	7.0%	7.2%	7.3%	3.6%

Ireland ranks 11<sup>th</sup> in the Human capital dimension, the same as last year. It scores above the EU average thanks to its relatively high ranking in the indicators on high-level ICT skills and female ICT specialists. It has the second largest proportion (7%) of ICT graduates among all graduates. While the proportion of ICT specialists in the overall workforce (4.3%) is above the EU average (3.9%), more than half of the firms that tried to recruit such specialists continue to experience difficulties. The proportion of people with above basic digital skills is slightly above the EU average. While still below the EU average, there was an improvement in the indicators that measure the basic digital skills of the general population. Over the past 2 years, the proportion of people with at least basic digital skills increased from 48% to 53%. The growth rate is higher than the EU average over the same period (1 percentage point), which explains the improvement in the corresponding ranking (18<sup>th</sup> compared to 23<sup>rd</sup> last year).

Ireland continued its efforts to address the shortages in high-level ICT skills. In November 2018, the government launched the €300 million Human Capital Initiative under the Skills and Talent pillar of the *Future Jobs Ireland* framework. Universities can use this special fund (€60 million per year over 5 years) to adapt to the needs of the knowledge-based economy. High-level ICT skills feature prominently among the fund's main objectives. For example, the money can be spent by universities to encourage graduates to reskill in areas with skill shortages and in emerging technologies, e.g. ICT, high-end manufacturing, data analytics, robotics or AI. This would complement Ireland's flagship reskilling programme, Springboard+, which also has a substantial focus on high-level ICT skills. The initiative will also respond to the targets outlined in the National Skills Strategy<sup>(181)</sup> and Technology

(181) [https://www.education.ie/en/Publications/Policy-Reports/pub\\_national\\_skills\\_strategy\\_2025.pdf](https://www.education.ie/en/Publications/Policy-Reports/pub_national_skills_strategy_2025.pdf)

Skills 2022 action plan<sup>(182)</sup>. In addition to efforts to increase the supply of ‘home-grown’ ICT specialists through this and other initiatives, migrant ICT talent continues to play an important role in plugging gaps in the supply of such skills (the proportion of non-Irish workers in ICT is well above the national average of 16%).

As for the general digital skills of the overall population, the Future Jobs Ireland 2019 framework set the target for Ireland to catch up with the EU by 2025. In practice, this would mean that the proportion of people with at least basic digital skills would be equal to or higher than the EU average. Further education and training will play a key role in this: *Future Jobs Ireland 2019* targets the doubling of participation in lifelong learning by 2025. Ireland has not so far published a detailed plan on how to achieve the specific digital skills objective, and no new major policy initiatives have been launched in the past year. When looking at the number of beneficiaries of various further education and training initiatives in 2019, digital skills have not been too prominent. When it comes to transversal core digital skills<sup>(6)</sup> only 9,293 people received training in this out of a total of 177,221<sup>(183)(184)</sup>. As in the previous year, €2.2 million was also allocated to third party organisations under the Digital Skills for Citizens Grant Scheme to provide free basic digital literacy training. Finally, digital skills gaps of the workforce continue to be addressed through the skills infrastructure which includes the National Skills Council, the Regional Skills Fora, the Expert Group on Future Skills Needs and the Skills and Labour Market Research Unit, who have identified programmes such as *Explore* and *Skills to Advance* as being crucial to support low skilled employees upskill and reskill.

Ireland continues to address high-level ICT skill shortages through dedicated schemes supported by funding for universities. At the same time, it recognises the need to improve the general digital skills of the wider population, especially the workforce.

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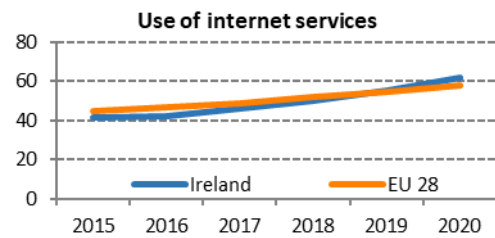
<sup>(182)</sup> <https://www.education.ie/en/Publications/Policy-Reports/technology-skills-2022.pdf>

<sup>(183)</sup> [https://www.solas.ie/f/70398/x/f94d9b8147/15083\\_solas\\_fet\\_services\\_plan\\_2019\\_data\\_sheet\\_web.PDF](https://www.solas.ie/f/70398/x/f94d9b8147/15083_solas_fet_services_plan_2019_data_sheet_web.PDF)

<sup>(184)</sup> As regards specific labour market skills, the ICT sector accounted for only 8042 of the 152 072 beneficiaries.

### 3 Use of internet services

3 Use of internet services	Ireland		EU
	rank	score	score
<b>DESI 2020</b>	<b>8</b>	<b>62.1</b>	<b>58.0</b>
DESI 2019	12	55.4	55.0
DESI 2018	14	50.0	51.8

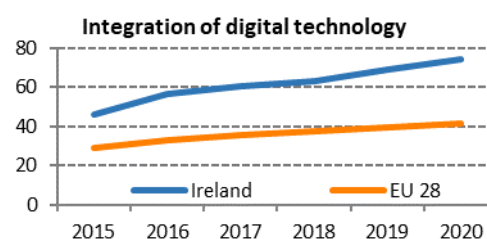


	DESI 2018	Ireland	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
	2017	value	2019	value
<b>3a1 People who have never used the internet</b> % individuals	<b>16%</b>	<b>16%</b>	<b>9%</b>	<b>9%</b>
<b>3a2 Internet users</b> % individuals	<b>79%</b>	<b>80%</b>	<b>88%</b>	<b>85%</b>
<b>3b1 News</b> % internet users	<b>65%</b>	<b>65%</b>	<b>74%</b>	<b>72%</b>
<b>3b2 Music, videos and games</b> % internet users	<b>73%</b>	<b>80%</b>	<b>80%</b>	<b>81%</b>
<b>3b3 Video on demand</b> % internet users	<b>24%</b>	<b>48%</b>	<b>48%</b>	<b>31%</b>
<b>3b4 Video calls</b> % internet users	<b>48%</b>	<b>46%</b>	<b>50%</b>	<b>60%</b>
<b>3b5 Social networks</b> % internet users	<b>72%</b>	<b>73%</b>	<b>70%</b>	<b>65%</b>
<b>3b6 Doing an online course</b> % internet users	<b>5%</b>	<b>5%</b>	<b>14%</b>	<b>11%</b>
<b>3c1 Banking</b> % internet users	<b>71%</b>	<b>70%</b>	<b>75%</b>	<b>66%</b>
<b>3c2 Shopping</b> % internet users	<b>64%</b>	<b>70%</b>	<b>73%</b>	<b>71%</b>
<b>3c3 Selling online</b> % internet users	<b>22%</b>	<b>29%</b>	<b>21%</b>	<b>23%</b>

Ireland ranks 8<sup>th</sup> in the Use of Internet services dimension, up four places from last year with an overall score comfortably above the EU average. The number of internet users increased significantly (from 80% to 88%) and exceeds the EU average. As in other EU countries, Irish internet users engage in a variety of activities online. The most popular online activities are entertainment (music, videos, games), followed by the news, banking and social networks. Online courses are also becoming more and more popular: 14% of internet users did an online course in 2019 compared to only 5% 2 years ago. This is above the EU average (11%).

## 4 Integration of digital technology

4 Integration of digital technology	Ireland		EU
	rank	score	score
<b>DESI 2020</b>	<b>1</b>	<b>74.3</b>	<b>41.4</b>
DESI 2019	1	69.1	39.8
DESI 2018	1	63.4	37.8



	Ireland		EU	
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b> % enterprises	<b>28%</b> 2017	<b>28%</b> 2017	<b>28%</b> 2019	<b>34%</b> 2019
<b>4a2 Social media</b> % enterprises	<b>36%</b> 2017	<b>36%</b> 2017	<b>44%</b> 2019	<b>25%</b> 2019
<b>4a3 Big data</b> % enterprises	<b>NA</b> 2016	<b>20%</b> 2018	<b>20%</b> 2018	<b>12%</b> 2018
<b>4a4 Cloud</b> % enterprises	<b>NA</b> 2017	<b>33%</b> 2018	<b>33%</b> 2018	<b>18%</b> 2018
<b>4b1 SMEs selling online</b> % SMEs	<b>30%</b> 2017	<b>30%</b> 2018	<b>35%</b> 2019	<b>18%</b> 2019
<b>4b2 e-commerce turnover</b> % SME turnover	<b>23%</b> 2017	<b>26%</b> 2018	<b>29%</b> 2019	<b>11%</b> 2019
<b>4b3 Selling online cross-border</b> % SMEs	<b>17%</b> 2017	<b>17%</b> 2017	<b>18%</b> 2019	<b>8%</b> 2019

Ireland maintained its top position in the Integration of digital technology dimension. SMEs in Ireland continue to excel in e-commerce: 35% of them sell online and 18% sell to other EU countries, well above the EU averages of 18% and 8% respectively. 29% of their total turnover comes from online sales, almost three times the EU average of 11%. Irish companies also rank relatively high on the use of big data (20%), cloud services (33%) and social media (44%).

In its March 2019 report, the European Investment Bank said there was scope to improve financing for SMEs looking to adopt digital technologies and/or to develop and supply digital products and technologies. It has subsequently been concluded that existing financing channels were currently sufficient, but there was scope for making better use of them. The government therefore intends to help SMEs make better use of existing financing channels such as the EU COSME pilot scheme launched in October 2019.

While recognising various government initiatives to support the digitisation of businesses<sup>(185)</sup> in Ireland, the European Investment Bank also noted the lack of overall policy coordination and strategies. The Irish Industry 4.0 strategy was launched in December 2019 (see 'Highlight 2020' below) and work is at an advanced stage to adopt a new national digital strategy and an artificial intelligence strategy.

Ireland's ambition to stay at the forefront of technological developments was also reiterated in the *Future Jobs Ireland* framework. €100 million has since been made available to support innovative and transformative technology investments under the Disruptive Technologies Fund. The fund is a

<sup>(185)</sup> For example, the long-running Trading Online Voucher Scheme to help SMEs trade online.

key policy initiative to achieve this goal, and one of its priority areas is ICT. Only projects that involve collaboration between businesses, SMEs and researchers are eligible for funding. This is consistent with Ireland's other initiatives to forge a close relationship between companies and research institutes and to help SMEs profit from such relationships. Technology Centre and Technology Gateway programmes and Knowledge Transfer Ireland<sup>(186)</sup> continue to drive this forward. Furthermore, the European Commission selected CeADAR, Ireland's national centre for applied data analytics and AI, as one of 30 digital innovation hubs to create a network for cross-border cooperation on AI. Helping SMEs benefit from the use of AI is a key aim of this initiative.

The digitisation of SMEs and the development of a vibrant local tech sector continues to be a priority for Ireland. The government recognises the critical role of targeted public funding as well as the need to exploit the considerable synergies between innovation-friendly policies that support both the business sector and the research and education sector.

#### **Highlight 2020: Industry 4.0 strategy**

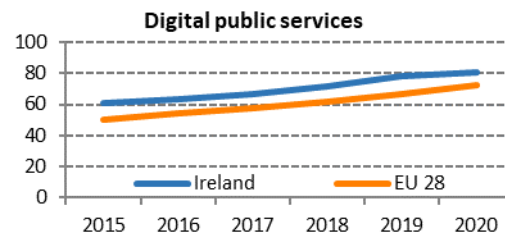
In December 2019, Ireland adopted a comprehensive five-year strategy to support the digital transformation of the manufacturing sector and its supply chain. Besides outlining an overall vision for such a transformation, the strategy also outlines actions to help companies implement complex digital technologies in their manufacturing processes. These include help with technological know-how, including access to 'demonstrators' to allow firms to experiment with individual Industry 4.0 technologies, as well as help with funding. The strategy also outlines actions to ensure that companies have the necessary skills base to adopt digital technologies. In addition, the strategy focuses on maximising the benefits from EU initiatives to help digitise industry.

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<sup>(186)</sup> See the Ireland DESI country profile 2019, available at <https://ec.europa.eu/digital-single-market/en/scoreboard/ireland>

## 5 Digital public services

5 Digital public services	Ireland		EU
	rank	score	score
<b>DESI 2020</b>	<b>9</b>	<b>80.6</b>	<b>72.0</b>
DESI 2019	8	78.1	67.0
DESI 2018	11	71.2	61.8



	DESI 2018 value	Ireland DESI 2019 value	DESI 2020 value	EU DESI 2020 value
<b>5a1 e-Government users</b> % internet users needing to submit forms	77%	72%	76%	67%
<b>5a2 Pre-filled forms</b> Score (0 to 100)	39	67	57	59
<b>5a3 Online service completion</b> Score (0 to 100)	89	88	88	90
<b>5a4 Digital public services for businesses</b> Score (0 to 100) - including domestic and cross-border	99	99	99	88
<b>5a5 Open data</b> % of maximum score	NA	NA	91%	66%

Ireland ranks 9<sup>th</sup> among EU countries in digital public services, dropping one place since last year, but still well above the EU average. It continues to score very high in open data and kept its almost perfect score for digital public services for businesses. 76% of internet users who had to submit forms to public services did this online, which is above the EU average of 67%. This shows a healthy demand for digital public services. However, Ireland's performance in indicators measuring the quality of services for the public (pre-filled forms, online service completion) is average.

The implementation of mid-term strategies continued over the past year. An important step in achieving the goals of these strategies was the adoption of the Data Sharing and Governance Act 2019 in March 2019. It aims to provide the legal basis for public bodies to share data while also setting out appropriate safeguards (in compliance with the General Data Protection Regulation). Effective data sharing is particularly important to make sure that users do not have to provide the same information over and over again for different purposes. This Act and the associated Data Strategy will therefore make it easier to make services more user-friendly and should help improve Ireland's score in the relevant indicators (e.g. on pre-filled forms). Moreover, the planned MyData portal will ensure that the data Government holds and how it is used will be made totally transparent to the citizen.

Progress has also been made on the Digital Services Gateway (gov.ie), a future one-stop shop for all digital public services: over half of the government departments have fully migrated to the platform, with the remaining migrations scheduled for 2020 completion. Customer research and web-site analytics are showing that this approach is working; with more people visiting the portal, staying on its pages for longer, and finding the overall process easier and more satisfying. A new initiative announced in May 2019 aims to create a digital post box service so individuals can receive government letters digitally in a secure electronic mailbox. This would also result in significant cost savings. Making services more user-friendly is also behind the consultation launched by the Office of the Government Chief Information Officer (OGCIO) to identify individuals' difficulties when trying to

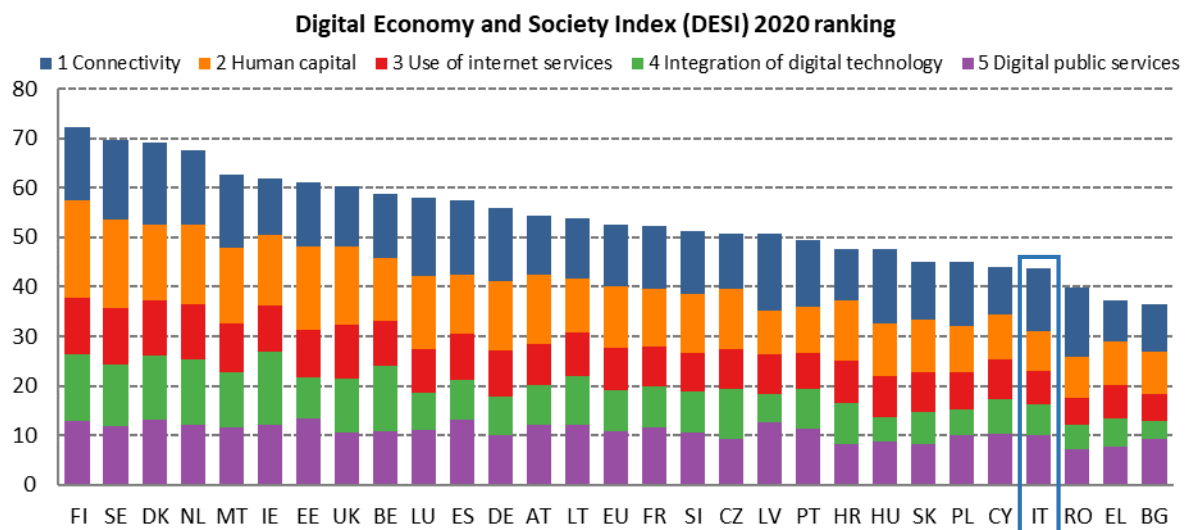
interact digitally with public bodies. OGCIO have also developed a partnership with Trinity Business School in which 120 postgraduate Digital Marketing Strategy students navigate “life events” online and provide constructive criticism to the client departments.

Ireland recognises the need to make its digital public services more user-friendly and is making progress on this. This may improve its average scores in the indicators over time, which measure the experience of not only businesses but also the public.



## Italy

	Italy		EU
	rank	score	score
<b>DESI 2020</b>	<b>25</b>	<b>43.6</b>	<b>52.6</b>
DESI 2019	23	41.6	49.4
DESI 2018	25	36.2	46.5



Italy ranks 25<sup>th</sup> out of 28 EU Member States in the 2020 edition of the Digital Economy and Society Index (DESI). Data prior to the pandemic shows that the country has a good ranking in terms of 5G preparedness, as all the pioneer bands were assigned and the first commercial services were launched. There are significant gaps as regards Human Capital. Compared to the EU average, Italy records very low levels of basic and advanced digital skills. The number of ICT specialists and ICT graduates is also well below the EU average. These gaps in digital skills are reflected in the low use of online services, including digital public services. Only 74% of Italians are regular internet users. Although the country ranks relatively high in its offer of e-government services, public take-up remains low. Similarly, Italian enterprises lag behind in the use of technologies such as cloud and big data, as well as in the uptake of e-commerce.

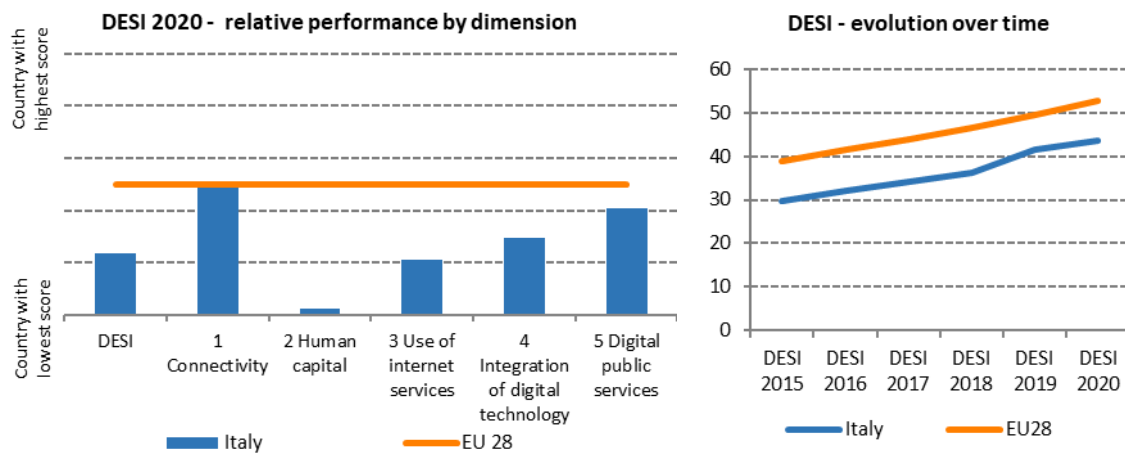
In 2019, there was a heightened focus at political level on boosting the digitisation of the Italian economy and society. The year was marked by the launch of new initiatives and notably the establishment of a new Ministry for Technological Innovation and Digitisation, acting as coordinator. In December 2019, the ministry presented the strategy *'Italia 2025'*, a five-year plan that puts digitisation and innovation at the centre of a 'process for the structural and radical transformation of the country'.

The pace of implementation of major projects to help digitise the public administration increased significantly in 2019. A new 'Three-Year Plan for Information Technology in Public Administration' set out a comprehensive list of targets for the next few years, with the objectives of promoting the digital transformation of the Italian administration and driving the uptake of digital technologies.

Regarding the digitisation of businesses, the government renewed the National Plan 'Enterprise 4.0' and launched 'Transition 4.0', with a stronger focus on innovation, green investment and participation of SMEs. In addition, in March 2020, the government launched the National Innovation

Fund with an initial budget of €1 billion and operating on the basis of Venture Capital methodologies, to support investment in innovative enterprises.

Lastly, in 2019, the government started work on two national strategies, one on Artificial Intelligence (AI) and another on Blockchain, with the support of groups of experts from industry, academia and social partners.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Italy has taken a large number of digital-related initiatives to deal with COVID-19 crisis. The government adopted a package of measures aimed at coping with the increase in the consumption of electronic communications services and of network traffic. Free Wi-Fi connections were provided to public hospitals.

The government devoted attention to schools, by supporting the adoption of digital instruments and platforms, the provision of devices to less well-off students, and the access to ultrafast connections and related services.

Simplified procurement measures were introduced to facilitate the purchase of IT goods and services by public administrations.

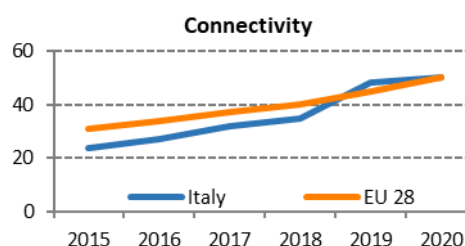
A number of initiatives focused on the use of data against the pandemic. The government also invited the private sector and associations to offer their products or services for free and help citizens, professionals and companies to continue their activities.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Italy is very advanced on 5G but it lags behind in the

deployment of Very High Capacity Networks (VHCN). The country has a weak performance in digital skills and the digitisation of businesses, while the uptake of digital public services remains low.

# 1 Connectivity

1 Connectivity	Italy		EU
	rank	score	score
DESI 2020	17	50.0	50.1
DESI 2019	12	48.2	44.7
DESI 2018	25	35.1	39.9



	Italy			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>1a1 Overall fixed broadband take-up</b>	<b>57%</b>	<b>60%</b>	<b>61%</b>	<b>78%</b>
% households	2017	2018	2019	2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b>	<b>5%</b>	<b>9%</b>	<b>13%</b>	<b>26%</b>
% households	2017	2018	2019	2019
<b>1b1 Fast broadband (NGA) coverage</b>	<b>87%</b>	<b>88%</b>	<b>89%</b>	<b>86%</b>
% households	2017	2018	2019	2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b>	<b>22%</b>	<b>24%</b>	<b>30%</b>	<b>44%</b>
% households	2017	2018	2019	2019
<b>1c1 4G coverage</b>	<b>91%</b>	<b>97%</b>	<b>97%</b>	<b>96%</b>
% households (average of operators)	2017	2018	2019	2019
<b>1c2 Mobile broadband take-up</b>	<b>86</b>	<b>89</b>	<b>89</b>	<b>100</b>
Subscriptions per 100 people	2017	2018	2019	2019
<b>1c3 5G readiness</b>	<b>NA</b>	<b>60%</b>	<b>60%</b>	<b>21%</b>
Assigned spectrum as a % of total harmonised 5G spectrum		2019	2020	2020
<b>1d1 Broadband price index</b>	<b>NA</b>	<b>NA</b>	<b>73</b>	<b>64</b>
Score (0 to 100)			2019	2019

With an overall connectivity score of 50.0, Italy ranks 17<sup>th</sup> among EU countries. Overall fixed broadband take-up increased by one percentage point compared to 2018. The at least 100 Mbps fixed broadband take-up increased from 9% in 2018 to 13% in 2019. Mobile broadband take-up (89 subscriptions per 100 people) remained stable in comparison to 2018. All the above data on take-up are below the respective EU average. With regard to coverage, NGA coverage continued to increase but only by one percentage point, reaching 89% of households and thereby outstripping the EU average (86%) by three percentage points. As regards VHCN coverage, Italy increased the pace of fibre deployment but is still lagging behind (only 30%), compared with the EU average of 44% (which however also includes upgrades of cable networks to DOCSIS 3.1)<sup>(187)</sup>. In terms of 5G readiness<sup>(188)</sup>

<sup>(187)</sup> According to AGCOM in Italy, thanks to the short copper lines and the use of VDSL2 technology, at least two thirds of the FTTC lines support the speed of 100Mbps.

<sup>(188)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

Italy performs well above the EU average. Also as to prices, Italy performs above the EU average in all price baskets considered (fixed, mobile, converged). Italy's score in the Broadband price index is 73 against an EU average of 64.

The Italian ultra-broadband strategy aims at achieving the objective of Gigabit society<sup>(189)</sup>.

In 2019, Italy completed Phase I of the ultra-broadband Italian plan for white areas (so-called 'C&D areas') and awarded the last of the three tenders to the wholesale-only operator Open Fiber. The practical roll-out of the plan is now fully underway but remains beset by serious delays. One of the main reasons behind these delays is the difficulty in accessing existing infrastructure and in obtaining permits. A partial solution to this problem has been found thanks to the *Conferenza di Servizi*, a legal instrument aimed at simplifying procedures involving the public administration. This has produced positive results in the regions where it was implemented. Italy also brought in new legal provisions with the 2019 Simplification Decree aimed at accelerating the permit-granting process. According to the Italian authorities, in mid-April 2020, work had begun in over 2,600 municipalities and the infrastructure has been completed in 600 municipalities.

Italy is considering further measures as part of a Phase II of the Italian broadband plan, which may include vouchers to encourage take-up and may frame an investment plan for grey areas.

Black areas have seen an increase in infrastructure competition, confirming the trend seen over the past years.

In 2019, as part of the WiFi.Italia.It project, the Italian government launched the 'Piazza Wi-Fi Italia' project. With a dedicated fund of €45 million, this involves installing new public Wi-Fi hotspots, extending the previous intervention aimed primarily at small municipalities (with fewer than 2,000 inhabitants) and to the municipalities affected by the 2016 earthquake. At the end of March 2020, 2,896 municipalities had joined the project and the authorities launched the procedure for installing the Wi-Fi hotspot in 1,112 of them.

Italy is ranked third on the 5G readiness indicator. 94% of the spectrum harmonised at EU level for wireless broadband has been assigned in Italy. 5G trials, which started in 2017, are still ongoing, both as part of the programme launched by the Ministry of Economic Development '5 cities for 5G' and under voluntary agreements between operators and municipalities. In 2019, some Italian operators started the commercialisation of 5G offers in the main cities. Italy completed the auction of the three '5G pioneer bands' in 2018. For these bands, although 3.6 GHz and 26 GHz are already assigned and available, the Italian authorities are still adopting the measures needed to make 700 MHz available by 2022. The delay in meeting the deadline of 30 June 2020 set by the UHF Decision (EU) 2017/899 is mainly due to the need to ensure, and the complexity of ensuring, the technical migration of large swathes of the population to advanced broadcasting standards. 5G commercial services have been launched in some of the assigned and available bands. The 26 GHz spectrum is being currently used, mainly for FWA testing.

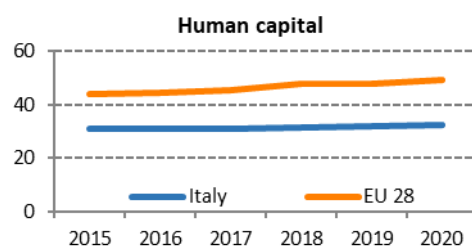
Italy confirms the rising trend in infrastructure-based competition and implementation of the ultra-broadband plan is now fully ongoing. Some steps are being taken to address the ongoing delays in the completion of works in white areas.

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<sup>(189)</sup> See <https://ec.europa.eu/digital-single-market/en/policies/improving-connectivity-and-access>.

## 2 Human capital

2 Human capital	Italy		EU
	rank	score	score
<b>DESI 2020</b>	<b>28</b>	<b>32.5</b>	<b>49.3</b>
DESI 2019	26	32.0	47.9
DESI 2018	27	31.6	47.6



	Italy			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b>	<b>NA</b>	<b>NA</b>	<b>42%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>NA</b>	<b>NA</b>	<b>22%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>NA</b>	<b>NA</b>	<b>45%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>2.6%</b>	<b>2.6%</b>	<b>2.8%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>0.9%</b>	<b>1.0%</b>	<b>1.0%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>NA</b>	<b>1.0%</b>	<b>1.0%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

In 2019, Italy dropped two places and now ranks last in the EU on the Human Capital dimension. Only 42% of people aged 16-74 years have at least basic digital skills (58% in the EU) and only 22% have above basic digital skills (33% in the EU). Although the percentage of ICT specialists in Italy increased to reach 2.8% of total employment, it is still below the EU average (3.9%). Italy's share of graduates holding an ICT degree remained stable compared to DESI 2019 (on the basis of 2016 data). Only 1% of Italian graduates are ICT graduates (the lowest in the EU), while female ICT specialists are 1% of all female employees (slightly below the EU average of 1.4%).

In terms of policy response, Italy incorporates measures on digital skills into several sectoral strategies.

In primary and secondary schools, implementation of the National Plan for Digital Schools<sup>(190)</sup> is gradually progressing, although not all Italian schools run education projects on digital skills or offer courses on computational thinking. A positive development is the new obligation for teachers to have coding competences<sup>(191)</sup>.

As in previous years, in 2019, many Italian schools participated in EU Code Week, which attracted some 621,000 people across the country to participate in almost 17,500 events.

Measures to support advanced digital skills are included in the National Plan 'Enterprise 4.0'. Under this plan, the government activated the tax credit for 'Training 4.0' in 2018 and extended it to 2020. However, data on the first years of implementation shows that uptake of the tax credit was

<sup>(190)</sup> *Piano Nazionale Scuola Digitale* — PNSD.

<sup>(191)</sup> Law of 20 December 2019, n. 15 (*Decreto Scuola 2020*).

significantly lower than expected<sup>(192)</sup>, because of regulatory constraints. The new plan ‘Transition 4.0’ extends the measure and simplifies its implementation to increase uptake.

Actions also focused on strengthening post-secondary technical education and vocational training institutes (*‘Istituti Tecnici Superiori’*, or ‘ITS’). In 2019, the ‘ITS 4.0’ project involved over 1,170 ITS students and about 130 partner companies in 106 technological innovation projects focusing on technologies such as 3D printing, virtual reality and big data. ‘Transition 4.0’ reinforces the role of ‘ITS’, by including them among the institutes that can provide ‘Training 4.0’ under the tax credit scheme.

Finally, the government tackles digital skills in *‘Italia 2025’*, its five-year strategy for innovation and digitisation launched in 2019<sup>(193)</sup>. In particular, the strategy includes ‘Digital Republic’, an initiative promoted and coordinated by the Ministry for Technological Innovation and Digitization<sup>(194)</sup>. The initiative aims to build an alliance between public and private organisations and citizens, and invite them to take concrete action to promote digital skills. ‘Digital Republic’ focuses on three lines of action: (i) boosting basic digital skills; (ii) promoting upskilling and reskilling of the workforce; and (iii) developing ICT and emerging technologies skills. It also includes a project to provide senior citizens, especially those living in small and isolated towns, with a tablet and assistance by volunteers<sup>(195)</sup>.

Shortly after the launch of the initiative, over 60 stakeholders had already joined the ‘Digital Republic’, including businesses, municipalities and other public entities, and associations.

In the context of the ‘Digital Republic’, Italian authorities set up a national Digital Skills and Job Coalition.

Italy is taking initiatives to increase digital skills and address e-inclusion. Intensifying and bringing together efforts would help reduce the digital divide amongst the population and ensure that most have at least basic digital skills. A comprehensive approach to upskilling and reskilling of the workforce including an increase in advanced digital skills would also be an important step.

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<sup>(192)</sup> Ministry of Economic Development (MISE), *Transizione 4.0*.

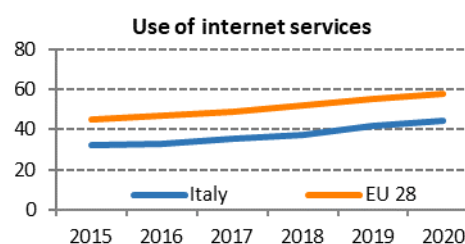
<sup>(193)</sup> *Strategia per l’innovazione tecnologica e la digitalizzazione del Paese* ([https://innovazione.gov.it/assets/docs/MID\\_Book\\_2025.pdf](https://innovazione.gov.it/assets/docs/MID_Book_2025.pdf)).

<sup>(194)</sup> <https://innovazione.gov.it/it/repubblica-digitale/#linee-d-azione>. The initiative is steered by an inter-ministerial coordination board.

<sup>(195)</sup> *‘Un anziano, un tablet e un sorriso per l’inclusione digitale’*, not started yet.

### 3 Use of Internet services

3 Use of internet services	Italy		EU
	rank	score	score
<b>DESI 2020</b>	<b>26</b>	<b>44.5</b>	<b>58.0</b>
DESI 2019	26	41.7	55.0
DESI 2018	26	37.4	51.8



	Italy			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>3a1 People who have never used the internet</b>	<b>22%</b>	<b>19%</b>	<b>17%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>69%</b>	<b>72%</b>	<b>74%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>56%</b>	<b>56%</b>	<b>58%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>79%</b>	<b>79%</b>	<b>79%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>15%</b>	<b>23%</b>	<b>23%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>39%</b>	<b>47%</b>	<b>65%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>61%</b>	<b>63%</b>	<b>56%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>8%</b>	<b>8%</b>	<b>9%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>43%</b>	<b>46%</b>	<b>48%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>44%</b>	<b>47%</b>	<b>49%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>11%</b>	<b>11%</b>	<b>11%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

Overall, the Use of Internet services in Italy remains well below the EU average. Its ranking remained the same as in the previous report, 26<sup>th</sup> out of 28 Member States.

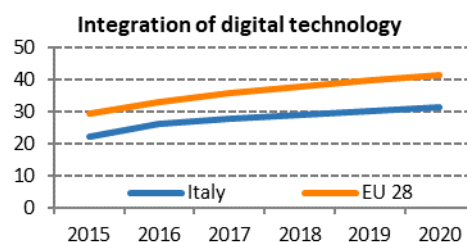
The low use of internet services reflects the low level of digital skills. 17% of people living in Italy have still never used the internet; this is almost double the EU average and places the country 23<sup>rd</sup> in the EU. The most popular online activities are listening to music, watching videos or playing games, followed by making video calls, reading news and using social networks. Doing a course online and selling online are the least popular activities.

The indicators remained overall stable over the last year. None of the online activities monitored scored above the EU average, except for video calls, used by 65% of internet users (above the EU average of 60%). This is the only activity that increased significantly since the previous year (from 47% in 2018).



## 4 Integration of digital technology

4 Integration of digital technology	Italy		EU
	rank	score	score
<b>DESI 2020</b>	<b>22</b>	<b>31.2</b>	<b>41.4</b>
DESI 2019	23	30.0	39.8
DESI 2018	22	29.1	37.8



	Italy			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>4a1 Electronic information sharing</b>	<b>37%</b>	<b>37%</b>	<b>35%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>17%</b>	<b>17%</b>	<b>22%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>9%</b>	<b>7%</b>	<b>7%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>NA</b>	<b>15%</b>	<b>15%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>8%</b>	<b>10%</b>	<b>10%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>6%</b>	<b>8%</b>	<b>8%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>6%</b>	<b>6%</b>	<b>6%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

Italy ranks 22<sup>nd</sup> in the EU on the Integration of digital technology. There has been almost no progress on the above indicators, except for the use of social media. The percentage of enterprises using social media increased to 22% (close to the EU average of 25%). The use of cloud services remained stable (used by 15% of Italian enterprises) and just below the EU average (18%). Despite a decrease between 2017 and 2019, the use of electronic information sharing remains higher among Italian enterprises than the EU average (35% of Italian enterprises, against the EU average of 34%). The gap between Italy and the EU is widening regarding e-commerce. Only 10% of Italian SMEs sell online (well below the EU average of 18%), 6% sell across border to other EU countries (8% in the EU), and they generate on average 8% of their turnover from online sales (11% in the EU).

The National Plan 'Enterprise 4.0' (i.e. *Piano Nazionale Impresa 4.0*), launched in 2016<sup>(196)</sup>, has been a key instrument to support the digital transformation of Italian enterprises. Tax deductions for investment in capital goods (i.e. super- and hyper-depreciation) were among the most significant measures in the plan, and they have proved to be effective in stimulating investment. However, these measures were mainly used by medium and large enterprises, and especially for investment in tangible (i.e. machinery) rather than intangible goods<sup>(197)</sup>.

On this basis, with the 2020 budget law, the Ministry of Economic Development (MISE) allocated €7 billion to a new 'Transition 4.0' plan (*Transizione 4.0*), redefined support measures and adopted a

<sup>(196)</sup> In 2016, the plan was introduced as 'Industry 4.0' and it was re-named 'Enterprise 4.0' in 2017.

<sup>(197)</sup> Based on: ISTAT, Rapporto Annuale 2019; preliminary data provided by the MISE; and Letter of the Minister of Economic Development Patuanelli to 'Il Sole 24 ore', 18 December 2019.

multi-annual planning approach to provide enterprises with a stable scenario. The changes introduced with 'Transition 4.0' are expected to facilitate SMEs access to tax credits for research, development and innovation, and to increase the number of beneficiary firms by 40%. Moreover, the plan emphasizes innovation, green investment and intellectual property, with attention on the sectors that characterize the 'Made in Italy'<sup>(198)</sup>.

At the end of 2019, the government also activated the vouchers for innovation managers, to help SMEs in their digital transformation processes and the adoption of Industry 4.0 technologies (e.g. big data, cloud, cybersecurity, robotics).

Another important development was the launch of the National Innovation Fund, with an initial budget of €1 billion. The Fund operates on the basis of Venture Capital methodologies and, by leveraging public and private resources, supports investment in start-ups, scale-ups and innovative SMEs<sup>(199)</sup>.

In Italy, there is a network of Competence Centres<sup>(200)</sup> financed by the MISE, and a significant number of support centres for SMEs, such as the Digital Innovation Hubs (run by business associations) and *Punti Impresa Digitale* (operating within the chambers of commerce). Although with different scopes of action and specialisation levels, these centres contribute to bringing together enterprises, Universities, research institutes and technology experts and play an important role when it comes to raising awareness of digital transformation, providing services and networking opportunities. In collaboration with *Unioncamere* (union of chambers of commerce), the government began mapping the activities and areas of specialisation of existing centres. The results are expected to feed into an 'Atlas 4.0' (*Atlante 4.0*), a portal to showcase and raise awareness of the range of organisations that support technology transfer and digital transformation.

Regarding new digital technologies, the country is one of eight hosting sites of a pre-exascale class computer funded by the EuroHPC Joint Undertaking. Italy is involved in European projects in the field of quantum computing, such as CiViQ, 2D-SIPC, and Quantum Flagship. Emerging technologies are also targeted by the national initiative 'House of emerging technologies', aimed to boost the uptake of technologies such as AI, blockchain and Internet of Things by SMEs. In its framework, at the end of 2019, the government signed an agreement for the setting up of the first 'House' in Matera<sup>(201)</sup>.

In 2019, the government launched two new national strategies, one on AI and another on Blockchain, with the support of groups of experts from industry, academia and social partners. The draft strategy on AI was opened for public consultation; it takes a comprehensive approach, including on aspects related to ethics, trust and education policies<sup>(202)</sup>. Regarding Blockchain, the group of experts appointed by the government provided scientific and technical support on a number of aspects linked to Distributed Ledger Technologies and, at the end of 2019, delivered a draft that will form the basis for the future National Strategy on Blockchain.

The government also announced a number of initiatives to support the development and uptake of key technologies, such as Artificial Intelligence, robotics and cybersecurity in its 'Italy 2025' strategy.

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<sup>(198)</sup> <https://www.mise.gov.it/index.php/it/transizione40>.

<sup>(199)</sup> <https://www.mise.gov.it/index.php/en/news/en/202-news-english/2039363-the-national-innovation-fund-unveiled>.

<sup>(200)</sup> The Competence Centres are expected to be fully operational in 2020.

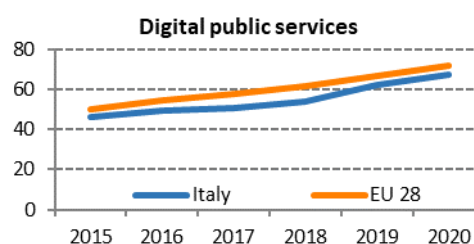
<sup>(201)</sup> <https://www.mise.gov.it/index.php/it/per-i-media/notizie/it/198-notizie-stampa/2040587-al-via-la-casa-delle-tecnologie-emergenti-di-matera>.

<sup>(202)</sup> <https://www.mise.gov.it/images/stories/documenti/Strategia-Nazionale-Intelligenza-Artificiale-Bozza-Consultazione.pdf>.

Providing for a stable framework, refocusing incentives on SMEs, and increasing the effectiveness and outreach of support services are all steps in the right direction. A systemic approach over time, greater investment and involvement of all relevant players are all important elements to raise the level of digitisation of Italian SMEs and boost the digital economy of the country.

## 5 Digital public services

5 Digital public services	Italy		EU
	rank	score	score
<b>DESI 2020</b>	<b>19</b>	<b>67.5</b>	<b>72.0</b>
DESI 2019	19	61.9	67.0
DESI 2018	22	54.1	61.8



	Italy			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>5a1 e-Government users</b>	<b>30%</b>	<b>37%</b>	<b>32%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>33</b>	<b>48</b>	<b>48</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>89</b>	<b>91</b>	<b>92</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>81</b>	<b>82</b>	<b>94</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>77%</b>	<b>66%</b>
% of maximum score			2019	2019

Italy ranks 19<sup>th</sup> in the EU on Digital public services, as it did in 2019. This places the country below the EU average, even though Italy performs well regarding the offer of digital services and open data. Italy outperforms the EU on online service completion, digital public services for businesses and open data. The low overall ranking of the country is due to the low level of online interaction between public authorities and the general public. Only 32% of Italian online users engage actively with e-government services (compared with the EU average of 67%). This figure even decreased between 2018 and 2019.

The establishment of the new Ministry for Technological Innovation and Digitisation in September 2019 represented a significant novelty in the governance of policies for the digitisation of public services. The new ministry took the lead on the digitisation of public administration and integrated the Digital Transformation Team. The tasks of the Digital Italy Agency (AgID), in charge of implementing the Italian Digital Agenda, are expected to be reorganised.

The strategy *'Italia 2025'* gives the public administration a central role as an enabler and driver of innovation and digitisation in Italy. Moreover, in March 2019, the government adopted a new *'Three-Year Plan for Information Technology in the Public Administration 2019 – 2021'*<sup>(203)</sup>. The plan sets out a comprehensive list of actions and places particular emphasis on the adoption of a cloud paradigm in the public administration with the objective of rationalising the current digital infrastructure and services and improve their security, efficiency, and reliability. The plan also reiterates the importance of people 'responsible for digital transformation' (RTD), i.e. designated officers in charge of supporting digital transformation in their administration. 2019 saw an exponential growth in the number of RTD appointments throughout the public administration.

<sup>(203)</sup> It follows and updates the previous plan to cover the period 2017-2019.

The implementation of key e-government projects accelerated notably in 2019.

The uptake of the eIDAS-compliant e-identity system (*Sistema Pubblico di Identità Digitale* or SPID) significantly increased to reach 5.5 million citizens in January 2020 (from 3.4 million at the beginning of 2019). However, the number of public administrations providing access to digital public services through the SPID remained relatively stable (4,100, against a target of 10,000 administrations in 2020). In parallel, use of the electronic identity card (CIE, notified under the eIDAS Regulation) is picking up, with 99.9% of Italian municipalities able to issue it, and 97.8% of citizens covered.

Centralising the digital population registries (*Anagrafe Nazionale Popolazione Residente* or ANPR) is another major project that aims to consolidate into a single register personal information spread across 8,000 administrations and increase efficiency and simplification. Implementation of this project improved between 2019 and 2020 and saw an increase from 21% of target administrations covered at the beginning of 2019 to 68% at the beginning of 2020.

The number of electronic payments made to the public administration (through PagoPA) rose sharply from around 13,000 transactions in 2018 to 42,500 in 2019<sup>(204)</sup>.

Regarding cybersecurity, Italy launched the pilot phase of a National Cyber-Attack Platform in 2019. It enables the automated exchange of information between public administrations on cyber risks, with the objective of preventing and responding to cyber attacks.

Italy has received €316 million in co-funding from the European Regional Development Fund for projects related to e-government services and applications.

Overall, the acceleration seen in 2019 in implementing key e-government projects may make up for the delays accumulated over previous years and bring Italy closer to the targets. Sustained and extended action is important to achieve digitisation in all areas and in all local administrations. The setting up of a new Minister is expected to rationalise the current governance system and streamline the complex set of institutions involved.

#### **Highlight 2020: Mobile access to digital public services - App IO.it**

In 2019 the government started the testing of 'IO', an application for mobile devices that facilitates the interaction between citizens and the Public Administration. The app allows citizens to receive messages, documents and notifications of deadlines from public administrations, as well as to request information and official certificates, or execute payments through their mobile phone or tablet. Around 1,000 citizens have tested the app, in large and small municipalities, and it is due to be fully rolled out in the course of 2020.

The app is expected to increase uptake of some public services, both at national and local level, by making them easily accessible through mobile devices.

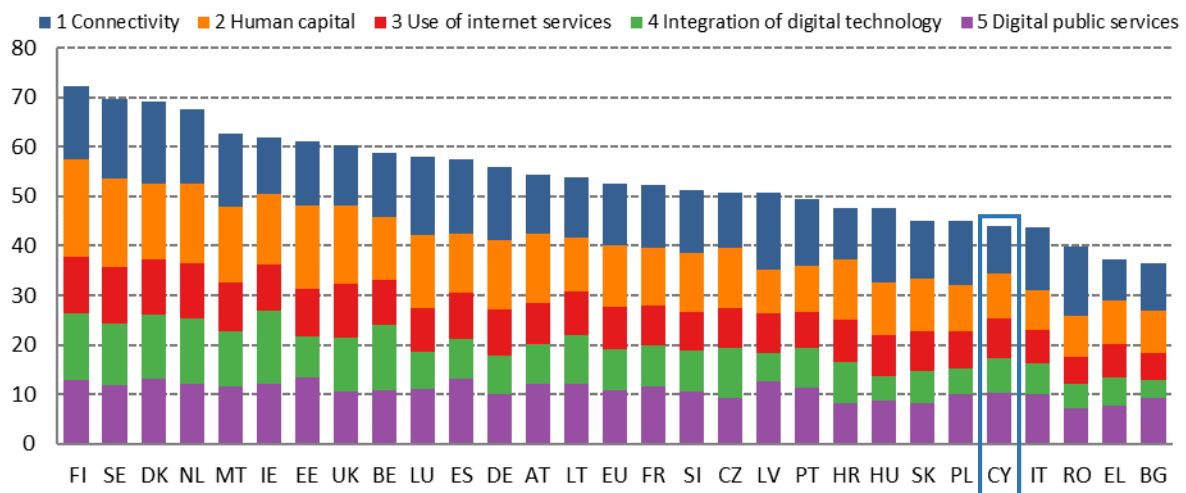
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<sup>(204)</sup> Newco (fully controlled by the Ministry for economy and finance) was created in 2019 to manage the pagoPA.

## Cyprus

	Cyprus		EU
	rank	score	score
<b>DESI 2020</b>	<b>24</b>	<b>44.0</b>	<b>52.6</b>
DESI 2019	24	41.5	49.4
DESI 2018	23	39.4	46.5

**Digital Economy and Society Index (DESI) 2020 ranking**



Cyprus ranks 24<sup>th</sup> out of the 28 EU Member States in the 2020 edition of the European Commission’s Digital Economy and Society Index (DESI).

Based on data prior to the pandemic, Cyprus has improved its results (scores) on all DESI dimensions, although it still scores below the EU average. Cyprus has made most progress in connectivity and use of internet.

Cyprus ranks above the EU average on mobile broadband take-up but well below the EU average on the take-up of fast broadband. Almost an eighth of Cypriots have never used the internet, and half lack basic digital skills. Despite growing demand in the labour market, the supply of ICT specialists is still below the EU average.

The current ‘Digital Strategy for Cyprus<sup>(205)</sup>’, which started in 2012 and was updated in 2015 and in 2018, is in line with the objectives and measures proposed in the ‘Digital Agenda for Europe<sup>(206)</sup>’, and is set to contribute substantially to economic growth and productivity. The strategy focuses on digital literacy for all businesses and unemployed people, on involving all citizens in lifelong learning programmes and on promoting digital education by using ICT to upgrade and reform the educational process. It also covers e-inclusion issues, digital entrepreneurship and public use of broadband and ICT services. The new digital strategy, which is in the process of being developed, aims to achieve the digital transformation of the public sector, to promote the digital transformation of the private sector, and to promote innovation in line with the country’s level of digital maturity. Cyprus plans to publish the strategy in the second half of 2020. Cyprus has a cybersecurity strategy in place since

<sup>(205)</sup> [http://www.mcw.gov.cy/mcw/dec/digital\\_cyprus/ict.nsf/3700071379D1C658C2257A6F00376A80/\\$file/Digital%20Strategy%20for%20Cyprus-Executive%20summary.pdf](http://www.mcw.gov.cy/mcw/dec/digital_cyprus/ict.nsf/3700071379D1C658C2257A6F00376A80/$file/Digital%20Strategy%20for%20Cyprus-Executive%20summary.pdf)

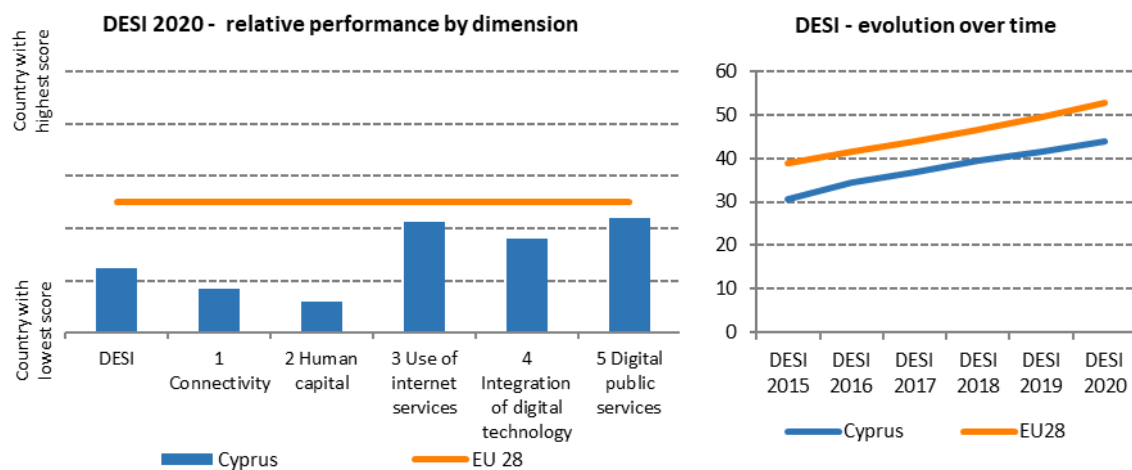
<sup>(206)</sup> [https://europa.eu/european-union/file/1497/download\\_en?token=KzfSz-CR](https://europa.eu/european-union/file/1497/download_en?token=KzfSz-CR)

2012<sup>(207)</sup>. The Digital Security Authority has proposed a new cybersecurity strategy, which is pending final approval from the Ministry of Communication and the Council of Ministers.

The ‘Cyprus National Reform Programme<sup>(208)</sup>’, published in 2015 and updated in 2018 and in April 2019, is in line with the Commission’s ‘Annual Growth Survey’. A ‘Competitiveness Report’ will provide an analytical tool to make a comprehensive assessment of Cyprus’ performance, facilitate dialogue between public and private sectors and help drive the agenda for reform to boost competitiveness.

The Council of Ministers adopted the new ‘Cyprus Industrial Strategy Policy<sup>(209)</sup>’ for 2019-2030 in May 2019, and it is currently in the process of being implemented.

In January 2020, the government approved a national strategy on artificial intelligence (AI). To steer implementation of the strategy, Cyprus created a new Deputy Ministry of research, innovation and digital policy, established in March 2020. The Ministry has the overall responsibility for the digital policy and digital transformation of the country including e-government and research and innovation.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public

<sup>(207)</sup> <https://www.enisa.europa.eu/topics/national-cyber-security-strategies/ncss-map/national-cyber-security-strategies-interactive-map/strategies/national-cyber-security-strategy-cyprus/view>

<sup>(208)</sup> <https://ec.europa.eu/info/sites/info/files/2019-european-semester-national-reform-programme-cyprus-en.pdf>

<sup>(209)</sup> <https://www.cyprusprofile.com/en/sectors/manufacturing-and-industry/>

services.

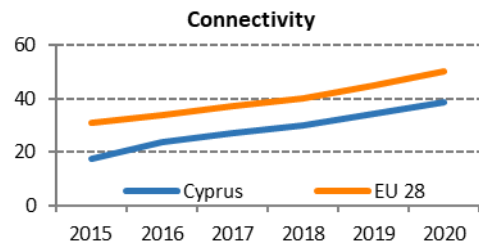
Cyprus has taken a large number of targeted measures in digital to deal with the COVID-19 crisis. Initiatives to minimise contagion and to support e-health solutions for patients and healthcare service providers include among others a dedicated call centre (1420), interactive voice response and text messaging for any movement of citizens. Additionally, Cyprus has launched a data register for tracking confirmed COVID-19 cases (COVID-19 platform), a location tracker of citizens/suspected cases (COVTRACKER) and a platform illustrating the spread of the virus (WEBGIS COVID-19). In the area of education, various online activities were developed to facilitate the provision of the best possible education to students of all levels. At the same time, supportive educational materials have been uploaded to the “Ministry of Education and Culture” and individual school webpages, for all students of all grades. Digitisation of the public administration is also being accelerated, enabling citizens to use their e-banking credentials to engage with e-government services. Tele-working has also been promoted for civil servants through the use of services supporting remote access and teleconferencing.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Cyprus has not yet assigned any radio spectrum for 5G services. The levels of basic digital skills remain low compared to the EU average. In addition, Cyprus has a relatively weak performance in the digitisation of businesses and in digital public services.



# 1 Connectivity

1 Connectivity	Cyprus		EU
	rank	score	score
DESI 2020	27	38.5	50.1
DESI 2019	27	34.6	44.7
DESI 2018	27	30.0	39.9



	DESI 2018	Cyprus	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
<b>1a1 Overall fixed broadband take-up</b> % households	76%	85%	87%	78%
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	0%	2%	2%	26%
<b>1b1 Fast broadband (NGA) coverage</b> % households	88%	90%	100%	86%
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	0%	1%	10%	44%
<b>1c1 4G coverage</b> % households (average of operators)	77%	94%	98%	96%
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	100	110	117	100
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	NA	0%	0%	21%
<b>1d1 Broadband price index</b> Score (0 to 100)	NA	NA	38	64

Cyprus ranks 27<sup>th</sup> in Connectivity, scoring 38.5, compared to 50.1 the EU average. While its ranking has remained stable, its distance from the EU average has increased, compared to 2019. Cyprus performs well in fast broadband (NGA) coverage (100%, ranking at the top). The same is true of fixed broadband take-up (87%, ranking 5<sup>th</sup>) and mobile broadband take-up (117 subscriptions per 100 people, 8<sup>th</sup>). In these categories, Cyprus is above the EU average and its scores have been improving. On the other hand, it still lags behind in at least 100 Mbps fixed broadband take-up, in fixed very high capacity network (VHCN) coverage and in the broadband price index. In these categories, it ranks among the lowest in the EU (respectively 27<sup>th</sup>, 26<sup>th</sup> and 28<sup>th</sup> among the 28 EU member states). Concerning VHCN coverage, Cyprus has shown a remarkable increase in 2019, from 1% to 10%. However, it remains close to the bottom and sees the difference from the EU average increase. On the other hand, the take-up of at least 100 Mbps remains stalled at a very low level (2%). At the same time, Cyprus remains close to the bottom of the price ranking, being among the three most expensive countries in almost all baskets above 100 Mbps<sup>(210)</sup>.

Cyprus is making progress in deploying very high capacity networks. All the main operators are seeking to deploy fibre networks. According to the Cypriot authorities, the incumbent has already connected over 61,000 homes, ahead of its 2019 target, and has increased its offer with speeds up

<sup>(210)</sup> The only exceptions are the 100-200 Mbps 2-play and 3-play baskets, where Cyprus is the 5<sup>th</sup> most expensive country.

to 300 Mbps. At the same time, one competitor has started a pilot project in the suburbs of Nicosia and is in the process of deploying a fibre network in Pafos. The Cypriot authorities are in the process of updating the national broadband plan for the period 2021-2025 and aim to have it ready by mid-2021. An important element of this new plan is to expand ultra-high speed networks, looking into using EU funding and focusing on digitally excluded, rural areas. Meanwhile, Cypriot authorities continue to implement demand stimulating measures as part of the 2019-2020 national broadband plan<sup>(211)</sup>. They include awareness campaigns, e-government projects and subsidies for new or upgraded subscriptions to ultra-fast speed networks.

All major operators are keen to invest in 5G, having in mind that national authorities have set concrete targets for the award of 5G spectrum. Currently, Cyprus scores 0% on the 5G readiness indicator as it has not assigned any of the pioneer bands<sup>(212)</sup>. The Cypriot authorities are moving forward with the auction of the 5G spectrum. While the initial plan was to award the right to use the bands by July 2020, this has been postponed to end 2020, due to the COVID-19 outbreak. The auction will include the 3.4-3.8 GHz band and the 700 MHz band but it will not include the 26 GHz band because the market has not shown interest. The 3.4-3.8 GHz band is currently not in use. For the 700 MHz band, the ministry has reached an agreement with the broadcaster, Velister, to free the band in September 2020, but this will also be delayed, as a result of the COVID-19 outbreak. The main issue with the effective use of this band is interference from areas that are not under the effective control of the Republic of Cyprus. Cypriot authorities expect that such interference will cease by September 2020, in view of parallel migration from TV to mobile telephony use. This is, of course, a pre-requisite for effective utilisation of the band. The reluctance of some local authorities to grant permits for antenna masts and delays in permit-granting procedures are another major challenge in developing 5G networks and services.

Cyprus is boosting its coverage of very high-speed networks and increasing its ability to benefit from the digital economy. The main challenges in improving take-up of high-speed broadband continue, stemming from a number of factors including the lack of demand and the retail pricing structure adopted by the operators, according to the Cypriot authorities<sup>(213)</sup>. Market players seem keen to invest in new networks and launch 5G services. National authorities have set specific targets for the award of 5G spectrum and have taken the steps needed to free the 700 MHz band, which are slightly delayed due to the COVID-19 outbreak. However, they anticipate interference in areas that are not under the effective control of the Republic of Cyprus to cease in autumn 2020.

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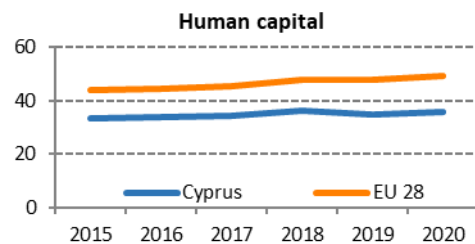
<sup>(211)</sup> 'Αναθεωρημένο ευρυζωνικό πλάνο της Κύπρου 2016-2020', published on 18/1/2019.

<sup>(212)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

<sup>(213)</sup> According to Statistical Service the main reason for households not upgrading the Internet connection to higher data transfer speeds is lack of necessity (83.6%) followed by high cost (52.6%).

## 2 Human capital

2 Human capital	Cyprus		EU
	rank	score	score
DESI 2020	23	35.8	49.3
DESI 2019	24	34.6	47.9
DESI 2018	22	36.2	47.6



	Cyprus			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b>	<b>50%</b>	<b>50%</b>	<b>45%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>19%</b>	<b>19%</b>	<b>25%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>54%</b>	<b>54%</b>	<b>46%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>2.2%</b>	<b>2.3%</b>	<b>2.7%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>0.9%</b>	<b>0.7%</b>	<b>0.8%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>3.0%</b>	<b>2.4%</b>	<b>2.7%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

Cyprus ranks 23<sup>rd</sup> in the EU on human capital, below the EU average. The level of basic digital skills remains below the EU average though Cyprus has made progress since 2018. Only 45% of people between 16 and 74 years of age at least have basic digital skills (against the EU average of 58%). Although it made modest progress compared to 2018, the share of ICT specialists in the workforce is lower than the EU average (2.7% compared to 3.9%). The share of female ICT specialists has risen slightly since 2018, but is far below the EU average of 1.4%. ICT graduates account for 2.7% of the total.

