Ministry of Digital Development, Communications and Mass Media of the Russian Federation

FEDERAL STATE STATISTICS SERVICE

HIGHER SCHOOL OF ECONOMICS
NATIONAL RESEARCH UNIVERSITY

DIGITAL ECONOMY INDICATORS IN THE RUSSIAN FEDERATION

DATA BOOK

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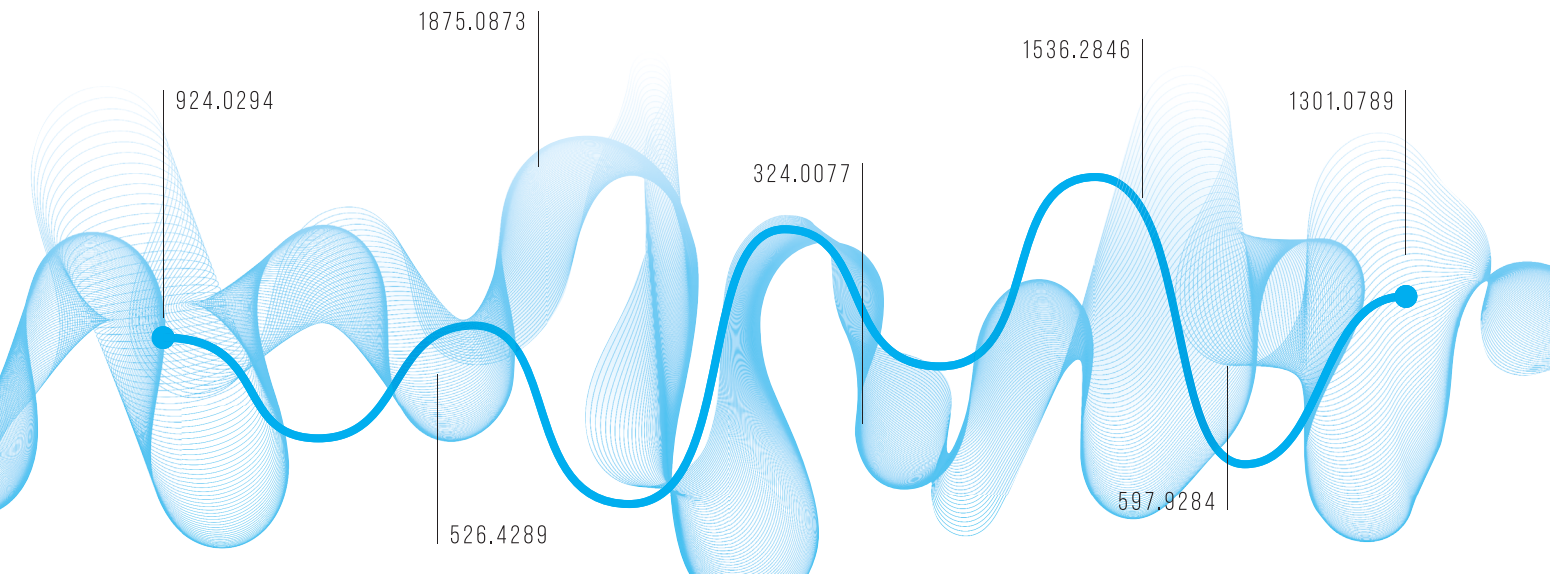

DIGITAL ECONOMY INDICATORS IN THE RUSSIAN FEDERATION

DATA BOOK

MOSCOW 2021

Editorial Board: Leonid Gokhberg, Yaroslav Kuzminov, Maxim Parshin, Irina Shapoval, and Nikolay Yatselenko
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With contributions by Ekaterina Leven, Ilya Lomakin, Dmitry Martynov, Elena Nechaeva, and Vitaliy Roud

Digital Economy Indicators in the Russian Federation : Data Book / G. Abdrakhmanova, O. Demidkina, A. Demyanova et al.; National Research University Higher School of Economics. – Moscow : HSE, 2021. – 376 p.

This data book is another publication in the series describing various aspects of the digital economy development in the Russian Federation. It covers the most recent statistical data representing the enterprises' activities on the development, dissemination, and use of digital technologies and related goods and services, and the public involvement in the digital environment. Russia's position in international rankings and indicators of digital economy development in Russian regions are provided in separate sections.

The data book contains information provided by the Ministry of Digital Development, Communications and Mass Media of the Russian Federation, Federal State Statistics Service (Rosstat), Ministry of Science and Higher Education of the Russian Federation, Ministry of Health of the Russian Federation, Ministry of Culture of the Russian Federation, Central Bank of the Russian Federation (the Bank of Russia), Federal Customs Service of Russia, Organisation for Economic Co-operation and Development (OECD), Eurostat, International Telecommunication Union (ITU), UN Department of Economic and Social Affairs, World Economic Forum, World Intellectual Property Organization (WIPO), as well as results of own methodological and analytical studies of the HSE Institute for Statistical Studies and Economics of Knowledge.

In some cases, the presented data specify those published earlier.

The publication was prepared within the framework of the Basic Research Programme at the National Research University Higher School of Economics (HSE).

CONTENTS

Symbols used in tables are:

… data not available and not included in the totals,
– data not applicable,
0.0 insignificant value.

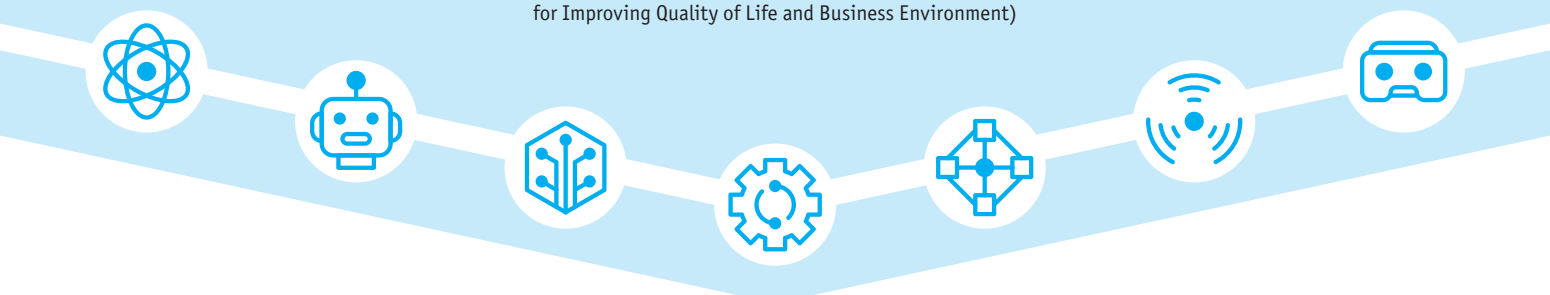
In some tables, the sum of the breakdown may not add to the total because of rounding.

Digital Economy in Statistical Terms

Definition of digital economy for the purposes of statistical measurement

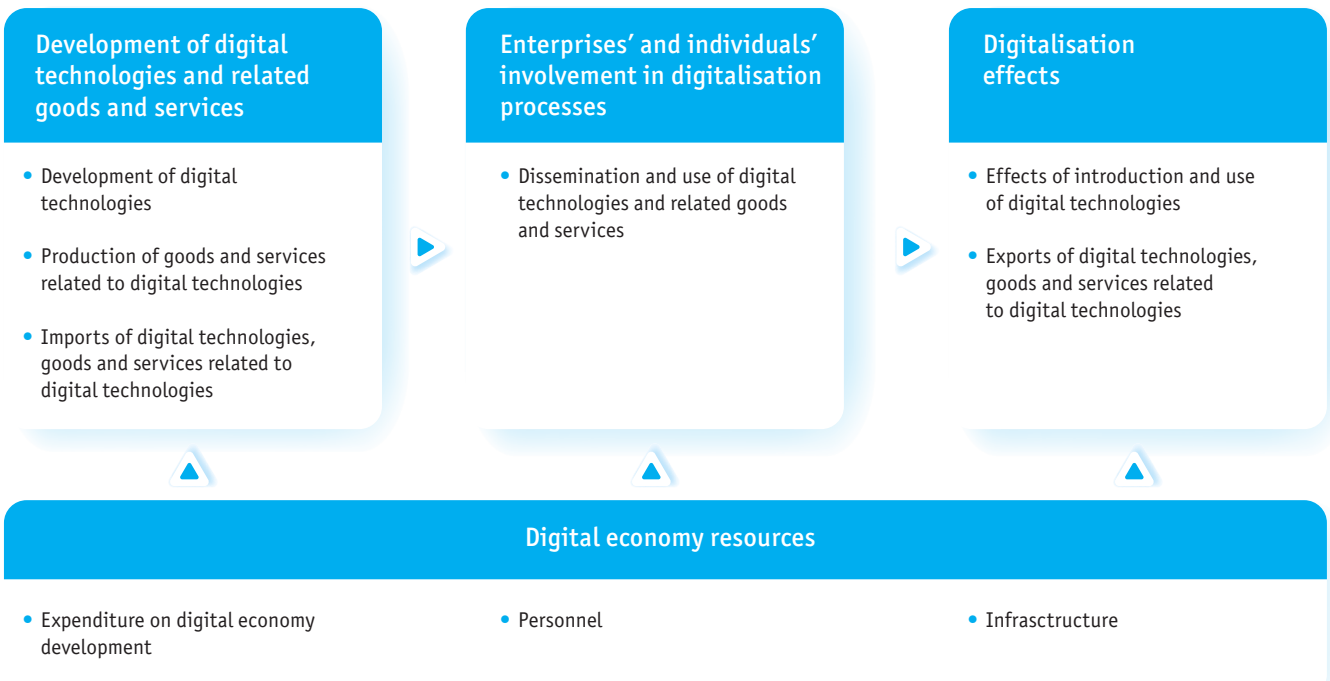
Digital economy combines activities on the development, dissemination, and use of digital technologies and related goods and services

(session protocol no. 557pr of September 27, 2019 of the Digital Economy Subcommittee under the Government Commission on the Digital Development, Use of Information Technologies for Improving Quality of Life and Business Environment)



Operationalisation of the digital economy's definition enables statistical measurement of technologies' life-cycle stages

Digital economy measurement model



MAIN DIGITAL ECONOMY DEVELOPMENT INDICATORS

	2010	2013	2014	2015	2016	2017	2018	2019	2020
Gross domestic expenditure on digital economy development from all sources as a percentage of GDP	…	…	…	…	1.7	1.9	1.9	2.2	2.5*
Gross domestic expenditure on R&D in 'Information and telecommunication systems' priority S&T area as a percentage of the gross domestic expenditure on R&D	7.3	8.0	8.3	8.2	8.3	8.0	7.4	7.8	…
ICT-related publications by Russian authors indexed in Scopus:									
total	3162	3773	5668	6831	8728	11382	13162	16899	16616
as a percentage of the world total number of ICT-related publications	0.87	1.07	1.57	1.81	2.13	2.64	2.74	3.01	3.48
ICT-related patent applications filed by Russian residents:									
total	1696	2206	2293	2342	1967	2269	2082	2665	…
as a percentage of the world total ICT-related patent applications	0.37	0.41	0.40	0.39	0.32	0.34	0.30	0.35	…
Innovative goods and services as a percentage of total sales in the ICT sector	5.4	5.1	5.1	5.7	6.4	6.6	8.0	8.0	…
ICT sector's gross value added as a percentage of GDP	…	2.74	2.79	2.81	2.82	2.87	2.75	2.86	3.10**
Content and media sector's gross value added as a percentage of GDP	…	0.37	0.33	0.34	0.37	0.39	0.36	0.35	0.34**
Export-to-import ratio:									
ICT goods, *percentage*	5.3	10.3	17.7	16.8	9.7	9.9	10.5	10.8	7.5
ICT services, *percentage*	66.3	68.5	65.7	71.9	71.4	86.4	95.9	104.7	100.6

(continued)

	2010	2013	2014	2015	2016	2017	2018	2019	2020
Fixed broadband subscriptions per 100 inhabitants	…	16.5	17.0	18.3	18.6	21.0	21.7	22.2	23.0**
Mobile broadband subscriptions per 100 inhabitants	…	59.8	64.5	68.1	71.1	79.9	86.2	96.4	99.8**
Households with Internet access as a percentage of all households	48.4	67.2	69.9	72.1	74.8	76.3	76.6	76.9	80.0
of which broadband	…	56.5	64.1	66.8	70.7	72.6	73.2	73.6	77.0
Individuals who have ever used the Internet as a percentage of individuals aged 15–74***	49.3	71.0	74.1	77.7	80.8	83.7	87.3	88.6	89.6
Individuals who have used the Internet daily or almost every day as a percentage of individuals aged 15–74***	26.0	48.0	51.6	55.1	57.7	60.6	68.8	72.6	76.7
Individuals who have used the Internet to receive public and municipal services in digital form as a percentage of individuals aged 15–74 who have received public and municipal services within the last 12 months***	…	30.8	35.2	39.6	51.3	64.3	74.8	77.6	81.1
Individuals who have encountered computer viruses that led to loss of information or took time to remove as a percentage of Internet users aged 15–74***	…	44.5	37.7	17.1	13.3	11.4	8.9	7.5	6.4

(continued)

	2010	2013	2014	2015	2016	2017	2018	2019	2020
Economy Digitalisation Index****	…	…	24	24	25	27	29	29	…
Enterprises in business enterprise sector (as a percentage of total number thereof) that use:									
broadband access	63.8	80.8	81.4	78.9	80.5	81.6	86.0	86.0	…
cloud computing services	…	11.0	13.8	18.4	20.5	22.6	27.1	29.1	…
Enterprises in agriculture (as a percentage of total number thereof) that use:									
broadband access	…	…	…	…	…	…	…	74.3	…
cloud computing services	…	…	…	…	…	…	…	20.9	…
Institutions in social sphere (as a percentage of the total number thereof) that use:									
broadband access	47.6	74.6	77.9	78.1	80.0	82.1	84.3	85.3	…
cloud computing services	…	11.3	13.5	19.1	21.0	23.5	24.7	27.0	…
Enterprises in financial sector (as a percentage of total number thereof) that use:									
broadband access	83.7	92.2	91.9	89.3	89.3	90.6	93.0	93.8	…
cloud computing services	…	11.8	13.8	18.4	20.1	30.1	33.8	38.5	…

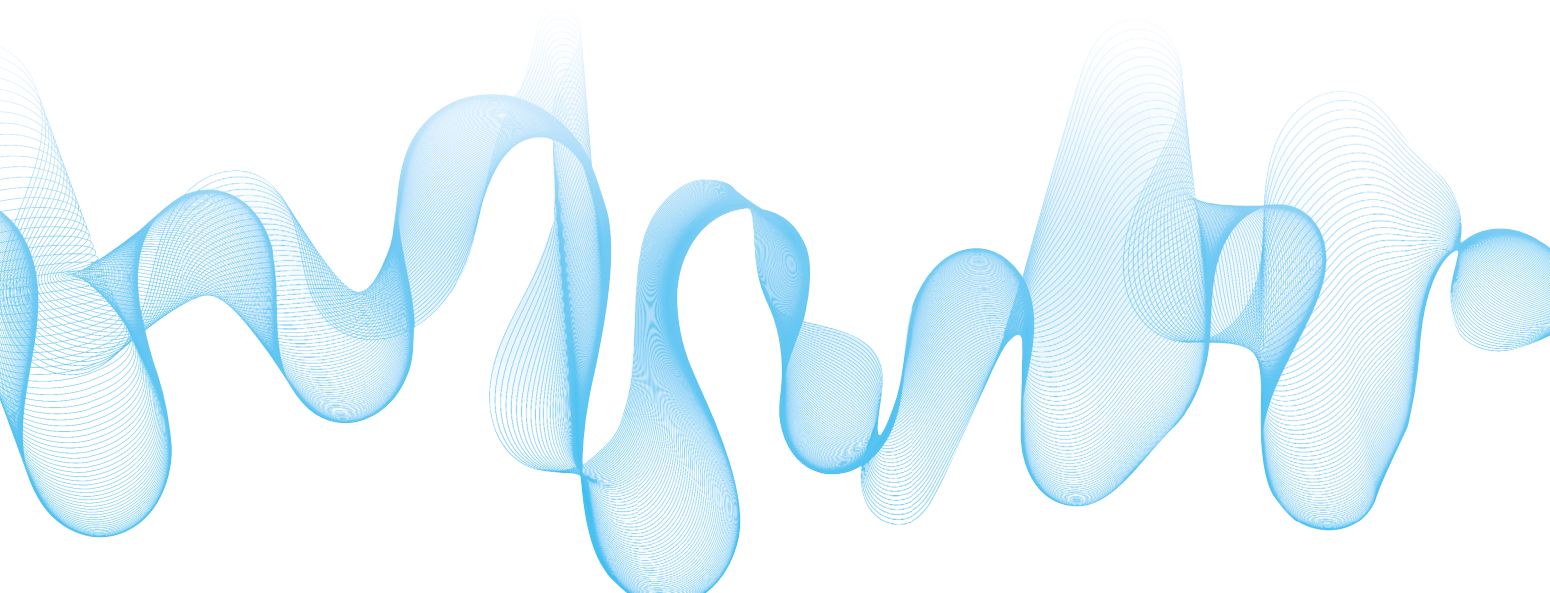
* The forecasted estimate of the HSE Institute for Statistical Studies and Economics of Knowledge.

** Preliminary estimates.

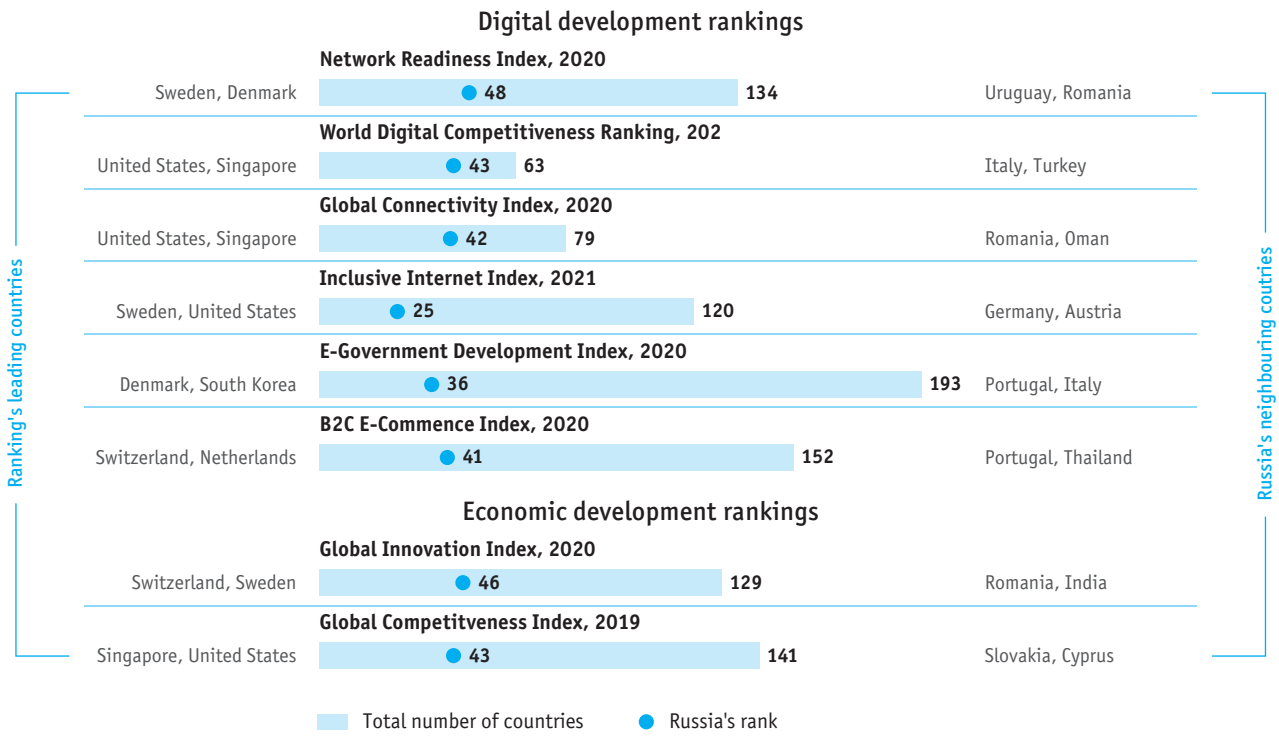
*** Here and below, the 2010 data on the individuals' use of Internet refer to individuals aged 16–74, the 2013–2016 data refer to individuals aged 15–72.

**** The Economy Digitalisation Index characterises the use of broadband access, cloud computing services, RFID technologies, ERP software, and involvement in e-commerce by instituitions and enterprises of all types of economic activity.

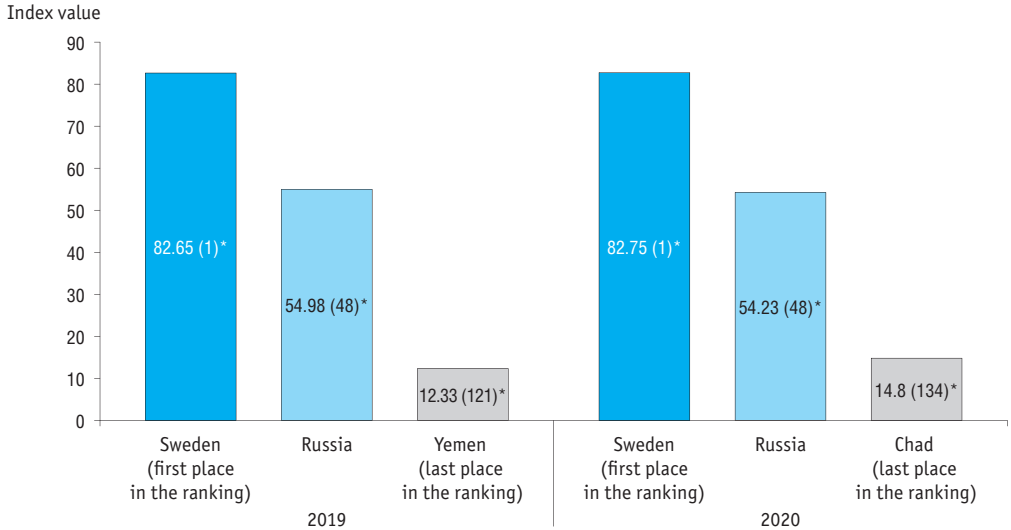
1 RUSSIA IN INTERNATIONAL RANKINGS



1.1. RUSSIA IN INTERNATIONAL DIGITAL DEVELOPMENT RANKINGS



1.2. NETWORK READINESS INDEX

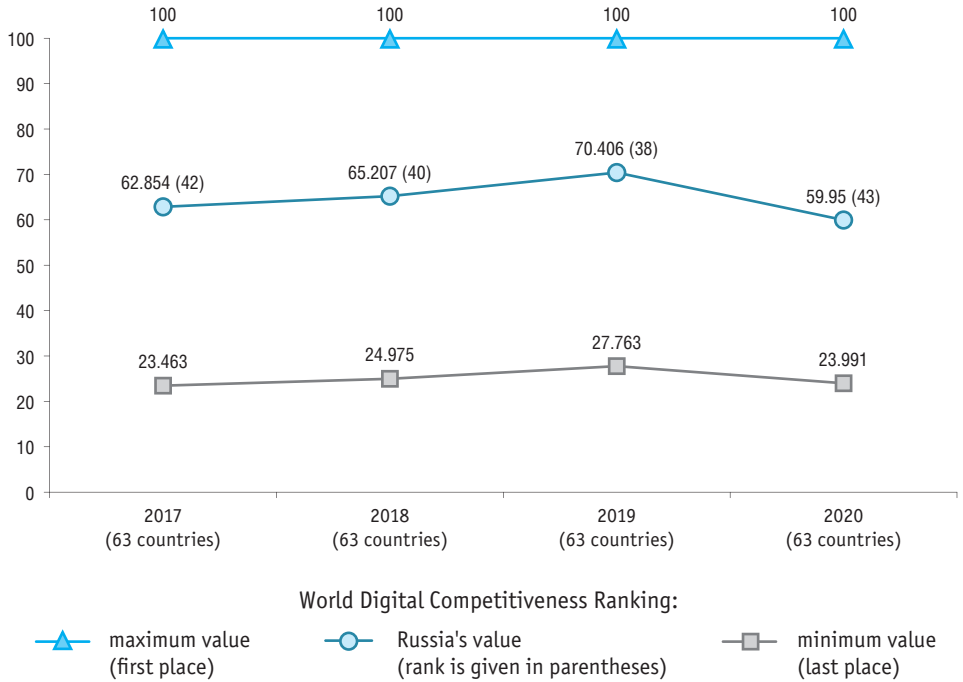


* Countries' positions in the ranking are given in parenthesis.
Sources: here and below in table 1.3, the Portulans Institute.

1.3. NETWORK READINESS INDEX BY COUNTRY: 2020

Country	Network Readiness Index (NRI)		NRI pillars							
			Technology		People		Governance		Impact	
	Rank (change in the ranking since 2019)	Value	Rank (change in the ranking since 2019)	Value	Rank (change in the ranking since 2019)	Value	Rank (change in the ranking since 2019)	Value	Rank (change in the ranking since 2019)	Value
Sweden	1 (0)	82.75	2 (+2)	83.82	4 (-2)	78.07	4 (+5)	88.88	3 (0)	80.23
Denmark	2 (+4)	82.19	5 (+6)	79.71	1 (0)	80.81	2 (-8)	89.80	5 (+1)	78.45
Singapore	3 (-1)	81.39	10 (-4)	76.16	5 (+4)	77.86	13 (-7)	83.35	1 (0)	88.17
Netherlands	4 (-2)	81.37	3 (-1)	83.81	9 (-3)	73.45	3 (+5)	89.47	4 (+1)	78.75
Switzerland	5 (0)	80.41	1 (+2)	85.67	13 (-1)	70.02	10 (+2)	85.04	2 (0)	80.93
Finland	6 (+1)	80.16	9 (-4)	78.24	3 (+2)	78.19	5 (+2)	88.61	9 (-2)	75.59
Norway	7 (+3)	79.39	11 (-3)	75.23	8 (-4)	73.88	1 (0)	91.30	6 (-2)	77.14
United States	8 (0)	78.91	4 (-3)	82.88	7 (+1)	74.59	8 (-4)	86.23	14 (+6)	71.96
Germany	9 (0)	77.48	7 (+3)	79.18	12 (-2)	70.54	12 (+3)	83.52	7 (+1)	76.69
United Kingdom	10 (0)	76.27	8 (-1)	78.34	14 (0)	69.69	14 (-9)	82.65	10 (+3)	74.40
Bulgaria	46 (+3)	55.03	43 (-1)	50.13	55 (+2)	51.27	44 (+9)	65.53	62 (-5)	53.19
Uruguay	47 (-1)	54.87	48 (-1)	46.96	41 (+1)	54.63	50 (0)	61.40	49 (+1)	56.49
Russia	**48 (0)**	**54.23**	**49 (+2)**	**46.62**	**31 (+8)**	**59.68**	**65 (+9)**	**56.98**	**60 (+1)**	**53.65**
Romania	49 (-2)	54.16	46 (-5)	49.62	59 (+7)	49.75	55 (-6)	58.69	43 (-3)	58.59
Chile	50 (-8)	54.06	50 (-2)	45.92	38 (-2)	56.15	46 (-7)	64.60	77 (-23)	49.57

1.4. WORLD DIGITAL COMPETITIVENESS RANKING

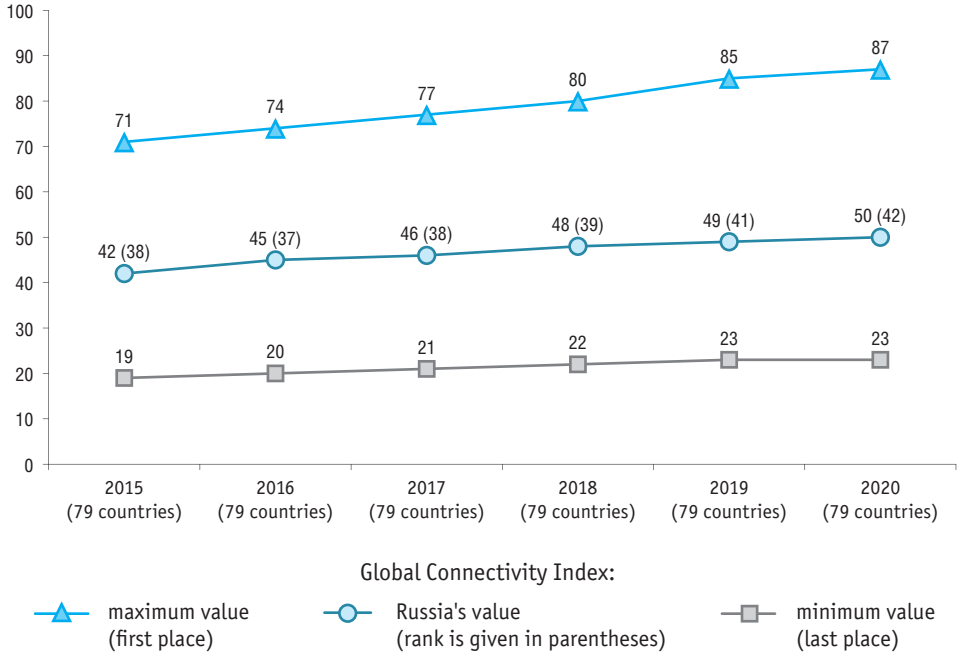


Sources: here and below in table 1.5, International Institute for Management Development.

