



Digital Economy and Society Index (DESI)

2019 Country Report

Germany

About the DESI

The European Commission has been monitoring Member States' digital competitiveness with the Digital Economy and Society Index (DESI) reports since 2015. The set of reports includes both country profiles and thematic chapters.

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. An in-depth telecoms chapter is annexed to the reports for each Member State.

The thematic chapters present a European-level analysis of broadband connectivity, digital skills, use of the internet, digitisation of businesses, digital public services, the ICT sector and its R&D spending, and Member States' use of Horizon 2020 funds.

To improve the methodology and take account of the latest technological developments, a number of changes have been made to the DESI for 2019. The DESI now covers:

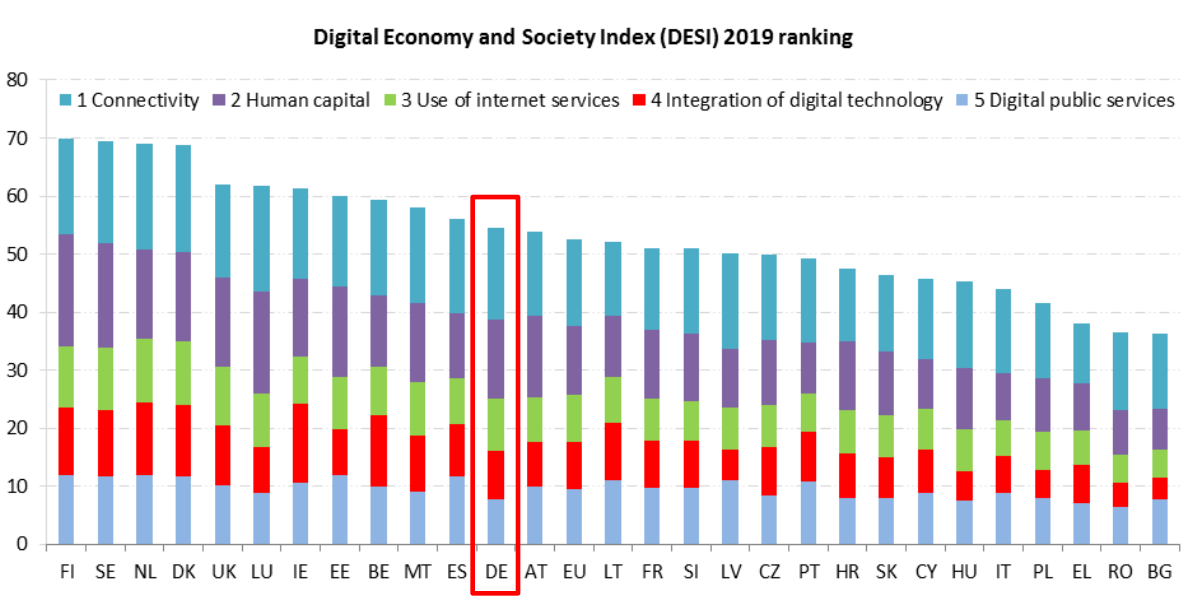
- *5G readiness,*
- *Above basic digital skills,*
- *At least basic software skills,*
- *Female ICT specialists,*
- *ICT graduates,*
- *People who never used the internet,*
- *Professional social networks,*
- *Doing an online course,*
- *Online consultations and voting,*
- *Individuals selling online,*
- *Big data,*
- *Medical data exchange and*
- *e-Prescriptions.*

The DESI was re-calculated for all countries for previous years to reflect the above changes in the choice of indicators and corrections to the underlying data. Country scores and rankings may thus have changed compared with previous publications.

For further information, please consult the DESI website: <https://ec.europa.eu/digital-single-market/en/desi>.

Germany overview

	Germany		EU
	rank	score	score
DESI 2019	12	54.4	52.5
DESI 2018	13	51.8	49.8
DESI 2017	11	49.4	46.9



Germany ranks 12th out of the 28 EU Member States in the European Commission Digital Economy and Society Index (DESI) 2019.