The 'Cyprus National Reform Programme' focuses on digital entrepreneurship, digital skills, women in digital and the national plan for the Cypriot National Coalition for Digital Skills and Jobs<sup>(214)</sup>. Cyprus has taken several initiatives based on the programme's objectives on digital skills. It is developing initiatives based on the European Commission's 2018 country-specific recommendations (CSRs)<sup>(215)</sup>. The Human Resource Development Authority of Cyprus<sup>(216)</sup> promotes digital skills building via a number of actions to improve and update the ICT knowledge and skills of company employees. The actions include single and multi-company training programmes. The Cyprus Pedagogical Institute<sup>(217)</sup> is implementing a number of ICT-related actions promoting training for schoolteachers and other executives at various levels. In this context and in cooperation with the Department of Electronic Communications, the Institute introduced a programme for the training of teachers for the use of digital technologies in classrooms. Additionally, and in line with the CSRs, Cyprus provides ICT classes

<sup>(214)</sup> <http://www.digitaljobs.cyprus-digitalchampion.gov.cy/el/page/home>

<sup>(215)</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1558000214530&uri=CELEX%3A52018DC0412>

<sup>(216)</sup> [http://www.cea.org.cy/en/we\\_qualify/anad](http://www.cea.org.cy/en/we_qualify/anad)

<sup>(217)</sup> <http://www.pi.ac.cy/pi/index.php?lang=en>

to the public at its Adult Education Centres, as part of its strategy to provide lifelong learning opportunities.

The European Commission funds several initiatives, such as the ‘Youth Board of Cyprus’ that aims to develop and boost young people’s entrepreneurial skills through education and practical training and through a special network of mentors. The European Commission is providing funding of €300,000 through the European Structural Funds.

The Cypriot National Coalition for Digital Skills and Jobs is running actions on digital skills development, including with industry, employer associations, labour unions and representatives of the education sector. The Coalition’s action plan ran until the end of 2019 and aimed to promote the take-up and improvement of digital skills to address the anticipated future mismatch between ICT professionals available and job vacancies. The Digital Champion for Cyprus<sup>(218)</sup> in close cooperation with the Department of Electronic Communications are in the process of renewing the Coalition’s action plan. The new action plan will incorporate action proposed by its stakeholders (private and public institutions, ICT companies, and academia) on education, certification and awareness, aiming to promote digital skills for the whole population.

Cyprus participated in the 2019 EU Code Week, which attracted a total of 4.2 million participants to participate in over 72,000 activities in over 80 countries around the world. Cyprus doubled the number of activities (72) compared to 2018, and attracted 6,772 participants. These events saw a balanced share of male and female participants, (49% female), with most held in schools (93%).

The Department of Labour Relations<sup>(219)</sup> is carrying out initiatives to help raise public awareness on the gender pay gap (inducing in ICT) and its detrimental consequences to women’s economic and social lives. In the same vein, it would be beneficial for Cyprus to continue promoting digital skills initiatives to improve skills, to match the demand for ICT specialists and fill vacancies in these jobs. It is of great importance to further support the National Coalition in finalising the action plan and implement the actions to improve digital skills in Cyprus.

#### **Highlight 2020: Declaration on the ‘Commitment on Women in Digital Technology’**

Given the multiple obstacles, difficulties and challenges faced by women in gaining access to and familiarity with the world of digital technology in Cyprus, the government included several actions in its third ‘Action Plan on Gender Equality 2019-2023’. It aims to tackle the issue by focusing on education and training for women in information and communication technologies.

Implementing these actions will increase the number of women working in computer studies, and develop professional technological skills for women. Furthermore, under the heading ‘Eradication of Stereotypes and Social Prejudices’, the plan puts forward several actions to boost female participation in technical sectors.

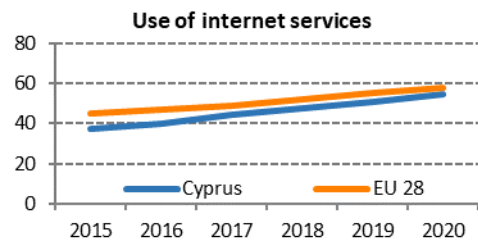
In this regard, the Cypriot Minister for Transport, Communication and Works, together with other European Ministers, signed on 05/04/2019 the Declaration on the ‘Commitment on Women in Digital Technology’ and provided information to the European Commission on corresponding action implemented and promoted at national level.

<sup>(218)</sup> <https://ec.europa.eu/digital-single-market/en/digital-champions>

<sup>(219)</sup> [http://www.mlsi.gov.cy/mlsi/dlr/dlr.nsf/index\\_en/index\\_en?OpenDocument](http://www.mlsi.gov.cy/mlsi/dlr/dlr.nsf/index_en/index_en?OpenDocument)

### 3 Use of internet services

3 Use of internet services	Cyprus		EU
	rank	score	score
<b>DESI 2020</b>	<b>16</b>	<b>54.5</b>	<b>58.0</b>
DESI 2019	20	50.6	55.0
DESI 2018	20	47.7	51.8

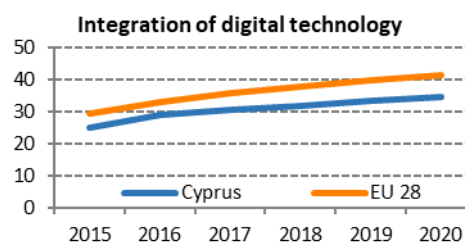


	Cyprus			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>3a1 People who have never used the internet</b>	<b>18%</b>	<b>15%</b>	<b>13%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>79%</b>	<b>84%</b>	<b>85%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>80%</b>	<b>80%</b>	<b>82%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>86%</b>	<b>87%</b>	<b>87%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>12%</b>	<b>11%</b>	<b>11%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>70%</b>	<b>74%</b>	<b>84%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>78%</b>	<b>82%</b>	<b>83%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>6%</b>	<b>6%</b>	<b>7%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>34%</b>	<b>39%</b>	<b>47%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>39%</b>	<b>38%</b>	<b>45%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>5%</b>	<b>3%</b>	<b>4%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

Overall, the use of internet services in Cyprus is below the EU average (ranking 16<sup>th</sup>); however, Cyprus has made progress and improved its ranking since 2018. Cypriots are keen to carry out a range of online activities, as in other parts of the EU. The most popular activities are listening to music, watching videos and playing games (87%). 82% of Cypriot internet users read news online, above the EU average of 72%. Cypriots are active internet users, but the share of respondents doing an online course (7%), and online shopping (45%) is significantly below the EU average. Furthermore, the share of online selling is lower than the EU average. However, Cypriots are active users of social media, with 83% social network users, the third highest in the EU on this indicator.

## 4 Integration of digital technology

4 Integration of digital technology	Cyprus		EU
	rank	score	score
<b>DESI 2020</b>	<b>20</b>	<b>34.5</b>	<b>41.4</b>
DESI 2019	20	33.5	39.8
DESI 2018	21	31.6	37.8



	Cyprus			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>35%</b>	<b>35%</b>	<b>33%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>37%</b>	<b>37%</b>	<b>38%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>3%</b>	<b>5%</b>	<b>5%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>12%</b>	<b>14%</b>	<b>14%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>11%</b>	<b>12%</b>	<b>12%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>6%</b>	<b>6%</b>	<b>8%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>9%</b>	<b>9%</b>	<b>9%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

Cyprus ranks 20<sup>th</sup> in the EU on the integration of digital technology in business activities. Cyprus retained its last year's ranking. 38% of enterprises use social media, 5% of enterprises analyse big data for their business purposes, and 9% of SMEs sell online services or products across borders to other EU countries. 8% of the total turnover of SMEs is generated online. In addition, 14% of enterprises purchased cloud services to further digitise their business. As regards the level of digitisation of enterprises, 27% of enterprises are highly digitised<sup>(220)</sup> (26% in the EU). They are increasingly taking advantage of the opportunities offered online, but 44% of enterprises that recruited ICT specialist had difficulties in doing so, although this is significantly below the EU average (57%).

A new scheme for enhancing the integration of digital technology in SMEs was launched in December 2019. It aims to enhance the digital identity of business, increase the amount of SMEs that use information and communication technologies including the e-commerce sector and the promotion of digital entrepreneurship. The scheme offers in total €6 million in grants that are given as a percentage on the entire eligible investment (50%), with a maximum ceiling of €25,000 per enterprise for manufacturing activities and €20,000 for other business activities.

The new 'Industrial Strategy Policy of Cyprus' aims to gradually raise industry's contribution to GDP by 2030. Smart manufacturing and digitisation are two of the seven pillars underpinning the strategy. The objective is to increase industrial productivity by strengthening the industrial ecosystem and investing in sustainability, innovation, digitisation, infrastructure and skills.

<sup>(220)</sup> [https://digital-agenda-data.eu/datasets/digital\\_agenda\\_scoreboard\\_key\\_indicators/visualizations](https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/visualizations)

Through the European Commission's Horizon 2020 programme<sup>(221)</sup>, Cyprus secured around €90 million to finance some 250 projects (including ICT projects) to be developed by research centres and companies.

The new national strategy on artificial intelligence (AI) will be based on five key pillars set by the European Commission:

- cultivating talent, skills and lifelong learning;
- increasing the competitiveness of businesses and maximising opportunities for networking and partnerships;
- improving the quality of public services through the use of digital and AI-related applications;
- creating national data areas; and
- developing ethical and reliable AI.

Cyprus is committed to advancing on new digital technologies and investing in digital technologies through EU-coordinated programmes. Cyprus is a member of the EuroHPC Joint Undertaking. The country has also signed the Declaration on the Cooperation Framework on HPC, the Declaration of European Blockchain Partnership, and the Declaration on Cooperation on Artificial Intelligence. In 2019, Cyprus signed a declaration agreeing to explore together with other 19 Member States how to develop and deploy a quantum communication infrastructure across the EU within the next 10 years. The aim of QKD is to build Europe's quantum infrastructure and become a backbone for Europe's quantum internet.

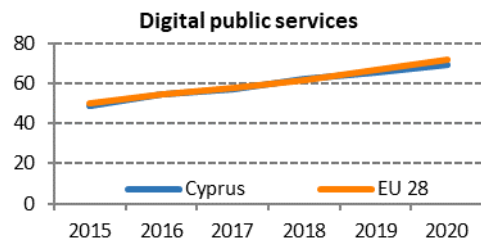
To boost the digital transformation of the Cypriot economy, it is important to raise awareness of the relevance of digitisation among SMEs and of their needs. This will enable SMEs to reap the full range of benefits from adopting digital technologies.

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<sup>(221)</sup> <https://ec.europa.eu/programmes/horizon2020/en>

## 5 Digital public services

5 Digital public services	Cyprus		EU
	rank	score	score
<b>DESI 2020</b>	<b>18</b>	<b>69.0</b>	<b>72.0</b>
DESI 2019	15	65.7	67.0
DESI 2018	15	62.1	61.8



	Cyprus			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>5a1 e-Government users</b>	<b>49%</b>	<b>53%</b>	<b>51%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>58</b>	<b>58</b>	<b>60</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>77</b>	<b>78</b>	<b>79</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>91</b>	<b>91</b>	<b>91</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>80%</b>	<b>66%</b>
% of maximum score			2019	2019

Cyprus ranks 18<sup>th</sup> in the EU on digital public services, below the EU average. Although overall Cyprus made slight improvements, progress was below the EU average. Besides the efforts made to improve and extend Cyprus' digital public services, demand side is weak. The number of Cypriot e-government users fell since 2018, at 51% (against the EU average of 67%) of internet users submitting filled forms in 2019. Cyprus performed slightly better than it did in 2018 on pre-filled forms and online service completion. It has a good level of open data maturity, scoring 80%, significantly above the EU average (66%).

As part of the work to provide a Single Sign-On (SSO), the public will be able to access and interact digitally with the government through Ariadne<sup>(222)</sup> by using only a single ID and password. The Civil Registry and Migration Department<sup>(223)</sup> also provides e-services through Ariadne, allowing citizens to validate and update their personal data.

The new deputy Ministry of research, innovation and digital policy is responsible for implementing all the e-government projects and actions.

In February 2019, the Ministerial e-government Board of Cyprus decided to take a flexible solution for the use of eID. The government will develop the national eID scheme following the eIDAS regulation<sup>(224)</sup>, which will be implemented by the private sector (electronic identification providers). The scheme follows 14 principles, including administrative simplification, accessibility, interoperability, trust and security. The Electronic Identification Provider (eIDP) complying with the national scheme will be able to issue eID to the Cypriot population.

<sup>(222)</sup> <https://eservices.cyprus.gov.cy/EL/Pages/Home.aspx>

<sup>(223)</sup> [http://www.moi.gov.cy/moi/crmd/crmd.nsf/index\\_en/index\\_en?OpenDocument](http://www.moi.gov.cy/moi/crmd/crmd.nsf/index_en/index_en?OpenDocument)

<sup>(224)</sup> <https://ec.europa.eu/digital-single-market/en/discover-eidas>



Cyprus is focusing on boosting digital skills in the public sector. In this vein, the Cyprus Academy of Public Administration<sup>(225)</sup> in cooperation with the Presidency's Administrative Reform Unit<sup>(226)</sup> are running a new project to identify and evaluate the needs of civil servants regarding digital skills (e-skills). After the needs assessment, training programmes will be designed to meet civil servants' needs.

On e-health, Cyprus is moving towards cross-border integration [law on e-health (59(I)/2019)]. The law, funded by the European Commission's CEF Programme<sup>(227)</sup>, focuses on supporting Cyprus's efforts to be part of a secure peer-to-peer network allowing the exchange of Patient Summaries (PSs) and e-prescriptions. The objective is to align the Cypriot health infrastructure with the standards set by the European Commission for exchanging health data across national borders within the EU and for the provision of interoperable e-health services.

Full implementation of the strategy by all public bodies could lead the way to even more significant improvements on digital public administration.

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<sup>(225)</sup> [https://www.mof.gov.cy/mof/capa/cyacademy.nsf/index\\_en/index\\_en?opendocument](https://www.mof.gov.cy/mof/capa/cyacademy.nsf/index_en/index_en?opendocument)

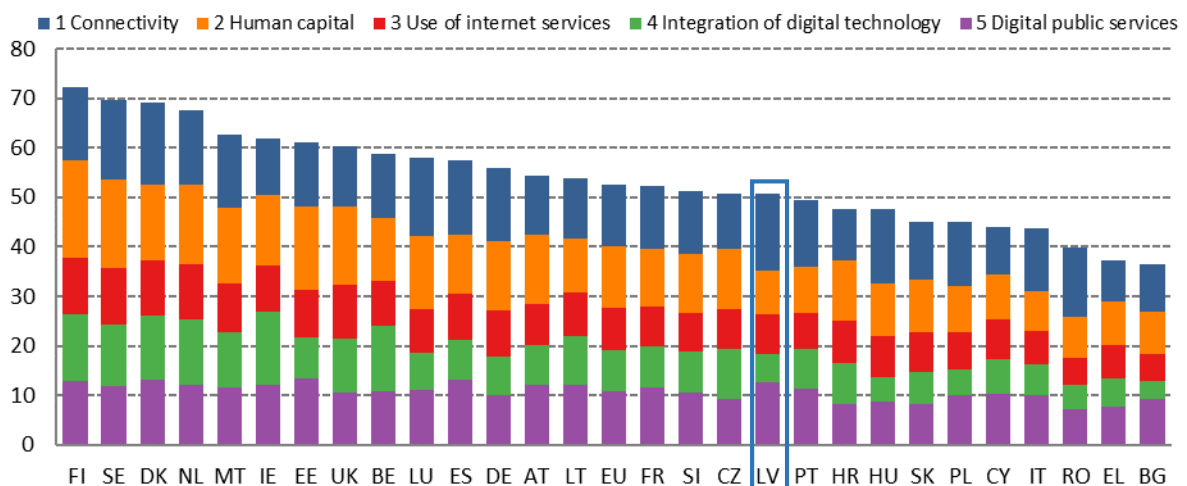
<sup>(226)</sup> <http://www.reform.gov.cy/en/>

<sup>(227)</sup> <https://ec.europa.eu/inea/en/connecting-europe-facility>

## Latvia

	Latvia		EU
	rank	score	score
<b>DESI 2020</b>	<b>18</b>	<b>50.7</b>	<b>52.6</b>
DESI 2019	15	49.9	49.4
DESI 2018	15	46.8	46.5

Digital Economy and Society Index (DESI) 2020 ranking

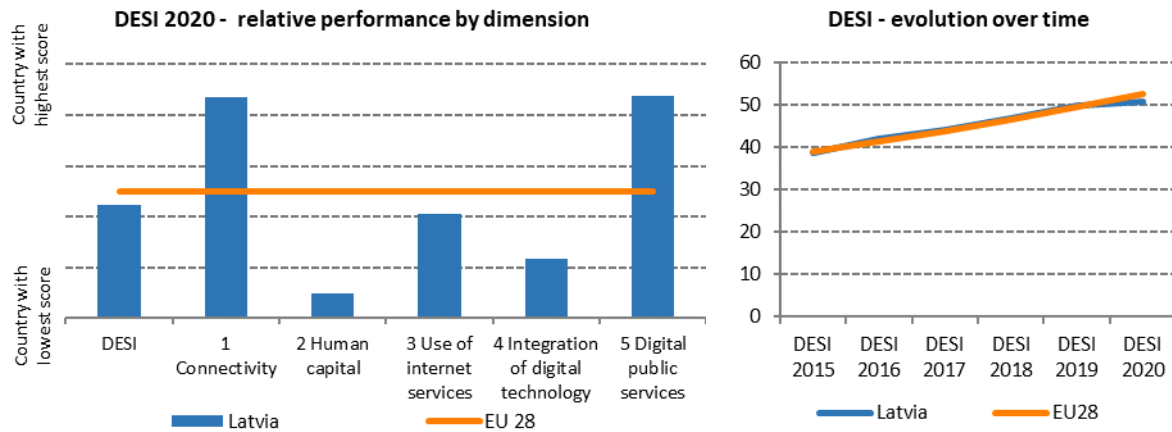


Latvia ranks 18<sup>th</sup> out of the 28 EU Member States in the 2020 Digital Economy and Society Index (DESI). Latvia's ranking fell three places compared to DESI 2019.

The country performs well in digital public services and connectivity. The quality of e-government services continued to improve last year and the number of users rose. Latvia has very good broadband coverage with fast and very high capacity networks, and has already allocated a radio spectrum for 5G. Although fixed broadband take-up is generally low, 38% of households subscribe to at least 100 Mbps broadband compared to the EU average of 26%. Nevertheless, the Latvian business sector still fails to take advantage of the opportunities offered by digital technologies. The country ranks 23<sup>rd</sup> on the integration of technology by business. Only 8% of companies use big data, 19% have social media activities and 11% rely on cloud services. In addition, only 11% of SMEs sell online and only 5% of SME turnover is from e-commerce. Latvia also scores well below average in digital skills. More than half of the population still lack basic digital skills and ICT specialists represent 1.7% of total employment (EU average: 3.9%).

The current Latvian Digital Agenda Strategy dates back to 2013, when the Latvian government approved the Information Society Development Guidelines for 2014-2020<sup>(228)</sup>. The guidelines cover ICT education and skills, internet access, modern and efficient public administration, e-services and digital content for society, cross-border cooperation for the digital single market, ICT research and innovation, and trust and security. Many plans and projects are in place to implement the strategy.

<sup>(228)</sup> <http://polsis.mk.gov.lv/documents/4518>



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

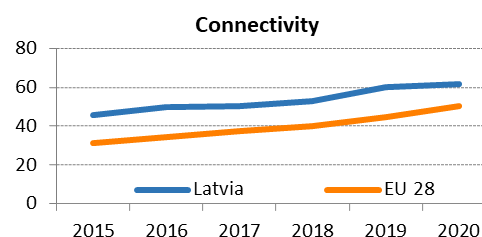
The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Latvia has taken a number of measures in digital to deal with the COVID-19 crisis. Initiatives to provide citizens with information include the development of a website gathering information on the epidemic as well as of an app that notifies users who have been close to confirmed COVID cases. For digital skills, measures have been presented targeting unemployed, employed, entrepreneurs and those wish to obtain advanced ICT skills, respectively, and online course offer has been expanded and promoted. Multiple measures have been taken to promote digitisation of businesses, including grants for digitisation of businesses and for the development of new ICT products and services, measures for digitisation of the cultural sector, and a targeted recommendation to encourage entrepreneurs to take advantage of e-commerce opportunities. Already advanced in digital public services, Latvia has taken a number of measures to go further; developing infographics to raise awareness of digital public services, online tax services, as well as standardisation of e-invoices and e-receipts. Many public servants, including the cabinet of ministers, telework and minister meetings are streamed to the public every week. National recommendations and support have been launched to help municipal councils to organise work remotely. The supply and demand of eHealth services has increased, offering e-sick leave certificates, online medical appointments, as well as online reception of medical test results.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Latvia performs well in digital public services, 5G and Very High Capacity Networks (VHCN). It performs weaker in digital skills and digital integration in businesses.

# 1 Connectivity

1 Connectivity	Latvia		EU
	rank	score	score
DESI 2020	4	61.8	50.1
DESI 2019	2	59.8	44.7
DESI 2018	3	53.0	39.9



	Latvia		EU	
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>1a1 Overall fixed broadband take-up</b> % households	64%	60%	64%	78%
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	35%	32%	38%	26%
<b>1b1 Fast broadband (NGA) coverage</b> % households	92%	93%	93%	86%
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	86%	88%	88%	44%
<b>1c1 4G coverage</b> % households (average of operators)	98%	98%	99%	96%
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	92	124	127	100
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	NA	33%	33%	21%
<b>1d1 Broadband price index</b> Score (0 to 100)	NA	NA	77	64

Latvia performs above EU average on the overall connectivity indicator, ranking 4<sup>th</sup> (compared to 2<sup>nd</sup> in the previous year). The country's main strengths are the extremely advanced coverage of fast broadband (NGA) (93% against the EU average 86%), and near complete average 4G coverage (99% against EU average 96%). Latvia also performs well as regards to very high capacity networks (VHCN), with coverage remaining at 88% in 2019, double the EU average of 44%. However, deploying the last mile (connection to the premises) in a number of white areas (i.e. areas that lack connection), in particular rural areas, remains a challenge. In addition, Latvia is trailing the EU in the overall fixed broadband take-up with 64% against 78% at EU level, placing Latvia at a 24 in the ranking. The take-up of at least 100 Mbps fixed broadband increased from 32% in 2018 to 38% in 2019, scoring above the EU average of 26%. Mobile broadband take-up is substantially above the EU average and has further improved in the last few years, rising from 92 in 2017, 124 in 2018, reaching 127 subscriptions per 100 people in 2019. Broadband prices in Latvia are lower than the EU average, placing the country at 6<sup>th</sup> place.

Latvia has made good progress on the national broadband strategy goals for 2013-2020, which include the Digital Agenda for Europe targets and the Gigabit society objectives. However, take-up of 100 Mbps fixed broadband speed remains substantially below the targeted 50% of households. Closing the digital divide between urban and rural areas has been one of the main objectives of the broadband strategy. Through the 'middle mile' project, fibre has been deployed (in particular backhaul infrastructures) up to the last mile in white areas. However, low income and population

scarcity in rural areas cause low commercial interest for deployment of the last part of the connection up to the premises. Further national efforts are under way to reach territories not covered by the current State aid programme and to bring the middle mile as close to end-users as possible, to make the deployment of the last mile more economically attractive for electronic communication operators. The middle mile and the last mile development measures, including State aid, will be evaluated and included as appropriate in the 2021-2027 broadband plan.

The national 5G roadmap was approved by the Cabinet of Ministers in February 2020. Latvia is one of the front-runners in preparation for the deployment of 5G, ranking 5th on the 5G readiness indicator<sup>(229)</sup> with 33% of 5G spectrum assigned. Commercial 5G services are available in the cities Jelgava and Daugavpils. Overall, Latvia has assigned 47% of the 2,090 MHz spectrum harmonised at EU level for wireless broadband, of which a part is also available for 5G. Of this spectrum, the complete 3.4-3.8 GHz band was awarded on technical conditions suitable for 5G already in 2018. Although the assignment of the 3.4-3.8 GHz band enabled the acquisition of large blocks of spectrum, some operators were not allocated contiguous blocks. In the medium term, this could create some technical difficulties in deploying 5G. The first use of 3.4-3.8 GHz band is likely to entail a gradual deployment of 4G+ and 4G++, finally moving to a 5G network. Latvia, Lithuania, Estonia and Poland have agreed on a roadmap to set the principles for the development of infrastructure under the 'Via Baltica' project. In September 2018, the countries signed a memorandum of understanding to gradually deploy the network along the Via Baltica (E67) section that links Tallinn (Estonia), Riga (Latvia), Kaunas (Lithuania) and the Lithuanian-Polish border.

There are plans to award the 700 MHz band for 5G, through auction in 2020. The band will be available for wireless broadband only from 1 January 2022. The reasons for the 2-year delay is the current use of the band for TV broadcasting until December 2021, and unresolved frequency coordination issues with Russia. The plan is to start 'refarming' the 26 GHz band in 2020 to allocate at least 1 GHz spectrum by the end of the year. The 1.5 GHz band will be 'refarmed' for 5G from 1 January 2021.

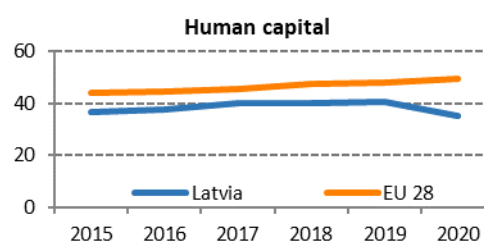
Latvia is well equipped with good coverage of very high-capacity fixed network infrastructure, has near-complete 4G coverage of households, and is prepared for 5G deployment in the 3.4-3.8 GHz band. However, in the medium to long term, the negotiations with Russia are delaying the use of the 700 MHz band, which is crucial for 5G and important for coverage, and this may hinder future 5G deployment. Moreover, deploying the last mile in a number of white areas remains a challenge. Further network roll-out in the already advanced market requires national efforts to create the necessary economic incentives for investments in the already identified investment gaps.

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<sup>(229)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

## 2 Human capital

2 Human capital	Latvia		EU
	rank	score	score
DESI 2020	24	35.0	49.3
DESI 2019	21	40.4	47.9
DESI 2018	21	40.0	47.6



	Latvia			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>2a1 At least basic digital skills</b> % individuals	48%	48%	43%	58%
<b>2a2 Above basic digital skills</b> % individuals	27%	27%	24%	33%
<b>2a3 At least basic software skills</b> % individuals	49%	49%	44%	61%
<b>2b1 ICT specialists</b> % total employment	2.2%	2.3%	1.7%	3.9%
<b>2b2 Female ICT specialists</b> % female employment	1.1%	1.0%	0.5%	1.4%
<b>2b3 ICT graduates</b> % graduates	4.4%	4.8%	5.0%	3.6%

On human capital, Latvia ranks 24<sup>th</sup> among EU countries, with several indicators deteriorating in the last years. Basic and advanced digital skill levels remain well below the EU average. Only 43% of people aged 16 to 74 have at least basic digital skills (EU average: 58%) and only 24% have advanced skills (EU average: 33%). The percentage of ICT specialists is also lower than the EU average (1.7% vs 3.9%). Latvia performs well above the EU average, however, on graduates with an ICT degree (5% vs 3.6%). By contrast, the percentage of female ICT specialists in the workforce is well below the EU average (0.5% vs 1.4%).

Although Latvia does not have a specific digital skills strategy, the development of digital skills is addressed in several sectoral policies. The main ones are: (i) the 2014-2020 Information Society Development Guidelines 2014-2020, which include ICT education and e-Skills in one of seven main pillars; (ii) the 2014-2020 Education Development Guidelines, which include measures to promote and modernise digital skills and science, technology, engineering and maths (STEM) studies, to use ICT in the learning process, and to develop teachers' digital skills; (iii) the 2014-2020 Science, Technological Development and Innovation Guidelines, whose smart specialisation strategy includes digital skills; and (iv) Latvia's 2019-2022 cybersecurity strategy<sup>(230)</sup>. Taken together, these strategies address a wide range of challenges, notably: (i) basic digital skills of workers and other individuals; (ii) skills of ICT professionals; (iii) digital skills in the public sector and in education; and (iv) awareness about cyber security.

Digital skills are included in both the primary and secondary curricula in Latvia. Coding and computational thinking have also now been introduced in the compulsory curricula and will

<sup>(230)</sup> <http://polsis.mk.gov.lv/documents/6581>

gradually be implemented starting from the 2020/2021 school year. In 2019, Latvian schools actively participated in EU Code Week. More than 7,500 young people participated in 150 Code Week events, 95% of which involved schools. The Ministry of Education promotes the initiative through competitions, webinars, and discussions with students. According to the Ministry's estimates, 48 secondary schools and 22 primary schools took part in the latest edition (2019), up from 32 and 11 respectively in 2018.

On the reskilling of the workforce, in Latvia, ICT programmes are an integral part of active labour market policy. There are 10 digital skills programmes available for unemployed people and one vocational ICT training programme. There are also various shorter-term courses on ICT use available to older workers, including internet-based ones. The Ministry of Welfare has increased its cooperation with the Latvian ICT Association (LIKTA). In the last 6 years, LIKTA has created a 'Training Commission' with some brand new ICT programmes. As a result, ICT programmes are regularly introduced into measures to improve competitiveness and non-formal education training. Workers' digital skills are also supported through collaboration with private enterprises, EU projects such as the Digital Competence Development System Project (DCDS) (see Highlight 2020), and regional competence centres.

The public's digital skills, more broadly, are promoted through the 'ICTskills4All' project<sup>(231)</sup>, while the 'Count me In' project is addressing the skills of the disabled. Latvia also takes part in the 'Women4IT', a multi-stakeholder partnership involving different countries, which aims to boost the participation of women in the digital sector, by providing tools to assess digital skills, training and personalised career guidance<sup>(232)</sup>.

Latvia has set up a national Digital Skills and Jobs Coalition, coordinated by LIKTA. The Coalition's partners - including several Ministries - signed a new Memorandum of Cooperation in 2017 defining the Coalition's priorities for 2017-2020<sup>(233)</sup>.

It is important to continue efforts in all relevant areas to increase digital skills. To ensure digital inclusion and business productivity, it is crucial to raise the level of digital skills among the general public and to increase the number of ICT specialists.

#### **Highlight 2020: Digital Competence Development System Project<sup>(234)</sup>**

The DCDS project aims to put a framework in place to provide the low-skilled EU adult population with the basic digital and transversal competences needed for employment, personal development, social inclusion and active citizenship.

The main objective is to create an integrated modular system – the 'Digital Competence Development System – DCDS' to develop basic digital and transversal competences among low-skilled adults in five European countries (Greece, Latvia, Italy, Romania and Spain). LIKTA represents Latvia in the project.

DCDS is co-funded by the Erasmus+ Programme, specifically the 'forward looking cooperation projects' to support policy reform. It started on 1 January 2018 and will last 2 years.

<sup>(231)</sup> <https://up.pt/ictskills4all/the-project/>

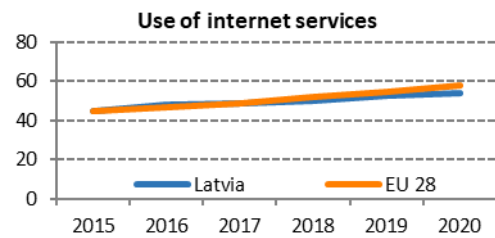
<sup>(232)</sup> <https://women4it.eu/>

<sup>(233)</sup> <http://eprasmes.lv/wp-content/uploads/2017/03/Memorands-27.03.2017-PUBLIC.pdf>

<sup>(234)</sup> <http://www.dcds-project.eu/>

### 3 Use of internet services

3 Use of internet services	Latvia		EU
	rank	score	score
<b>DESI 2020</b>	<b>19</b>	<b>54.0</b>	<b>58.0</b>
DESI 2019	15	52.7	55.0
DESI 2018	13	50.0	51.8



	DESI 2018	Latvia	DESI 2020	EU
	value 2017	DESI 2019 value 2018	value 2019	DESI 2020 value 2019
<b>3a1 People who have never used the internet</b> % individuals	<b>16%</b>	<b>13%</b>	<b>12%</b>	<b>9%</b>
<b>3a2 Internet users</b> % individuals	<b>78%</b>	<b>81%</b>	<b>84%</b>	<b>85%</b>
<b>3b1 News</b> % internet users	<b>84%</b>	<b>84%</b>	<b>78%</b>	<b>72%</b>
<b>3b2 Music, videos and games</b> % internet users	<b>77%</b>	<b>76%</b>	<b>76%</b>	<b>81%</b>
<b>3b3 Video on demand</b> % internet users	<b>15%</b>	<b>15%</b>	<b>15%</b>	<b>31%</b>
<b>3b4 Video calls</b> % internet users	<b>51%</b>	<b>62%</b>	<b>66%</b>	<b>60%</b>
<b>3b5 Social networks</b> % internet users	<b>74%</b>	<b>74%</b>	<b>75%</b>	<b>65%</b>
<b>3b6 Doing an online course</b> % internet users	<b>5%</b>	<b>5%</b>	<b>5%</b>	<b>11%</b>
<b>3c1 Banking</b> % internet users	<b>75%</b>	<b>79%</b>	<b>83%</b>	<b>66%</b>
<b>3c2 Shopping</b> % internet users	<b>55%</b>	<b>53%</b>	<b>54%</b>	<b>71%</b>
<b>3c3 Selling online</b> % internet users	<b>10%</b>	<b>11%</b>	<b>10%</b>	<b>23%</b>

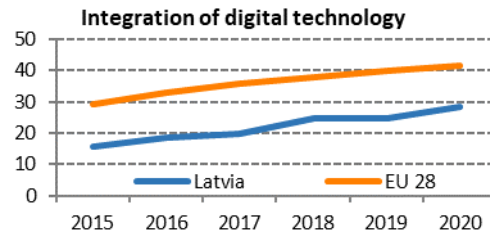
Overall, the use of internet services in Latvia is slightly below the EU average. 84% of the population use the internet at least once a week, which is 3 percentage points higher than a year ago, and just below the EU average of 85%. More than 3 out of 4 Latvian internet users read online news, listen to music, play videos or games online, or use social networks. 66% make video calls compared to the EU average of 60%. On the other hand, only 15% watch videos on demand, and 5% engage in e-learning activities.

As for transactions, although 83% bank online (well above the EU average of 66%), e-commerce remains low: only 54% shop and 10% sell online.



## 4 Integration of digital technology

4 Integration of digital technology	Latvia		EU
	rank	score	score
<b>DESI 2020</b>	<b>23</b>	<b>28.3</b>	<b>41.4</b>
DESI 2019	25	24.7	39.8
DESI 2018	25	24.6	37.8



	Latvia		EU	
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>25%</b>	<b>25%</b>	<b>32%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>13%</b>	<b>13%</b>	<b>19%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>NA</b>	<b>8%</b>	<b>8%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>9%</b>	<b>11%</b>	<b>11%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>11%</b>	<b>10%</b>	<b>11%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>9%</b>	<b>5%</b>	<b>5%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>5%</b>	<b>5%</b>	<b>7%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

On the integration of digital technology, Latvia ranks 23<sup>rd</sup> among EU countries. It improved on the use of electronic information sharing (which is now in place in 32% of Latvian enterprises) and on the use of social media (19% of Latvian enterprises), but is still below the EU average for both indicators (34% and 25% respectively).

Latvian enterprises do not make sufficient use of the opportunities provided by big data and cloud computing. Only 8% use big data (EU average: 12%) and 11% take advantage of cloud computing (EU average: 18%). On e-commerce, only 11% of SMEs sell online (significantly below the EU average of 18%). However, the share of SMEs engaged in e-commerce across border to other EU countries increased in the last 2 years, getting closer to the EU average (7% vs 8%).

The digital transformation of the Latvian economy is addressed in broader national strategies and guidelines (such as the 2014-2020 National Development Plan<sup>(235)</sup>, the 2014-2020 Guidelines for Science, Technology Development and Innovation, and the 2014-2020 Guidelines for National Industrial Policy). Moreover, a key part of the Latvian Smart Specialisation Strategy (RIS3) is to develop innovation ecosystems to foster and support technological progress. The government is currently focusing on strategic projects to develop innovation ecosystems in three areas: smart cities, smart materials and biomedicine.

<sup>(235)</sup> The draft National Development Plan 2021-2027 was adopted by the Cabinet of Ministers on 28 February 2020; the adoption of the Plan in the National Parliament has to follow.

The government supports the digital transformation of enterprises through a number of complementary programmes and initiatives (also making use of EU funding). In particular, since 2016, the 'Competence Centre Programme' has enabled eight competence centres to be set up, corresponding to areas of Latvia's Smart Specialisation Strategy. The centres target enterprises of any size and promote research and industrial cooperation in new product and technology development projects. They have to earmark at least 25% of their funding for experimental development.

In addition to these competence centres, Latvia has three Digital Innovation Hubs which are expected to act as centres of digital excellence and one-stop-shops for digital transformation.

The Technology Transfer programme is another initiative to promote innovation activities in SMEs. The programme provides: (i) innovation vouchers (e.g. for feasibility studies, industrial research, experimental development and attracting highly qualified personnel); (ii) research and innovation support (e.g. developing commercialisation offers or participating in exhibitions and conferences); and (iii) start-up support (e.g. meetings with potential investors).

Support for the digitisation of enterprises also includes initiatives to develop advanced digital skills. For example, LIKTA supports training programmes that boost the uptake of digital tools, particularly by SMEs. In particular, the EU-cofunded 'SMEs trainings for digital technologies and innovation development' project, launched in 2016, was aimed at entrepreneurs, managers and SME employees. By the end of December 2019 over 1,200 companies had been involved in the project, and more than 3,900 training activities had been organised.

In June 2019, the Latvian government adopted its national AI strategy, following a public consultations<sup>(236)</sup>. The document defines the way forward in promoting the use of AI solutions over the next three years, and invites ministries to identify areas where AI can be exploited for the automation of public administration tasks. More specifically, its key objectives include: (i) promoting AI in education and science; (ii) making data, data transfer and computation capacity available; (iii) the use of AI in the public sector; (iv) encouraging the adoption of AI in economic sectors; (v) actively engaging in international cooperation; (vi) integrating automation and AI in all sectoral strategies; and (vii) creating an appropriate legal framework and assessment system.

The country is a member of the EuroHPC Joint Undertaking and has signed the Declaration on European Blockchain Partnership, and the Declaration on Cooperation on Artificial Intelligence.

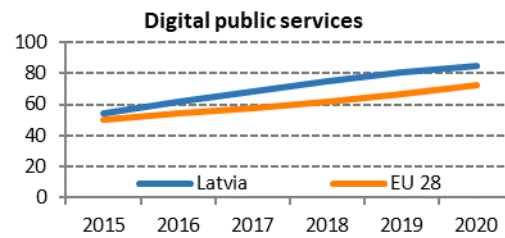
It is important that Latvia steps up its efforts to boost the digital transformation of businesses. This includes bringing together the different initiatives and all the relevant players, and raising awareness of the opportunities the transformation offers.

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<sup>(236)</sup> <http://tap.mk.gov.lv/mk/mksedes/saraksts/darbakartiba/?sede=1104>.

## 5 Digital public services

5 Digital public services	Latvia		EU
	rank	score	score
<b>DESI 2020</b>	<b>5</b>	<b>85.1</b>	<b>72.0</b>
DESI 2019	5	80.2	67.0
DESI 2018	8	74.5	61.8



	DESI 2018 value	Latvia DESI 2019 value	DESI 2020 value	EU DESI 2020 value
<b>5a1 e-Government users</b> % internet users needing to submit forms	77%	81%	83%	67%
<b>5a2 Pre-filled forms</b> Score (0 to 100)	71	83	86	59
<b>5a3 Online service completion</b> Score (0 to 100)	91	94	96	90
<b>5a4 Digital public services for businesses</b> Score (0 to 100) - including domestic and cross-border	93	90	90	88
<b>5a5 Open data</b> % of maximum score	NA	NA	75%	66%

Latvia ranks 5<sup>th</sup> in digital public services. It scores above average on all indicators in this area. The number of e-government users continued to increase and there was a further improvement in the provision of online public services. Latvia scores 86 in pre-filled forms (measuring the re-use of information across administrations to make life easier for people), 96 in online service completion (measuring the sophistication of services) and 90 in services for businesses (all out of 100). Open data maturity is also high at 75% (EU average: 66%). According to the 2019 Integrated Public Services delivery and end user needs monitoring study, the average satisfaction rate with all services is 7.8/10.

On services for businesses, setting up companies online is supported by national legislation. A person wanting to register a company online can submit all necessary documents to the Register of Enterprises. People can also register key life events online. There are currently more than 800 public services available digitally.

An official e-address (Digital Post-box) enables digital-only communication between the government (including municipalities), citizens and businesses. Following the activation of such an e-address, central and local institutions are obliged to communicate with citizen and business digitally only.

In 2020, the government adopted the 'Public Service Development Plan 2020-2023'. This plan sets the policy strategy for years to come and reinforces digital public services by enhancing: proactive service provision, user-centricity built around key life events, coordinated and integrated approach in service design, cross-border services, digital-by-default and digital-first principles. Overall, the plan continues promoting the use of ICT as a tool to build a knowledge-based economy and to improve the overall quality of life.

To boost access to digital public services, in 2018, the government launched 'Mana Latvija.lv. Dari digitāli!' - a large-scale communication and training programme. It aims to improve people's digital skills and to facilitate the use of digital public services. The programme comprises extensive

information and training activities at national and regional information events, and the training of at least 6,000 national and local government officials.

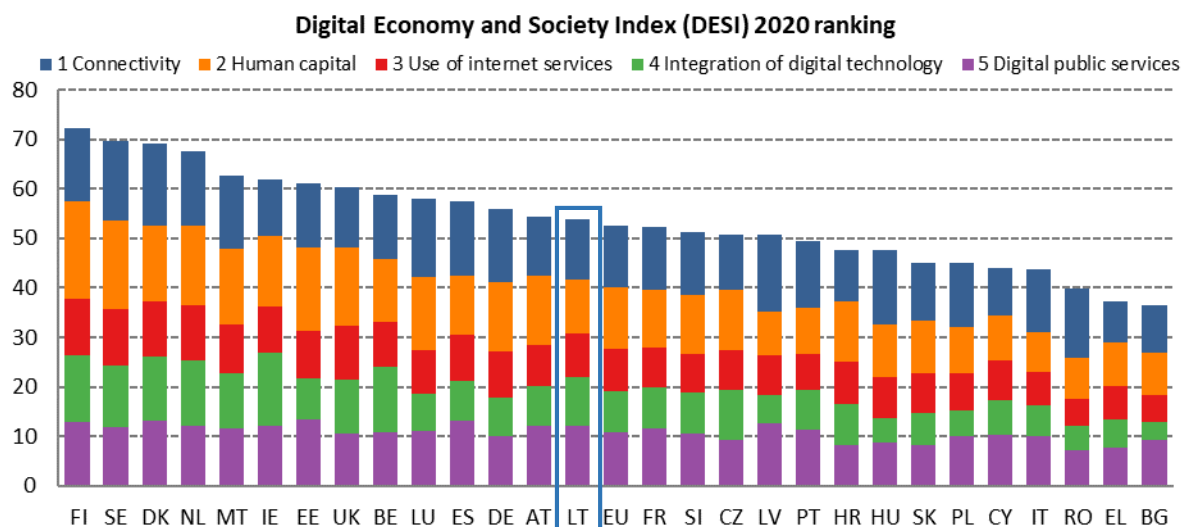
European Structural and Investment Funds (ESIF) are key for developing public administration platforms and digital services, and for enabling public administration data to be reused by the private sector. The Connecting Europe Facility (CEF) can also help fund cross-border eID, cross-border sectoral data exchange and e-invoices. Customer service centres have also been in place since 2015 to help people switch to online services.

Regarding e-health, although telemedicine applications for physician-patient consultation are not currently provided as state-funded services, digital technologies are regularly used by the specialised medicine centre of the emergency medical service. This centre provides highly qualified specialist advice to regional hospitals in difficult cases. The centre's specialists have remote access to electrocardiograms and visual diagnostic examinations. This remote access allows them to assess the situation from a distance and then decide whether counselling or surgery at a regional hospital is needed or whether the patient should be transferred to another hospital.

Overall, Latvia performs very well and has made progress in the area of digital public administration. It is important to continue these efforts and enhance open data policies.

## Lithuania

	Lithuania		EU
	rank	score	score
<b>DESI 2020</b>	<b>14</b>	<b>53.9</b>	<b>52.6</b>
DESI 2019	12	51.8	49.4
DESI 2018	12	49.4	46.5



Lithuania ranks 14<sup>th</sup> out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020.

In the past year, Lithuania has improved in most of the measured areas. In particular, it performed exceptionally well in the integration of digital technology and digital public services. However, some areas such as human capital are still below the EU average in spite of recent improvements.

Lithuania's digital strategy, the Information Society Development Programme for 2014-2020, was adopted in 2014 and amended in 2017<sup>(237)</sup>. The Ministry of Economic Affairs and Innovation have responsibility for this strategy in cooperation with other relevant governmental bodies. The strategy covers all areas of the digital economy and society: digital skills; digital content in the Lithuanian language; investments in high-speed broadband; e-government; use of open public data and innovative e-service creation; security; reliability; and interoperability. This strategy aims to reduce the digital divide, improve quality of life for Lithuanians, and make companies more efficient.

To help achieve the strategy's goals, the government has developed an interinstitutional action plan. This plan is updated every year with financial targets and key performance indicators to be achieved by 2022. The most recent update took place on 10 December 2019<sup>(238)</sup>.

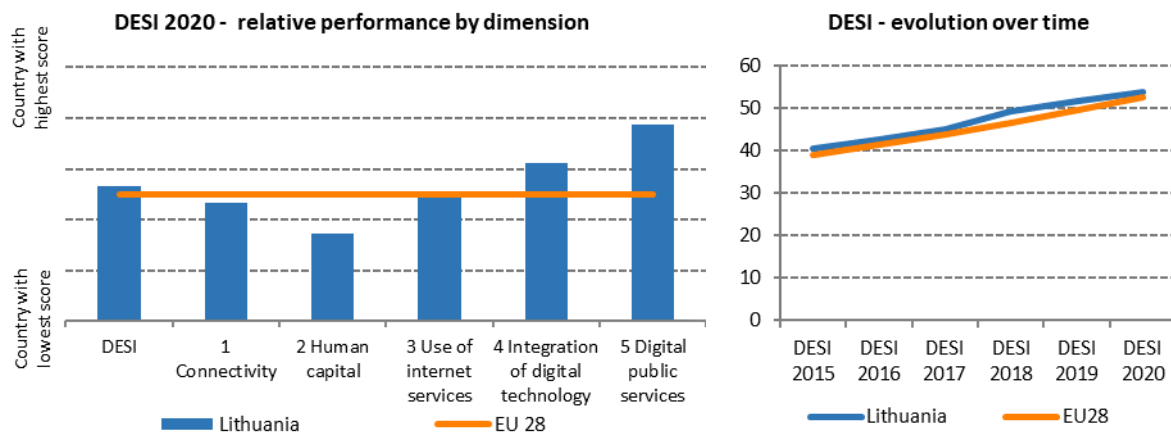
Lithuania's digital strategy is complemented by the 2018 national cybersecurity strategy and the 2019 Artificial Intelligence (AI) strategy.

To strengthen the ecosystem for start-ups and SMEs, the Ministry of Economic Affairs is currently developing a proposal for a €900 million investment fund that would allow the government over the

<sup>(237)</sup> [http://eimin.lrv.lt/uploads/eimin/documents/files/30310\\_LRV%20nutarimas\(en\).pdf](http://eimin.lrv.lt/uploads/eimin/documents/files/30310_LRV%20nutarimas(en).pdf)

<sup>(238)</sup> <https://www.e-tar.lt/portal/lt/legalAct/eabe9b40fa0811e4b733cba410730a6c/asr>

course of 20 years to contribute up to 0.14% of GDP in funding, which would be further leveraged by private capital.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

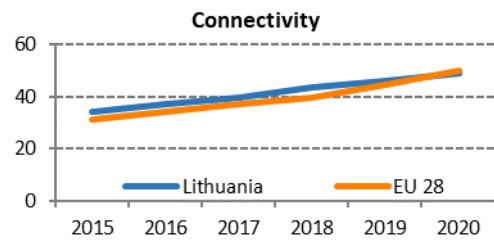
The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Lithuania has taken multiple targeted measures in digital as response to the COVID-19 crisis. The government launched a hackathon to gather creative minds in finding solutions to the unprecedented challenges. Initiatives to minimise the contagion include the development of a real-time tracking map of the spread of the virus. An AI chat tool that answers citizens' questions about the virus, travel restrictions as well as public support for business has been launched on the government's COVID-19 information website, and a hotline answering non-urgent medical questions is available via video-call. To encourage people and firms whose conditions have been affected by the crisis to enter the digital society, a distance learning and mentoring initiative has been made available, helping people to find work or retraining opportunities and to develop online business. Furthermore, the Ministry of Education has provided technological support as well as 35,000 digital devices (laptops and iPads) to families and schools in need, to facilitate remote education when schools are closed.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Lithuania is above EU average in Very High Capacity Networks (VHCN) coverage, but performs weaker in 5G. The country is advanced in digital public services and digitisation of businesses, but weaker in digital skills.

# 1 Connectivity

1 Connectivity	Lithuania		EU
	rank	score	score
<b>DESI 2020</b>	<b>19</b>	<b>48.9</b>	<b>50.1</b>
DESI 2019	15	46.0	44.7
DESI 2018	11	43.5	39.9



	Lithuania			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>1a1 Overall fixed broadband take-up</b>	<b>65%</b>	<b>64%</b>	<b>68%</b>	<b>78%</b>
% households	2017	2018	2019	2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b>	<b>27%</b>	<b>29%</b>	<b>32%</b>	<b>26%</b>
% households	2017	2018	2019	2019
<b>1b1 Fast broadband (NGA) coverage</b>	<b>54%</b>	<b>63%</b>	<b>69%</b>	<b>86%</b>
% households	2017	2018	2019	2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b>	<b>54%</b>	<b>61%</b>	<b>61%</b>	<b>44%</b>
% households	2017	2018	2019	2019
<b>1c1 4G coverage</b>	<b>98%</b>	<b>98%</b>	<b>100%</b>	<b>96%</b>
% households (average of operators)	2017	2018	2019	2019
<b>1c2 Mobile broadband take-up</b>	<b>78</b>	<b>91</b>	<b>103</b>	<b>100</b>
Subscriptions per 100 people	2017	2018	2019	2019
<b>1c3 5G readiness</b>	<b>NA</b>	<b>0%</b>	<b>0%</b>	<b>21%</b>
Assigned spectrum as a % of total harmonised 5G spectrum		2019	2020	2020
<b>1d1 Broadband price index</b>	<b>NA</b>	<b>NA</b>	<b>79</b>	<b>64</b>
Score (0 to 100)			2019	2019

Lithuania progressed slower than the EU average in Connectivity, scoring 19<sup>th</sup> amongst the Member States. It comes out very strong in mobile, both in terms of broadband take-up, and 4G coverage. Nevertheless, its performance is still being undermined by low next generation access (NGA) coverage (69% in 2019 against the EU average of 86%, up from 63% in 2018) and low fixed broadband coverage. With only 68% of the households subscribing to fixed broadband, Lithuania lags significantly behind the EU average (78%).

Although it did not progress in FTTP deployment and this is reflected in a stable very-high capacity networks coverage which stands at 61% as in previous year, its coverage remains significantly above the EU average of 44%.

Its take-up of at least 100 Mbps fixed broadband stands 6 percentage points higher than the EU average. Lithuania scores well in the broadband price index, ranking as the 4<sup>th</sup> cheapest Member State, thanks to very low prices for fixed broadband and converged bundles.

To help achieve its targets under the digital agenda for Europe and gigabit society, Lithuania is implementing the Development of Next Generation Access Infrastructure – RAIN 3 project (a state aid measure). The project aims to further develop broadband networks in rural areas between 2018 and 2021. It offers operators that wish to connect end-users with download speeds above 30 Mbps

wholesale access to a newly built fibre backhaul network. The network is provided by Plačiajuostis internetas, a state-owned body. So far, only 468 km of fibre-optic cable lines (out of 1,465 km planned in total) have been deployed, and 165 telecommunication facilities have been connected.

However, no telecommunication towers (out of 180 planned) have been built yet, but work continues on the design and issuance of permits.

In 2019, the Ministry of Transport and Communications set up a working group on 5G to discuss and develop together with stakeholders “Guidelines for the development of next-generation mobile networks (5G) in the Republic of Lithuania for 2020-2025. The government should approve these guidelines in 2020. They contain a set of measures that would facilitate the deployment of 5G in Lithuania, e.g. measures on access to sites for radio-network building. Cross-border coordination issues with Russia related to the 700 MHz and the 3.6 GHz bands persist. Lithuania hopes to conclude an agreement on the 700 MHz band after Russia decides on moving broadcasting from this band, even though this will only allow the band to be used for 5G after 2022. Use of the 3.6 GHz band for 5G purposes remains problematic due to Russia’s use of this band in Kaliningrad for military and satellite communications. For the 26 GHz band, a public consultation was completed at the beginning of 2020, taking into account that there is no market demand for 5G in this band yet.

In 2019, in order to facilitate 5G roll-out Lithuania adopted a new law aligning its EMF limits with the 1999 Council Recommendation on EMF limits, which entered into force on 6 March 2020. Together with the other Baltic States, Lithuania also started mapping the existing infrastructure in preparations for the implementation of a cross-border 5G corridor together with other neighbouring states (most likely, across the Via Baltica motorway). An international consortium of stakeholders from the Baltic region is also preparing to test autonomous driving in the cross-border areas. Overall, 34% of the spectrum harmonised at EU level for wireless broadband has been assigned so far in Lithuania.

However, none of the spectrum in the 5G pioneer bands is assigned at 5G conditions, and Lithuania scores 0 in the 5G readiness indicator.<sup>(239)</sup>

Overall, Lithuania made some progress in 2019 towards meeting the 2020 and gigabit society targets as well as its 5G objectives, but challenges remain. The roll-out of 5G has been delayed due to the postponed assignment of spectrum in the 700 MHz band until 2022 and the unclear situation of the availability of the 3.6 GHz band. Progress on the RAIN 3 project has so far been limited.

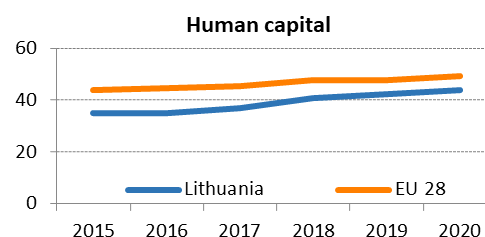
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<sup>(239)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 of the Electronic Communications code are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.



## 2 Human capital

2 Human capital	Lithuania		EU
	rank	score	score
<b>DESI 2020</b>	<b>18</b>	<b>43.8</b>	<b>49.3</b>
DESI 2019	19	42.2	47.9
DESI 2018	20	40.7	47.6



	Lithuania			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b>	<b>55%</b>	<b>55%</b>	<b>56%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>32%</b>	<b>32%</b>	<b>32%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>57%</b>	<b>57%</b>	<b>58%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>2.5%</b>	<b>2.7%</b>	<b>2.7%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>1.2%</b>	<b>1.4%</b>	<b>1.4%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>1.8%</b>	<b>2.0%</b>	<b>2.7%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

Lithuania's human capital score increased from 42.2 in 2019 to 43.8 in 2020, improving ranking from 19<sup>th</sup> to 18<sup>th</sup>. Lithuania performs best in digital and software skills, as well as female employment in ICT. However, the proportion of ICT graduates remains low. Based on the 2017 data used in this ranking, ICT graduates only account for 2.7% of all graduates in Lithuania, which is below the average EU value of 3.6%.

Lithuania is implementing policies to increase the number of ICT specialists, reduce the gender-gap, and boost investments in up-skilling the ICT labour force. The digital agenda strategy includes measures to encourage more young people to choose ICT as a career, attract more women to ICT, and improve vocational training for ICT specialists.

The digital agenda strategy in Lithuania aims to reduce the digital divide by encouraging people to develop new skills in ICT. The latest update of the strategy places even more emphasis on this goal, and emphasises reaching out to rural, older, disabled and lower-income residents.

Lithuania actively participates in Code Week<sup>(240)</sup>, a grass-roots movement that celebrates creativity, problem solving and collaboration through programming and other tech activities. In 2019, the number of Code Week activities in Lithuania increased to 513 (up from 457 in 2018), attracting 18,533 participants. Most participation took place in schools, where 45% of participants were female.

The Lithuanian IT community welcomes foreign talent from Europe and other parts of the world. For example, the Digital Explorers 2019 project improves Lithuania's talent pool through access to IT specialists from Nigeria.

<sup>(240)</sup> <https://codeweek.eu/>

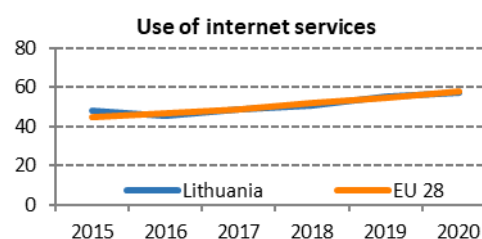
To prevent disinformation online, Lithuanian media stakeholders have launched the Demaskuok.lt NGO. This NGO is supported by senior government officials and civil society organisations. Activists working for Demaskuok.lt are known as digital 'elves' and use advanced ICT tools to identify disinformation articles and immediately debunk them.

The availability of competent and well-educated workers, and the good overall working conditions in Lithuania, attract start-ups from neighbouring non-EU countries. These start-ups frequently choose Lithuania as a suitable destination to scale-up their activities.

In conclusion, Lithuania is gradually improving in human capital. This has been thanks to policies dedicated to: (i) reducing basic shortfalls in digital skills; (ii) narrowing the gender-gap; and (iii) investing in the up-skilling of the ICT labour force. These policies have helped Lithuania to make modest improvements in this DESI dimension.

### 3 Use of internet services

3 Use of internet services	Lithuania		EU
	rank	score	score
<b>DESI 2020</b>	<b>13</b>	<b>57.3</b>	<b>58.0</b>
DESI 2019	11	55.5	55.0
DESI 2018	12	50.8	51.8



	Lithuania			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>3a1 People who have never used the internet</b>	<b>19%</b>	<b>17%</b>	<b>15%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>75%</b>	<b>78%</b>	<b>81%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>93%</b>	<b>93%</b>	<b>91%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>77%</b>	<b>84%</b>	<b>84%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>11%</b>	<b>15%</b>	<b>15%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>71%</b>	<b>74%</b>	<b>75%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>69%</b>	<b>73%</b>	<b>74%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>9%</b>	<b>9%</b>	<b>9%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>72%</b>	<b>76%</b>	<b>79%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>49%</b>	<b>54%</b>	<b>59%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>9%</b>	<b>10%</b>	<b>11%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

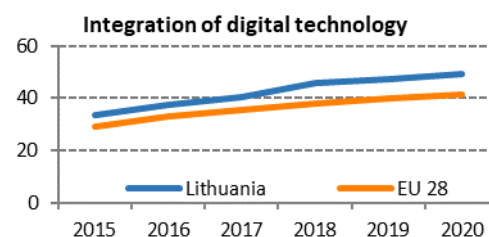
Lithuania has improved its overall score for use of internet services, but progress has not been fast enough. Lithuania ranks 13<sup>th</sup> for use of internet services in DESI 2020, which is lower than its 2019 ranking of 11<sup>th</sup>.

Overall, the use of internet services in Lithuania is comparable with the EU average. Like people elsewhere in the EU, Lithuanians are keen to engage in a variety of online activities. The number of internet users is increasing and has now reached 81%.

Compared to the EU average, Lithuanians' online activities rank higher for news, banking, video calls, social networking as well as for music, videos and games. Lithuanians are below the EU average in using the internet for video-on-demand, selling online and shopping. The proportion of people who have never used the internet is decreasing but remains higher than the EU average (15% versus 9% in the EU).

## 4 Integration of digital technology

4 Integration of digital technology	Lithuania		EU
	rank	score	score
<b>DESI 2020</b>	<b>10</b>	<b>49.5</b>	<b>41.4</b>
DESI 2019	9	47.6	39.8
DESI 2018	8	45.9	37.8



	Lithuania			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>47%</b>	<b>47%</b>	<b>48%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>20%</b>	<b>20%</b>	<b>24%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>12%</b>	<b>14%</b>	<b>14%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>17%</b>	<b>17%</b>	<b>17%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>22%</b>	<b>21%</b>	<b>24%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>12%</b>	<b>14%</b>	<b>12%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>12%</b>	<b>12%</b>	<b>13%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

Lithuania ranks above the EU average for integration of digital technology. There has been recent progress on a number of indicators, except e-Commerce turnover. Lithuania excels in electronic information sharing (48% of Lithuanian enterprises share information electronically compared to an EU average of 34%). Lithuania also performs exceptionally well in SMEs selling online, selling online across border to other EU countries and, even after a slight decrease recently, e-Commerce turnover. Lithuania's performance is close to the EU average in corporate use of social media, cloud services and big data.

In 2019, the government drew up the Lithuanian Industry Digitisation Roadmap for 2019-2030<sup>(241)</sup>. Work on this roadmap was helped by the efforts of thematic working groups on digital manufacturing, digitisation services, human resources, cybersecurity, standardisation, and legal regulation.