1.5. WORLD DIGITAL COMPETITIVENESS RANKING BY COUNTRY: 2020

Country	World Digital Competitiveness Ranking		World Digital Competitiveness Ranking factors					
	Rank (change in the ranking since 2019)	Value	Knowledge		Technology		Future Readiness	
			Rank (change in the ranking since 2019)	Value	Rank (change in the ranking since 2019)	Value	Rank (change in the ranking since 2019)	Value
United States	1 (0)	100	1 (0)	97.922	7 (-2)	87.927	2 (-1)	98.652
Singapore	2 (0)	98.052	2 (+1)	92.031	1 (0)	99.504	12 (-1)	87.123
Denmark	3 (+1)	96.013	6 (0)	86.145	9 (+2)	86.394	1 (+1)	100
Sweden	4 (-1)	95.146	4 (0)	89.199	6 (+1)	88.348	7 (-1)	92.393
Hong Kong (China)	5 (+3)	94.451	7 (0)	85.380	2 (+2)	94.603	10 (+5)	87.872
Switzerland	6 (-1)	93.693	3 (-1)	89.770	11 (-1)	82.734	5 (+5)	93.075
Netherlands	7 (-1)	92.567	14 (-1)	80.839	8 (-2)	87.618	4 (-1)	93.745
South Korea	8 (+2)	92.252	10 (+1)	82.499	12 (+5)	82.634	3 (+1)	96.124
Norway	9 (0)	92.170	16 (0)	78.196	3 (0)	91.263	6 (+2)	92.943
Finland	10 (-3)	91.130	15 (-6)	80.438	10 (-2)	79.658	9 (-2)	91.184
Chile	41 (+1)	61.518	49 (+1)	49. 501	40 (+1)	60.318	39 (-2)	59.236
Italy	42 (-1)	60.911	42 (-1)	54.920	46 (0)	51.828	38 (-7)	60.486
Russia	**43 (-5)**	**59.950**	**26 (-4)**	**67.891**	**47 (-4)**	**51.653**	**53 (-11)**	**44.807**
Turkey	44 (+8)	59.823	56 (+4)	46.294	42 (+6)	54.402	34 (+7)	63.274
Bulgaria	45 (0)	56.295	47 (-1)	50.023	45 (-3)	51.906	44 (+4)	51.458

1.6. GLOBAL CONNECTIVITY INDEX

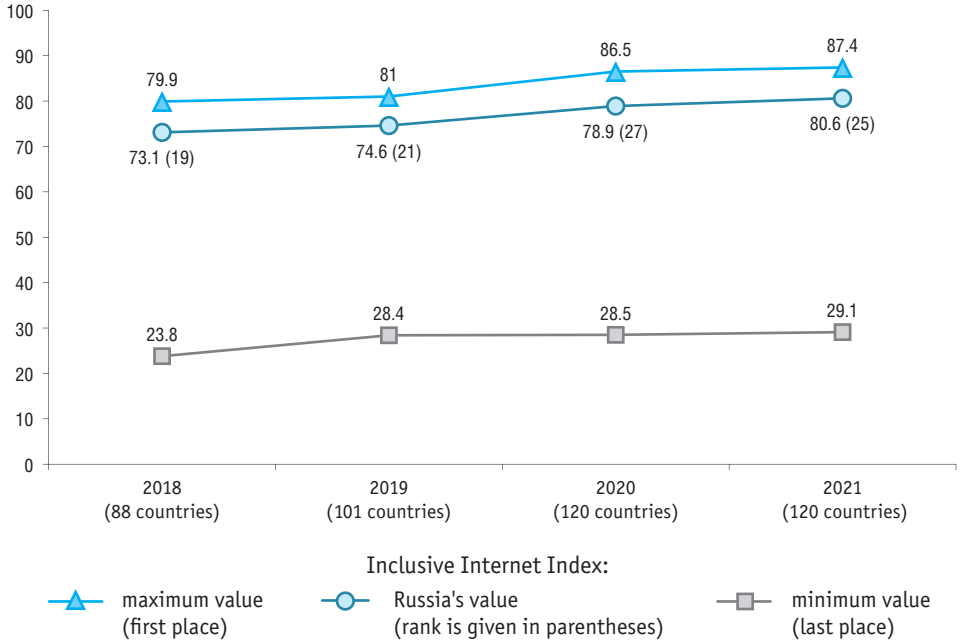


Sources: here and below in table 1.7, Huawei.

1.7. GLOBAL CONNECTIVITY INDEX BY COUNTRY: 2020

Country	Global Connectivity Index (GCI)		GCI pillars			
	Rank (change in the ranking since 2019)	Value	Supply	Demand	Experience	Potential
United States	1 (0)	87	81	91	94	80
Singapore	2 (0)	81	78	84	93	71
Switzerland	3 (0)	81	69	84	87	83
Sweden	4 (0)	80	76	78	87	79
Denmark	5 (0)	77	69	87	86	66
Finland	6 (0)	76	73	75	80	74
Netherlands	7 (+2)	75	62	86	87	68
United Kingdom	8 (0)	75	73	81	85	61
Japan	9 (-2)	75	64	68	86	80
Norway	10 (0)	73	60	79	87	67
Australia	11 (-0)	72	64	79	79	67
New Zealand	12 (+1)	72	69	75	79	64
South Korea	13 (-1)	71	58	66	87	75
Luxembourg	14 (0)	70	63	82	79	57
Bahrain	37 (+1)	51	45	56	59	45
Croatia	38 (+1)	51	35	58	64	48
Poland	39 (-3)	51	29	60	65	49
Uruguay	40 (+2)	50	43	54	58	46
Romania	41 (-1)	50	34	56	64	43
Russia	**42 (-1)**	**50**	**34**	**58**	**63**	**42**
Oman	43 (+1)	48	31	50	63	48

1.8. INCLUSIVE INTERNET INDEX

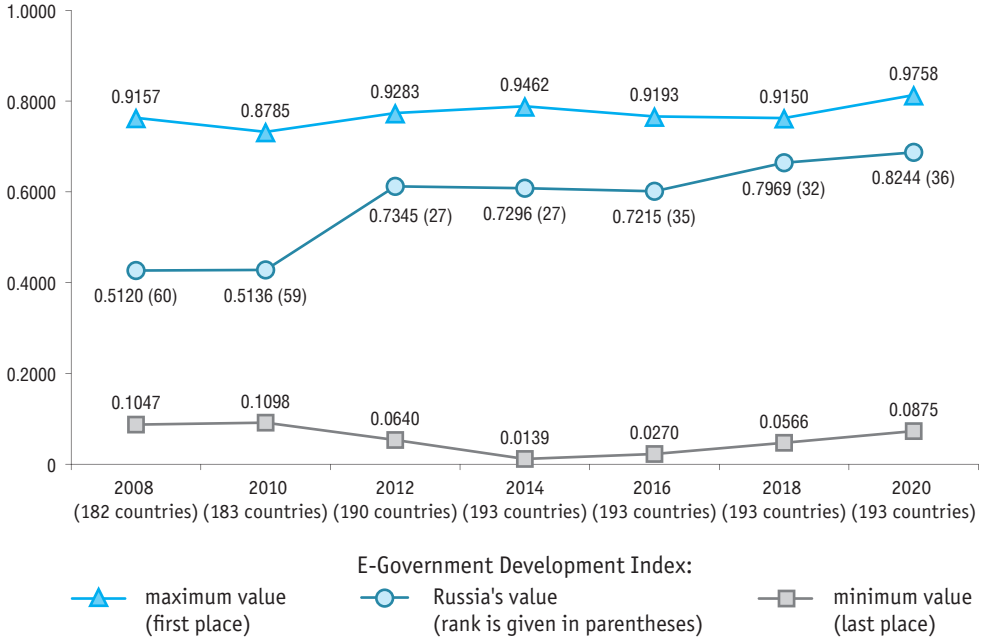


Sources: in here and below in table 1.9, The Economist Intelligence Unit.

1.9. INCLUSIVE INTERNET INDEX BY COUNTRY: 2021

Country	Inclusive Internet Index		Inclusive Internet Index categories							
			Availability		Affordability		Relevance		Readiness	
	Rank (change in the ranking since 2020)	Value	Rank (change in the ranking since 2020)	Value	Rank (change in the ranking since 2020)	Value	Rank (change in the ranking since 2020)	Value	Rank (change in the ranking since 2020)	Value
Sweden	1 (+1)	87.4	6 (-1)	83.9	7 (-2)	91.3	10 (+15)	90.7	4 (+3)	83.0
United States	2 (-1)	86.8	12 (+1)	80.8	5 (-4)	92.3	3 (+18)	92.9	8 (+24)	81.9
Spain	3 (+6)	85.7	14 (0)	79.7	6 (0)	91.9	19 (+22)	88.5	2 (+4)	85.1
Australia	4 (+10)	85.2	14 (-3)	79.7	9 (+12)	90.1	7 (+5)	91.2	11 (+16)	80.9
Hong Kong (China)	5 (+3)	85.0	2 (0)	86.9	18 (+2)	85.8	29 (-7)	87.5	53 (-5)	69.6
Canada	6 (-2)	84.8	13 (+4)	80.2	1 (-1)	95.8	54 (-18)	81.9	23 (-9)	76.6
France	7 (0)	84.8	19 (+1)	78.9	3 (-1)	93.6	15 (+8)	89.3	41 (-22)	72.6
New Zealand	8 (-5)	84.8	7 (-1)	83.5	15 (-1)	87.9	16 (-14)	89.2	43 (-14)	72.5
Denmark	9 (-4)	84.7	5 (-2)	84.3	24 (-7)	83.5	6 (+9)	91.9	28 (+12)	75.8
United Kingdom	10 (-4)	84.7	16 (-1)	79.6	2 (-2)	94.7	46 (-6)	84.1	24 (-4)	76.5
Ireland	23 (-17)	81.1	39 (-4)	73.4	12 (-4)	88.9	14 (-10)	89.8	49 (-4)	70.6
Taiwan (China)	24 (+6)	81.0	9 (+10)	83.9	47 (0)	74.3	5 (+15)	92.0	21 (+22)	77.2
Russia	**25 (+2)**	**80.6**	**45 (+2)**	**72.2**	**10 (+1)**	**91.3**	**4 (+14)**	**92.3**	**71 (+3)**	**64.3**
Germany	25 (-6)	80.6	20 (-5)	78.8	22 (+1)	84.4	60 (-23)	78.5	12 (-1)	80.7
Austria	27 (-5)	80.3	23 (+3)	78.4	34 (-2)	78.1	31 (-25)	87.2	10 (-7)	81.4
Kuwait	28 (0)	80.1	28 (+1)	76.7	17 (-4)	86.2	44 (+8)	84.3	60 (+15)	66.8

1.10. E-GOVERNMENT DEVELOPMENT INDEX

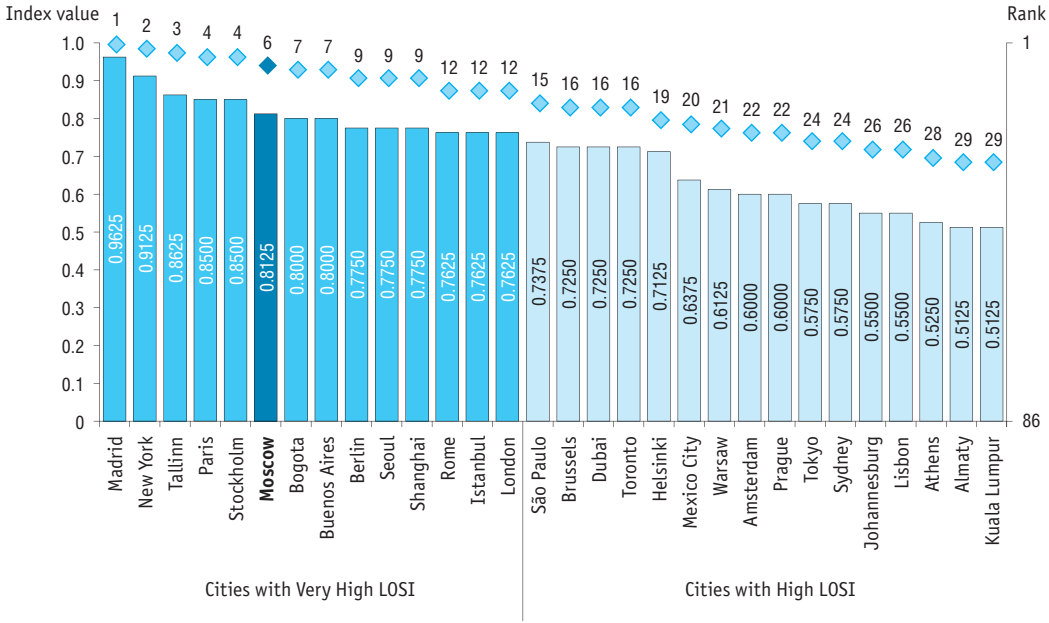


Sources: here and below in tables 1.11 and 1.12, UN Department of Economic and Social Affairs (UN DESA).

1.11. E-GOVERNMENT DEVELOPMENT INDEX BY COUNTRY: 2020

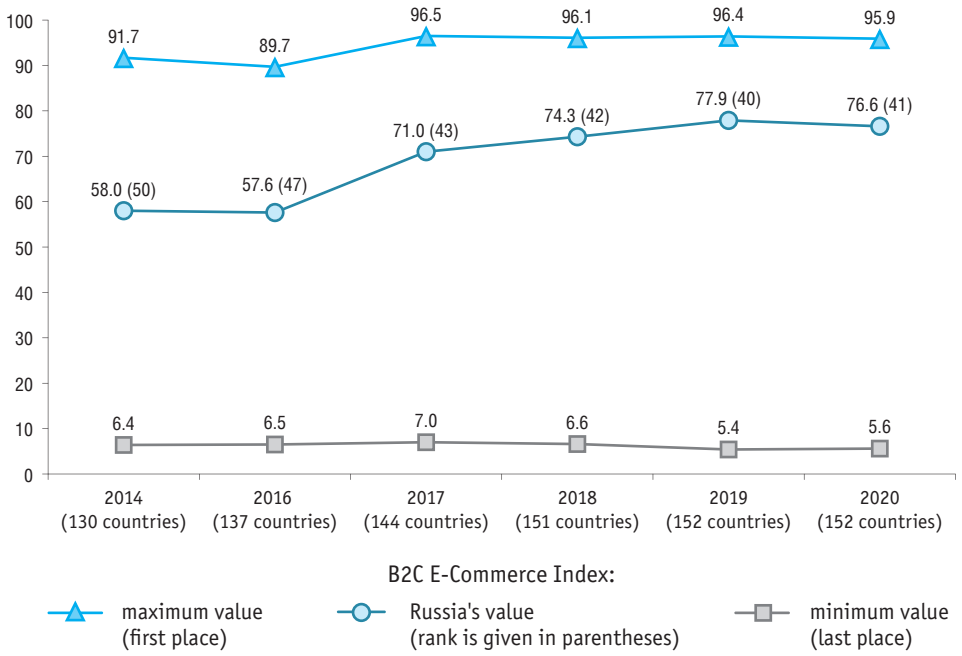
	E-Government Development Index (EGDI)		EGDI components					
			Online Service Index		Telecommunications Infrastructure Index		Human Capital Index	
	Index	Human Capital Index	Index	Human Capital Index	Rank (change in the ranking since 2019)	Value	Rank (change in the ranking since 2019)	Value
Denmark	1 (0)	0.9758	3	0.9706	2	0.9979	2	0.9588
South Korea	2 (+1)	0.956	1	1.0000	4	0.9684	23	0.8997
Estonia	3 (+13)	0.9473	2	0.9941	11	0.9212	13	0.9266
Finland	4 (+2)	0.9452	3	0.9706	15	0.9101	3	0.9549
Australia	5 (-3)	0.9432	7	0.9471	21	0.8825	1	1.0000
Sweden	6 (-1)	0.9365	15	0.9000	5	0.9625	8	0.9471
United Kingdom	7 (-3)	0.9358	6	0.9588	13	0.9195	12	0.9292
New Zealand	8 (0)	0.9339	10	0.9294	12	0.9207	6	0.9516
United States	9 (+2)	0.9297	7	0.9471	14	0.9182	15	0.9239
Netherlands	10 (+3)	0.9228	12	0.9059	8	0.9276	11	0.9349
Chile	34 (+8)	0.8259	24	0.8529	51	0.7606	36	0.8643
Portugal	35 (-6)	0.8255	35	0.8353	43	0.7948	45	0.8463
Russia	**36 (-4)**	**0.8244**	**39**	**0.8176**	**49**	**0.7723**	**31**	**0.8833**
Italy	37 (-13)	0.8231	36	0.8294	44	0.7932	44	0.8466
Bahrain	38 (-12)	0.8213	45	0.7882	30	0.8319	46	0.8439

1.12. LOCAL ONLINE SERVICE INDEX BY CITY: 2020*



* In 2020, the Local Online Service Index (LOSI) was calculated for 86 cities categorised into 4 groups based on the rating results: 14 cities with a very high index value (Very High LOSI), 16 – with high index level (High LOSI), 33 – with medium index value (Middle LOSI), 23 – low index value (Low LOSI).

1.13. B2C E-COMMERCE INDEX



Sources: here and in table 1.14, the United Nations Conference on Trade and Development (UNCTAD).

1.14. B2C E-COMMERCE INDEX BY COUNTRY: 2020

Country	B2C E-Commerce Index		Including dimensions			
	Rank (change in the ranking since 2019)	Value	Share of individuals using the Internet, *percentage*	Share of individuals aged 15 and over with an account, *percentage*	Secure Internet servers per 1 million people*, *units*	UPU Postal Reliability Score
Switzerland	1 (+1)	95.9	97	98	92	97
Netherlands	2 (-1)	95.8	96	100	94	93
Denmark	3 (+3)	94.5	97	100	100	81
Singapore	4 (-1)	94.4	89	98	94	97
United Kingdom	5 (-1)	93.6	96	96	84	98
Germany	6 (+3)	93.4	93	99	90	91
Finland	7 (-2)	93.4	95	100	88	91
Ireland	8 (-1)	93.4	88	95	92	98
Norway	9 (+1)	92.6	98	100	84	88
Hong Kong (China)	10 (+4)	91.8	92	95	88	92
New Zealand	11 (-1)	91.8	95	99	80	93
United States	12 (+1)	91.0	87	93	94	90
Canada	13 (-2)	90.8	91	100	84	88
Estonia	14 (+1)	90.8	90	98	91	84
Sweden	15 (+2)	90.8	98	100	82	84
Latvia	39 (-4)	77.8	86	93	80	52
Portugal	40 (+2)	77.5	75	92	79	63
Russia	**41 (-1)**	**76.6**	**83**	**76**	**74**	**74**
Thailand	42 (+6)	76.0	67	82	59	97
Serbia	43 (+1)	75.3	77	71	73	80

* Normalised value.

1.15. ICT INDICATORS WITHIN THE GLOBAL INNOVATION INDEX: 2020

Indicator	Russia		Leading country: Switzerland	
	Rank in the respective indicator (change in the ranking since 2019)	Value	Rank in the respective indicator (change in the ranking since 2019)	Value
Global Innovation Index	**47 (0)**	**35.63**	**1 (0)**	**66.08**
Subindex 2. Human Capital & Research	30 (-7)	45.6	6 (+1)	60.7
Block 2.2. Tertiary Education	17 (-3)	49.9	18 (-1)	49.4
2.2.2 Graduates in science & engineering,%	15 (-5)	30.0	39 (-6)	24.9
Subindex 3. Infrastructure	60 (+2)	42.4	3 (0)	62.0
Block 3.1. Information & Communication Technologies, ICTs	29 (0)	81.2	21 (-2)	85.8
3.1.1. ICT access	51 (0)	72.8	14 (-4)	85.2
3.1.2 ICT use	44 (+1)	68.3	3 (-1)	88.8
3.1.3 Government's online service	25 (0)	91.7	35 (0)	84.7
3.1.4 E-Participation	23 (0)	92.1	41 (0)	84.3
Subindex 5. Business Sophistication	42 (-7)	34.0	2 (0)	64.1
Block 5.3. Knowledge Absorption	32 (0)	39.7	12 (-9)	52.0
5.3.3. ICT services imports, % total trade	54 (-9)	1.3	3 (-2)	3.8

(continued)

Indicator	Russia		Leading country: Switzerland	
	Rank in the respective indicator (change in the ranking since 2019)	Value	Rank in the respective indicator (change in the ranking since 2019)	Value
Subindex 6. Knowledge & Technology Outputs	50 (-3)	26.4	1 (0)	65.5
Block 6.2. Knowledge Impact	68 (+9)	23.0	5 (-1)	50.8
6.2.3. Computer software spending, % GDP	63 (0)	0.0	3 (0)	0.0
Block 6.3. Knowledge Diffusion	66 (-3)	23.6	6 (-3)	57.9
6.3.3. ICT services exports, % total trade	74 (-3)	1.2	33 (-5)	3.0
Subindex 7. Creative Outputs	60 (+12)	22.8	2 (-1)	60.0
Block 7.1. Intangible Assets	61 (+10)	28.4	3 (+4)	60.3
7.1.3. ICTs & business model creation	72 (+19)	0.9	22 (-21)	6.2
7.1.4. ICTs & organizational model creation	49 (0)	58.4	9 (0)	77.4
Block 7.3. Online Creativity	44 (+3)	25.3	5 (+2)	68.3
7.3.1. Generic top-level domains (TLDs) / th pop. 15–69	61 (0)	3.5	13 (0)	58.4
7.3.2. Country-code TLDs / th pop. 15–69	33 (+1)	14.2	1 (0)	100.0
7.3.3. Wikipedia edits / mn pop. 15–69	47 (+2)	65.9	16 (+11)	84.0
7.3.4. Mobile app creation / bn PPP$ GDP	25 (+1)	19.4	17 (-2)	31.8

Sources: Cornell University, INSEAD Business School, and World Intellectual Property Organization (WIPO).

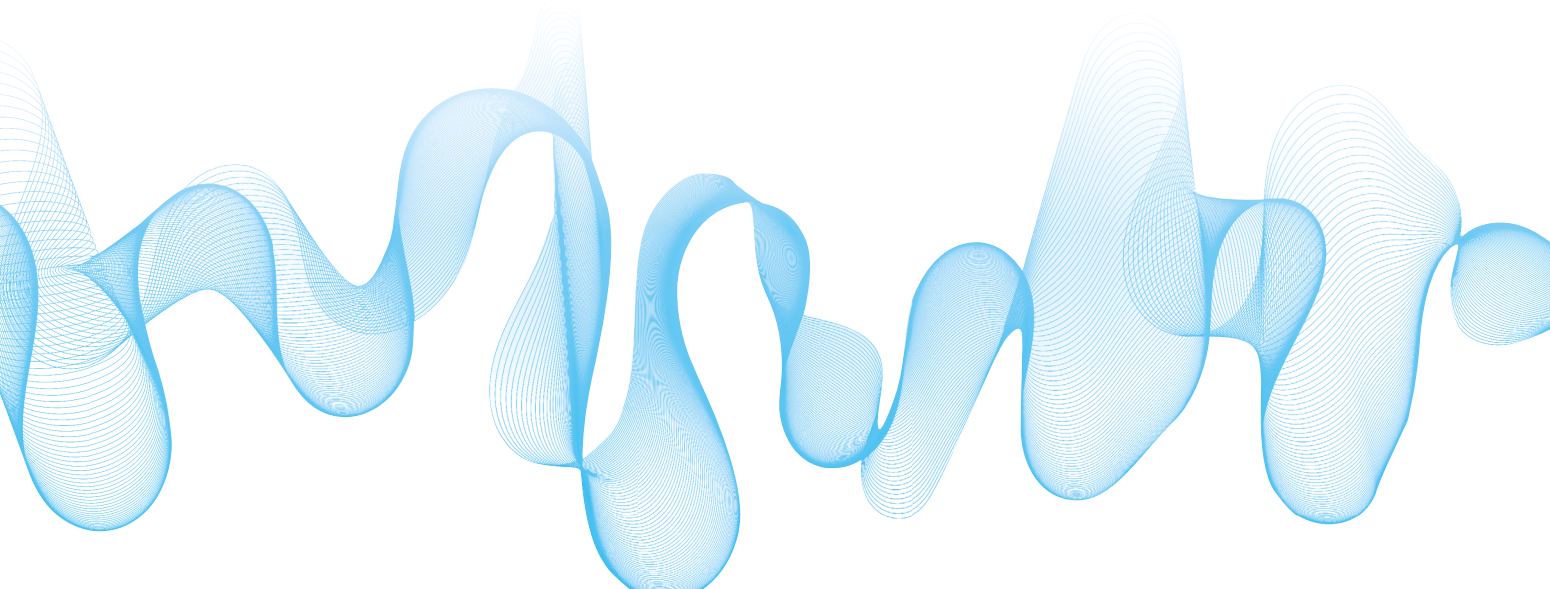
1.16. ICT INDICATORS WITHIN THE GLOBAL COMPETITIVENESS INDEX: 2019

Indicators	Russia		Leading country: Singapore	
	Rank in the respective indicator (change in the ranking since 2018)	Value	Rank in the respective indicator (change in the ranking since 2018)	Value
Global Competitiveness Index	**43 (0)**	**66.7**	**1 (+1)**	**84.8**
Subindex 1. Institutions	74 (+2)	52.6	2 (+1)	80.4
1.12. E-Participation	23 (0)	0.92	13 (0)	0.97
Subindex 3. ICT Adoption	22 (+3)	77.0	5 (-1)	87.1
3.01. Mobile-cellular telephone subscriptions per 100 pop.	9 (+2)	157.4	16 (-1)	145.7
3.02. Mobile-broadband subscriptions per 100 pop.	51 (0)	87.3	6 (-2)	145.7
3.03. Fixed-broadband Internet subscriptions per 100 pop.	47 (-1)	22.2	43 (-4)	25.9
3.04. Fiber Internet subscriptions per 100 pop.	14 (-2)	15.8	8 (-4)	22.3
3.05. Internet users % of adult population	39 (+10)	80.9	24 (0)	88.2
Subindex 6. Skills	54 (-4)	68.3	19 (+1)	78.8
6.05. Digital skills among active population	27 (+10)	4.9	5 (-1)	5.6

Source: World Economic Forum.

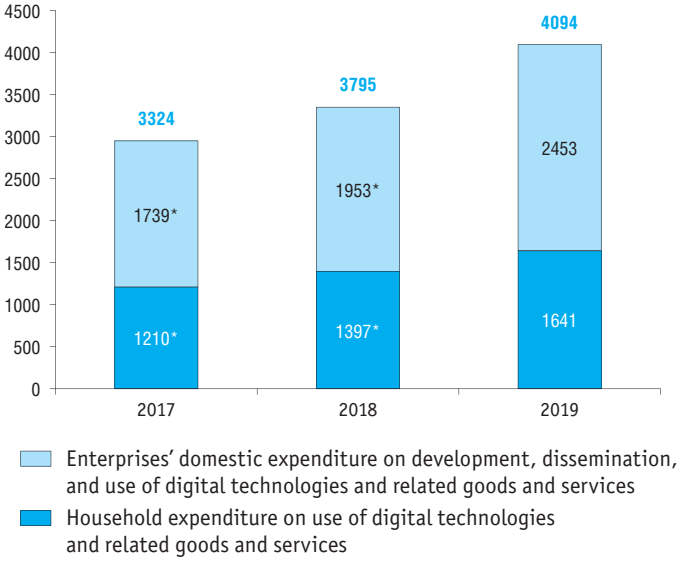
2

EXPENDITURE ON DIGITAL ECONOMY DEVEOPMENT



2.1. GROSS DOMESTIC EXPENDITURE ON DIGITAL ECONOMY DEVELOPMENT

(billion roubles)

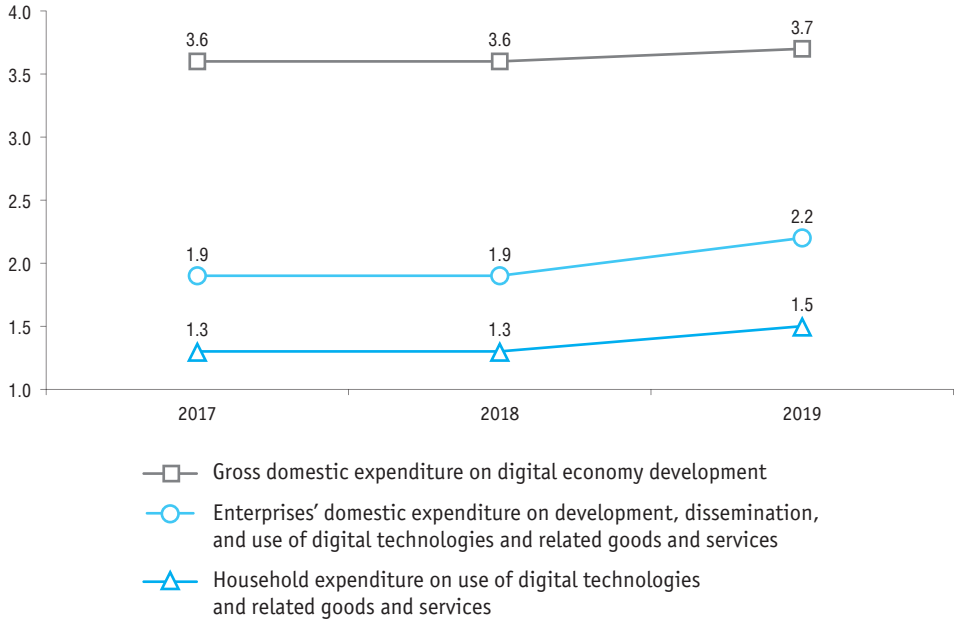


* Here and below in figure 2.2, the 2017, 2018 data for enterprises' domestic expenditure on development, dissemination, and use of digital technologies and related goods and services, household expenditure on use of digital technologies and related goods and services are given excluding expenditure on digital content.

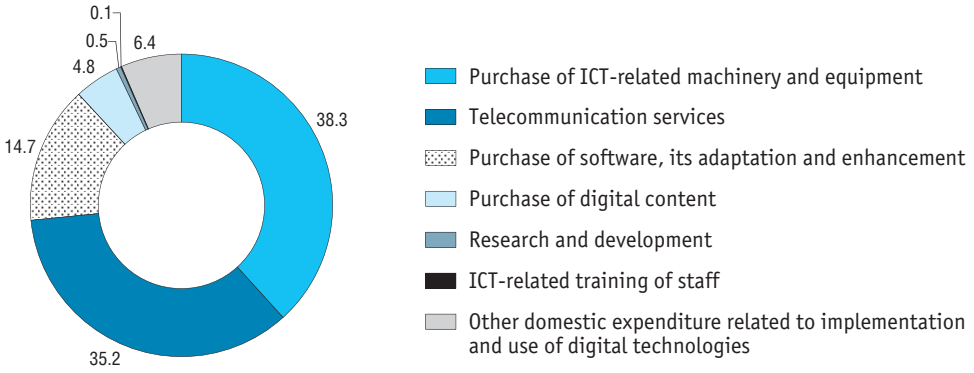
** Enterprises' domestic expenditure on development, dissemination, and use of digital technologies and related goods and services is domestic expenditure on the digital economy development from all sources of funds (session protocol no. 557pr of September 27, 2019 of the Digital Economy Subcommittee under the Government Commission on the Digital Development, Use of Information Technologies for Improving Quality of Life and Business Environment).

Sources: here and below in this section, HSE Institute for Statistical Studies and Economics of Knowledge (HSE ISSEK) estimates based on Rosstat data.