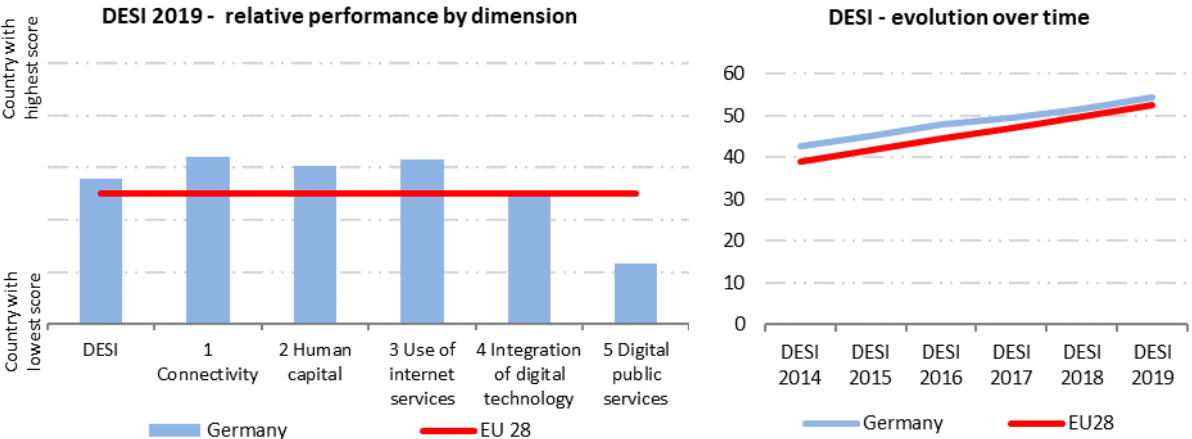
Germany performs well in most DESI dimensions, thanks to the wide availability and high take-up of basic fixed broadband. The country performs above average in digital skills and has increased its score in the Integration of digital technologies by enterprises. Although it has improved the take-up of fast broadband, it still scores below the EU average as regards the take-up of ultrafast broadband. As regards digital skills, Germany is among the EU's top performers. The share of ICT specialists has also increased since 2017. Among all dimensions, Germany ranks highest (ninth) in the Use of internet services, as Germans are keen to engage in online activities; only 5 % of them have never used the internet.

The country's greatest digital challenge is to improve online interaction between public authorities and members of the public. Germany ranks 26th in the use of e-government services, with only 43 % of internet users being e-government users, while a mere 7% of individuals use e-health services.

In 2014, Germany adopted its Digital Agenda 2014-2017¹ and in March 2016, the Federal Ministry for Economic Affairs and Energy presented the Digital Strategy 2025². A state minister for digital affairs

¹ <https://www.bmwi.de/Redaktion/EN/Publikationen/digital-aganeda-2014-2017.html>

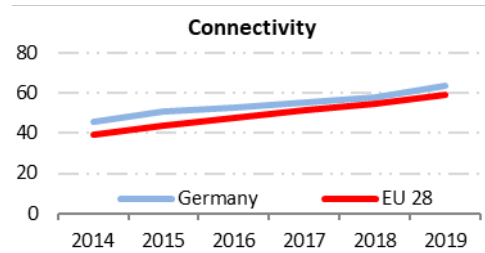
attached to the Chancellor’s Office has become part of the new government established in March 2018.



² <https://www.de.digital/DIGITAL/Redaktion/EN/Publikation/digital-strategy-2025.html>

1 Connectivity

1 Connectivity	Germany		EU
	rank	score	score
DESI 2019	11	63.4	59.3
DESI 2018	9	57.6	54.8
DESI 2017	9	55.2	51.2



	DESI 2017	Germany	DESI 2019		EU
	value	DESI 2018 value	value	rank	DESI 2019 value
1a1 Fixed broadband coverage % households	98%	98%	98%	15	97%
	2016	2017	2018	2018	2018
1a2 Fixed broadband take-up % households	86%	88%	87%	4	77%
	2016	2017	2018	2018	2018
1b1 4G coverage % households (average of operators)	86%	88%	90%	24	94%
	2016	2017	2018	2018	2018
1b2 Mobile broadband take-up Subscriptions per 100 people	73	79	81	23	96
	2016	2017	2018	2018	2018
1b3 5G readiness Assigned spectrum as a % of total harmonised 5G spectrum	NA	NA	33%	3	14%
			2018	2018	2018
1c1 Fast broadband (NGA) coverage % households	82%	84%	88%	14	83%
	2016	2017	2018	2018	2018
1c2 Fast broadband take-up % households	26%	36%	44%	14	41%
	2016	2017	2018	2018	2018
1d1 Ultrafast broadband coverage % households	NA	66%	66%	16	60%
		2017	2018	2018	2018
1d2 Ultrafast broadband take-up % households	8%	11%	15%	19	20%
	2016	2017	2018	2018	2017
1e1 Broadband price index Score (0 to 100)	94	92	93	3	87
	2016	2017	2018	2018	2017