The national cybersecurity strategy was approved in August 2018. It aims to: (i) further strengthen regional leadership in cyber defence capabilities; (ii) ensure the prevention and investigation of cybercrime; (iii) promote a culture of cyber security and associated innovation; and (iv) increase public-private and international collaboration.

The AI strategy was launched in March 2019. It gives an overview of emerging AI ecosystems in research, industry, agriculture, health, transportation, energy, finance, and society more broadly. The strategy plans the roll-out of AI in both the private and public sector. The strategy pays

<sup>(241)</sup> [https://industrie40.lt/wp-content/uploads/2019/03/Lithuanian-Industry-Digitisation-Roadmap-2019-2030\\_final.pdf](https://industrie40.lt/wp-content/uploads/2019/03/Lithuanian-Industry-Digitisation-Roadmap-2019-2030_final.pdf)

particular attention to developing necessary skills; encouraging research and experimentation; the ethics of AI; transparency; and security.

Lithuania is a member of the EuroHPC Joint Undertaking. It has also signed a number of declarations promoting EU collaboration, such as: (i) the declaration establishing the European Blockchain Partnership; (ii) the Declaration of cooperation on Artificial Intelligence (and a related agreement on ethical guidelines for AI); (iii) the Declaration of cooperation on advancing the digitisation of cultural heritage; (iv) a declaration of cooperation on the digitisation of agriculture and rural areas; and (v) a declaration on promoting greater participation of women in the digital sector.

The governmental agency for science, innovation and technology MITA<sup>(242)</sup> plays an active role in technology integration. MITA coordinates and promotes multi-stakeholder collaboration in national, European and international R&D programmes by bringing together researchers, businesses and civil society organisations. MITA helps with access to finance, finding partners, including Horizon 2020, giving training and organising events for the research and innovation community.

In 2019, the government, in collaboration with the research agency CERN, set up highly specialised business-innovation incubators in Vilnius and Kaunas. These incubation sites bring together universities, innovative medicine clinics, and business/industry stakeholders to help apply and scale-up CERN research.

Lithuania also has four digital innovation hubs specialising in advanced manufacturing, laser technology, robotics, photonics, e-business models and IT solutions. One of Lithuania's greatest start-up success is the online clothing marketplace Vinted<sup>(243)</sup> – the first Lithuanian 'unicorn' (i.e. a start-up valued at more than USD 1 billion). Other well-known start-ups include Trafi, Oberlo and Deeper.

A fintech ecosystem is developing in Lithuania thanks to the Lithuanian central bank's regulatory sand-box. The Bank of Lithuania ranks among the world's most progressive regulators. Guided by the principle of being a partner for the financial sector, and not merely a watchdog, the Lithuanian central bank has a proven record of ensuring an innovation-conducive regulatory environment.

One of the most helpful programmes for start-ups in Lithuania is the Newcomer programme. This programme is specifically designed for new entrants to the financial sector who are considering acquiring a banking licence. The Newcomer programme allows investors to check whether the new entrant's plans are in line with legislative and regulatory requirements, and also gives help and guidance to new entrants so they can improve their plans. Over the past 2 years, this opportunity has been taken up by over 400 applicants from more than 60 countries.

Combining regulatory flexibility with the highest risk-mitigation standards makes Lithuania one of the leading jurisdictions in the world in which to set up and scale-up fintech businesses.

The start-up accelerator Blockchain Centre Vilnius<sup>(244)</sup> acts as a global hub for blockchain-related services with an additional focus on community-building and education. Blockchain Centre Vilnius collaborates with international venture capitalists, consultants and educators. It also organises events and helps blockchain start-ups to reach their business goals.

In conclusion, Lithuania actively participates in EU digital initiatives. This has been thanks to well-thought-out ICT policies and initiatives by: the digital community, technology integrators, researchers and start-ups. Their work has meant that Lithuania's score for integration of digital technology is well above the EU average.

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<sup>(242)</sup> <https://mita.lrv.lt/en/>

<sup>(243)</sup> <https://www.vinted.lt/>

<sup>(244)</sup> <https://bcgateway.eu/>

### Highlight 2020: the Vilnius fintech ecosystem

The Lithuanian central bank set up LBChain, a dedicated ‘sand-box’ environment, to help build a vibrant cluster of fintech companies in the country. LBChain is a successful example of using the European Commission’s pre-commercial procurement funds.

Another factor promoting the fintech ecosystem is the CENTROLink<sup>(245)</sup> platform. This platform strengthens capabilities and simplifies the operations of fintech start-ups by enabling instant debit and credit payments in the single European payment area (SEPA).

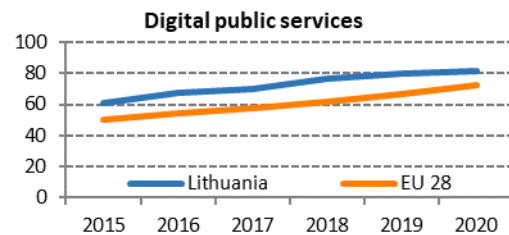
The Lithuanian central bank is also launching the world’s first blockchain-based digital collectors’ coin, LBCoin. 24,000 collector tokens will be created using blockchain technology. Each token will feature a signatory of the 16 February 1918 Act of Independence. After collecting a set of tokens with different signatories, it will be possible to redeem the physical coin.

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<sup>(245)</sup> <https://www.lb.lt/en/centrolink>

## 5 Digital public services

5 Digital public services	Lithuania		EU
	rank	score	score
<b>DESI 2020</b>	<b>6</b>	<b>81.4</b>	<b>72.0</b>
DESI 2019	7	79.4	67.0
DESI 2018	5	76.6	61.8



	DESI 2018	Lithuania	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
		value		value
<b>5a1 e-Government users</b>	<b>81%</b>	<b>81%</b>	<b>81%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>85</b>	<b>88</b>	<b>88</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>95</b>	<b>96</b>	<b>96</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>93</b>	<b>93</b>	<b>93</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>53%</b>	<b>66%</b>
% of maximum score			2019	2019

Lithuania ranks 6<sup>th</sup> in the EU for digital public services. The score improved to 81.4 in 2020 from 79.4 in DESI 2019, improving rank by one place. Lithuania scores well above the EU average for most components of digital public services. The only exception is open data, where Lithuania is ranked 24<sup>th</sup> in the EU.

The e-government gateway Elektroniniai valdžios vartai<sup>(246)</sup> acts as the central portal for government and public-administrative services. This portal has a partnership with commercial banks, which allows simple identification on the portal via e-banking accounts. The e-services available on the portal include: completing administrative procedures to start a business; looking for a job; finding employment documentation; paying taxes; enrolling at a university or educational establishment; registering changes in civil status; finding real-estate information; and many others. The portal supports e-signature through digital ID in line with eIDAS and via mobile operators.

In 2019, Lithuania launched the GovTech Lab initiative, which promotes cooperation between government and business. Through the GovTech Lab, any public sector institution can identify challenges for the private sector, academia or individuals to solve. The GovTech Lab aims to solve real-world problems that have a clear social impact by: (i) connecting start-ups and entrepreneurs with investors, accelerators and potential clients; and (ii) spreading the culture of innovation and innovation expertise in the public sector.

E-Health services are accessible via a dedicated portal<sup>(247)</sup>. This portal focuses strongly on being user-friendly and simple for older people to use. The portal can be used to: make doctor's appointments; access medical documents and lab reports; access prescriptions; find information about vaccines;

<sup>(246)</sup> <https://www.epaslaugos.lt/portal>

<sup>(247)</sup> <https://www.esveikata.lt/>

and receive online training and health tips. There is also a mobile self-help app integrated in the portal.

More advanced e-health services include Oxipit ChestEye<sup>(248)</sup>, the AI-based chest x-ray radiology tool. Lithuania is part of the European 1 Million Genomes initiative<sup>(249)</sup>, which promotes collaboration towards sequencing at least 1 million genomes in the EU by 2022. This initiative aims to improve disease prevention, allow for more personalised treatments, and provide sufficient scale for new socially beneficial research.

Lithuania has already achieved substantial results in the use of e-government and public digital services. Going even further in this domain has strong support from business, society and government.

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<sup>(248)</sup> <https://www.oxipit.ai/products/chesteye/>

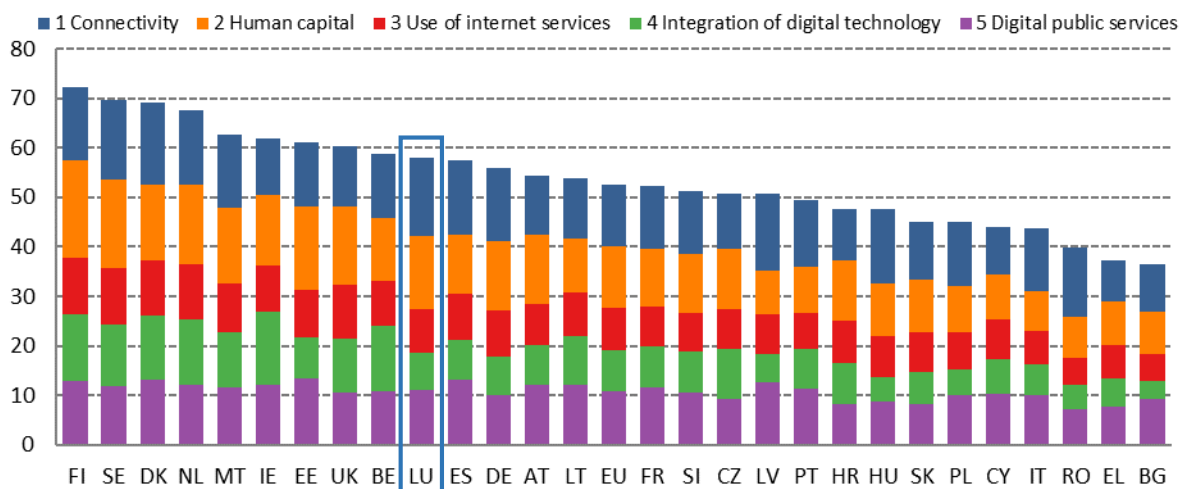
<sup>(249)</sup> <https://ec.europa.eu/digital-single-market/en/european-1-million-genomes-initiative>



## Luxembourg

	Luxembourg		EU
	rank	score	score
<b>DESI 2020</b>	<b>10</b>	<b>57.9</b>	<b>52.6</b>
DESI 2019	9	54.5	49.4
DESI 2018	9	52.4	46.5

Digital Economy and Society Index (DESI) 2020 ranking



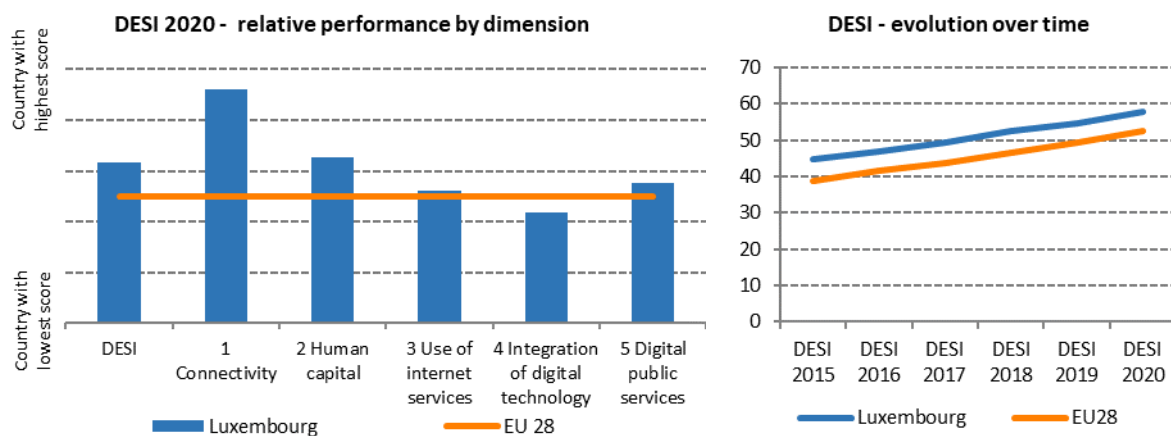
Luxembourg ranks 10<sup>th</sup> out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020, lower than in the previous year. Based on data prior to the pandemic, significant progress is observed on digital public services, rising two positions in the ranking, mainly thanks to digital public services for business and pre-filled online forms of public services. Likewise, Luxembourg improves one position in the ranking on connectivity. By contrast, although it remains above the EU average, Luxembourg's ranking fell on the human capital dimension. On integration of digital technology, Luxembourg's ranking also fell one position and as in previous years it remains below the EU average. The indicator that saw the greatest fall is in the use of internet services dimension, from 9<sup>th</sup> to 12<sup>th</sup> position, though it remains very close to the EU average.

Luxembourg continues to implement a range of strategies and initiatives to boost the digital skills of its population and to attract and retain talent, to address the significant digital skills gap on the labour market. Relevant examples are the inclusion of coding in the education curricula of cycle 4 of the basic education programme, the Digital4Education strategy, and the Artificial Intelligence (AI) strategy that includes measures to boost advanced digital skills.

Luxembourg continues to promote the uptake of strategic digital technologies by businesses. Several strategies are being implemented such as the data-driven innovation strategy to develop a trusted and sustainable economy and the AI strategy. Luxembourg is a founding member of the Euro High-Performance Computing Joint Undertaking, and will acquire the supercomputer Meluxina. In parallel, it has signed the Declaration of European Blockchain Partnership and the Declaration on cooperation on Artificial Intelligence. In 2019, Luxembourg launched the first Digital Innovation Hub to boost the digitisation of its industry, particularly among SMEs.

After the government coalition was established following the general elections in October 2018, Luxembourg created a new Ministry of Digitisation. The Ministry is headed by the Prime Minister

and it is in charge of all issues linked to digitisation. The Ministry coordinates initiatives developed by other Ministries and other partners in the field of digitisation and e-Government.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Luxembourg implemented several measures in digital to deal with the COVID-19 crisis. Initiatives to minimise contagion and to support the health system included teleconsultation platforms and applications that allowed remote monitoring of all patients tested positive for COVID-19. For the economy, digital platforms were set up to connect companies in need of manpower with companies whose staff are partially unemployed, short-time workers and self-employed people; and to link supply and demand for personal protective equipment produced and supplied by Luxembourgish companies. Digitisation of businesses was accelerated with initiatives like an e-commerce platform to allow local traders sell online. This platform, 'corona.letzshop.lu', includes dedicated to support vulnerable groups by distributing essential food products. For education, digital communication tools were scaled up to allow for a range of remote learning solutions<sup>(250)</sup>. Digital public services continued to be offered though the website 'Guichet.lu', that experienced a significant demand increase.

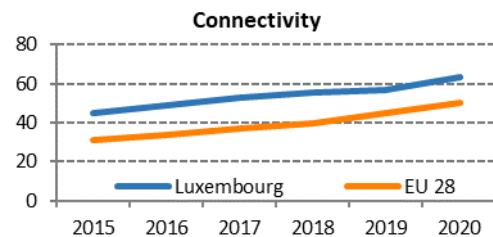
Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Luxembourg is very advanced in the deployment of Very High Capacity Network (VHCN) and is above EU average in the digital skills indicators. On the

<sup>(250)</sup> Examples: [www.schouldoheem.lu](http://www.schouldoheem.lu), [www.kannerdoheem.lu](http://www.kannerdoheem.lu), [www.aktivdoheem.lu](http://www.aktivdoheem.lu), [www.competence.lu](http://www.competence.lu), [www.houseoftraining.lu](http://www.houseoftraining.lu)

other hand, it lags behind in the assignment of radio spectrum for 5G, and has a relatively weak performance in the digitisation of businesses and use of internet services.

## 1 Connectivity

1 Connectivity	Luxembourg		EU
	rank	score	score
<b>DESI 2020</b>	<b>3</b>	<b>63.3</b>	<b>50.1</b>
DESI 2019	4	57.1	44.7
DESI 2018	1	55.3	39.9



	Luxembourg			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>1a1 Overall fixed broadband take-up</b> % households	<b>94%</b> 2017	<b>88%</b> 2018	<b>91%</b> 2019	<b>78%</b> 2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	<b>22%</b> 2017	<b>33%</b> 2018	<b>45%</b> 2019	<b>26%</b> 2019
<b>1b1 Fast broadband (NGA) coverage</b> % households	<b>95%</b> 2017	<b>98%</b> 2018	<b>98%</b> 2019	<b>86%</b> 2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	<b>57%</b> 2017	<b>63%</b> 2018	<b>92%</b> 2019	<b>44%</b> 2019
<b>1c1 4G coverage</b> % households (average of operators)	<b>98%</b> 2017	<b>99%</b> 2018	<b>98%</b> 2019	<b>96%</b> 2019
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	<b>123</b> 2017	<b>136</b> 2018	<b>122</b> 2019	<b>100</b> 2019
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	<b>NA</b>	<b>0%</b> 2019	<b>0%</b> 2020	<b>21%</b> 2020
<b>1d1 Broadband price index</b> Score (0 to 100)	<b>NA</b>	<b>NA</b>	<b>71</b> 2019	<b>64</b> 2019

Luxembourg improved its rank in connectivity from 4<sup>th</sup> to 3<sup>rd</sup> and improved its score at a higher pace than the EU average. The country is almost fully covered by fast fixed broadband networks and has also a very good coverage of very high capacity networks. Luxembourg performs very well in the take-up of fixed broadband services and 45% of households have opted for speeds of 100 Mbps and above. Broadband services (the price index including both fixed and mobile subscriptions and taking into account purchasing power parity) are slightly more affordable compared to the EU average.

Luxembourg continues to be well on track to meeting the EU broadband targets. Its own revised and more ambitious targets of 1 Gbps downstream and 500 Mbps upstream for every household by 2020 would seem unrealistic and are being reconsidered by the Ministry. 5G is expected to play a significant role for households not connected to the fibre network. Despite there being no public funding for broadband roll-out, the 100% state-owned incumbent operator *POST* is the only significant contributor to fibre roll-out. At the same time, cable operators are investing in the upgrading of their networks to DOCSIS 3.1 technologies. Given the good fibre to the premises (FTTP) coverage of 68% of households in Luxembourg, further roll-out targets households nationwide without fibre connections. *POST* is relying increasingly on opportunities for co-deployment with other infrastructure providers. It had only a slight decrease in the number of new connections in 2019 compared to those added in 2018, with a reduced investment budget in 2019. This opportunity-based roll-out policy, driven by cost-cutting considerations, results in less predictability

as to where exactly new fibre lines will be available and by when. At the same time, POST's GPON<sup>(251)</sup> fibre infrastructure (28% of all fibre connections) is being upgraded to point to point with four fibres linking the sub loops in the street cabinets with the main distribution frame. The migration concerns 1,200 street cabinets and is scheduled to be finalised over a 10-year period.

In Luxembourg, 25% of the total 2090 MHz spectrum harmonised at EU level for wireless broadband has been assigned. Luxembourg scores 0 on the 5G readiness indicator<sup>(252)</sup> as by the end of 2019, no spectrum in the 700 MHz, 3.6 GHz and 26 GHz bands was yet available for 5G use. However, assignments of the 700 MHz and 3.6 GHz wireless broadband bands are planned for mid-2020. Following a first public consultation, which revealed that demand exceeded supply (six operators showing interest in the 700 MHz band, eight in the 3.6 GHz band), the national regulatory authority '*Institut Luxembourgeois de Régulation*' (ILR) prepared the auction design and usage requirements on coverage (in the 700 MHz band) and on roll-out (in the 3.6 GHz band) and launched a second public consultation on 13 March 2020. In the 3.6 GHz band, 330 MHz will be made available<sup>(253)</sup>. In the guard band in the upper part of the 3.6 GHz band (3750-3800 MHz), some spectrum could be granted in a second step for local use. So far, interest in the 26 GHz spectrum seems to be limited. Luxembourg has to protect other primary services (those already deployed and those expected to be launched in the future), i.e. fixed service links, and the uplink for fixed satellite services. While Luxembourg has not completed its analyses on the exact amount of spectrum to be released, it seems realistic to allow the use of 1 GHz for mobile broadband by the end of 2020. The ILR plans to run a public consultation in the 26 GHz band during the second half of 2020 to assess the market demand for this band. The upgrading of the radio network's existing sites by mobile network operators (MNOs) and the setting up of new sites is challenging as various authorities at municipality level have to be consulted, environmental and town planning requirements have become stricter (e.g. negative visual impacts are a possible issue) and concerns about radiation emitted by electromagnetic fields are picking up in the general public. The various levels of permit granting are not only slowing down the roll-out of mobile radio access networks, but also of fibre, which is particularly important for mobile backhaul and FTTH roll-out.

Luxembourg's authorities will need to make timely preparations to assign additional spectrum which can be used for 5G services to meet the EU target for 5G. Framing a strategy to streamline permit procedures and to facilitate access to public property to extend and densify mobile networks would further stimulate and accelerate the roll-out of both fixed and mobile infrastructure.

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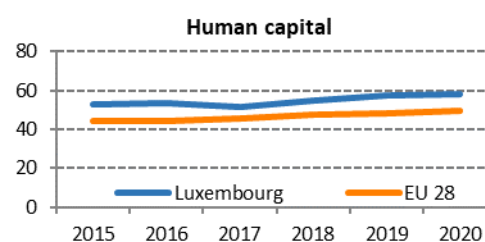
<sup>(251)</sup> Gigabit passive optical network: It has a point-to-multipoint architecture where passive splitters in the fibre distribution network enable one single feeding fibre to serve multiple subscribers.

<sup>(252)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

<sup>(253)</sup> A ministerial decision was published in the official journal on 27 April 2020.

## 2 Human capital

2 Human capital	Luxembourg		EU
	rank	score	score
<b>DESI 2020</b>	<b>8</b>	<b>58.2</b>	<b>49.3</b>
DESI 2019	7	57.4	47.9
DESI 2018	9	55.1	47.6



	Luxembourg			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b> % individuals	NA 2017	NA 2017	65% 2019	58% 2019
<b>2a2 Above basic digital skills</b> % individuals	NA 2017	NA 2017	36% 2019	33% 2019
<b>2a3 At least basic software skills</b> % individuals	NA 2017	NA 2017	68% 2019	61% 2019
<b>2b1 ICT specialists</b> % total employment	4.1% 2016	5.0% 2017	5.6% 2018	3.9% 2018
<b>2b2 Female ICT specialists</b> % female employment	1.3% 2016	1.4% 2017	1.5% 2018	1.4% 2018
<b>2b3 ICT graduates</b> % graduates	5.9% 2015	5.8% 2016	4.6% 2017	3.6% 2017

In the human capital dimension, Luxembourg ranks 8<sup>th</sup>. Although this is lower than its 2019 ranking, it continues to score well above the EU average. Luxembourg ranks above the EU average on the three digital literacy indicators. In 2019, 65% of 16-74-year-olds in Luxembourg had at least basic digital skills compared to the EU average of 58%. The country continues to report an increase in the share of ICT specialists as a percentage of the total employment, and is well above the EU average (5.6% and 3.9% respectively). Although the share of ICT graduates of the total pool of graduates fell in 2019 compared to the previous year, it remains above the EU average (4.6% and 3.6% respectively). At the same time, Luxembourg continues to experience significant labour shortages in terms of ICT specialists. 69% of companies that recruited or tried to recruit ICT specialists in 2019 reported difficulties in filling vacancies, significantly above the EU average of 57%.

In 2019, the Ministry of Education announced plans to systematically teach coding and computational thinking throughout primary and secondary education programmes in public schools. The 2020-2021 school year will incorporate coding in mathematics classes throughout cycle 4 of the basic education programme<sup>(254)</sup>. In parallel, Luxembourg continued to implement its digital education strategy, Digital4Education, with several initiatives such as BEE SECURE designed to raise awareness of the security aspects of using digital technologies and the Digital Classroom to train school pupils in the use of digital technologies<sup>(255)</sup>.

Luxembourg also plans to boost advanced digital skills in areas such as AI. The main objective of the national AI strategy is to boost AI-related skills and competences and to provide opportunities for

<sup>(254)</sup> [https://gouvernement.lu/en/actualites/toutes\\_actualites/articles/2019/12-decembre/31-nouveaux-2020.html](https://gouvernement.lu/en/actualites/toutes_actualites/articles/2019/12-decembre/31-nouveaux-2020.html)

<sup>(255)</sup> <https://portal.education.lu/digital4education/>

lifelong learning. However, the strategy does not provide details on the budget or an implementation plan.

In 2019, Luxembourg relaunched the Digital Skills and Jobs Coalition with the aim of improving digital skills by unveiling a new governance structure, a revised action plan and a clear focus<sup>(256)</sup>. At the time of writing, it had about 50 active members from both the public and private sectors and the Women in Digital Initiatives Luxembourg (WIDE) became the Coalition's new coordinating partner. One of the main objectives of the Coalition is to address the skills mismatch in the labour market, for example by facilitating traineeships for young people. In the same vein, the government is assessing the recent pilot programme 'Luxembourg Digital Skills Bridge' to develop a national strategy and a support mechanism to coach and upskill employees. In addition, Luxembourg plans to launch a new national strategy on attracting talent that will be co-designed by the Ministry of Economy, the Ministry of Education and the Ministry of Employment<sup>(257)</sup>.

Luxembourg participated in the EU Code Week 2019<sup>(258)</sup>, a grassroots movement run by volunteers to encourage people of all ages to discover coding and digital creativity. Compared to the 2018 edition, it organised fewer activities (from 16 to 10), all of which were organised in schools. The number of participants was around 350, with 56% of female participation on average.

To continue improving the level of digital skills of the population and to tackle the labour shortages in terms of ICT specialists, it is critical to continue working on the initiatives detailed above and to frame corresponding action plans to ensure they are implemented.

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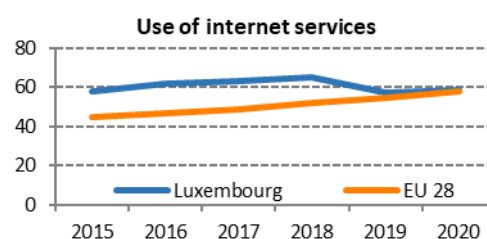
<sup>(256)</sup> <https://ec.europa.eu/digital-single-market/en/news/luxembourg-relaunches-its-digital-skills-and-jobs-coalition>

<sup>(257)</sup> <https://www.cdm.lu/news/fiche/newsnew/news/un-coordonateur-pour-la-future-strategie-nationale-talent-attraction>

<sup>(258)</sup> <https://blog.codeweek.eu/post/190418441025/eucodeweek19stats>

### 3 Use of internet services

3 Use of internet services	Luxembourg		EU
	rank	score	score
<b>DESI 2020</b>	<b>12</b>	<b>58.9</b>	<b>58.0</b>
DESI 2019	9	57.6	55.0
DESI 2018	5	65.1	51.8



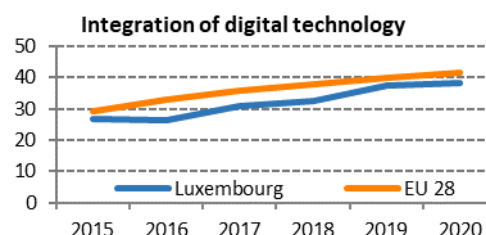
	Luxembourg			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>3a1 People who have never used the internet</b> % individuals	<b>2%</b> 2017	<b>3%</b> 2018	<b>3%</b> 2019	<b>9%</b> 2019
<b>3a2 Internet users</b> % individuals	<b>96%</b> 2017	<b>92%</b> 2018	<b>93%</b> 2019	<b>85%</b> 2019
<b>3b1 News</b> % internet users	<b>NA</b> 2017	<b>NA</b> 2017	<b>74%</b> 2019	<b>72%</b> 2019
<b>3b2 Music, videos and games</b> % internet users	<b>89%</b> 2016	<b>72%</b> 2018	<b>72%</b> 2018	<b>81%</b> 2018
<b>3b3 Video on demand</b> % internet users	<b>29%</b> 2016	<b>24%</b> 2018	<b>24%</b> 2018	<b>31%</b> 2018
<b>3b4 Video calls</b> % internet users	<b>57%</b> 2017	<b>49%</b> 2018	<b>55%</b> 2019	<b>60%</b> 2019
<b>3b5 Social networks</b> % internet users	<b>70%</b> 2017	<b>66%</b> 2018	<b>65%</b> 2019	<b>65%</b> 2019
<b>3b6 Doing an online course</b> % internet users	<b>10%</b> 2017	<b>10%</b> 2017	<b>11%</b> 2019	<b>11%</b> 2019
<b>3c1 Banking</b> % internet users	<b>78%</b> 2017	<b>70%</b> 2018	<b>73%</b> 2019	<b>66%</b> 2019
<b>3c2 Shopping</b> % internet users	<b>82%</b> 2017	<b>74%</b> 2018	<b>75%</b> 2019	<b>71%</b> 2019
<b>3c3 Selling online</b> % internet users	<b>18%</b> 2017	<b>15%</b> 2018	<b>16%</b> 2019	<b>23%</b> 2019

Luxembourg scores well on the use of internet services dimension, although it fell down the ranking compared with its result in previous years. It now ranks 12<sup>th</sup> in the EU due to a drop in several indicators in this dimension. Nevertheless, internet use remains very high, with only 3% of people reporting they have never used the internet and 93% of people (down from 96% in 2017) reporting to be internet users, against an EU average of 85%. Luxembourg also ranks very high in terms of users of online banking and shopping, with 75% of respondents shopping online against an EU average of 71%. However, Luxembourg ranks relatively low in terms of users watching video on demand (with 24%), listen to music or play games (with only 72% using the Internet for these activities). Also relatively few users sell their products or services online (16% against the EU average of 23%).



## 4 Integration of digital technology

4 Integration of digital technology	Luxembourg		EU
	rank	score	score
<b>DESI 2020</b>	<b>19</b>	<b>38.2</b>	<b>41.4</b>
DESI 2019	18	37.4	39.8
DESI 2018	20	32.5	37.8



	Luxembourg			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>41%</b>	<b>41%</b>	<b>41%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>20%</b>	<b>20%</b>	<b>29%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>13%</b>	<b>16%</b>	<b>16%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>NA</b>	<b>16%</b>	<b>16%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>8%</b>	<b>12%</b>	<b>9%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>8%</b>	<b>8%</b>	<b>NA</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

On the integration of digital technology by businesses, Luxembourg, ranks 19<sup>th</sup> and continues to perform below the EU average. Consistent with the country's ambition to make the transition to a data-driven economy, Luxembourg has made major progress in terms of the uptake of digital innovation. In particular, it performs well on the share of companies that analyse big data (16% versus the EU average of 12%, ranking 7<sup>th</sup>). A high share of companies (41% versus the EU average of 34%) use the internet to share information. By contrast, the country continues to perform well below the EU average as regards the share of SMEs selling online, with only 9% in comparison to the EU average of 18%. Furthermore, only 8% of SMEs sell online across border to other EU countries.

The government has taken key measures to promote the development and uptake of strategic digital technologies, such as supercomputing, AI, blockchain and big data. In line with the country's ambitious digital transformation agenda, Luxembourg has developed several national strategies, including its smart specialisation strategy, a data-driven innovation strategy for the development of a trusted and sustainable economy, and its AI strategy. To create a sustainable digital innovation ecosystem, Luxembourg aims to build on its digital infrastructure, develop core competences through education and research, and gain experience in using these technologies.

Luxembourg is committed to fully engaging at European level on digital technology. The country is a member of the Euro High Performance Computing (Euro HPC) Joint Undertaking<sup>(259)</sup>. It has signed the Declaration of European Blockchain Partnership<sup>(260)</sup> and the Declaration on cooperation on Artificial

<sup>(259)</sup> <https://ec.europa.eu/digital-single-market/en/eurohpc-joint-undertaking>

<sup>(260)</sup> <https://ec.europa.eu/digital-single-market/en/news/european-countries-join-blockchain-partnership>

Intelligence. In June 2019, EuroHPC selected Luxembourg as one of the eight sites to host supercomputers (see highlight).

In addition, a centre of competence is being developed in Luxembourg as part of a European network of centres of competences. 'Luxinnovation', jointly run by the Ministry of Economy, the University of Luxembourg and LuxProvide is a European consortium to extend the range of HPC and big data-related competences and to facilitate industrial research and innovation applications. Building communities of knowledge on data production, algorithms and AI is instrumental to economic diversification in Luxembourg.

Furthermore, Luxembourg has taken action to promote the digitisation of SMEs. It has set up several initiatives, including the fourth national action plan to support SMEs and the 'Fit4Digital' programme, a programme managed by Luxinnovation to boost the use of digital solutions in SMEs. In September 2019, the Luxembourg Digital Innovation Hub (L-DIH), a platform of industry and solution providers, was set up to boost the digitisation of industry, especially SMEs. The fifth national action plan to support SMEs, which includes financial support measures, is under stakeholder consultation with approval expected in the first half of 2020.

Luxembourg is advancing in the deployment of new technologies and related infrastructure. It is crucial for SMEs to update these technologies to ensure a level-playing field approach in the adoption of new technologies to benefit all parts of the economy.

#### **Highlight 2020: High Performance Computing in Luxembourg, Meluxina**

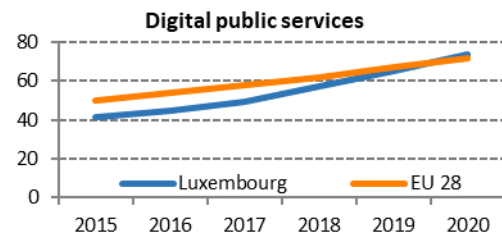
Luxembourg is a founding member of EuroHPC. EuroHPC is a Joint Undertaking set up with the aim of developing a world-class pan-European infrastructure of supercomputers, from peta-scale to post-exascale, and to grow the associated ecosystem across Europe.

High Performance Computing (HPC) is a central element of the government's national strategy and an enabler for the current technological, ecological and energy transformation. First, as a cornerstone of the Luxembourgish digital infrastructure, Meluxina, Luxembourg's new national high-performance computer will be accessible to both businesses and research. Second, the country will build new skills and competences related to HPC through new educational, up-skilling and re-skilling programmes. Luxembourg thus plans to spread expertise on HPC and experience in testing innovative processes along the entire value chain of data, algorithms and AI from research organisations like Uni.lu or LIST to businesses.

Meluxina will feature an innovative and modular architecture, building on key European technologies. It will be co-financed by the EU and it will support sustained innovation capabilities. Larger companies that already use digital simulations or create virtual environments have expressed their interest and SMEs have shown a particular interest in adopting these capabilities.

## 5 Digital public services

5 Digital public services	Luxembourg		EU
	rank	score	score
<b>DESI 2020</b>	<b>14</b>	<b>73.7</b>	<b>72.0</b>
DESI 2019	16	64.9	67.0
DESI 2018	18	57.2	61.8



	Luxembourg			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>5a1 e-Government users</b> % internet users needing to submit forms	<b>49%</b> 2017	<b>55%</b> 2018	<b>58%</b> 2019	<b>67%</b> 2019
<b>5a2 Pre-filled forms</b> Score (0 to 100)	<b>50</b> 2017	<b>55</b> 2018	<b>67</b> 2019	<b>59</b> 2019
<b>5a3 Online service completion</b> Score (0 to 100)	<b>81</b> 2017	<b>87</b> 2018	<b>90</b> 2019	<b>90</b> 2019
<b>5a4 Digital public services for businesses</b> Score (0 to 100) - including domestic and cross-border	<b>82</b> 2017	<b>89</b> 2018	<b>99</b> 2019	<b>88</b> 2019
<b>5a5 Open data</b> % of maximum score	<b>NA</b>	<b>NA</b>	<b>63%</b> 2019	<b>66%</b> 2019

In digital public services, Luxembourg has made major progress. It now ranks 14<sup>th</sup> in the EU, significantly improving its score to more than 1 point higher than the EU average. Therefore, Luxembourg's overall performance on digital public services has improved faster than the EU-28 average. The country performs particularly well in the provision of digital public services to businesses, scoring 99 out of 100 against the EU average of 88. By contrast, there is a low level of online interaction between public authorities and citizens. Only 58% of Luxembourg internet users actively engage with e-Government services (substantially below the EU average of 67%). Luxembourg performs above the EU average on pre-filled forms and online service completion, and has made significant progress on both indicators over the past few years. The country performs relatively well on open data, ranking 19<sup>th</sup> in the EU.

After the government coalition was established following the general elections in October 2018, Luxembourg set up a new Ministry of Digitisation, headed by the Prime Minister, the Minister for Digitisation, and the Minister-delegate for Digitisation. It is in charge of all matters of digitisation and coordinates initiatives developed by other ministries and partners on digitisation and on e-Government.

One of the top priorities of the newly created Ministry is to provide more e-Government services in collaboration with the CTIE (*Centre des technologies de l'information de l'État*) in order to foster the modernisation of public administrations and improve the daily life and administrative processes of citizens and businesses<sup>(261)</sup>. In 2019, Luxembourg brought in new digital government services such as online payments of standard files, registration for electoral polls and online applications to vote by post. Businesses can now apply online for a business permit and for certification of Luxembourgish documents to be used abroad.

<sup>(261)</sup> National Interoperability Framework Observatory, *Digital Government factsheets 2019 — Luxembourg*.

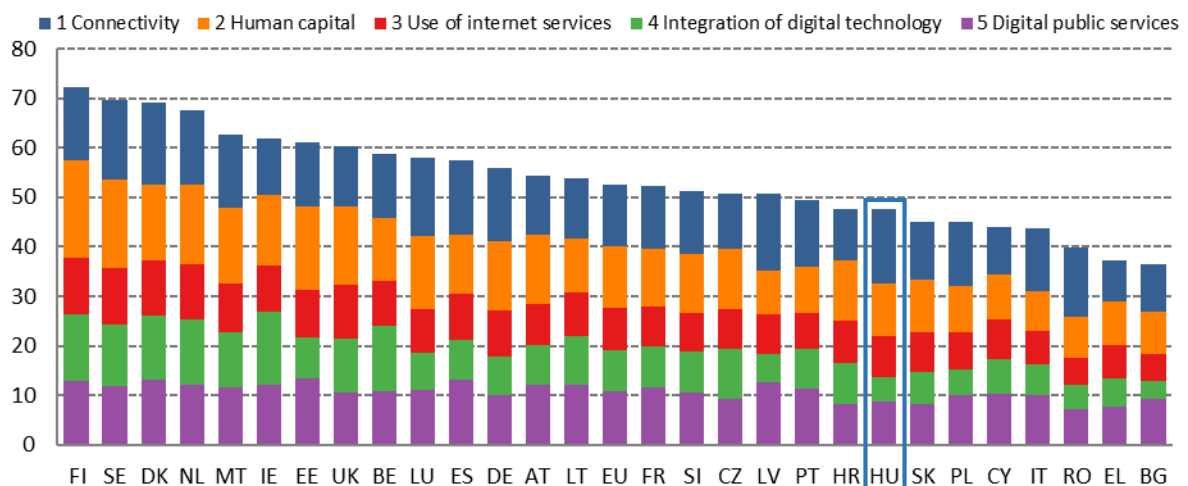
In September 2018, Luxembourg adopted a law on transparent and open administration. The purpose of the new law is to provide the framework for implementing a policy on access to citizens' administrative documents held by government departments, municipalities, local authorities and public institutions, placed under the supervision either of the State or of the municipalities.

The new Ministry of Digitisation's central coordination role has the potential to lead to major improvements on digital public administration. Continued work to create further digital public services is fundamental to complete the process of modernising the public administration.

## Hungary

	Hungary		EU
	rank	score	score
DESI 2020	21	47.5	52.6
DESI 2019	22	42.3	49.4
DESI 2018	22	40.0	46.5

Digital Economy and Society Index (DESI) 2020 ranking



Hungary ranks 21<sup>st</sup> out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020. Over the last few years, its score improved broadly in line with the EU average.

Based on data prior to the pandemic, Hungary ranks most highly on broadband Connectivity. It is among the leaders in the take-up of at least 100 Mbps broadband, 5G readiness, and also scores well in Overall fixed broadband take-up. It still lags behind in Digital public services and in the Integration of digital technologies in businesses. The country ranks 24<sup>th</sup> on Digital public services despite a marked improvement in all indicators in this area. Most companies are not exploiting the opportunities offered by digital technologies, such as cloud computing and big data, and few of them sell online. On Human capital, over half of the population lacks basic digital skills and software skills.

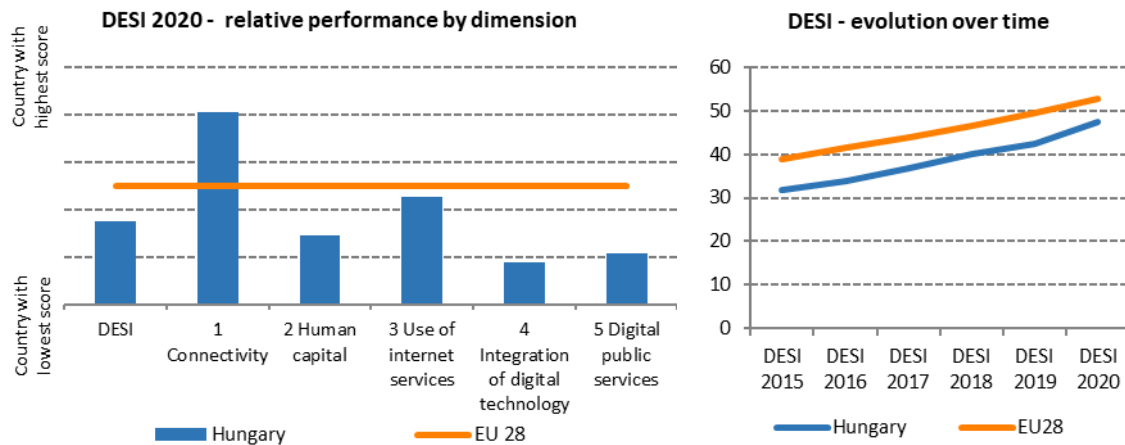
In 2014, Hungary adopted the National Info-communication Strategy 2014-2020<sup>(262)</sup>. It started implementing it in 2014, and continued with the adoption of the Digital Success Programme (*'Digitális Jólét Program – DJP'*) at the end of 2015 and the Digital Success Programme 2.0 in 2017. The Digital Success Programme has been managed by the Ministry for Innovation and Technology since 2019. Since 2017, it has developed several specific strategies, such as digital education, digital start-ups, digital exports, 5G deployment, artificial intelligence (AI), digitisation in the agriculture sector, fintech and e-health. It is currently developing a digital strategy for the food and beverage industry, and is building aspects of digitisation for various sectoral strategies such as construction, tourism and logistics. A large number of projects, many of which are jointly financed by the EU, are in place to implement the strategies. The Superfast Internet Programme aims to deploy high capacity fibre broadband in underserved areas. The EDIOP<sup>(263)</sup> 6.1.2 programme on bridging the

<sup>(262)</sup> [http://www.kormany.hu/download/5/ff/70000/NIS\\_EN\\_clear.pdf](http://www.kormany.hu/download/5/ff/70000/NIS_EN_clear.pdf)

<sup>(263)</sup> Economic Development and Innovation Operational Programme.

digital skills gap targets the working age population, while the development of community internet access points helps digitally illiterate individuals. The Modern Enterprises Programme remains the main tool for improving the digitisation of small and medium-sized enterprises (SMEs).

As for emerging technologies, Hungary has developed an AI action plan, which will serve as a basis for a future AI strategy. In addition, the country is planning to modernise its high performance computing infrastructure and ecosystem.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

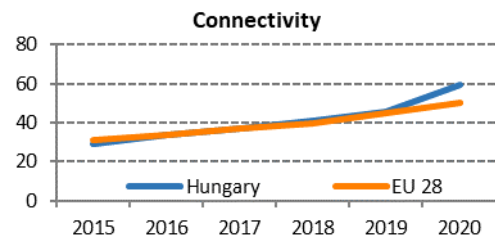
Hungary has taken a large number of measures in digital to deal with the COVID-19 crisis, covering all the five dimensions of DESI. Public education and higher education has moved to an online curriculum. Apart from the central KRÉTA and Neptun applications, other collaborative spaces are also used for continuing educational activities. The Education Office has issued a methodological recommendation for the organisation of education for the out-of-classroom digital work schedule. As for digitising businesses, the activities of the Modern Enterprises Programme have been revised to provide new measures and services for the SMEs in light of the pandemic crisis. The Digital Success Programme's capital and lending programme has been modified to make landing easier for ICT SMEs. On the national e-health platform, now powers and mandates can be set, so redeeming e-prescriptions and access to medical documents of other persons online became possible.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Hungary is very advanced on 5G, and Fixed very high capacity networks (VHCN) coverage stands just below the EU average. On the other hand, it

lags behind in the digitisation of businesses and in digital public services.

# 1 Connectivity

1 Connectivity	Hungary		EU
	rank	score	score
<b>DESI 2020</b>	<b>7</b>	<b>59.8</b>	<b>50.1</b>
DESI 2019	16	45.9	44.7
DESI 2018	14	41.1	39.9



	DESI 2018	Hungary	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
		value		value
<b>1a1 Overall fixed broadband take-up</b> % households	<b>78%</b> 2017	<b>77%</b> 2018	<b>82%</b> 2019	<b>78%</b> 2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	<b>30%</b> 2017	<b>40%</b> 2018	<b>51%</b> 2019	<b>26%</b> 2019
<b>1b1 Fast broadband (NGA) coverage</b> % households	<b>83%</b> 2017	<b>87%</b> 2018	<b>90%</b> 2019	<b>86%</b> 2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	<b>30%</b> 2017	<b>36%</b> 2018	<b>43%</b> 2019	<b>44%</b> 2019
<b>1c1 4G coverage</b> % households (average of operators)	<b>91%</b> 2017	<b>96%</b> 2018	<b>97%</b> 2019	<b>96%</b> 2019
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	<b>49</b> 2017	<b>59</b> 2018	<b>70</b> 2019	<b>100</b> 2019
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	<b>NA</b>	<b>8%</b> 2019	<b>61%</b> 2020	<b>21%</b> 2020
<b>1d1 Broadband price index</b> Score (0 to 100)	<b>NA</b>	<b>NA</b>	<b>63</b> 2019	<b>64</b> 2019

As regards connectivity, Hungary ranks 7<sup>th</sup> after showing significant improvement in the past year. Fast broadband coverage improved further with 3 percentage points to 90% of households above the EU average of 86%. There is very strong platform-based competition illustrated by a stable technology share of cable (49%), declining share of DSL (23% against 25% in 2018) and rising share of FTTH/B (25% against 22% in 2018). Fixed broadband take-up increased to 82%, above the EU average of 78%. Connection speeds saw a large improvement as well, as over half of homes, 51% against the EU average of 26%, subscribe to at least 100 Mbps fixed broadband, mainly owing to the country's widespread cable networks. This is a significant jump from last year's 40%. VHCN coverage stands at 43%, just below the EU average of 44%. The average mobile broadband coverage of 97% inches above the EU average of 96%. However, mobile broadband take-up is still the lowest in the EU (70 subscriptions per 100 people, against 100 in the EU overall). This may be, because prices for mobile phone users are persistently among the highest in Europe. Hungary ranks 16<sup>th</sup> in the EU in terms of broadband prices when analysing all product baskets (fixed, mobile, converged). Hungary ranks 8<sup>th</sup> in terms of fixed broadband prices. However, converged products (19<sup>th</sup> place) and mobile broadband prices (23<sup>rd</sup> place) are still higher than the EU average.

The vast majority of projects under the Superfast Internet Programme deployed FTTH technology, enabling speeds envisaged in the gigabit society targets. The project intends to cover all Hungarian households – the connectivity of almost 410,000 households is financed by EU structural funds –, with networks supplying at least 30 Mbps broadband by 2023. For areas that are not economically



viable, a €250 million state aid scheme has been developed to ensure broadband roll-out. The project deployment is reflected in the increase of rural FTTP coverage from 4% in 2015 to 29% in 2019. By the end of 2019 213,064 households were covered by 30 Mbps broadband.

Hungary is 3<sup>rd</sup> regarding the 5G readiness indicator with 61%<sup>(264)</sup>. 49% of the 2090 MHz spectrum harmonised at EU level for wireless broadband has been assigned in Hungary. The 5G strategy elaborated on the basis of the proposals of the 5G Coalition (5GC) has not been adopted yet by the Hungarian government. The 5GC was launched by the Digital Success Programme, and aims to make Hungary a major European centre of 5G developments. It should also take the leading role in the region in testing 5G applications. The multi-band award process of the 700 MHz, 3400-3800 MHz bands and remaining spectrum in the 2100 MHz and 2600 MHz bands took place on 26 March 2020. Magyar Telekom, Telenor and Vodafone gained licences for a total amount of 128.5 billion HUF (approximately 360 million EUR). Meanwhile, the fourth operator, DIGI Hungary was ruled out by the national regulatory authority (NMHH) from the auction process in October 2019. The mobile operator contested the decision in Court and the case is pending.

In October 2019, 5G commercial services were launched in Budapest by an MNO. Other MNOs undertook 5G mobile tests in Győr, Debrecen and Zalaegerszeg (in the latter testing self-driving cars).

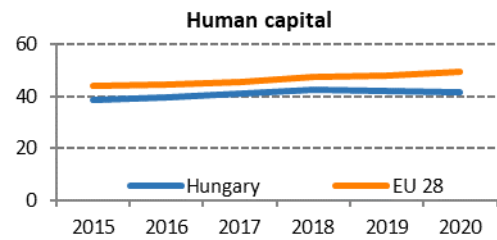
While significant advancements have been achieved in high speed fixed broadband take-up (51% in case of at least 100 Mbps, double of the EU average), the mobile broadband take-up is still well below (70 subscriptions/ 100 people) the EU average of 100 subscriptions/100 people.

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<sup>(264)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU) 2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

## 2 Human capital

2 Human capital	Hungary		EU
	rank	score	score
<b>DESI 2020</b>	<b>19</b>	<b>41.8</b>	<b>49.3</b>
DESI 2019	20	42.1	47.9
DESI 2018	19	42.5	47.6



	DESI 2018	Hungary	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
<b>2a1 At least basic digital skills</b> % individuals	<b>50%</b> 2017	<b>50%</b> 2017	<b>49%</b> 2019	<b>58%</b> 2019
<b>2a2 Above basic digital skills</b> % individuals	<b>26%</b> 2017	<b>26%</b> 2017	<b>25%</b> 2019	<b>33%</b> 2019
<b>2a3 At least basic software skills</b> % individuals	<b>52%</b> 2017	<b>52%</b> 2017	<b>51%</b> 2019	<b>61%</b> 2019
<b>2b1 ICT specialists</b> % total employment	<b>3.6%</b> 2016	<b>3.6%</b> 2017	<b>3.7%</b> 2018	<b>3.9%</b> 2018
<b>2b2 Female ICT specialists</b> % female employment	<b>1.0%</b> 2016	<b>0.7%</b> 2017	<b>0.7%</b> 2018	<b>1.4%</b> 2018
<b>2b3 ICT graduates</b> % graduates	<b>NA</b> 2015	<b>4.3%</b> 2016	<b>4.3%</b> 2017	<b>3.6%</b> 2017

Hungary ranks 19<sup>th</sup> among EU countries on Human capital and is below the EU average. It is cause for concern that no progress has been made in digital skills and in advanced specialist skills in recent years. At least basic digital skills remained well below the EU average (49% compared to 58% in the EU) and at least basic software skills are also modest. Only a quarter of the population aged between 16 and 74 has above basic digital skills, below the EU average of 33%. ICT specialists account for a slightly lower proportion of the workforce as in the rest of the EU (3.7% against 3.9% in the EU), while the proportion of female ICT specialists is very low at only 0.7% of all female employees. Nevertheless, 4.3% of graduates study ICT, which exceeds the EU average of 3.6%.

Government initiatives to improve digital skills are mainly based on two key strategies (the Digital Education Strategy and the Digital Labour Force Programme) and the reform of the professional training and adult education.

The Digital Education Strategy, which was launched in 2016, covers all levels of the education system, including public education, vocational training, higher education and lifelong learning. To implement this strategy, the government set up the Digital Pedagogical Methodology Centre. Its role is to support the digital transformation of public education, provide the professional background and expert base, and support applications and priority projects. The broadband infrastructure is being upgraded in state schools to ensure at least 100 Mbps broadband for schools with less than 500 pupils (75.9% completed) and gigabit connectivity for those with more than 500 pupils (24% completed). Furthermore, 80% (3234 out of 4035) of all schools have a Wi-Fi connection.

Last year new regulations on vocational training, higher education and public education entered into force (11/2020, 12/2020 government regulation) emphasising the importance of digital skills.

The Digital Workforce Programme was launched in 2018 and includes four pillars. First, it aims to improve how labour market needs are measured, and how the digital economy is monitored in

general. Second, it develops a new digital competence framework using the EU's DigComp 2.1 framework<sup>(265)</sup> for citizens, and integrates it into the input and output requirements of the training system. Third, it focuses on motivational factors through the lifelong learning support system, the expansion of e-learning and blended learning opportunities as well as through providing financial benefits and support for disadvantaged groups. Fourth, the programme includes different training programmes, such as general IT training (short cycle), on-the-job training and specific training for career changers and for those without higher education. In addition, the programme provides for National Digital Skills Councils to be set up to assist in analysing skills mismatches. This may bring about changes in education and promote certifications of skills.

EU funds are widely used to finance government initiatives. They are used to help develop digital skills in both the inactive and working population, narrow the skills gap and to boost the inclusion of disadvantaged people. Initiatives concentrate on both basic digital skills for the digitally illiterate and professional skills for the workforce, including ICT specialists.

The Hungarian government has introduced several measures on the e-inclusion of senior citizens. In 2019, 6,000 received training in a pilot project to help them develop basic IT skills (computers, smart devices and internet). Based on the experience of the pilot, the government also published a detailed handbook to facilitate self-learning. In addition, video chat has been installed in elderly care homes, and a special service keeps regular contact with senior citizens through this channel. This programme has been running for 2 years and has more than 6,000 participants.

Several programmes are in place to develop the skills of the working age population. The EDIOP 6.1.2 programme has provided some 200,000 people with digital skills training. The EDIOP 3.3.1. programme has set up 1,500 community digital access points ('Digital Success Programme Points') with ICT trainings for those with low digital skills.

The 'Programme your future' project continued in 2019. It aims to boost the number of students that graduate in ICT and improve cooperation between the educational institutions and the ICT sector. Within the programme, three experience centres have been created (Győr, Budapest, Debrecen) to motivate pupils of primary and secondary schools to study IT and engineering. In 2019, 1,330 activities were organised in Hungary during the EU Code Week.

The government has launched two initiatives to increase the number of women in ICT. TechGirls is organised by the German-Hungarian Chamber of Commerce and Industry, while Girls' Day is organised by the Association of Hungarian Women in Science. Both target 14-18 year-olds.

Hungary has set up the National Coalition for Digital Skills and Jobs to facilitate stakeholder discussions on tackling the shortage of digitally skilled people in the Hungarian labour market and help the government develop and implement adequate strategies. Alongside to that, 'digital topic weeks' are organised on a regular basis to promote digital pedagogic methodologies.

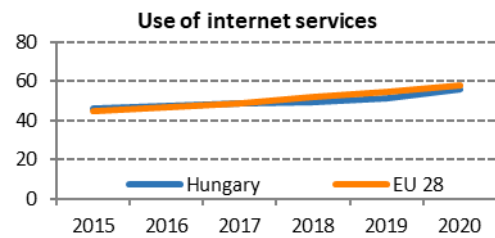
Hungary continued to implement the various national strategies designed to tackle the issues related to digital skills. The related initiatives aim to address the main aspects of the digital skills gap. The proper and timely implementation of the Digital Education Strategy is key to improving the country's performance on both internet user skills and advanced digital skills.

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<sup>(265)</sup> <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/digcomp-21-digital-competence-framework-citizens-eight-proficiency-levels-and-examples-use>

### 3 Use of internet services

3 Use of internet services	Hungary		EU
	rank	score	score
<b>DESI 2020</b>	<b>14</b>	<b>55.9</b>	<b>58.0</b>
DESI 2019	19	51.2	55.0
DESI 2018	16	49.5	51.8



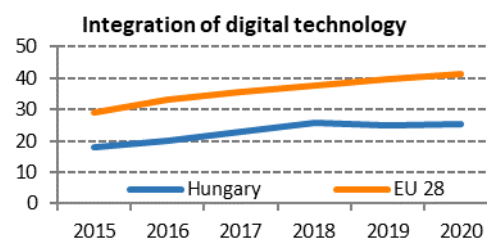
	DESI 2018	Hungary	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
	2017	value	2019	value
<b>3a1 People who have never used the internet</b>	<b>17%</b>	<b>16%</b>	<b>14%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>76%</b>	<b>75%</b>	<b>80%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>85%</b>	<b>85%</b>	<b>84%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>81%</b>	<b>82%</b>	<b>82%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>8%</b>	<b>11%</b>	<b>11%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>59%</b>	<b>60%</b>	<b>75%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>84%</b>	<b>86%</b>	<b>86%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>5%</b>	<b>5%</b>	<b>7%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>49%</b>	<b>54%</b>	<b>58%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>49%</b>	<b>52%</b>	<b>59%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>14%</b>	<b>14%</b>	<b>16%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

Overall, the use of internet services in Hungary is broadly comparable with the EU average. 80% of the population use the internet at least once a week, which is 5 percentage points higher than a year ago, but is still below the EU average of 85%. 86% of internet users use social networks, the highest score in the EU; 84% read news online (72% in the EU), and 75% make video calls, up from 60% last year (60% in the EU). On the other hand, only 7% of internet users took part in e-learning activities.

There was a large increase in online banking and shopping. In 2019, 58% of internet users used online banking services, up from 49% 2 years ago. 59% purchased online, 7 percentage points more than in 2018. Despite the improvements, Hungary still performs below average on online transactions.

## 4 Integration of digital technology

4 Integration of digital technology	Hungary		EU
	rank	score	score
<b>DESI 2020</b>	<b>26</b>	<b>25.3</b>	<b>41.4</b>
DESI 2019	24	24.9	39.8
DESI 2018	24	25.7	37.8



	DESI 2018	Hungary	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
<b>4a1 Electronic information sharing</b> % enterprises	<b>14%</b> 2017	<b>14%</b> 2017	<b>14%</b> 2019	<b>34%</b> 2019
<b>4a2 Social media</b> % enterprises	<b>15%</b> 2017	<b>15%</b> 2017	<b>12%</b> 2019	<b>25%</b> 2019
<b>4a3 Big data</b> % enterprises	<b>7%</b> 2016	<b>6%</b> 2018	<b>6%</b> 2018	<b>12%</b> 2018
<b>4a4 Cloud</b> % enterprises	<b>11%</b> 2017	<b>11%</b> 2018	<b>11%</b> 2018	<b>18%</b> 2018
<b>4b1 SMEs selling online</b> % SMEs	<b>12%</b> 2017	<b>12%</b> 2018	<b>12%</b> 2019	<b>18%</b> 2019
<b>4b2 e-Commerce turnover</b> % SME turnover	<b>10%</b> 2017	<b>9%</b> 2018	<b>11%</b> 2019	<b>11%</b> 2019
<b>4b3 Selling online cross-border</b> % SMEs	<b>5%</b> 2017	<b>5%</b> 2017	<b>5%</b> 2019	<b>8%</b> 2019

Hungary remained one of the worst performing EU countries in the Integration of digital technology in businesses. ICT adoption is low across all indicators measured in this area. The use of enterprise resource planning software packages to share information electronically is the lowest in the EU. The facts that 57% of companies in Hungary has a very low level of digitisation (39% in the EU) and only 15% are highly digitised (26% in the EU) are cause for concern<sup>(266)</sup>. On advanced digital technologies, only 6% of companies rely on big data solutions (12% in the EU) and 11% use cloud computing (18% in the EU). As for e-commerce, although online shopping by individuals increased, only 12% of SMEs sold goods online in 2019 compared to 18% in the EU.

Hungary continued with the Modern Enterprises Programme, which is managed by the Hungarian Chamber of Commerce and Industry. The programme provides businesses in rural areas with non-financial services and free services, helping them to join the digital economy and increase their competitiveness. More than 11,000 companies have taken part in this initiative to date. Linked to the above programme, the 'Support of the introduction of business ICT, mobile solutions and cloud services' scheme provided 923 SMEs with funding (grants or loans) to digitise their operations.

Hungary's total high performance computing (HPC) capacity is currently less than 0.5 petaflops, which is not enough for advanced R&D needs. The government launched the national HPC development plan in 2019 to expand the national HPC infrastructure and ecosystem. In the first phase, a 5 petaflops HPC centre will be installed at Debrecen University by the end of 2021.

<sup>(266)</sup> Digital Intensity index, source: Digital Scoreboard 2020 <https://ec.europa.eu/digital-single-market/en/digital-scoreboard>

Most businesses, especially SMEs, still do not take advantage of digital technologies. It is, therefore, essential to continue to raise awareness and further develop funding programmes. In addition, policies and initiatives for emerging technologies such as HPC and AI will be vital to boost the competitiveness of the economy in the longer term.