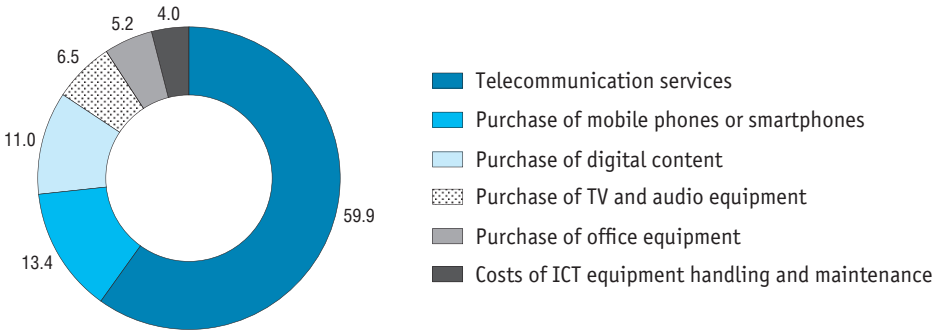
2.2. GROSS DOMESTIC EXPENDITURE ON DIGITAL ECONOMY DEVELOPMENT AS A PERCENTAGE OF GDP



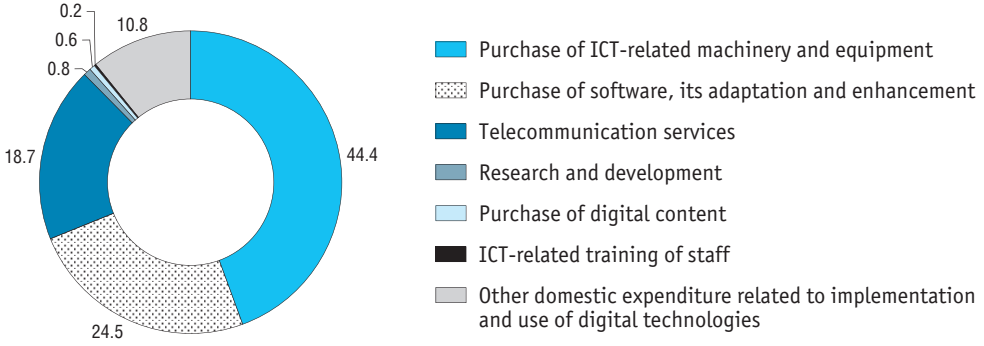
2.3. PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC EXPENDITURE ON THE DIGITAL ECONOMY DEVELOPMENT BY TYPE OF COSTS: 2019



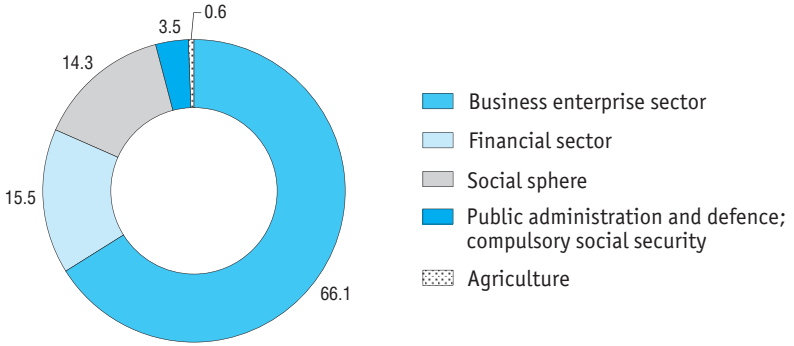
2.4. PERCENTAGE DISTRIBUTION OF HOUSEHOLD EXPENDITURE ON DIGITAL TECHNOLOGIES AND RELATED GOODS AND SERVICES BY TYPE OF COSTS: 2019



2.5. PERCENTAGE DISTRIBUTION OF ENTERPRISES' DOMESTIC EXPENDITURE ON DEVELOPMENT, DISSEMINATION, AND USE OF DIGITAL TECHNOLOGIES AND RELATED GOODS AND SERVICES BY TYPE OF COSTS: 2019



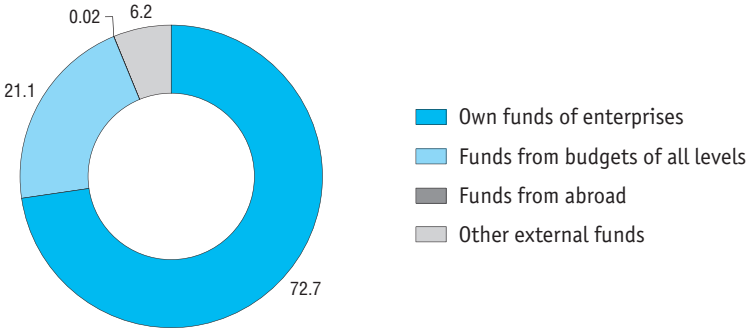
2.6. PERCENTAGE DISTRIBUTION OF ENTERPRISES' DOMESTIC EXPENDITURE ON DEVELOPMENT, DISSEMINATION, AND USE OF DIGITAL TECHNOLOGIES AND RELATED GOODS AND SERVICES BY SECTOR: 2019



2.7. ENTERPRISES' DOMESTIC EXPENDITURE ON DEVELOPMENT, DISSEMINATION, AND USE OF DIGITAL TECHNOLOGIES AND RELATED GOODS AND SERVICES BY SECTOR AND TYPE OF ECONOMIC ACTIVITY: 2019

	Billion roubles	As a percentage of the total enterprises' domestic expenditure on development, dissemination, and use of digital technologies and related goods and services	As a percentage of the industry's GVA
Business enterprise sector	**1621.0**	**66.1**	**2.2**
Mining and quarrying	27.8	1.1	0.2
Manufacturing	176.3	7.2	1.2
Electricity, gas, steam and air-conditioning supply	38.8	1.6	1.5
Water supply, sewerage, waste management and remediation activities	6.6	0.3	1.4
Construction	31.3	1.3	0.6
Wholesale and retail trade, repair of motor vehicles and motorcycles	150.8	6.1	1.2
Transportation and storage	76.6	3.1	1.1
Accommodation and food service activities	8.1	0.3	0.9
Information and communication	530.5	21.6	20.8
Telecommunications	289.3	11.8	30.7
IT industry	160.3	6.5	15.9
Real estate activities	58.5	2.4	0.6
Professional, scientific and technical activities	484.0	19.7	11.4
Agriculture	**14.0**	**0.6**	**0.4**
Financial sector	**380.2**	**15.5**	**8.9**
Social sphere	**350.6**	**14.3**	**4.7**
Education	295.1	12.0	9.4
Human health and social work activities	39.5	1.6	1.2
Arts, entertainment and recreation	16.0	0.7	1.6
Public administration and defence; compulsory social security	**87.1**	**3.6**	**1.2**

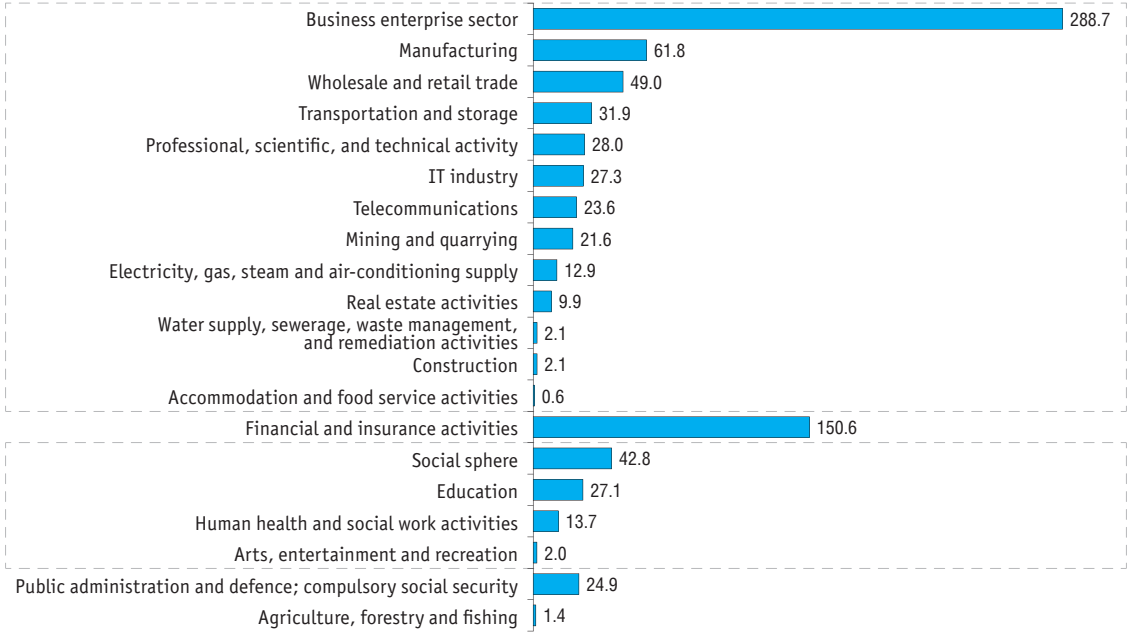
2.8. PERCENTAGE DISTRIBUTION OF ENTERPRISES' DOMESTIC EXPENDITURE ON DEVELOPMENT, DISSEMINATION, AND USE OF DIGITAL TECHNOLOGIES AND RELATED GOODS AND SERVICES BY SOURCE OF FUNDS: 2019*



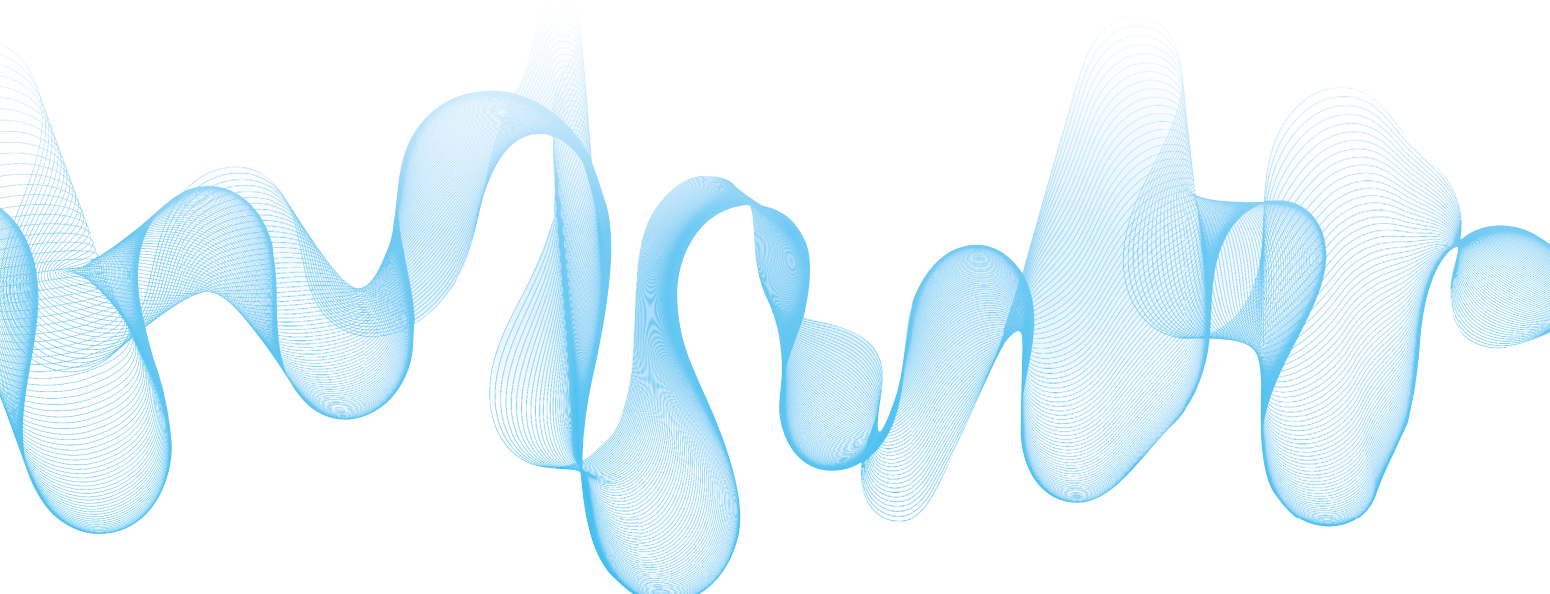
* Here and below in figure 2.9, excluding small businesses and expenditure on research and development.

2.9. EXPENDITURE ON PAYMENTS FOR THIRD-PARTY SERVICES (EXTERNAL EXPENDITURE) ON DEVELOPMENT, DISSEMINATION, AND USE OF DIGITAL TECHNOLOGIES AND RELATED GOODS AND SERVICES BY SECTOR AND TYPE OF ECONOMIC ACTIVITY: 2019

(billion roubles)



3 R&D IN ICT-RELATED FIELDS



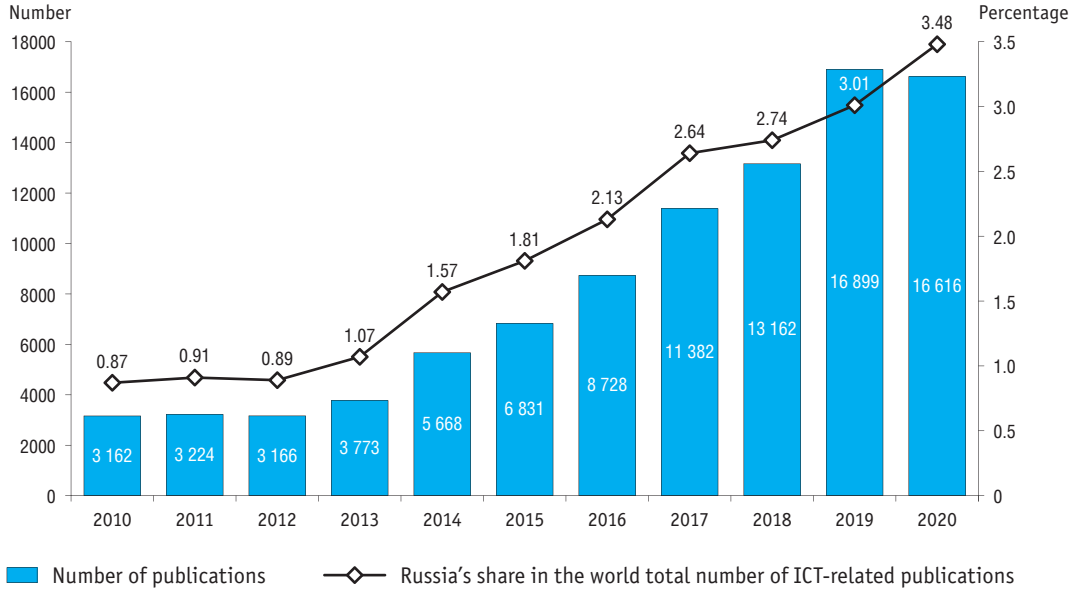
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gross domestic expenditure on R&D in 'Information and Telecommunication Systems' priority S&T area:										
at current prices, *million rubles*	38128.8	46609.9	61966.0	60031.7	70631.5	74555.8	77932.0	81390.7	76116.1	88471.6
as a percentage of gross domestic expenditure on R&D in priority S&T areas	12.9	12.9	13.1	12.2	12.3	11.9	11.6	11.3	10.6	11.0
as a percentage of gross domestic expenditure on R&D	7.3	7.6	8.9	8.0	8.3	8.2	8.3	8.0	7.4	7.8

Sources: here and below in this section, HSE ISSEK estimates based on Rosstat data.

3.2. GROSS DOMESTIC EXPENDITURE ON R&D IN 'INFORMATION AND TELECOMMUNICATION SYSTEMS' PRIORITY S&T AREA BY SOURCE OF FUNDS

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
					At current prices, *million roubles*					
Total	**38128.8**	**46609.9**	**61966.0**	**60031.7**	**70631.5**	**74555.8**	**77932.0**	**81390.7**	**76116.1**	**88471.6**
By sources of funds:										
funds from budgets of all levels	23997.4	29260.4	41205.7	40571.9	45867.5	48060.8	48115.8	49973.9	47457.3	51760.3
of which federal budget appropriations	23729.0	28242.3	38927.3	39155.2	45184.0	47107.1	47650.4	49284.2	43344.8	50186.0
own funds	…	…	…	…	6540.9	7500.1	12622.9	12701.6	13031.7	18489.8
government sector institutions' funds	…	…	…	…	5911.3	7398.4	7463.3	7232.5	4000.6	4350.9
business enterprise sector units' funds	…	…	…	…	10838.5	9310.3	7913.7	9554.5	9864.4	10780.4
other	…	…	…	…	1473.3	2286.2	1816.3	1928.2	1762.1	3090.1
					Percentage					
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
By sources of funds:										
funds from budgets of all levels	62.9	62.8	66.5	67.6	64.9	64.5	61.7	61.4	62.3	58.5
of which federal budget appropriations	62.2	60.6	62.8	65.2	64.0	63.2	61.1	60.6	56.9	56.7
own funds	…	…	…	…	9.3	10.1	16.2	15.6	17.1	20.9
government sector institutions' funds	…	…	…	…	8.4	9.9	9.6	8.9	5.3	4.9
business enterprise sector units' funds	…	…	…	…	15.3	12.5	10.2	11.7	13.0	12.2
other	…	…	…	…	2.1	3.1	2.3	2.4	2.3	3.5

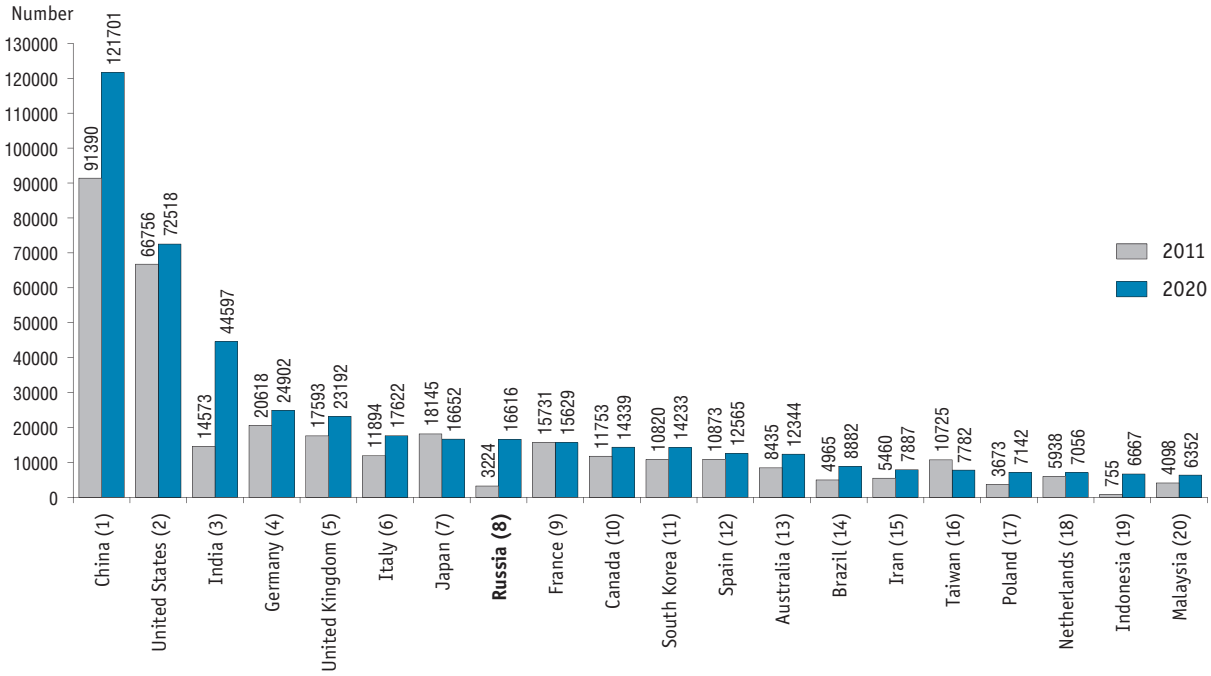
3.3. ICT-RELATED PUBLICATIONS BY RUSSIAN AUTHORS INDEXED IN SCOPUS*



* Here and below in 3.4–3.9, the term 'publication' refers to Scopus-indexed documents of the following types: articles, conference papers, reviews, books, and book chapters. These publications may be issued in Scopus-indexed scientific journals, books, book series, conference proceedings, and trade publications.

Sources: here and below in 3.4–3.7, 3.9, HSE ISSEK estimates based on Scopus data (as at February 17, 2021).

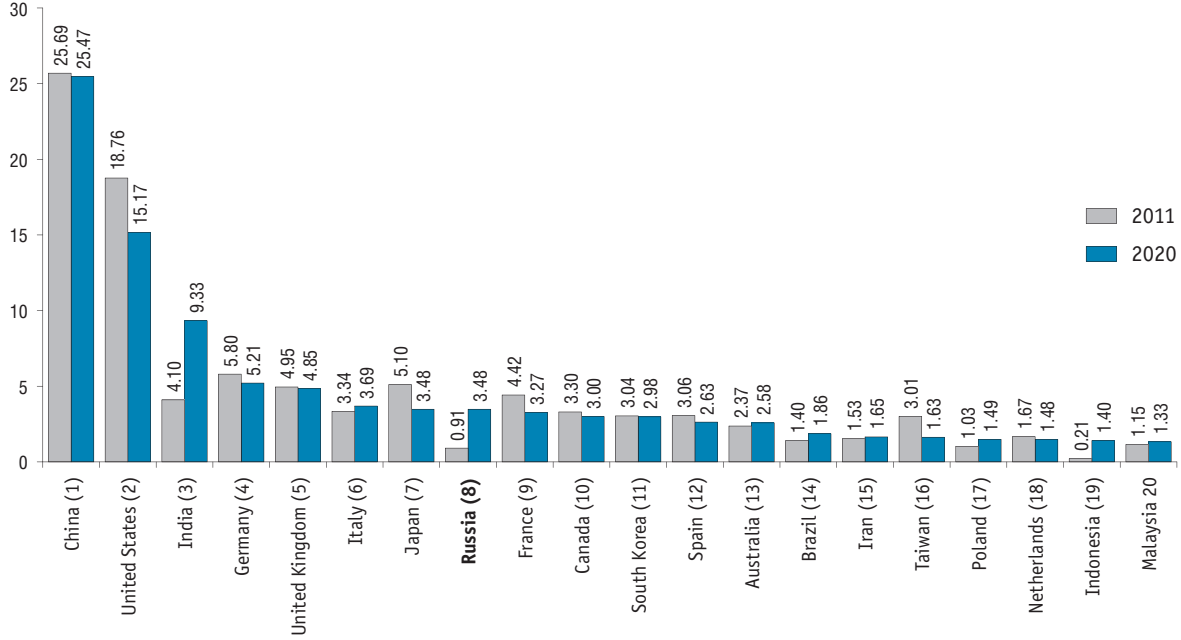
3.4. ICT-RELATED PUBLICATIONS INDEXED IN SCOPUS BY COUNTRY*



* The country's 2020 rank in the global ranking by the number of ICT-related publications indexed in Scopus is shown in parentheses.

3.5. COUNTRIES' SHARES IN THE WORLD TOTAL NUMBER OF ICT-RELATED PUBLICATIONS INDEXED IN SCOPUS*

(percentage)



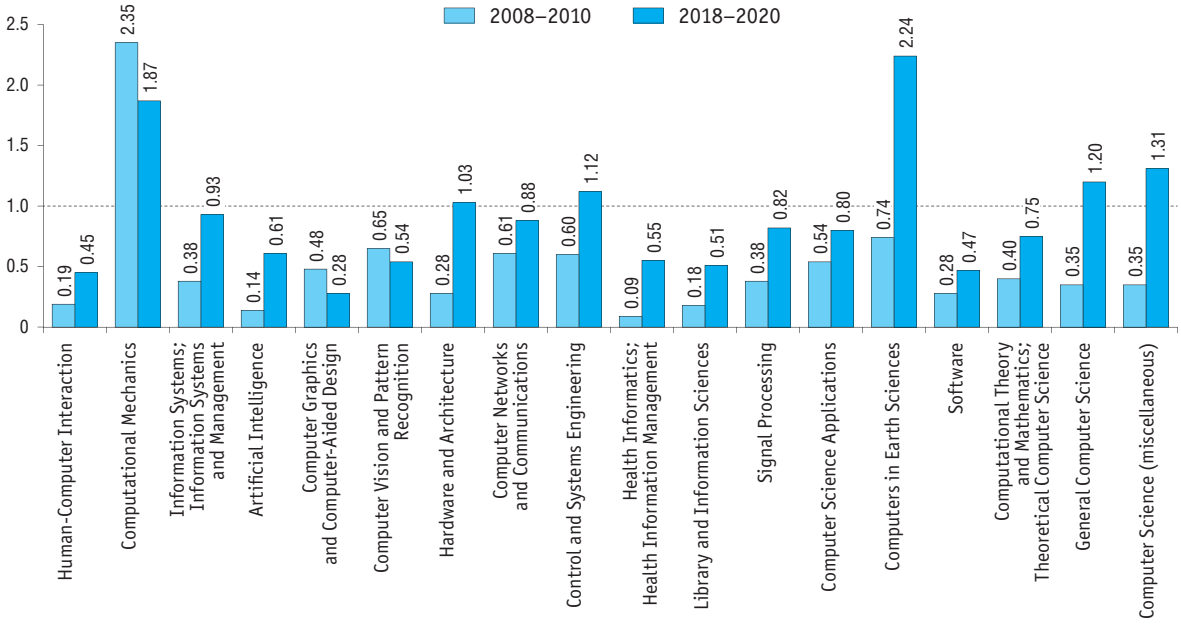
* The country's 2020 rank in the global ranking by the number of ICT-related publications indexed in Scopus is shown in parentheses.

3.6. ICT-RELATED PUBLICATIONS BY RUSSIAN AUTHORS INDEXED IN SCOPUS BY SUBJECT CATEGORY*

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ICT-related publications – total	**3162**	**3224**	**3166**	**3773**	**5668**	**6831**	**8728**	**11382**	**13162**	**16899**	**16616**
Of which by Scopus subject category:											
Human-Computer Interaction	59	79	90	195	162	160	254	448	579	456	383
Computational Mechanics	184	205	156	239	311	468	295	447	374	563	533
Information Systems; Information Systems and Management	365	393	288	369	474	689	975	1401	1606	2746	3454
Artificial Intelligence	95	91	125	165	201	203	656	749	794	2019	2526
Computer Graphics and Computer-Aided Design	95	214	82	100	99	189	146	165	204	109	93
Computer Vision and Pattern Recognition	199	295	188	225	298	435	514	621	590	596	1228
Hardware and Architecture	88	91	110	59	146	158	307	1019	1830	2168	1909
Computer Networks and Communications	706	739	629	648	1223	1532	2137	3184	3585	4566	4374
Control and Systems Engineering	689	654	630	805	1160	1667	1684	2107	2656	2996	3818
Health Informatics; Health Information Management	11	12	35	28	33	43	49	56	308	554	404
Library and Information Sciences	32	24	36	21	42	75	65	81	109	110	359
Signal Processing	155	116	102	111	236	315	840	866	843	1572	2168
Computer Science Applications	853	778	787	739	1641	1901	2148	3231	3705	4748	4402
Computers in Earth sciences	21	27	13	17	73	141	204	255	207	477	415
Software	292	275	410	394	594	707	752	1245	1297	1610	1256
Computational Theory and Mathematics; Theoretical Computer Science	462	448	433	535	683	879	1013	1425	1151	1428	1220
General Computer Science	364	457	509	693	929	1499	2226	2627	3090	4096	4450
Computer Science (miscellaneous)	84	25	30	51	35	59	141	173	609	345	503

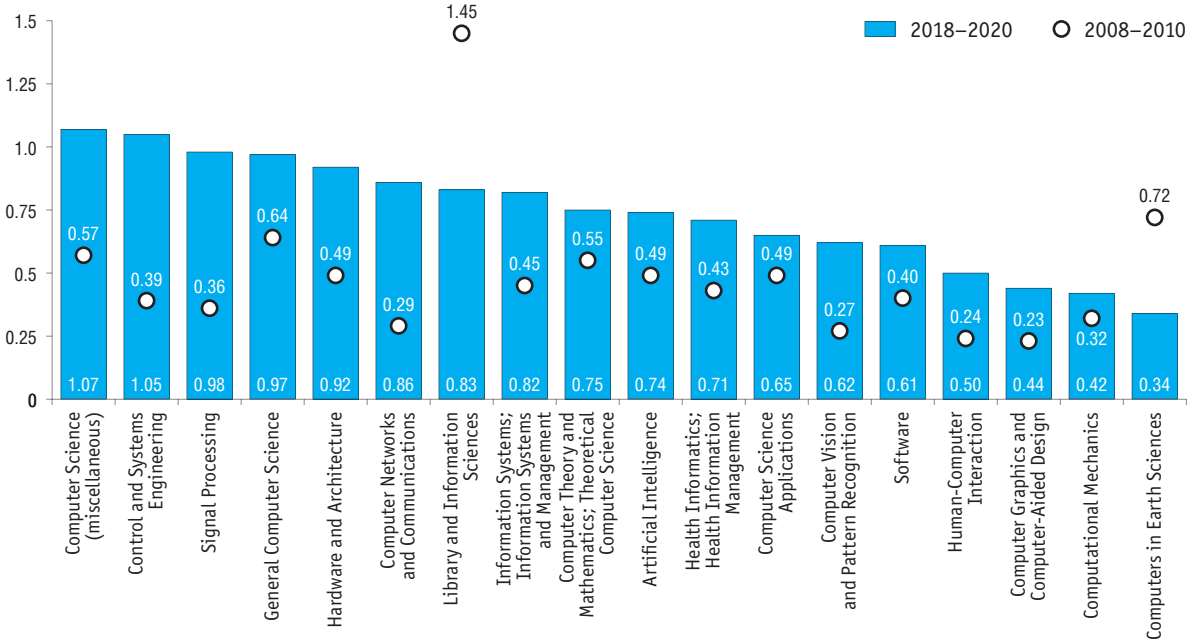
* The sum of values in a column may exceed the total indicator value as one publication may refer to several Scopus subject categories.

3.7. SCIENTIFIC SPECIALISATION INDEX OF ICT-RELATED PUBLICATIONS BY RUSSIAN AUTHORS INDEXED IN SCOPUS BY SUBJECT CATEGORY*



* ICT-related Scopus subject categories are considered as areas of Russia's scientific specialisation where the values of scientific specialisation index are over 1.0.

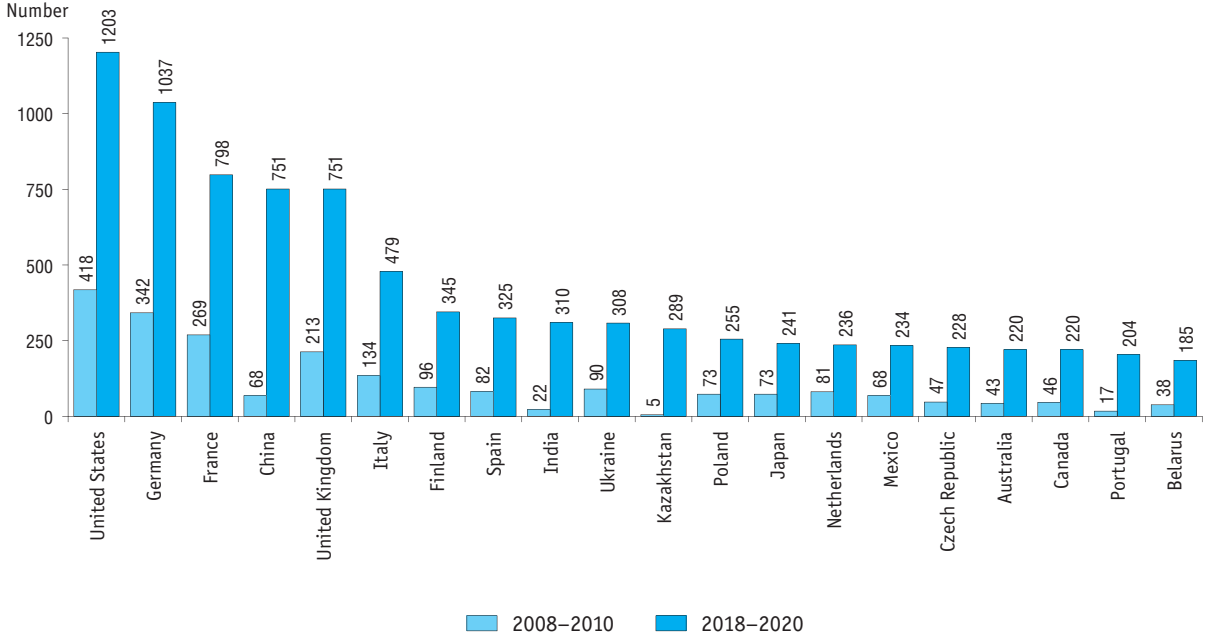
3.8. FIELD-WEIGHTED CITATION IMPACT OF ICT-RELATED PUBLICATIONS BY RUSSIAN AUTHORS INDEXED IN SCOPUS BY SUBJECT CATEGORY*



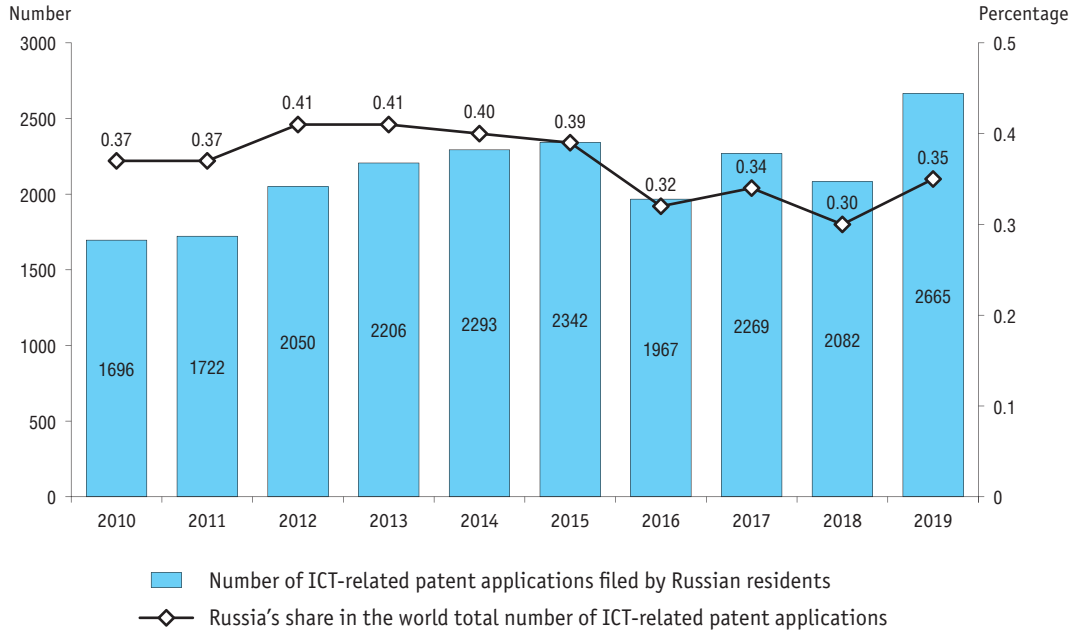
*If the value of the indicator is over 1.0 in a specific Scopus subject category, then the citation level of ICT-related publications of Russian authors in this subject category exceeds the world average.