In 2018, Germany made progress with most Connectivity indicators. Since other countries were progressing faster, however, it fell from place 9 to place 11. Fixed broadband coverage stands at 98 %. Although rural next-generation access (NGA) coverage has significantly improved since 2017, from 54 % to 66 %, and is above the EU average, the digital divide between urban and rural areas is still obvious (total fixed NGA coverage was 88 % in Germany in 2018). Germany performs particularly well in fixed broadband prices and in fixed broadband take-up. Currently, 87 % of households subscribe to fixed broadband. Ultra-fast broadband coverage is at 66 %, above the EU average of 60 %, but is static year over year, reflecting its reliance on upgraded legacy infrastructure. As regards the Broadband Pricing Index (based on several fixed broadband offers and also income), Germany ranked the third best in the EU. Mobile broadband prices for handset offers³ have fallen substantially over the past year (from EUR 19.30 to EUR 15.20), and are even below the EU average (EUR 22.30).

³ Offers from February 2018 including 1 GB, 300 calls and 225 SMS.

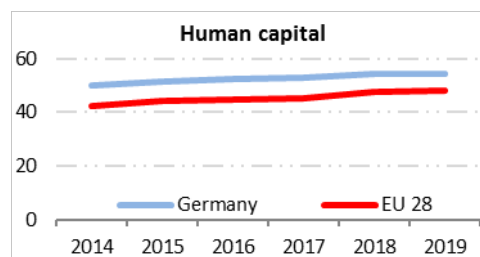
The Federal Ministry of Transport and Digital Infrastructure (*BMVI*) is working on a gigabit strategy including a commitment to full coverage by gigabit-ready networks by 2025. A commercial upgrade of cable networks should contribute about 75 % to achieving this goal. Commercial fibre roll-out is expected to increase, but it is not clear to what extent it will go beyond the areas currently covered by cable networks. It is expected that at least 10 % of households will be connected with fibre by subsidy programmes in white spots. For the remaining 15 % of households, which have at least 30 Mbps available via NGA networks, but with connections which cannot be upgraded to gigabit speeds, the government is working on a programme to subsidise such 'grey areas' and on rolling out of direct fibre connections to socio-economic drivers (schools, hospitals, business parks, etc.) by 2021. Besides, the Government coalition agreement announces a legal 'right to fast Internet' with effect from 1 January 2025.

In Germany, 52 % of the total 2090 MHz spectrum harmonised at EU level for wireless broadband has been assigned. Germany ranks third in the 5G readiness indicator, as by the end of 2018, it had assigned spectrum in the 700 MHz band, and the spectrum is expected to become available for use for 5G by 2020. The spectrum award of the 2 GHz and the 3.6 GHz bands started in the second half of March 2019. The main issues under debate are coverage and access obligations as part of the auction design. It is planned to award the 3.7-3.8 GHz and of the 24.25 GHz to 27.5 GHz bands by the end of 2020, including the option of licensing directly to industrial users with spectrum sharing with other users (such as MNOs) outside industrial sites. 5G is being trialled by MNOs, as DTAG and Vodafone have launched the first 5G sites. Policy envisages stimulating dynamic demand for 5G services by creating lighthouse projects, especially ones involving new collaborations with 'vertical' industrial and service sectors. Various research projects for automated driving (including in urban test fields and on motorways) and for integrating 5G into industrial communications networks are currently running.