#### **Highlight 2020: Artificial intelligence action plan**

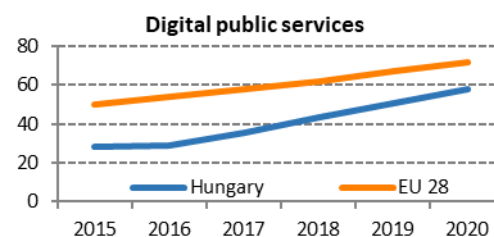
The Artificial Intelligence Coalition – created in 2018 and with 235 members and more than 900 experts representing all relevant stakeholders along the entire value chain – developed an AI action plan in October 2019. The plan consists of a set of specific initiatives for the data economy, AI R&D and communication to educate the public.

The plan:

- lays the groundwork for the Hungarian data market and the institutional framework of the local AI ecosystem,
- defines the legislative and infrastructure framework for data wealth management by creating data markets and making non-personal public data searchable,
- launches widespread awareness-raising campaigns for the general public, and
- prepares the framework for the Hungarian AI strategy, to be completed in 2020.

## 5 Digital public services

5 Digital public services	Hungary		EU
	rank	score	score
<b>DESI 2020</b>	<b>24</b>	<b>57.8</b>	<b>72.0</b>
DESI 2019	26	50.7	67.0
DESI 2018	26	43.6	61.8



	DESI 2018 value	Hungary DESI 2019 value	DESI 2020 value	EU DESI 2020 value
<b>5a1 e-Government users</b> % internet users needing to submit forms	45%	53%	55%	67%
<b>5a2 Pre-filled forms</b> Score (0 to 100)	28	31	42	59
<b>5a3 Online service completion</b> Score (0 to 100)	75	82	87	90
<b>5a4 Digital public services for businesses</b> Score (0 to 100) - including domestic and cross-border	73	79	85	88
<b>5a5 Open data</b> % of maximum score	NA	NA	32%	66%

Digital public services have been one of the most challenging areas of the digital economy and society in Hungary. Although the country still ranks a lowly 24<sup>th</sup>, it has started to catch up with the rest of the EU by improving the quality of e-government services. It now ranks 20<sup>th</sup> on e-government users, pre-filled forms (measuring the re-use of information across administrations to make life easier for individuals) and on online service completion (measuring the sophistication of services). The scores for online service completion and for business services are just below the EU average.

On the other hand, Hungary has the lowest score in the EU for open data. To tackle the main problems concerning the use of public data, the Hungarian government is about to establish a new governmental data agency (NAVÜ) with the aim of developing a new model for managing the use of public data and creating an optimal legal framework.

Since January 2019, all municipalities have been providing their online services on a single platform through intelligent online forms with pre-filled information. The user interface of the e-government portal for municipalities has been reworked to integrate it with the new national point of single contact portal (<https://szuf.magyarorszag.hu>), and single sign-on between them also ensures a more seamless user experience.

In 2018, a new platform for public e-procurement has been launched (Digital Governmental Agency) that centralized the procurement activities of several government entities. It made the procurement processes more effective, less expensive, helped government institutions avoid duplications and ensured stronger interoperability.

In 2019, the electronic services of the police improved significantly: it became possible to process 220 cases fully online with the use of pre-filled online forms and e-payment. Furthermore, the vehicle service platform was launched on the national e-government portal to provide official information from the vehicle registry free of charge ('car history check'). Users can check all technical data for the vehicle, the number of previous owners, the mileage registered during official

technical checks since 2012 and all accidents and damages registered after January 2019. This can help reduce used car scams.

In Hungary, the application for registering a company has been a 'one-stop shop' electronic process for years, but it may only be made by a legal representative. The 'one-stop shop' means that the relevant authorities automatically obtain all the necessary information via an electronic system after the court has registered the company. This means that the applicant does not have to deal with the tax authorities to get a tax number or the statistical office to get a statistical identification number.

In the health sector, a nationwide e-health infrastructure ('Elektronikus Egészségügyi Szolgáltatási Tér- EESZT') was launched already in 2017. Health service providers are obliged to use EESZT. The platform allows health service providers to have access to all the relevant data of patients at all level of the healthcare system<sup>(267)</sup>.

To further improve digital public services, all public administration bodies are obliged to introduce structured online forms for services used at least 100 times a month. If implemented properly, this may not only increase the number of e-government service transactions, but may also result in large efficiency gains in public administration.

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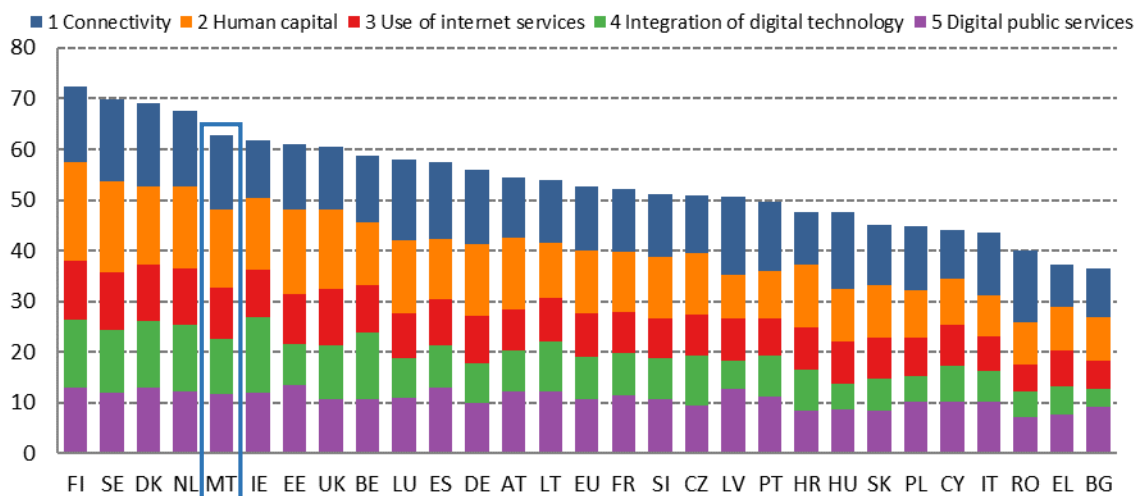
<sup>(267)</sup> <https://e-egeszsegugy.gov.hu/>



## Malta

	Malta		EU
	rank	score	score
<b>DESI 2020</b>	<b>5</b>	<b>62.7</b>	<b>52.6</b>
DESI 2019	8	55.3	49.4
DESI 2018	7	53.3	46.5

**Digital Economy and Society Index (DESI) 2020 ranking**

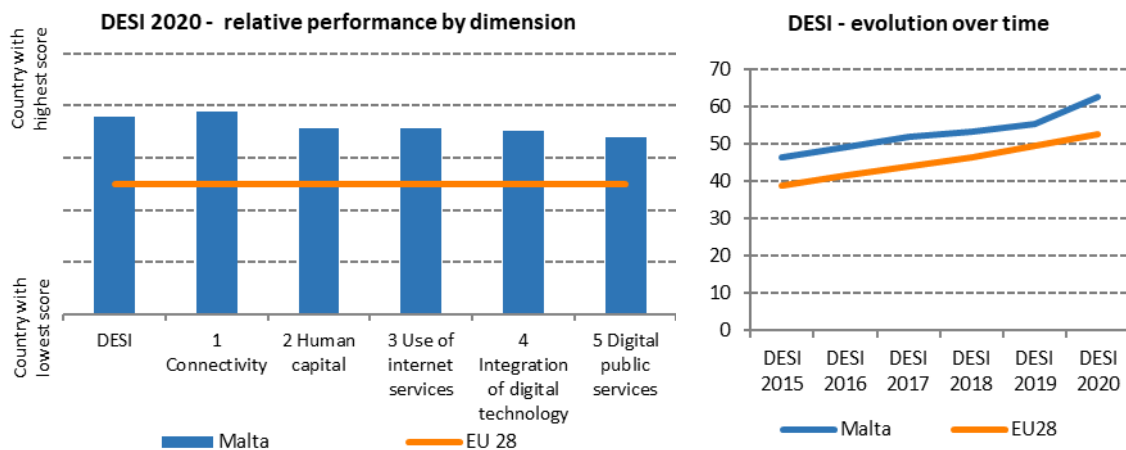


Malta ranks 5<sup>th</sup> out of the 28 EU Member States in the Digital Economy and Society Index (DESI) 2020. Based on data prior to the pandemic, the country performs above the EU average in all the five dimensions of the index. Malta performs well on broadband connectivity. The country records good scores on human capital, especially because of the high share of ICT specialists and ICT graduates, while also the involvement of women in the digital sector is gradually increasing. More and more people in Malta use the internet (with a percentage of internet users now in line with the EU average) and engage in a number of activities (scoring very high when it comes to selling online). Maltese businesses rank first on the use of big data, and the overall level of business digitisation is relatively high. The country's performance in digital public services continues to be negatively affected by the low use of e-government services by the general public. Low progress on open data policies is another reason for Malta falling behind other EU Member States.

Malta has continued to emphasise the role of digital policies as key to shaping its competitiveness. The National Digital Strategy 2014-2020 is the general framework guiding government action in the digital field. Malta also launched a blockchain strategy and regulatory framework in 2018, and several new strategies in 2019: (i) a national strategy on Artificial Intelligence (AI); (ii) a comprehensive 'National eSkills Strategy'; and (iii) 'Mapping Tomorrow', a new strategic plan for the digital transformation of the public administration.

The implementation of these strategies continued and built on various initiatives started in previous years on digitisation of business, digital skills and improvement of e-government services and m-services.

Another 2019 achievement is related to cybersecurity, where a new scheme was introduced to help businesses strengthen their capacity against cyber-attacks. Finally, a National Data Portal enabling access to government data in a number of fields has been launched.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

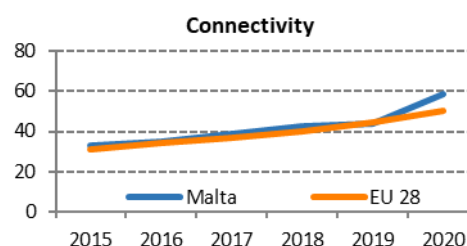
The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Malta has taken a large number of targeted measures in digital to deal with the COVID-19 crisis. Service providers offered health workers and law enforcement officers with free data and minutes, opened up entertainment services and provided flexibility to subscribers on the payment of the bills. To address the closure of schools, the government provided online education resources and guidelines for educators. eSkills Malta developed eLearning resources (for students, but also for SMEs about remote work) and is proposing a Skills Development Plan for the Covid-19 and post Covid-19 periods. Businesses were supported to invest in technology for teleworking and through online webinars on digitisation, while the Malta Digital Innovation Authority (MDIA) launched an award to encourage the fast deployment of innovative technology in response to COVID-19. Government bodies have continued their activities remotely, ensuring the continuation of services during the pandemic.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Malta is very advanced on Very High Capacity Networks (VHCN) coverage, digital skills, digitisation of businesses and the offer of digital public services. On the other hand, there is room to increase the use of digital public services.

## 1 Connectivity

1 Connectivity	Malta		EU
	rank	score	score
DESI 2020	10	58.7	50.1
DESI 2019	17	43.9	44.7
DESI 2018	12	42.4	39.9



	DESI 2018	Malta	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
<b>1a1 Overall fixed broadband take-up</b> % households	83%	83%	84%	78%
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	11%	23%	34%	26%
<b>1b1 Fast broadband (NGA) coverage</b> % households	100%	100%	100%	86%
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	23%	32%	100%	44%
<b>1c1 4G coverage</b> % households (average of operators)	99%	83%	100%	96%
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	77	77	83	100
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	NA	0%	0%	21%
<b>1d1 Broadband price index</b> Score (0 to 100)	NA	NA	63	64

With an overall connectivity score of 58.7, Malta ranks 10<sup>th</sup> among Member States in connectivity. Malta performs better than the EU average in all coverage indicators with 100% of households covered with NGA and VHC networks. Fixed broadband take-up (84%) increased by one percentage point and remains significantly above the EU average of 78%. Important improvements were registered in at least 100 Mbps broadband take-up (from 23% of the households in 2018 to 34% in 2019). The broadband price index for Malta is 63 in comparison to an EU average of 64. This shows that prices in Malta are slightly higher than the EU average.

On international connectivity, in 2019 one of the main operators announced a multi-million euro investment in a new submarine cable system. Once completed, the new system will connect Malta to Marseille and Egypt, thus providing international connectivity from the West coast of the island towards landing points in Europe and Africa that diversify from the existing ones in Italy. Malta has therefore put on hold considerations regarding potential state aid via an incentive programme to support investment in submarine cables pending an analysis of recent market developments.

The upgrade of the National Broadband plan, which was supposed to factor in envisaged developments on 5G deployment and the gigabit society, expected at the beginning of 2019, was put on hold pending a wider review of the National Digital Strategy (2014-2020). Malta therefore currently mainly relies on private investments.

In Malta, one of the two main fixed operators has upgraded all street broadband cabinets to fibre (FTTC). It is rolling out a FTTH network that currently provides various locations with broadband of speeds of up to 1Gbps.

The other main fixed operator's network is based on the cable HFC DOCSIS3.1 standard. In the past years, it has upgraded its network, extending fibre to street broadband cabinets, and created many additional optical nodes. It is therefore able to provide nationwide coverage of speeds of up to 1Gbps.

The 430 Wi-Fi hotspots installed by the Malta Communications Authority around the island have been handed over to a newly established agency, Tech.MT, which has plans to increase the number of Wi-Fi hotspots in the coming years.

One operator also provides its subscribers with access to 75,000 high-speed Wi-Fi hotspots in main public areas and in the homes.

Under the WiFi4EU programme, 39 out of 68 local councils have been given a €15,000 voucher to install Wi-Fi equipment in public spaces that do not already have a free Wi-Fi hotspot.

At the end of 2018, one of the mobile operators announced that its investment in a 5G-ready mobile network already covers 85% of the Maltese Islands, with full coverage being achieved by end 2018. Notwithstanding, the market has not yet expressed any interest in the 5G pioneer bands. Spectrum in the 800 MHz and 2.5 GHz bands was assigned in 2018 on a technology and service neutral basis. No demand has been registered for the 1.5 GHz band either, which remains available on a technology and service neutral basis. Consequently, Malta scores 0% on the 5G readiness indicator which is based on the percentage of spectrum assigned in the 5G pioneer bands<sup>(268)</sup>. Only 30% of the total 2090 MHz spectrum harmonised at EU level for wireless broadband has been awarded on the basis of market demand. The country also lacks a well-structured 5G strategy. On the 5G pioneer bands, in June 2018 the National Authority for Communications (MCA) adopted a roadmap for the ultra-high frequency band between 470-790 MHz. This roadmap lays out the key initiatives and milestones leading to the 700 MHz band being available to provide wireless broadband (WBB). According to the roadmap, the 700 MHz band should be available by 2021 whereas the 3.6 GHz and 26 GHz are already available but none of the operators have expressed interest in them.

In May 2019, the MCA published a discussion paper and survey on '5G Demand and Future Business Models - Towards a Feasible 5G Deployment'. It is now reportedly planning - in the first quarter of 2020 - to introduce a framework setting out the rights to use 5G pioneer bands. This paper was part of a wider initiative including the establishment of a 5G think-tank, engagement with industry and the public sector concerning the benefits of 5G, and the promotion of tests and trials in 5G technology. MCA suggested a consolidation of these initiatives into an overall 5G strategy.

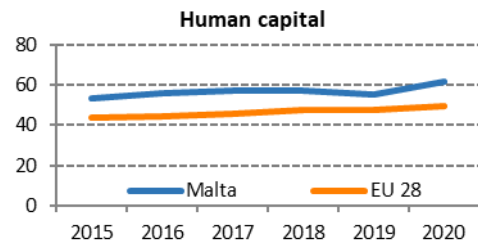
Malta performs extremely well on broadband connectivity. It ranks first in all DESI fixed broadband coverage indicators and has thus achieved the EU broadband coverage objectives. It is important that the country now focuses on paving the way for the 5G deployment.

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<sup>(268)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

## 2 Human capital

2 Human capital	Malta		EU
	rank	score	score
<b>DESI 2020</b>	<b>6</b>	<b>61.8</b>	<b>49.3</b>
DESI 2019	9	55.0	47.9
DESI 2018	7	57.3	47.6



	Malta			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b>	<b>57%</b>	<b>57%</b>	<b>56%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>39%</b>	<b>39%</b>	<b>38%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>57%</b>	<b>57%</b>	<b>58%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>3.9%</b>	<b>4.3%</b>	<b>4.8%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>1.2%</b>	<b>1.1%</b>	<b>2.1%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>8.5%</b>	<b>6.8%</b>	<b>7.9%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

On Human Capital, Malta ranks 6<sup>th</sup> among EU countries and has moved up in the ranking since last year's DESI. The country is slightly below the EU average for basic digital and software skills. 56% of people have at least basic digital skills (EU average: 58%), and 58% have at least basic software skills (EU average: 61%).

However, the country outperforms the EU average on all the other indicators. 38% of people in Malta have above basic digital skills, outperforming the EU average of 33%. The percentage of ICT specialists in the workforce is also higher than the EU average (4.8% vs 3.9%). ICT graduates have significantly increased, reaching 7.9% of all graduates - well above the EU average of 3.6%. Progress has been also made on female ICT specialists, who account for 2.1% of the female workforce, compared to an EU average of 1.4%.

In March 2019, Malta launched a comprehensive 'National eSkills Strategy' (2019-2021), led by the eSkills Malta Foundation<sup>(269)</sup>. The strategy covers many areas, including: (i) basic digital literacy; (ii) quality of ICT teaching; (iii) advanced skills; and (iv) re-skilling and upskilling of the workforce. To steer its implementation and facilitate stakeholder engagement, an 'eSkills Strategic Consultative Committee' was set up in 2019. This Committee brings together representatives of the education and training systems, industry (SMEs), citizens and ICT professionals.

The strategy is progressing, building on a number of digital skills initiatives launched in previous years. In 2019, initiatives have included: (i) upskilling of teachers; (ii) investing in ICT infrastructure (e.g. the 'One Tablet per Child' scheme in primary schools); and (iii) re-designing educational

<sup>(269)</sup> eSkills Malta Foundation is a National Coalition made up of various representatives of the government, industry and education.

curricula to include the concepts of coding, robotics, animation and editing (by introducing ICT C3 as a compulsory subject instead of ECDL).

In tertiary education, in line with the country's overall digitisation strategy, a master's programme on Distributed Ledger Technology (DLT) was introduced in 2019, run by the newly established Centre for Distributed Ledger at the University of Malta.

Malta has introduced measures to strengthen collaboration between education and industry. For example: (i) ICT teachers can work for 5 days in the ICT industry; (ii) people working in industry are invited to give talks in schools; and (iii) secondary schools students can visit companies to learn about the skills and competences required by the ICT industry ('Career Guidance Initiatives') or have a one-week placement in a digital company ('Career Exposure Scheme'). In addition, tertiary level ICT students can participate in the summer Student Placement Programme run by the Malta Information Technology Agency (MITA). In 2019, 382 students took part in this programme.

Malta has also launched initiatives to address skill mismatches. Ongoing projects include a training needs analysis, as basis to design paths for the upskilling and re-skilling of the workforce, and a 'Demand and Supply Monitor'<sup>(270)</sup>. This Monitor is expected to become a regularly updated portal that maps competences and skills requested by the ICT industry and matches them with the available education in the country. Furthermore, the eSkills Malta Foundation kept the momentum about the e-Competence Framework and has provided training to industry and education on the use of this European standard.

The Foundation has started discussing the launch of citizen-centric initiatives for digital literacy with national stakeholders, and has set up a register to map digital skills projects, track their progress and - if appropriate - scale them up.

The eSkills Malta Foundation is a National Coalition for Digital Skills, its founding members coming from government, education and industry, and participates very actively in EU Code Week. In 2019, Malta ranked first on the number of events per capita (as in 2018). Over 20,000 people participated in 537 events. 97% of the events involved activities in schools. In 2019, the eSkills Malta Foundation also organised summer boot camps to raise awareness of coding among children, youth and adults.

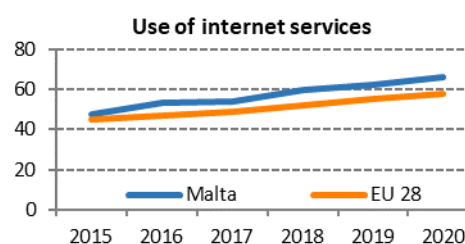
Malta has carried out many digital skills initiatives, with a comprehensive coverage. With the collaboration of all players involved, it is important that these efforts are continued, with a focus on addressing skills mismatches and on monitoring and evaluating projects and policies implemented.

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<sup>(270)</sup> Previously named 'ICT Skills Audit'.

### 3 Use of internet services

3 Use of internet services	Malta		EU
	rank	score	score
<b>DESI 2020</b>	<b>6</b>	<b>65.9</b>	<b>58.0</b>
DESI 2019	7	62.4	55.0
DESI 2018	8	59.6	51.8

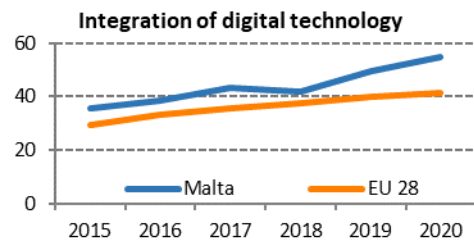


	Malta			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>3a1 People who have never used the internet</b>	<b>18%</b>	<b>17%</b>	<b>13%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>80%</b>	<b>80%</b>	<b>85%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>83%</b>	<b>83%</b>	<b>82%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>90%</b>	<b>88%</b>	<b>88%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>26%</b>	<b>48%</b>	<b>48%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>56%</b>	<b>59%</b>	<b>64%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>87%</b>	<b>85%</b>	<b>82%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>8%</b>	<b>8%</b>	<b>13%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>62%</b>	<b>62%</b>	<b>63%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>64%</b>	<b>66%</b>	<b>67%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>36%</b>	<b>36%</b>	<b>35%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

Malta ranks 6<sup>th</sup> in the Use of internet services by citizens. 85% of the population uses the internet at least once a week, in line with the EU average. However, the percentage of people who have never used the internet is higher than the EU average (13% vs 9%). Maltese internet users engage in a broad range of activities online. 88% of internet users play music, videos and games (EU average: 81%), 82% read news online (EU average: 72%) and 82% use social networks (EU average: 65%). Malta also performs above the EU average in video on demand (48%), making video calls (64%), doing online courses (13%) and selling online (35%). However, it falls just below the EU average on transactional services such as e-banking and online shopping. 67% of internet users shop online (EU average: 71%) and 63% use online banking (EU average: 66%).

## 4 Integration of digital technology

4 Integration of digital technology	Malta		EU
	rank	score	score
<b>DESI 2020</b>	<b>7</b>	<b>54.9</b>	<b>41.4</b>
DESI 2019	8	49.6	39.8
DESI 2018	9	42.1	37.8



	Malta			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>4a1 Electronic information sharing</b> % enterprises	<b>29%</b> 2017	<b>29%</b> 2017	<b>32%</b> 2019	<b>34%</b> 2019
<b>4a2 Social media</b> % enterprises	<b>26%</b> 2017	<b>26%</b> 2017	<b>43%</b> 2019	<b>25%</b> 2019
<b>4a3 Big data</b> % enterprises	<b>19%</b> 2016	<b>24%</b> 2018	<b>24%</b> 2018	<b>12%</b> 2018
<b>4a4 Cloud</b> % enterprises	<b>NA</b> 2017	<b>22%</b> 2018	<b>22%</b> 2018	<b>18%</b> 2018
<b>4b1 SMEs selling online</b> % SMEs	<b>15%</b> 2017	<b>20%</b> 2018	<b>23%</b> 2019	<b>18%</b> 2019
<b>4b2 e-Commerce turnover</b> % SME turnover	<b>6%</b> 2017	<b>NA</b> 2018	<b>NA</b> 2019	<b>11%</b> 2019
<b>4b3 Selling online cross-border</b> % SMEs	<b>9%</b> 2017	<b>9%</b> 2017	<b>NA</b> 2019	<b>8%</b> 2019

Malta performs above the EU average in the Use of digital technologies by enterprises, and ranks 7<sup>th</sup>. Maltese businesses are very strong in the use of big data analysis (24%, the highest rate in the EU), social media (43% versus an EU average of 25%) and cloud computing (22% versus 18% in the EU). The percentage of enterprises that use electronic information sharing has increased (32% in 2019) almost reaching the EU average (34%).

In e-commerce, 23% of SMEs sell online, and e-commerce represents 6% of SMEs turnover. Cross-border online sales of SMEs are somewhat above the EU average.

Malta's positive performance is also confirmed by the Digital Intensity Index, according to which 41% of enterprises in Malta have high and very high levels of digitisation - well above the EU average of 26%.

In recent years, the Maltese government has promoted measures to boost digital technologies as a key to shaping the country's competitiveness. An important initiative was the blockchain/DLT strategy and regulatory framework, adopted in 2018, to attract operators while promoting dependable technology. In the same year, to implement the legislation, the government established the Malta Digital Innovation Authority (MDIA) and a framework for the certification of DLT platforms and related service providers. MDIA established guidelines for Innovative Technology Arrangements that are based on DLT and accredited the first Systems Auditors<sup>(271)</sup>; discussions with operators that plan to apply for certification are under way.

<sup>(271)</sup> Guidelines available here: <https://mdia.gov.mt/ita-guidelines/>.



In October 2019, the government adopted a national strategy on Artificial Intelligence, based on three strategic pillars: (i) investment; (ii) startups and innovation; and (iii) public sector and private sector adoption<sup>(272)</sup>. To support the strategy, Malta is planning to set up a Digital Innovation Hub (DIH), as a multi-stakeholder innovation centre to help both the public and private organisations through advisory services, applied research and demo spaces.

On cybersecurity, the Maltese government organised the National Cyber Security Summit<sup>(273)</sup> in October 2019, where it launched the B SECURE scheme<sup>(274)</sup> - an initiative to strengthen the cybersecurity culture within the local business community. The scheme helps businesses assess their vulnerability against cybersecurity threats and train employees on cybersecurity (with the possibility of earning recognised qualifications).

The programmes run by MITA to support businesses' digital transformation have continued. In 2019, the MITA Innovation Hub<sup>(275)</sup> accelerated 11 innovative startups as part of its YouStartIT programme, which covers technologies such as blockchain, deep tech, Internet of Things, AI and augmented reality<sup>(276)</sup>.

The MITA Emerging Technologies Lab<sup>(277)</sup> has provided learning activities and equipment to experiment with different technologies. Since the lab was established in October 2018, over 50 different activities have been organised, with over 700 people attending seminars, workshops, hands-on sessions and courses.

It is important that Malta continues its initiatives to boost the digital transformation of the economy, and that it focuses on the digitisation of SMEs and the widespread adoption of digital technologies, including mature ones.

#### Highlight 2020: Tech.mt

Tech.mt is a new public-private partnership, established in March 2019 by the Government of Malta and the Malta Chamber of Commerce to 'position Malta as a quality, creative, tech-savvy country'. It operates in the framework of the 2014-2020 National Digital Strategy<sup>(278)</sup> and its twofold objective is to attract foreign direct investment in Malta and promote the local technological industries abroad.

Tech.mt will assist Maltese companies in their innovation, digitisation and internationalisation efforts, by giving them the opportunity to be exposed to innovative technology and to showcase their work abroad, and by facilitating connections and collaborations between local and foreign academia<sup>(279)</sup>.

<sup>(272)</sup> 'The Ultimate AI Launchpad - A Strategy and Vision for Artificial Intelligence in Malta 2030'.  
[https://malta.ai/wp-content/uploads/2019/11/Malta\\_The\\_Ultimate\\_AI\\_Launchpad\\_vFinal.pdf](https://malta.ai/wp-content/uploads/2019/11/Malta_The_Ultimate_AI_Launchpad_vFinal.pdf).

<sup>(273)</sup> <https://cybersecurity.gov.mt/cybersummitmt/>.

<sup>(274)</sup> <https://cybersecurity.gov.mt/bsecure/>.

<sup>(275)</sup> <https://mih.mt/>.

<sup>(276)</sup> Since its start (in 2017), the programme has accelerated 27 startups.

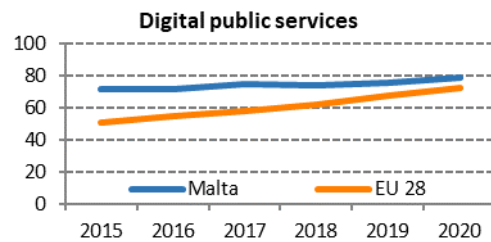
<sup>(277)</sup> <https://mita.gov.mt/en/DigitalOutReach/Pages/lab.aspx>.

<sup>(278)</sup> Digital Malta, National Digital Strategy 2014-2020.  
<https://digitalmalta.org.mt/en/Documents/Digital%20Malta%202014%20-%202020.pdf>.

<sup>(279)</sup> <https://tech.mt/technology-industry-malta/>.

## 5 Digital public services

5 Digital public services	Malta		EU
	rank	score	score
<b>DESI 2020</b>	<b>11</b>	<b>78.1</b>	<b>72.0</b>
DESI 2019	11	75.2	67.0
DESI 2018	9	73.5	61.8



	Malta			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>5a1 e-Government users</b>	<b>48%</b>	<b>50%</b>	<b>57%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>94</b>	<b>94</b>	<b>94</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>42%</b>	<b>66%</b>
% of maximum score			2019	2019

Malta ranks 11<sup>th</sup> on Digital public services. The country is an EU leader in providing government services to the public. It ranks first in the re-use of information across administrations to make life easier for people (pre-filled forms) as well as in the sophistication of services (online service completion), with the maximum score for both of these indicators. The country also scores above the EU average on online public services for businesses (94 vs 89). However, Malta's performance is low on use of e-government services and on open data. The percentage of e-government users is 57% (EU average: 67%) and Malta is among the worst performing EU countries on open data.

In June 2019, Malta launched 'Mapping Tomorrow', the new strategic plan for the digital transformation of public administration (for 2019–2021), which focuses on delivering improved, simplified and client-centred e-government services<sup>(280)</sup>. The plan's three pillars of action are: (i) Take-up, by simplifying services; (ii) Once-only, targeting the sharing and re-use of information already acquired by the government; and (iii) Service of Excellence, looking at the development of personalised, user-friendly and timely services, including through the use of emerging technologies (e.g. AI).

Moreover, 'Servizz.gov' Agency became the government's one-stop-shop for the general public, and [www.servizz.gov.mt](http://www.servizz.gov.mt) is now the central website for public administration services<sup>(281)</sup>. Through this website, citizens can look up services categorised under 12 'super sectors' (not linked to a specific Ministry and, thus, possibly subject to change). The website also gives citizens the possibility to report complaints and excessive bureaucracy, offer suggestions and request information. All cases are processed against service level agreements.

<sup>(280)</sup> Mapping Tomorrow, A Strategic Plan for the Digital Transformation of the Public Administration 2019-2021 ([https://publicservicecms.gov.mt/en/Documents/MappingTomorrow\\_StrategicPlan2019.pdf](https://publicservicecms.gov.mt/en/Documents/MappingTomorrow_StrategicPlan2019.pdf)).

<sup>(281)</sup> Services currently provided on [www.mygov.mt](http://www.mygov.mt) will feature on [www.servizz.gov.mt](http://www.servizz.gov.mt).

The government has also continued to enhance the offer of mobile e-government services, provided since 2017, including the ‘maltapps’ app that enables users to enlist all published mobile services. Initiatives to improve the take up of mobile public services have also been supported by a project co-funded by the European Social Fund (2014-2020), which involves training for public employees, awareness campaigns and a citizens’ survey<sup>(282)</sup>.

Malta has continued to implement the Connected e-Government (CONvErGE) programme<sup>(283)</sup>, which is helping to create a number of digital services<sup>(284)</sup> and to modernise the ICT infrastructure. As part of this programme, MITA is developing a hybrid cloud platform, which combines both public and private cloud solutions, and hosts several of the government’s information systems and services. The platform will continue to be expanded, in order to offer better services and security for the government’s core applications.

Another project launched in 2019 is the development of a Business Process Re-Engineering (BPR) plan, through the Structural Reform Support Programme. The project involves a redesign and modernisation of core business processes in the public administration, and helps public employees implement them. The aim is to improve productivity, efficiency, effectiveness and better customer service through digitisation.

The country is using blockchain technology in some fields (education, finance and health) and encouraging Ministries to uptake this technology, in line with the legislation introduced in 2018. In 2019, MITA organised a number of workshop with government stakeholders to identify areas where blockchain could be used. In line with the national AI strategy, the government is also exploring how to use AI to improve public services. Pilot projects to deploy AI solutions will be carried out in the coming years in traffic management, education, health, customer service, tourism, and utilities.

Finally, the National Data Portal, expected to enable access to government data in the fields of education, police and taxation, has been launched<sup>(285)</sup>.

Overall, Malta performs well on the provision of e-government services, but increasing the public’s uptake and accelerating on open data policies remain two priorities.

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<sup>(282)</sup> ESF 04.0072 - Mobile Public Services Take-Up (total budget of € 661,325).

<sup>(283)</sup> ERDF 2.035, co-funded by the EU (total budget of around € 40 million).

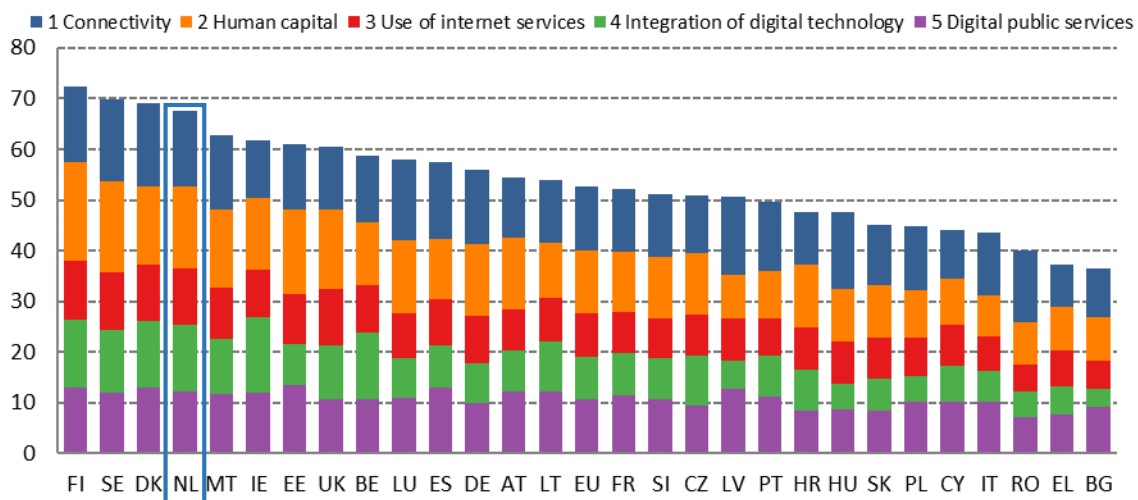
<sup>(284)</sup> In several areas: Government to Business (G2B), Government to Customers (G2C) and Government to Government (G2G).

<sup>(285)</sup> <https://open.data.gov.mt/>.

## The Netherlands

	Netherlands		EU
	rank	score	score
<b>DESI 2020</b>	<b>4</b>	<b>67.7</b>	<b>52.6</b>
DESI 2019	4	63.6	49.4
DESI 2018	4	60.8	46.5

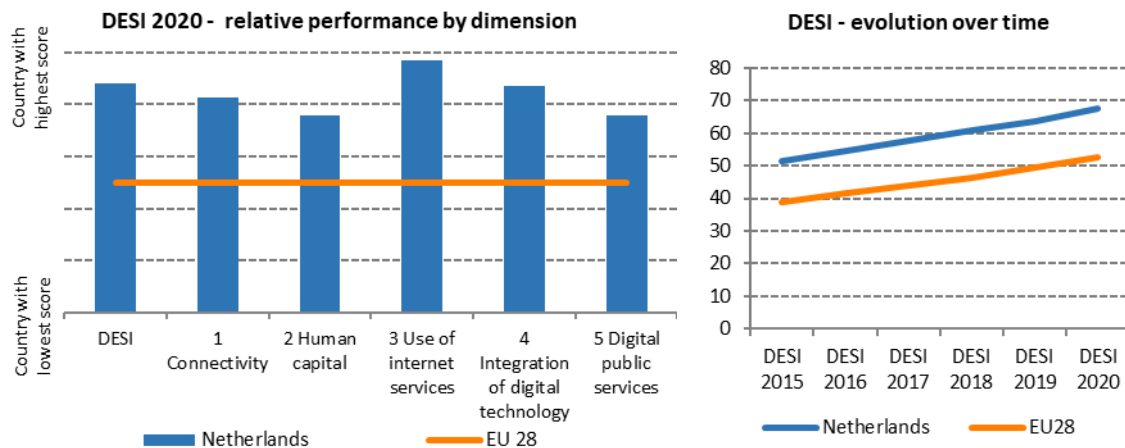
**Digital Economy and Society Index (DESI) 2020 ranking**



Based on data prior to the pandemic, the Netherlands ranks 4<sup>th</sup> out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020. It therefore remains one of the top performers across Europe, with solid and steady ‘digital growth’.

The Netherlands increased its score in human capital, use of internet services, integration of digital technology and digital public services, in line with a comparable average increase across the EU. It is among the top performers in connectivity, with near-complete fast broadband coverage (next generation access/NGA) and 4G coverage. However, when it comes to 5G, there are margins of improvement. 5G pilots have started in all regions of the Netherlands and testing licenses at a national level were granted already in 2017. However, no 5G spectrum has yet been awarded.

The review and update in mid-2019 of the Dutch Digitalisation Strategy, first adopted in 2018, confirms the clear political commitment to taking action to reap the benefits of digital transformation. The accompanying strategies in key areas such as lifelong learning, Artificial Intelligence, digitisation of business are clearly based on a transparent and accountable approach to maximise the buy-in of all stakeholders.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

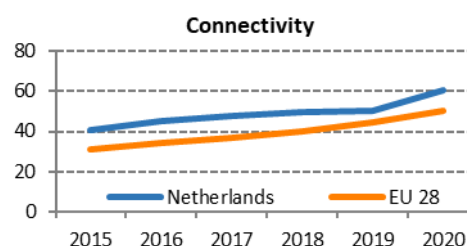
The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

The Netherlands has taken a number of measures in digital to deal with the COVID-19 crisis. Even though data traffic on the Dutch telecom and internet networks is significantly higher than before the crisis, there are no capacity problems; nonetheless, a reporting system has been set up so that the Authority for Consumers & Markets can signal to BEREC potential capacity problems. Particular care is being taken to ensure continuity of service even in cases of financial distress of companies or households, as well as to limit public works (e.g. excavations) that might damage existing networks. The Alliance for Digital Coexistence, together with all relevant Ministries, has launched a national campaign to provide as many people as possible with digital devices. It takes care of the central coordination of the collection, cleaning, installation and distribution of the devices and the assistance. Furthermore, in reaction to an increase of criminal cyber-attacks to healthcare institutions and providers, experts have joined the “We support Hospitals” coalition to provide free help to all healthcare institutions in the Netherlands in need.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, the Netherlands is well placed to make use of the opportunities offered by digital technologies. Particular attention should be paid to avoiding delays in the roll-out of 5G technology.

# 1 Connectivity

1 Connectivity	Netherlands		EU
	rank	score	score
DESI 2020	6	60.3	50.1
DESI 2019	7	50.5	44.7
DESI 2018	5	49.6	39.9



	Netherlands			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>1a1 Overall fixed broadband take-up</b>	<b>98%</b>	<b>97%</b>	<b>98%</b>	<b>78%</b>
% households	2017	2018	2019	2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b>	<b>32%</b>	<b>39%</b>	<b>40%</b>	<b>26%</b>
% households	2017	2018	2019	2019
<b>1b1 Fast broadband (NGA) coverage</b>	<b>98%</b>	<b>98%</b>	<b>98%</b>	<b>86%</b>
% households	2017	2018	2019	2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b>	<b>32%</b>	<b>32%</b>	<b>89%</b>	<b>44%</b>
% households	2017	2018	2019	2019
<b>1c1 4G coverage</b>	<b>100%</b>	<b>100%</b>	<b>99%</b>	<b>96%</b>
% households (average of operators)	2017	2018	2019	2019
<b>1c2 Mobile broadband take-up</b>	<b>88</b>	<b>90</b>	<b>92</b>	<b>100</b>
Subscriptions per 100 people	2017	2018	2019	2019
<b>1c3 5G readiness</b>	<b>NA</b>	<b>0%</b>	<b>0%</b>	<b>21%</b>
Assigned spectrum as a % of total harmonised 5G spectrum		2019	2020	2020
<b>1d1 Broadband price index</b>	<b>NA</b>	<b>NA</b>	<b>56</b>	<b>64</b>
Score (0 to 100)			2019	2019

The Netherlands is performing very well in connectivity, ranking 6<sup>th</sup>. The country has near-complete average 4G coverage of 99%. In addition, with its near-complete fast broadband (NGA) coverage of 98% of households, the country is largely covered by two competing fixed infrastructures, and in some areas three. In 2019, the coverage of very high capacity networks (VHCN) increased by 57 percentage points, from 32% in 2018 to 89%, largely reflecting the upgrade of cable networks to DOCSIS 3.1. The country still ranks first in overall fixed broadband take-up with 98% of households in 2019, compared to the EU average of 78%. While mobile broadband take-up has increased steadily from 88 subscriptions in 2017, 90 subscriptions in 2018 to 92 subscriptions per 100 people in 2019, it remains below the EU average, ranking 17<sup>th</sup>. Broadband prices are above EU average, putting the country at 22<sup>nd</sup> place. On 5G readiness, the Netherlands scores low, with 0% 5G spectrum assigned<sup>(286)</sup>.

<sup>(286)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU) 2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands

While the country met the Digital Agenda for Europe 2020 goal for fixed broadband coverage, it failed to achieve the 50% take-up of 100 Mbps broadband by households. In July 2018, the Dutch national broadband plan was updated with the connectivity action plan, outlining the government's efforts to remain Europe's digital leader. The action plan targets the provision of fixed broadband connections of at least 100 Mbps speeds available to everyone by 2023. 100 Mbps speed coverage (upgradeable to 1 Gbps) is expected to be 99.5% in 2023. For the remaining 0.5% (50,000 households), the target may prove to be more challenging, especially for the 20,000 most remote households. By the same year, most households should be able to take advantage of connection speeds of 1 Gbps. As a result of new entrants on the broadband market focusing on the deployment of fibre to the home (FTTH), it is likely that most rural areas will be connected by FTTH in the foreseeable future. Overall FTTH penetration is expected to reach 65% by the end of 2023. In addition, the next generation standard, DOCSIS 3.1, enables Gigabit speeds over cable. There is no national broadband funding scheme in the Netherlands. Dutch central authorities assist regional and local authorities to create the right conditions for market players to roll out fast internet by sharing knowledge and best practices.

The Netherlands is focusing its future efforts on 5G applications in vertical industries (Internet of Things) as key drivers for future communications technologies, especially in sectors as mobility/transport, food/agriculture and health. 5G pilots have started in all regions of the Netherlands and trial licenses were already granted at national level in 2017<sup>(287)</sup>. The national action plan<sup>(288)</sup> aims at uninterrupted 5G wireless broadband coverage in all urban areas, as well as on major roads and railways, by 2025. However, no 5G spectrum has been awarded yet.

Overall, the Netherlands has assigned 47% of the 2,090 MHz spectrum harmonised at EU level for wireless broadband. However, this spectrum is not assigned under technical requirements suitable for 5G. The first 5G frequency multiband auction is planned for June 2020<sup>(289)</sup>. The 700 MHz band will be auctioned together with the 1.4 and 2.1 GHz bands for a period of 20 years. The 700 MHz band will come with coverage obligations: 2 years after the licence has been granted, 98% of the surface area of each Dutch municipality must have coverage<sup>(290)</sup>. One source of concern about 5G deployment was interference in the 3.4-3.8 GHz frequency band with a satellite listening station used by the security service in the north of the country. In December 2018, the government took a preliminary decision to move the station in order to free up the band for 5G. In March 2019, the Dutch Ministry of Economic Affairs and Climate Policy held a consultation on making the 3.4-3.8 GHz band available. However, spectrum from 3.45 GHz to 3.75 GHz will only be auctioned in the beginning of 2022, while it can only be used from September 2022. Moreover, spectrum from 3.4 to 3.45 GHz and from 3.75 to 3.8 GHz will be reassigned for local licensed use from 2026, under technical conditions suitable for 5G. On the 26 GHz band, a public consultation was launched in January 2020 to assess the demand<sup>(291)</sup>. Based on the outcome of the consultation, a more detailed

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for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

<sup>(287)</sup> On 28 April 2020 Vodafone launched its 5G network across half of the Netherlands, with full coverage expected for end of July, using an innovative and dynamic spectrum sharing technology on existing 1800 MHz spectrum bands (<https://www.vodafone.nl/daarom-vodafone/netwerk/5g>).

<sup>(288)</sup> <https://www.government.nl/documents/reports/2018/07/13/connectivity-action-plan>.

<sup>(289)</sup> The application procedure started in March 2020.

<sup>(290)</sup> The coverage should allow for a minimum speed of 8 Mbps with a high degree of probability at all locations within the defined area for users located outdoors. 6 years after the licence has been granted, the minimum speed must be 10 Mbps, with the same conditions.

<sup>(291)</sup> <https://www.internetconsultatie.nl/marktconsultatie26ghzband>.

policy approach for the 26 GHz band will be developed in 2020. ACM intends to publish guidelines on network sharing in view of upcoming auctions of 5G spectrum<sup>(292)</sup>.

The Netherlands has high-quality infrastructure with several fixed telecom networks (copper, cable and fibre) and three mobile network providers. Public policy initiatives could boost the efficient use of the advanced broadband technologies by promoting the uptake of higher Mbps speeds. Further network roll-out in an already advanced market, as well as upcoming 5G deployment can be improved through coordination between central and local governments. Creating the preconditions for 5G roll-out is vital for the further deployment of Gigabit networks. While the Netherlands has not yet assigned any 5G pioneer bands, it has taken steps to lay the groundwork with the upcoming auction of the 700 MHz band.

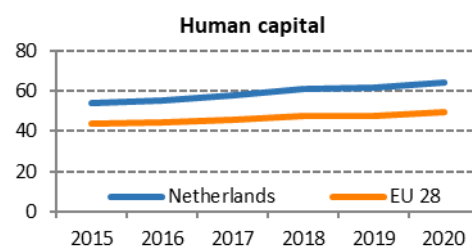
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<sup>(292)</sup> <https://www.acm.nl/en/publications/acm-draw-guidelines-sharing-telecom-infrastructure>.



## 2 Human capital

2 Human capital	Netherlands		EU
	rank	score	score
<b>DESI 2020</b>	<b>4</b>	<b>64.2</b>	<b>49.3</b>
DESI 2019	4	62.0	47.9
DESI 2018	3	61.2	47.6



	Netherlands			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b>	<b>79%</b>	<b>79%</b>	<b>79%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>48%</b>	<b>48%</b>	<b>50%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>80%</b>	<b>80%</b>	<b>80%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>5.0%</b>	<b>5.0%</b>	<b>5.4%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>1.7%</b>	<b>1.8%</b>	<b>1.9%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>2.1%</b>	<b>NA</b>	<b>2.5%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

The Netherlands ranks 4<sup>th</sup> among EU countries on Human capital and well above the EU average. Its position has remained stable since 2019. Basic and advanced digital skills are above the EU average. The number of ICT specialists has increased slightly and is also above the EU average. Despite this positive trend, the growth rate will arguably not be sufficient to meet labour market demands. The percentage of female ICT specialists continues its slow but steady growth, slightly above the EU average, although it remains relatively low.

The importance of equipping everyone with the right skills and competences to take full advantage of the opportunities that digitalisation brings for economic growth and for tackling societal challenges was one of the key principles underlying the Digitalisation Strategy, adopted in June 2018. This approach was confirmed and strengthened in a review of the strategy, which was finalised in summer 2019. The main focus was on lifelong learning, although this comes with significant challenges and requires strong cooperation across the public and private sector, and in general between all stakeholders. The Human Capital Agenda – the 2015 action plan to meet the growing demand for ICT professionals – focused in 2019 on helping educational institutions make adjustments to the curriculum due to the emergence of new technologies<sup>(293)</sup>.

As announced in the Digitalisation Strategy, the Ministry of Education and the Ministry of Economic Affairs and Climate, together with other stakeholders, also launched the Digitalisation Agenda for Primary and Secondary Education in March 2019. The focus is on five key areas:

- 1) using existing financial resources to promote safe and affordable Internet facilities for schools;

<sup>(293)</sup> Source: Dutch Digital Delta, <https://dutchdigitaldelta.nl/hca-ict>.

- 2) ensuring that students are digitally literate;
- 3) making teachers more digitally competent;
- 4) strengthening the innovative capacity of schools;
- 5) paying more attention to the ethical issues surrounding the digitalisation of education<sup>(294)</sup>.

This initiative builds upon previous efforts of the Dutch Government, including the ‘Mediawijzer’ network for media literacy<sup>(295)</sup>. It is also part of the broader efforts for educational reform to improve the national educational curriculum, which include proposals on digital literacy, basic ICT skills and computational thinking to help solve problems<sup>(296)</sup>. The increase in participation to the EU Code Week grass-root initiatives (122 in 2019, up from 90 in 2018) confirms the high-level of interest in ICT education in the country<sup>(297)</sup>.

ECP – Platform for the Information Society works closely with partners in public authorities across different ministries as well as with industry, teachers, researchers and non-governmental organisations to advance this agenda. It coordinates the Dutch National Coalition for Digital Skills, which has already launched and supported a number of relevant projects.

These efforts should be seen in light of a national labour market that is performing well, with an increasing labour force participation (among the highest in the EU at 82.5% in the second quarter of 2019), unemployment rates at historically low levels, and robust GDP growth. However, there is also an increase in labour shortages, including in the ICT sector, with a vacancy rate of more than 6%<sup>(298)</sup>. The growth of non-standard forms of work, including platform work (gig economy), could also be a factor in the high level of labour market segmentation (division of the jobs market into different categories of workers with different levels of job security and/or access to social and other benefits), which can have negative effects on wage growth and is generally a cause for concern. On the other hand, the recent growth in permanent contracts for highly-skilled workers points to the importance of basic and advanced digital skills for the current and future workforce.

The Dutch Strategic Action Plan for Artificial Intelligence, adopted in October 2019, underlines the importance of investing in AI-relevant skills for everyone, focusing both on advanced digital skills (e.g. data science) and on basic competences. This approach includes the need to ensure societal inclusion, including for migrants and other vulnerable groups<sup>(299)</sup>.

The Netherlands has made important steps to strengthen human capital in the digital age. It is important that these efforts continue.

### Highlight 2020: Strategic Action plan for Artificial Intelligence

The Dutch Strategic Action Plan for Artificial Intelligence was formally adopted by the government in October 2019, following a broad consultation among all stakeholders. It focuses on three tracks:

1. capitalising on societal and economic opportunities, helping large and small companies to invest in this area, including via targeted financial support and multi-stakeholder

<sup>(294)</sup> Source: Letter of the Dutch Minister of Education to the Parliament, 21 March 2019.

<sup>(295)</sup> Source: DESI Country Report The Netherlands, 2019.

<sup>(296)</sup> Source: <https://www.curriculum.nu/actueel/actueel-voorstellen-in-de-tweede-kamer/>.

<sup>(297)</sup> Source: EU Code Week, <https://blog.codeweek.eu/post/190418441025/eucodeweek19stats>.

<sup>(298)</sup> Source: European Semester 2020. The vacancy rate is the number of vacant positions as a percentage of the total number of vacant and occupied positions.

<sup>(299)</sup> Source: Dutch Strategic Action Plan for Artificial Intelligence, October 2019, <https://www.government.nl/documents/reports/2019/10/09/strategic-action-plan-for-artificial-intelligence>.

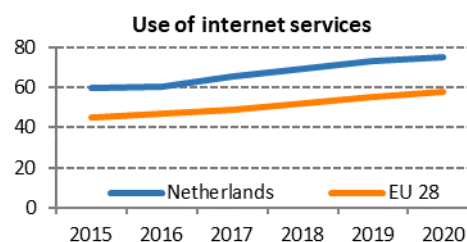
cooperation (the Dutch AI Coalition);

2. ensuring that the Netherlands has the right combination of knowledge, skills and training, from top-quality AI research to applied research, including the availability of usable data and high-quality connectivity;
3. protecting citizens' fundamental rights and creating an appropriate legal and ethical framework.

The overriding goal is to make sure that the Netherlands is able to capitalise on AI's societal and economic opportunities as well as safeguard the public interests of AI. This is expected to help generate prosperity and well-being.

### 3 Use of internet services

3 Use of internet services	Netherlands		EU
	rank	score	score
<b>DESI 2020</b>	<b>3</b>	<b>75.2</b>	<b>58.0</b>
DESI 2019	3	73.3	55.0
DESI 2018	3	69.4	51.8



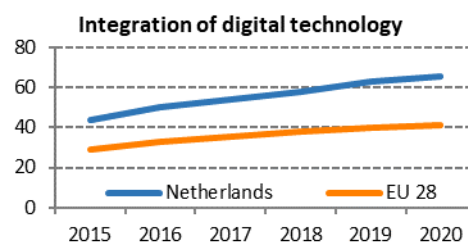
	Netherlands			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>3a1 People who have never used the internet</b> % individuals	<b>3%</b> 2017	<b>4%</b> 2018	<b>2%</b> 2019	<b>9%</b> 2019
<b>3a2 Internet users</b> % individuals	<b>94%</b> 2017	<b>94%</b> 2018	<b>95%</b> 2019	<b>85%</b> 2019
<b>3b1 News</b> % internet users	<b>80%</b> 2017	<b>80%</b> 2017	<b>79%</b> 2019	<b>72%</b> 2019
<b>3b2 Music, videos and games</b> % internet users	<b>88%</b> 2016	<b>92%</b> 2018	<b>92%</b> 2018	<b>81%</b> 2018
<b>3b3 Video on demand</b> % internet users	<b>39%</b> 2016	<b>58%</b> 2018	<b>58%</b> 2018	<b>31%</b> 2018
<b>3b4 Video calls</b> % internet users	<b>46%</b> 2017	<b>61%</b> 2018	<b>63%</b> 2019	<b>60%</b> 2019
<b>3b5 Social networks</b> % internet users	<b>70%</b> 2017	<b>69%</b> 2018	<b>70%</b> 2019	<b>65%</b> 2019
<b>3b6 Doing an online course</b> % internet users	<b>11%</b> 2017	<b>11%</b> 2017	<b>14%</b> 2019	<b>11%</b> 2019
<b>3c1 Banking</b> % internet users	<b>93%</b> 2017	<b>94%</b> 2018	<b>94%</b> 2019	<b>66%</b> 2019
<b>3c2 Shopping</b> % internet users	<b>82%</b> 2017	<b>84%</b> 2018	<b>84%</b> 2019	<b>71%</b> 2019
<b>3c3 Selling online</b> % internet users	<b>38%</b> 2017	<b>37%</b> 2018	<b>38%</b> 2019	<b>23%</b> 2019

In the Netherlands, the Use of internet services is well above the EU average. 95% of the population use the internet at least once a week, which is 10 percentage points higher than the EU average.

People in the Netherlands are keen to engage in a variety of activities, the most popular ones being banking (94%), shopping (84%) and playing music, videos and games (92%). 79% of Dutch internet users read news online (against 72% in the EU as a whole). The number of internet users taking an online course has increased slightly (from 11% to 14%) and is above the EU average (11%).

## 4 Integration of digital technology

4 Integration of digital technology	Netherlands		EU
	rank	score	score
<b>DESI 2020</b>	<b>4</b>	<b>65.7</b>	<b>41.4</b>
DESI 2019	2	62.6	39.8
DESI 2018	2	57.5	37.8



	Netherlands			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>48%</b>	<b>48%</b>	<b>48%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>39%</b>	<b>39%</b>	<b>37%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>19%</b>	<b>22%</b>	<b>22%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>NA</b>	<b>42%</b>	<b>42%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>15%</b>	<b>17%</b>	<b>21%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>10%</b>	<b>10%</b>	<b>12%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>11%</b>	<b>11%</b>	<b>13%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

As regards the Integration of digital technology by businesses, the Netherlands ranks 4<sup>th</sup> among EU countries, well above the EU average. There were slight improvements in a few indicators, but also a slight decrease in the number of businesses using social media (from 39% to 37%). The number of small and medium-sized enterprises (SMEs) selling online and those doing so across border to other EU countries has increased but remains relatively low.

In its 2018 Digitalisation Strategy and in its annual reports on the state of the SME sector (*Jaarbericht Staat van the het MKB*) the Dutch government recognised that companies, in particular SMEs, are not fully reaping the benefits of digitalisation, including when it comes to total factor productivity. However, it must be kept in mind that this slow-down is common among advanced economies, and that the Netherlands remains one of the most productive and innovative economies in the EU<sup>(300)</sup>.

The Netherlands is committed to advancing new digital technologies and to investing strategically in digital technologies thanks to joint initiatives with the EU: the country is a member of the European High-Performance Computing Joint Undertaking and has signed the Declaration on Cooperation Framework on High-Performance Computing. It has also signed EU declarations on the European Blockchain Partnership, Cooperation on Artificial Intelligence and Quantum Computing Infrastructure.

<sup>(300)</sup> Source: European Semester 2020.

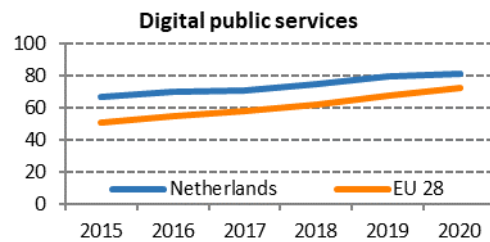
The Dutch Strategic Action Plan for Artificial Intelligence, adopted in October 2019, includes specific measures to encourage companies to adopt AI and other advanced digital technologies. For example, it promotes access to innovation financing for start-ups through early-stage financing and the Innovation Credit, making it easier to access to risk capital. The plan also scales up the 'Accelerating the Digitalisation of SMEs' programme launched in 2018, using the existing five regional smart industry hubs and research centres to boost information sharing and knowledge transfer.

The Dutch National Cybersecurity Agenda, adopted in April 2018, aims to capitalise on the economic and social opportunities of digitalisation in a secure way, protecting national security in the digital domain. It focuses on strengthening the country's capabilities to detect, limit and respond to cyber threats, building successful barriers to cybercrime and maintaining a resilient, robust infrastructure. The participation of the private sector and their adoption of measures that improve trust is seen as key to promoting digitalisation in the country.

To boost the digital transformation of the Dutch economy even more, it is important to adopt a strategic cross-cutting approach with the full involvement of all stakeholders. It is also essential to raise awareness of the relevance of digitisation for SMEs and further support their ability to develop the necessary capabilities and skills.

## 5 Digital public services

5 Digital public services	Netherlands		EU
	rank	score	score
<b>DESI 2020</b>	<b>7</b>	<b>81.0</b>	<b>72.0</b>
DESI 2019	6	79.6	67.0
DESI 2018	7	74.7	61.8



	Netherlands			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>5a1 e-Government users</b>	<b>84%</b>	<b>86%</b>	<b>86%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>77</b>	<b>81</b>	<b>78</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>91</b>	<b>92</b>	<b>90</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>81</b>	<b>85</b>	<b>85</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>78%</b>	<b>66%</b>
% of maximum score			2019	2019

As regards Digital public services, the Netherlands ranks 7<sup>th</sup> among EU countries, above the EU average. It performs well in general. Although the number of e-government users has remained stable, a few other indicators, such as the use of pre-filled forms and online service completion, have worsened slightly.

The 2018 Digitalisation Strategy had already put the goal of a transparent and accessible e-government squarely at the centre of the country's priorities. This should pass the 'feasibility test' in terms of accessibility, transparency, availability and efficiency for all members of the public. The 2018 assessment recognised that work was needed to strengthen a sound, future-proof, basic digital infrastructure and to improve the skills of public sector workers.

Accordingly, the Dutch government launched DIGibeter, the Digital Government Agenda<sup>(301)</sup>, in February 2019. It aims to increase the autonomy of individuals and entrepreneurs by providing a central hub for data and information sharing among the different public agencies and levels of government based on open standards. In parallel, the Netherlands is investing in resources to ensure inclusiveness also in the digital environment, including via the Digital Inclusion Action Plan<sup>(302)</sup>.

The Network and Information Systems Security Act entered into force in 2019. It includes duties of care and reporting obligations for providers of essential services and digital service providers. The Public Service Information Security Office also entered into force in January 2019. The government has also developed a 'Diplomatic Response Framework' for international cyber incidents.