Sources: HSE ISSEK estimates based on the Scopus database and the SciVal web-based analytical tool. The data are given as at February 10, 2021.

3.9. INTERNATIONALLY COLLABORATED ICT-RELATED PUBLICATIONS BY RUSSIAN AUTHORS INDEXED IN SCOPUS BY PARTNER COUNTRY

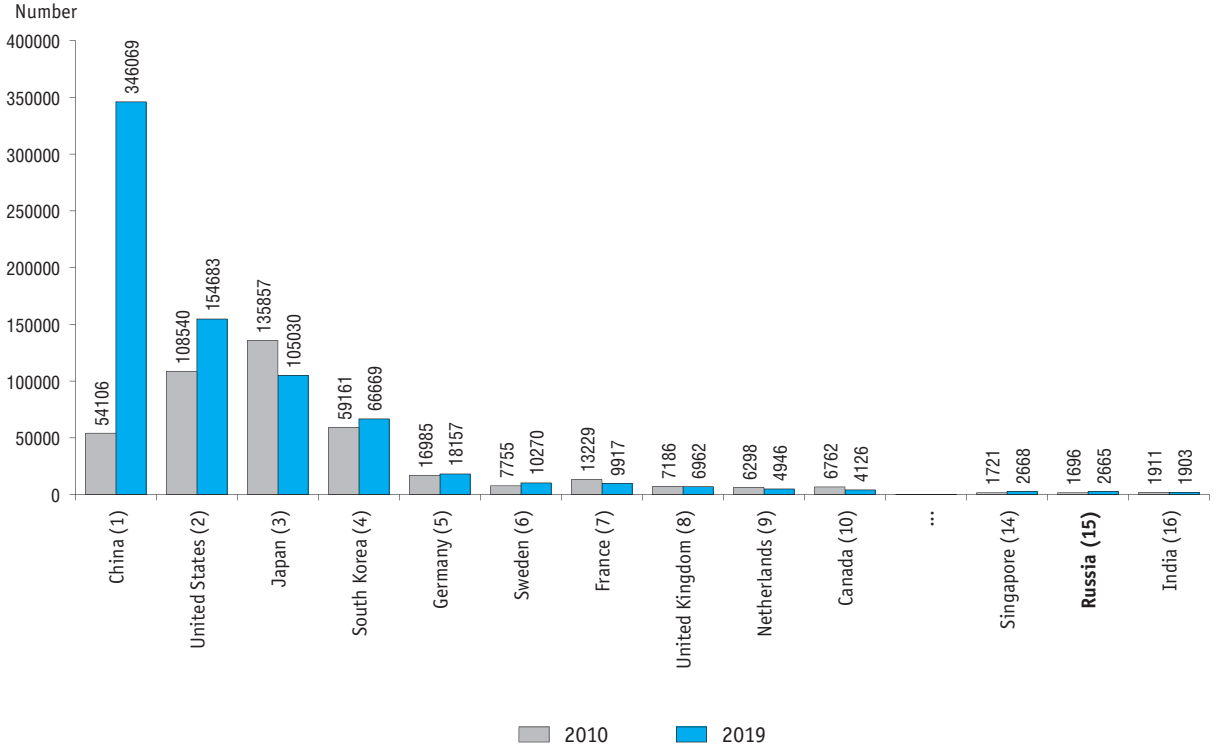


3.10. ICT-RELATED PATENT ACTIVITY OF RUSSIAN RESIDENTS



Sources: here and below in 3.11–3.13, HSE ISSEK estimates based on the WIPO data. The data are given as at February 12, 2021.

3.11. ICT-RELATED PATENT APPLICATIONS BY COUNTRY OF ORIGIN*



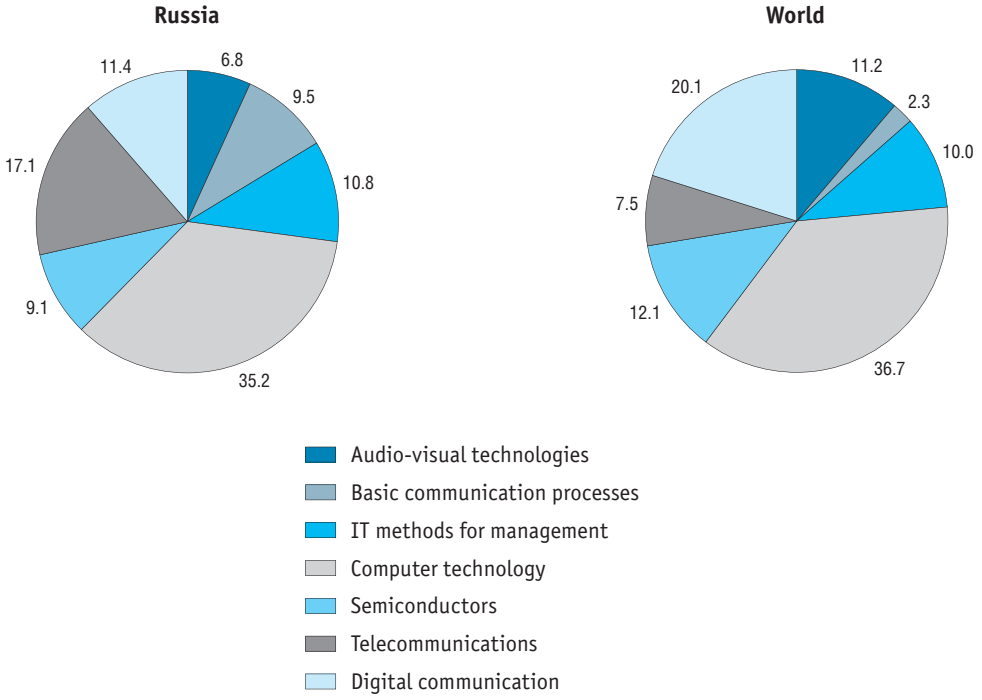
* The country's rank by the number of ICT-related patent applications in 2019 is indicated in parentheses.

3.12. ICT-RELATED PATENT ACTIVITY OF RUSSIAN RESIDENTS BY TECHNOLOGICAL AREA

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
ICT-related patent applications by Russian residents – total	**1696**	**1722**	**2050**	**2206**	**2293**	**2342**	**1967**	**2269**	**2082**	**2665**
Of which by technological area*:										
Audio-visual technologies	246	197	175	214	193	216	152	165	175	180
Basic communication processes	220	257	260	227	257	268	214	199	172	254
IT methods for management	84	78	111	198	166	145	116	147	161	289
Computer technology	475	535	673	701	824	862	703	925	745	937
Semiconductors	217	226	303	236	324	224	228	239	244	243
Telecommunications	350	321	371	409	326	427	374	399	400	457
Digital communication	104	108	157	221	203	200	180	195	185	305

* The full list ICT-related fields is based on the OECD taxonomy (Inaba T., Squicciarini M. (2017) ICT: A New Taxonomy Based on the International Patent Classification / OECD Science, Technology and Industry Working Papers, 2017/01. Paris: OECD Publishing) and WIPO Classification of Technological Areas (Schmoch U. (2008) Concept of a Technology Classification for Country Comparisons: Final Report to the World Intellectual Property Organization. Karlsruhe: Fraunhofer Institute for Systems and Innovation Research).

3.13. PERCENTAGE DISTRIBUTION OF ICT-RELATED PATENT APPLICATIONS BY TECHNOLOGICAL AREA: 2019



3.14. DEVELOPMENT OF ICT-RELATED ADVANCED MANUFACTURING TECHNOLOGIES BY TYPE: 2020*

	Total	Of which		Technologies developed with the use of patented inventions
		new to Russia	radically new	
Advanced manufacturing technologies – total	**1989**	**1788**	**201**	**519**
Of which ICT-related by type:				
Computer-aided design and virtual product development technologies	305	269	36	100
Virtual manufacturing, digital twins	44	42	–	20
Industrial robots / automated equipment for collecting, transporting, or assembling components	54	50	–	13
Industrial robots / automated production processing lines (welding, cutting, painting, etc.)	51	46	–	10
Industrial robots with sensor systems / computer vision	18	18	–	5
Safe 'human – machine' interaction technologies (collaborative robots adapted to human conditions)	9	8	–	6
Equipment with computer numerical control (CNC) 4–9 axes	53	51	–	8
Additive manufacturing technologies / rapid prototyping, 3D printing – plastics	24	23	–	6
Additive manufacturing technologies / rapid prototyping, 3D printing – metals	20	19	–	14
Additive manufacturing technologies / rapid prototyping, 3D printing – materials other than metals, plastics	10	7	3	3
Automated storage (AS) and retrieval (RS) systems	9	9	–	5

* Here and below in table 3.15, the list of advanced manufacturing technologies has been changed in 2020. The data for previous years are unsuitable for comparison.

(continued)

	Total	Of which		Technologies developed with the use of patented inventions
		new to Russia	radically new	
Automated control systems (for example, based on vision, laser, X-ray, high-definition (HD) cameras or sensors)	83	75	8	16
Sensor networks, Industrial Internet of Things	25	22	3	7
Unmanned aerial vehicles, devices of a similar purpose	11	8	3	3
Automated identification of products and components (for example, bar codes or QR codes)	17	17	–	3
RFID tags	6	5	–	–
Inter-company computer networks, including Extranet and electronic data interchange (EDI)	71	69	–	20
Wireless communication technologies for manufacturing	43	35	8	9
Integration of computer-aided quality assurance with planning and management software	47	42	5	12
Geographic information systems (GIS)	33	31	–	5
Global navigation systems (GLONASS, GPS, etc.), except for individual use by employees	36	35	–	5
Earth's remote sensing (ERS)	10	10	–	4
Mobile devices with geolocation	14	13	–	–
Remote sensors for wireless data transmission / over the Internet	17	16	–	7
Spatial data infrastructure	–	–	–	–
Enterprise resource planning (ERP)	54	50	4	13
Manufacturing resource planning (MRP II)	25	22	3	–
Customer relationship management (CRM) software	46	45	–	13

(continued)

	Total	Of which		Technologies developed with the use of patented inventions
		new to Russia	radically new	
Demand planning and forecasting software	–	–	–	–
Transportation management system	5	5	–	–
Warehouse management system (WMS)	15	15	–	4
Supply management chain (SMC) systems	–	–	–	–
Manufacturing execution system (MES)	34	34	–	–
Computerised integrated manufacturing (CIM)	9	9		
Big data processing technologies	41	38	3	6
High-performance computing for technical and industrial tasks	11	10	–	–
Streaming data processing / real-time monitoring technologies	37	35	–	5
Artificial intelligence technologies (including predictive analytics and decision support)	46	37	9	9
Status boards / visual 'dashboards' for analytics and / or decision-making	8	8	–	–
Software as a Service (SaaS)	35	31	4	6
Infrastructure as a Service (IaaS)	6	6	–	–
Distributed ledger technologies	3	–	–	–
Monitoring workload of robotic systems	–	–	–	–
Electronic management of work execution teams	5	4	–	–

Sources: here and in table 3.15, Rosstat data.

3.15. USE OF ICT-RELATED ADVANCED MANUFACTURING TECHNOLOGIES BY TYPE: 2020

	Total	Of which acquired		Number of patented inventions in the technologies used
		in Russia	abroad	
Advanced manufacturing technologies – total	**242931**	**117815**	**77117**	**7995**
Of which ICT-related by type:				
Computer-aided design and virtual product development technologies	35242	20740	7467	1300
Virtual manufacturing, digital twins	2314	1197	577	184
Industrial robots / automated equipment for collecting, transporting, or assembling components	7648	2574	3366	361
Industrial robots / automated production processing lines (welding, cutting, painting, etc.)	5514	1574	2808	290
Industrial robots with sensor systems / computer vision	1045	346	528	–
Safe 'human–machine' interaction technologies (collaborative robots adapted to human conditions)	410	194	170	–
Equipment with computer numerical control (CNC) 4–9 axes	32796	8063	10436	419
Additive manufacturing technologies / rapid prototyping, 3D printing – plastics	982	296	550	42
Additive manufacturing technologies / rapid prototyping, 3D printing – metals	251	63	127	25
Additive manufacturing technologies / rapid prototyping, 3D printing – materials other than metals, plastics	176	59	66	18
Automated storage (AS) and retrieval (RS) systems	988	464	453	25
Automated control systems (for example, based on vision, laser, X-ray, high-definition (HD) cameras or sensors)	11065	5552	3797	447
Sensor networks, Industrial Internet of Things	5922	3169	2463	162

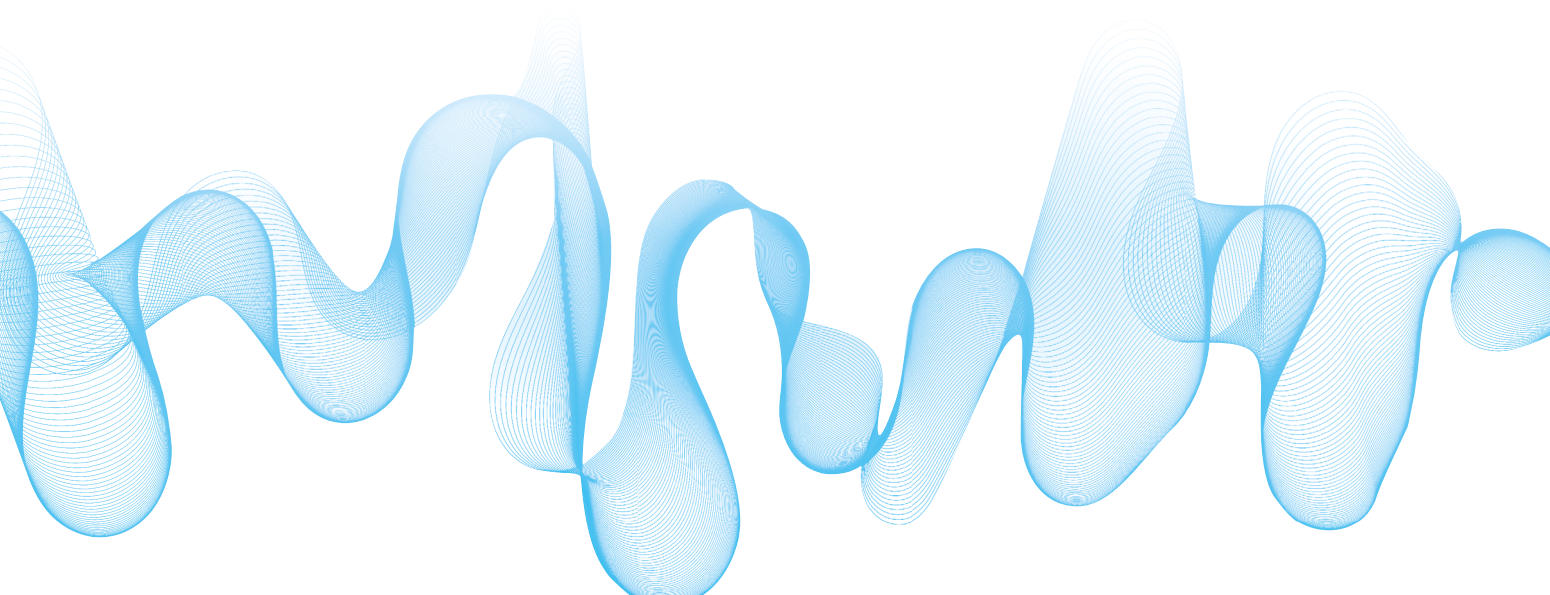
(continued)

	Total	Of which acquired		Number of patented inventions in the technologies used
		in Russia	abroad	
Unmanned aerial vehicles, devices of a similar purpose	354	111	197	28
Automated identification of products and components (for example, bar codes or QR codes)	1944	988	778	34
RFID tags	1572	1275	249	10
Inter-company computer networks, including Extranet and electronic data interchange (EDI)	19192	13763	3944	933
Wireless communication technologies for manufacturing	12063	7449	3916	482
Integration of computer-aided quality assurance with planning and management software	11811	6197	4904	284
Geographic information systems (GIS)	2545	1726	691	71
Global navigation systems (GLONASS, GPS, etc.), except for individual use by employees	8045	6490	1356	97
Earth's remote sensing (ERS)	174	95	30	31
Mobile devices with geolocation	5074	2419	2540	34
Remote sensors for wireless data transmission / over the Internet	1946	1144	734	46
Spatial data infrastructure	514	185	277	37
Enterprise resource planning (ERP)	6534	3844	2150	120
Manufacturing resource planning (MRP II)	2469	1449	436	71
Customer relationship management (CRM) software	3320	2345	717	44
Demand planning and forecasting software	497	296	145	7
Transportation management system	803	277	449	8

(continued)

	Total	Of which acquired		Number of patented inventions in the technologies used
		in Russia	abroad	
Warehouse management system (WMS)	1031	605	319	31
Supply management chain (SMC) systems	520	255	224	3
Manufacturing execution system (MES)	2927	1289	1284	97
Computerised integrated manufacturing (CIM)	2524	1578	778	19
Big data processing technologies	1223	661	381	32
High-performance computing for technical and industrial tasks	437	203	157	35
Streaming data processing / real-time monitoring technologies	1676	823	648	36
Artificial intelligence technologies (including predictive analytics and decision support)	582	305	156	23
Status boards / visual 'dashboards' for analytics and / or decision-making	1421	506	756	19
Software as a Service (SaaS)	1130	715	367	23
Infrastructure as a Service (IaaS)	667	379	278	7
Distributed ledger technologies	133	6	117	3
Monitoring workload of robotic systems	175	29	132	–
Electronic management of work execution teams	710	212	419	11

4 ICT SECTOR



4.1. MAIN ICT SECTOR INDICATORS

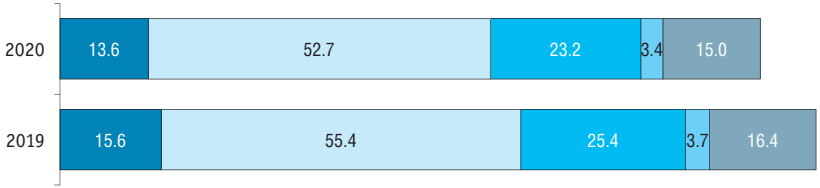
	Total						As a percentage of Russia's total for the corresponding indicator					
	2015	2016	2017	2018	2019	2020	2015	2016	2017	2018	2019	2020
Number of enterprises, *thousand units; at the beginning of the year*	…	…	119.5	120.8	116.5	107.9	…	…	2.5	2.6	2.8	2.8
Gross value added, *billion roubles*	2096.9	2174.9	2376.4	2552.2	2803.2	2985.4*	2.8	2.8	2.9	2.7	2.9	3.1*
Number of employees, *thousand persons*	…	1245.2	1219.6	1191.3	1173.9	1240.0	…	1.7	1.7	1.6	1.6	1.8
Fixed capital investment, *billion roubles*	427.6	460.9	474.0	603.7	750.9	847.7	3.1	3.1	3.0	3.4	3.9	4.2

* Preliminary estimates.

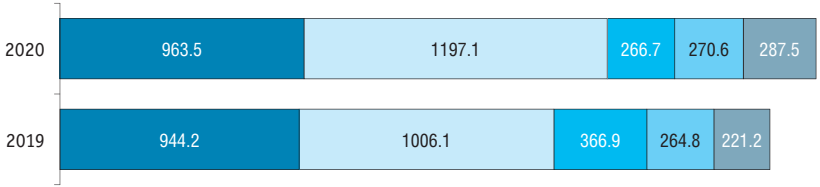
Sources: here and below in this section, for Russia, HSE ISSEK estimates based on Rosstat data (4.1–4.12, 4.14–4.21); field surveys conducted by HSE ISSEK jointly with Statistics of Russia (a non-profit analytical centre) under the project 'Monitoring of Business Tendencies and Economic Uncertainty in Russia: 2020' (4.13); for countries other than Russia, Eurostat.

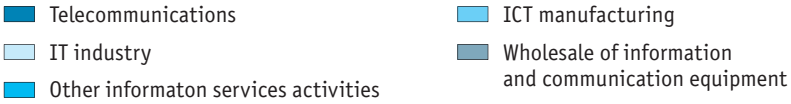
4.2. MAIN ICT SECTOR INDICATORS BY TYPE OF ECONOMIC ACTIVITY

Number of enterprises, *thousand units; at the beginning of the year*



Gross value added, *billion roubles*





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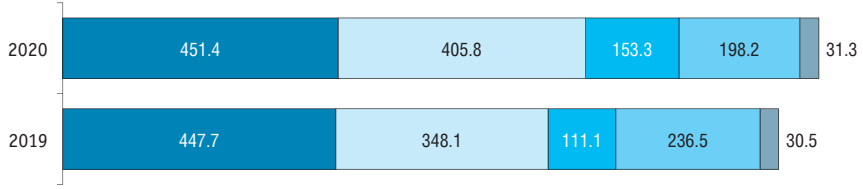
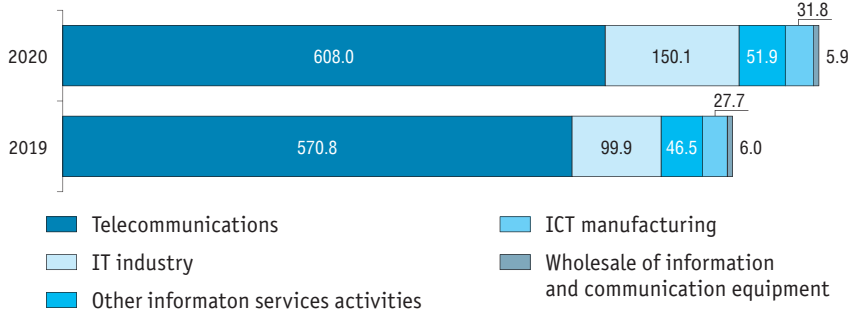
Number of employees, *thousand persons*



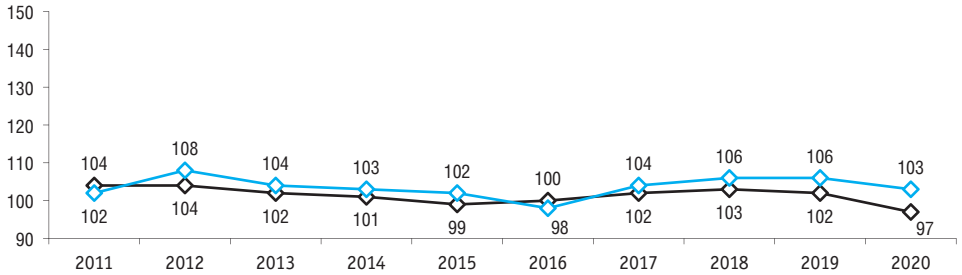
Fixed capital investment, *billion roubles*



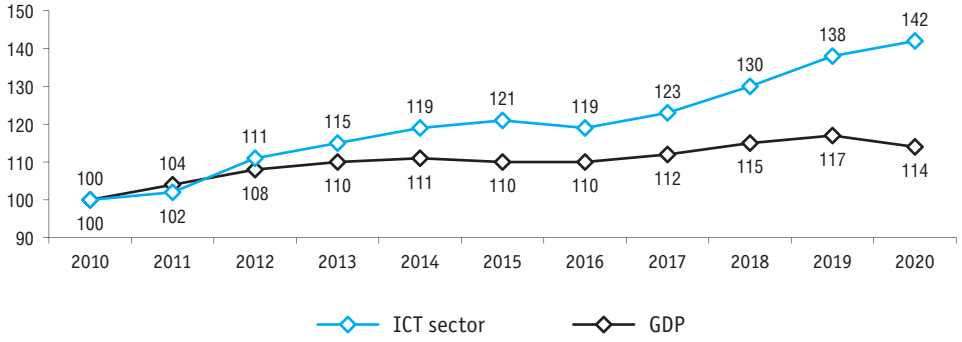
4.3. TRENDS IN THE GROSS VALUE ADDED OF THE ICT SECTOR

(in constant prices)

As a percentage of the previous year

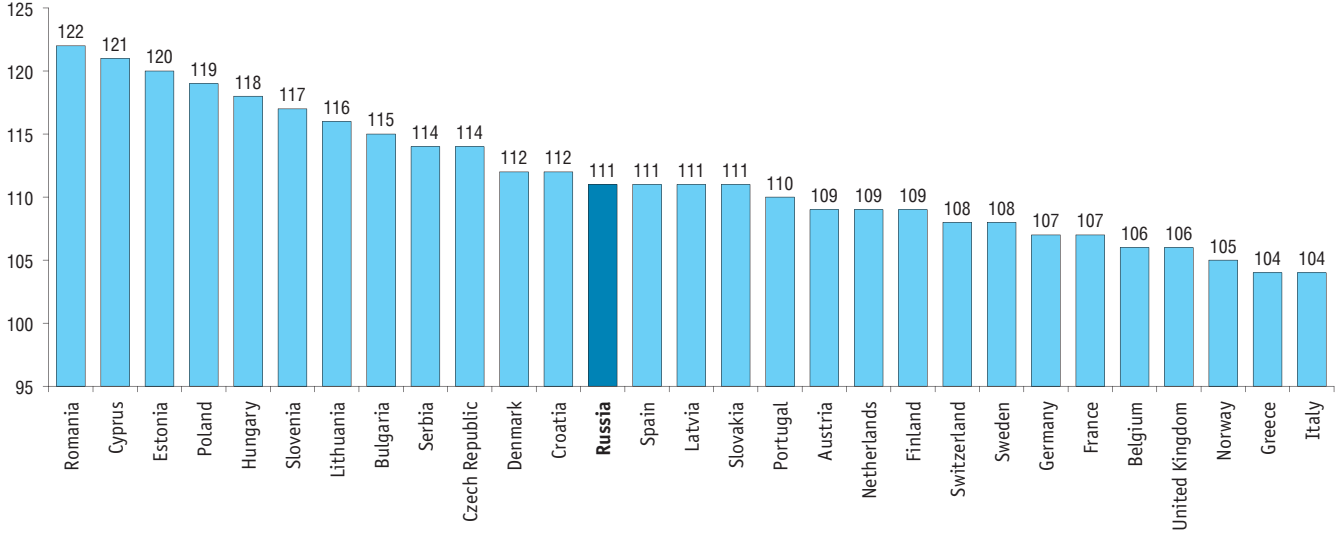


As a percentage of 2010



4.4. TRENDS IN THE GROSS VALUE ADDED OF THE ICT SECTOR BY COUNTRY: 2019*

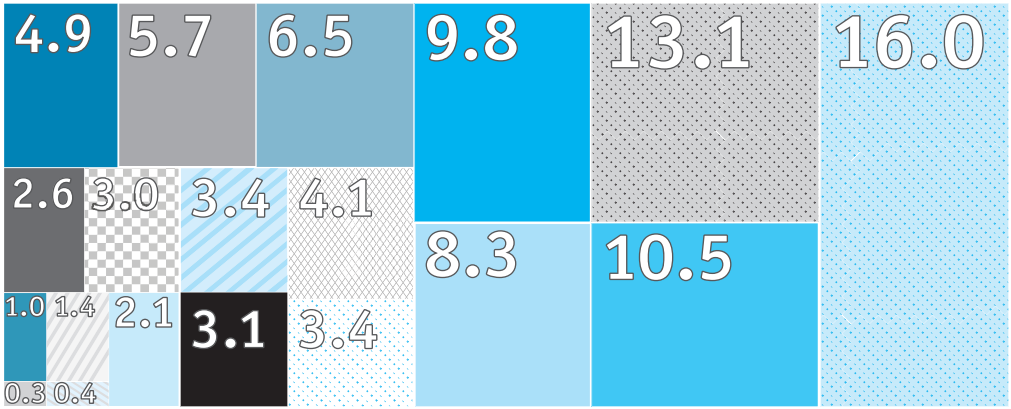
(as a percentage of 2015; in constant prices)



* Here and below in 4.6–4.9, for the purposes of international comparison in the ICT sector, the survey includes enterprises with the following OKVED2 codes of economic activity: 26 (ICT manufacturing), 61 (Telecommunications), 62, 63 (IT industry and other information service activities).