Germany continues to face challenges on the fixed and mobile markets. There is an obvious urban-rural digital divide regarding fixed NGA coverage and the share of fibre connections is still very low. While federal broadband funding has been refocussed and applies, de facto, almost exclusively to fibre, and preparations for increased funding over the next four years are on track, the incumbent's focus on vectoring technology (now including super-vectoring) could further delay deployment of gigabit connections. The incumbent's plans for substantial investment in fibre (of the order of two million new connections annually) would not kick in before 2021 and are still said to be contingent on adaptations to the policy and regulatory framework. While policy for encouraging demand for 5G services is progressing, the political debate about coverage and access obligations in the 5G auction was intense and debate on the regulatory implementation of the obligations is expected to continue. The overriding need for sufficient economic incentives to roll out 5G infrastructure in the first place and to sustain infrastructure-based competition will have to be carefully balanced against other objectives such as rural development and quality of service for end-users.

2 Human capital

2 Human capital	Germany		EU
	rank	score	score
DESI 2019	10	54.4	48.0
DESI 2018	10	54.2	47.6
DESI 2017	10	52.8	45.4



	DESI 2017	Germany	DESI 2019	EU
	value	DESI 2018	value rank	DESI 2019
2a1 At least basic digital skills % individuals	68%	68%	68% 7	57%
2a2 Above basic digital skills % individuals	33%	37%	37% 8	31%
2a3 At least basic software skills % individuals	70%	70%	70% 8	60%
2b1 ICT specialists % total employment	3.7%	3.7%	3.8% 12	3.7%
2b2 Female ICT specialists % female employment	1.3%	1.3%	1.3% 13	1.4%
2b3 ICT graduates % graduates	4.4%	4.5%	4.5% 9	3.5%

As regards the Human capital dimension, Germany ranks 10th among EU countries and well above the EU average. Germans generally have levels of digital skills that are above the EU average. 68 % of individuals between 16 and 74 have at least basic digital skills (57 % in the EU as a whole) and 37 % have above basic digital skills (31 % in the EU). In terms of ICT graduates, Germany ranks ninth among EU countries. However, despite the small increase in the percentage points of ICT specialists since 2017, there is still a lack of ICT specialists in the country. The proportion of female ICT specialists in Germany is slightly below the EU average (1.3 % vs. 1.4 %).

In Germany, digital skills and literacy are considered to be a cross-cutting issue that plays an important role in all relevant strategies: in the Federal Government's implementation strategy 'Designing digitisation'⁴ and in the 'Artificial Intelligence Strategy'⁵, both adopted in November 2018; in the Digital Strategy⁶ of the Federal Ministry of Education and Research (BMBF) and in the MINT Action Plan⁷. The last two were presented in early 2019.

⁴<https://www.bundesregierung.de/resource/blob/975226/1552758/c34e443dbe732e79c9439585b4fbade5/pdf-umsetzungsstrategie-digitalisierung-data.pdf?download=1>

⁵<https://www.de.digital/DIGITAL/Redaktion/EN/Standardartikel/artificial-intelligence-strategy.html>

⁶https://www.bildung-forschung.digital/files/BMBF_Digitalstrategie_web.pdf

⁷<https://www.bundesregierung.de/breg-en/news/mint-for-the-future-1580792>

Alongside the *Länder*, the Standing Conference of the Ministers of Education (*Kultusminister Konferenz (KMK)*) has adopted the 'Education in the digital world strategy'.⁸ This strategy deals with school education (primary and lower secondary education), vocational school education and higher education. The *KMK* strategy sets the following goal: by 2021, every pupil should be able to use a digital learning environment and have access to the internet, wherever that is considered useful in lessons on educational grounds.

The various topics addressed in the Education Offensive for the Digital Knowledge-based Society⁹ will continue to be promoted. This applies in particular to the school cloud and the *DigitalPakt Schule*, and to MINT education activities. The *DigitalPakt Schule* is designed to shape digital transformation in the education system. The Federal Government supports the *Länder* and municipalities in investing in the digital municipal education infrastructure. At the same time, the *Länder* commit to implementing digital education through educational approaches, curriculum adaptation, and by transforming teacher education and training. The aim is to promote nationwide investments for a total of EUR 5 billion over five years (2017-2021).

Germany has not established a National Digital Skills and Jobs Coalition. It played an active part in the EU Code Week¹⁰ in 2018, with 600 events and an estimated 35,400 participants.

The focus on digital skills in all relevant strategies will bring benefits in the future. Increasing the number of German ICT specialists and closing the gender gap is of the utmost importance for Germany if it is to exploit the full potential of the digital economy.