<sup>(301)</sup> Source: <https://www.nldigitalgovernment.nl/digital-government-agenda/>

<sup>(302)</sup> Source: <https://www.nldigitalgovernment.nl/wp-content/uploads/sites/11/2019/02/digital-inclusion-everyone-must-be-able-to-participate.pdf/>

In conclusion, the Netherlands is one of the EU countries with better overall performance in terms of e-government maturity: this applies to both the widespread availability of online services and the digitisation level of back and front offices of public administrations<sup>(303)</sup>.

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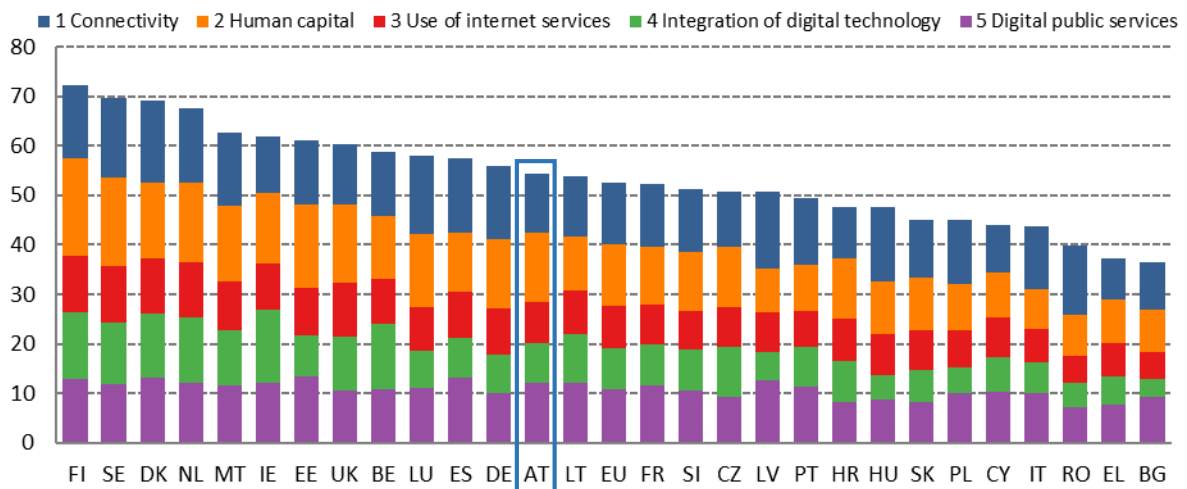
<sup>(303)</sup> Source: eGovernment Benchmark 2019, <https://ec.europa.eu/digital-single-market/en/news/egovernment-benchmark-2019-trust-government-increasingly-important-people>



## Austria

	Austria		EU
	rank	score	score
<b>DESI 2020</b>	<b>13</b>	<b>54.3</b>	<b>52.6</b>
DESI 2019	14	51.1	49.4
DESI 2018	13	48.5	46.5

Digital Economy and Society Index (DESI) 2020 ranking



Austria ranks 13<sup>th</sup> out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020. Based on data prior to the pandemic, in two of the DESI dimensions Austria is above average, in three below.

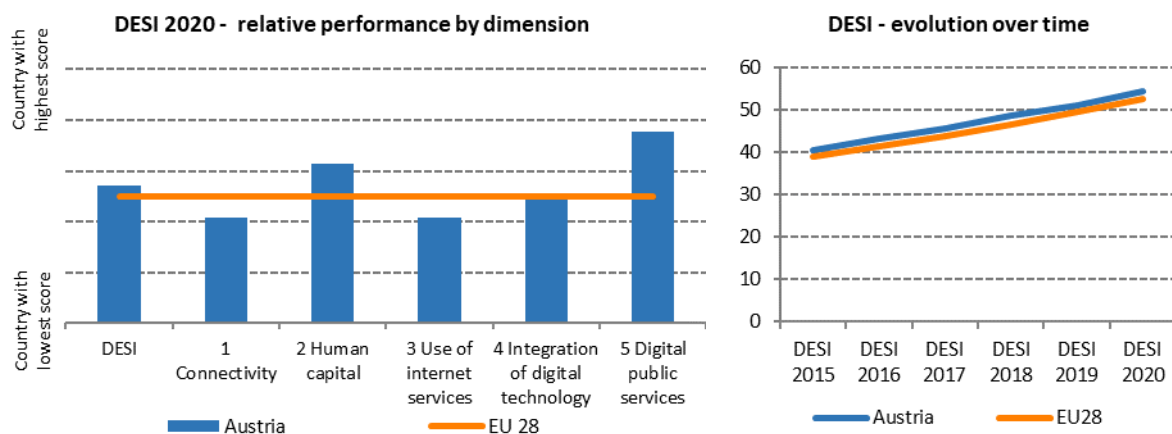
Compared to last years' DESI, Austria's ranking remained relatively stable. While Austria remains slightly above the EU average, the distance to the best performing countries has increased. Austria is an above average performer in every indicator of the Human Capital dimension of the DESI (digital skills, software skills, ICT graduates and specialists). As in the year before, the use of internet services in Austria improved slower than that of other Member States, placing Austria in 18<sup>th</sup> rank, in the lower third. It performs below average in Connectivity and Integration of digital technologies. Regarding the integration of digital technology, Austria slightly improved its positions to the 17<sup>th</sup> rank, up 2 places from last year's 19<sup>th</sup> rank. Austrian companies still do not take full advantage of the use of digital technologies such as cloud services or big data, but there was a substantial increase in the percentage of companies using social media and selling online.

The 'Digital Roadmap Austria' was published in January 2017 under a previous government. The roadmap was comprehensive but lacked quantified targets and monitoring. The development of a Vision "Digital Austria in 2050" - which will be the starting point for the overall digitisation strategy ("strategic action plan") - was started in 2019. The Vision aims to provide the necessary framework for the Digitalisation Strategy. It will in turn consist of several strategic action plans focusing on selected priority topics. The strategy is intended to harmonise many existing and replace partly outdated strategies (e.g. Digital Roadmap). Fostering the digital transformation in selected priority topics (e.g. data, art/culture, climate and environment protection, etc.) and improving user-centric, modern e-government services are among the main topics within the upcoming strategic action plans.

The stakeholder consultation for the Austrian national artificial intelligence (AI) strategy, ‘Artificial Intelligence Mission Austria 2030’, was completed. The strategy process focused on seven policy fields: i) research and innovation; ii) AI in the public sector; iii) AI in the economy/industry; iv) society, ethics and the labour market; v) infrastructure; vi) AI governance, legal issues, safety and security; and vii) qualification and training, and the Austrian Caretaker Government has approved the results from this process. The new government programme<sup>(304)</sup> published in January 2020 announces digital strategies for tourism, agriculture and railways. In 2020, an Austrian AI Strategy will also be adopted.

In August 2019, the Austrian government adopted the Austrian Broadband Strategy 2030<sup>(305)</sup>, which replaced the “Broadband 2020” Strategy that is coming to an end. This strategy has set ambitious targets to close connectivity gaps in especially rural areas. It aims to provide full coverage of gigabit-capable connections throughout the country by 2030. The strategy sets specific intermediate targets, such as providing country-wide availability of 5G by 2025. It envisages that full coverage of ultrafast broadband connections will be provided by the end of 2020.

A threat seen is that the regulatory framework in Austria still needs to be better adapted to the digital age. Many of the pillar-specific initiatives have been launched only within the recent past and their real impact still needs to be seen.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Austria has taken a large number of targeted measures in digital to deal with the COVID-19

<sup>(304)</sup> [https://www.dieneuevolkspartei.at/Download/Regierungsprogramm\\_2020.pdf](https://www.dieneuevolkspartei.at/Download/Regierungsprogramm_2020.pdf)

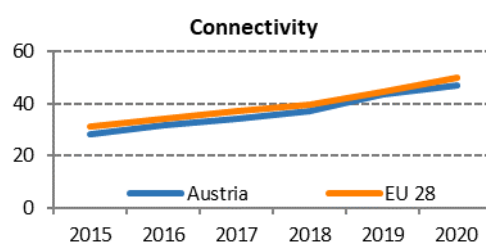
<sup>(305)</sup> <https://www.bmvit.gv.at/themen/telekommunikation/breitband/strategie.html>

crisis. Initiatives to minimise contagion and to support the health system include real time compulsory notifications of positive COVID-19 test by all laboratories, chat bots informing about COVID-19 and subsidies for companies. Austria is also active in improving cybersecurity, by e.g. informing about COVID-19 themed phishing or malware emails and fake shops pretending to sell masks and other protective equipment. The possibility of teleworking in the public administration has been increased, the number of possible teleworkers in the Styrian regional government increased tenfold. As for education, online resources for pupils, apprentices and teachers such as edutube.at, eduthek.at or eeducation.at have been developed and improved, and 12,000 digital devices are loaned to socially disadvantaged pupils. 23 million euros funding is provided for increased COVID-19 research activities using artificial intelligence. Apps to allow infected smartphone owners to anonymously warn persons they have seen in the previous 48 hours and to facilitate the compulsory daily health check with the authorities of persons having been in contact with an infected person are used as well.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Austria is advanced on 5G, is above EU average in the digital skills indicators and especially in digital public services. On the other hand, it lags behind in the deployment of Very High Capacity Networks (VHCN) and has a relatively weak performance in the digitisation of businesses.

# 1 Connectivity

1 Connectivity	Austria		EU
	rank	score	score
<b>DESI 2020</b>	<b>22</b>	<b>47.2</b>	<b>50.1</b>
DESI 2019	18	43.5	44.7
DESI 2018	22	37.5	39.9



	Austria		EU	
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>1a1 Overall fixed broadband take-up</b> % households	<b>71%</b> 2017	<b>69%</b> 2018	<b>72%</b> 2019	<b>78%</b> 2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	<b>5%</b> 2017	<b>7%</b> 2018	<b>29%</b> 2019	<b>26%</b> 2019
<b>1b1 Fast broadband (NGA) coverage</b> % households	<b>84%</b> 2017	<b>84%</b> 2018	<b>84%</b> 2019	<b>86%</b> 2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	<b>12%</b> 2017	<b>13%</b> 2018	<b>14%</b> 2019	<b>44%</b> 2019
<b>1c1 4G coverage</b> % households (average of operators)	<b>97%</b> 2017	<b>98%</b> 2018	<b>98%</b> 2019	<b>96%</b> 2019
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	<b>83</b> 2017	<b>86</b> 2018	<b>90</b> 2019	<b>100</b> 2019
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	<b>NA</b>	<b>33%</b> 2019	<b>33%</b> 2020	<b>21%</b> 2020
<b>1d1 Broadband price index</b> Score (0 to 100)	<b>NA</b>	<b>NA</b>	<b>75</b> 2019	<b>64</b> 2019

Austria ranks 22<sup>nd</sup> (compared to 18<sup>th</sup> in the previous year) on the overall connectivity indicator. Austria performs very well in 4G with 98% average coverage in 2019, slightly above the EU average. With its low coverage of FTTP and DOCSIS 3.1, Austria has particularly low coverage with very high-capacity networks, reaching 14% in 2019 (30 p.p. below the EU average), putting the country at a low 25 in the ranking. Having increased considerably from 5% in 2017, 7% in 2018 to 29% in 2019 Austria's take-up of fixed broadband with speeds of at least 100 Mbps now lies above the EU average of 26%. The coverage of fast broadband (NGA) remains at 84% of households, slightly below the EU average of 86%. Furthermore, broadband prices, both for fixed and for mobile, are below the EU average, placing Austria at 7<sup>th</sup> place on the broadband price index. Mobile broadband take-up is consistently improving in Austria (from 83 in 2017, 86 in 2018 to 90 subscriptions per 100 people in 2019, against the EU average of 100). In addition, Austria is lagging on the overall fixed broadband take-up with 72% against 78% at EU level.

Austria stands 9<sup>th</sup> in the 5G readiness indicator<sup>(306)</sup>, having assigned only the 3.4-3.8 GHz band under 5G conditions.

<sup>(306)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical

'Broadband Austria 2020', Austria's national broadband plan, aims to achieve 99% coverage of 100 Mbps downstream broadband for households in Austria by 2020. With the increasing NGA coverage Austria is moving towards this goal. Since 2015, € 1 billion have been allocated under 'Broadband Austria 2020'. Under this initiative, about 400 beneficiaries receive funding in over 1,200 projects. To address Austria's connectivity shortages in the take-up for fibre connections, the project BBA2020\_Backhaul as part of the national broadband plan, aims to significantly reduce the cost of connecting to fibre. The aim is to increase take-up by establishments of particular socio-economic importance, such as educational institutions and small and medium-sized businesses. In addition, several private investments are directed at deployment of FTTH in the near future. On the Gigabit society objectives, Austria has yet to achieve the targeted take-up of 100 Mbps by 50% of households. Looking beyond 2020, the Austrian Broadband Strategy 2030, adopted in August 2019, seeks to achieve nationwide access to Gigabit-capable broadband services (fixed and mobile) by the end of 2030. The Austrian government is working on the development of a new funding model as part of the strategy, with the funds expected to come from the proceeds of past and upcoming 5G spectrum auctions.

Concerning 5G network deployment, Austria is expected to have a fully-fledged commercial 5G service in all capital cities in 2020. All three mobile network operators (MNOs) have already launched commercial 5G offers in selected locations in Austria. The Austrian Broadband Strategy 2030, which also covers 5G, aims to ensure 5G coverage along all main traffic routes by the end of 2023 and nationwide coverage of 5G by the end of 2025.

Austria has assigned 47% of the total 2,090 MHz spectrum harmonised at EU level for wireless broadband. Of this spectrum, the 3.4-3.8 GHz frequency band was auctioned in 2019 on technical conditions suitable for 5G; blocks of at least 100 MHz contiguous nation-wide spectrum were awarded to all the three MNOs. Four regional operators (Salzburg AG, Holding Graz, Lwest and Mass Response) acquired spectrum of up to 80 MHz each. The auction of the 700 MHz band has been delayed to the second half of 2020 due to the Covid-19 pandemic. The auction will include spectrum in the 1.5 and 2.1 GHz bands. Together with the Ministry, the Austrian Regulatory Authority for Broadcasting and Telecommunication (RTR) organised a consultation on the 26 GHz band. The main findings show that there is currently a lack of demand. It has been argued that 26 GHz spectrum will only be used if the other bands (700 MHz, 1.5 GHz and 3.4-3.8 GHz,) are heavily utilised. The authorities have therefore decided to award that spectrum after 2020.

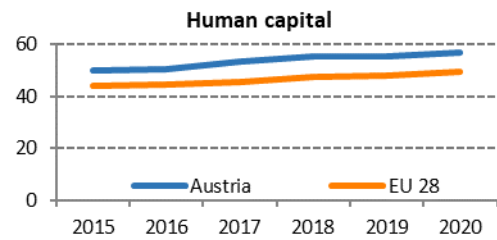
Austria has strong ambitions to become a pioneer in the roll-out of 5G, and consumers already have access to limited commercial 5G offers. Although the country has a very high level of mobile coverage, it scores below the EU average for fixed very high-speed broadband coverage and take-up. Public policy initiatives may therefore play an important role in further improving connectivity in Austria. The 2030 broadband strategy includes ambitious targets to address the high costs of fibre rollout and to incentivise the take-up of higher bandwidths.

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conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

## 2 Human capital

2 Human capital	Austria		EU
	rank	score	score
DESI 2020	9	56.7	49.3
DESI 2019	8	55.7	47.9
DESI 2018	8	55.4	47.6



	Austria			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>2a1 At least basic digital skills</b> % individuals	67%	67%	66%	58%
<b>2a2 Above basic digital skills</b> % individuals	36%	36%	39%	33%
<b>2a3 At least basic software skills</b> % individuals	71%	71%	69%	61%
<b>2b1 ICT specialists</b> % total employment	4.2%	4.4%	4.5%	3.9%
<b>2b2 Female ICT specialists</b> % female employment	1.5%	1.5%	1.7%	1.4%
<b>2b3 ICT graduates</b> % graduates	4.0%	4.1%	3.9%	3.6%

In the human capital, Austria ranks 9<sup>th</sup> out of 28 EU countries and is above the EU average in all underlying indicators. 66% of people between 16 and 74 years of age have at least basic digital skills (the figure is 58% in the EU as a whole). The proportion of ICT specialists in the workforce is higher than the EU average (4.5% compared to 3.9% in the EU). ICT graduates in Austria account for 3.9% all graduates in the country, above the 3.6% EU average. Female ICT specialists account for a mere 1.7% of total female employment, which is still above EU average of 1.4%.

Austrian enterprises lack staff with the right IT skills. In 2019, The Federal Ministry for Digital and Economic Affairs launched a review of apprenticeship programmes to develop updated and new apprenticeship training content. This involves new and updated job profiles, which address the lack of skilled workers<sup>(307)</sup>, and also include a stronger digital component in training courses as well as new job profiles such as coders<sup>(308)</sup>. In parallel and in addition to upskilling the domestic workforce, the Austrian Business Agency supports Austrian companies in finding skilled workers abroad to work in Austria, including digitally skilled workers<sup>(309)</sup>.

Austria actively participated in the CodeWeek and the number of activities more than doubled, which places Austria among the best EU performers<sup>(310)</sup>. With the implementation of the "Digital Basic Education" subject in the schools of the lower secondary level in 2018/19, all Austrian pupils

<sup>(307)</sup> [https://www.oesterreich.gv.at/nachrichten/arbeit\\_und\\_pension/Modernisierung-des-Lehr--und-Berufsausbildungsangebots.html](https://www.oesterreich.gv.at/nachrichten/arbeit_und_pension/Modernisierung-des-Lehr--und-Berufsausbildungsangebots.html)

<sup>(308)</sup> <https://www.oesterreich.gv.at/nachrichten/digitalisierung/Die-Coding-Lehrlinge-kommen.html>

<sup>(309)</sup> [https://www.oesterreich.gv.at/nachrichten/arbeit\\_und\\_pension/Work-in-Austria-gegen-Fachkraeftemangel.html](https://www.oesterreich.gv.at/nachrichten/arbeit_und_pension/Work-in-Austria-gegen-Fachkraeftemangel.html),

<sup>(310)</sup> <https://blog.codeweek.eu/post/190418441025/eucodeweek19stats>

will acquire digital skills. Ongoing digital initiatives such as *digi.check* or *fit4internet* continued; they help pupils and adults to self-assess their digital skills, and offer information on training courses and financial support to improve one's digital skills. The recently created digitalisation agency continued its work of implementing projects, providing support and advice, communicating the opportunities for digitalisation and for attending networking events with stakeholders<sup>(311)</sup>. Austria has made progress on creating a National Coalitions for Digital Skills and Jobs<sup>(312)</sup>. To help existing staff attain higher digital qualifications, the programme "Digital Pro Bootcamps" was launched. Up to 20 employees from at least 5 companies with IT have the chance to further boost their IT knowledge during a nine week intensive training course<sup>(313)</sup>. The programme funds up to 70% of the cost.

Three digital innovation hubs began operations in autumn 2019; these also help SMEs to improve their staff's digital skills<sup>(314)</sup>. A new platform promoting digital jobs was launched in partnership with stakeholders (see Highlight 2020)<sup>(315)</sup>. Following a call, 35 universities will receive €50m for projects related to the digital transformation<sup>(316)</sup>.

The new government programme recognises the importance of digital skills and provides for a number of measures to enable pupils and teachers to acquire digital competences to pupils and teachers. Digitisation of school education is a major priority. It is important that digital education is integrated into all curricula. The variety of Austrian measures to improve the digital skills of its population, both through formal education of the workforce and pupils may produce tangible results over the coming years.

#### Highlight 2020: Digital Jobs Information Website

With already 10,000 unfilled ICT vacancies and an estimated loss of value added of €1.5bn as a result, Austria has launched a digital jobs platform (*digitaleberufe.at*). It informs pupils, parents and teachers about digital jobs' profiles and requirements.

The platform also offers supporting material for teachers to use in their classrooms.

Pupils can find some 40 digital job profiles, often with video testimonials, and indications on the 'difficulty' of the jobs. Besides the objective of motivating more pupils to start an education in the digital area, it therefore also aims at better informing pupils at an early stage, in order to reduce drop-outs from vocational training or university. Currently more than 50% of students in informatics do not finish their studies. The platform aims at halving these rates by better informing future students about the content of and requirements for studying digital subjects at universities.

*DigitaleBerufe.at* is a joint initiative involving government and private organisations such as telecom- and software companies.

<sup>(311)</sup> <https://www.ffg.at/dia>

<sup>(312)</sup> <https://ec.europa.eu/digital-single-market/en/national-local-coalitions>

<sup>(313)</sup> <https://www.ffg.at/ausschreibungen/digital-pro-bootcamps-1-ausschreibung>

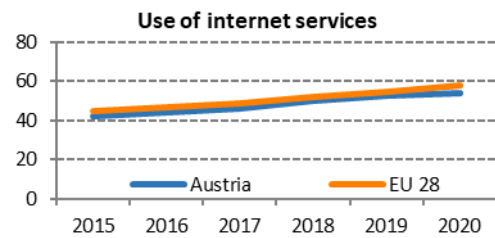
<sup>(314)</sup> <https://www.ffg.at/presse/zwei-digital-innovation-hubs-entstehen-niederoesterreich>

<sup>(315)</sup> <https://www.oesterreich.gv.at/nachrichten/digitalisierung/digitaleberufe.at--Video-Testimonials-praesentieren-IT-Jobprofile.html>

<sup>(316)</sup> <https://www.oesterreich.gv.at/nachrichten/digitalisierung/50-Millionen-Euro-fuer-Digitalisierungsprojekte-an-oesterreichischen-Hochschulen.html>

### 3 Use of internet services

3 Use of internet services	Austria		EU
	rank	score	score
DESI 2020	18	54.0	58.0
DESI 2019	16	52.5	55.0
DESI 2018	15	50.0	51.8



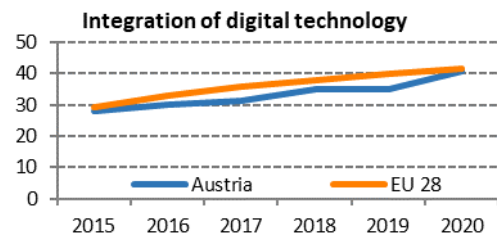
	DESI 2018	Austria	DESI 2020	EU
	value 2017	DESI 2019 value 2018	value 2019	DESI 2020 value 2019
<b>3a1 People who have never used the internet</b> % individuals	10%	10%	10%	9%
<b>3a2 Internet users</b> % individuals	85%	85%	86%	85%
<b>3b1 News</b> % internet users	71%	71%	67%	72%
<b>3b2 Music, videos and games</b> % internet users	79%	80%	80%	81%
<b>3b3 Video on demand</b> % internet users	14%	28%	28%	31%
<b>3b4 Video calls</b> % internet users	42%	45%	47%	60%
<b>3b5 Social networks</b> % internet users	58%	61%	63%	65%
<b>3b6 Doing an online course</b> % internet users	5%	5%	9%	11%
<b>3c1 Banking</b> % internet users	65%	67%	72%	66%
<b>3c2 Shopping</b> % internet users	70%	69%	71%	71%
<b>3c3 Selling online</b> % internet users	15%	16%	14%	23%

Overall, the use of internet services in Austria is below the EU average. Austria ranks 18<sup>th</sup> out of 28 Member States. Hence, use of internet services is Austria's weakest dimension of the DESI. People in Austria are keen to engage in a variety of online activities in line with the rest of the EU. Two areas where Austria is above the EU average are the percentage of internet users with 86% against the EU average of 85% and internet banking with 72% of Austrians internet users against the EU average of 66%. Only 14% of internet users sell online compared to an EU average of 23%. With 47%, Austrian internet users make far less video calls compared to the EU average of 60%. Regarding the use of music, videos and games, social networks or online shopping, Austrian figures are similar to the EU average.



## 4 Integration of digital technology

4 Integration of digital technology	Austria		EU
	rank	score	score
<b>DESI 2020</b>	<b>17</b>	<b>40.6</b>	<b>41.4</b>
DESI 2019	19	34.8	39.8
DESI 2018	19	34.9	37.8



	Austria			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>4a1 Electronic information sharing</b> % enterprises	<b>40%</b> 2017	<b>40%</b> 2017	<b>43%</b> 2019	<b>34%</b> 2019
<b>4a2 Social media</b> % enterprises	<b>21%</b> 2017	<b>21%</b> 2017	<b>30%</b> 2019	<b>25%</b> 2019
<b>4a3 Big data</b> % enterprises	<b>NA</b> 2016	<b>6%</b> 2018	<b>6%</b> 2018	<b>12%</b> 2018
<b>4a4 Cloud</b> % enterprises	<b>11%</b> 2017	<b>11%</b> 2018	<b>11%</b> 2018	<b>18%</b> 2018
<b>4b1 SMEs selling online</b> % SMEs	<b>16%</b> 2017	<b>13%</b> 2018	<b>19%</b> 2019	<b>18%</b> 2019
<b>4b2 e-Commerce turnover</b> % SME turnover	<b>6%</b> 2017	<b>7%</b> 2018	<b>9%</b> 2019	<b>11%</b> 2019
<b>4b3 Selling online cross-border</b> % SMEs	<b>14%</b> 2017	<b>14%</b> 2017	<b>15%</b> 2019	<b>8%</b> 2019

As regards the integration of digital technology into the activity of businesses Austria ranks 17<sup>th</sup> among EU countries. In 2019 Austria ranked 19<sup>th</sup>. Cross border online sales of Austrian SMEs are relatively high, almost twice the EU average (AT: 15%, EU: 8%), while the proportion of SMEs selling online grew by six percentage points to 19%, now similar to the EU-average. However, the share of e-Commerce in the SME's turnover only increased from 7% to 9%, which implies that the average turnover per SME has declined. Austria has one of the lowest EU-values regarding the use of Big data: Only 6% of enterprises use it, while the EU share is twice as high. Equally, the proportion of companies using the cloud is with 11% far below the EU average of 18%, placing Austria on the 23<sup>rd</sup> position.

In October 2019, Austria renewed its SME Digital programme offering SMEs up to €9,000 in support for the analysis of their digital potential. The renewed programme added support for the implementation of digital projects<sup>(317)</sup>. In the previous version of the programme, more than 7,000 SME took part and learned about digital opportunities and challenges.

Existing programmes such as The Global Incubator Network Austria (GIN)<sup>(318)</sup> linking Austrian and international start-ups, investors, incubators and accelerators with a focus on selected hotspots in Asia continues its work. Another is the JumpStart programme supporting start-up incubators and

<sup>(317)</sup> <https://www.kmudigital.at/>

<sup>(318)</sup> <https://www.gin-austria.com/about>

their start-ups in order to allow innovative and technology-focused business ideas to quickly reach their market<sup>(319)</sup>.

Three digital innovation hubs already mentioned in Section 2 are also building a network of partners and providing SMEs with digital know how. An additional 2-3 digital innovation hubs are planned for 2020.

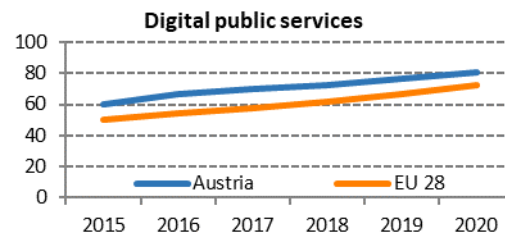
To further boost the digital transformation of the Austrian economy, it is important to raise awareness among SMEs of the relevance of digitisation and to increase the adoption of digital tools. This will enable SMEs to reap the full range of benefits from adopting digital technologies. Many of the measures mentioned above measures are already boosting the digital transformation of the Austrian economy, but additional measures targeting SMEs in particular in relation to cloud and big data may be crucial to unlock the full potential for growth stemming from the adoption of digital technologies.

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<sup>(319)</sup> <https://www.aws.at/aws-jumpstart/>

## 5 Digital public services

5 Digital public services	Austria		EU
	rank	score	score
<b>DESI 2020</b>	<b>8</b>	<b>80.8</b>	<b>72.0</b>
DESI 2019	10	76.3	67.0
DESI 2018	10	72.3	61.8



	Austria			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>5a1 e-Government users</b> % internet users needing to submit forms	64%	68%	70%	67%
<b>5a2 Pre-filled forms</b> Score (0 to 100)	79	81	81	59
<b>5a3 Online service completion</b> Score (0 to 100)	97	97	97	90
<b>5a4 Digital public services for businesses</b> Score (0 to 100) - including domestic and cross-border	84	87	93	88
<b>5a5 Open data</b> % of maximum score	NA	NA	66%	66%

Digital public services is the DESI dimension that Austria performs best in. Austria ranks 8<sup>th</sup> among EU countries, above the EU average. Austria is above or in line with the EU average in all areas.

The country performs well in the pre-filled forms indicator (Austrian score: 81, EU: 59) and in online service completion (Austrian score: 97, EU: 90). The open data score is 66, Austria's weakest score but still in line with the EU average.

In order to reduce the administrative burden, Austria introduced the "once only" principle, whereby companies only have to submit information only once, and government departments exchanged data among themselves and hence do not ask the company again.

The Austrian One-Stop eGovernment Portal for businesses (Unternehmensserviceportal, [www.usp.gv.at](http://www.usp.gv.at)) offers about 50 eGovernment services for companies on one website with a single sign-in. The information concerns amongst other things the creation of companies, questions about hiring, taxation and sector specific information. Moreover, all public tenders are announced in the one-stop platform USP giving SMEs free and unlimited access to tender from 7000 public authorities. The portal Digital Austria ([digitalaustria.gv.at](http://digitalaustria.gv.at)) offers also SMEs relevant information and an overview of government support schemes.

The two governments in charge respectively in 2019 have continued the initiatives concerning digital public services. In March 2019 a revised one stop platform for government services ([oesterreich.gv.at](http://oesterreich.gv.at)) went online. The portal has been expanded with the introduction of new services for citizens (e.g. baby point and relocation) and relaunched under the new name of [oesterreich.gv.at](http://oesterreich.gv.at). In addition, in March 2019 a chatbot named "Mona" and a dedicated mobile app (Digital Office App) were launched to improve the service quality of Austria's most used eGovernment portal for citizens. According to the Austrian E-Government Act, on 1 January 2020, the right to electronic correspondence with the public administration entered into force. Citizens now have the

opportunity of handling their contacts with the authorities electronically and entirely without a break in media<sup>(320)</sup>.

Austrian administrations are obliged to offer the possibility to send important documents electronically<sup>(321)</sup>.

Austria aims at joining the “Digital 10”, the network of the 10 most digitally advanced nations<sup>(322)</sup>. The new government programme of January 2020 continues to emphasise Austria’s ambition to be a digitally advanced nation.

The Austrian public sector is digitally advanced compared to its EU peers, and an additional focus on open data and e-Government users will help Austria to join the Top 5 in the DESI ranking for digital public services.

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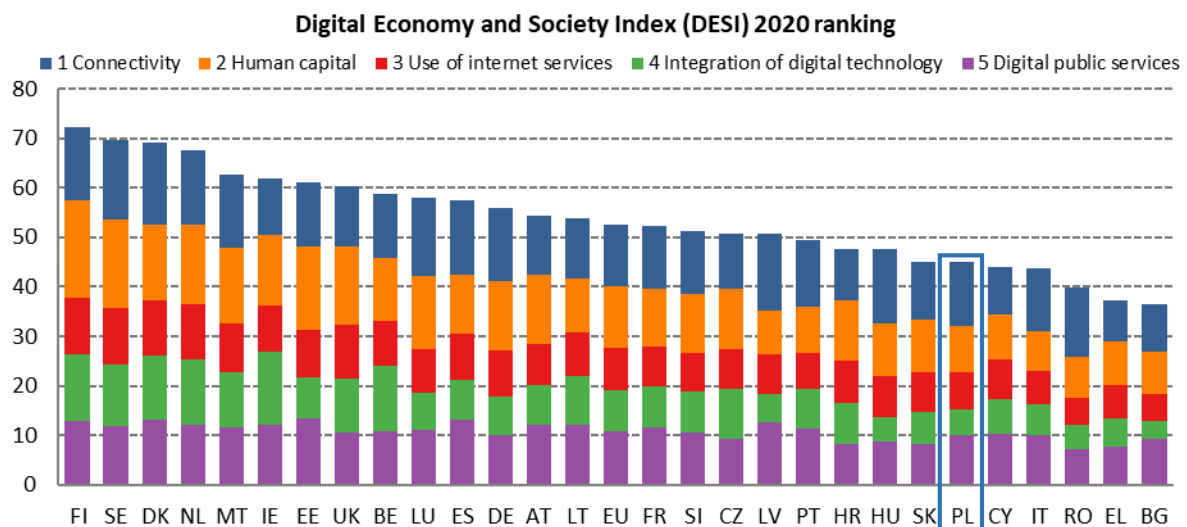
<sup>(320)</sup> <https://www.oesterreich.gv.at/nachrichten/digitalisierung/Behoerdenbriefe-rasch-und-bequem--Die-elektronische-Zustellung.html>

<sup>(321)</sup> <https://www.oesterreich.gv.at/nachrichten/digitalisierung/Behoerdenbriefe-rasch-und-bequem--Die-elektronische-Zustellung.html>

<sup>(322)</sup> <https://www.oesterreich.gv.at/nachrichten/digitalisierung/Vom-Amtsweg-zum-Amtsklick.html>

## Poland

	Poland		EU
	rank	score	score
<b>DESI 2020</b>	<b>23</b>	<b>45.0</b>	<b>52.6</b>
DESI 2019	25	40.7	49.4
DESI 2018	24	37.7	46.5



Poland ranks 23<sup>rd</sup> out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020. Based on data prior to the pandemic, Poland's score has increased in line with the EU average.

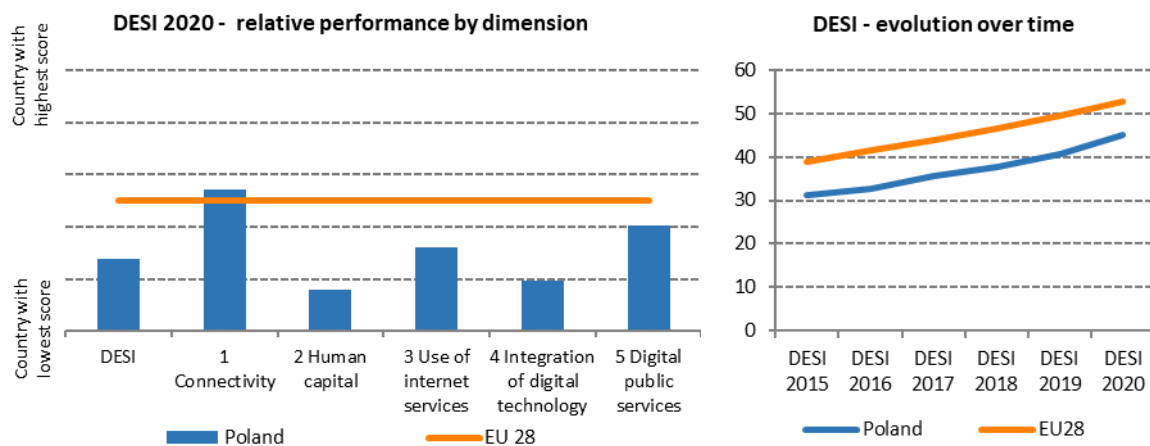
Poland continues to have the highest mobile broadband take-up in the EU and very competitive prices. High scores in fixed very high capacity network and 4G coverage improved its overall score in connectivity. The score in digital public services domain improved, but this has not translated into a change in its position. Poland improved its performance in using pre-filled forms, online service completion, and is an above-EU-average user of open data.

However its performance is offset by lower scores in integration of digital technology and use of internet services, which remain the most challenging areas. In particular, 15% of people in Poland are not yet online and nearly half still lack basic digital skills. The supply of ICT specialists and graduates is growing steadily, but it is still below the EU average. Polish businesses are in favour of using new technologies, a trend reflected in the increasing use of social media, electronic information sharing, and online selling. However, according to the Digital Intensity Index, 60% of companies have a very low level of digitisation (EU: 39%), and only 11% are highly digitised (EU: 26%)<sup>(323)</sup>.

Poland finalised a new strategy, the Digital Competence Development Programme (*Program Rozwoju Kompetencji Cyfrowych*), which targets development of digital skills and is coordinated centrally by the Ministry of Digital Affairs. The new programme will focus on digital skills needed by

<sup>(323)</sup> Digital Scoreboard 2020

citizens, ICT specialists and for employees of SMEs and public administration. The programme is expected to be adopted by the Council of Ministers in the first half of 2020. The new Operational Programme Digital Poland for 2021-2027, co-funded by European Regional Development Fund, is also being prepared. The strategy will include among others support for broadband infrastructure, e-services (e-government and e-health), basic and advanced digital skills, upskilling and re-skilling and skills needed for the future.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Poland has taken a large number of targeted digital measures to deal with the COVID-19 crisis. Initiatives to minimise contagion, to support the e-health solutions for patients and healthcare service providers have been ranging from teleconsultations, symptom checker, chatbots, contact tracking and self-diagnostic apps. In the education, various online activities were developed to engage school pupils (educational gaming activities). Teachers can find support through remote lessons portal (*Zdalne lekcje*<sup>(324)</sup>) or by consulting virtual assistant - chatbot Edzia<sup>(325)</sup>. Digitisation of the public administration is also being accelerated through the 'Anti-Crisis Shield', a governmental programme for supporting Polish companies affected by the COVID-19.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Poland is advanced in the deployment of Very High Capacity

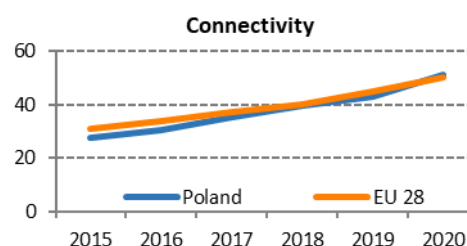
<sup>(324)</sup> <https://www.gov.pl/web/zdalnelekcje>

<sup>(325)</sup> The Central Technology Hub, the Digital Center Foundation, the Center for Citizenship Education, the Cyfrowy Dialog Association, the School with Class Foundation and IBM have jointly created a computer program that answers teachers' questions about remote education.

Networks (VHCN). On the other hand, Poland has not yet assigned any radio spectrum for 5G services. The levels of basic digital skills remain low compared to the EU average. Poland has a relatively weak performance in the digitisation of businesses and in digital public services.

# 1 Connectivity

1 Connectivity	Poland		EU
	rank	score	score
DESI 2020	15	51.3	50.1
DESI 2019	20	42.8	44.7
DESI 2018	18	39.4	39.9



	DESI 2018	Poland	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
<b>1a1 Overall fixed broadband take-up</b>	<b>61%</b>	<b>60%</b>	<b>62%</b>	<b>78%</b>
% households	2017	2018	2019	2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b>	<b>13%</b>	<b>23%</b>	<b>28%</b>	<b>26%</b>
% households	2017	2018	2019	2019
<b>1b1 Fast broadband (NGA) coverage</b>	<b>65%</b>	<b>66%</b>	<b>76%</b>	<b>86%</b>
% households	2017	2018	2019	2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b>	<b>21%</b>	<b>29%</b>	<b>60%</b>	<b>44%</b>
% households	2017	2018	2019	2019
<b>1c1 4G coverage</b>	<b>91%</b>	<b>93%</b>	<b>99%</b>	<b>96%</b>
% households (average of operators)	2017	2018	2019	2019
<b>1c2 Mobile broadband take-up</b>	<b>144</b>	<b>163</b>	<b>176</b>	<b>100</b>
Subscriptions per 100 people	2017	2018	2019	2019
<b>1c3 5G readiness</b>	<b>NA</b>	<b>0%</b>	<b>0%</b>	<b>21%</b>
Assigned spectrum as a % of total harmonised 5G spectrum		2019	2020	2020
<b>1d1 Broadband price index</b>	<b>NA</b>	<b>NA</b>	<b>81</b>	<b>64</b>
Score (0 to 100)			2019	2019

Poland ranks 15<sup>th</sup> in the connectivity dimension of DESI. It has achieved significant progress on the fixed very high-capacity networks coverage (60% comparing to 29% one year earlier), thanks to both increase in FTTP deployment and upgrade of cable networks to DOCSIS 3.1. In both take-up of fixed broadband with speeds of at least 100 Mbps, and mobile broadband take-up, it achieves better results than the EU average. As regards mobile broadband take-up, Poland ranks first in the EU, with 176 subscriptions per 100 people. The Polish market boasts one of the lowest retail prices in the EU – it scores 81 on the broadband price index, compared with the EU average of 64. It remains slightly above the EU average in terms of average 4G coverage (99%) but is significantly below the EU average in terms of NGA broadband coverage (76%).

In order to address the difficulties with broadband roll-out, a number of amendments to the so-called ‘Megaustawa’<sup>(326)</sup> (‘Mega-law’) were adopted in 2019. These amendments include provisions creating a new Broadband Fund (budget of PLN 140 million, or approximately €33 million) to provide parallel or complementary support, from 2021, for actions financed under the country’s operational programme Digital Poland (POPC)<sup>(327)</sup>. Other amendments to the Megaustawa address the

<sup>(326)</sup> Act of 7 May 2010 on the support of the development of telecommunications services and networks, O.J. 2010 No 106, 675.

<sup>(327)</sup> The programme is financed through both the European Regional Development Fund (€2.17 billion) and national funds (€394.4 million).



bottlenecks that have been preventing application of the Broadband Cost Reduction Directive (BB CRD). Those amendments include: better mapping of the existing infrastructure (including fibre and other cable networks; data will have to be provided twice a year starting in 2022), facilitation of permits (significantly lower fees applicable to all local authorities) and amended rules for access to buildings. Poland has also finally adopted an updated national broadband plan (on March 10<sup>th</sup> 2020), which reflects the gigabit society goals and includes actions regarding 5G implementation, foreseen in the '5G Strategy for Poland'. In addition, despite its efforts, Poland is still far from achieving goal 2 of the Digital Agenda for Europe (connectivity of 30 Mbps or more for all citizens by 2020). The main difficulties are still related to the geographical conditions that raise the cost of network deployment.

Poland scores 0% in the 5G readiness indicator <sup>(328)</sup>. In 2019, a technical agreement was finally reached with Russia concerning spectrum utilisation in the 470 – 694 MHz band. This makes it possible to rearrange nationwide DVB-T networks in Poland to free spectrum in the 700 MHz band by mid-2022 for IMT purposes, as envisaged in the derogation notification to the European Commission sent in 2018. However, until now Russia, Belarus and Ukraine have not indicated the date for releasing the 700 MHz band from TV transmission. This is the prerequisite before assigning the 700 MHz spectrum band for IMT purposes in Poland. As for the assignment of the band, Poland is exploring the idea of establishing one national 5G network in the 700 MHz band. All mobile network operators, a state-owned company Exatel and the Polish Development Fund signed a Memorandum of Understanding to reflect on the feasibility of having such a network, which raises a number of legal and practical questions. Meanwhile, the national regulatory authority launched the 3.6 GHz band auction on 6 March 2020; however, the auction was subsequently suspended on 16 April 2020 in light of the COVID-19 pandemic. The auction had since been annulled by virtue of the so-called 'Anti-COVID shield 3.0' <sup>(329)</sup>, which entered into force on 16 May 2020. The new auction had not yet been announced at the time of drafting the report.

Overall, Poland adopted a number of regulatory measures in 2019 to facilitate broadband roll-out and to prepare for spectrum assignment in view of deploying 5G networks. Nevertheless, 5G deployment may be delayed in non-urban areas, mainly due to postponed assignment of spectrum in the 700 MHz band and the overall uncertain future of its use. Poland continues to face difficulties in achieving the 2020 EU objectives despite the efforts it has made. The Polish market would benefit from more regulatory certainty, especially for 5G planning, ensuring timely market reviews and resolving long-standing issues related to a number of regulatory decisions.

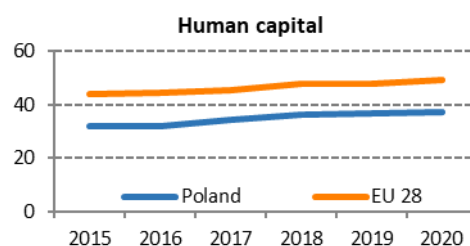
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<sup>(328)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

<sup>(329)</sup> Act of 14 May 2020 on the amendment of some acts regarding protection measures in relation to the spread SARS-CoV-2 virus O.J. 2020, 875.

## 2 Human capital

2 Human capital	Poland		EU
	rank	score	score
<b>DESI 2020</b>	<b>22</b>	<b>37.3</b>	<b>49.3</b>
DESI 2019	22	36.8	47.9
DESI 2018	24	36.2	47.6



	Poland			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b>	<b>46%</b>	<b>46%</b>	<b>44%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>21%</b>	<b>21%</b>	<b>21%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>49%</b>	<b>49%</b>	<b>46%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>2.7%</b>	<b>2.8%</b>	<b>3.0%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>0.9%</b>	<b>0.9%</b>	<b>0.9%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>3.0%</b>	<b>3.1%</b>	<b>3.5%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

In Human capital, Poland ranks 22<sup>nd</sup>. Basic and advanced digital skills still remain below the EU average with only 44% of individuals between the ages of 16 and 74 having at least basic digital skills (against an EU average of 58%). The supply of ICT specialists is gradually growing but remains below the EU average. ICT specialists represent a lower proportion of the workforce (3%) against the EU average (3.9%) and only 0.9% of employed women are ICT specialists.

Digital skills are covered under the third priority, ‘Digital competences of society’ of the Operational Programme Digital Poland for 2014-2020, co-funded by the European Regional Development Fund. Poland finalised preparation of a new Digital Competence Development Programme (*Program Rozwoju Kompetencji Cyfrowych*), which targets development of digital skills, coordinated centrally by the Ministry of Digital Affairs. It will focus on digital skills needed by citizens, ICT specialists and for employees of SMEs and public administration. It is expected to be adopted in 2020. Additionally, the follow-up of the Operational Programme Digital Poland for 2021-2027 is being prepared. It will include support for broadband, e-services (e-government and e-health), digital skills, upskilling and re-skilling and skills needed for the future.

In 2019, the ministry initiated the IT Talent Development Programme for 2019-2029<sup>(330)</sup> (*Program Rozwoju Talentów Informatycznych*). The goal is to manage IT talents and reduce the labour gap in the IT sector. The programme consists of two paths: (i) championships in algorithmic and programming; and (ii) championships in designing computer games. During the programme, 10,000 pupils and 1,500 teachers will receive dedicated support (training, workshops and webinars). Regarding changes to curricula, a new study path was added for the school year 2019/2020 - the

<sup>(330)</sup> <https://www.gov.pl/web/cyfryzacja/rusza-program-wsparcia-mlodych-talentow-informatycznych>

‘technician/programmer’ path. It allows new skills to be acquired, up-skilling, or reskilling to another existing study path called the ‘technician/IT’ path.

The Digital Skills and Job Coalition<sup>(331)</sup> continues to bring together companies, social partners, non-profit organisations and education providers, who take action to improve the digital skills in Poland. One of the partners, the Orange Foundation is leading a project ‘Lesson: Enter’ (*Lekcja: Enter*<sup>(332)</sup>). It is the biggest, nationwide digital education project in Poland addressed to school teachers and schools. Its main goal is to prepare and encourage teachers to use available dedicated digital content and tools more often in their everyday work. It aims to train 75,000 teachers (approximately 15% of all teachers in Poland) within 4 years period (2019-2023).

The Ministry of Digital Affairs alongside with NASK<sup>(333)</sup> launched several promotional and informational campaigns in 2019. The campaigns ranged from promoting security online (*Nie zagub dziecka w sieci*<sup>(334)</sup>), increasing usage of e-governmental services (*e-Polak potrafi*<sup>(335)</sup>), encouraging adults to use computers and the internet, to finish up with campaigns targeting parents to inspire their kids to learn programming and participate in EU Code Week<sup>(336)</sup>.

In EU Code Week, Poland was once again one of the most active countries worldwide. It tripled the number of activities to 15,438 and increased the number of people participating to 489,639, of which one third were women. Among other success stories, we can find the e-Pionier project, which supported 379 talented programmers in 2019, the IT Master Centre (*Centrum Mistrzostwa Informatycznego*<sup>(337)</sup>) offered complex support and found talents in IT, robotics and programming.

Through the Innovative Solution for Digital Education (Zintegrowana Platforma Edukacyjna), more than 30,000 educational e-materials created during previous EU projects will be made available in one spot<sup>(338)</sup>. In the future, a single point for all the new e-resources will be created, including PO WER and RPO<sup>(339)</sup>. In 2019, the Łukasiewicz Research Network<sup>(340)</sup> was established. Its goal is to ensure excellence of research, development and transfer of knowledge in automation, chemicals, biomedicine, ICT, materials, and advanced manufacturing.

To derive maximum benefit from the digital economy and support long-term productivity, Poland needs to continue raising the levels of digital skills among all groups with a focus on improving female participation in the digital field.

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<sup>(331)</sup> <http://umiejtnoscicyfrowe.pl/>

<sup>(332)</sup> Project is implemented by a consortium of three non-profit organizations: Orange Foundation (leader – [www.fundacja.orange.pl](http://www.fundacja.orange.pl)), Information Society Development Foundation ([www.frsi.org.pl](http://www.frsi.org.pl)) and Institute of Public Affairs ([www.isp.org.pl](http://www.isp.org.pl)) thanks to the grant of €12,500,000 from the Digital Poland Operational Program funded by the European Regional Development Fund. Project includes 40 hours training courses designed according to the teacher’s needs, subjects and school levels. Study visits, teachers networking and exchanges, regional meetings are also among activities to be implemented within the project framework. More about Lekcja Enter: <https://lekcjaenter.pl/>

<sup>(333)</sup> NASK is a national research institute supervised by the Ministry of Digital Affairs.

<sup>(334)</sup> <https://www.gov.pl/web/niezagubdzieckawsieci>

<sup>(335)</sup> <https://www.gov.pl/web/cyfryzacja/e-polak-potrafi>

<sup>(336)</sup> <https://codeweek.eu/>

<sup>(337)</sup> <https://cmi.edu.pl/>

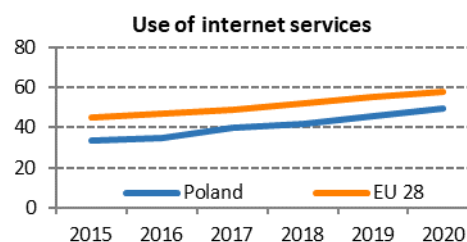
<sup>(338)</sup> <http://e-podreczniki.pl>

<sup>(339)</sup> The European Social Fund offers funding available at national level through Program Operacyjny Wiedza Edukacja Rozwoj (PO WER) and at regional level through Regionalne Programy Operacyjne (RPO).

<sup>(340)</sup> <https://lukasiewicz.gov.pl/en/about-us/>

### 3 Use of internet services

3 Use of internet services	Poland		EU
	rank	score	score
<b>DESI 2020</b>	<b>23</b>	<b>49.6</b>	<b>58.0</b>
DESI 2019	23	45.8	55.0
DESI 2018	24	42.2	51.8

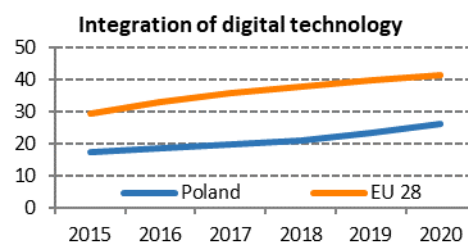


	Poland			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>3a1 People who have never used the internet</b>	<b>20%</b>	<b>18%</b>	<b>15%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>73%</b>	<b>75%</b>	<b>78%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>79%</b>	<b>79%</b>	<b>75%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>68%</b>	<b>75%</b>	<b>75%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>6%</b>	<b>15%</b>	<b>15%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>42%</b>	<b>44%</b>	<b>60%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>63%</b>	<b>64%</b>	<b>66%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>5%</b>	<b>5%</b>	<b>7%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>52%</b>	<b>57%</b>	<b>59%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>58%</b>	<b>60%</b>	<b>66%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>20%</b>	<b>18%</b>	<b>17%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

Overall, the use of internet services in Poland is below the EU average and Poland ranks 23<sup>rd</sup>. The proportion of people who have never used the internet continues to drop. Poles are keen to engage in a variety of online activities, just as in the rest of the EU. The most popular online activities are reading the news, listening to music, watching videos, playing video games, and using social networks. 75% of Polish internet users read news online, above the EU average of 72%. Poles use the internet extensively for shopping (66%) and banking (59%). In comparison to last year, the use of video calls rose by 16 percentage points, reaching the EU average of 60%.

## 4 Integration of digital technology

4 Integration of digital technology	Poland		EU
	rank	score	score
<b>DESI 2020</b>	<b>25</b>	<b>26.2</b>	<b>41.4</b>
DESI 2019	26	23.5	39.8
DESI 2018	26	21.0	37.8



	Poland			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>26%</b>	<b>26%</b>	<b>29%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>10%</b>	<b>10%</b>	<b>14%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>6%</b>	<b>8%</b>	<b>8%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>6%</b>	<b>7%</b>	<b>7%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>9%</b>	<b>12%</b>	<b>13%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>7%</b>	<b>NA</b>	<b>NA</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>4%</b>	<b>4%</b>	<b>5%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

As regards the Integration of digital technology in businesses' activities, Poland ranks 25<sup>th</sup> among EU countries. Polish enterprises are increasingly taking advantage of the opportunities offered by online commerce: 13% of SMEs sell online, an increase compared to the previous year but still below the EU average of 18%. Only 5% of all SMEs sell online cross-border to other EU countries. 14% of enterprises use social media (EU average: 25%), 7% use cloud services and 8% analyse big data.

Poland is committed to progressing and investing in digital technologies. In 2019, it launched several major initiatives including the Foundation Future Industry Platform (*Fundacja Platforma Przemysłu Przyszłości*<sup>(341)</sup>). The platform's goal is to increase the competitiveness of entrepreneurs by supporting their digital transformation. The platform will be coordinating, standardising and supporting activities implemented by Polish Digital Innovation Hubs (DIH). The competition 'Standardization of Digital Innovation Hubs services to support the digital transformation of enterprises', announced under the Industry 4.0<sup>(342)</sup> programme of the Minister of Development 2019-2021, will help in building the capacity and selection of the future DIH.

Poland keenly invests in digital technologies through EU-coordinated programmes. It is a member of the EuroHPC Joint Undertaking. It participates in PRACE (Partnership for Advanced Computing in Europe) and the PIONIER-LAB - National Platform for Integration of Research Infrastructures. It is an active member of the European Blockchain Partnership Policy Group.

<sup>(341)</sup> <https://przemyslprzyszlosci.gov.pl>

<sup>(342)</sup> <https://www.gov.pl/web/rozwoj/przemysl-4-0>

Poland launched extensive work on the Artificial Intelligence Development Policy for 2019-2027. Its goal is to enter a narrow group of 20-25% of countries building Artificial Intelligence (AI) and increase investments, coordinate research funding and monitor the impact of AI on the labour market. The policy will also be a part of the Polish Strategy of Productivity as well as of the Strategy of the Efficient State 2030. The new Cybersecurity Strategy of the Republic of Poland for 2019-2024 (replacing the previous strategy for 2017-2022) aims to increase the country's resilience to cyber-attacks and improve data protection. Development of the National Cyber-security System, expanding its cyber-threat information exchange and enhancing coordination are key elements of the new strategy.

The National Centre for Research and Development announced the 'Infostrateg'<sup>(343)</sup> - a project in the area of advanced information, telecommunications and mechatronic technologies. It will support high-budget research and development in many strategic areas ranging from image processing (satellite imagery) to IT methods in personalised medicine, diagnostics, therapy and chemoinformatics. Additionally, the 'Programme with PO WER' (*Programuj z PO WER*)<sup>(344)</sup> offers dedicated programming loans (455 loans of up to €4,250 per participant) for workshops and training. The loans are available for people outside of the IT industry and interested in upskilling and reskilling.

The Industrial Development Agency (*Polski Fundusz Rozwoju*) supports the start-up ecosystem through various projects. The flagship programme, Start in Poland<sup>(345)</sup>, creates favourable conditions for start-ups at every stage of their development. It is the largest programme for start-ups in Central and Eastern Europe, with an estimated future creation of 1,500 innovative start-ups within 7 years. Meanwhile, the Open Innovation Network<sup>(346)</sup> supports the purchase of licences and technology for enterprises. The Poland Prize<sup>(347)</sup> programme is the first Polish programme focusing on foreign start-ups. The Polish Development Fund, a 'fund of funds', offers financing to innovative start-ups through venture capital funds or business angels. SMES and scientific units are also allowed to apply for 'Innovation Vouchers for SMEs' (*Bon na innowacje*).

Beefing up support for new digital and innovative business models and further encouragement to digitise would help to increase productivity, enable SMEs to achieve more efficiency and boost their competitiveness.

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<sup>(343)</sup> <https://www.ncbr.gov.pl/programy/programy-strategiczne/aawansowane-technologie-informacyjne-telekomunikacyjne-i-mechatroniczne-infostrateg/>

<sup>(344)</sup> <http://www.power.gov.pl/Strony/wiadomosci/Programuj-z-POWERem>

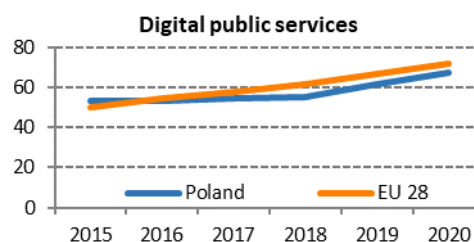
<sup>(345)</sup> Start In Poland: <https://www.gov.pl/web/przedsiębiorczosc-technologie/start-in-poland>

<sup>(346)</sup> <https://www.startup.pfr.pl/en/news/next-call-open-innovation-netwok/>

<sup>(347)</sup> <https://www.parp.gov.pl/component/site/site/en-poland-prize>

## 5 Digital public services

5 Digital public services	Poland		EU
	rank	score	score
<b>DESI 2020</b>	<b>20</b>	<b>67.4</b>	<b>72.0</b>
DESI 2019	20	61.5	67.0
DESI 2018	20	54.9	61.8



	Poland			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>5a1 e-Government users</b>	<b>45%</b>	<b>49%</b>	<b>54%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>48</b>	<b>54</b>	<b>58</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>81</b>	<b>84</b>	<b>87</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>70</b>	<b>75</b>	<b>75</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>78%</b>	<b>66%</b>
% of maximum score			2019	2019

On Digital public services, Poland ranks 20<sup>th</sup>, well below the EU average. It shows good open data maturity, scoring significantly above the EU average. Conversely, there is still a low level of online interaction between public authorities and the public, despite the increasing number of Polish online users. In 2019, Poland performed better as regards pre-filled forms, getting closer to the EU average. On the availability of e-government services for business, Poland scores only 75 out of 100, compared to the EU average of 88.

The Strategy for Responsible Development and the Integrated State Digitisation Programme (PZIP) lays down the basis for the digitisation of public administrations. After recent reviews, the PZIP will focus more on modernisation and on improving the quality of the administration's relations with the public.

Following the migration of governmental websites to one portal *gov.pl*, all websites of ministries, four voivodships<sup>(348)</sup> and 12 thematic websites were migrated. Additionally, the 'My gov' functionality, a newly-added intuitive user panel, allows access to e-services and data contained in public registers. The user dashboard includes 'My inbox' for exchanging messages between the public administration and the public. There is also 'My electricity' for submitting co-financing applications for photovoltaic micro-installations. Setting up a business is also becoming easier and faster. The *biznes.gov.pl* website is in the process of combining functionality with CEIDG<sup>(349)</sup>, which will enable further simplifications.

<sup>(348)</sup> A voivodeship is the highest-level administrative subdivision of Poland, which corresponds to a 'province' in other countries.

<sup>(349)</sup> Central Registration and Information on Business: <https://prod.ceidg.gov.pl/ceidg.cms.engine/>

The Polish Council of Ministers adopted the 'Common IT Infrastructure of the State' Initiative. It will focus on the development, maintenance and management of the government cloud and facilitate purchases of public cloud computing services.

The 'Trusted Profile' (*Profil Zaufany*), which can confirm user identity on the internet and submit a trusted signature, reached 4.5 million users in 2019. The Ministry of Foreign Affairs launched its e-Election registration system service (*e-Wybory*). Voters receiving a voting card for elections to the European Parliament, as well as to the Sejm and Senate of the Republic of Poland, could authenticate their identity using the mCitizen (*mObywatel*) mobile application.

In 2019, the Ministry of Digital Affairs started implementation of the project Open Data Plus (*Otwarte Dane Plus*). It aims to increase the quantity and quality of open public data and further data reuse. The Ministry also continues its cooperation with the National Centre for Research and Development (NCBR) on the CyberSecIdent Programme – Cybersecurity and E-Identity. The goal of CyberSecIdent is to raise the level of security of Polish cyberspace by increasing the availability of hardware and programming tools by 2023. Poland has signed the Declaration on Quantum Communication Infrastructure facilitating Quantum Key Distribution (QKD). QKD aims to secure European infrastructure, a backbone of Europe's Quantum Internet.