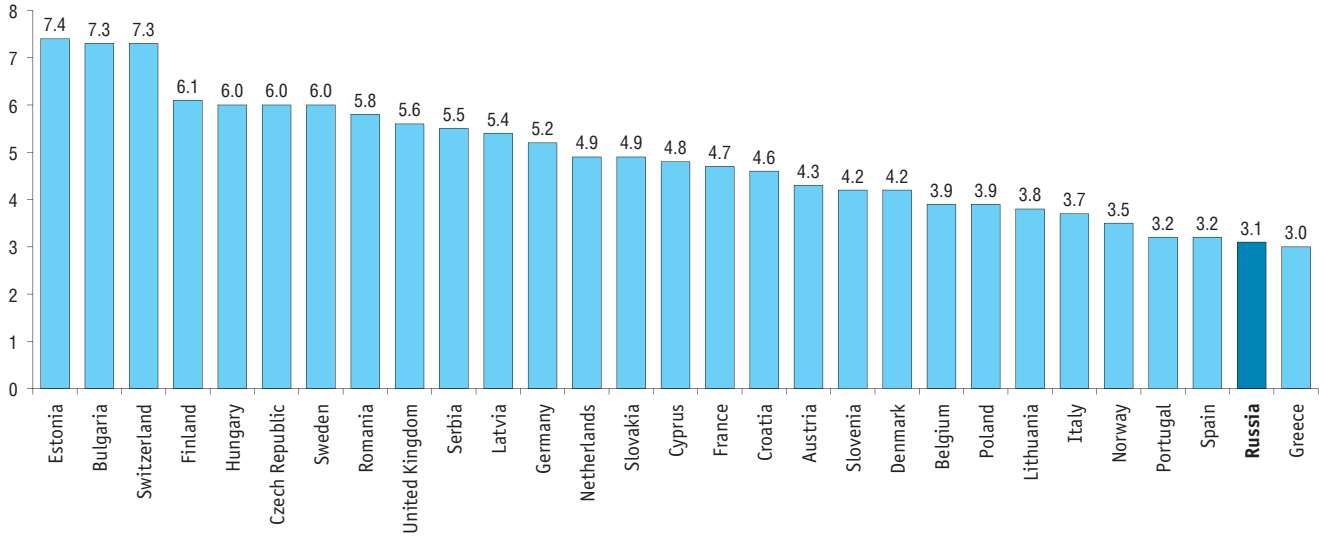
4.5. ICT SECTOR'S INPUT INTO THE NATIONAL ECONOMY DEVELOPMENT: 2020

(as a percentage of GDP)



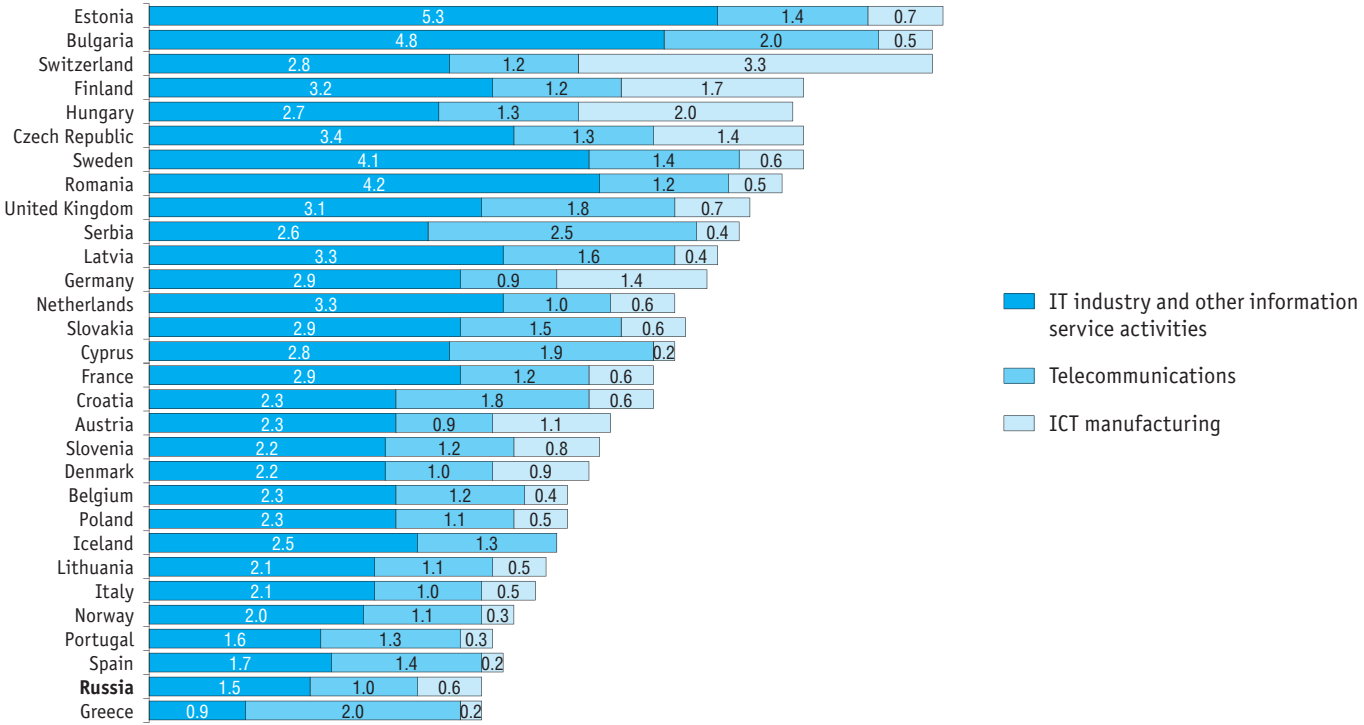
- **ICT sector (2,985 billion roubles)**
- Content and mass media sector
- Manufacture of motor vehicles, trailers, and semi-trailers
- Manufacture of chemicals and chemical products
- Scientific research and development
- Manufacture of coke and refined petroleum products
- Electricity, gas, steam and air-conditioning supply
- Manufacture of basic metals
- Education
- Human health and social work activities
- Agriculture, forestry and fishing
- Financial and insurance activities
- Construction
- Transportation and storage
- Public administration and defence; compulsory social security
- Mining and quarrying
- Real estate activities
- Wholesale and retail trade
- Other sectors

4.6. ICT SECTOR AS A PERCENTAGE OF GROSS VALUE ADDED BY COUNTRY: 2020*

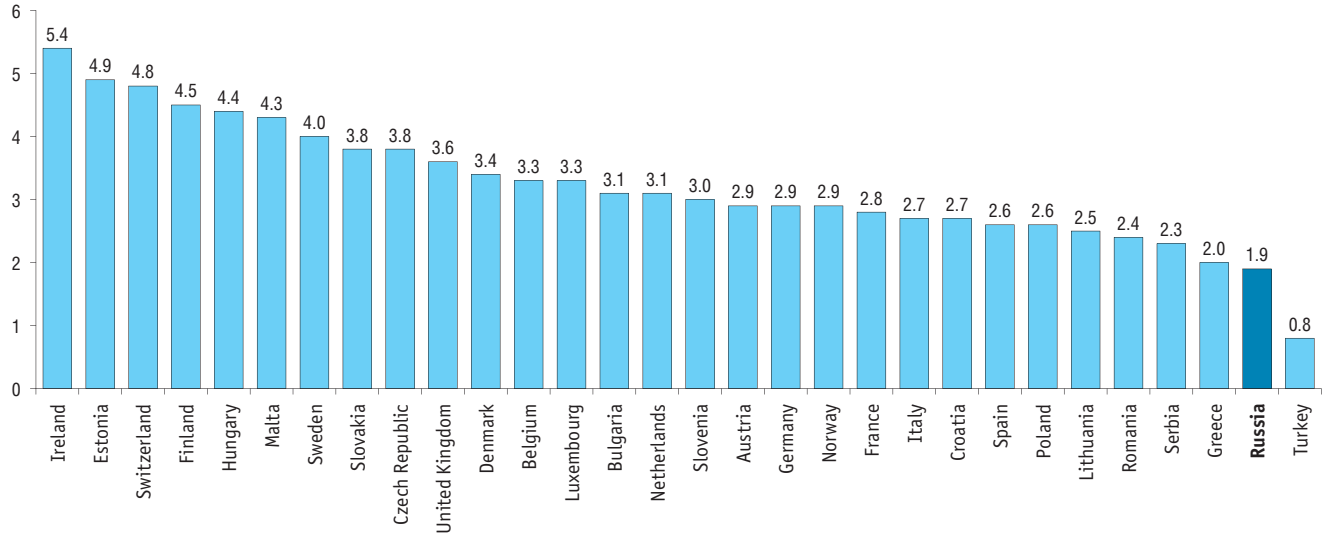


* Here and below in 4.6–4.8, or nearest years for which data are available.

4.7. ICT SECTOR AS A PERCENTAGE OF GROSS VALUE ADDED BY TYPE OF ECONOMIC ACTIVITY AND COUNTRY: 2020



4.8. ICT SECTOR AS A PERCENTAGE OF EMPLOYMENT BY COUNTRY: 2020

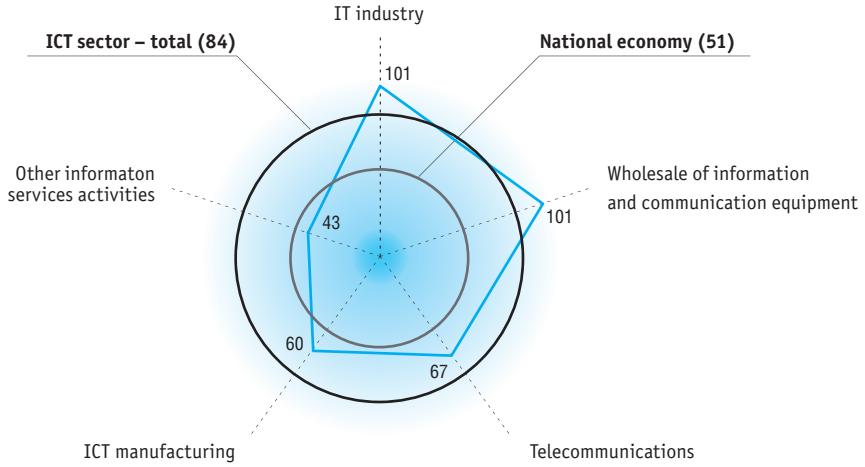


4.9. EMPLOYEES UNDER 40 AS A PERCENTAGE OF THE TOTAL NUMBER OF EMPLOYEES IN THE ICT SECTOR BY TYPE OF ECONOMIC ACTIVITY AND COUNTRY: 2020

	ICT sector – total	IT industry and other information service activities	Telecommunications	ICT manufacturing
Russia	**60**	**72**	**63**	**43**
Austria	54	55	58	51
Belgium	51	54	55	33
Bulgaria	64	76	54	38
Czech Republic	53	58	49	47
Denmark	45	48	46	31
Finland	48	51	47	37
France	53	62	37	36
Germany	46	49	38	42
Hungary	52	55	49	51
Ireland	57	60	49	50
Italy	38	43	21	38
Lithuania	76	82	64	54
Malta	57	53	65	58
Netherlands	51	53	44	40
Poland	69	78	53	56
Romania	62	74	59	47
Serbia	65	76	52	50
Slovakia	58	63	61	47
Spain	49	53	43	38
Sweden	49	51	45	33
Switzerland	50	53	44	47
Turkey	78	81	78	73
United Kingdom	51	52	57	45

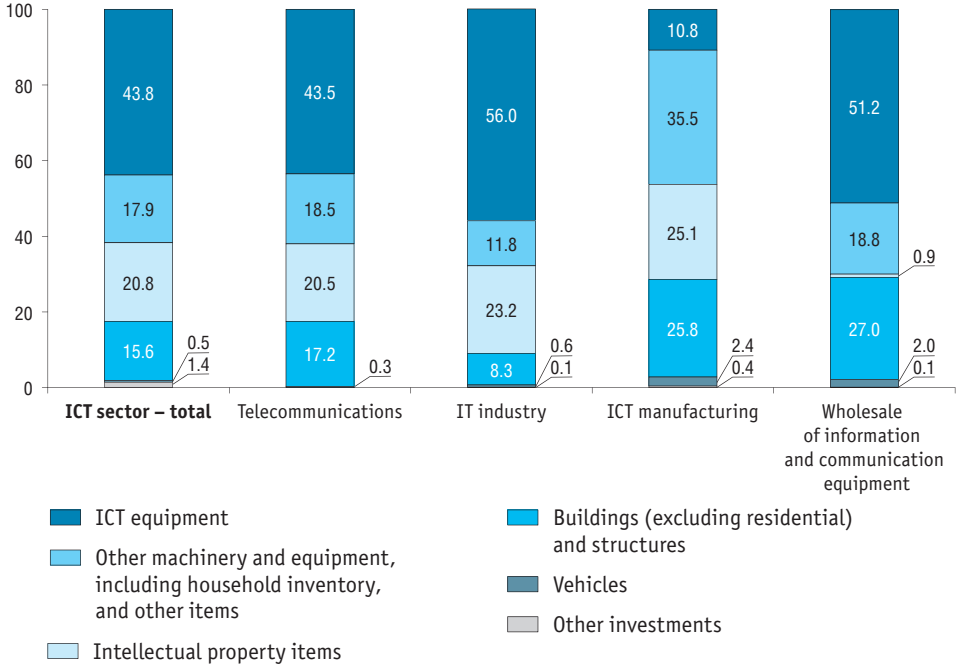
4.10. AVERAGE MONTHLY ACCRUED SALARY IN THE ICT SECTOR BY TYPE OF ECONOMIC ACTIVITY: 2020

(thousand roubles)



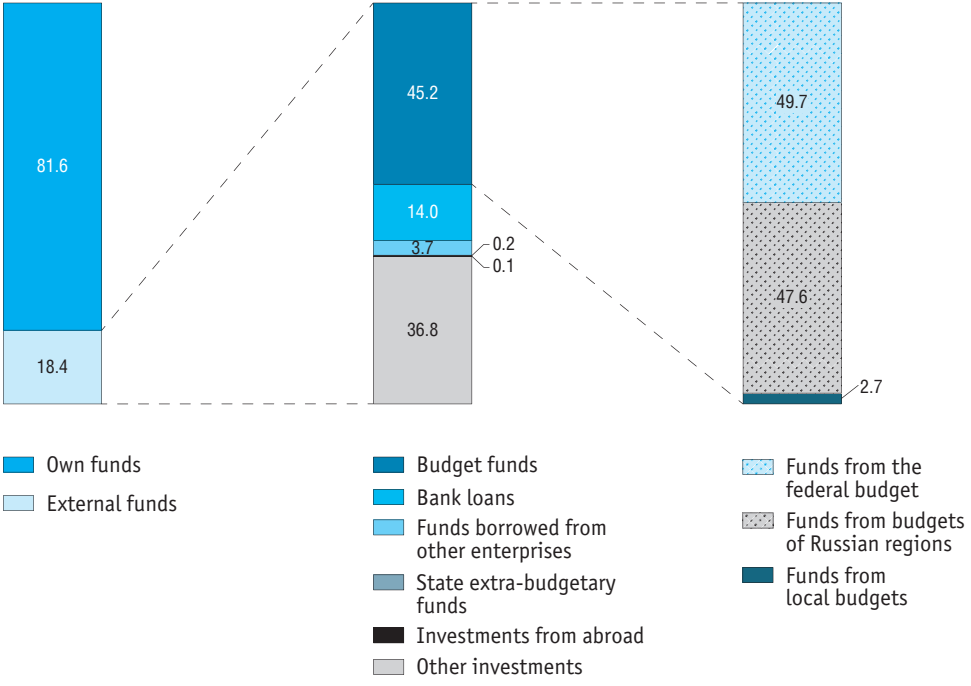
4.11. PERCENTAGE DISTRIBUTION OF FIXED CAPITAL INVESTMENT IN THE ICT SECTOR BY TYPE OF FIXED ASSETS: 2020*

(as a percentage of all fixed capital investment)



* Excluding small enterprises.

4.12. PERCENTAGE DISTRIBUTION OF FIXED CAPITAL INVESTMENT IN THE ICT SECTOR BY SOURCE OF FUNDS: 2020*



* Excluding small enterprises.

4.13. BUSINESS ACTIVITY OF ENTERPRISES PROVIDING IT SERVICES*

*(statistical balances**, percentage)*

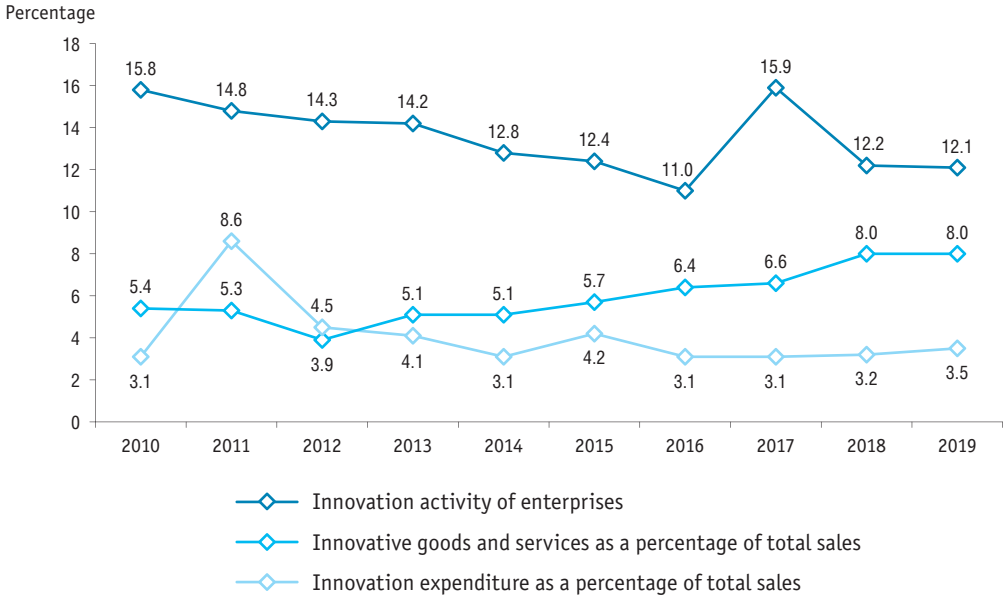
	Levels***			Trends					
				During the year			Prospects for the next year		
	2018	2019	2020	2018	2019	2020	2019	2020	2021
Demand for enterprises' services	-28	-16	-27	-5	+8	-12	+12	+14	+10
Number of contracts (customers)	-34	-17	-25	-3	+5	-14	+13	+18	+11
Sales of developed software in the domestic market	…	-14	-26	…	+5	-15	…	+7	+3
Sales of developed software abroad	…	-17	-30	…	-1	-14	…	+2	-8
Cost of services	-23	-17	-25	-2	+13	-8	+9	+17	+14
Prices (fees) for services	-10	-14	-11	+3	+11	+3	+10	+14	+14
Number of employees	-14	-11	-13	-1	+9	-2	+11	+16	+13
Competitive strength	+3	+14	-1	+9	+13	-2	+16	+16	+4
Investments	-32	-25	-32	-6	-2	-11	+2	+4	-3
Financial status	-16	-8	-11	+2	+3	-20	+12	+8	-4

* Enterprises developing computer software and providing consultancy and other related activities (OKVED2 code 62) and enterprises engaged in information service activities (code 63).

** Statistical balance is the difference between the shares of respondents evaluating an indicator as being 'up' or 'down' from the preceding period, or the difference between the shares of respondents who evaluated the indicator as 'above normal' or 'below normal' during the surveyed period.

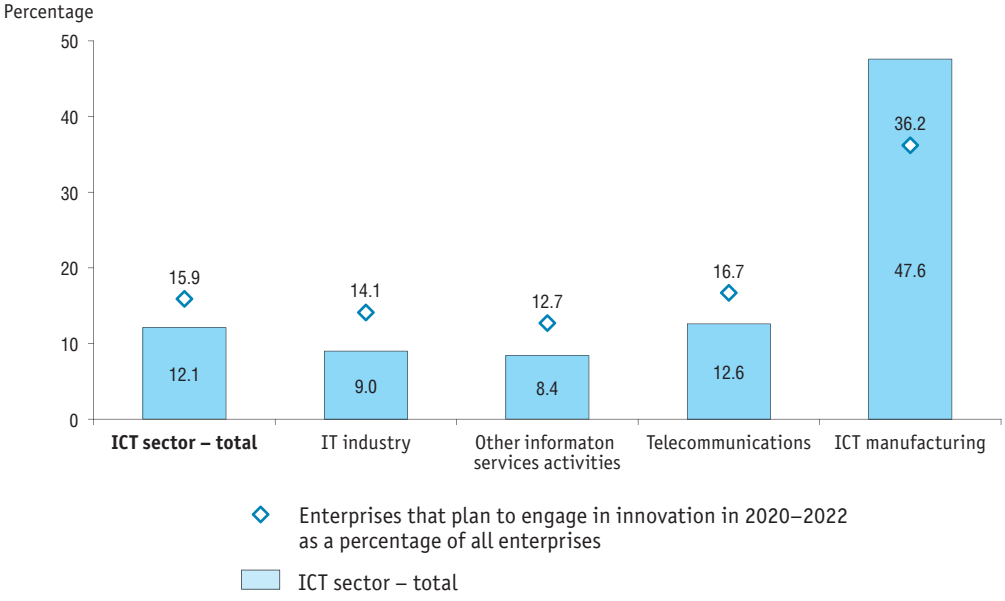
*** Levels can be deemed acceptable, regular, or sufficient according to circumstances prevailing during the surveyed period.

4.14. MAIN ICT SECTOR INDICATORS OF INNOVATIVE ACTIVITY*



* Aggregate ICT sector enterprises's data covering the following types of economic activity: for 2017, OKVED2 codes 26.1, 26.20, 26.30, 26.40, 26.80, 58.2, 61, 62, 62.09, 63.11, and 63.12; until 2017, OKVED (Rev. 1.1) codes 30, 32, 64, and 72.

4.15. INNOVATION ACTIVITY OF ICT SECTOR ENTERPRISES BY TYPE OF ECONOMIC ACTIVITY: 2019



4.16. DISTRIBUTION OF ICT SECTOR ENTERPRISES BY TYPES OF INNOVATIVE AND ECONOMIC ACTIVITY: 2019

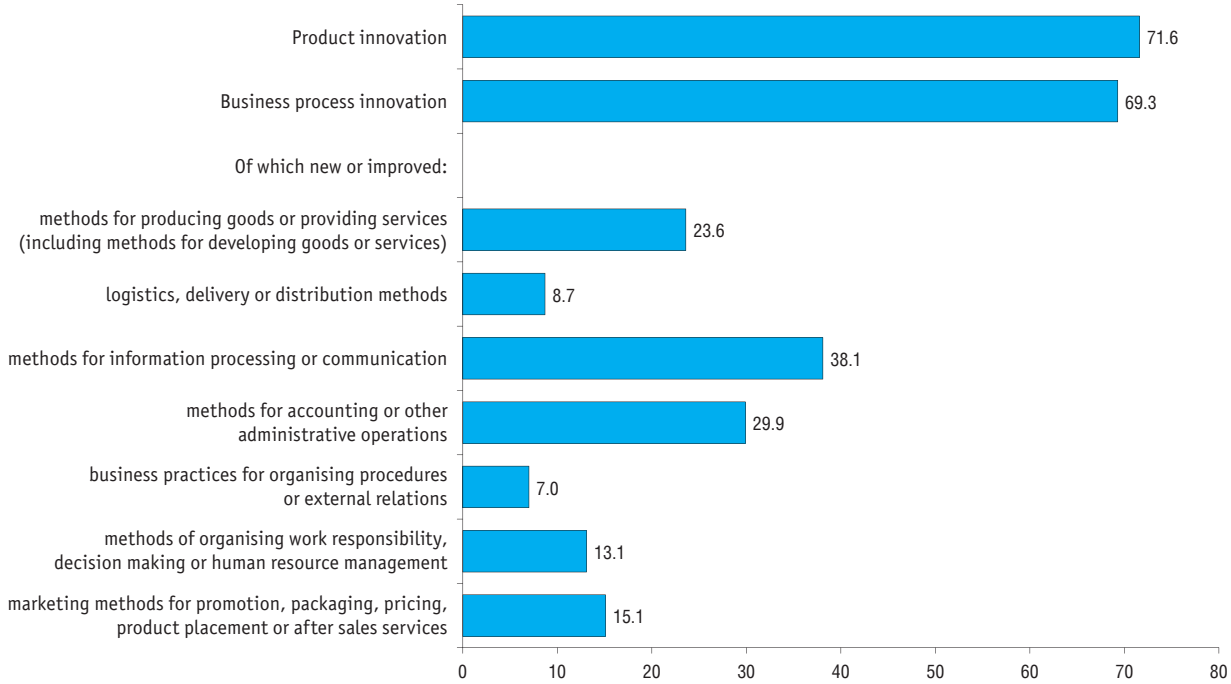
(as a percentage of ICT sector enterprises that had innovation expenditure)

	Research and development	Purchase of machinery and equipment, or other fixed assets	Marketing and brand creation	Education and training of staff	Design	Engineering	Development and purchase of software and databases	Acquisition of rights to the results of intellectual activity*	Planning, development, and implementation of new business methods, organisation of workplaces and networking	Other innovative activities
ICT sector – total	**33.7**	**51.9**	**8.5**	**24.1**	**2.2**	**18.4**	**36.1**	**8.7**	**2.7**	**11.7**
IT industry	37.1	45.8	10.4	18.3	3.2	4.8	52.6	10.0	1.6	20.7
Other information service activities	20.0	46.7	6.7	10.0	-	3.3	56.7	6.7	3.3	16.7
Telecommunications	17.5	57.9	5.8	35.4	0.8	35.0	17.9	4.2	3.8	4.2
ICT manufacturing	64.9	54.1	10.8	16.2	3.6	17.1	32.4	16.2	2.7	6.3

* Here and below in table 4.19, acquisition of patent rights (alienation), licenses, industrial designs, utility models, selection achievements, integrated circuit designs, etc.; patenting (registration) of the results of intellectual activity.

4.17. ICT SECTOR ENTERPRISES ENGAGED IN PRODUCT AND BUSINESS PROCESS INNOVATION: 2017–2019

(as a percentage of all ICT sector enterprises that have had completed innovation activities)



4.18. INNOVATION EXPENDITURE AND OUTPUT OF ICT SECTOR ENTERPRISES BY TYPE OF ECONOMIC ACTIVITY: 2019

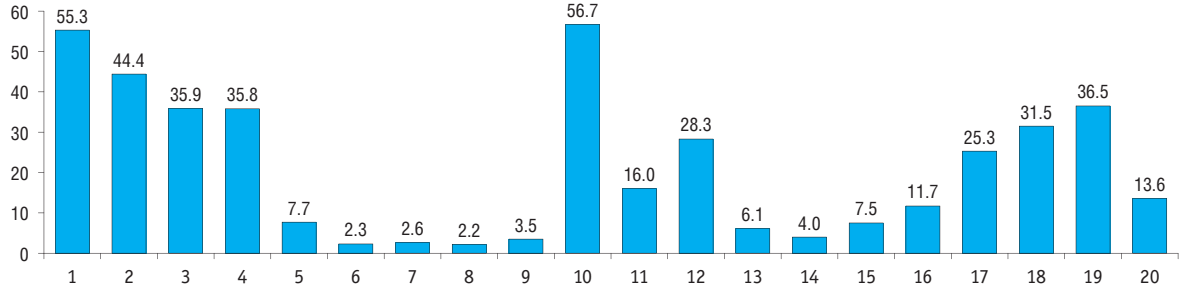
	Innovation expenditure		Sales of innovative goods and services	
	Million roubles	As a percentage of total sales	Million rouble	As a percentage of total sales
ICT sector – total	**125509.5**	**3.5**	**288850.5**	**8.0**
IT industry	50590.5	5.3	113493.9	11.8
Other information service activities	3659.2	1.3	2294.7	0.8
Telecommunications	46586.5	2.6	84144.8	4.6
ICT manufacturing	24673.2	4.4	88917.1	16.0

4.19. PERCENTAGE DISTRIBUTION OF ICT SECTOR ENTERPRISES' INNOVATION EXPENDITURE BY TYPES OF INNOVATIVE AND ECONOMIC ACTIVITY: 2019

	Research and development	Purchase of machinery and equipment, or other fixed assets	Marketing and brand creation	Education and training of staff	Design	Engineering	Development and purchase of software and databases	Acquisition of rights to the results of intellectual activity	Planning, development, and implementation of new business methods, organisation of workplaces and networking	Other expenditure
ICT sector – total	**30.8**	**16.6**	**1.5**	**0.7**	**2.1**	**18.5**	**21.2**	**1.1**	**0.1**	**7.3**
IT industry	34.9	6.2	0.3	1.7	0.02	1.0	37.8	2.2	0.01	15.8
Other information service activities	76.8	16.8	0.02	0.05	–	2.3	1.5	0.0	0.0	2.5
Telecommunications	10.4	18.1	3.7	0.1	3.9	46.6	14.5	0.2	0.3	2.2
ICT manufacturing	54.0	35.0	0.1	0.1	3.3	3.6	3.0	0.7	0.1	0.1

4.20. ICT SECTOR ENTERPRISES INDICATING THE FOLLOWING INNOVATION OUTCOMES AS SIGNIFICANT TO THEIR MANUFACTURING AND ECONOMIC DEVELOPMENT: 2017–2019

(as a percentage of all ICT sector enterprises that have had completed innovation activities)



1 – Expansion of goods and services range
2 – Retaining traditional sales markets
3 – Market expansion:
4 – in Russia
5 – in EEU countries*
6 – in candidate countries**, United Kingdom, Liechtenstein, Norway, Switzerland
7 – in BRICS countries***
8 – in United States and Canada
9 – in other countries
10 – Goods and services quality improvement
11 – Higher manufacturing flexibility
12 – Production capacity increase
13 – Lower salary costs
14 – Lower inventory and/or material costs
15 – Better energy efficiency in production processes
16 – Better working environment and occupational health and safety
17 – More rapid customer and supplier interaction
18 – Improvements in internal and external communications
19 – Improvements in absorbing, processing and analysing knowledge
20 – Compliance with advanced technical standards, rules, and regulations and with sanitation,veterinary and phytosanitary requirements

* Armenia, Belarus, Kazakhstan, and Kyrgyzstan.
** Albania, Bosnia and Herzegovina, Iceland, Kosovo, North Macedonia, Serbia, Turkey, and Montenegro.
*** Brazil, India, China, and South Africa.

4.21. MAIN INDICATORS OF ICT SECTOR INNOVATION ACTIVITY BY COUNTRY: 2019*

(percentage)

	Innovation activity of enterprises	Innovative goods and services as a percentage of total sales	Innovation expenditure as a percentage of total sales
Russia	**12.1**	**8.0**	**3.5**
Austria	87.1	19.2	5.4
Belgium	85.3	43.4	6.6
Bulgaria	54.4	20.5	3.9
Croatia	72	27.4	3.6
Cyprus	82.2	12.2	1.1
Czech Republic	68	25.6	2.8
Denmark	73.3	18.1	7.1
Estonia	86	23.4	7.1
Finland	84	28.6	8.4
France	75	9.9	5.5
Germany	91.3	27.7	10.6
Greece	74.3	31.6	4.9
Hungary	54.1	9.8	2.3
Iceland	87.1	14.3	7.1
Ireland	60	23.9	3.7
Italy	81.2	25.6	6.2
Latvia	53.5	24.1	1.7
Lithuania	70.8	28.5	4.6
Luxembourg	56.2	6.1	0.5

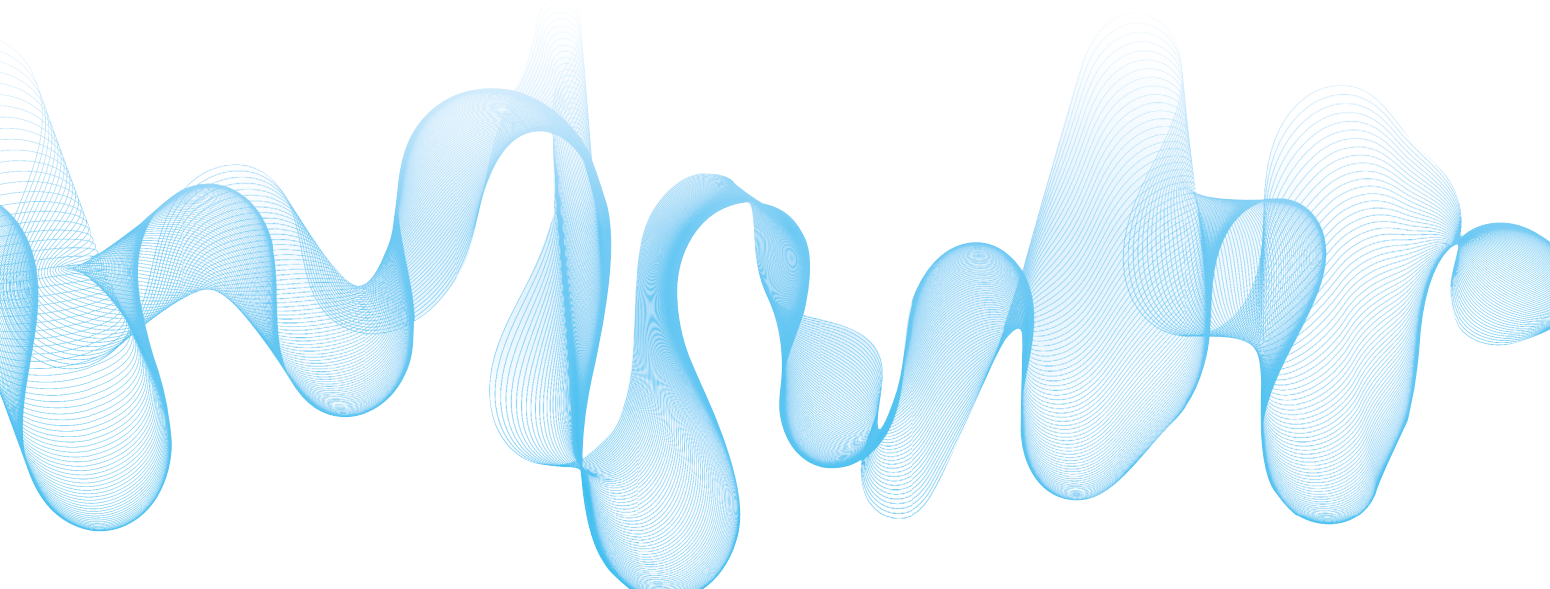
* The data for the EU countries, Iceland, Norway, Turkey, and Switzerland are based on the results of the Community Innovation Survey (2016–2018); for Great Britain and Serbia, based on the results of the Community Innovation Survey (2014–2016). For the purposes of international comparison in the ICT sector, the data covers only enterprises with the following OKVED2 codes of economic activities: 26, 61, 62, and 63.