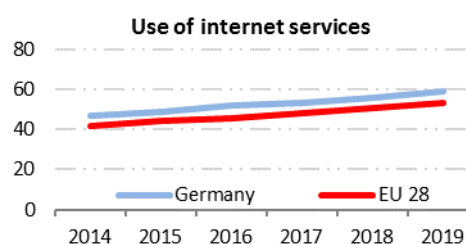
⁸ https://www.kmk.org/fileadmin/Dateien/pdf/PresseUndAktuelles/2017/KMK-Strategie_Bildung_in_der_digitalen_Welt_Zusammenfassung_en.pdf

⁹ https://www.bmbf.de/files/Bildungsoffensive_fuer_die_digitale_Wissensgesellschaft.pdf

¹⁰ <https://codeweek.eu/>

3 Use of internet services

3 Use of internet services	Germany		EU
	rank	score	score
DESI 2019	9	58.9	53.4
DESI 2018	9	56.0	50.7
DESI 2017	9	53.1	47.8

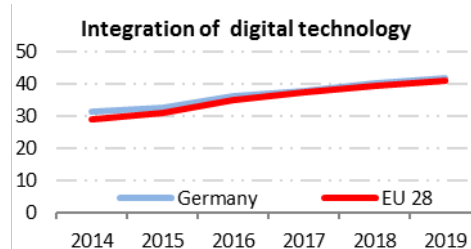


	Germany		EU	
	DESI 2017 value	DESI 2018 value	DESI 2019 value	DESI 2019 rank
3a1 People who never used the internet % individuals	8%	7%	5%	7
3a2 Internet users % individuals	87%	87%	90%	7
3b1 News % internet users	72%	74%	74%	21
3b2 Music, videos and games % internet users	78%	78%	82%	15
3b3 Video on demand % internet users	23%	23%	31%	9
3b4 Video calls % internet users	31%	54%	57%	12
3b5 Social networks % internet users	56%	56%	57%	27
3b6 Professional social networks % internet users	12%	13%	13%	16
3b7 Doing an online course % internet users	5%	6%	6%	16
3b8 Online consultations and voting % internet users	15%	13%	13%	8
3c1 Banking % internet users	59%	62%	64%	15
3c2 Shopping % internet users	82%	82%	82%	5
3c3 Selling online % internet users	33%	34%	35%	3

Overall, the Use of internet services in Germany is above the EU average. People in Germany are keen to engage in a variety of online activities, in line with the rest of the EU. The most popular online activities are shopping (82 % versus 69 % in the EU as a whole), listening to music, watching videos and playing games (82 % against an EU average of 81 %), and reading news online (74 % versus 72 % EU average). However, professional social networking and doing online courses (13 % and 6 %, respectively) are below the EU average (15 % and 9 %, respectively). Of all internet services, video calls is the one that has increased most in the last two years (up from 31 % in 2016 to 57 % in 2018), followed by video on demand (up from 23 % in 2016 to 31 % in 2018).

4 Integration of digital technology

4 Integration of digital technology	Germany		EU
	rank	score	score
DESI 2019	13	41.9	41.1
DESI 2018	13	40.1	39.6
DESI 2017	13	37.9	37.6



	Germany		EU	
	DESI 2017	DESI 2018	DESI 2019	DESI 2019
	value	value	value	rank
4a1 Electronic information sharing	NA	38%	38%	11
% enterprises	2015	2017	2017	2017
4a2 Social media	18%	16%	16%	20
% enterprises	2016	2017	2017	2017
4a3 Big data	6%	6%	15%	9
% enterprises	2016	2016	2018	2018
4a4 Cloud	9%	NA	12%	21
% enterprises	2016	2017	2018	2018
4b1 SMEs selling online	26%	23%	19%	10
% SMEs	2016	2017	2018	2018
4b2 e-Commerce turnover	7%	11%	9%	18
% SME turnover	2016	2017	2018	2018
4b3 Selling online cross-border	9%	11%	11%	7
% SMEs	2015	2017	2017	2017

As regards the Integration of digital technology by businesses, Germany ranks 13th among EU countries, which is slightly above the EU average. However, Germany has stagnated in the ranking. German enterprises are increasingly taking advantage of the opportunities offered by big data: 6 % of enterprises performed big data analysis in 2016 versus 15 % in 2018 (above the EU average). 11 % of all SMEs sell cross-border (above the EU average). More than a third of enterprises (38 %) share information electronically. However, only 12 % of German enterprises use cloud services (compared to the 18 % EU average). The number of SMEs selling online fell from 26 % in 2016 to 19 % in 2018, but this remains above the EU average.