Poland finalised work on a new ID card, enabling electronic identification with a high level of security. All ID cards issued from March 2019 contain a special electronic layer in the form of a chip. Users can identify themselves online and sign electronic documents. Moreover, e-delivery services and the Electronic Address Database (*Baza Adresów Elektronicznych - BAE*) are also underway. All users will be able to search in BAE for the electronic delivery address of public bodies and entrepreneurs. Public bodies will be able to additionally search for the addresses of citizens.

The Ministry of Health continues to pursue digital projects to further transform healthcare in Poland. It has successfully implemented national e-prescription (mandatory from January 2020), piloted e-referral (mandatory from January 2021), launched the Patient's Internet Account (IKP) and developed a free IT application *gabinet.gov.pl*, allowing physicians to issue e-prescriptions and e-referrals.

Easier access, more user-friendly e-services for the public and businesses could lead the way to more improvements in digital public administration. Additional measures enabling everyone to use e-health services, regardless of geographical location, could boost their take-up.

#### Highlight 2020: Documents on your mobile phone

Through mCitizen (mObywatel), the Ministry of Digital Affairs grants access to basic documents digitally through mobile phones (e.g. allowing access to and fulfilment of e-prescriptions in pharmacies). mCitizen also offers:

- mobile identity (mTożsamość) for digital identification;
- mPojazd to access car registration certificates and liability policies. Users can receive an automatic reminder of the approaching expiry of the validity of technical inspections or civil liability insurance;
- younger users of the application can use the digital version of the school ID; an electronic representation of student ID is in the pilot phase.

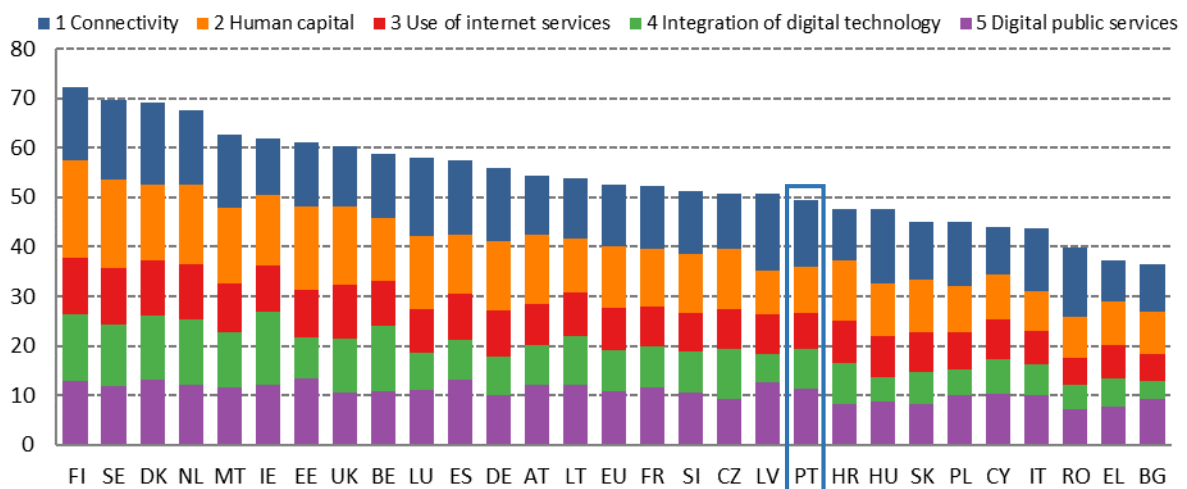
The Ministry plans to further develop and increase services and functionalities in the next year.



## Portugal

	Portugal		EU
	rank	score	score
<b>DESI 2020</b>	<b>19</b>	<b>49.6</b>	<b>52.6</b>
DESI 2019	19	47.0	49.4
DESI 2018	18	44.8	46.5

**Digital Economy and Society Index (DESI) 2020 ranking**



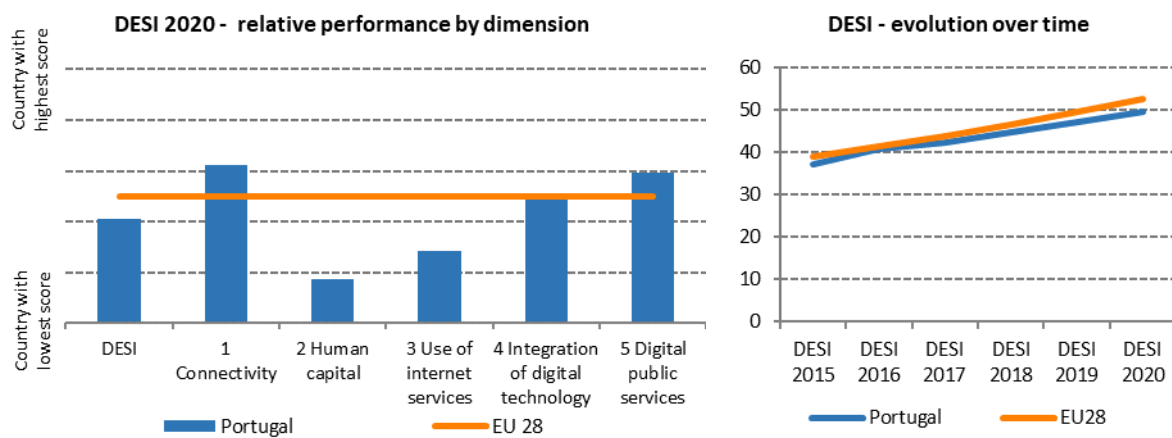
Portugal ranks 19<sup>th</sup> out of the 28 EU Member States in the Digital Economy and Society Index (DESI) 2020. Over the last few years, and based on data prior to the pandemic, its score has increased in line with the EU average.

Compared with the previous edition of DESI, progress is observed in the human capital dimension, thanks to an improvement in the basic level of digital skills and a greater proportion of ICT graduates. This is particularly significant for Portugal, given its population's current low level of digital literacy. However, the country continues to perform weakly by European standards in human capital and use of internet services. In connectivity, Portugal has fallen one place compared with the previous year's ranking, but has an above-average overall score. This is mainly due to above-average results in the deployment of very-high capacity networks as well as the take-up of broadband connections of at least 100 Mbps. The indicator that saw the greatest fall is in digital technology in business, from 11<sup>th</sup> to 16<sup>th</sup> position, and it is now below the EU average. In digital public services, Portugal continues to perform well though it has fallen one place compared to last year's ranking, and is one of the best EU performers in this area.

In 2019, Portugal continued implementing the national initiative on digital competencies *INCoDe.2030*. Timely implementation and upscaling of the projects are fundamental to attaining the objectives, as well as to continuing the promotion of public-private collaborations. In parallel, Portugal launched the second phase of the *Indústria 4.0* national strategy for the digitisation of the economy with €600 million in total funding over the next 2 years. In addition, two relevant strategies on Artificial Intelligence (AI) and advanced computing have been launched. Both are strongly focused on improving advanced digital skills.

The Portuguese general elections took place in October 2019. One of the new government four strategic challenges is building up a digital society. The Secretary of State for Digital Transition under

the Ministry of Economy and Digital Transition monitors the implementation of the interministerial measures of this challenge.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

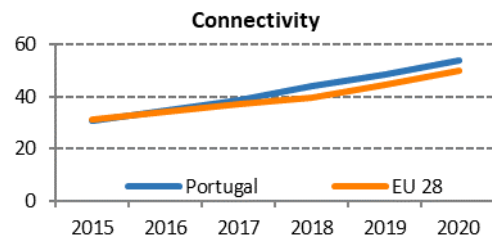
The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Portugal has taken a large number of targeted measures in digital to deal with the COVID-19 crisis. Initiatives to minimise contagion and to support the health system included the development of platforms and applications to coordinate the availability of hospital beds and resources at national level and to trace and communicate with COVID-19 suspects and home patients. Digital service infrastructures were reinforced to deal with higher demand. Digitisation of the public administration was also accelerated mainly through the *ePortugal* portal and new services were offered like online registration of births. For the economy, digital platforms were set up in order to support SMEs that continued open during the crisis and to coordinate the hotel occupation to support COVID-19 health professionals. As for education, several initiatives provided support to digital home schooling, and national and regional tele-school channels were created mainly to support students without internet access or equipment.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Portugal is advanced in the deployment of Very High Capacity Network (VHCN) and is above EU average in the provision of digital public services. On the other hand, it lags behind in the assignment of radio spectrum for 5G, and has a weak performance in the digital skills indicators.

## 1 Connectivity

1 Connectivity	Portugal		EU
	rank	score	score
<b>DESI 2020</b>	<b>12</b>	<b>53.9</b>	<b>50.1</b>
DESI 2019	11	48.4	44.7
DESI 2018	9	44.3	39.9



	DESI 2018	Portugal	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
		value	value	value
<b>1a1 Overall fixed broadband take-up</b> % households	<b>72%</b> 2017	<b>74%</b> 2018	<b>75%</b> 2019	<b>78%</b> 2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	<b>35%</b> 2017	<b>50%</b> 2018	<b>56%</b> 2019	<b>26%</b> 2019
<b>1b1 Fast broadband (NGA) coverage</b> % households	<b>72%</b> 2017	<b>76%</b> 2018	<b>83%</b> 2019	<b>86%</b> 2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	<b>64%</b> 2017	<b>70%</b> 2018	<b>83%</b> 2019	<b>44%</b> 2019
<b>1c1 4G coverage</b> % households (average of operators)	<b>94%</b> 2017	<b>96%</b> 2018	<b>96%</b> 2019	<b>96%</b> 2019
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	<b>65</b> 2017	<b>70</b> 2018	<b>76</b> 2019	<b>100</b> 2019
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	<b>NA</b>	<b>0%</b> 2019	<b>8%</b> 2020	<b>21%</b> 2020
<b>1d1 Broadband price index</b> Score (0 to 100)	<b>NA</b>	<b>NA</b>	<b>51</b> 2019	<b>64</b> 2019

Portugal ranks 12<sup>th</sup> in the Connectivity dimension of DESI 2020. It has very good VHCN broadband coverage of 83% (against an EU average of 44%) and good fast broadband (NGA) coverage (83%), which is close to the EU average. Portugal ranks 2<sup>nd</sup> in at least 100 Mbps fixed broadband take-up (56% compared to an EU average of 26%) but continues to lag behind the EU average on mobile broadband take-up rates despite substantial improvement (from 70 subscriptions per 100 people in 2018 to 76 in 2019). Overall fixed broadband take-up rose from 74% in 2018 to 75% in 2019, narrowing the gap with the EU average (78%). Prices in Portugal are higher than the EU average ranking 24<sup>th</sup> in DESI. Mobile 4G coverage has reached 96%, at the same level as EU average.

Public investment and competition between private operators are the two factors driving the expansion of broadband in Portugal. The authorities continue to monitor projects in rural areas that benefitted from state aid in the past. In April 2019, the Government decided to reduce the wholesale tariffs for access to Fibroglobal's network<sup>(350)</sup> (managing fibre networks in rural areas in the centre of the country and the Azores, built with public support), extent Fibroglobal's bitstream offer to 200 Mbps, 400 Mbps or 1 Gbps speeds and introduce a multicast functionality for operator to deploy their own IPTV. Despite these measures, there is still no interest in accessing Fibroglobal's network and MEO is the only provider to make extensive use of Fibroglobal's offer. For the next programming period, Portugal's priority is to replace the Atlantic submarine cable ring linking the mainland with Madeira and Azores (CAM submarine cables) which is reaching the end of its life. In

<sup>(350)</sup> <http://www.fibroglobal.com/>

May 2019, a working group on the future of submarine cables for CAM communications, chaired by ANACOM, was set up. In December 2019, the working group submitted a report including 12 recommendations to the Government, to fit in with the start of operations for the new CAM ring within the deadline (2023) and lasting 25 years<sup>(351)</sup>. Portugal is also interested in linking Lisbon to Marseille through a new submarine cable. EllaLink, a submarine cable system connecting Fortaleza (Brazil) to Sines in Portugal, is expected to enter into service the first quarter of 2021. A further challenge to network deployment is the fragmentation of the rules on the authorisations necessary to access the infrastructure at municipal level, and the lack of coordination between them.

As regards 5G, several 5G trials are underway<sup>(352)</sup>. The city of Aveiro has committed to be a 5G city by 2020. The Spain-Portugal cross-border corridor connecting the cities of Vigo and Porto was launched in 2018 in the context of an EU project known as 5GMOBIX. The process continued during 2019, with first trials on roads planned for 2020. On 22 October 2019, ANACOM, the national regulatory authority for communications, launched a public consultation concerning the upcoming multi-band auction of the 700, 900 MHz, 1800, 2100, 2600 and 3600 MHz bands, then scheduled for April 2020 but now suspended on account of the COVID-19 pandemic. A new public consultation on the specific terms of the auction was carried out in February 2020. One operator (Dense Air) holds the rights of use of 56-100 MHz in the 3.4-3.8 GHz band until 2025. This may pose some difficulties in the reorganisation and/or the amount of the spectrum of the band available before the deadline of December 2020. ANACOM has authorised operators to use the 3.6 GHz band, as well as the 1800 MHz and 2.6 GHz bands, for trials. Its aim is to develop technical tests and scientific studies using various technologies (namely 5G, in conjunction with 4G), to test the various features and capabilities of these technologies, as well as refine their theoretical models, before moving on to the implementation of future 5G networks. Regarding the 700 MHz band, the second digital dividend process is ongoing. On 4 October 2019, ANACOM issued a decision approving the migration plan of the DTT<sup>(353)</sup>. However, the migration process has been suspended on account of the COVID-19 pandemic. The March 2018 public consultation showed a current lack of market interest in the 26 GHz band. Accordingly, ANACOM is to auction the other bands first and defer its decision on the 26 GHz band. By the first quarter of 2019, Portugal had assigned 36% of the total 2090 MHz spectrum harmonised at EU level for wireless broadband however none of the pioneer bands have been assigned, so Portugal ranks 16<sup>th</sup> in the 5G readiness indicator<sup>(354)</sup>.

Portugal performs well on the deployment of very-high capacity networks and on the take-up of broadband connections of at least 100 Mbps. An additional effort is still required to ensure that very high-capacity networks coverage and mobile broadband take-up reaches all households, including those in rural areas. Broadband prices remain a challenge. The rollout of 5G will depend on the

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<sup>(351)</sup> <https://www.anacom.pt/render.jsp?contentId=1499946&languageId=1>

<sup>(352)</sup> [http://5gobservatory.eu/wp-content/uploads/2019/10/90013-5G-Observatory-Quarterly-report-5\\_final.pdf](http://5gobservatory.eu/wp-content/uploads/2019/10/90013-5G-Observatory-Quarterly-report-5_final.pdf)

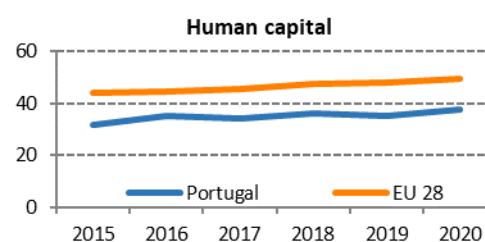
<sup>(353)</sup> After conducting a pilot test in the city of Odivelas downtown, on the 27 of November 2019, the process of releasing the 700 MHz band continued on the 7 of February, as determined by ANACOM's above mentioned decision.

<sup>(354)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

implementation of the 5G strategy and on the prompt completion of the 700 MHz award procedures.

## 2 Human capital

2 Human capital	Portugal		EU
	rank	score	score
<b>DESI 2020</b>	<b>21</b>	<b>37.8</b>	<b>49.3</b>
DESI 2019	23	35.2	47.9
DESI 2018	23	36.2	47.6



	Portugal			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b> % individuals	<b>50%</b> 2017	<b>50%</b> 2017	<b>52%</b> 2019	<b>58%</b> 2019
<b>2a2 Above basic digital skills</b> % individuals	<b>31%</b> 2017	<b>31%</b> 2017	<b>32%</b> 2019	<b>33%</b> 2019
<b>2a3 At least basic software skills</b> % individuals	<b>55%</b> 2017	<b>55%</b> 2017	<b>55%</b> 2019	<b>61%</b> 2019
<b>2b1 ICT specialists</b> % total employment	<b>2.4%</b> 2016	<b>2.2%</b> 2017	<b>2.4%</b> 2018	<b>3.9%</b> 2018
<b>2b2 Female ICT specialists</b> % female employment	<b>0.8%</b> 2016	<b>0.7%</b> 2017	<b>0.7%</b> 2018	<b>1.4%</b> 2018
<b>2b3 ICT graduates</b> % graduates	<b>1.2%</b> 2015	<b>1.2%</b> 2016	<b>1.9%</b> 2017	<b>3.6%</b> 2017

On the human capital dimension, Portugal ranks 21<sup>st</sup> out of 28 EU countries - an improvement of two places compared with the previous year, but is still below the EU average. In 2019, the percentage of the Portuguese population without at least basic digital skills decreased from 50% to 48%. However, about 26% had no digital skills at all. This is still mainly due to many people never having used the internet (see section 3). The proportion of ICT specialists represents a lower percentage of the workforce compared to the EU average (2.4% compared to 3.9% in the EU). In the same vein, Portugal still has one of the smallest shares of ICT specialists in total female employment, representing half the EU average. The proportion of ICT graduates in the total graduate pool has improved, but is still very low by EU standards (1.9% compared to 3.6% in the EU).

In 2019, Portugal continued its efforts to improve the digital skills of the population with the implementation of the national initiative on digital competencies *INCoDe.2030*, which also acts as National Coalition for Digital Skills and Jobs. As regards inclusion, the Creative Communities for Digital Inclusion initiative has been extended to other areas, such as prisons, to develop the digital competencies of vulnerable groups. Upscaling will be fundamental to the effectiveness of all initiatives at the pilot stage, and in this case, the Portuguese government is preparing the corresponding financing mechanism. As regards education, Portugal launched the Digital Competence Reference Framework<sup>(355)</sup> - a new instrument to allow the Portuguese population to assess their digital competencies and their development needs. To promote ICT qualifications, Portugal successfully implemented ICT training programmes for unemployed graduates with a budget of €3.5 million. Additionally, different companies promoted similar training programmes in ICT areas where they have a direct need or interest (755 graduates participated).

<sup>(355)</sup> [https://www.incode2030.gov.pt/sites/default/files/qdrcd\\_set2019.pdf](https://www.incode2030.gov.pt/sites/default/files/qdrcd_set2019.pdf)

In parallel, other public-private collaborations helped to improve the population's digital literacy. The #EUSOUDIGITAL initiative<sup>(356)</sup>, developed jointly by the Portuguese Government, .PT and the Movement for the Active Digital Use (MUDA)<sup>(357)</sup>, promoted digital awareness and inclusion through national roadshows covering 20 locations. In addition, through MUDA, which is mainly privately funded, several initiatives are being implemented in schools, villages and neighbourhoods to promote digital inclusion in hard-to-reach groups of the population, like the elderly or people living in rural areas. MUDA also collaborates with the Portuguese Administrative Modernisation Agency, the Tax Authority, universities and private entities to raise awareness of digital topics through one-minute videos broadcast on national television: *MUDA num minuto*. So far, the 200 programmes produced have reached 250,000 viewers daily. The further development of this type of partnerships can leverage the work carried out by private organisations and contribute to the *INCoDe.2030* objectives.

Also in 2019, Portugal once again participated in the EU Code Week<sup>(358)</sup>, a grassroots movement run by volunteers to encourage people of all ages to discover coding and digital creativity. Compared to 2018, the number of activities organised increased very significantly from 140 to 742 and were organised mainly in schools. Accordingly, the number of participants increased to more than 85,000, of which 51% on average were women.

In order to attain good levels of digital literacy, it is critical to continue the timely implementation of the aforementioned initiatives, and to upscale and promote public-private collaborations. In this respect, the general coordination of the digital initiatives under the new Secretary of State for Digital Transition could encourage collaboration and boost implementation.

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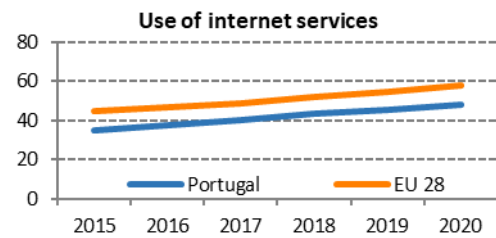
<sup>(356)</sup> <https://www.eusoudigital.pt/>

<sup>(357)</sup> <https://www.muda.pt/>

<sup>(358)</sup> <https://blog.codeweek.eu/post/190418441025/eucodeweek19stats>

### 3 Use of internet services

3 Use of internet services	Portugal		EU
	rank	score	score
<b>DESI 2020</b>	<b>24</b>	<b>48.1</b>	<b>58.0</b>
DESI 2019	24	45.2	55.0
DESI 2018	23	43.2	51.8



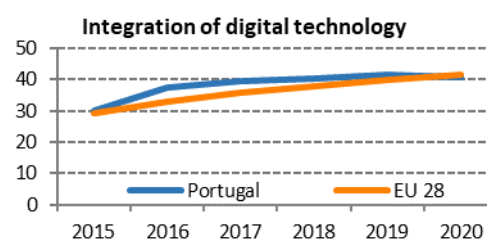
	Portugal			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>3a1 People who have never used the internet</b>	<b>22%</b>	<b>23%</b>	<b>22%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>71%</b>	<b>71%</b>	<b>73%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>80%</b>	<b>80%</b>	<b>83%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>83%</b>	<b>83%</b>	<b>83%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>9%</b>	<b>14%</b>	<b>14%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>44%</b>	<b>46%</b>	<b>53%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>76%</b>	<b>79%</b>	<b>80%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>6%</b>	<b>6%</b>	<b>8%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>42%</b>	<b>52%</b>	<b>56%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>45%</b>	<b>49%</b>	<b>51%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>11%</b>	<b>11%</b>	<b>12%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

Despite a higher overall score compared with the previous year, Portugal still ranks 24<sup>th</sup> out of 28 Member States. The proportion of people who have never used the internet is more than double the EU average. In the same vein, relatively few Portuguese use the internet at least once a week - 73% compared to 85% for the EU as a whole. The proportion of internet users who engage in video calls increased significantly from 46% in 2018 to 53% in 2019, bringing it closer to the EU average of 60%. In 2019, the use of online banking and online shopping continued increasing to 56% and 51% of internet users respectively. Those figures remain, however, below the EU average of 66% and 71% respectively. Conversely, the online consumption of music, videos, games and news and the use of social networks are above the EU average.



## 4 Integration of digital technology

4 Integration of digital technology	Portugal		EU
	rank	score	score
<b>DESI 2020</b>	<b>16</b>	<b>40.9</b>	<b>41.4</b>
DESI 2019	11	41.4	39.8
DESI 2018	12	40.3	37.8



	Portugal			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>40%</b>	<b>40%</b>	<b>42%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>16%</b>	<b>16%</b>	<b>16%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>13%</b>	<b>13%</b>	<b>13%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>14%</b>	<b>16%</b>	<b>16%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>17%</b>	<b>18%</b>	<b>16%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>13%</b>	<b>15%</b>	<b>15%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>8%</b>	<b>8%</b>	<b>8%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

As regards the integration of digital technologies in businesses, Portugal ranks 16<sup>th</sup> in the EU. It has fallen five places compared with the previous year's ranking, and has a below-average overall score. The proportion of Portuguese companies using business resource planning increased to 42%, which is significantly higher than the EU average of 34%. Portugal continues to rank high in the share of e-commerce in SMEs turnover. Conversely, the proportion of SMEs selling online has decreased to 16%, and is now below the EU average of 18%. Generally, Portuguese SMEs are less active in digitisation than their larger counterparts. This is particularly significant because the Portuguese economy is mostly dominated by micro enterprises concentrated in traditional sectors. One of the main obstacles to the digitisation of SMEs is the digital knowledge gap, which is caused by low levels of digital literacy among owners, managers and employees<sup>(359)</sup>.

Portugal is actively implementing measures to promote the digitisation of businesses. In 2019, it launched the second phase of the *Indústria 4.0* national strategy for the digitisation of the economy with total funding of €600 million over the following 2 years. The authorities estimate that it will generate additional exports worth around €1.2 million. This phase has three main objective lines: i) *Capacitar i4.0* to reskill, upskill and train more than 200,000 workers; ii) *Generalizar i4.0* to promote digital transition in more than 20,000 companies; and iii) *Assimilar i4.0* to scale up more than 350 projects. In addition, Portugal supported the launch of the programme *ComércioDigital.pt*<sup>(360)</sup> with

<sup>(359)</sup> EIB and COTEC, *The digitalisation of small and medium-sized enterprises in Portugal, models for financing digital projects*, September 2019.

<sup>(360)</sup> ACEPI initiative: <https://www.comerciodigital.pt/>

the objective to promote the presence of SMEs in e-commerce and digital services by offering 50,000 vouchers '3-in-1' and to improve digital literacy by providing free access to training. In parallel, Portugal plans to expand the network of digital innovation hubs (DIH) as an instrument for scaling up the digitisation of companies, particularly of SMEs<sup>(13)</sup>. Each DIH technical focus must be clearly defined so that the expected results and those of the regional smart specialisation strategies can be achieved.

In the context of the research action line of *INCoDe.2030*, Portugal launched the Artificial Intelligence Portugal 2030 strategy, which aims to put Portugal at the forefront of 'AI Education for all', and the Advanced Computing Portugal 2030 strategy, which aims to expand cyberinfrastructure and to improve advanced computing skills, among other things. In July 2019, Portugal's inauguration of the supercomputer BOB marked the start of national participation in the European High-Performance Computing initiative (EuroHPC JU). Portugal also signed a Declaration of Cooperation with other EU Member States to explore how to develop and deploy a Quantum Communication Infrastructure across the EU within the next 10 years<sup>(361)</sup>. In addition, the Portuguese Cybersecurity Working Group presented a final report to raise awareness on this technology, identifying opportunities and challenges for businesses and consumers.

Portugal is concentrating its efforts on promoting the digitisation of SMEs. The implementation of the initiatives launched in 2019, and the leveraging of synergies among them, can help improve coordination of the action lines.

#### **Highlight 2020: Suppliers' Club initiative (*Clube de Fornecedores*)**

The Suppliers' Club initiative is a policy measure to promote research and innovation by integrating Portuguese SMEs in international value chains through cooperation with relevant companies. These nuclear companies can offer the suppliers better market access conditions, technologies and competencies. The Government sets up the Clubs following a two-step process of calls for tenders:

1. Selection of the nuclear companies that will make up each Suppliers' Club.
2. Selection of the suppliers of each nuclear company in three different areas: R&D, innovation in production processes and qualification of SMEs.

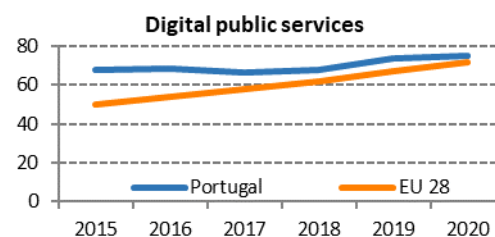
So far, the first Supplier Club, 'Bosch Car Multimedia Portugal', which was created in 2017, brings together 36 companies. The expected total investment is around €88 million, with €22 million coming from the European Regional Development Fund. This cluster aims to empower companies providing new technological solutions and to align them with the Industry 4.0 strategy of Bosch. It includes companies in areas such as robotics, industrial automation, hardware and software development, etc. In addition, Bosch and the University of Minho have created an academy to provide advanced training programmes to help Bosch employees and suppliers develop critical knowledge aligned with the new challenges of Industry 4.0. It also includes students interested in applying for jobs at Bosch or its suppliers.

In 2019, Portugal recognised two other Suppliers' Clubs: 'PSA Peugeot Citroen' and 'VW Auto Europa'. At the time of writing, the proposals bring together 23 and 16 suppliers respectively, with a total investment of €222 million and €55 million respectively.

<sup>(361)</sup> <https://ec.europa.eu/digital-single-market/en/news/future-quantum-eu-countries-plan-ultra-secure-communication-network>

## 5 Digital public services

5 Digital public services	Portugal		EU
	rank	score	score
<b>DESI 2020</b>	<b>13</b>	<b>75.1</b>	<b>72.0</b>
DESI 2019	12	73.4	67.0
DESI 2018	12	67.4	61.8



	DESI 2018 value	Portugal DESI 2019 value	DESI 2020 value	EU DESI 2020 value
<b>5a1 e-Government users</b> % internet users needing to submit forms	56%	70%	70%	67%
<b>5a2 Pre-filled forms</b> Score (0 to 100)	74	81	82	59
<b>5a3 Online service completion</b> Score (0 to 100)	98	99	99	90
<b>5a4 Digital public services for businesses</b> Score (0 to 100) - including domestic and cross-border	88	88	88	88
<b>5a5 Open data</b> % of maximum score	NA	NA	42%	66%

In digital public services, Portugal ranks 13<sup>th</sup> out of 28 Member States. Although it has fallen one place compared with the previous year's ranking, it is still above the EU average and ranks amongst the best performers in the EU in this area. The online service completion and the amount of data being pre-filled in public services' online forms remained stable in 2019, putting Portugal in 2<sup>nd</sup> and 5<sup>th</sup> positions respectively in the European ranking. Portugal's performance in online interaction between internet users and public authorities and in the digital public services for business also remains stable. The overall score for the two dimensions is good - above the EU average in the first case (70% compared to 67% in the EU) and the EU average in the second case (88%). Conversely, only 42% of the digital public services in Portugal are open data, compared to the EU average of 66%.

In 2019, Portugal continued to implement relevant measures to modernise public services by using digital technologies. The Portuguese strategy for the digital transformation of the public administration, *Estratégia TIC 2020*, promoted the use of ICT for more effective and efficient administrative simplification and the improvement of public services. In addition, a revamped edition of the flagship programme on administrative simplification *SIMPLEX* was presented in 2019. *iSIMPLEX* focuses on pillars such as 'digital-by-default', 'once-only-principle' or 'emergent technologies'. An assessment of 40 measures implemented by *SIMPLEX* during 2016 and 2017, concluded that the total impact of the measures was above €170 million annually, with annual savings of 15 million hours.

During 2019, Portugal launched the web portal *ePortugal*<sup>(362)</sup> that merged the Citizen Portal and the Entrepreneur's Desk in a central repository for all public services dedicated to citizens and businesses. The portal offers several customisation options, a reserved area for the citizen, and

<sup>(362)</sup> <https://eportugal.gov.pt/>

innovative support mechanisms such as the chat-bot SIGMA or the possibility to geo-locate all Portuguese public services in a Citizen Map, which allows to see waiting times and get virtual queue tickets. In the same vein, Portugal launched the Mobile Medical Electronic Prescription (*PEM Mobile*) that allows the creation of medical prescriptions enabling doctors to digitally prescribe medicines through a smartphone. In addition, the new mobile application *Social Security +* provides an easier and simpler way for citizens and companies to access social security services.

The Usability and Accessibility Badge initiative, launched in 2019, identifies and promotes the application of best practices in websites and mobile applications. It is developed by the Administrative Modernisation Agency and the National Institute for Rehabilitation, with the objective to simplify and make more efficient the use of online public services by citizens.

The Data Science and Artificial Intelligence in Public Administration programme continued its implementation in 2019. This programme has a global budget of €20 million allocated to two financing instruments for science and administrative modernisation, one defined under the *INCoDe.2030* research action line and the other under the Support System for the Digital Transformation of the Public Administration (SAMA 2020). So far, both instruments have financed 32 and 44 projects respectively and more calls will be launched in 2020.

Portugal signed the Digital 9 Nations Charter, which marked its integration into the network of advanced digital nations<sup>(363)</sup>.

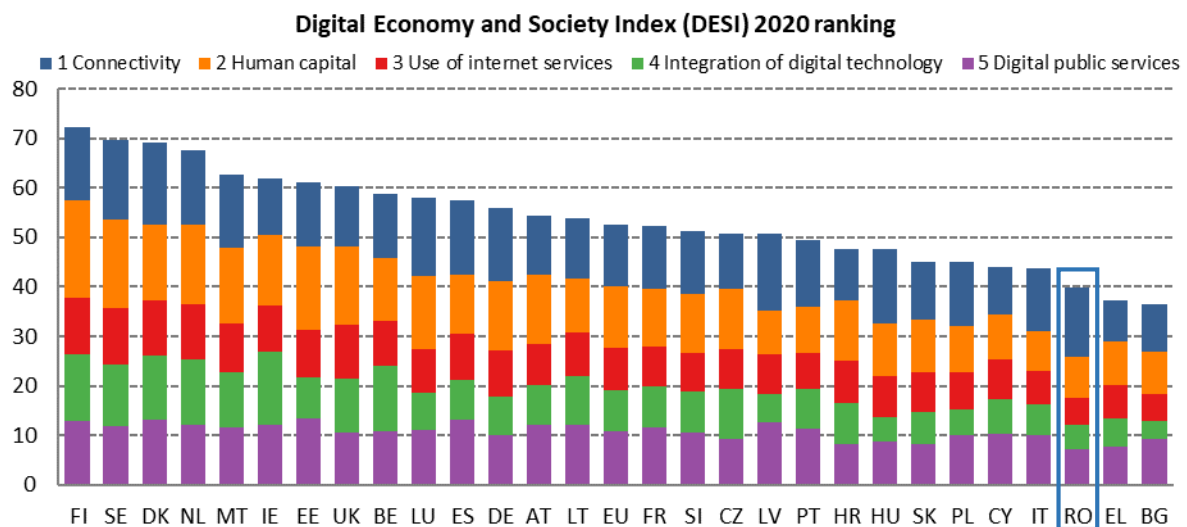
Portugal continues to adopt relevant measures to digitise public services, and is one of the leaders in the EU in this regard. The parallel efforts made to improve basic digital skills will allow an increasing share of the population to benefit from those services. The promotion of initiatives that address digital skills and digital public services together can help to improve both of these dimensions.

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<sup>(363)</sup> National Interoperability Framework Observatory, *Digital Government Factsheets 2019*.

## Romania

	Romania		EU
	rank	score	score
<b>DESI 2020</b>	<b>26</b>	<b>40.0</b>	<b>52.6</b>
DESI 2019	26	36.5	49.4
DESI 2018	26	35.1	46.5



Romania ranks 26<sup>th</sup> out of 28 EU Member States in the 2020 Digital Economy and Society Index (DESI).

Based on data prior to the pandemic, Romania's performance was the same in four of the five DESI dimensions measured. This is due to slow progress overall, but also due to political developments, as Romania has had four different governments over the last 3 years. Romania performs best on Connectivity dimension, thanks to the high take-up of ultrafast broadband and the wide availability of fixed very high capacity networks, especially in urban areas. 49% of Romanian homes subscribe to ultrafast (at least 100 Mbps) broadband, the fifth highest figure in the EU. However, digitisation of the economy lags behind, almost one fifth of Romanians have never used the internet, and less than a third have at least basic digital skills. Romania is well positioned as regards ICT graduates, as it ranks fifth, with 5.6% of all graduates (EU average: 3.6%), but on Digital public services and on Use of internet services, Romania has the lowest performance among the EU Member States.

In February 2015, Romania adopted its National Strategy on the Digital Agenda for Romania for 2020 (SNADR<sup>(364)</sup>) setting out four areas of action. The degree to which Romania has met the commitments of the strategy is unknown. It is also unclear whether Romania plans to evaluate the strategy's implementation and whether it intends to present a report on the state of play.

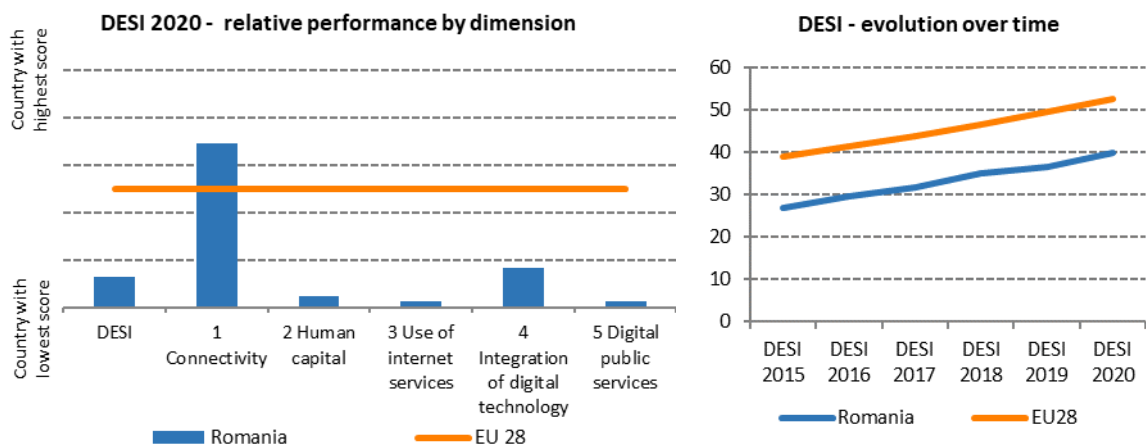
There have been two government decisions adopted recently that will affect the electronic communications sector and digitalisation in Romania.

<sup>(364)</sup> <https://www.comunicatii.gov.ro/agenda-digitala-pentru-romania-2020/>

Firstly, Government Decision No 89/2020 of 28 January 2020 provides for the organisation and the functioning of a new body, the Authority for the Digitalisation of Romania (ADR<sup>(365)</sup>). The ADR, under the coordination of the Prime Minister, takes over the Ministry of Communications and Information Society's activities and structures in the field of information technology, information society and the national interoperability framework. The ADR has the following responsibilities: (i) Drafting the action plans in the IT domain; (ii) Organizing and coordinating the implementation of the eGovernment and eAdministration projects; (iii) Coordinating the public policies for ensuring the interoperability of the IT system of the public administration; (iv) Monitoring and evaluating the IT systems of the central public administration in order to achieve the strategic objectives those systems are supporting; (v) Supervising and coordinating of all nation-wide government programs for IT infrastructure and services.

Under the new act, the Secretary-General of the Government will implement government policy on cyber security. The act also sets out at national level the strategies and public policies in the field of cyber security. In addition, the National Institute for Research and Development in Informatics (ICI) – the institute that manages the .ro internet domains – was transferred to the coordination of the Secretary-General of the Government.

Secondly, Government Decision No 90/2020 of 28 January 2020 abolishes the Ministry for Transport and the Ministry of Communications and Information Society and creates a new entity, the Ministry of Transport, Infrastructure and Communications. The new Ministry will have responsibilities for policy development in the area of electronic communications and the implementation of policies related to electronic communications infrastructure<sup>(366)</sup>.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic

<sup>(365)</sup> Government Decision No 89/2020 on the organisation and functioning of the Authority for the Digitalisation of Romania, Official Gazette No 113 of 13 February 2020.

<sup>(366)</sup> Government Decision No 90/2020 on the organisation and functioning of the Ministry of Transport, Infrastructure and Communications, published in Official Gazette No 127 of 19 February 2020.

and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Romania has taken several targeted measures in digital to deal with the COVID-19 crisis. An application of the Ministry of Health serves for the centralisation of medical data on the situation caused by the COVID-19 virus. A website<sup>(367)</sup> has been set up for companies to submit electronically the documentation necessary for granting technical unemployment. Another initiative<sup>(368)</sup> is helping people who have been made redundant due to the COVID-19 situation and are actively looking for work. Several information websites<sup>(369)</sup> have been created in order to provide clear information, increase transparency, to reduce panic, to tackle disinformation, to explain the risks and inform about prevention measures. A platform<sup>(370)</sup> is providing support to Romanian citizens living abroad, who are directed towards specific help based on their needs. Several websites<sup>(371)</sup> have been set up for providing support for hospitals, but also for the coherent and safe collection and distribution of aid. Based on a government decision adopted on 7 May 2020, the budget of the Ministry of Education has been supplemented with the amount of 150 million lei (~24 million EUR) for 2020 for the acquisition of laptops for 250,000 children. The objective is to ensure access to distance learning activities for students from disadvantaged backgrounds, enrolled in pre-university education units.

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Romania is very advanced on VHCN coverage and is 14<sup>th</sup> regarding 5G readiness in the EU. On the other hand, it lags behind in the digital skills indicators, has a weak performance in the digitisation of businesses and in digital public services.

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<sup>(367)</sup> <https://aici.gov.ro>

<sup>(368)</sup> <https://datafara.ro>

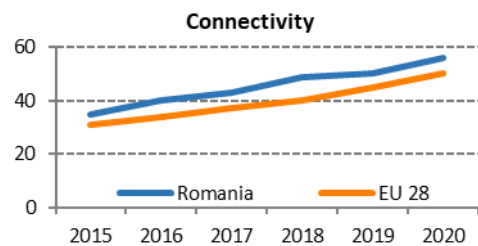
<sup>(369)</sup> <https://stirioficiala.ro/>, <https://datelazi.ro/>, <https://fiipregatit.ro>, <https://cetrebuiasafac.ro/>

<sup>(370)</sup> <https://diasporahub.ro/>

<sup>(371)</sup> <https://www.ajutorospitale.ro>; <https://spitale.quickdata.ro>; <https://thefutureisnow.ro>; <https://rohhelp.ro/>

# 1 Connectivity

1 Connectivity	Romania		EU
	rank	score	score
DESI 2020	11	56.2	50.1
DESI 2019	8	50.0	44.7
DESI 2018	6	48.8	39.9



	DESI 2018	Romania	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
<b>1a1 Overall fixed broadband take-up</b> % households	67%	66%	66%	78%
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	44%	45%	49%	26%
<b>1b1 Fast broadband (NGA) coverage</b> % households	74%	76%	82%	86%
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	61%	63%	68%	44%
<b>1c1 4G coverage</b> % households (average of operators)	72%	77%	85%	96%
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	82	86	86	100
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	NA	0%	21%	21%
<b>1d1 Broadband price index</b> Score (0 to 100)	NA	NA	92	64

Romania ranks 11<sup>th</sup> in the Connectivity dimension. In 2019, it improved in terms of coverage while stagnating in terms of take-up. Notably, fast broadband coverage increased to 82% but still lags behind most Member States (EU average of 86%). Broadband take-up stalled at 66 % of households in the third year in a row and it is well below the EU average of 78%. The strong infrastructure-based competition in Romania, mainly in urban areas, is reflected in the indicators in which the country performs very well, namely fixed very high capacity network (VHCN) coverage and take-up (68 % and 49 % respectively). However, Romania's urban-rural digital divide is illustrated by the figures for VHCN coverage, where only 39% of rural areas are covered (albeit, double the EU average of 20%). As regards take-up of at least 100 Mbps broadband, Romania still largely outperforms the EU average (49% versus 26%) a 4 percentage point improvement compared to last year. Romania lags behind on 4G coverage (85%, well below the EU average of 96%). The mobile broadband take-up indicator that stagnated in the past year places Romania amongst the least performing Member States, despite the significant drop in broadband prices. Romania ranks first in the EU in terms of broadband prices when analysing all product baskets (fixed, mobile, converged). It is leading in terms of mobile and converged baskets with an index of 97 and 91 respectively. In terms of fixed broadband prices, Romania ranks second in the EU.

The Romanian national broadband plan adopted in 2015 has not yet been updated to reflect the gigabit society targets. To address the urban-rural digital divide, Romania has accessed EU funding under the 2014-2020 financial framework. Firstly, the Romanian Operational Programme for



Competitiveness has €100 million earmarked from the European Regional Development Fund (ERDF). Secondly, the 2014-2020 Rural Development Operational Programme initially provided for an indicative amount of €25 million from the European Agricultural Fund for Rural Development (EAFRD) under the LEADER programme<sup>(372)</sup>, out of which less than €2 million were actually allocated to broadband infrastructure measures. In addition, the RoNet project to support deployment of backhaul networks in 'white areas' was granted ERDF financing of €45 million, ensuring broadband backhaul infrastructure for a target of 696 localities. At the end of December 2019, the national authorities reported the finalisation of works in 606 localities, while works are at an advanced stage of completion in an additional 82 localities. A new grant scheme for next-generation networks (NGN) deployment, with a total contracted budget of €59 million, provides support to private operators deploying backhaul and last-mile access infrastructure for additional localities in white areas. The project aims to cover 160,000 households in the 'white areas'.

Several disputes over access to physical infrastructure are pending between operators and utilities providers, with the longest outstanding for more than a year. ANCOM, the designated dispute settlement body, has issued a first decision on one of these disputes in March 2020<sup>(373)</sup>.

Romania scores 21% in the 5G readiness indicator<sup>(374)</sup>, same as the EU average. Overall, in Romania, 38% of the spectrum harmonised at EU level for wireless broadband has been assigned. A national strategy for the implementation of 5G in Romania was adopted in June 2019. The document expects an impact on the Romanian economy of 250,000 jobs and €4.7 billion in revenues. The National Strategy foresees the organisation of a multi-band spectrum auction in the 700 MHz, 800 MHz, 1500 MHz, 2600 MHz and 3400-3600 MHz bands. However, the auction process was delayed until the second quarter of 2020. The reasons behind the delay are: (i) the adoption of Emergency Ordinance No 114/2018<sup>(375)</sup> setting high reserve prices beyond European benchmark levels and increased minimum fees for the renewal of existing licences; and (ii) the transposition into national legislation of the memorandum signed by Romania with the US State Department on the security of 5G infrastructure.

While 5G licencing seems to be on track, the cumbersome authorisation process could prove to be a serious bottleneck for the deployment of 5G infrastructure.

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<sup>(372)</sup> 'LEADER' is the French acronym for 'Liaison Entre Actions de Développement de l'Économie Rurale', meaning 'Links between the rural economy and development actions'.

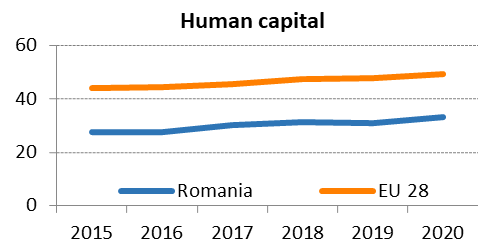
<sup>(373)</sup> [https://www.ancom.ro/uploads/articles/file/Legea%20infrastructurii%202016/DECIZIE%20solutionare%20itigiu%20Digital%20Catv\\_SDEE.pdf](https://www.ancom.ro/uploads/articles/file/Legea%20infrastructurii%202016/DECIZIE%20solutionare%20itigiu%20Digital%20Catv_SDEE.pdf)

<sup>(374)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

<sup>(375)</sup> Published in Romania's Official Journal of Romania on 29 December 2018. The Emergency Ordinance set a very high level for the reserve price, beyond European benchmark levels for future licences, and similarly increased minimum fees for the renewal of existing licences. In addition, the Emergency Ordinance substantially raises the yearly monitoring tariff levied on the sector. These provisions were subsequently amended through Emergency Ordinance No 54/2019 of 4 July 2019.

## 2 Human capital

2 Human capital	Romania		EU
	Rank	Score	Score
<b>DESI 2020</b>	<b>27</b>	<b>33.2</b>	<b>49.3</b>
DESI 2019	27	31.1	47.9
DESI 2018	28	31.5	47.6



	Romania			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b>	<b>29%</b>	<b>29%</b>	<b>31%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>10%</b>	<b>10%</b>	<b>10%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>32%</b>	<b>32%</b>	<b>35%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>2.0%</b>	<b>2.1%</b>	<b>2.2%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>1.2%</b>	<b>1.3%</b>	<b>1.2%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>5.4%</b>	<b>4.9%</b>	<b>5.6%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

Romania ranks 27th out of 28 EU countries on Human capital and its ranking stagnated in comparison to the previous year. At least basic digital skills and at least basic software skills levels rank 27th among EU Member States. Less than one third of people aged between 16 and 74 have at least basic digital skills (58% in the EU as a whole), while 35% have at least basic software skills (against an EU average of 61%). As for above basic digital skills, Romania is last in the EU with only 10% of individuals. Although there was a slight increase on the previous year in the percentage of ICT specialists, they represent a much lower proportion of the workforce than in the EU as a whole (2.2%, against an EU average of 3.9%). Female ICT specialists account for 1.2% of total female employment. In contrast, Romania is performing well with regard to ICT graduates, ranking 5<sup>th</sup> among EU Member States, with 5.6% of all graduates.

The Ministry of Education and Research is implementing the 2014-2020 national strategy for strengthening public administration. In addition, the Ministry is implementing an administrative simplification project for the national education system, with a budget of RON 28 million (approx. €6 million) from SIPOCA (Structural Instruments under the Administrative Capacity Operational Programme).

The 'Wi-Fi Campus' project, a national wireless internet platform already in the implementation phase, will provide wireless internet access service for schools (based on wi-fi), with priority on secondary schools. The project's specific objectives are: (i) creating the technical infrastructure necessary for the use of OER and WEB 2.0 type resources and services in education in a minimum 2,000 schools; (ii) equipping 4,500 middle schools with wireless equipment, reaching 1,000,000 students and teachers; and (iii) increasing by 15% the share of teachers who use the internet via wireless campus. The project has funding of about RON 210 million (approx. €45 million), of which about RON 177 million (approx. €38 million) are non-reimbursable EU funds (from the ERDF).

On 10 September 2019, the Ministry of Communications and the Information Society, together with the Ministry of European Funds and the Ministry of Education, announced the signing of contracts for two major digitalisation projects in the field of education: 'The school management information system (SIMS - Electronic Catalogue)' and 'Digital platform with open educational resources (EDULIB - Virtual Library)'. The combined value of the projects is close to €98 million<sup>(376)</sup>.

The first project, the School Management Information System (SIMS), aims to achieve, in an online environment, the management of schooling based on the flows set out in the eGOV project (online enrolment in high school, implementation of the electronic class registers and online evaluation of the papers written in national exams). The project will run for 3 years and has funding of RON 225 million (approx. €48 million), of which about RON 191 million (approx. €40 million) are non-reimbursable EU funds (ERDF).

The EDULIB – Virtual Library open educational resources digital platform projects aims to create a digital platform with open educational resources, mainly for high schools, facilitating free access to electronic textbooks and other electronic educational resources. The project also involves supplying 5,400 secondary schools with a multimedia kit. The project will run for 2 years and has funding of about RON 230 million (approx. €49 million), of which about RON 195 million (approx. €41 million) are non-reimbursable EU funds (ERDF).

SIMS and EDULIB form a platform of resources and management for the education, teaching, learning and evaluation system. The SIMS, EDULIB and Wi-Fi Campus projects are concrete actions in support of education in transition to a digital age.

Romania has a National Coalition for Digital Skills and Jobs<sup>(377)</sup>, known as Skills4IT<sup>(378)</sup>. This open platform includes several stakeholders, ICT companies, associations, training providers and NGOs involved in the digital transformation and has political backup from the Ministry of Transport, Infrastructure and Communication and the Education Ministry. Activities focus on rolling out coding and IT classes in schools, organising cybersecurity courses and educational events. The coalition also provides training to upgrade the digital skills of the labour force. The coalition's activities are in line with the National Strategy for Digital Romania 2020, having as objective the development of digital skills.

Although there are several projects led by the government that envisage improving digital skills levels around the country, the results to date remain limited. As digital infrastructure and digital skills are key to unlocking the benefits of digitalisation, coordinated and targeted efforts are necessary to improve digital competences not only in schools, but also in the labour force and among elderly people.

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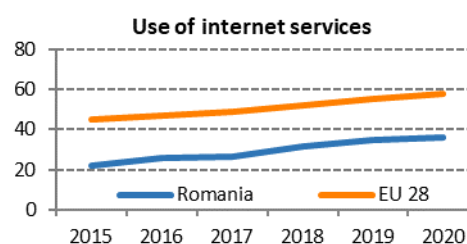
<sup>(376)</sup> <https://www.news.ro/economic/ministerul-comunicatiilor-a-semnat-contractele-de-finantare-pentru-catalogul-electronic-si-biblioteca-virtuala-proiecte-de-aproape-98-milioane-euro-1922404910412019091819110274>

<sup>(377)</sup> <https://ec.europa.eu/digital-single-market/en/national-local-coalitions>

<sup>(378)</sup> <http://coalitiait.ro/>

### 3 Use of internet services

3 Use of internet services	Romania		EU
	Rank	score	score
<b>DESI 2020</b>	<b>28</b>	<b>35.9</b>	<b>58.0</b>
DESI 2019	28	35.0	55.0
DESI 2018	28	31.5	51.8



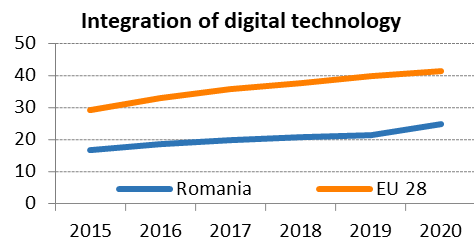
	Romania			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>3a1 People who have never used the internet</b>	<b>27%</b>	<b>21%</b>	<b>18%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>61%</b>	<b>68%</b>	<b>72%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>69%</b>	<b>69%</b>	<b>55%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>67%</b>	<b>63%</b>	<b>63%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>6%</b>	<b>10%</b>	<b>10%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>53%</b>	<b>51%</b>	<b>67%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>82%</b>	<b>86%</b>	<b>82%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>5%</b>	<b>5%</b>	<b>4%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>11%</b>	<b>10%</b>	<b>11%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>23%</b>	<b>26%</b>	<b>29%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>4%</b>	<b>5%</b>	<b>3%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

The Use of internet services in Romania continues to be the lowest among the EU Member States, which is in correlation with the low level of basic digital skills around the country (see previous chapter). 18% of individuals aged 16-74 have never used the internet (EU average: 9%). Nevertheless, there are two online activities in which the country ranks 6<sup>th</sup> in the EU. These are the use of social networks (82%, versus an EU average of 65%) and video calls (67%; EU average: 60%). In contrast, the use of online banking (11%), shopping (29%), reading news (55%), as well as the consumption of music, videos and games online (63%), is lowest among EU Member States, mainly due to a lack of trust in digital technology. The low level of online banking is also due to more than two out of five (42%)<sup>(379)</sup> Romanian adults not having a bank account. Only 3% of Romanian internet users sell online and 4% follow online courses.

<sup>(379)</sup> World Bank, *Global Findex Database 2017*, <https://globalfindex.worldbank.org/>

## 4 Integration of digital technology

4 Integration of digital technology	Romania		EU
	rank	score	score
<b>DESI 2020</b>	<b>27</b>	<b>24.9</b>	<b>41.4</b>
DESI 2019	27	21.3	39.8
DESI 2018	27	20.8	37.8



	Romania			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>22%</b>	<b>22%</b>	<b>23%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>9%</b>	<b>9%</b>	<b>8%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>11%</b>	<b>11%</b>	<b>11%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>6%</b>	<b>7%</b>	<b>7%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>8%</b>	<b>8%</b>	<b>11%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>5%</b>	<b>5%</b>	<b>5%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>2%</b>	<b>2%</b>	<b>6%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

Romania ranks 27<sup>th</sup> among EU countries on the Integration of digital technology by businesses, well below the EU average. Romania's ranking remained stable in this area compared to the last 2 years. There was almost no change in any of the indicators. 23% of Romanian enterprises share information electronically, while only 8% use social media (EU average: 25%). There was a slight improvement in the share of SMEs selling online, from 8% in 2017 to 11% in 2019, but this remains well below the EU average of 18%. SMEs are increasingly selling online across borders, but this applies to only 6% of the total number of SMEs, compared to an EU average of 8%.

Romania does not have a national digital transformation strategy for enterprises. Romania supports the ecosystem of start-ups through the Start-up Nation programme, including start-ups that produce innovations or integrate them into new product and service developments.

In Romania, there are currently three hubs for digital innovation (HDIs), one in Bucharest and two in Cluj-Napoca.

Romania is a member of the EuroHPC Joint Undertaking. The Minister of Communications and Information Society expressed Romania's interest in participating in the Consortium for the Barcelona Supercomputing Center as host site for the pre-Exascale supercomputers. The main target for the moment is the implementation of HPC Competence Centres. However, Romania has not yet provided any formal financial commitment to EuroHPC as regards budget or timing.

On blockchain, the National Institute for Research and Development in Informatics (ICI Bucharest) has taken an active role since 2017 in the emerging technologies of Industry 4.0. Blockchain is a vital

part of this technology. In this context, the Institute created the European Center for Excellence in Blockchain – ECEB<sup>(380)</sup>, as a hub for sharing experience between experts, academics, students and business people in Romania. As an R&D institute, ICI Bucharest has developed substantial ‘in vitro’ pilot projects for system-of-systems architectures based on blockchain technology. ICI Bucharest is self-financing activities on blockchain, within the limits of its institutional budget.

ICI Bucharest’s blockchain initiative has a number of expected outcomes: (i) the continuous signing of partnerships with entities in this field of activity; (ii) the implementation of solutions from the pilot studies in collaboration with the Romanian Government; (iii) national and international collaborations with companies, institutions and universities; and (iv) finding the necessary funds for future activities.

On cybersecurity, Law No 362/2018 concerning measures for a high common level of security of network and information systems came into force in January 2019. The new law aims to increase the level of preparedness to cope with computer security incidents and to increase citizens’ trust in the digital single market. This law applies to operators of essential services (OESs) and digital service providers (DSPs).

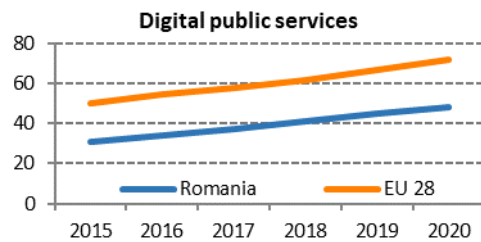
Romania would benefit from a national strategy focusing on the digital transformation of enterprises. Targeted measures are needed to support the digitisation of SMEs and raise awareness on the relevance and benefits of adopting digital technologies.

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<sup>(380)</sup> [www.eceb.ro](http://www.eceb.ro)

## 5 Digital public services

5 Digital public services	Romania		EU
	rank	score	score
<b>DESI 2020</b>	<b>28</b>	<b>48.4</b>	<b>72.0</b>
DESI 2019	28	45.0	67.0
DESI 2018	28	41.1	61.8



	Romania			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>5a1 e-Government users</b>	<b>80%</b>	<b>82%</b>	<b>82%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>12</b>	<b>10</b>	<b>10</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>62</b>	<b>67</b>	<b>70</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>51</b>	<b>53</b>	<b>53</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>57%</b>	<b>66%</b>
% of maximum score			2019	2019

On Digital public services, Romania ranked last among EU Member States during the last 3 years. Romania does rank eighth for e-government users, with 82% of internet users, versus an EU average of 67%. However, this high level of online interaction between public authorities and the public concerns only those internet users who need to submit forms. The low scores for pre-filled forms and online service completion, where the country ranks 28th, indicate a systemic problem with the quality and usability of the services offered. There was no improvement in digital public services for businesses, for which Romania also ranks last.

The lack of interoperability of IT systems in the public administration has been an issue for years, one that no government has yet managed to resolve. In June 2019, a public consultation was launched on the draft law establishing a national reference framework for achieving interoperability in ICT ('CNRTIC'). The aim is to bring to fruition the vision expressed in the 2017-2020 programme of the government (specifically in the chapter on 'Policies in the field of communications – Digital convergence'), to achieve a simplification of procedures and reduction of bureaucracy through e-government. The draft law would establish a general framework to manage the interoperability of the IT systems of public institutions that provide services to the public. The draft law is currently pending before Parliament.

Romania's eIDAS (electronic identification) node is still in the process of being built through an ERDF-financed project ('SITUE') that should be finalised by the end of 2020. The high cost of a qualified digital signature (around €40/year per user) is the main challenge when it comes to providing a digital identity for all citizens.

The main barriers to achieving digital public services in Romania are: (i) the lack of coordination between public institutions in setting up such services; (ii) the migration of IT specialists from the public sector to the private sector or to other countries; and (iii) the overall lack of digital skills. A well-implemented eGovernment solution would help enterprises to carry out their business with government more easily, more quickly and at lower cost. The adoption of the Interoperability Law

and its implementation by all public bodies involved would be a first step towards improvements in digital public administration.