(continued)

	Innovation activity of enterprises	Innovative goods and services as a percentage of total sales	Innovation expenditure as a percentage of total sales
Malta	70	9.6	4.8
Netherlands	70.2	…	…
Norway	84.1	13.5	5.4
Poland	46.7	17.4	4.6
Portugal	61	17.2	2.8
Romania	44	32.1	0.4
Serbia	46	11.4	36.6
Slovakia	45	30.8	2.1
Slovenia	72	19.4	3.3
Spain	53.9	38.1	4.6
Sweden	78	23.3	10.5
Switzerland	58	21.8	…
Turkey	65	24.4	9.5
United Kingdom	72	30.2	…

Source: Eurostat.

5 CONTENT AND MEDIA SECTOR



5.1. MAIN CONTENT AND MEDIA SECTOR INDICATORS

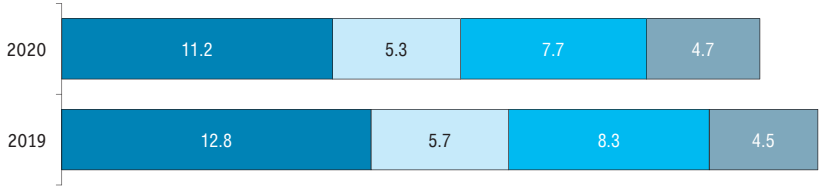
	Total						As a percentage of Russia's total for the corresponding indicator					
	2015	2016	2017	2018	2019	2020	2015	2016	2017	2018	2019	2020
Number of enterprises, *thousand units; at the beginning of the year*	…	…	34.2	33.9	31.3	28.9	…	…	0.7	0.7	0.7	0.8
Gross value added, *billion roubles*	256.7	287.2	321.2	335.6	340.6	330.8*	0.3	0.4	0.4	0.4	0.3	0.3*
Number of employees, *thousand persons*	…	405.2	365.7	394.7	436.8	443.9	…	0.6	0.5	0.5	0.6	0.6
Fixed capital investment, *billion roubles*	27.3	27.4	36.4	58.7	81.4	75.2	0.2	0.2	0.2	0.3	0.4	0.4

* Preliminary estimates.

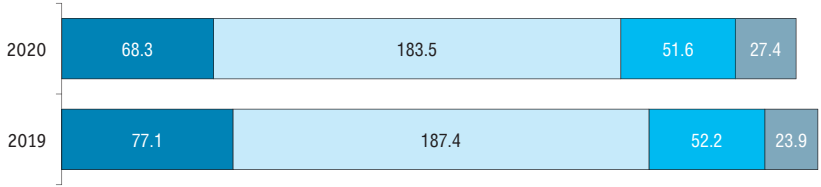
Sources: here and below in this section, for Russia, HSE ISSEK estimates based on Rosstat data; for countries other than Russia, Eurostat.

5.2. MAIN CONTENT AND MEDIA SECTOR INDICATORS BY TYPE OF ECONOMIC ACTIVITY

Number of enterprises, *thousand units; at the beginning of the year*



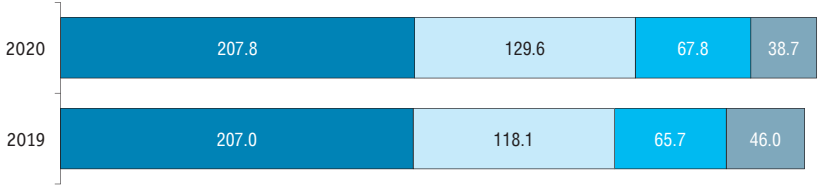
Gross value added, *billion roubles*



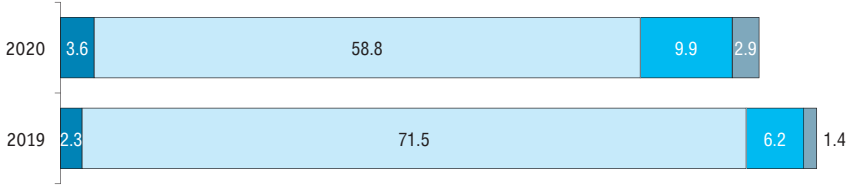
- Publishing of books, periodicals and other publishing activities
- Motion picture, video and television programme activities
- Radio and TV programming and broadcasting activities
- Other services

(continued)

Number of employees, *thousand persons*



Fixed capital investment, *billion roubles*



Publishing of books, periodicals and other publishing activities

Motion picture, video and television programme activities

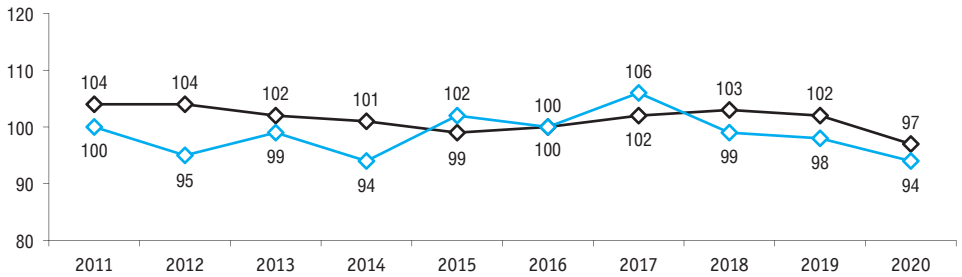
Radio and TV programming and broadcasting activities

Other services

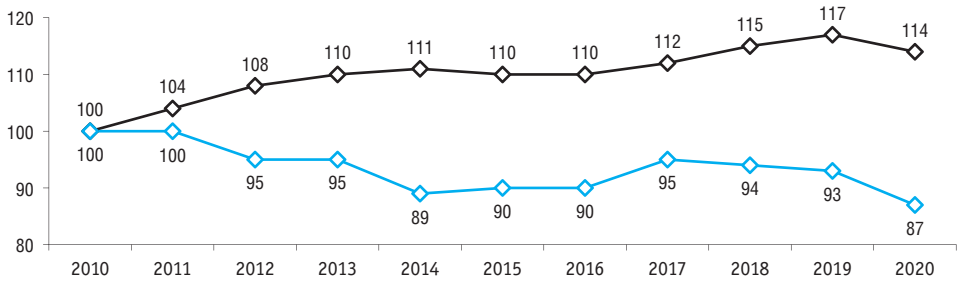
5.3. TRENDS IN THE GROSS VALUE ADDED OF THE CONTENT AND MEDIA SECTOR

(in constant prices)

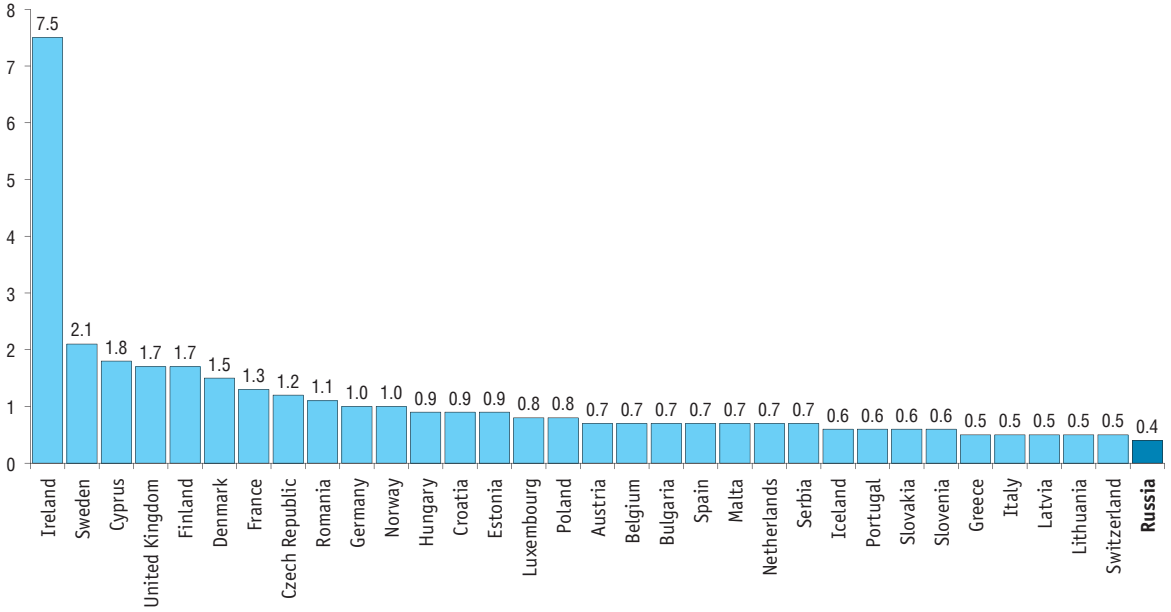
As a percentage of the previous year



As a percentage of 2010

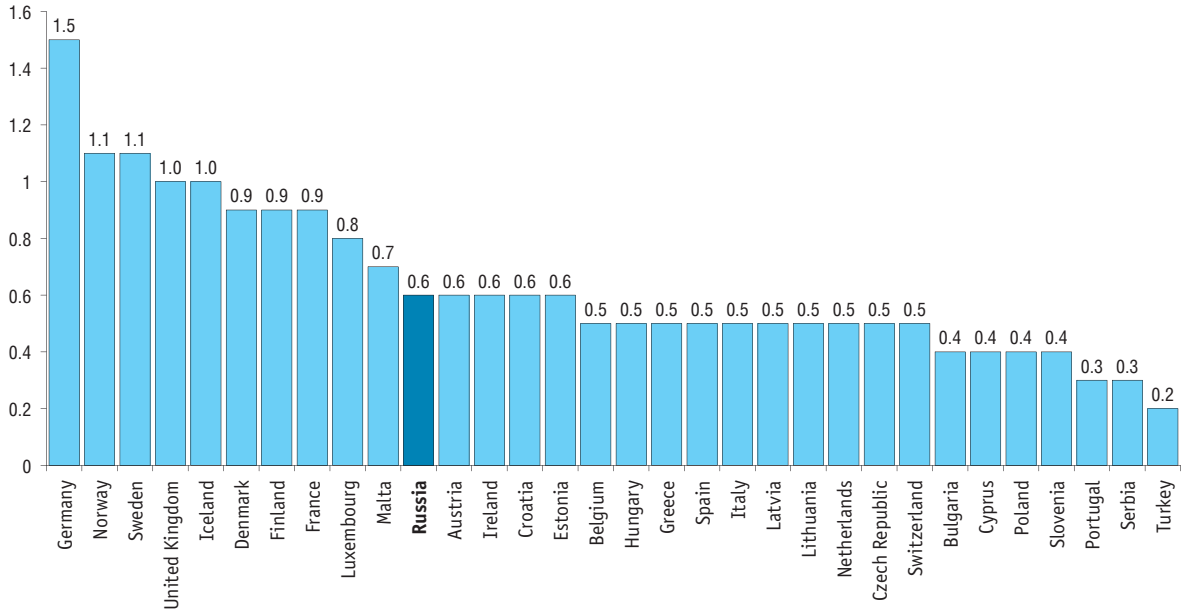


5.4. CONTENT AND MEDIA SECTOR AS A PERCENTAGE OF THE GROSS VALUE ADDED BY COUNTRY: 2020*



* Here and below in 5.5 and 5.6, or nearest years for which data are available; for the purposes of international comparison in the content and media sector, the data covers only enterprises with the following OKVED2 codes of economic activities: 58 (Publishing of books, periodicals and other publishing activities), 59 (Motion picture, video and television programme activities), 60 (Radio and TV programming and broadcasting activities).

5.5. CONTENT AND MEDIA SECTOR EMPLOYMENT AS A PERCENTAGE OF TOTAL EMPLOYMENT BY COUNTRY: 2020



5.6. EMPLOYEES UNDER 40 AS A PERCENTAGE OF THE TOTAL NUMBER OF EMPLOYEES IN THE CONTENT AND MEDIA SECTOR BY TYPE OF ECONOMIC ACTIVITY AND COUNTRY: 2020

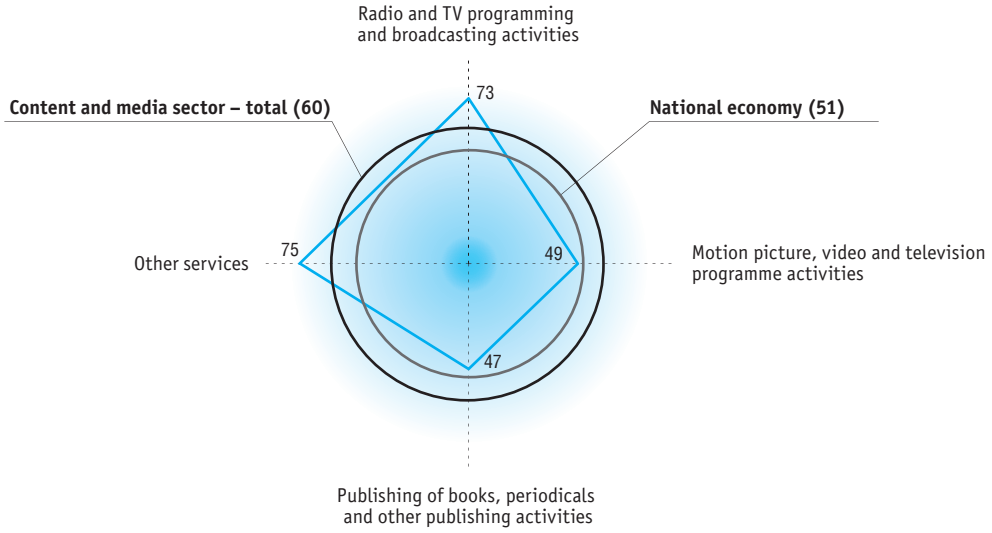
	Content and media sector – total	Publishing of books, periodicals and other publishing activities	Motion picture, video and television programme activities	Radio and TV programming and broadcasting activities
Russia	**56**	**54**	**63**	**55**
Austria	53	51	57	43
Belgium	59	56	62	36
Bulgaria	…	46	…	48
Croatia	24	15	55	42
Czech Republic	48	54	39	57
Denmark	57	56	61	52
Finland	…	44	70	…
France	54	49	62	41
Germany	49	49	52	40
Iceland	…	42	67	…
Ireland	58	53	61	45
Italy	36	31	43	48
Netherlands	59	49	69	49
Norway	…	41	77	…
Poland	58	56	64	52

(continued)

	Content and media sector – total	Publishing of books, periodicals and other publishing activities	Motion picture, video and television programme activities	Radio and TV programming and broadcasting activities
Slovenia	41	33	75	32
Spain	46	36	58	35
Switzerland	53	47	67	54
Turkey	69	64	76	67
United Kingdom	52	46	62	51

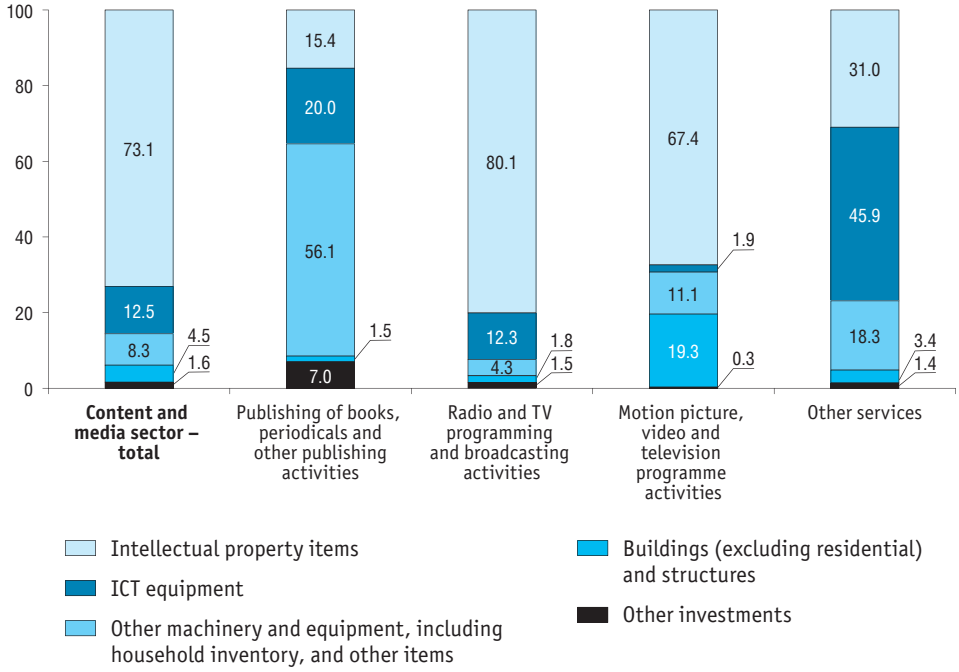
5.7. AVERAGE MONTHLY ACCRUED SALARY IN THE CONTENT AND MEDIA SECTOR BY TYPE OF ECONOMIC ACTIVITY: 2020

(thousand roubles)



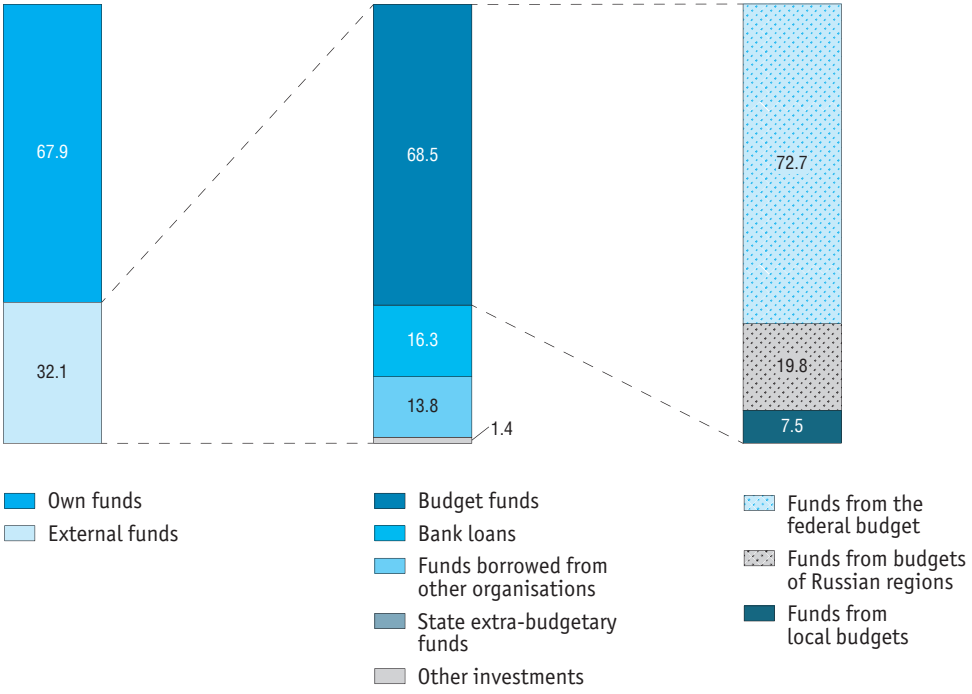
5.8. PERCENTAGE DISTRIBUTION OF FIXED CAPITAL INVESTMENT IN CONTENT AND MEDIA SECTOR BY TYPE OF FIXED ASSETS: 2020*

(as a percentage of all fixed capital investment)



* Excluding small enterprises.

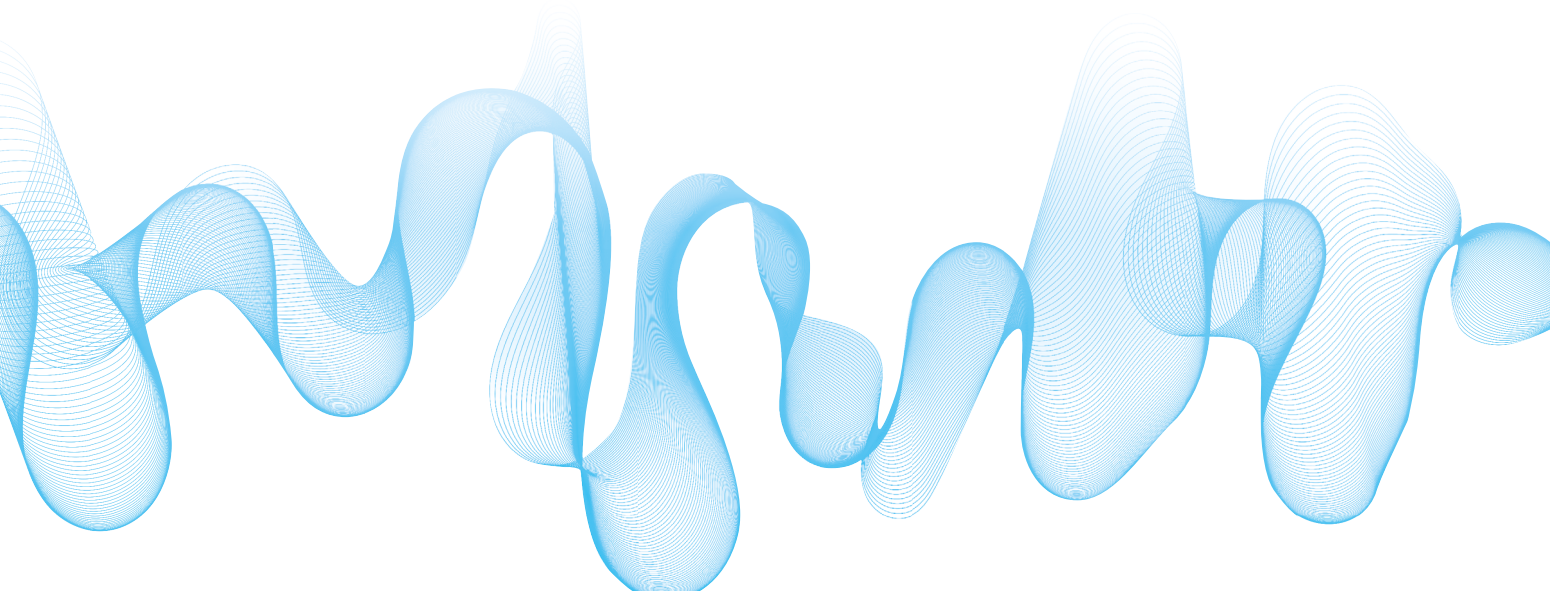
5.9. PERCENTAGE DISTRIBUTION FIXED CAPITAL INVESTMENT IN CONTENT AND MEDIA SECTOR BY SOURCES OF FUNDS: 2020*



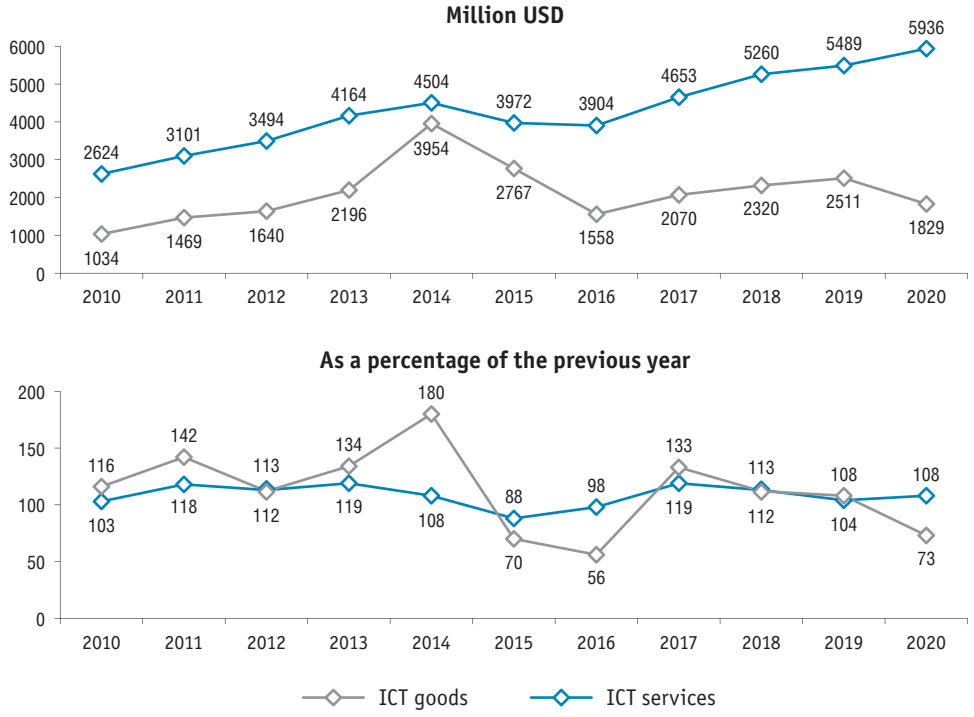
* Excluding small enterprises.

6

EXPORTS AND IMPORTS OF GOODS AND SERVICES



6.1. TRENDS IN EXPORTS OF ICT GOODS AND SERVICES



Sources: here and below in this section, for Russia, HSE ISSEK estimates based on the data of Rosstat, Federal Customs Service of Russia; for countries other than Russia, UNCTAD.

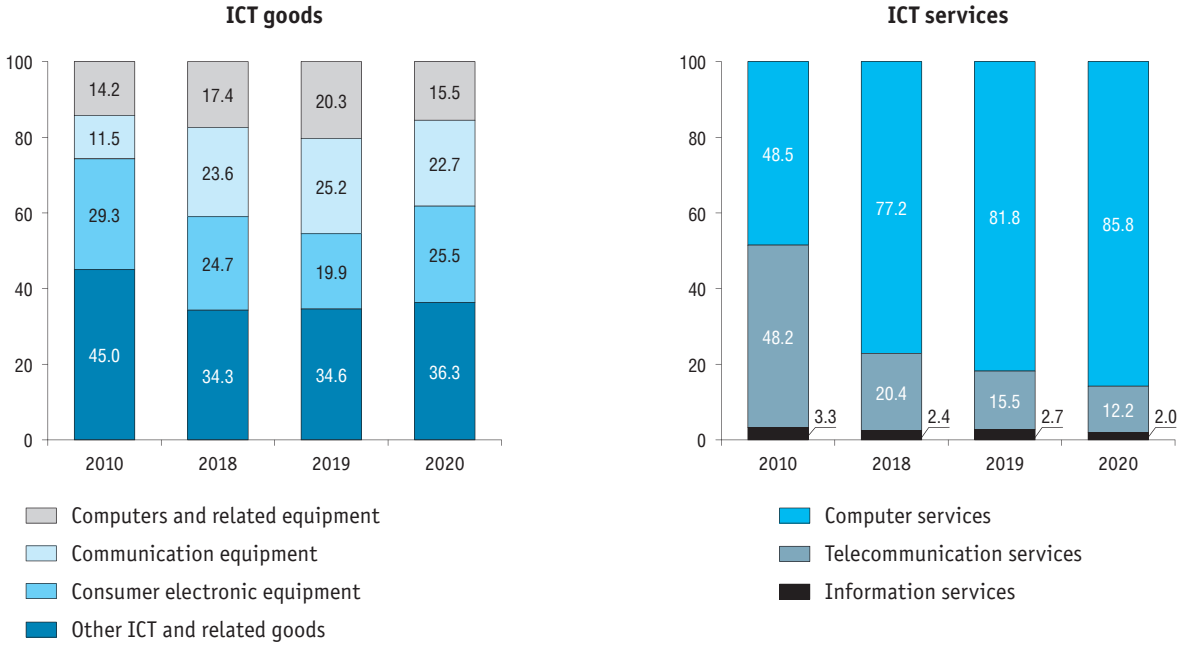
6.2. EXPORTS OF ICT GOODS AND SERVICES BY TYPE

(million USD)

	2010	2014	2015	2016	2017	2018	2019	2020
ICT goods – total	**1034**	**3954**	**2767**	**1558**	**2070**	**2320**	**2511**	**1829**
Computers and related equipment	146	1843	1630	284	365	406	509	283
Of which computers	99	1098	445	218	283	314	413	197
Communication equipment	119	352	238	329	478	547	633	414
Of which telephone and telegraph equipment	83	291	184	279	428	501	561	365
Consumer electronic equipment	303	1038	385	368	450	572	500	467
Of which TV receivers	260	453	248	256	321	404	320	304
Other ICT and related goods	466	721	514	577	777	795	869	665
ICT services – total	**2624**	**4504**	**3972**	**3904**	**4653**	**5260**	**5489**	**5936**
Computer services	1273	2651	2455	2664	3417	4061	4488	5093
Telecommunication services	1265	1732	1418	1147	1111	1072	853	723
Information services	86	121	99	93	125	127	148	120

6.3. PERCENTAGE DISTRIBUTION OF EXPORTS OF ICT GOODS AND SERVICES

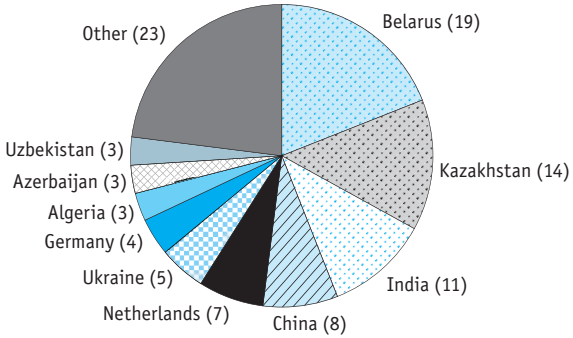
(as a percentage of the total exports)



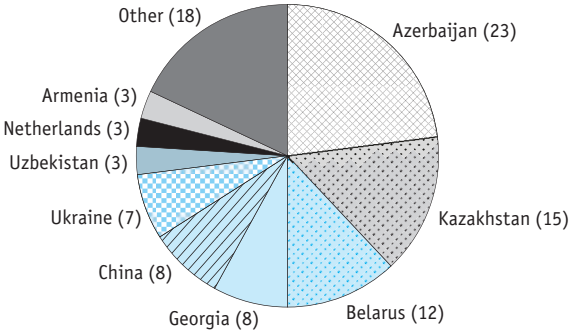
6.4. PERCENTAGE DISTRIBUTION OF EXPORTS OF ICT GOODS BY TYPE AND COUNTRY: 2020

(as a percentage of the total exports in the corresponding group of goods)