There are a number of initiatives in Germany for the digitisation of the economy. Many of them target SMEs. These include the *Mittelstand 4.0*¹¹ competence centres and the Go-Digital programme.¹² The common goal of the *Mittelstand 4.0* competence centres is to improve the degree of digitization among medium-sized companies. For 2018, approximately EUR 40 million of federal funds are available for this initiative. The Go-Digital programme promotes consulting and implementation services for SMEs by authorised consulting firms in the area of digitised business processes, digital market development and IT security. There is also an initiative on IT security, designed to increase cybersecurity awareness among SMEs.

¹¹ <https://www.mittelstand-digital.de/MD/Navigation/DE/Home/home.html>

¹² <https://www.bmwi.de/Redaktion/DE/Artikel/Digitale-Welt/foerderprogramm-go-digital.html>

Germany is committed to advancing new digital technologies and making strategic investments in this area through EU-coordinated programmes. It is a member of the EuroHPC Joint Undertaking and it has also signed the Declaration creating the European Blockchain Partnership, and the Declaration on Cooperation on Artificial Intelligence.

Germany continues to pursue its HPC development strategies. The operation of a high-performance research infrastructure is an integral part of the High-Tech Strategy for 2025 - Research and Innovation for People. In the context of 'Supercomputing 2.0'¹³, the Federal Government and the *Länder* agreed in 2016 on a second phase for the gradual expansion of research infrastructure and the further development of computing structures and software technologies. Germany will support projects with a total budget of EUR 450 million.

On 15 November 2018, the Federal Government adopted its Artificial Intelligence (AI) strategy.¹⁴ The three key goals of the strategy are: (1) for Germany and Europe to become leaders in the development and application of AI technologies, (2) to ensure that the development and use of AI is responsible and pursued for the common good and (3) to firmly anchor AI in society in ethical, legal, cultural and institutional terms.

In the 2019 federal budget, the Federal Government will initially allocate a total of EUR 500 million to the implementation of the AI strategy in 2019 and subsequent years. By the end of 2025, the Federal Government intends to provide up to EUR 3 billion. The leverage effect of this commitment on business, science and the *Länder* is meant to at least double those resources.

Germany is taking important measures to safeguard the digital sovereignty of German industry and the state. Its cybersecurity strategy, in place since 2011, was updated in 2016. In 2018, the Federal Ministry of the Interior founded the Cyber-Alliance in cooperation with the Federation of German Industries e.V.. The Alliance's goal is to promote key technologies for critical business processes, which are essential for safeguarding digital sovereignty. To achieve this, the Federal Ministry of the Interior (*BMI*) is to set up a Project Office for Trustworthy IT (*Projektbüro vertrauenswürdige IT*).

To ensure technological innovation leadership, it was decided in 2018 under the joint leadership of the *BMI* and the Federal Ministry of Defence (*BMVg*) to set up the Agency for Innovation in Cybersecurity, to be founded in 2019. The purpose of the agency is the targeted promotion of ambitious research projects with high innovation potential in the area of cybersecurity and related key technologies, to meet the state's needs in the field of domestic and external security.

To boost the digital transformation of the German economy, it is important to raise awareness of the relevance of digitisation to SMEs and of their cybersecurity needs. This will enable the full range of benefits from the adoption of digital technologies by SMEs to be achieved.