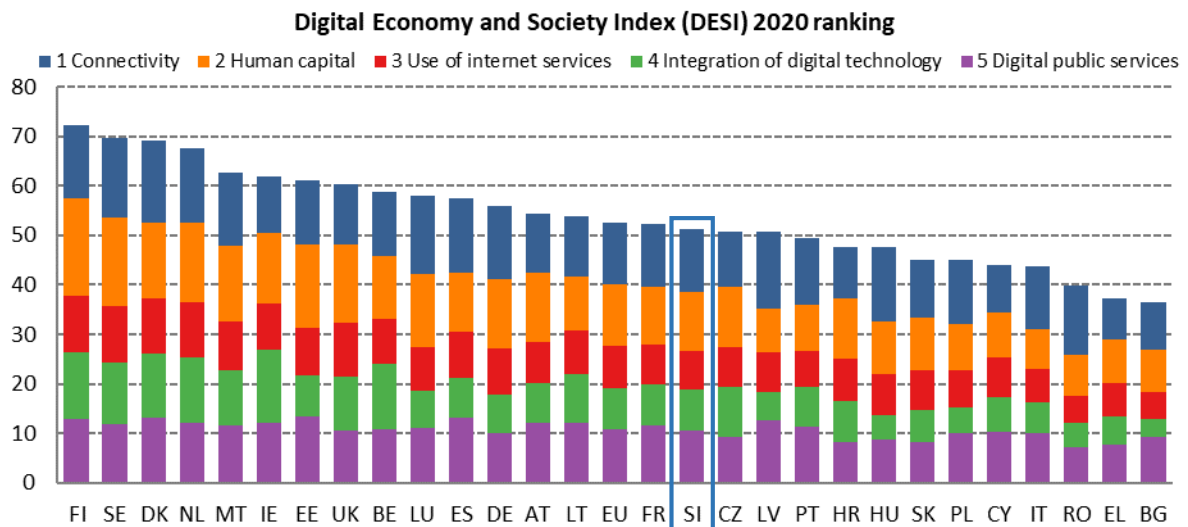
**Highlight 2020: Strategic technical support for the central digitalisation projects of the Romanian central authorities**

The Romanian Ministry of Communication and Information Society is implementing with the support of EU funds (Technical Assistance OP) since 2016 a strategic technical assistance project, targeted at helping the central authorities and ministries draft and implement key digitalisation projects around the public services involved in the “life events” of citizens and companies, e-health, e-IDAS node, digital ID, all according to the Digital Agenda of Romania (2020). It enabled key ministries like the Ministry of the Interior and the Ministry of Labour to sign contracts (ERDF funding) for building the IT systems necessary for the digital delivery of public services like the Civil Status registries, the child protection and adoption system, the public support for disabled persons system, etc. Once completed these contracts will enable citizens to gain access through digital means to several key public services, a feature long-awaited by the Romanian public and companies. Thus in around 3 years’ time services like registering a birth or obtaining public support for a disability will become easily available through digital means (sophistication of the 4th degree).



## Slovenia

	Slovenia		EU
	rank	score	score
<b>DESI 2020</b>	<b>16</b>	<b>51.2</b>	<b>52.6</b>
DESI 2019	17	48.7	49.4
DESI 2018	16	45.9	46.5



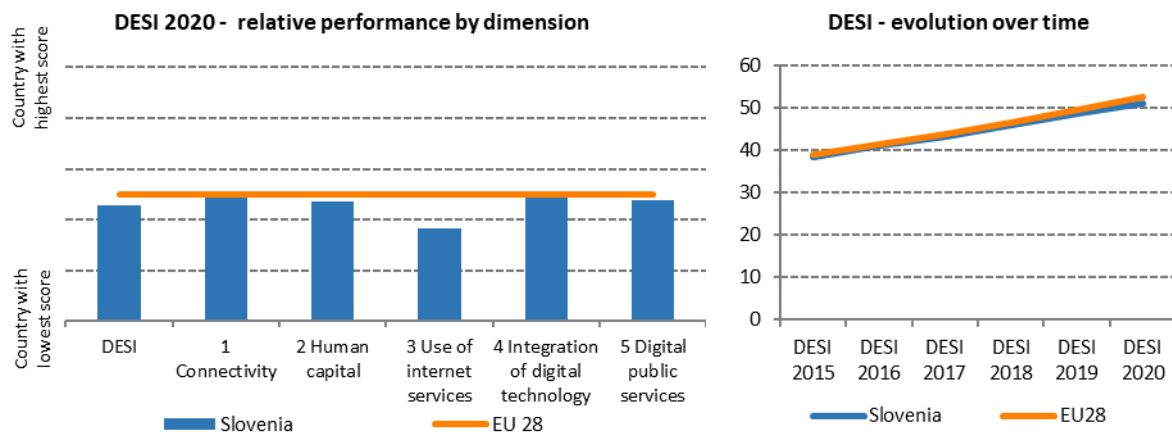
Slovenia has improved and now ranks 16<sup>th</sup> out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020. Based on data prior to the pandemic, Slovenia has improved its score in all five dimensions, but advanced in ranking only in the integration of digital technology dimension.

In the human capital dimension, the score has risen from 46.3 to 48.3 and is now close to the EU average score of 49.3. While the score in the use of internet also risen from 49.8 to 51.7, Slovenia continues to lag behind the EU average score of 58.0. While in the connectivity dimension, Slovenia has improved its score from 48.6 to 50.2 it is now just above the EU average score of 50.1 and has lost several ranks. Slovenia improved its score in the integration of digital technology from 39.1 to 40.9 and ranks now very close to the average EU score of 41.4. Slovenia improved the score in the digital public services dimension substantially from 64.5 to 70.8 just slightly below the EU average score of 72.0. Slovenia improved its' ranking in the digital public services dimension for one place.

Slovenia is implementing the *Digitalna Slovenija 2020* strategy<sup>(381)</sup> adopted in March 2016. Together with the Slovenian Industrial Policy (RISS - Research and Innovation Strategy of Slovenia and SIP), Digital Slovenia is one of the three key sectoral strategies with guidelines for the creation of an innovative knowledge society. The strategy covers all areas of life and development: public services, entrepreneurship, households and education.

<sup>(381)</sup> <https://www.gov.si/assets/ministrstva/MJU/DID/Strategija-razvoja-informacijske-druzbe-2020.pdf>

Slovenia is currently drafting an all-inclusive artificial intelligence strategy and updating the strategy Digital Slovenia. In November 2019, UNESCO decided that Slovenia should host the International Research Center for Artificial Intelligence at the Jožef Stefan Institute in Ljubljana<sup>(382)</sup>.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Slovenia implemented swiftly several measures in digital to deal with the COVID-19 crisis. Citizens and business adapted to the social distancing measures by changing the way they interact and do business. A wide array of new IT solutions and tools was rolled-out and videoconferences and online shopping became a norm. Businesses, including SMEs, introduced teleworking wherever possible and retailers switched to online selling. Education at all levels introduced online teaching. Children who could not afford IT equipment received donation of PCs or laptops through a local initiative that was complemented by more systemic solutions at national level. A high share of employees in private and public service, including teachers swiftly acquired the necessary knowledge for online working. Public administration interacted online with citizens and business and some identification requirements were lifted or loosened in order to make digital public services more user friendly.

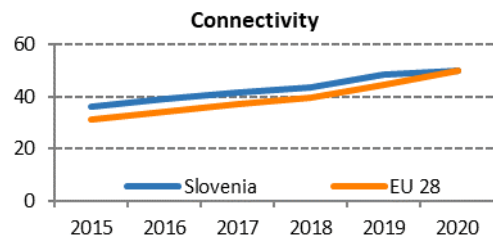
Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Slovenia is improving in the integration of digital technology in businesses and in the provision digital public services. Likewise, it is advancing in the digital skills indicators. On the other hand, it lags behind in the assignment of radio spectrum for 5G,

<sup>(382)</sup> <https://en.unesco.org/news/slovenia-host-international-research-centre-artificial-intelligence-under-auspices-unesco>

and has a relatively weak performance in the use of internet services.

# 1 Connectivity

1 Connectivity	Slovenia		EU
	rank	score	score
<b>DESI 2020</b>	<b>16</b>	<b>50.2</b>	<b>50.1</b>
DESI 2019	10	48.6	44.7
DESI 2018	10	43.8	39.9



	DESI 2018	Slovenia	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
	2017	value	2019	value
<b>1a1 Overall fixed broadband take-up</b> % households	<b>77%</b>	<b>85%</b>	<b>83%</b>	<b>78%</b>
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	<b>13%</b>	<b>16%</b>	<b>21%</b>	<b>26%</b>
<b>1b1 Fast broadband (NGA) coverage</b> % households	<b>83%</b>	<b>86%</b>	<b>87%</b>	<b>86%</b>
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	<b>52%</b>	<b>61%</b>	<b>66%</b>	<b>44%</b>
<b>1c1 4G coverage</b> % households (average of operators)	<b>96%</b>	<b>98%</b>	<b>99%</b>	<b>96%</b>
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	<b>66</b>	<b>74</b>	<b>81</b>	<b>100</b>
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	<b>NA</b>	<b>0%</b>	<b>0%</b>	<b>21%</b>
<b>1d1 Broadband price index</b> Score (0 to 100)	<b>NA</b>	<b>NA</b>	<b>63</b>	<b>64</b>

In 2019, Slovenia progressed slower than the EU average and ranked 16<sup>th</sup> in connectivity. Overall, fixed broadband take-up remains stable at 83% and above the EU average of 78%. Slovenia increased its take-up of at least 100 Mbps fixed broadband by 5 percentage points, approaching the EU average (26%). Fast NGA coverage improved slightly. Still ahead of the EU average of 44%, VHCN coverage continued to improve but at a slower pace than in recent years, reaching 66%. 4G coverage is ubiquitous, covering 99% of households. Slovenia increased its mobile broadband take-up to 81 subscriptions per 100 people, but remains far below the EU average of 100. The country scored 63 in the broadband price index what places it amongst slightly more expensive Member States.

Slovenia is preparing a National Broadband Plan 2025, which would be aligned with the gigabit objectives for 2025. It includes plans for 5G coverage for urban areas and the main terrestrial transport routes, gigabit connectivity for schools, transport hubs, public service providers and digital industry, and networks of at least 100 Mbps, upgradable to 1 Gbps, covering all citizens.

The country continues to face a digital divide between urban and rural areas regarding fixed NGA coverage, and the proportion of fibre connections varies significantly. The publicly funded project for the construction of the next-generation network (NGN) 2020, with a budget of approximately €35 million (of which €27.2 million comes from the ERDF), has been long delayed. Following two unsuccessful tenders in 2018, Slovenia is investing additional efforts in making the conditions for the new tender, which was published at the end of February 2020, more attractive.

In 2019, all major operators actively continued to invest in very high capacity networks. In the period 2016-2019 operators expressed commercial interest in covering about 250,000 households with networks capable of providing speeds of 100 Mbps by 2022.

Slovenia still lacks a dedicated, comprehensive strategy for the management of the radiofrequency spectrum necessary for the timely assignment of the 5G pioneer spectrum bands (700 MHz, 3.6 GHz and 26 GHz), and for 5G deployment. The adoption of the third strategy draft, which provided for a multi-frequency auction by 30 June 2020, has again been temporarily suspended. According to the planned amendment of the national plan for the use of 700 MHz Slovenia intends to postpone the use of the band 700 MHz for the wireless broadband electronic communications services until 31 December 2021 due to unresolved cross-border coordination issues resulting in harmful interferences. Slovenia will delay assignment of one of 5G pioneer spectrum bands; Slovenia's 5G readiness indicator therefore stands at 0%<sup>(383)</sup>.

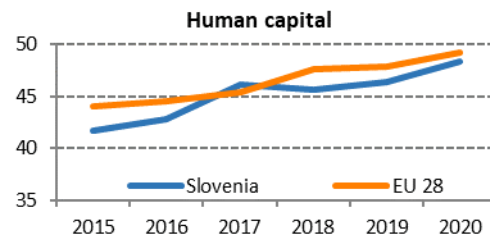
Despite improvements achieved in the past years, national challenges impacted Slovenia's connectivity ranking negatively. Slovenia could speed up the rollout of its publicly funded projects. The Slovenian market would benefit from greater collaboration between all public stakeholders and the industry, especially in establishing the appropriate regulatory environment necessary to boost private investment and competition, and in adopting the radio spectrum management strategy.

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<sup>(383)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

## 2 Human capital

2 Human capital	Slovenia		EU
	rank	score	score
<b>DESI 2020</b>	<b>15</b>	<b>48.3</b>	<b>49.3</b>
DESI 2019	15	46.3	47.9
DESI 2018	14	45.7	47.6



	Slovenia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b>	<b>54%</b>	<b>54%</b>	<b>55%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>30%</b>	<b>30%</b>	<b>31%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>57%</b>	<b>57%</b>	<b>59%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>3.5%</b>	<b>3.8%</b>	<b>4.0%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>1.3%</b>	<b>1.3%</b>	<b>1.4%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>3.5%</b>	<b>3.5%</b>	<b>3.7%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

In the human capital dimension, Slovenia remains in 15<sup>th</sup> among the 28 EU Member States. Basic digital skills levels remain below the EU average. Only 55% of people between the ages of 16 and 74 years have at least basic digital skills (58% in the EU as a whole). The proportion of ICT specialists is slightly above the EU average (4% compared to 3.9% in the EU). ICT graduates in Slovenia account for 3.7% of the total. However, female STEM graduates (20.5 individuals per 1000 inhabitants in 2016) in Slovenia outnumber their male peers (13.1). The proportion of female ICT specialists as a percentage of total female employment in 2017 (1.3%) was below that of their male counterparts (5.9%)<sup>(384)</sup>.

For the period 2016-2020, the *Digitalna Slovenija 2020* strategy provides for improving connectivity and WiFi access in schools, enhancing digital literacy, e-inclusion and the digital inclusion of the elderly. This is complemented by the strategic guidelines for further implementation of ICT in Slovenian education until 2020<sup>(385)</sup>.

In 2019, there was no significant progress in broadening the scope digital skills in the school curricula of primary and secondary schools<sup>(386)</sup>. The Ministry for Education, Research and Sport acknowledges the need to increase the teaching of digital content in schools, but points out that reforming curricula is a complex and lengthy process. According to the Slovenian authorities a new Digital Education Action Plan 2021–2027 is expected to be prepared until June 2020.

<sup>(384)</sup> European Commission, *Women in digital 2019*, <https://ec.europa.eu/digital-single-market/en/women-ict>

<sup>(385)</sup> Ministry of Education, science and sport, *Strategic guidelines for further implementation of ICT in the Slovenian education until 2020*, <https://www.gov.si/assets/ministrstva/MJU/DID/Digital-Slovenia-2020-Development-Strategy-for-the-Information-Society-until-2020.pdf>

<sup>(386)</sup> Please compare with European Commission DESI 2019

While the proportion of teachers who feel well or very well prepared in using information and communications technology for teaching (67%) is much higher than the EU average (39.4%), a growing number of teachers is approaching retirement age and shortages are already appearing in certain fields, including science, technology, engineering, and mathematics. Development projects on key competences and 21<sup>st</sup> century skills including digital content are running in 361 selected kindergarten and schools, both at primary and secondary level, and they are improving the situation in practice<sup>(387)</sup>. Slovenia organised 199 events during the Code Week 2019 (10 activities per 100,000 inhabitants) with 6,977 participants, 43% of whom were women.

At tertiary level, the scope of digital skills teaching has improved. The engineering and informatics programmes at the Universities of Ljubljana and Maribor now provide digital skills training. The offer has recently been complemented with informatics programmes at Primorska and Novo Mesto Universities. The Faculty of Engineering and Computing at Maribor and the Faculty for Informatics at Novo Mesto cooperate closely with business and provide students with expertise that can be used on the labour market. As the labour market tightens, labour shortages are also worsening because of skills mismatches and insufficient digital literacy, indicating a clear need for up-skilling and reskilling. While vocational training in digital skills as an active labour market measure remains marginal, the competence centres for human resource development run successful upskilling programmes<sup>(388)</sup>. 132 training projects, though not exclusively in the area of digital skills, were finalised in 2019 bringing together students and mentors from the educational and business sectors.

The Chamber of Commerce has been running a Digital Academy since 2017. The Academy is targeting SMEs in the electrical engineering sector. Industry associations assess the measure as useful in training digital transformation managers, and by 2019, it had achieved a high uptake<sup>(389)</sup>. This is complemented by the efforts of the Digital Coalition: several Strategic Research and Innovation Partnerships (SRIPs) and the Digital Innovation Hubs (DIH) offer on the job training and awareness - raising activities for the management of member companies.

One of the biggest strengths of Slovenia is its human capital. The knowledge needed for digital transformation is concentrated in the country. It is reflected in the high number of ICT start-ups (above the EU average) and a high proportion of STEM graduates. Digital infrastructure is good and stable. Slovenia has the potential to serve as a reference model for the introduction of new digital technologies and new niche business models.

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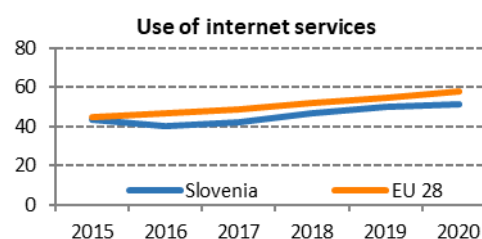
<sup>(387)</sup> Ministry for education, science and sport, 2019; *Flexible learning styles*

<sup>(388)</sup> [www.sklad-kadri.si/si/razvoj-kadrov/projekti-2007-2013/kompetencnacentri/](http://www.sklad-kadri.si/si/razvoj-kadrov/projekti-2007-2013/kompetencnacentri/)

<sup>(389)</sup> Chamber of Commerce. *Digital Academy*,  
[https://www.gzs.si/zbornica\\_elektronske\\_in\\_elektroindustrije/vsebina/Strokovna-podrocja/Digitalna-akademija-DA](https://www.gzs.si/zbornica_elektronske_in_elektroindustrije/vsebina/Strokovna-podrocja/Digitalna-akademija-DA)

### 3 Use of internet services

3 Use of internet services	Slovenia		EU
	rank	score	score
<b>DESI 2020</b>	<b>22</b>	<b>51.7</b>	<b>58.0</b>
DESI 2019	22	49.8	55.0
DESI 2018	22	47.1	51.8



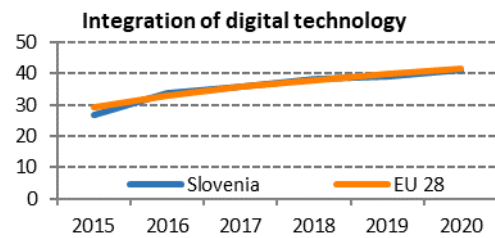
	Slovenia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	Value	value	value
<b>3a1 People who have never used the internet</b>	<b>18%</b>	<b>16%</b>	<b>13%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>77%</b>	<b>79%</b>	<b>81%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>77%</b>	<b>77%</b>	<b>76%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>78%</b>	<b>84%</b>	<b>84%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>18%</b>	<b>16%</b>	<b>16%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>47%</b>	<b>50%</b>	<b>50%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>57%</b>	<b>61%</b>	<b>63%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>7%</b>	<b>7%</b>	<b>7%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>50%</b>	<b>53%</b>	<b>57%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>57%</b>	<b>63%</b>	<b>66%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>27%</b>	<b>22%</b>	<b>22%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

Overall, the use of internet services in Slovenia is below the EU average. While the proportion of people who have never used internet continues to decrease (from 18% in 2017 to 13% in 2019), it remains above the EU average (9%). By contrast, the proportion of internet users increased from 77% to 81%, but remains below the EU average of 85%. People in Slovenia are keen to engage in a variety of online activities in line with the rest of the EU. Compared to the EU, the higher-ranking activities are reading news (76% compared to the EU average of 72%) and consumption of music, videos and games (84% of internet users, as against the EU average of 81%). The use of video on demand in Slovenia is only half the EU average (16% of internet users compared to an EU average of 31%). In 2019, the use of online banking (57% of internet users) was substantially lower than the EU average (66%).



## 4 Integration of digital technology

4 Integration of digital technology	Slovenia		EU
	rank	score	score
<b>DESI 2020</b>	<b>15</b>	<b>40.9</b>	<b>41.4</b>
DESI 2019	16	39.1	39.8
DESI 2018	14	38.2	37.8



	Slovenia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>30%</b>	<b>30%</b>	<b>33%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>18%</b>	<b>18%</b>	<b>24%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>11%</b>	<b>10%</b>	<b>10%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>13%</b>	<b>17%</b>	<b>17%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>18%</b>	<b>17%</b>	<b>17%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>NA</b>	<b>NA</b>	<b>11%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>12%</b>	<b>12%</b>	<b>12%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

As regards the integration of digital technology in businesses, Slovenia ranks 15<sup>th</sup> among EU countries. Compared with last year, the country has gone one place up in the ranking. Slovenian enterprises are taking advantage of the opportunities presented by electronic information sharing (used by 33% of enterprises compared to the EU average of 34%) and the use of social media (used by 24% of enterprises, against 25% in the EU as whole). They are also close to the EU average in the use of big data, cloud services, SMEs selling online and e-Commerce turnover.

Slovenia continues to implement its *Digitalna Slovenija 2020* strategy, the Research and Innovation Strategy of Slovenia, as well as the Smart Specialization Strategy. Some of the concrete actions, based on these strategies are the Strategic Research and Innovation Partnerships (SRIPs), the Digital Innovation Hubs, and the FabLabs. However, the uptake in companies, especially SMEs, which lack capacity and resources (both financial and skills) remains a challenge.

Slovenia developed the comprehensive programme of digitisation and digital transformation of SMEs 2018-2023. It includes four measures: (i) the activities of the Digital Innovation Hub Slovenia (supported with €2.6 million); (ii) the Slovene Entrepreneurial Fund, which runs several voucher schemes for digitisation between 1,000 and 9,999 € per project (4 calls for 'digital' vouchers for SMEs were published for preparing a digital strategy, digital marketing, raising digital competences and cyber security)<sup>(390)</sup>; (iii) SPIRIT Slovenia launched a public call for e-business for SMEs that

<sup>(390)</sup> <https://podjetniskisklad.si/sl/novice-in-objave/novice/sporocila-za-javnost/588-slovenski-podjetniski-sklad-objavlja-se-dodaten-vavcer-za-digitalizacijo-in-sicer-vavcer-za-kibernetsko-varnost>

internationalise and digitalise their business; (iv) the public call for digital transformation for SMEs was published by Slovene enterprises fund.

The adoption of digital technologies and business models is generally well advanced, but some sectors (SMEs) are lagging behind. The digital transformation is going well in the automotive sector, e-commerce, tourism, innovation of composite materials and companies integrated into foreign value chains. Furthermore, Slovenia is strong in some areas such as robotics, fin-tech, cyber security and artificial intelligence. There is a growing awareness of the need to integrate digital technologies into business processes. According to the EIB<sup>(391)</sup>, 75% of Slovenian firms have implemented, either fully or partially, at least one digital technology<sup>(392)</sup>. This is well above the EU average of 57%.

ICT experts in SMEs usually focus on core business operations rather than on innovation and technology transfer. Recently more attention has been devoted to the digitisation of SMEs, which may lead the way to improvements in this domain.

### Highlight 2020: Strategic Research and Innovation Partnerships (SRIP)

Slovenia's dynamic start-up ecosystem in information and communication technologies, backed by solid business support services, is an important driver for the country's industrial transition. Academia-business linkages are particularly important for the successful translation of knowledge, first into innovation, and then into industry, higher productivity and improved competitiveness for the Slovenian economy. Several examples of fruitful public-private cooperation can be found within the framework of the Strategic Research and Innovation Partnerships (SRIPs). SRIPs are long-term partnerships between the business community, research organisations, the state and municipalities and facilitators, innovation users and NGOs. Stakeholders cooperate by coordinating on of R&D activities, sharing capacities, exchanging knowledge and experience, networking and the collective representation of their interest abroad in the priority domains outlined in the S4 Smart Specialisations Strategy.

There are in total nine SRIPs<sup>(393)</sup>. Two involving key digital technologies:

- SRIP Smart Cities and Communities/ICT Horizontal Network (ICT) and
- SRIP Factories of the future (robotics, photonics, process technologies, plasma).

The SRIPs have 763 members, with 81% from the business sector. 78% of these are SMEs<sup>(394)</sup>.

SRIPs play a key role in awareness-raising, roll-out and the penetration of digital technologies into the Slovenia business environment (especially SMEs), through knowledge sharing.

<sup>(391)</sup> [https://www.eib.org/attachments/efs/eibis\\_2019\\_slovenia\\_en.pdf](https://www.eib.org/attachments/efs/eibis_2019_slovenia_en.pdf)

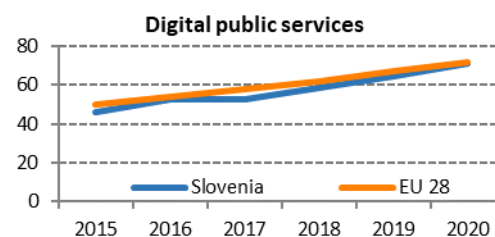
<sup>(392)</sup> Companies implemented at least one of the following technologies: 3-D printing, automation via advanced robotics, internet of things, cognitive technologies, augmented or virtual reality, drones, platform technologies.

<sup>(393)</sup> <https://www.gzs.si/Search-Results?q=SRIP#77946105-sripi> and <https://www.sripzdravje-medicina.si/en/>

<sup>(394)</sup> <https://www.gov.si/zbirke/projekti-in-programi/izvajanje-slovenske-strategije-pametne-specializacije/>

## 5 Digital public services

5 Digital public services	Slovenia		EU
	rank	score	score
<b>DESI 2020</b>	<b>17</b>	<b>70.8</b>	<b>72.0</b>
DESI 2019	18	64.5	67.0
DESI 2018	17	58.7	61.8



	Slovenia		EU	
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>5a1 e-Government users</b> % internet users needing to submit forms	54%	56%	59%	67%
<b>5a2 Pre-filled forms</b> Score (0 to 100)	51	61	64	59
<b>5a3 Online service completion</b> Score (0 to 100)	84	86	91	90
<b>5a4 Digital public services for businesses</b> Score (0 to 100) - including domestic and cross-border	73	74	77	88
<b>5a5 Open data</b> % of maximum score	NA	NA	75%	66%

In digital public services, Slovenia now ranks 17<sup>th</sup> among EU countries. The country performs well in the open data indicator for which it is ranks 10<sup>th</sup>. Only 59% of Slovenian internet users actively engage with e-government services compared to an EU average of 67%. A wide range of basic online services for businesses is available in Slovenia. Nevertheless, the use of these services by businesses is lower than on average in the EU. Slovenia's digital public services score for business is 77 compared to 88 for the EU. Low trust and the absence of unique and secure identifiers may be the reasons for the lower uptake. The numbers show that while Slovenia has substantially improved in all indicators in the digital public services domain in nominal terms, it has not advanced in terms of its ranking.

Slovenia is preparing new legislation to introduce a national e-identity card in 2021 and has rolled out the smsPASS for mobile-based access. Slovenia intends to introduce new app-based mobile solutions for authentication and e-signature to offer more secure mobile access. Slovenian citizens and companies have unique ID numbers (personal registration number, company's registration number, tax number), that are widely used in both paper-based and online procedures. These cannot be used for electronic identification, however. At present, most e-services rely on qualified digital certificates issued by the public or private sector (used for authentication and e-signature). These certificates are relatively complex for the average user, and can be heavily dependent on browser policies.

Business portals have also been set-up for domestic and foreign entrepreneurs (e-VEM and EUGO). In 2017, these systems were integrated into the newly established national business point (*Slovenska poslovna točka, SPOT*) portal. It is now easier to set up a business, and tax regulation for micro companies have been simplified. E-invoicing and a simpler online system for paying compulsory duties have also been introduced.

The tax authority offers a wide array of tax applications and tax declarations to citizens, business and independent entrepreneurs (e-Davki)<sup>(395)</sup>. In 2019, a mobile application for the general public was introduced<sup>(396)</sup>.

Slovenia performs very well in the data economy. Slovenian companies rank in the top third in the EU for the re-use of public sector data, profiting from the wide range of large databases that are available to the public. Slovenia is drafting a data strategy and has plans to develop an integrated data warehouse to make access to public sector data more user-friendly to governmental bodies, citizens and companies. This is expected to strengthen use of emerging data-based solutions and artificial intelligence.

In the area of e-Health, sickness certificates underwent a major reform in 2019 and can now be submitted fully electronically. The reform is expected to reduce the administrative burden for businesses by €16 million per year.

The planned rollout of the national e-identity card in 2021 and new app-based mobile solutions for authentication and e-signature in 2020 will result in secure, unique and user-friendly electronic identifiers, which are expected to boost the take up of digital public services and online transactions in the business sector.

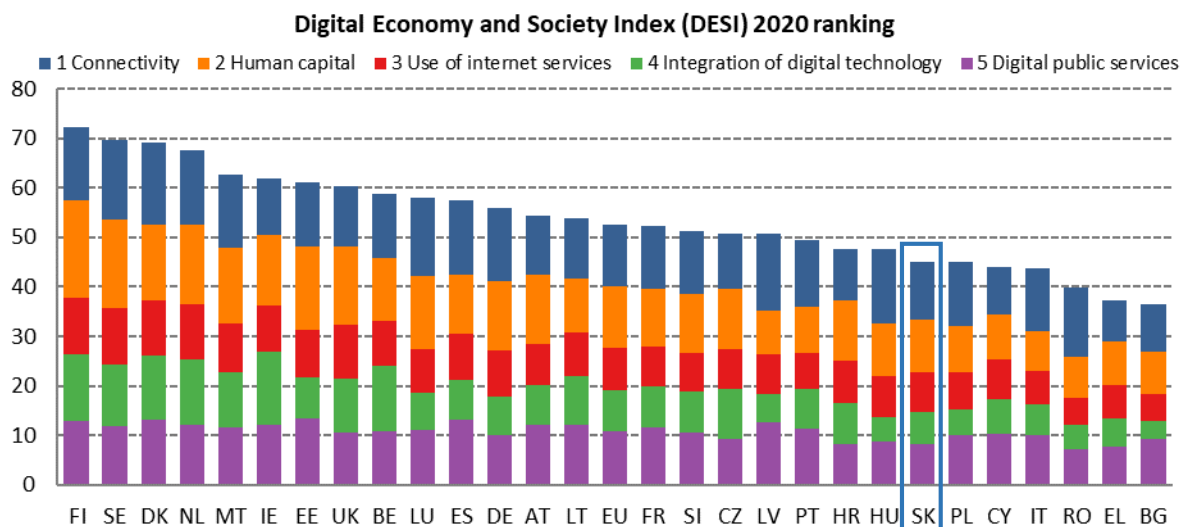
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<sup>(395)</sup> [https://www.fu.gov.si/davki\\_in\\_druge\\_dajatve/poslovanje\\_z\\_nami/e\\_davki/](https://www.fu.gov.si/davki_in_druge_dajatve/poslovanje_z_nami/e_davki/)

<sup>(396)</sup> [https://www.fu.gov.si/davki\\_in\\_druge\\_dajatve/poslovanje\\_z\\_nami/e\\_davki/mobilna\\_aplikacija\\_edavki/](https://www.fu.gov.si/davki_in_druge_dajatve/poslovanje_z_nami/e_davki/mobilna_aplikacija_edavki/)

## Slovakia

	Slovakia		EU
	rank	score	score
<b>DESI 2020</b>	<b>22</b>	<b>45.2</b>	<b>52.6</b>
DESI 2019	21	42.9	49.4
DESI 2018	20	41.9	46.5



Slovakia ranks 22<sup>nd</sup> out of the 28 EU Member States in the European Commission Digital Economy and Society Index (DESI) 2020.

Based on data prior to the pandemic, Slovakia's scores slightly increased thanks to the performance in connectivity, the use of internet services and digital public services. However, the majority of indicators have not improved sufficiently to keep up the pace with the EU average. As a result Slovakia dropped in the ranking in the dimension of human capital and in the use of internet services to the 20<sup>th</sup> position and in digital public services to the 26<sup>th</sup> position.

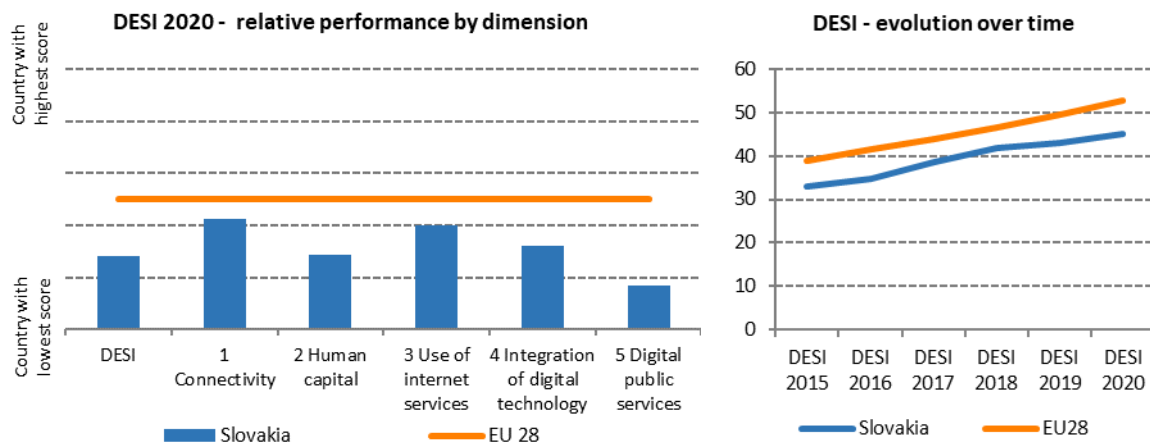
Slovakia continues to improve the fast and ultrafast broadband coverage. The share of ICT specialists on total employment has increased and there are less Slovaks who have never used the internet. An increasing share of internet users make video calls and use online banking services. E-Commerce is stagnating as the share of SMEs selling online decreased for the second year in a row. The e-Government quality indicators are growing but remain below the EU average.

In 2019, Slovak government adopted a new Strategy for the digital transformation of Slovakia 2030<sup>(397)</sup>. This document lays down a longterm vision and aims to guide the economy, society and public administration through the technological change. Its goals are also to stimulate smart regional development and help researchers and innovators to keep the pace with global trends.

The strategy aims to reach its objectives through the related Action plans. The first one for the years 2019-2022 lists four main objectives: digital transformation of schools, conditions for a data-based

<sup>(397)</sup> <https://www.vicpremier.gov.sk/wp-content/uploads/2019/10/SDT-English-Version-FINAL.pdf>

economy, innovating public administration and support for the development of Artificial Intelligence (AI).



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Slovak public authorities actively used digital technologies across all the monitored dimensions to help the society and economy to cope with the COVID-19 restrictions. The Ministry of education launched a dedicated portal<sup>(398)</sup> to help teachers and schools organise remote classes and online assessment. The Slovak Digital Coalition mobilised organisations and companies who offered services for teamwork or videoconferencing to schools temporarily for free. The government set up a single-access portal<sup>(399)</sup> with information about coronavirus and related restrictions targeting various groups from citizens, sick people, travellers, businesses to employers or health workers. Ministry of health has upgraded current e-health applications to offer instructions, relevant information, notifications and additional services related to COVID-19. The Ministry of economy organised webinars and provided online support to enterprises and self-employed people on how to use EU cohesion funds and national programmes to cope with the restrictions. The innovator community organised a 48-hour hackathon<sup>(400)</sup> to develop new solutions for healthcare providers, cities, the economy and the communities.

<sup>(398)</sup> <https://www.ucimenadialku.sk/>

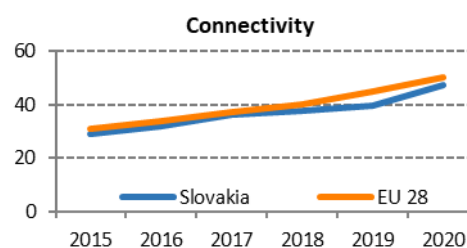
<sup>(399)</sup> <http://www.korona.gov.sk/>

<sup>(400)</sup> <https://www.hackthecrisis.sk/>

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Slovakia is advancing on rolling out fast and super-fast broadband. The main features of the national e-health system are sufficiently reliable and can enable new applications. A more user-centric digital public services and especially more people with basic and advanced digital skills would help the society to better cope with the impact of the pandemic.

# 1 Connectivity

1 Connectivity	Slovakia		EU
	rank	score	score
DESI 2020	21	47.5	50.1
DESI 2019	24	39.6	44.7
DESI 2018	21	37.9	39.9



	Slovakia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>1a1 Overall fixed broadband take-up</b>	<b>70%</b>	<b>70%</b>	<b>72%</b>	<b>78%</b>
% households	2017	2018	2019	2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b>	<b>10%</b>	<b>13%</b>	<b>15%</b>	<b>26%</b>
% households	2017	2018	2019	2019
<b>1b1 Fast broadband (NGA) coverage</b>	<b>70%</b>	<b>73%</b>	<b>76%</b>	<b>86%</b>
% households	2017	2018	2019	2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b>	<b>41%</b>	<b>43%</b>	<b>47%</b>	<b>44%</b>
% households	2017	2018	2019	2019
<b>1c1 4G coverage</b>	<b>82%</b>	<b>87%</b>	<b>89%</b>	<b>96%</b>
% households (average of operators)	2017	2018	2019	2019
<b>1c2 Mobile broadband take-up</b>	<b>84</b>	<b>88</b>	<b>95</b>	<b>100</b>
Subscriptions per 100 people	2017	2018	2019	2019
<b>1c3 5G readiness</b>	<b>NA</b>	<b>0%</b>	<b>33%</b>	<b>21%</b>
Assigned spectrum as a % of total harmonised 5G spectrum		2019	2020	2020
<b>1d1 Broadband price index</b>	<b>NA</b>	<b>NA</b>	<b>60</b>	<b>64</b>
Score (0 to 100)			2019	2019

With an overall connectivity score of 47.5, Slovakia ranks 21<sup>st</sup> among EU countries. Overall fixed broadband take-up has seen some progress with 72% of households subscribing to any kind of fixed internet offer (70% in 2018), and lies slightly below EU average. While the number of households subscribing to at least 100 Mbps fixed broadband has also seen some progress (15%), it ranks relatively low compared to other EU countries (22<sup>nd</sup>). Slovakia's fast broadband (NGA) coverage (covering 73% in year 2018) has reached 76%, but is still below the EU average of 86%. Nevertheless, Slovakia has good VHCN coverage, which has improved further to 47%. The number of households covered by 4G (average coverage) stands at 89%, but still lies below the EU average of 96%. Mobile broadband take-up (95 subscriptions per 100 people) has seen also a slight progress and is close to the EU average. The broadband prices in Slovakia are high compared to the EU average – the country scored 60 in the broadband price index compared to the EU average of 64, which puts it 20<sup>th</sup> among all the Member States.

While the 2011 national broadband strategy is still in place, the Deputy Prime Minister's Office for Investments and Informatisation is currently finalising the new national broadband plan for 2021-2025. The new plan is expected to align Slovakia's broadband strategy with the 2025 gigabit society targets. It will be based on the priorities of the European structural and investment fund (ESIF 2021-2027).



In 2020, a new broadband mapping project was launched at the household/address level, as a basis for preparing the national broadband plan. To replace the cancelled 'Atlas for passive infrastructure' project, the Ministry of Environment will start a new project with a different approach.

One of Slovakia's long-term connectivity issues is the provision of high-speed broadband coverage for 'white spots' (i.e. municipalities covered by speeds of less than 30 Mbps). Slovakia intends to address its remaining few dozen white spots by the end of 2020, thanks to private investment by market players who declared their intention to give the majority of people in each municipality access to speeds of at least 30 Mbit/s.

The Deputy Prime Minister's Office for Investments and Informatisation introduced a measure to enable free wi-fi coverage (under the *de minimis* rule) at municipal level. It is based on the WiFi4EU principles and financed under the 'Integrated Infrastructure' Operational Programme. It received €10 million allocation from the European Regional and Development Fund and the total amount of submitted applications currently stands at €3.9 million; the Prime Minister's Office has signed 375 contracts with successful cities and municipalities to date.

Slovakia scores 33% in the 5G readiness indicator<sup>(401)</sup>. To achieve its mobile connectivity ambitions, the Ministry of Transport and Construction is currently finalising a new document on "Support for the development of 5G networks in Slovakia for the years 2020-2025". In Slovakia, 46% of the spectrum harmonised at EU level for wireless broadband has been assigned. The Slovak national regulatory authority for electronic communications (Regulatory Authority for Electronic Communications and Postal Services, RÚ) published a call for tender in the form of a national consultation for the award of frequencies in the 700, 900, and 1800 MHz bands on 31 March 2020. However, there is one nationwide DTT network operator on the Slovak market holding the rights to use the 700 MHz spectrum beyond 2020; the Slovak authorities presume that the process of releasing the 700 MHz frequency band will be finalised by the end of May 2020. Slovakia plans to compensate the previous holder (the nationwide network operator).

The assignment of frequencies in the 3.4-3.6 GHz band was completed in 2016 and nationwide licences were assigned to four operators (O2 Slovakia, SWAN, Orange, Slovanet) until August 2025, with different frequency block sizes. However, for rights to using frequencies in the upper part of the 3.6-3.8 GHz band, the selection procedures took place in 2017 and rights were granted at local (district) level until the end of 2024. This could make it difficult to make it possible for all operators to use sufficiently large frequency blocks in the band by 31 December 2020, the target date for 5G deployment.

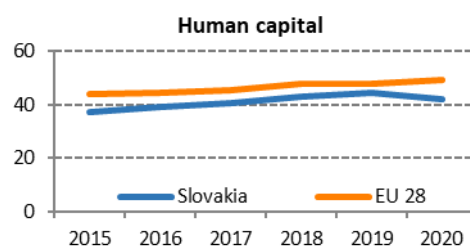
The finalisation of an update to the national broadband strategy will be a significant step towards delivering on the gigabit targets. The effective implementation of the integrated infrastructure operational programme, built on close coordination between public and private stakeholders, could help make efficient use of EU funds, also with a view to ensuring coverage in Slovakia's 'white spots'. Slovakia could improve its prospect of timely 5G deployment by finalising the process of releasing the 700 MHz frequency in time and allowing the use of sufficiently large frequency blocks in the 3.6 GHz for all operators by the end of 2020.

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<sup>(401)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

## 2 Human capital

2 Human capital	Slovakia		EU
	rank	score	score
<b>DESI 2020</b>	<b>20</b>	<b>41.8</b>	<b>49.3</b>
DESI 2019	18	44.2	47.9
DESI 2018	18	42.9	47.6



	Slovakia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>2a1 At least basic digital skills</b>	<b>59%</b>	<b>59%</b>	<b>54%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>33%</b>	<b>33%</b>	<b>27%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>63%</b>	<b>63%</b>	<b>56%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>2.9%</b>	<b>2.8%</b>	<b>3.2%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>0.6%</b>	<b>0.8%</b>	<b>0.9%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>2.9%</b>	<b>3.2%</b>	<b>3.3%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

Slovakia ranks 20<sup>th</sup> among EU countries on human capital. The score as the proportion of Slovaks who declare to have digital skills decreased. 27% of Slovaks have above basic digital skills, which is the best score in the Visegrad 4 region but it remains below the EU average (33%). The proportion of ICT specialists in total employment grew to 3.2% but remains below the EU average (3.9%). Slovakia still has one of EU's lowest proportions of female ICT specialists – only 0.9% compared to the EU average of 1.4%. The share of ICT graduates is slowly growing (3.3%) but remains below the EU average (3.6%).

Improving digital skills is one of the priorities of the Slovak Digital Transformation strategy 2030<sup>(402)</sup> and the related action plan for 2019-2022<sup>(403)</sup>. The aim is to adapt the education system and focus on skills for jobs. The strategy also mentions the need to develop soft skills and competences for participating in digital society (digital citizenship). The strategy builds on relevant parts of the previous smart industry action plan<sup>(404)</sup> whose education-related measures were not fully delivered. In parallel, Slovak businesses are increasingly calling for a reform of the education system to reduce the mismatch between the skills graduates gain at school and those requested by employers.

Low levels of digital literacy among young people is also a challenge. According to the Slovak School Inspectorate, 45% of schools do not have a single qualified IT teacher<sup>(405)</sup>. The latest European survey

<sup>(402)</sup> <https://www.vicpremier.gov.sk/wp-content/uploads/2019/06/Strategia-digitalnej-transformacie-Slovenska-2030.pdf>

<sup>(403)</sup> [https://www.vicpremier.gov.sk/wp-content/uploads/2019/07/Akcny-plan-DTS\\_2019-2022.pdf](https://www.vicpremier.gov.sk/wp-content/uploads/2019/07/Akcny-plan-DTS_2019-2022.pdf)

<sup>(404)</sup> <https://www.mhsr.sk/inovacie/strategie-a-politiky/akcny-plan-inteligentneho-priemyslu-sr>

<sup>(405)</sup> <https://www.minedu.sk/statna-skolska-inspekcia-informuje-o-vysledkoch-svojej-cinnosti/>

on ICT in education<sup>(406)</sup> shows that only 17% of Slovak primary schools are highly digitally equipped and connected (EU average: 35%). While children intensively use digital tools and the internet for entertainment, a recent report<sup>(407)</sup> found that only 4 out of 10 are able to create presentations, charts or work with spreadsheets. The situation is particularly serious in families that are lower on the socio-economic scale.

Slovakia is home to several initiatives such as IT Fitness test<sup>(408)</sup> or IT Akademia<sup>(409)</sup> that aim to improve digital skills of students and teachers. To tackle the issues the country also follows the line of the National Education Programme<sup>(410)</sup> that highlights the need to increase the use of digital technologies in classrooms, and improve the digital skills of both students and teachers. However, the related implementation plan only has 1 action out of 106 that directly supports the digitisation objectives.

Slovakia has an active National Digital Coalition<sup>(411)</sup> that works closely with the government. Its 83 members have submitted 219 pledges that vary from bringing more IT classes to schools, to training teachers, to helping workers get their skill-sets ready for industry 4.0.

Slovakia regularly participates in EU Code Week. In 2019, the number of activities increased by 8% to 165 and the organisers reported over 9,100 participants.

Human capital is not any more Slovakia's best performing area. The score dropped and is far beyond the EU average. The country's strategy is to reform education, adapting it to technological developments, and to better equip students with skills and competences for living and working in a digital economy. The main challenge will be to translate the strategy into concrete actions, ensure proper funding and to use current successful initiatives such as the IT Fitness test to impact a larger share of population.

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<sup>(406)</sup> <https://ec.europa.eu/digital-single-market/en/news/2nd-survey-schools-ict-education>

<sup>(407)</sup> Endowment Fund Telekom at the Pontis Foundation: <https://www.nadacnyfondtelekom.sk/digitalna-gramotnost-deti-rozdeluje-slovensko/>

<sup>(408)</sup> <https://itfitness.sk/>

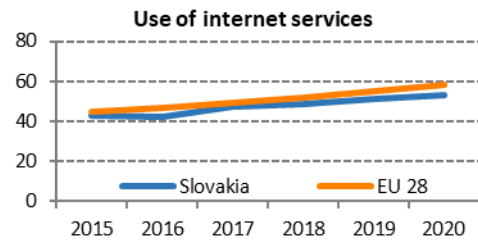
<sup>(409)</sup> <http://itakademia.sk/>

<sup>(410)</sup> <https://www.minedu.sk/data/att/13285.pdf>

<sup>(411)</sup> <https://digitalnakoalicia.sk/>

### 3 Use of internet services

3 Use of internet services	Slovakia		EU
	rank	score	score
<b>DESI 2020</b>	<b>20</b>	<b>53.4</b>	<b>58.0</b>
DESI 2019	17	51.3	55.0
DESI 2018	18	48.7	51.8

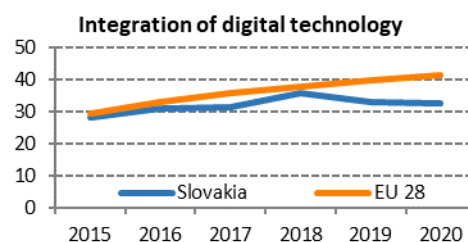


	Slovakia			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>3a1 People who have never used the internet</b>	<b>14%</b>	<b>13%</b>	<b>12%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>79%</b>	<b>78%</b>	<b>82%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>77%</b>	<b>77%</b>	<b>72%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>69%</b>	<b>66%</b>	<b>66%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>7%</b>	<b>17%</b>	<b>17%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>55%</b>	<b>51%</b>	<b>66%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>72%</b>	<b>74%</b>	<b>72%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>4%</b>	<b>4%</b>	<b>6%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>63%</b>	<b>62%</b>	<b>66%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>70%</b>	<b>71%</b>	<b>71%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>14%</b>	<b>29%</b>	<b>27%</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

While there is a steady increase in the use of internet services by people in Slovakia, the country is not keeping pace with other EU Member States. The country fell from 17<sup>th</sup> to 20<sup>th</sup> in the EU ranking, with scores for some indicators well below the EU average. The proportion of people who have never used the internet has decreased to 12% but remains above the EU average (9%). More Slovaks are using the internet (82%, up from 78% in 2018) and banking online (66%, up from 62% in 2018). Slovakia has also made significant progress in video calls, with 66% of people now using this service – a 15 p.p. increase compared to the previous year. Interest in online shopping remains stable. However, the share of internet users who sell online dropped to 27% and the share of internet users active on social networks also fell. Only 72% of internet users read news online (compared to 77% in 2017) and only 6% have followed an online course - one of the lowest scores in the EU.

## 4 Integration of digital technology

4 Integration of digital technology	Slovakia		EU
	rank	score	score
<b>DESI 2020</b>	<b>21</b>	<b>32.6</b>	<b>41.4</b>
DESI 2019	21	33.1	39.8
DESI 2018	18	35.8	37.8



	Slovakia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>31%</b>	<b>31%</b>	<b>31%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>17%</b>	<b>17%</b>	<b>18%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>11%</b>	<b>9%</b>	<b>9%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>15%</b>	<b>14%</b>	<b>14%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>15%</b>	<b>13%</b>	<b>11%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>12%</b>	<b>11%</b>	<b>11%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>8%</b>	<b>8%</b>	<b>7%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

Slovakia ranks 21<sup>st</sup> in the EU on integration of digital technology. Its score decreased to 32.6, compared to 33.1 in 2019. The proportion of companies that share electronic information remained stable at 31% (EU average: 34%). Slovakia falls short of the EU average in the use of big data analysis by companies (9% vs 12%) and in the use of the cloud (14% vs 18%). The country's e-commerce scores have not improved. Only 11% of SMEs sell online (compared to 13% in previous year), the share of SME turnover from e-commerce remains stagnant at 11%, and the proportion of SMEs that sell online across borders has decreased to 7% (compared to 8% in 2017).

Slovakia has a national digitisation strategy that supports the integration of innovative technologies in companies. It aims to introduce legislation that will enable new business models, particularly ones built on digital platforms and AI. It also plans to develop infrastructure and create favourable conditions to test automated transport and enable new transport business models.

A growing number of industrial companies are taking steps towards digital transformation, mostly in order to increase their performance and make internal processes more efficient. However, only 18% of companies report a high or very high level of digital intensity (EU average: 26%). In general, businesses still lack digitalisation support from public institutions, as the regulatory framework is not yet fully adapted to this process<sup>(412)</sup>.

<sup>(412)</sup> [https://ec.europa.eu/information\\_society/newsroom/image/document/2019-32/country\\_report\\_-\\_slovakia\\_-\\_final\\_2019\\_OD31C79C-EC95-A759-9A4EFF789FEB2FB2\\_61219.pdf](https://ec.europa.eu/information_society/newsroom/image/document/2019-32/country_report_-_slovakia_-_final_2019_OD31C79C-EC95-A759-9A4EFF789FEB2FB2_61219.pdf)

When adopting new digital solutions, companies often rely on help from the private sector. For example, Industry4UM<sup>(413)</sup> is a private initiative hosted by the Ministry of Economy that serves as a platform to help businesses in the digitising era. According to its annual survey<sup>(414)</sup>, 48% of industrial companies already have an internal team that deals with digital transformation.

Slovak businesses struggle to find qualified, talented workers to carry forward the digital transformation. Companies do not generally offer quality in-house training to properly upskill their employees. According to the national business environment index, companies consider bureaucracy, corruption and insufficient law enforcement to be the main barriers for doing business. The index is at its lowest level since 2001<sup>(415)</sup>. Slovakia does not yet have a digital innovation hub (DIH). However, the government aims to create and support a network of specialised centres for digital innovation that would have enough expertise and financial capability to qualify to become DIHs. Three companies are already receiving mentoring and coaching through an EU project.

Slovakia takes part in all relevant EU initiatives that aim to strengthen the digital single market and foster cooperation in strategic fields such as high performance computing, AI and cybersecurity. At the end of 2019, Slovakia joined other EU countries that work together to develop a quantum communication infrastructure in the EU<sup>(416)</sup>.

Slovakia is one of the 20 biggest car producers in the world, making it also an EU leader in robotic intensity. With 165 industrial robots per 10,000 employees, the country is 16<sup>th</sup> in the global ranking<sup>(417)</sup>. This is mainly thanks to the robotisation of the car industry, but a rapid growth in robotic automation has also been observed in logistics and in the service robots sector.

Slovak businesses are not yet fully benefiting from the digital transformation. The use of digital technologies is stagnating as companies lack the right expertise. E-commerce is a missed opportunity, in particular for SMEs. A rapid introduction of the measures set out in the national digitisation strategy could help to improve this trend. As a first step, businesses will need more support, advice and enough talented people on the job market.

#### Highlight 2020: Slovak.AI<sup>(418)</sup>

This non-profit platform was set up in 2019 and connects students, researchers, universities, businesses, associations and investors who want to turn Slovakia into an artificial intelligence centre. Due to the structure of the country's industry and economy, future technological disruptions, including automation, are likely to impact Slovakia's economy more than they will other countries. Slovak.AI shows how an active involvement of academia, and the private and public sector can help the country address the challenges.

The Slovak.AI partnership has three objectives:

- Attract and keep talented people in Slovakia
- Help to understand, use and improve AI
- Turn Slovakia into a digital country.

<sup>(413)</sup> <http://industry4um.sk/>

<sup>(414)</sup> [https://industry4um.sk/wp-content/uploads/2019/10/vyhodnotenie\\_prieskum\\_2019\\_odpovede.pdf](https://industry4um.sk/wp-content/uploads/2019/10/vyhodnotenie_prieskum_2019_odpovede.pdf)

<sup>(415)</sup> <https://www.alianciapas.sk/2019/07/30/podnikatelia-su-nespokojni-so-stavom-podnikatelskeho-prostredia/>

<sup>(416)</sup> <https://ec.europa.eu/digital-single-market/en/news/nine-more-countries-join-initiative-explore-quantum-communication-europe>

<sup>(417)</sup> <https://ifr.org/downloads/press2018/IFR%20World%20Robotics%20Presentation%20-%202018%20Sept%202019.pdf>

<sup>(418)</sup> <https://slovak.ai/>

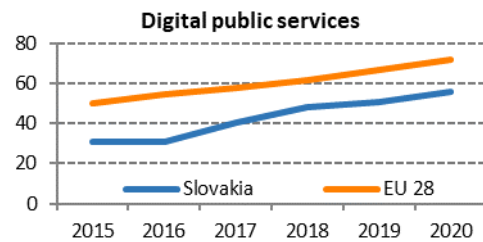
One of the first outputs is 'Slovak Academia for AI' - a mapping of the AI research landscape<sup>(419)</sup>. It has identified 3 main scientific centres in Bratislava, 2 in Kosice and 1 in Zilina, and more than 200 researchers and over 40 companies active in AI. These companies are involved in several ongoing Horizon 2020 projects and focus on computer vision, data analysis and machine learning, computational biology, language processing, knowledge representation, and AI in robotics.

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<sup>(419)</sup> [https://slovak.ai/wp-content/uploads/2020/02/bro%C5%BE%C3%BAra\\_SK-Academia-AI.pdf](https://slovak.ai/wp-content/uploads/2020/02/bro%C5%BE%C3%BAra_SK-Academia-AI.pdf)

## 5 Digital public services

5 Digital public services	Slovakia		EU
	rank	score	score
<b>DESI 2020</b>	<b>26</b>	<b>55.6</b>	<b>72.0</b>
DESI 2019	25	50.7	67.0
DESI 2018	24	48.0	61.8



	Slovakia			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>5a1 e-Government users</b>	<b>55%</b>	<b>54%</b>	<b>52%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>34</b>	<b>35</b>	<b>38</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>78</b>	<b>79</b>	<b>85</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>73</b>	<b>78</b>	<b>84</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>33%</b>	<b>66%</b>
% of maximum score			2019	2019

Even with a higher score than in 2019, Slovakia has dropped to 26<sup>th</sup> position on digital public services. Only 52% of Slovak internet users who need to submit forms to public institutions do so online. This is less than in previous years, and significantly below the EU average (67%). Despite some improvement, Slovakia scores 21 percentage points less on pre-filled forms than the EU average. Improvement in the other monitored indicators is modest and overall the scores remain below the EU average.

According to the Supreme Audit Office, the use of national and EU funds to invest in digital public services has not led to a greater take-up by the public<sup>(420)</sup>. This could be due to low trust in e-government services, as 19% of Slovaks, compared to an EU average of 8%, are concerned about the security of digital public services and limit or avoid electronic communication with public authorities<sup>(421)</sup>.

However, the government maintains its ambition and continues to roll out new features to make e-government more attractive. The national digitisation strategy entails the introduction of a 'data-driven state' concept to improve the public administration's use of data for analytical purposes. Other positive measures include the 'once-only' principle introduced by the law against bureaucracy, the planned mobile eID and the API<sup>(422)</sup> gateway. To make the services more user-centric and attractive the government set up a unit of behavioural innovation. The unit trains public servants and has developed principles of user-friendly and quality electronic public services which should be applied across whole public administration.

<sup>(420)</sup> <https://www.nku.gov.sk/documents/10157/9cdf145b-56e1-40b9-97db-dcf4d87f3e04>

<sup>(421)</sup> <https://ec.europa.eu/eurostat/documents/2995521/10335072/9-16012020-BP-EN.pdf/30431c3f-cbce-6d2d-e9d1-4cf6b084b6af>

<sup>(422)</sup> Application programming interface



However, stakeholders and NGOs are often critical about the digitisation of public services and administration. Despite the government's effort to improve the quality of public sector ICT and involve external specialists, the experts grouped in Slovensko.digital<sup>(423)</sup> point out that digitisation projects in public administration often lack thorough analysis, are not properly prepared, are too costly or do not reflect future technological developments.

The digitisation of healthcare and the rollout of e-health services are also objectives of the national digitisation strategy. Since its launch in 2018, the national e-health system has already registered over 100 million e-prescriptions<sup>(424)</sup> and 75% of healthcare providers are connected. In 2020, the system will start rolling out a new e-lab service that will help doctors and laboratories exchange laboratory analyses. The Supreme Audit Office confirmed<sup>(425)</sup> that the system has made good progress in recent years and - even though it does not yet offer all features - it is saving resources. However, the costs of the system remain high. By April 2019, the Ministry of Health has spent over €123 million on it and by 2021, the additional features will cost other €57 million.

The government's ambition is to offer new digital public services that will help both people and businesses. However, the take-up remains low and the quality of the services already in place is not consistent. Involving a broader group of stakeholders, in particular consumers, in designing new services and making them more user friendly could help to tackle these persisting issues and increase trust. The national e-health system can serve as a good example.