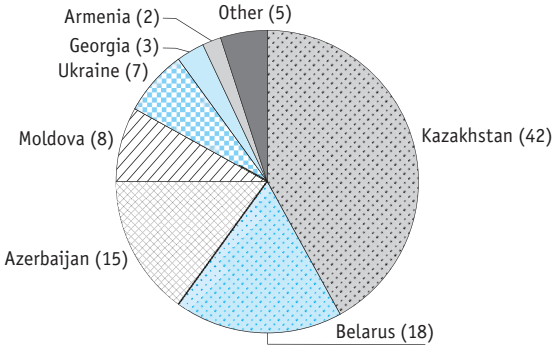
Computers



Telephone and telegraph equipment

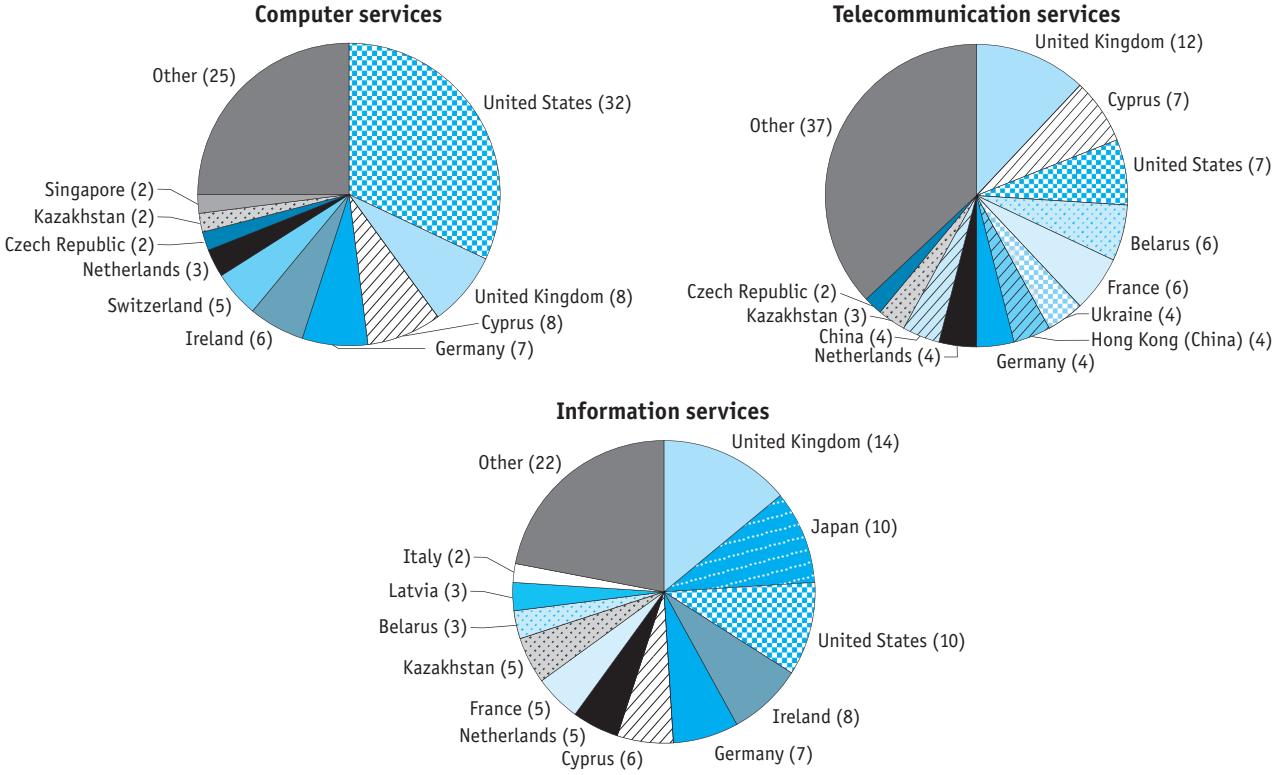


TV receivers



6.5. PERCENTAGE DISTRIBUTION OF EXPORTS OF ICT SERVICES BY TYPE AND COUNTRY: 2019

(as a percentage of the total exports in the corresponding group of services)



6.6. WORLD EXPORTS OF ICT GOODS BY EXPORTING COUNTRY: 2019*

	Volume		Growth/decline rate		Export-to-import ratio, *percentage***
	Million USD	As a percentage of the total	As a percentage of 2018	As a percentage of 2010	
Exports of ICT goods – total	**2276439**	**100**	**98**	**132**	-
Of which by country:					
China	662177	29.09	97	144	142
Hong Kong (China)	303454	13.33	96	171	98
Taiwan (China)	152878	6.72	107	161	202
United States	143744	6.31	97	107	43
South Korea	139727	6.14	83	140	175
Singapore	114361	5.02	94	95	119
Vietnam	92642	4.07	113	1621	142
Malaysia	77382	3.40	94	114	156
Germany	73181	3.21	94	109	71
Mexico	68302	3.00	101	114	95
Netherlands	59229	2.60	99	97	85
Japan	56447	2.48	94	69	64
Philippines	34767	1.53	134	252	142
Thailand	33543	1.47	85	91	118
Czech Republic	32255	1.42	105	163	103
United Arab Emirates	30352	1.33	111	…	88
France	21059	0.93	93	93	53
United Kingdom	18716	0.82	99	77	36
Poland	16496	0.72	91	109	80
Hungary	15663	0.69	111	65	97

(continued)

	Volume		Growth/decline rate		Export-to-import ratio, *percentage***
	Million USD	As a percentage of the total	As a percentage of 2018	As a percentage of 2010	
Ireland	15024	0.66	133	181	152
Slovakia	11941	0.52	89	96	100
Italy	10424	0.46	95	108	45
Sweden	9877	0.43	103	64	69
Belgium	9063	0.40	113	95	63
Canada	8563	0.38	104	80	26
India	6478	0.28	170	147	14
Israel	5842	0.26	81	81	87
Spain	5489	0.24	109	102	29
Austria	5366	0.24	89	94	58
Indonesia	4635	0.20	89	59	34
Denmark	4012	0.18	99	114	56
Australia	2935	0.13	116	144	13
Russia	**2511**	**0.11**	**108**	**243**	**11**
Romania	2475	0.11	106	60	36
Portugal	2280	0.10	102	115	42
Turkey	2073	0.09	105	99	24
Finland	1877	0.08	96	42	36
Latvia	1292	0.06	102	253	85
Estonia	1277	0.06	84	125	92
Greece	1179	0.05	96	215	42

* The data are provided for the countries with the largest volume of exports of ICT goods.

** If the indicator value is greater than 100%, then the volume of exports of ICT goods exceeds the volume of their imports.

6.7. WORLD EXPORTS OF ICT SERVICES BY EXPORTING COUNTRY: 2019*

	Volume		Growth/decline rate		Export-to-import ratio, *percentage***
	Million USD	As a percentage of the total	As a percentage of 2018	As a percentage of 2010	
Exports of ICT services – total	**635734**	**100**	**109**	**210**	–
Of which by country:					
Ireland	122696	19.30	121	…	2165
India	64636	10.17	112	162	706
China	53785	8.46	114	513	200
United States	44653	7.02	112	212	113
Germany	40145	6.31	99	192	102
United Kingdom	23880	3.76	90	141	199
Netherlands	20109	3.16	103	…	118
France	18206	2.86	93	…	85
Israel	16338	2.57	113	374	…
Sweden	14831	2.33	99	178	191
Spain	14520	2.28	104	…	…
Singapore	14335	2.25	101	…	104
Belgium	13395	2.11	100	184	141
Finland	11890	1.87	150	…	260
Italy	8894	1.40	95	110	80
Poland	8371	1.32	110	449	208
Canada	7832	1.23	100	103	…

(continued)

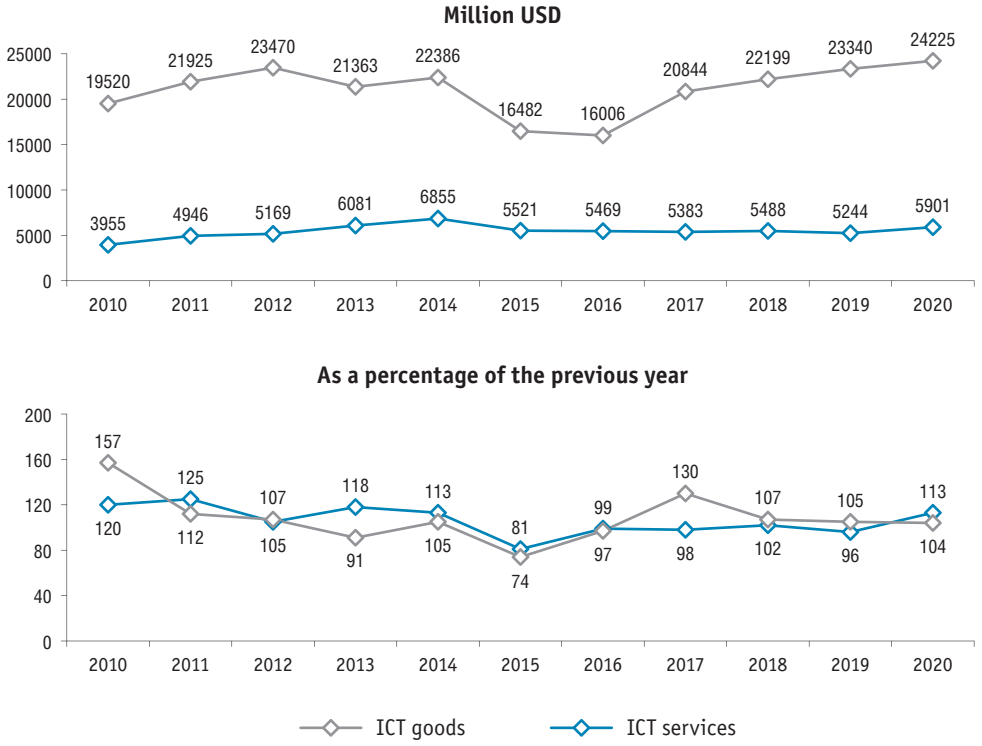
	Volume		Growth/decline rate		Export-to-import ratio, *percentage***
	Million USD	As a percentage of the total	As a percentage of 2018	As a percentage of 2010	
Austria	7533	1.18	106	214	126
United Arab Emirates	6916	1.09	103	…	192
Japan	6406	1.01	148	381	34
Romania	5533	0.87	111	348	221
Russia	**5489**	**0.86**	**104**	**209**	**105**
Denmark	4577	0.72	97	177	81
Czech Republic	4465	0.70	108	256	208
Ukraine	4298	0.68	125	619	639
South Korea	3479	0.55	101	367	123
Australia	3173	0.50	104	177	98
Cyprus	2781	0.44	116	411	148
Norway	2601	0.41	104	121	57
Hungary	2567	0.40	99	158	147
Brazil	2451	0.39	96	425	46
Belarus	2383	0.37	130	619	597
Argentina	1918	0.30	90	136	155
Portugal	1887	0.30	96	203	175
Serbia	1651	0.26	119	393	222
Morocco	1579	0.25	95	159	467
Slovakia	1568	0.25	94	…	187

(continued)

	Volume		Growth/decline rate		Export-to-import ratio, *percentage***
	Million USD	As a percentage of the total	As a percentage of 2018	As a percentage of 2010	
Turkey	1445	0.23	107	312	89
Bulgaria	1428	0.22	119	282	370
Indonesia	1310	0.21	107	106	42
Greece	1088	0.17	107	…	142
Estonia	955	0.15	110	244	179
Croatia	920	0.14	100	240	216
Slovenia	642	0.10	111	158	120

* The data are provided for the countries with the largest volume of exports of ICT services.
** If the indicator value is greater than 100%, then the volume of exports of ICT services exceeds the volume of their imports.

6.8. TRENDS IN IMPORTS OF ICT GOODS AND SERVICES



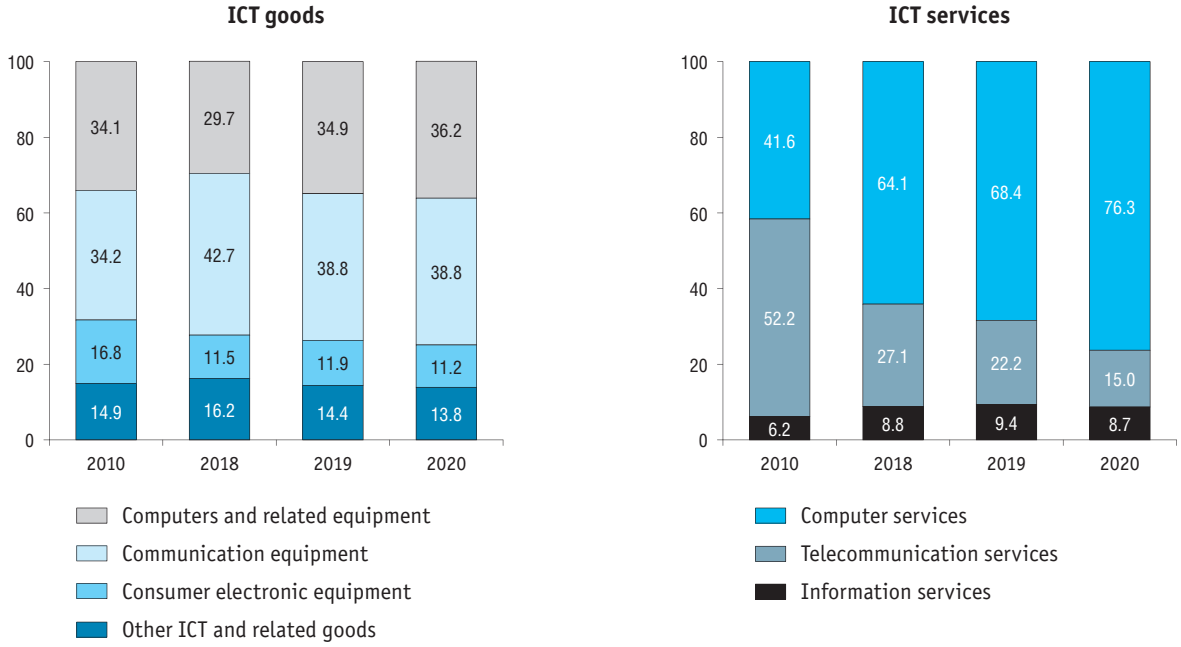
6.9. IMPORTS OF ICT GOODS AND SERVICES

(million USD)

	2010	2014	2015	2016	2017	2018	2019	2020
ICT goods – total	**19520**	**22386**	**16482**	**16006**	**20844**	**22199**	**23340**	**24225**
Computers and related equipment	6660	7080	6101	5065	7425	6582	8152	8758
Of which computers	4817	5082	4035	3824	5099	5953	5666	6266
Communication equipment	6681	8298	6328	6749	8434	9477	9051	9399
Of which telephone and telegraph equipment	6607	8236	6293	6715	8394	9434	9007	9362
Consumer electronic equipment	3283	3151	1471	1543	1997	2551	2777	2712
Of which TV receivers	742	637	316	273	366	440	436	385
Other ICT and related goods	2896	3857	2582	2649	2988	3589	3360	3356
ICT services – total	**3955**	**6855**	**5521**	**5469**	**5383**	**5488**	**5244**	**5901**
Computer services	1644	3590	2772	3063	3398	3521	3590	4503
Telecommunication services	2065	2839	2388	1947	1539	1486	1162	887
Information services	246	426	361	459	446	481	492	511

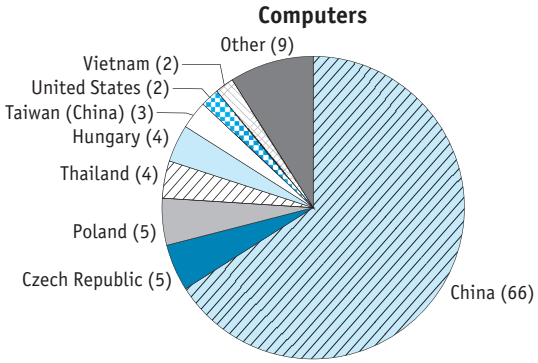
6.10. PERCENTAGE DISTRIBUTION OF IMPORTS OF ICT GOODS AND SERVICES

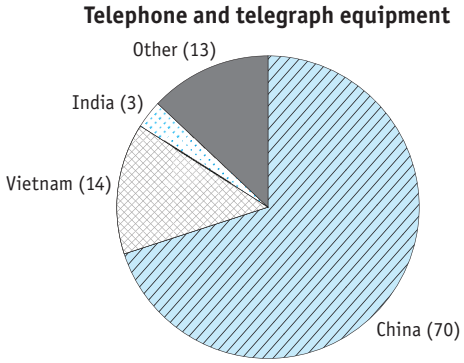
(as a percentage of the total imports)

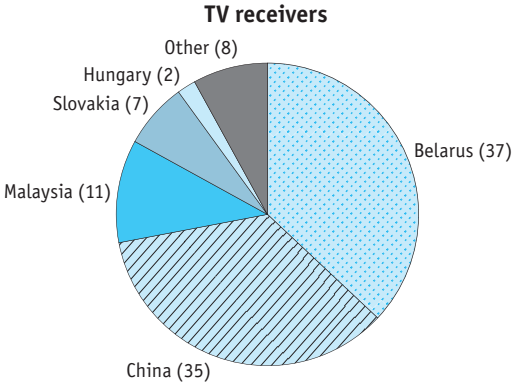


6.11. PERCENTAGE DISTRIBUTION OF IMPORTS OF ICT GOODS BY TYPE AND COUNTRY: 2020

(as a percentage of the total imports in the corresponding group of goods)



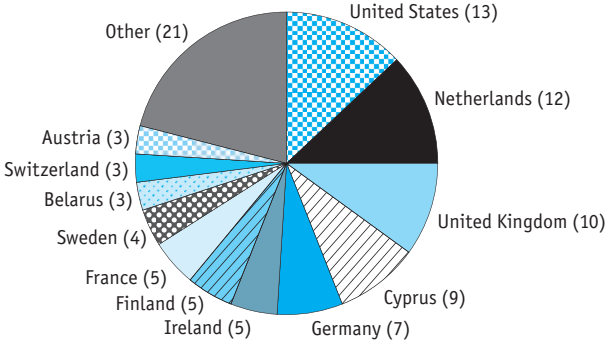




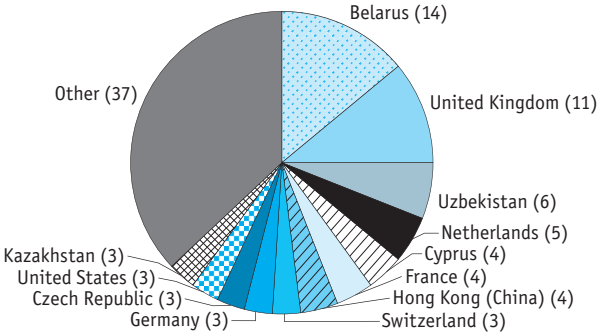
6.12. PERCENTAGE DISTRIBUTION OF IMPORTS OF ICT SERVICES BY TYPE AND COUNTRY: 2019

(as a percentage of the total imports in the corresponding group of services)

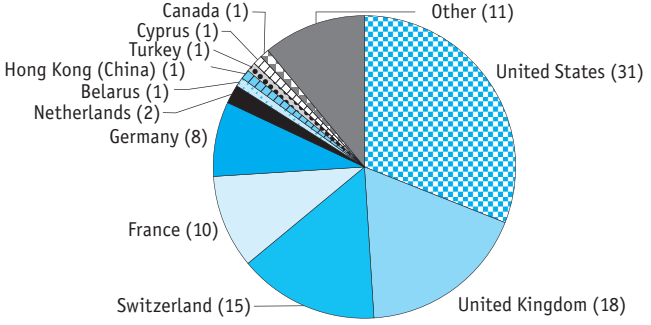
Computer services



Telecommunication services

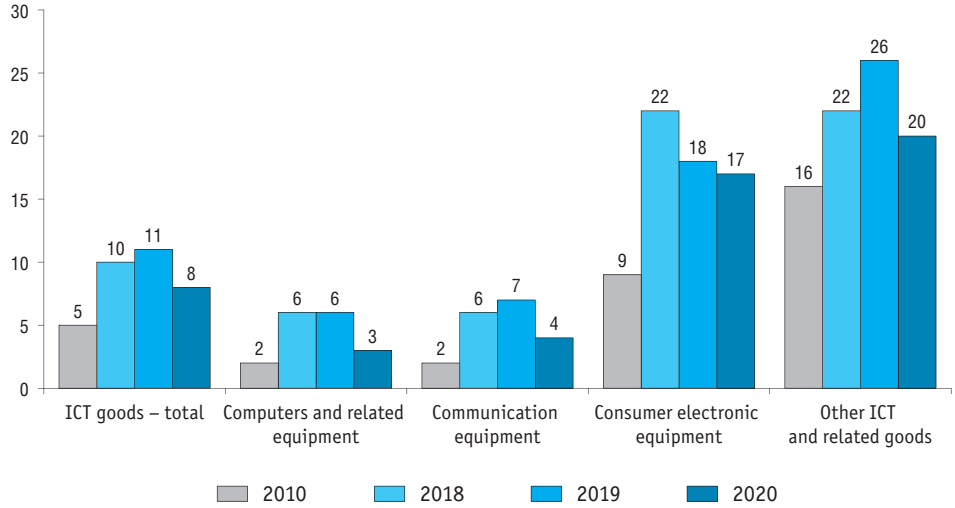


Information services



6.13. EXPORT-TO-IMPORT RATIO OF ICT GOODS*

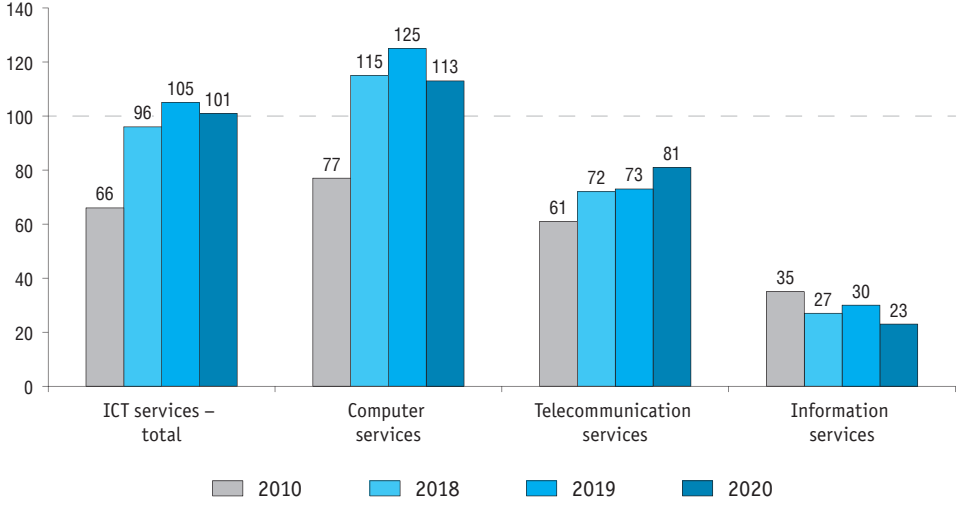
(exports as a percentage of imports in the corresponding group of goods)



* If the exports volume is less than the imports volume, the indicator value does not exceed 100%.

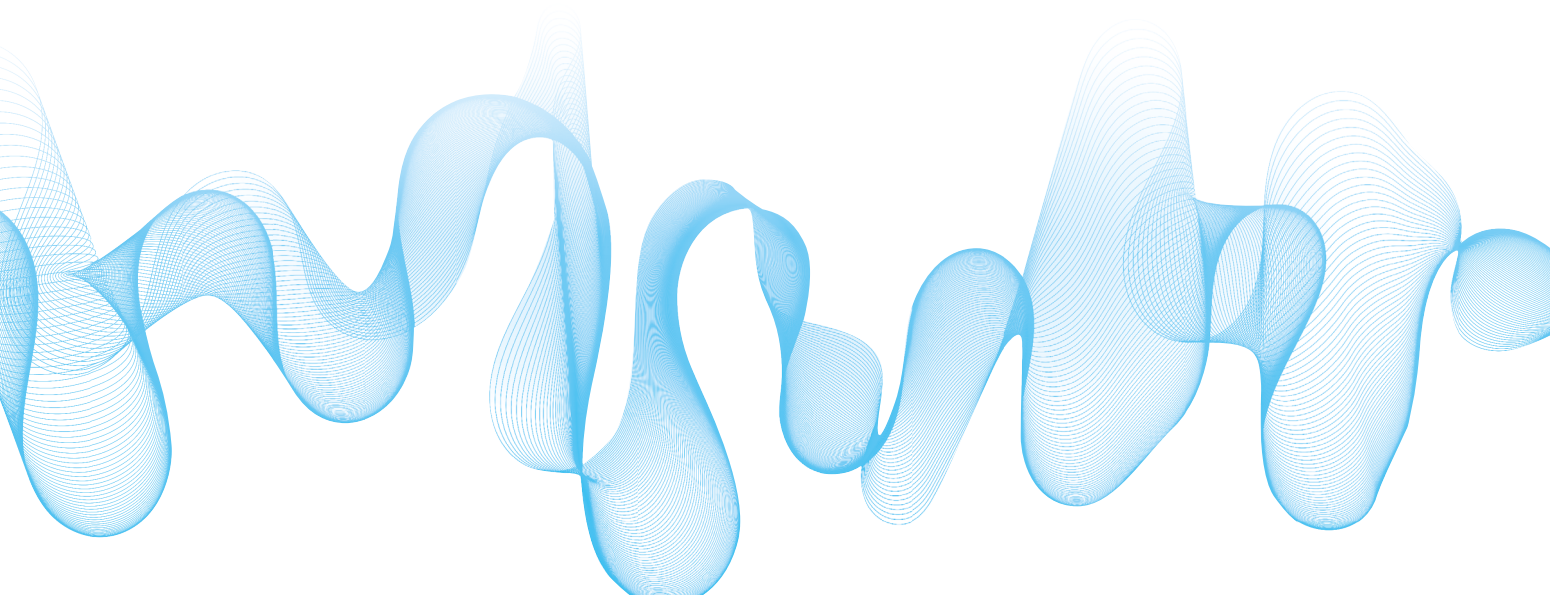
6.14. EXPORT-TO-IMPORT RATIO OF ICT SERVICES*

(exports as a percentage of imports in the corresponding group of services)



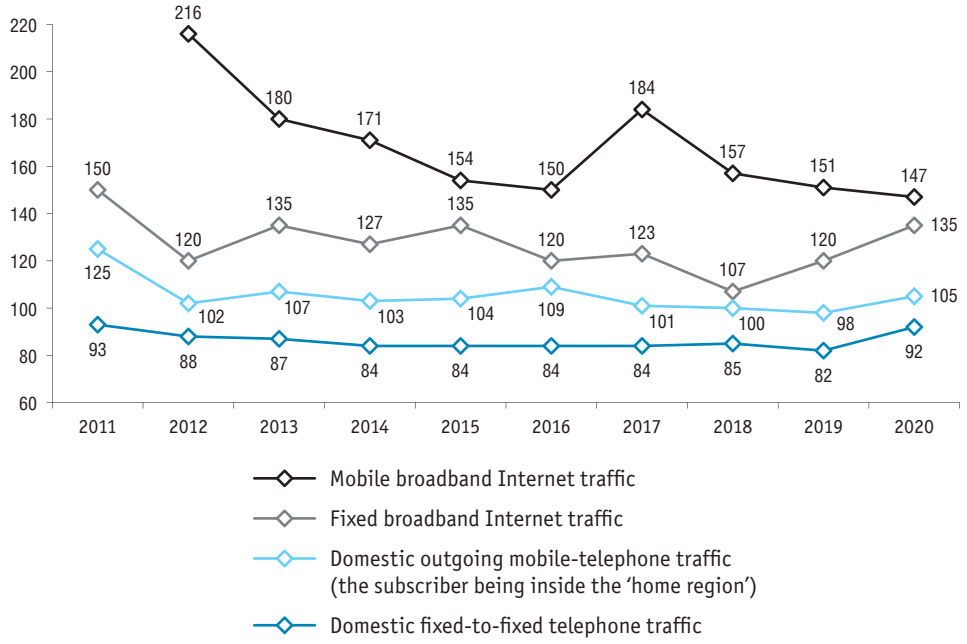
* If the exports volume exceeds the imports volume, the indicator value is greater than 100%.

7 INFRASTRUCTURE



7.1. TRENDS IN TELECOMMUNICATION SERVICES BY TYPE*

(as a percentage of the previous year)

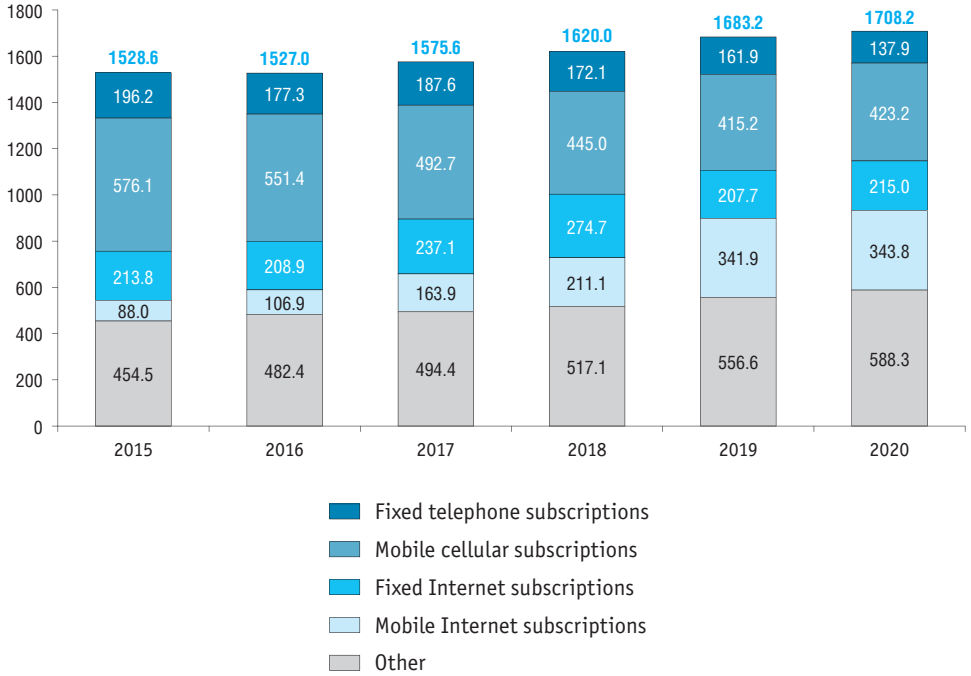


* Here and below in this section, the 2020 data are preliminary estimates.

Sources here and below in this section, for Russia, HSE ISSEK estimates based on data provided by the Ministry of Digital Development, Communications and Mass Media of the Russian Federation (7.1–7.8, 7.10 – 7.13) and Rosstat (7.9); for countries other than Russia, OECD and ITU.