¹³ <https://www.bmbf.de/de/hoechstleistungsrechnen-staerkt-den-forschungsstandort-deutschland-852.html>

¹⁴ <https://www.ki-strategie-deutschland.de/home.html>

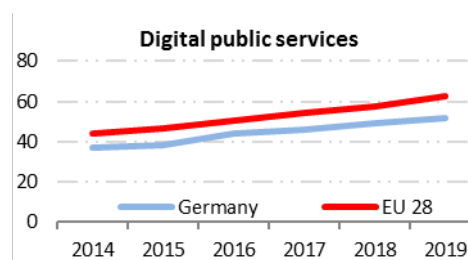
Highlight 2019: The National Cybersecurity Council organises political cooperation on cybersecurity

To ensure cybersecurity, it is essential to identify and eliminate the structural causes of crises at an early stage. The National Cybersecurity Council will coordinate preventive instruments and cybersecurity policy as they apply to the state and the economy. Its work complements the duties of the IT Management Federation (*IT-Steuerung Bund*) and the IT Planning Council (*IT-Planungsrat*) in the area of cybersecurity, at both political and strategic level. So far, its work has focused on protecting critical infrastructure and Germany's cyber foreign policy.

The National Cybersecurity Council has been raising awareness of IT issues since its inception. It has achieved significant developments in the protection of critical infrastructure through the IT Security law. In addition, the activities and interests of the Federal Government, the *Länder* and industry have been brought into line with shared objectives. A coherent cyber foreign policy is also one of the common goals. The National Cybersecurity Council summarises regularly the results of its work in a written report, which is sent to the Federal Cabinet for information.

5 Digital public services

5 Digital public services	Germany		EU
	rank	score	score
DESI 2019	24	51.9	62.9
DESI 2018	20	49.3	57.9
DESI 2017	18	45.8	54.0



	DESI 2017	Germany		EU	
	value	DESI 2018	DESI 2019	rank	DESI 2019
5a1 e-Government users % internet users needing to submit forms	38%	39%	43%	26	64%
	2016	2017	2018		2018
5a2 Pre-filled forms Score (0 to 100)	38	38	41	20	58
	2016	2017	2018		2018
5a3 Online service completion Score (0 to 100)	83	88	88	14	87
	2016	2017	2018		2018
5a4 Digital public services for businesses Score (0 to 100) - including domestic and cross-border	84	84	80	22	85
	2016	2017	2018		2018
5a5 Open data % of maximum score	NA	NA	64%	17	64%
			2018		2018
5b1 e-Health services % individuals	NA	7%	7%	26	18%
		2017	2017		2017
5b2 Medical data exchange % of general practitioners	NA	NA	26%	17	43%
			2018		2018
5b3 e-Prescription % of general practitioners	NA	NA	19%	22	50%
			2018		2018

As regards Digital public services, Germany ranks 24th among EU countries, well below the EU average. It performs well as regards online service completion. However, there is a low level of online interaction between public authorities and the general public. Only 43 % of German online users engage actively with e-government services (compared with an average of 64 % in the EU as a whole), although Germany performed better in 2018 than in 2017. As regards e-health, only 7 % of Germans have used health and care services provided online. 19 % of general practitioners use e-prescriptions and 26 % of them exchange medical data.

The Online Access Act (*Onlinezugangsgesetz, OZG*) came into force in 2017 and must be implemented by 2022. In the future, administrative services will also be offered electronically via the administrative portals of the Federal Government, *Länder* and municipalities, which should be linked to a portal network (*Portalverbund*). Over the last two years, the focus has been on establishing and further developing the federal digitisation programme, the portal network, the Single Digital Gateway and Federal Information Management.

All federal levels are involved in implementing the Online Access Act. In addition to the state budgets, EUR 500 million are available to digitise the administration, managed centrally by the *BMI*. In 2017, the IT Planning Council adopted the basic principles underpinning the architecture of the future portal network. On this basis, a pilot project for technical infrastructure linking the portals was

set up in 2018¹⁵. Further expansion will be gradual, with the inclusion of additional administrative services.

After 2015 the e-Health Act significantly accelerated the deployment of e-health infrastructure and brought about important breakthroughs. Efforts to roll out the necessary infrastructure started in late 2017. In 2018, the Federal Ministry of Health made important adjustments to the Appointment Service and Care law, enabling health insurance companies to provide electronic patient records on a nationwide and interoperable basis by 2021. The Electronic Emergency Data Set and the Electronic Medication Plan will be launched in 2019.

The country's greatest digital challenge is to improve online interaction between public authorities and the general public, as Germans' take-up of e-government services remains low.

¹⁵ www.beta.bund.de