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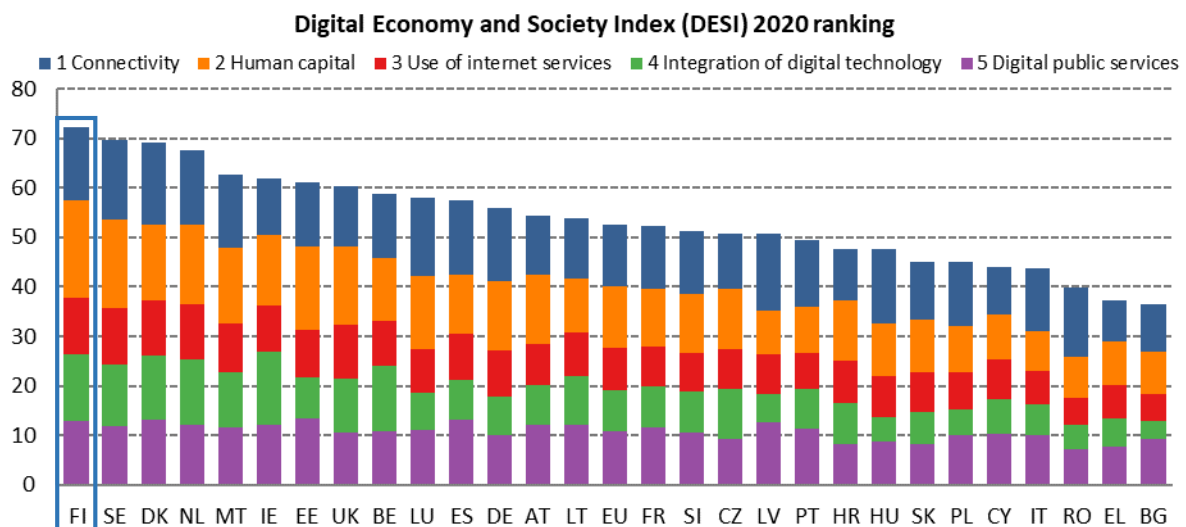
<sup>(423)</sup> <https://slovensko.digital/>

<sup>(424)</sup> <https://www.ezdravotnictvo.sk/sk/-/v-systeme-ezdravie-je-uz-100-milionov-ereceptov>

<sup>(425)</sup> Kontrola funkčnosti a využívania elektronického zdravotníctva (záverečná správa): <http://shorturl.at/oHIR9>

## Finland

	Finland		EU
	rank	score	score
<b>DESI 2020</b>	<b>1</b>	<b>72.3</b>	<b>52.6</b>
DESI 2019	1	68.1	49.4
DESI 2018	2	62.8	46.5

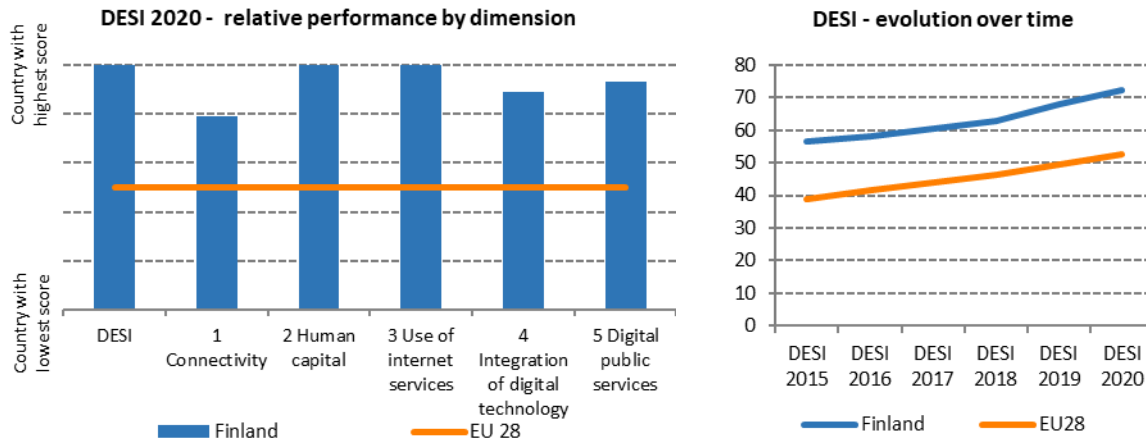


Finland is a digital leader ranking 1<sup>st</sup> out of the 28 EU Member States with a score of 72.3 in the Digital Economy and Society Index (DESI) 2020. Based on data prior to the pandemic, its leading performance is due to its excellence in digital public services and the integration of digital technologies, enabled by active cooperation between the public and private sectors and an active start-up scene. Its human capital is one of its strongest competitive advantages where 76% of the population have basic or above basic digital skills, considerably above the EU average (58%).

Finland excels thanks to innovative thinking linked with social responsibility. Governmental support is far-sighted, setting regulatory incentives and funding basic research. Finland has developed an equitable and inclusive information society. Digitisation and the development of the information society at all levels and in all sectors play a key role in sustaining Finnish well-being and increasing productivity. Efficient use of information and communication technologies (ICT) in different sectors of society leads to increased productivity.

The government report 'Productive and innovative Finland — digital agenda for 2011–2020', sets out future objectives for the development of the information society, along with the measures necessary to achieve them. Key objectives include i) opening up access to public data and its efficient use, ii) promoting user-oriented service development, iii) securing the position of older people as active citizens, and iv) promoting sustainable development by adopting new technologies.

Finland is working for to establish the national Digital Skills and Jobs Coalition (DSJC) during the year 2020.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions the Member States took. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means paying particular attention to the indicators relevant to a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

A great number of central government staff has been working from home. In order to ensure the availability of remote access to the network, network capacity has continuously increased and load sharing is in place. This will continue as network capacity is being monitored. If necessary, telecommunications traffic for remote access will be prioritised.

Several ongoing initiatives seek to develop digital solutions for tracing digital contacts. The aim is to create a common technological approach to ensure extensive coverage and critical user mass to combat the Covid-19 pandemic. The responsibility for this development work lies with the health authorities. The Ministry of Transport and Communications ensures the safeguards of data security and privacy.

A few national projects in Finland deserve attention in this context. The Helsinki and Uusimaa Hospital District (HUS) have created a questionnaire called Coronabot that gives citizens guidance on questions related to Covid-19 symptoms and exposure together with a mental support programme. It is still a pilot and its content receives regular updates. The Coronabot collects its users' postcodes for statistical purposes without creating a person register.

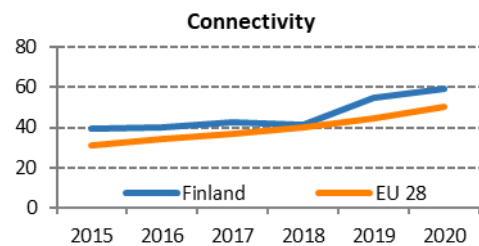
The Symptom Radar is an open source project developed by the largest subscription newspaper in Finland, Helsingin Sanomat together with the technology company Futurice. Its purpose is to gather information from people who have suffered from Covid-19 symptoms. The purpose of this data gathering is to understand the spread of Covid-19 in Finland and share this information. Other Finnish media companies are also participating in the data collection.

With regard to the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Finland is very advanced on the 5G, the digital skills and the digitisation of

businesses indicators as well as in digital public services. On the deployment of VHCN it ranks 14<sup>th</sup>.

# 1 Connectivity

1 Connectivity	Finland		EU
	rank	score	score
DESI 2020	9	59.2	50.1
DESI 2019	6	54.5	44.7
DESI 2018	13	41.6	39.9



	Finland			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>1a1 Overall fixed broadband take-up</b> % households	57%	58%	57%	78%
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	17%	21%	23%	26%
<b>1b1 Fast broadband (NGA) coverage</b> % households	74%	74%	75%	86%
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	32%	31%	58%	44%
<b>1c1 4G coverage</b> % households (average of operators)	98%	99%	99%	96%
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	146	153	154	100
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	NA	67%	67%	21%
<b>1d1 Broadband price index</b> Score (0 to 100)	NA	NA	79	64

With an overall connectivity score of 59.2, Finland ranks ninth among the Member States. Fast broadband (NGA) coverage increased slightly from a year to the other as it stood at 75% in 2019, significantly lower than the EU average (86%). Fixed very high capacity network coverage has substantially increased from a year to the other as it stood at 58% in 2019 against 31% in 2018. Fixed broadband take-up is at 57%, significantly behind the EU average of 78%. Only 23% of households chose to subscribe to fixed broadband of at least 100 Mbps or above, which is slightly below the EU average of 26%. One of the reasons for the relatively low take-up of fixed broadband connectivity can be seen in Finland's excellent performance in mobile broadband. Average 4G coverage is almost ubiquitous as it stood at 99% of the households in 2019 and 99% in 2018. This is also thanks to the timely assignment of spectrum including for 5G: the 5G readiness indicator<sup>(426)</sup> stands significantly

<sup>(426)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

above the EU average at 67% against 21%, ranking the country first in the EU. Finland is second in mobile broadband take-up (154 subscriptions per 100 people), far above the EU average (100). Finally, Finland's broadband price index stood at 79 against 64 for the EU.

Despite some limited structural changes, the deployment of gigabit networks in Finland continues to depend almost exclusively on private companies. Telia has created a joint venture with the CapMan infrastructure investor. The joint venture will own and intends to heavily invest in Telia's fibre-to-the-home infrastructure and provide the connection to end users in an 'open fibre' business model. The customers will then be able to choose from - and set up contracts with - a number of different internet service providers who have agreed to offer their services. This is a new set-up in Finland. The transaction is subject to approval from the relevant authorities and is expected to be completed during the first quarter of 2020. Another new market player is the Adola company, a joint venture between a fully state-owned fibre company and private investors. The company operates as a software company and as an internet service provider active in fibre roll-out. For all fixed operators, the migration from copper to fibre is challenging, as replacement by fibre is not economically feasible in all cases. Operators want to avoid maintaining copper without having customers. Uptake of fibre in suburbs is still low, due to overall good mobile coverage. However, in rural and remote areas, existing 4G infrastructure can have capacity constraints.

As regards Finland's national broadband plan, the application period for the high-speed broadband aid scheme ended in 2018 but payments are estimated to continue until 2021. The authorities are planning to make arrangements so it would be possible to apply and receive aid again from the beginning of 2021.

In Finland, 50% of the spectrum harmonised at EU level for wireless broadband has been assigned. While the 700 MHz band and the 3.4-3.8 GHz bands have already been assigned, the authorities are planning to auction the 26 GHz band in summer 2020. A public consultation on the 26 GHz band, launching the assignment process, will also take place in 2020.

Commercial 5G services are already available in the centres of the biggest cities (from all three mobile network operators. Depending on the providers, speeds are 1 Gbit/s, 600 or 300 Mbit/s, using 3.6 GHz spectrum)<sup>(427)</sup>. Corporate 5G Internet of things (IoT) services are at a pilot stage, mainly in factories (e.g. Nokia factory) and harbours, as part of more comprehensive trials.

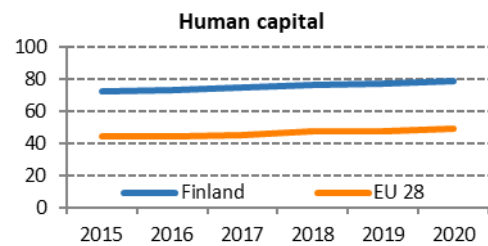
While Finland has good fixed broadband and 4G coverage overall, coverage in rural areas could be further improved. The main problem has been the lack of incentive for market players to invest in sparsely populated areas of the country. Finland has adopted State aid measures and has further adjusted them to tackle this issue, resulting in the implementation of more projects.

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<sup>(427)</sup> The 700 MHz and 3.6 GHz wireless broadband bands have already been assigned.

## 2 Human capital

2 Human capital	Finland		EU
	rank	score	score
<b>DESI 2020</b>	<b>1</b>	<b>78.4</b>	<b>49.3</b>
DESI 2019	1	77.5	47.9
DESI 2018	1	76.1	47.6



	Finland		EU	
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>2a1 At least basic digital skills</b> % individuals	<b>76%</b> 2017	<b>76%</b> 2017	<b>76%</b> 2019	<b>58%</b> 2019
<b>2a2 Above basic digital skills</b> % individuals	<b>45%</b> 2017	<b>45%</b> 2017	<b>50%</b> 2019	<b>33%</b> 2019
<b>2a3 At least basic software skills</b> % individuals	<b>76%</b> 2017	<b>76%</b> 2017	<b>77%</b> 2019	<b>61%</b> 2019
<b>2b1 ICT specialists</b> % total employment	<b>6.6%</b> 2016	<b>6.8%</b> 2017	<b>7.2%</b> 2018	<b>3.9%</b> 2018
<b>2b2 Female ICT specialists</b> % female employment	<b>3.0%</b> 2016	<b>3.1%</b> 2017	<b>3.0%</b> 2018	<b>1.4%</b> 2018
<b>2b3 ICT graduates</b> % graduates	<b>6.7%</b> 2015	<b>7.1%</b> 2016	<b>6.3%</b> 2017	<b>3.6%</b> 2017

Finland ranks 1<sup>st</sup> out of the 28 EU countries in human capital. At least basic digital skills levels remain well above the EU average at 76%, despite of the fact that Finland ranks 2<sup>nd</sup> on that indicator. Finland made significant progress in increasing the proportion of people with above basic digital skills jumping to 50% this year and gaining first position in the EU in this ranking. ICT specialists also represent an increased percentage of the workforce compared to the EU average (7.2% compared to 3.9% in the EU as a whole), affirming its lead position in that indicator too. ICT graduates in Finland account for 6.3% of the total number of graduates above the EU average (3.6%). Female ICT specialists account for 3% of total female employment, maintaining Finland's lead in this indicator.

Finland has the highest percentage of ICT specialists in the labour force in the EU, yet 66.2% of companies, which recruited or tried to recruit an ICT specialist, had difficulties doing so (by contrast, the EU average is 56.8%)<sup>(428)</sup>. Demand for graduates in ICT is high while graduate output struggles to meet the business demand and gender imbalances remain<sup>(429)</sup>.

To tackle demand, Finland is reforming its vocational and training schemes, focusing on digital skills and the quality of learning. Introducing coding and embedding it as a mandatory component of the school curriculum is a long-term action with the potential to satisfy the growing appetite for qualified ICT-related labour.

In addition, Finnish teachers report that they do not feel sufficiently prepared in terms of using ICT<sup>(430)</sup>. The proportion of Finnish teachers who feel well or very well prepared to use ICT for

<sup>(428)</sup> European Commission, Digital Scoreboard.

<sup>(429)</sup> [European education & training monitor 2019, Finland country report.](#)

<sup>(430)</sup> TALIS (OECD, 2019a).

teaching is the second lowest in the EU (21.5%, EU average 39.4%) while 19% say they need professional development in this area (EU average 16.1%). However, more than half report that their formal education covers that (55.6%, EU average 52.9%).

Finland is a frontrunner in anticipating the skills development needed for Artificial Intelligence (AI). Finland's free online AI course seeks to demystify the technology by making it more accessible. The course targets anyone interested in learning about AI without prior mathematical or programming skills required. This initiative by the Finnish government aims to attract 1% of the population to take up the challenge and learn more about AI basics such as machine learning and neural networks.

Finland is working for to establish its national Digital Skills and Jobs Coalition during the year 2020. It is also a signatory of the ministerial Declaration of commitment on women in digital.

Finland actively participated in the 2019 edition of EU Code Week with 145 activities bringing together 7,545 participants. Finland also organized DigiEduHack in 2019.

Finland's strong and consistent lead in human capital reflects the high levels of competence its workforce has, which is one of its strongest competitive advantages. Finland demonstrates the ability of its people, businesses, communities and public administration to produce, protect, understand and utilise information and technology. Finland advanced digitisation, and the skills necessary to thrive in it, through persistent action and broad, cross cutting cooperation between different sectors and organisations in society. It is spearheading efforts to bring AI closer to the public by improving their understanding of the technology and addressing the need for skills that accompanies it. Finland is also stepping up action to enhance teachers' skills in teaching science, technology, engineering and mathematics in order to stimulate students to choose these study fields.

**Highlight 2020: Learning science, technology, engineering and mathematics (STEM) and improving teachers' skills in these areas**

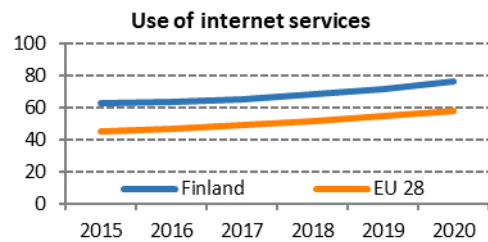
The Ministry of Education aims to boost the learning of science, mathematics and technology in schools through the €5 million it provided in support to the LUMA-SUOMI programme 2013-2019. The national LUMA centre is an umbrella organisation coordinated by the University of Helsinki, boosting cooperation between schools, universities and business. The objective is to motivate children to study STEM by promoting the latest pedagogical methods. It supports lifelong learning of teachers and strengthens research-based teaching. The main activities are i) continuing professional development for teachers, including an annual LUMA science day, ii) the national LUMA activation week for schools, iii) mathematics, science and technology camps for children, and iv) resource centres for mathematics and science. The programme will continue under the name of LUMA2020. Its practical implementation began in October 2019. About 160 learning communities were selected for the program including preschools, elementary schools, high schools, vocational schools and hobby schools. Currently, there are 13 LUMA centres from different Finnish universities and university campuses<sup>(431)</sup>.

<sup>(431)</sup> <https://www.luma.fi/en/centre/>



### 3 Use of internet services

3 Use of internet services	Finland		EU
	rank	score	score
<b>DESI 2020</b>	<b>1</b>	<b>76.3</b>	<b>58.0</b>
DESI 2019	4	71.8	55.0
DESI 2018	4	68.1	51.8

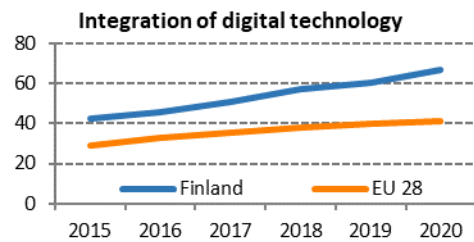


	Finland		EU	
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
<b>3a1 People who have never used the internet</b> % individuals	5%	4%	3%	9%
<b>3a2 Internet users</b> % individuals	92%	93%	93%	85%
<b>3b1 News</b> % internet users	90%	90%	85%	72%
<b>3b2 Music, videos and games</b> % internet users	91%	94%	94%	81%
<b>3b3 Video on demand</b> % internet users	37%	50%	50%	31%
<b>3b4 Video calls</b> % internet users	37%	46%	68%	60%
<b>3b5 Social networks</b> % internet users	70%	71%	70%	65%
<b>3b6 Doing an online course</b> % internet users	17%	17%	22%	11%
<b>3c1 Banking</b> % internet users	93%	94%	95%	66%
<b>3c2 Shopping</b> % internet users	75%	74%	77%	71%
<b>3c3 Selling online</b> % internet users	25%	29%	33%	23%

Finland ranks 1<sup>st</sup> in the EU as regards the use of internet services. Finns are keen to engage in a variety of online activities in line with the rest of the EU, the most popular online activity being banking, followed by music, videos and games, and news. 85% of Finnish internet users read news online (72% in the EU as a whole). Finns score above the EU average in all internet activities, with notable leadership in online banking. Furthermore, with 68% of users, the use of video calls is the activity with the highest growth, followed by doing an online course and selling online. With only 3% of Finns who have never used the internet, Finland is three times lower than the EU average (9%).

## 4 Integration of digital technology

4 Integration of digital technology	Finland		EU
	rank	score	score
<b>DESI 2020</b>	<b>2</b>	<b>67.0</b>	<b>41.4</b>
DESI 2019	5	60.1	39.8
DESI 2018	3	56.9	37.8



	Finland			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>4a1 Electronic information sharing</b>	<b>39%</b>	<b>39%</b>	<b>43%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>29%</b>	<b>29%</b>	<b>44%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>15%</b>	<b>19%</b>	<b>19%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>48%</b>	<b>50%</b>	<b>50%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>20%</b>	<b>20%</b>	<b>22%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>6%</b>	<b>6%</b>	<b>9%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

On the integration of digital technology by businesses into their activities, Finland ranks 2nd among EU countries, well above the EU average. Results across indicators improved with increases in the percentage of companies using electronic information sharing and social media. The use of cloud among Finnish companies is well above the EU average (50% in Finland, against 18% at the EU level). The country also performs well in the use of big data analysis (19% of Finnish companies, compared to an EU average of 12%). Finnish companies continue to take advantage of the possibilities offered by online commerce: 22% of SMEs sell online (above the EU average of 18%), 9% of all SMEs sell across borders (slightly above the EU average of 8%).

Finland is member of the EuroHPC Joint Undertaking and Finland will host one of the three pre-exascale supercomputers. Finland is a signatory of the Declaration on European Blockchain Partnership and the Declaration on Cooperation on Artificial Intelligence.

The Digital Finland Framework<sup>(432)</sup> coordinates sustainable digital transformation in Finland. The Framework combines key perspectives: 1) the digital innovations exploiting the benefits of the platform economy and the transformation of the spearhead industry sectors; 2) seamless support for sustainable digital transformation; and 3) responses to global megatrends and sustainable development goals. The Finnish government uses direct capital funding and regional grants to support various digital projects by local authorities in 2018-2022 with €400 million, linking that investment to the Digital Finland Framework.

<sup>(432)</sup> <https://www.businessfinland.fi/496a6f/globalassets/julkaisut/digital-finland-framework.pdf>

Recent action includes identifying priority areas (clean-tech, bio economy, ICT and health) to focus investment on technology-intensive sectors with the potential for upscaling. Finnish companies continue to be among the most advanced businesses in the EU in the integration of digital technologies.

Cloud services are becoming the norm, with many Finnish companies planning to evaluate the benefits of 5G technology, automation and AI in the future.

Despite the strong support for digitisation, disparities persist among sectors, and there are obstacles related to skills and awareness of the benefits digitisation offers.

According to the Finnish Innovation Survey, the importance of digitisation for business activity receives greater acknowledgement in services than in manufacturing companies (41% of service companies consider digitisation key to the firm's operations, compared to 25.4% of manufacturing companies).

A 2019 survey of 382 entrepreneurs reveals that many Finnish SMEs face challenges with digital skills<sup>(433)</sup>. While every second manager and entrepreneur in SMEs rated their digital skills as good, slightly over a third rated themselves as highly skilled in using digital resources. Lack of time and finding suitable ways to develop digital skills are the major challenges.

The 'Entrepreneurs of Finland' is cooperating with Google, as part of a tour around Finland offering free training events for SMEs through the 'New Growth with Digital Skills' programme.

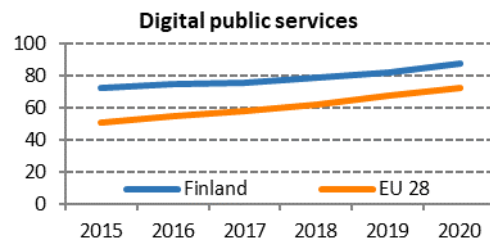
Finland has a high-level approach to policy issues including the digital and platform economies, AI and the data economy, usage of cloud computing services in companies and its digital economy competitiveness. These issues are not siloed and instead are approached holistically and horizontally, emphasising the opportunities of the digital economy and tech in sectors including health, education and manufacturing, always keeping the needs of business or people in mind. Finland's thriving digital sector encompasses manufacturing, burgeoning research and development and investment in digital infrastructure.

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<sup>(433)</sup> The commissioning of the study is done by the Entrepreneurs of Finland and Elisa Corporation. Planning, research, data collection, analysis and reporting were carried out by Prior Consulting Oy.

## 5 Digital public services

5 Digital public services	Finland		EU
	rank	score	score
<b>DESI 2020</b>	<b>4</b>	<b>87.0</b>	<b>72.0</b>
DESI 2019	3	82.0	67.0
DESI 2018	3	78.3	61.8



	Finland			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>5a1 e-Government users</b>	<b>91%</b>	<b>92%</b>	<b>94%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>86</b>	<b>82</b>	<b>82</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>94</b>	<b>96</b>	<b>96</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>80</b>	<b>86</b>	<b>92</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>76%</b>	<b>66%</b>
% of maximum score			2019	2019

In digital public services, Finland ranks 4<sup>th</sup> among EU countries, well above the EU average. This is primarily thanks to the high number of e-government users. Online interaction between public authorities and the public is high with 94% of Finnish internet users using e-government services, 2 percentage points up from last year. The country performs well also in relation to the availability of pre-filled forms, online service completion and open data. Finland has scaled up significantly in providing digital services to businesses with a score that grew by 6 percentage points compared to last year's.

The government programme 'Productive and inventive Finland: a digital agenda for 2011-2020' is the overarching document that guides all government activities from 2015-2020 with 5 strategic priorities, one being 'digitalisation, experimentation and deregulation'. It establishes a growth environment for digital business operations, services and business models with a strong focus on big data and robotisation as well as information security. There is no push for regional digitalisation agendas from the national level although some regions have introduced their own digital agendas, supporting broadband coverage and digital skills development. Digital programmes are drawn up and implemented on the municipal level too e.g. Helsinki, Tampere.

The regional digitisation process requires new information management legislation and a single-point service system. Municipalities are launching projects to increase public sector productivity and are paving the way for greater streamlining of public services. This will include the use of spatial data in services, scaling up supervision and developing automated financial management processes, procurement activities and reporting systems.

Finland's e-authorisation system allows people without easy access to a computer or the skills to use one to access e-services through someone else. That makes it the first country in the world that allows people to electronically authorise another person to make important decisions for them.

The digitisation of municipal administration and frontline healthcare infrastructure is an essential part of the government-led Smart Economy project. The initiative aims to ensure the availability of public funding and capital investments for digital transformation schemes.

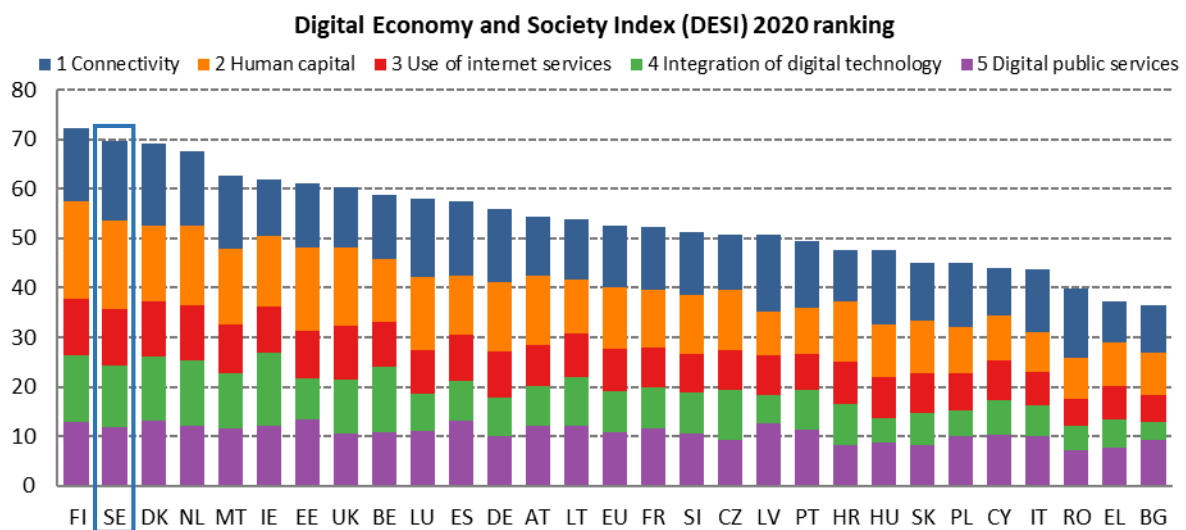
The national AuroraAI programme aims to strengthen Finland's ability to solve difficult issues in its society relating to the national economy's sustainability gap, the ageing population or the social exclusion of young people. It will implement an operations model based on people's needs, where AI helps individuals and companies use services in a timely and ethically sustainable manner. The authorities' activities will support people's life events and companies' business-related events, facilitating service paths that function smoothly involving several service providers. Using AI, the AuroraAI network will make it possible to allocate the current, partly siloed supply of services in a timely manner to individuals or companies in need of such services.

The preliminary study on AuroraAI identified the activities based on human-centricity and life event thinking, creating the test version of the AuroraAI network and an implementation plan for 2019–2023. The Ministry of Finance has appointed a strategic group to refine the implementation plan and create a joint, cross-sectoral view of the development and management of AuroraAI.

Finland excels in offering efficient digital public services and is one of the world leaders in this field. The Finnish government has prioritised the digitisation of public services projecting it as a transversal theme, cutting across all milestone projects in the service of its people and businesses. The ultimate goal is to make available public services that are digital and user-centred by developing principles for the digitisation of all public services and a one-stop-shop service system for the public and businesses, backed by the necessary information management legislation, governance and security. Finland's success is also due to the improved availability of open data and the country's forward thinking in using cutting-edge technology in service of its society, providing solutions to its societal challenges.

## Sweden

	Sweden		EU
	rank	score	score
<b>DESI 2020</b>	<b>2</b>	<b>69.7</b>	<b>52.6</b>
DESI 2019	2	67.5	49.4
DESI 2018	1	64.0	46.5



Sweden is a digital leader, ranking 2<sup>nd</sup> out of the 28 EU Member States with a score of 69.7 in the Digital Economy and Society Index (DESI) 2020, based on data prior to the pandemic.

The Swedish government adopted a digitisation strategy in 2017 with the overarching goal of making Sweden the world leader in harnessing the opportunities offered by digitisation. In order to progress, it is important to link the strategy to specific policy instruments and concrete targets, action plans, budget lines and clear responsibilities<sup>(434)</sup>.

Sweden is the front-runner when it comes to connectivity (ranking 2<sup>nd</sup> in the EU), but still faces challenges when it comes to the roll-out of broadband and coverage of remaining sparsely populated areas, as well as the timely assignment of 5G bands.

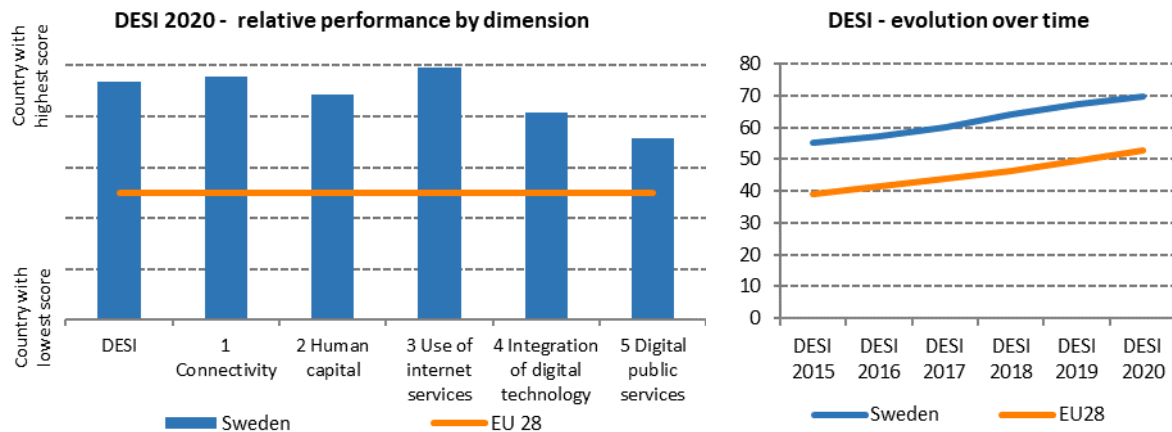
Sweden's human capital is one of its strongest competitive advantages (ranking 2<sup>nd</sup>). 72% of the population has at least basic digital skills and 46% above basic digital skills. To keep its technological edge it is important that the country addresses the unmet demand for digital experts.

Sweden also ranks 2<sup>nd</sup> when it comes to internet use. Almost all Swedes use the internet daily. Streaming of film, TV and music are all popular. Swedes are also keen users of online banking and shopping.

Swedish companies are integrating digital technology relatively well (ranking 6<sup>th</sup>), although progress is slowing and other countries are catching up. There is also a big difference between large companies and SMEs. To further boost the digital transformation of the Swedish economy, it is important that SMEs become more aware of the advantages of data-driven innovation.

<sup>(434)</sup> <https://digitaliseringsradet.se/media/1272/laegesrapport-digital-ledning-dnr-19-5942.pdf>

The Swedish public sector is digitally mature, ranking 10<sup>th</sup> in the EU, but other countries are progressing faster. The country ranks 23<sup>rd</sup> when it comes to open data, and it is important that it focuses on data as a strategic resource.



### The role of digital to manage the coronavirus pandemic and to support the economic recovery

The current COVID-19 crisis is having an important impact on key societal indicators, relating to the use of internet services by citizens. This does not show in the latest 2019 official statistics as reported in DESI. Consequently, the DESI 2020 findings need to be read in conjunction with the strained demand that has been put on digital infrastructure and services during the pandemic and the immediate actions taken by the Member States. Similarly, as Europe progressively exits from the pandemic, the recovery must be planned taking into account the lessons learnt from this crisis. This means a particular attention to the indicators relevant for a stronger and more resilient digital transformation and economic recovery, notably very high capacity networks (VHCNs) and 5G, digital skills, advanced digital technologies for businesses and digital public services.

Sweden has taken a number of targeted measures in digital to deal with the COVID-19 crisis. They include launching the platform *Skola Hemma*, which provides support to teachers and school leaders in the form of free tools, resources, practical tips, webinars etc. to handle remote teaching<sup>435</sup>. The government organised a national, virtual hackathon to come up with digital solutions to be used to combat the COVID-19 outbreak<sup>436</sup>. The Swedish Civil Contingencies Agencies is developing a digital self-assessment test, which aims to strengthen the public's risk awareness. The government has also requested the Swedish Post and Telecom Authority to take measures to help the elderly use IT and electronic communication services. Moreover, around €2.4 million has been allocated to the regions to develop and strengthen online communication channels between healthcare providers, patients with mental health problems and relatives when physical visits are not possible as a result of the spread of COVID-19<sup>437</sup>.

<sup>435</sup> <https://www.skolahemma.se/>

<sup>436</sup> <https://www.hackthecrisis.se/>

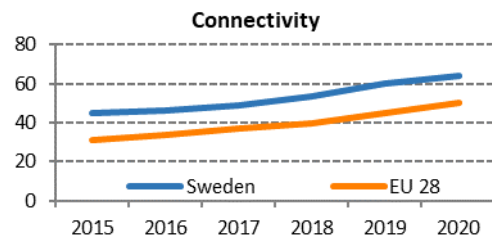
<sup>437</sup> <https://www.regeringen.se/pressmeddelanden/2020/04/utokade-digitala-kontaktvagar-for-att-varna-psykisk-halsa/>

Looking forward, as regards the DESI indicators that are especially relevant for the economic recovery after the COVID-19 crisis, Sweden performs well when it comes to 5G and Very High Capacity Networks (VHCN) and digital skills. On the other hand, it has a relatively weak performance in the digitisation of businesses and in digital public services.



## 1 Connectivity

1 Connectivity	Sweden		EU
	rank	score	score
<b>DESI 2020</b>	<b>2</b>	<b>64.4</b>	<b>50.1</b>
DESI 2019	1	60.1	44.7
DESI 2018	2	53.5	39.9



	DESI 2018	Sweden	DESI 2020	EU
	value	DESI 2019	value	DESI 2020
		value		value
<b>1a1 Overall fixed broadband take-up</b> % households	<b>78%</b> 2017	<b>78%</b> 2018	<b>86%</b> 2019	<b>78%</b> 2019
<b>1a2 At least 100 Mbps fixed broadband take-up</b> % households	<b>48%</b> 2017	<b>55%</b> 2018	<b>66%</b> 2019	<b>26%</b> 2019
<b>1b1 Fast broadband (NGA) coverage</b> % households	<b>78%</b> 2017	<b>86%</b> 2018	<b>85%</b> 2019	<b>86%</b> 2019
<b>1b2 Fixed Very High Capacity Network (VHCN) coverage</b> % households	<b>66%</b> 2017	<b>72%</b> 2018	<b>77%</b> 2019	<b>44%</b> 2019
<b>1c1 4G coverage</b> % households (average of operators)	<b>96%</b> 2017	<b>96%</b> 2018	<b>97%</b> 2019	<b>96%</b> 2019
<b>1c2 Mobile broadband take-up</b> Subscriptions per 100 people	<b>122</b> 2017	<b>121</b> 2018	<b>124</b> 2019	<b>100</b> 2019
<b>1c3 5G readiness</b> Assigned spectrum as a % of total harmonised 5G spectrum	<b>NA</b>	<b>22%</b> 2019	<b>22%</b> 2020	<b>21%</b> 2020
<b>1d1 Broadband price index</b> Score (0 to 100)	<b>NA</b>	<b>NA</b>	<b>66</b> 2019	<b>64</b> 2019

Sweden ranks second in connectivity, scoring 64.4, well above the EU average (50.1). Overall take-up of fixed broadband increased from 78% in 2017 to 86% in 2019, which is higher than the EU average of 78%. Fast broadband (NGA) coverage went up from 78% in 2017 to 85% in 2019, close to the EU average of 86%. Sweden has achieved a 66% take-up rate for at least 100 Mbps fixed broadband, almost two and a half times the EU average of 26%. Very high capacity network coverage also increased, reaching 77% (compared to 72% in 2018), exclusively thanks to FTTP networks, and Sweden now ranks eighth at EU level. In 2019, the prices remain close to the EU average and Sweden scores 66 on the broadband price index, compared with the EU average of 64. Take-up of mobile broadband has reached 124 subscriptions per 100 people and is one of the highest in Europe. Average 4G coverage in Sweden was 97% in 2019 up from 96% in 2018, while the European average is 96%.

Sweden is a front-runner in very high capacity connectivity in Europe, but in order to reach its ambitious national broadband targets it needs to address coverage in remote areas. 84% of Swedish households already had access to 100 Mbps speeds in 2018. The goal is by 2020 to reach 95% coverage of 100 Mbps, and by 2025, 99.9% coverage of 100 Mbps and 98% coverage of 1 Gbps (homes passed). To reach these targets, roll-out in remaining sparsely populated areas needs to speed up. For the next 3 years, the Swedish government has allocated SEK 650 million (€61.16 million) for broadband development. Sweden is preparing a new national State aid scheme for the distribution of this funding for the effective deployment of broadband. Approximately SEK 150 million (€14.11 million) will be available for 2020. The Swedish Post and Telecom Authority (PTS)

estimates that in addition to the allocations and commercial investments, an additional investment of SEK 22 billion (€2.07 billion) is required in the next three years in order to reach all targets set for 2025 in the national broadband strategy. In June 2019, the Swedish government gave PTS the assignment to evaluate how future support for broadband could be designed effectively, based on the PTS's earlier report from 2017 with suggestions for future support measures in the broadband area. PTS's proposal for the State aid scheme was submitted to the government in January 2020 and concerns a state-subsidised scheme. The new state-aid scheme aims to promote the support of a long-term sustainable infrastructure of good-performance enabling access to 1 Gbps speeds, as well as a cost-effective expansion that contributes to the goals of the broadband strategy for 2020 and 2025. The support scheme sets regional priorities and covers non-urban areas, where there is no access to next-generation access networks. Following an ordinance from the Swedish government, the Swedish Transport Administration managed to make the permit procedure shorter and more efficient, in order to tackle delays in deployment in sparsely populated areas due to permit-granting procedures. Private investments in broadband are still ongoing, but the pace of fibre roll-out has decreased since the 2016 peak. The main reason for this is probably market saturation and the fact that mostly rural/difficult/rocky areas remain to be covered. Telia, the largest private investor, announced an investment slow-down and is examining other business scenarios for roll-out in difficult/rural areas, such as Fixed Wireless Access. Local networks continue their investments, and IP-Only has announced an increase in its fibre investments in the next years.

Sweden ranks 13th in the 5G readiness indicator<sup>(438)</sup>. A total of 60 licenses for 5G test trials have been issued since the release of PTS spectrum plan for 5G test licenses in March 2017, with 38 in the 3.4 – 3.8 GHz, 8 in the 2.3 GHz and 4 in the 26 GHz-band at 27 different locations. In Sweden, 37 5G trial licences in 15 different locations (mainly urban) have been issued for spectrums in the 5G pioneer bands, 3.4-3.8 GHz and 24.25-27.5 GHz as well as in the 2.3 GHz band. 48% of the spectrum harmonised at EU level for wireless broadband has been assigned. There is still no decision from the Government on the use of the reserved 2x10 MHz FDD spectrum in the 700MHz band, and no decision for the 20 MHz SDL spectrum that remained unsold. Despite the fact that this spectrum, according to the Government's decision, is still available for DTT until the end of 2020, both the Ministry and the PTS confirmed that the entire 700 MHz band is no longer used for terrestrial TV broadcasting. The auction for the 3.4-3.8 GHz band was initially planned for March 2020 but has been postponed until October 2020 to take into consideration the national security issues concerning 5G roll-out. PTS ran a public consultation for the 26 GHz in January 2020.

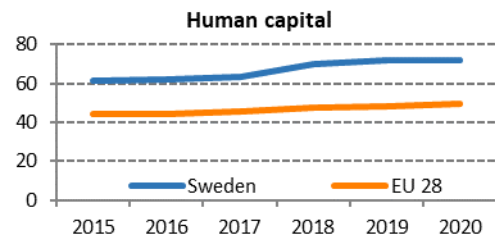
Sweden is a front-runner in ultrafast connectivity in Europe. The biggest challenge for achieving the goals of its ambitious national broadband strategy by 2020 is to address the difficulties of ensuring roll-out and coverage of the remaining sparsely populated areas. In this respect, a spectrum policy consistent with its investment needs will be key. The successful deployment of 5G in Sweden depends on the timely availability and assignment of the 5G pioneer bands. The Ministry is working together with PTS and the other relevant authorities to solve the delays with the permit-granting procedures and to allocate funding more efficiently.

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<sup>(438)</sup> The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for 5G use by 2020 within the 5G pioneer bands in each EU Member State. For the 3.4-3.8 GHz band, this means that only licences aligned with the technical conditions in the Annex to Commission Decision (EU)2019/235, are considered 5G-ready. For the 26 GHz band, only assignments aligned with the technical conditions in the Annex to Commission Implementing Decision (EU) 2019/784 are taken into account. By contrast, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

## 2 Human capital

2 Human capital	Sweden		EU
	rank	score	score
<b>DESI 2020</b>	<b>2</b>	<b>71.7</b>	<b>49.3</b>
DESI 2019	2	71.6	47.9
DESI 2018	2	69.9	47.6



	Sweden			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>2a1 At least basic digital skills</b>	<b>77%</b>	<b>77%</b>	<b>72%</b>	<b>58%</b>
% individuals	2017	2017	2019	2019
<b>2a2 Above basic digital skills</b>	<b>46%</b>	<b>46%</b>	<b>46%</b>	<b>33%</b>
% individuals	2017	2017	2019	2019
<b>2a3 At least basic software skills</b>	<b>78%</b>	<b>78%</b>	<b>74%</b>	<b>61%</b>
% individuals	2017	2017	2019	2019
<b>2b1 ICT specialists</b>	<b>6.3%</b>	<b>6.6%</b>	<b>6.8%</b>	<b>3.9%</b>
% total employment	2016	2017	2018	2018
<b>2b2 Female ICT specialists</b>	<b>2.8%</b>	<b>2.9%</b>	<b>3.0%</b>	<b>1.4%</b>
% female employment	2016	2017	2018	2018
<b>2b3 ICT graduates</b>	<b>3.5%</b>	<b>3.7%</b>	<b>4.3%</b>	<b>3.6%</b>
% graduates	2015	2016	2017	2017

Sweden ranks 2<sup>nd</sup> out of the 28 EU countries in the human capital dimension. In general, Swedes have a good level of digital skills. 46% of the Swedish adult population has above-basic digital skills. 52% of employees, self-employed and family workers have above basic digital skills, among the highest in the EU. Sweden also has a high number of ICT specialists compared to other EU countries, at 6.8% of total employment. Female ICT specialists account for 3% of total female employment, which is among the highest in the EU. However, 72% of Swedish enterprises (EU average 57%) who tried to recruit ICT specialists report that it is hard to fill vacancies. Moreover, only 4.3% of graduates study ICT, leaving Sweden at 12<sup>th</sup> place in the EU.

The Swedish education system is one of the most digitalised in the EU. A revised curriculum for early childhood learning is in place since autumn 2019. It aims, among others, to ensure that every child can use digital tools in a way that stimulates development and learning. In primary education, programming has been incorporated into the national curriculum since 2018 and national tests are being digitised. A digital strategy for school system<sup>(439)</sup> has been in place since 2017 and an action plan<sup>(440)</sup> was presented to the government in March 2019, containing 18 proposals involving different stakeholders. The slow start of the implementation of these actions casts doubt on whether the goals will be achieved by 2022.<sup>(441)</sup> However, in December, the government took a step

<sup>(439)</sup> <http://skoldigiplan.se/nationelldigitaliseringsstrategi.2417.html>

<sup>(440)</sup> <http://skoldigiplan.se/>

<sup>(441)</sup> <http://skoldigiplan.se/download/18.57b4a3ba16e6b961dbf6812c/1574065764134/Lagesbeskrivning-november-2019-Nationell-handlingsplan-for-digitalisering-av-skolvasendet.pdf>

forward and decided that the National Agency for Education will coordinate the digitisation of the school system<sup>(442)</sup>.

To inspire more people to be willing to participate in digital development the association 'Future Work Forum' launched *Digital@Dag* (Digital Day) for the first time in November 2019. It aims to be a nationwide thematic day on the opportunities and challenges of digitalisation, which involves 100 actors<sup>(443)</sup>.

To help tackle the lack of Artificial Intelligence (AI) experts, the Swedish government is putting a special focus on education, including professional education and re-training, in the 'National Focus on AI'<sup>(444)</sup>. It has also provided extra government funding to universities to organise short specialist courses to strengthen life-long learning skills related to the development and use of AI. In 2019, the government also tasked the Swedish Higher Education Authority and the Agency for Economic and Regional Growth with analysing and providing suggestions on how the pool of digital experts can be developed both in the short and long term<sup>(445)</sup>.

The Swedish Digital Skills and Jobs Coalition, led by the IT and telecom industries, was launched in 2018. It has close to 30 members, including industry, employer associations, unions and representatives from the education sector. The aim of the Coalition is to increase awareness of the need for digital competences in society. It emphasises the need for cooperation and coordination to ensure digital competences for all citizens in an accessible and inclusive way.

The EU Code Week is supported by volunteer ambassadors, leading teachers and the Swedish Association of Local Authorities and Regions (SALAR). Sweden ranked 37<sup>th</sup> out of over 80 participating countries in 2019, and counted 298 activities involving nearly 11,000 people. 63% of activities took place in schools and the average female participation rate was 51%<sup>(446)</sup>.

To reach the goals set out in the digitisation strategy for the school system by 2022, all actors must dedicate appropriate resources and work more actively. Skills mismatches in the labour force limit the capacity of companies to innovate and capitalise from innovation. If Sweden wants to keep its edge in the digital economy, increasing the number of digital experts, involving more women in digitally intensive sectors and up-skilling the labour force are factors of great importance.

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<sup>(442)</sup> <https://www.regeringen.se/debattartiklar/2019/12/skolverket-far-ansvar-for-digitaliseringen/>

<sup>(443)</sup> <https://digitalidag.org/>

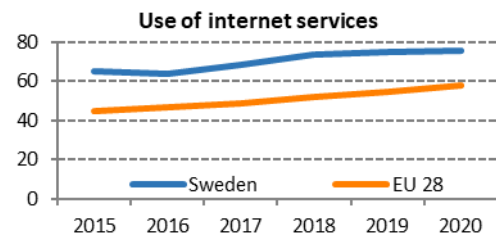
<sup>(444)</sup> <https://www.regeringen.se/informationsmaterial/2018/05/nationell-inriktning-for-artificiell-intelligens/>

<sup>(445)</sup> <https://www.uka.se/om-oss/aktuellt/nyheter/2019-08-23-uka-far-nytt-uppdrag--kompetensforsorjning-av-digital-spetskompetens.html>

<sup>(446)</sup> <https://blog.codeweek.eu/post/190421452885/new-record-for-eu-code-week-42-million>

### 3 Use of internet services

3 Use of internet services	Sweden		EU
	rank	score	score
<b>DESI 2020</b>	<b>2</b>	<b>76.0</b>	<b>58.0</b>
DESI 2019	2	75.0	55.0
DESI 2018	1	73.7	51.8



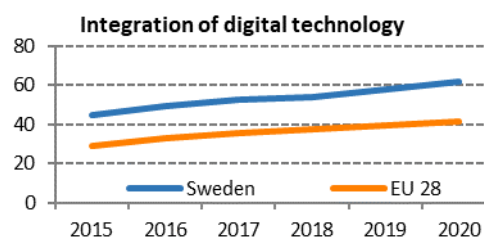
	Sweden			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
	value	value	value	value
<b>3a1 People who have never used the internet</b>	<b>2%</b>	<b>4%</b>	<b>2%</b>	<b>9%</b>
% individuals	2017	2018	2019	2019
<b>3a2 Internet users</b>	<b>95%</b>	<b>91%</b>	<b>95%</b>	<b>85%</b>
% individuals	2017	2018	2019	2019
<b>3b1 News</b>	<b>88%</b>	<b>88%</b>	<b>82%</b>	<b>72%</b>
% internet users	2017	2017	2019	2019
<b>3b2 Music, videos and games</b>	<b>91%</b>	<b>92%</b>	<b>92%</b>	<b>81%</b>
% internet users	2016	2018	2018	2018
<b>3b3 Video on demand</b>	<b>49%</b>	<b>61%</b>	<b>61%</b>	<b>31%</b>
% internet users	2016	2018	2018	2018
<b>3b4 Video calls</b>	<b>58%</b>	<b>58%</b>	<b>65%</b>	<b>60%</b>
% internet users	2017	2018	2019	2019
<b>3b5 Social networks</b>	<b>74%</b>	<b>76%</b>	<b>74%</b>	<b>65%</b>
% internet users	2017	2018	2019	2019
<b>3b6 Doing an online course</b>	<b>18%</b>	<b>18%</b>	<b>19%</b>	<b>11%</b>
% internet users	2017	2017	2019	2019
<b>3c1 Banking</b>	<b>90%</b>	<b>91%</b>	<b>87%</b>	<b>66%</b>
% internet users	2017	2018	2019	2019
<b>3c2 Shopping</b>	<b>84%</b>	<b>84%</b>	<b>84%</b>	<b>71%</b>
% internet users	2017	2018	2019	2019
<b>3c3 Selling online</b>	<b>22%</b>	<b>27%</b>	<b>NA</b>	<b>23%</b>
% internet users	2017	2018	2019	2019

95% of Swedes use the internet every day or almost every day ranking 2<sup>nd</sup> in the EU. However, according to the 2019 edition of *The Swedes and the internet*<sup>(447)</sup> 9% of the population above 12 years old say they do not feel part of the digital society. According to the report, Youtube is the biggest provider for watching films online (bigger than Netflix). Moreover, 47% of Swedes listen to music online every day, and the proportion of people who pay for digital subscriptions to film and music online is increasing. Swedes also use social media, but 40% do not believe that the time they spend there is meaningful. When it comes to gaming, more than half of internet users play online and a tenth play for money. One fifth of internet users also watch other people play games. In the 12-15 age group, two thirds watch others play. The majority of Swedes use internet banking, mobile bank identification and payment apps. 80% feel safe when paying online. Shopping online is popular and many internet users also sell goods or services online.

<sup>(447)</sup> <https://svenskarnaochinternet.se/rapporter/svenskarna-och-internet-2019/>

## 4 Integration of digital technology

4 Integration of digital technology	Sweden		EU
	rank	score	score
<b>DESI 2020</b>	<b>6</b>	<b>62.1</b>	<b>41.4</b>
DESI 2019	6	57.9	39.8
DESI 2018	6	54.2	37.8



	Sweden			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>4a1 Electronic information sharing</b>	<b>31%</b>	<b>31%</b>	<b>37%</b>	<b>34%</b>
% enterprises	2017	2017	2019	2019
<b>4a2 Social media</b>	<b>25%</b>	<b>25%</b>	<b>40%</b>	<b>25%</b>
% enterprises	2017	2017	2019	2019
<b>4a3 Big data</b>	<b>10%</b>	<b>10%</b>	<b>10%</b>	<b>12%</b>
% enterprises	2016	2018	2018	2018
<b>4a4 Cloud</b>	<b>NA</b>	<b>43%</b>	<b>43%</b>	<b>18%</b>
% enterprises	2017	2018	2018	2018
<b>4b1 SMEs selling online</b>	<b>28%</b>	<b>30%</b>	<b>30%</b>	<b>18%</b>
% SMEs	2017	2018	2019	2019
<b>4b2 e-Commerce turnover</b>	<b>15%</b>	<b>18%</b>	<b>18%</b>	<b>11%</b>
% SME turnover	2017	2018	2019	2019
<b>4b3 Selling online cross-border</b>	<b>10%</b>	<b>10%</b>	<b>10%</b>	<b>8%</b>
% SMEs	2017	2017	2019	2019

Sweden remains 6<sup>th</sup> in the EU when it comes to integration of digital technologies in enterprises. 50% of Swedish enterprises get a high or very high digital intensity score. However, there is a big difference between large companies and SMEs. 18% of SMEs have very low digital intensity compared to 1% of large companies. Moreover, only 31% of SMEs provide training for their staff to develop or upgrade their skills in information and communication technologies, compared to 80% in large companies. Swedish companies use cloud services, social media and sell online to a relatively high extent compared to European counterparts. However, they lag behind when it comes to using big data, where Sweden ranks 19<sup>th</sup>, and in selling online across border to other EU countries (10<sup>th</sup> place).

In line with the Swedish smart industry strategy, the government supports the digital transformation of SMEs through, for example, vouchers for consultancy services (€10.7 million). The government has also provided €1.46 million to improve the digital skills of management teams of SMEs. Moreover, to help SMEs become better at exploiting the potential of data-driven innovation and data as a resource – an area where Swedish companies fall behind their European counterparts – the government has tasked the Swedish Agency for Economic and Regional Growth with helping SMEs use data as a strategic resource. The Agency will identify sectors and industries where there is the greatest potential, and organise seminars and pilot projects in a laboratory environment<sup>(448)</sup>.

<sup>(448)</sup> <https://www.regeringen.se/pressmeddelanden/2019/06/data-som-resurs-ska-hoja-sma-och-medelstora-foretag/>

The Agency and Almi<sup>(449)</sup> have also been tasked with supporting SMEs in rural areas with digitisation process<sup>(450)</sup>. Companies are offered help to create clear targets and action plans, as well as information on how the investment in digital can be financed in the form of loans, venture capital, cheques and grants. The budget for 2019-2020 is €5.4 million<sup>(451)</sup>.

AI is expected to have a strong impact on Swedish society. The Swedish government adopted a national approach on AI in 2018 with the aim of making Sweden a leader in harnessing the opportunities that the use of AI can offer to strengthen Sweden's welfare and competitiveness. The Swedish Innovation Agency (Vinnova) will invest €100 million over the next 10 years in AI-related projects such as strengthening AI environments and development of projects. This complements the investment of the same amount made by the Wallenberg Foundation in machine learning, deep learning, explainable AI as well as the mathematics behind AI. In June 2019, the government announced the investment of SEK 40 million in professional education in AI. Universities – led by Chalmers University of Technology – will develop short specialists courses targeting professionals to strengthen their skills related to the development of AI<sup>(452)</sup>.

Sweden is committed to advancing and to investing strategically in new digital technologies through EU-coordinated programmes. The country is a member of the EuroHPC Joint Undertaking and it has signed the declaration establishing a European Blockchain partnership and the declaration on cooperation on AI. At the end of 2019, Sweden also signed the declaration on quantum communication infrastructure<sup>(453)</sup>.

To further boost the digital transformation of the Swedish economy, it is important that SMEs become more aware of the advantages of data-driven innovation. To keep its technological edge, it is important that the country also tackles the lack of digital experts.

### **Highlight 2020: AI Innovation of Sweden**

AI Innovation of Sweden<sup>(454)</sup> is a national centre for applied AI research and innovation, with the aim of strengthening the competitiveness of Swedish industry and of its public sector. The initiative links academia, business and the private sector. It is funded by Vinnova and the Västra Götaland Region and brings together more than 50 partners from industrial and public sectors, research institutions, and the academic world. AI Innovation Of Sweden focuses on accelerating the implementation of AI through sharing of knowledge and data and co-location of competences and collaboration projects, all with a strong emphasis on ethics, transparency, and security. The AI Innovation Centre was inaugurated in February 2019 and is situated in Gothenburg, but nodes will also open in other locations in Sweden.

<sup>(449)</sup> Almi is a state-owned company which consists of 16 regional subsidiaries and the Almi Invest subgroup. The regional subsidiaries provide loans and business development opportunities.

<sup>(450)</sup> <https://www.almi.se/nyheter/nationella/foretag-pa-landsbygden-ska-bli-bättre-pa-digitalisering/>

<sup>(451)</sup> <https://tillvaxtverket.se/amnesomraden/regional-kapacitet/landsbygdsuppdrag.html>

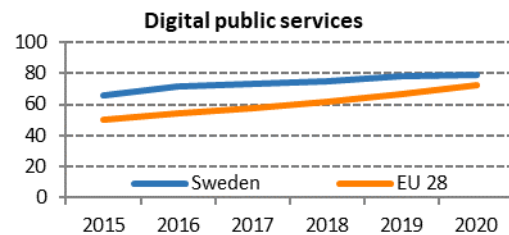
<sup>(452)</sup> Sources AI strategy of Sweden + information survey with MS.

<sup>(453)</sup> <https://ec.europa.eu/digital-single-market/en/news/future-quantum-eu-countries-plan-ultra-secure-communication-network>

<sup>(454)</sup> <https://www.ai.se/en/about>

## 5 Digital public services

5 Digital public services	Sweden		EU
	rank	score	score
<b>DESI 2020</b>	<b>10</b>	<b>79.3</b>	<b>72.0</b>
DESI 2019	9	77.9	67.0
DESI 2018	6	74.8	61.8



	Sweden			EU
	DESI 2018	DESI 2019	DESI 2020	DESI 2020
<b>5a1 e-Government users</b>	<b>90%</b>	<b>93%</b>	<b>89%</b>	<b>67%</b>
% internet users needing to submit forms	2017	2018	2019	2019
<b>5a2 Pre-filled forms</b>	<b>74</b>	<b>76</b>	<b>76</b>	<b>59</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a3 Online service completion</b>	<b>90</b>	<b>92</b>	<b>92</b>	<b>90</b>
Score (0 to 100)	2017	2018	2019	2019
<b>5a4 Digital public services for businesses</b>	<b>92</b>	<b>92</b>	<b>92</b>	<b>88</b>
Score (0 to 100) - including domestic and cross-border	2017	2018	2019	2019
<b>5a5 Open data</b>	<b>NA</b>	<b>NA</b>	<b>55%</b>	<b>66%</b>
% of maximum score			2019	2019

Swedes are among the top users of e-Government services, but other EU countries are progressing faster. According to the annual report 'Swedes and the internet'<sup>(455)</sup>, 85% of those above 16 years old believe that digital public services make their lives easier. One contributing reason may be that it is possible to use mobile bank identification for most e-services, and 84% of the population (+16 years) and nearly 99% of those aged between 21 and 50 have an electronic bank identity. 51% of the population (+16) use a digital mailbox to receive information from over 100 public authorities, municipalities and regions. Sweden ranks 23<sup>rd</sup> when it comes to open data, which pulls the country's ranking in digital public services down.

In 2019, the government gave the Agency for Digital Government (DIGG) and several other agencies assignments related to open data and the use of new technologies, including artificial intelligence in the public sector<sup>(456)</sup>. Two assignments<sup>(457)</sup> aim to establish a national framework for basic data and a common digital infrastructure that will simplify and streamline information exchange between authorities, regions and municipalities. The underlying principle is that citizens and companies should only have to report information once.

DIGG estimates that the use of AI within public administration could strengthen the welfare system and create an economic value equivalent to SEK 140 billion per year, which equals 6% of the total public expenditure in Sweden. Areas that need to be improved to increase the public's ability to use

<sup>(455)</sup> <https://svenskarnaochinternet.se/rapporter/svenskarna-och-internet-2019/>

<sup>(456)</sup> <https://www.regeringen.se/49a186/contentassets/ba64455f7f9e435b8cb5b675d3681bf7/uppdrag-att-oka-den-offentliga-forvaltningens-formaga-att-tillgangliggora-oppna-data.pdf>

<sup>(457)</sup> <https://www.digg.se/nyheter--publikationer/nyheter/digg-far-tva-nationella-uppdrag-for-att-utveckla-gemensamma-it-losningar>



AI include governance and management, legal development, skills provision, digital infrastructure, data management and innovation<sup>(458)</sup>.

In 2019, the government tasked SALAR with boosting digital skills and competences in municipalities and regions. The aim is to increase the ability to take advantage of the opportunities offered by digitalisation, manage its challenges and increase the modernisation of welfare in the public sector. SALAR offers workshops in digital competence development for politicians, senior officials and other key people, adapted to the needs of municipalities and regions<sup>(459)</sup>.

Digital care is on the rise. The use of remote consultations has increased sharply in primary care, largely driven by two companies. This resulted in increased costs for the regions, but still only amounts to a small proportion of the primary care budget. A national recommendation for the pricing of digital care, along with a minimum patient fee for such contacts, has been reached<sup>(460)</sup>. Digital care also includes self-monitoring and registration of values, and computer programmes that use AI to give advice about health needs based on the patient's questions<sup>(461)</sup>.

In September 2019, the government presented new measures to strengthen information security and increase society's resilience to cyberattacks. In 2020, a national cybersecurity centre will be established with the aim of strengthening Sweden's overall ability to prevent, detect and manage cyber threats. In addition, the government has asked the Civil Contingencies Agency to carry out targeted educational actions and to develop a structure for monitoring systematic information security work in the public administrations<sup>(462)</sup>.

The Swedish public sector is digitally mature, but it is important to focus on data as a strategic resource and better leadership complemented with work on trust and accessibility in digital services. According to the OECD, there are good conditions for using data to build citizen-related services, analyse complex societal changes and promote digital innovation.

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<sup>(458)</sup> <https://www.mynewsdesk.com/se/digg-myndigheten-foer-digital-foervaltning/pressreleases/vaerdet-av-ai-inom-det-offentliga-beraeknas-till-miljarder-aarligen-2960861>

<sup>(459)</sup> <https://skr.se/demokratiledningstyrning/digitalkompetensutveckling.27897.html>

<sup>(460)</sup> <http://www.oecd.org/publications/sweden-country-health-profile-2019-2dcb7ca6-en.htm>

<sup>(461)</sup> <https://skr.se/halsasjukvard/ehalsa/dethargorskrinomehalsa/digitalavardtjanster.28304.html>

<sup>(462)</sup> <https://www.regeringen.se/pressmeddelanden/2019/09/regeringen-genomfor-atgarder-for-starkt-informations--och-cybersakerhet/>