7.2. INCOME FROM TELECOMMUNICATION SERVICES

(billion roubles)



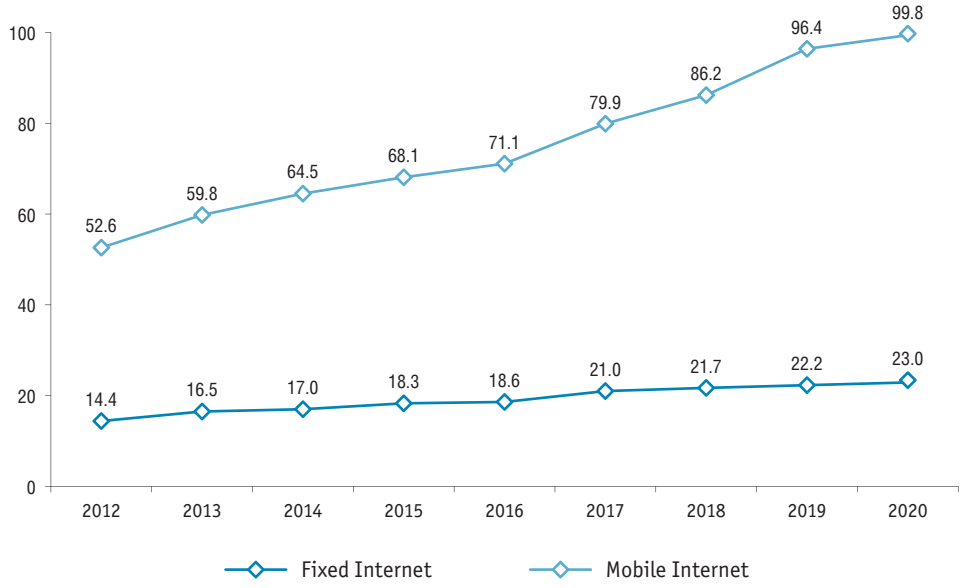
7.3. INTERNET SUBSCRIPTIONS

(thousand units; at the end of the year)

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Fixed access – total	21111	24115	25044	26944	27493	31084	31968	32739	33772
Of which:									
broadband	20704	23745	24825	26756	27293	30877	31789	32524	33561
by technology:									
xDSL	7854	7654	7002	6315	5701	5426	4904	4242	3628
FTTH/FTTB (FTTx)	11063	14078	16014	18407	19433	22995	24568	25868	27674
cable modem	372	331	318	487	452	442	408	383	353
other	1415	1682	1491	1547	1707	2014	1909	2031	1907
Mobile access	91217	101919	105828	109926	115813	122828	131359	145633	149869
of which broadband	75442	85908	92795	99793	104391	117406	126557	141464	145873
Satellite access	27	18	30	82	49	67	66	88	65
of which broadband	23	16	17	23	30	41	44	68	45
Terrestrial fixed wireless access	140	161	113	107	203	186	233	269	271
of which broadband	122	146	108	103	199	180	230	266	267
Terrestrial mobile wireless access	…	…	1088	1822	2185	1809	697	669	678
of which broadband	…	…	983	1387	1708	1741	643	600	623

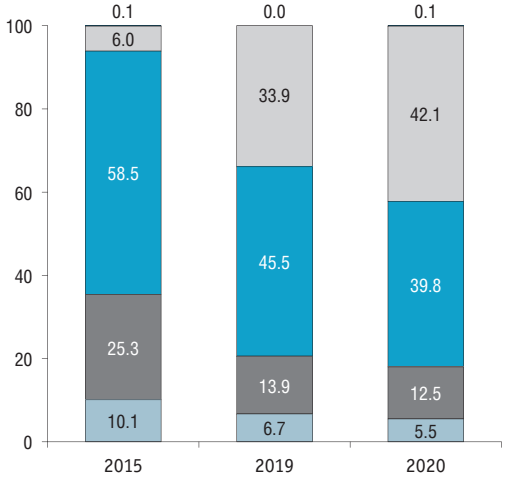
7.4. BROADBAND SUBSCRIPTIONS

(units per 100 inhabitants; at the end of the year)



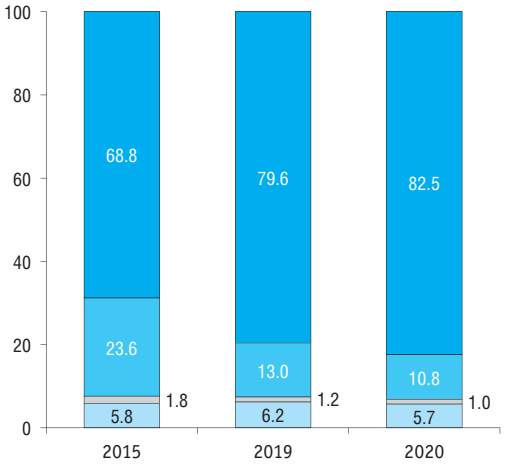
7.5. PERCENTAGE DISTRIBUTION OF FIXED BROADBAND SUBSCRIPTIONS BY ACCESS SPEED AND TECHNOLOGY

(as a percentage of all fixed broadband subscriptions; at the end of the year)



Access speed:

- over 1 Gbit/s
- 100 Mbit/s to 1 Gbit/s
- 10 to 100 Mbit/s
- 2 to 10 Mbit/s
- 256 kbit/s to 2 Mbit/s

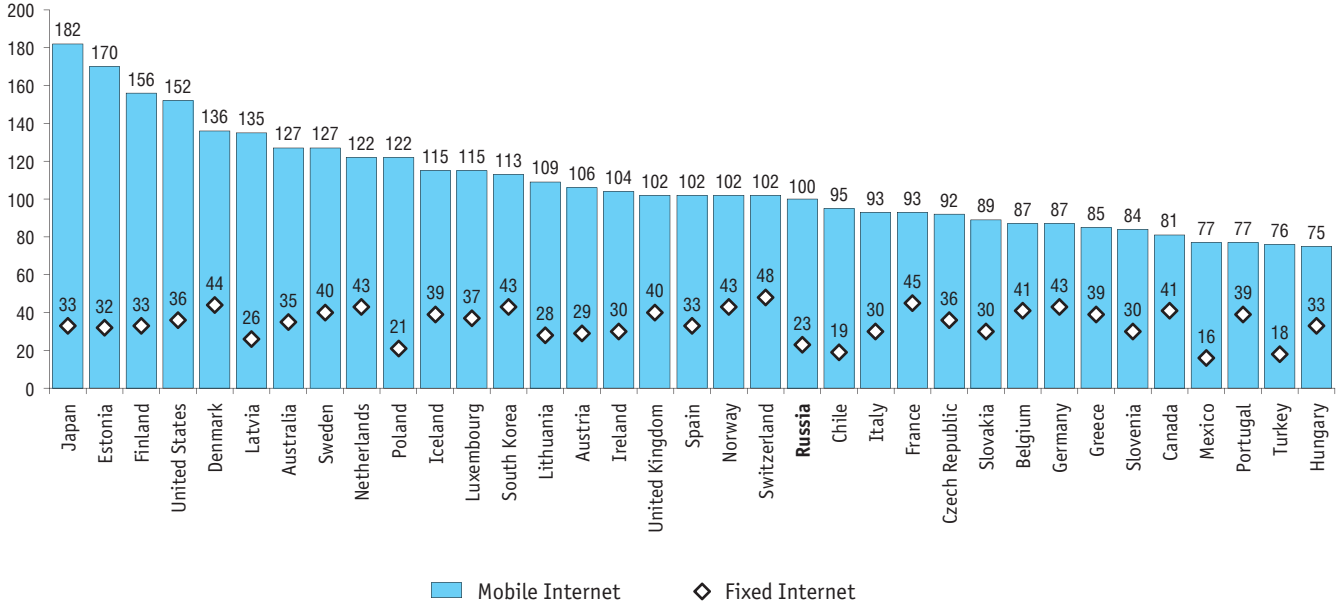


Technology:

- FTTH/ FTTB (FTTx)
- xDSL
- cable modem
- other

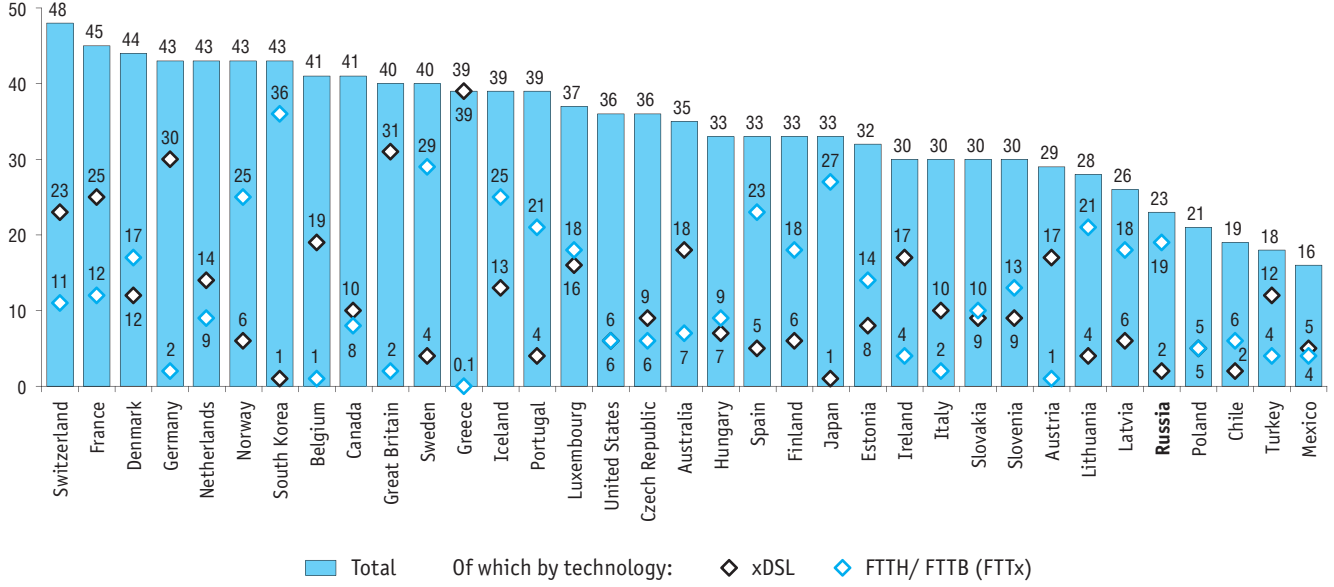
7.6. BROADBAND SUBSCRIPTIONS BY COUNTRY: 2020

(units per 100 inhabitants)



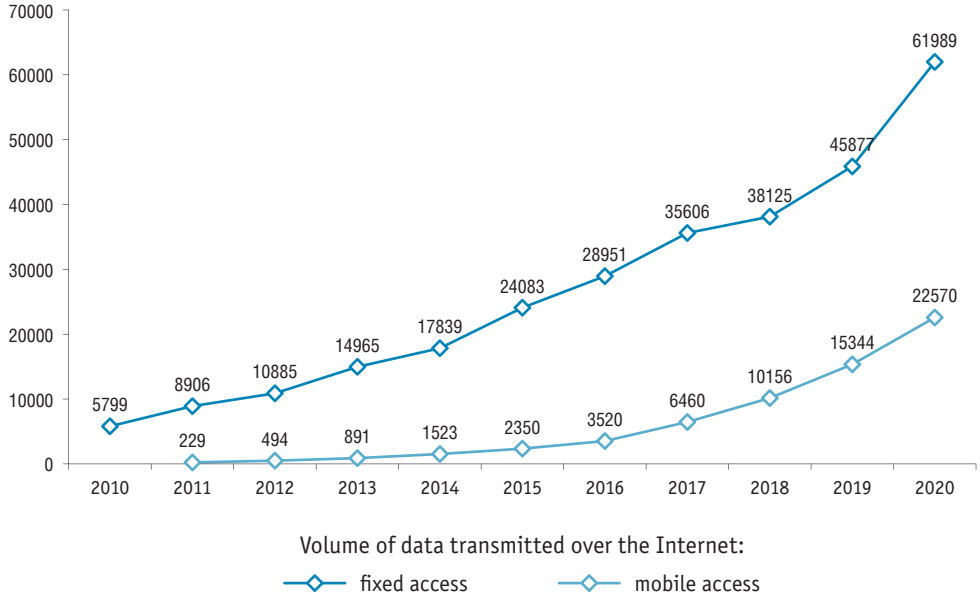
7.7. FIXED BROADBAND SUBSCRIPTIONS BY TECHNOLOGY AND COUNTRY: 2020

(units per 100 inhabitants)

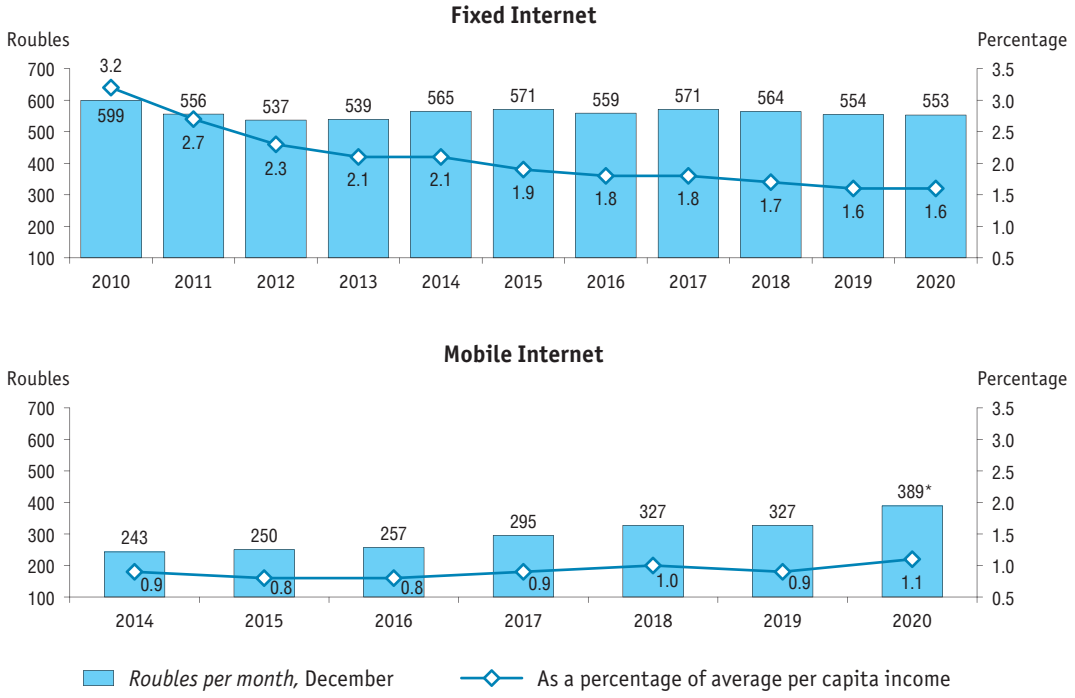


7.8. INTERNET TRAFFIC

(Petabytes)



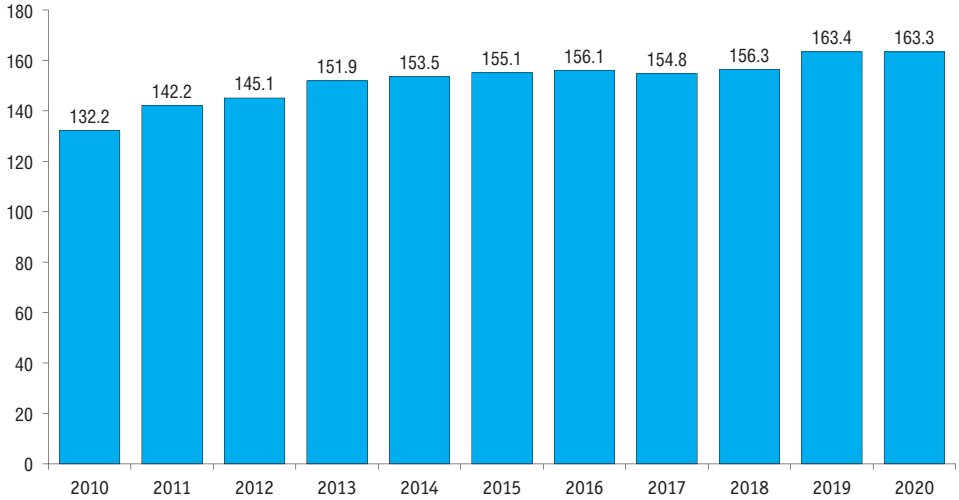
7.9. INTERNET SUBSCRIPTION FEES FOR INDIVIDUALS



* Due to changes in the Rosstat methodology, the 2020 data are provided for the service 'Subscription fee for a mobile cellular network services package', which includes mobile Internet, minutes of phone calls, SMS messages.

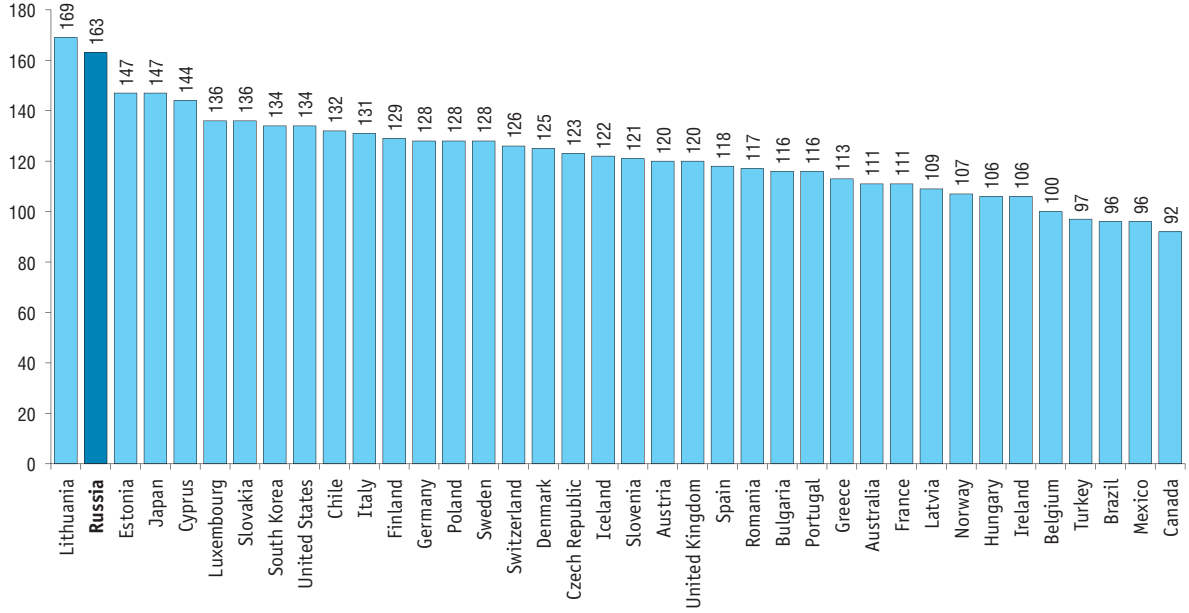
7.10. ACTIVE MOBILE CELLULAR TELEPHONE SUBSCRIPTIONS

(units per 100 inhabitants; at the end of the year)



7.11. ACTIVE MOBILE CELLULAR TELEPHONE SUBSCRIPTIONS BY COUNTRY: 2020

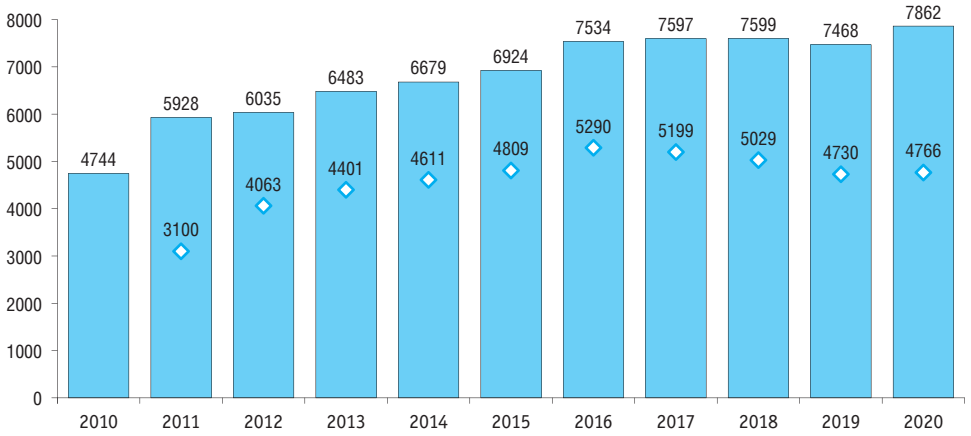
(units per 100 inhabitants; at the end of the year)



* Or nearest years for which data are available.

7.12. MOBILE CELLULAR TELEPHONE NETWORK TRAFFIC

(million hours)

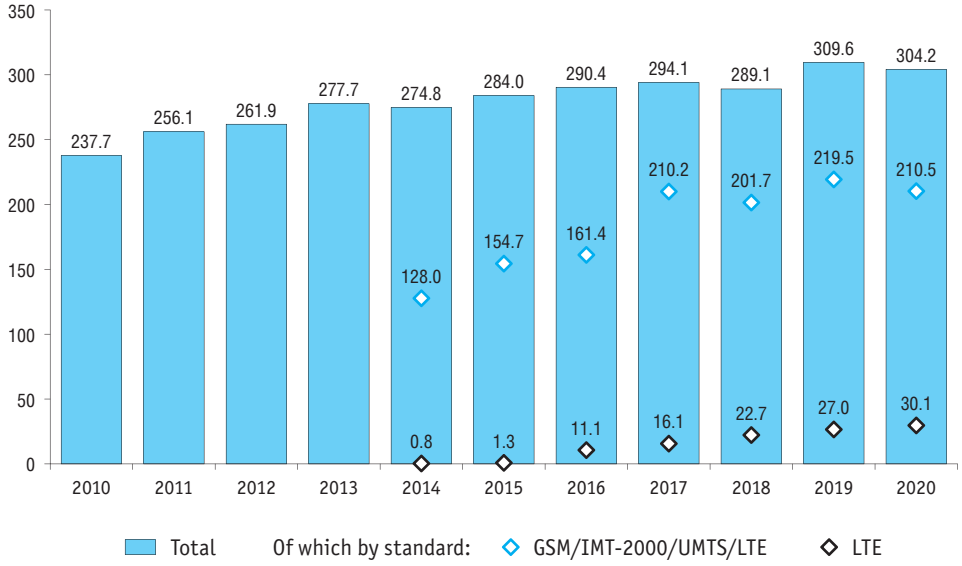


Outgoing payable calls (inside the Russian Federation) within the mobile cellular network (the subscriber being inside the 'home region'):

total ◇ with mobile cellular network's subscribers inside the 'home region'

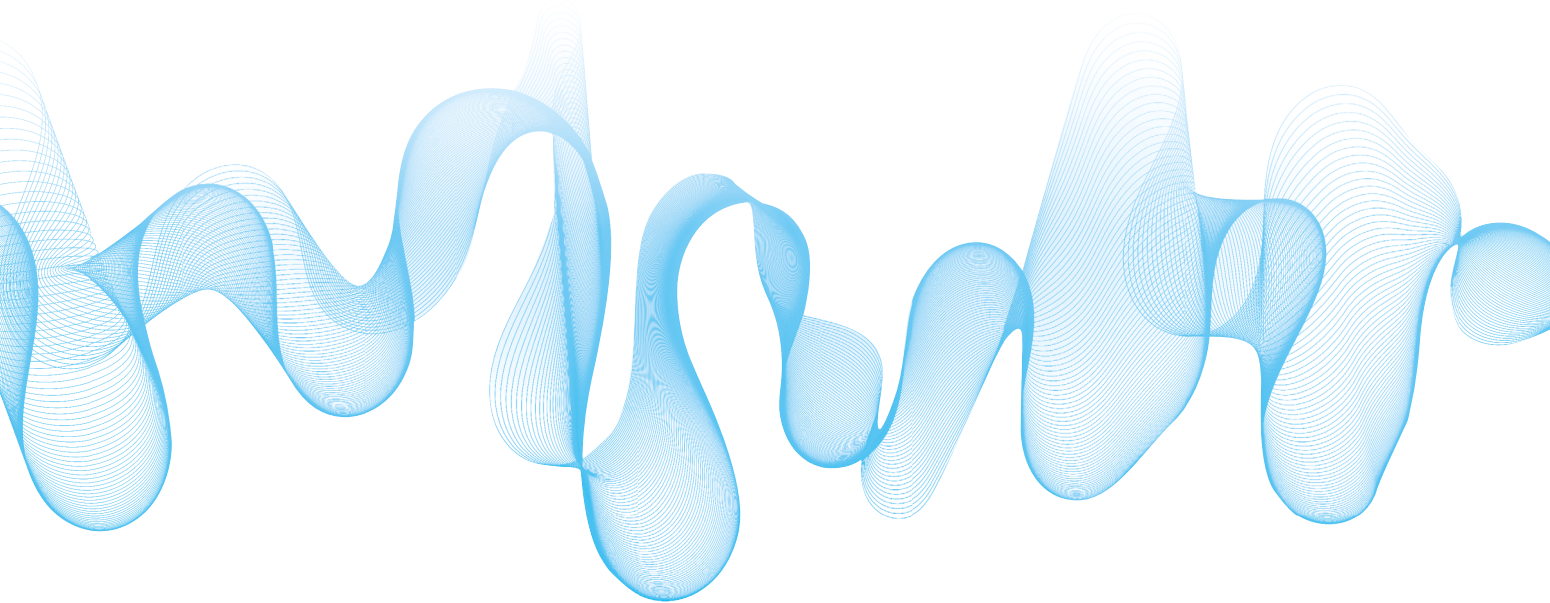
7.13. MOBILE CELLULAR SUBSCRIPTION DEVICES

(million units; at the end of the year)



8

EDUCATION AND TRAINING OF PERSONNEL FOR THE DIGITAL ECONOMY



8.1. ENROLMENT IN SECONDARY VOCATIONAL EDUCATION PROGRAMMES BY FIELD OF EDUCATION WITHIN AREAS OF DIGITAL TECHNOLOGIES AND PRODUCTION OF RELATED GOODS AND SERVICES

(at the beginning of the academic year)

	Programmes for skilled workers and employees				Programmes for mid-level specialists			
	2019/2020		2020/2021		2019/2020		2020/2021	
	Thousand persons	As a percentage of the total enrolment*	Thousand persons	As a percentage of the total enrolment*	Thousand persons	As a percentage of the total enrolment**	Thousand persons	As a percentage of the total enrolment**
Total	**28.1**	**5.2**	**28.1**	**4.9**	**286.5**	**11.1**	**322.2**	**11.7**
Computer science and engineering	18.9	3.5	19.1	3.3	188.1	7.3	216.4	7.8
Information security	–	–	–	–	15.1	0.6	18.2	0.7
Electronics and communications engineering	5.6	1.0	5.6	1.0	36.5	1.4	37.6	1.4
Photonics, instrumentation engineering, optical and biomedical engineering	–	–	–	–	2.5	0.1	2.3	0.1
Mechanical engineering	3.7	0.7	3.4	0.6	21.6	0.8	23.4	0.8
Applied geology, mining and quarrying, oil and gas engineering, geodesy	–	–	–	–	3.6	0.1	3.8	0.1
Engineering systems management	–	–	–	–	16.9	0.7	18.1	0.7
Screen arts	–	–	–	–	2.2	0.1	2.3	0.1

* Enrolment in programmes for skilled workers and employees.

** Enrolment in programmes for mid-level specialists.

Sources: here and below in this section, for Russia, HSE ISSEK estimates based on the data of the Ministry of Education of the Russian Federation (8.1–8.4, 8.11, 8.12), Ministry of Science and Higher Education of the Russian Federation (8.5–8.8, 8.11, 8.12), and Rosstat (8.9-8.12); for countries other than Russia, OECD.

8.2. ENTRANTS TO SECONDARY VOCATIONAL EDUCATION PROGRAMMES BY FIELD OF EDUCATION WITHIN AREAS OF DIGITAL TECHNOLOGIES AND PRODUCTION OF RELATED GOODS AND SERVICES

	Programmes for skilled workers and employees				Programmes for mid-level specialists			
	2019		2020		2019		2020	
	Thousand persons	As a percentage of the total number of entrants*	Thousand persons	As a percentage of the total number of entrants*	Thousand persons	As a percentage of the total number of entrants**	Thousand persons	As a percentage of the total number of entrants**
Total	**11.3**	**5.4**	**11.1**	**5.2**	**94.1**	**11.3**	**106.7**	**11.9**
Computer science and engineering	8.0	3.8	7.8	3.6	62.7	7.5	73.9	8.2
Information security	–	–	–	–	5.4	0.6	6.4	0.7
Electronics and communications engineering	2.0	1.0	2.1	1.0	11.2	1.3	11.0	1.2
Photonics, instrumentation engineering, optical and biomedical engineering	–	–	–	–	0.6	0.1	0.6	0.1
Mechanical engineering	1.3	0.6	1.3	0.6	6.9	0.8	7.1	0.8
Applied geology, mining and quarrying, oil and gas engineering, geodesy	–	–	–	–	1.1	0.1	1.2	0.1
Engineering systems management	–	–	–	–	5.3	0.6	5.6	0.6
Screen arts	–	–	–	–	0.8	0.1	0.8	0.1

* Of the total number of entrants to programmes for skilled workers and employees.

** Of the total number of entrants to programmes for mid-level specialists.

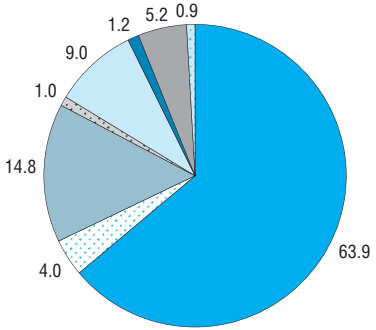
8.3. GRADUATES OF SECONDARY VOCATIONAL EDUCATION PROGRAMMES BY FIELD OF EDUCATION WITHIN AREAS OF DIGITAL TECHNOLOGIES AND PRODUCTION OF RELATED GOODS AND SERVICES

	Programmes for skilled workers and employees				Programmes for mid-level specialists			
	2019		2020		2019		2020	
	Thousand persons	As a percentage of the total number of graduates*	Thousand persons	As a percentage of the total number of graduates*	Thousand persons	As a percentage of the total number of graduates**	Thousand persons	As a percentage of the total number of graduates**
Total	**9.7**	**5.9**	**9.6**	**6.7**	**47.8**	**8.9**	**51.8**	**9.4**
Computer engineering	6.5	3.9	6.7	4.7	30.3	5.6	32.5	5.9
Information security	–	–	–	–	2.0	0.4	2.5	0.4
Electronics and communications engineering	1.7	1.0	1.7	1.2	7.0	1.3	7.4	1.3
Photonics, instrumentation engineering, optical and biomedical engineering	–	–	–	–	0.5	0.1	0.6	0.1
Mechanical engineering	1.5	0.9	1.3	0.9	3.9	0.7	4.3	0.8
Applied geology, mining and quarrying, oil and gas engineering, geodesy	–	–	–	–	0.6	0.1	0.7	0.1
Engineering systems management	–	–	–	–	2.9	0.5	3.2	0.6
Screen arts	–	–	–	–	0.5	0.1	0.6	0.1

* Of the total number of graduates of programmes for skilled workers and employees.

** Of the total number of graduates of programmes for mid-level specialists.

8.4. PERCENTAGE DISTRIBUTION OF GRADUATES OF SECONDARY VOCATIONAL EDUCATION PROGRAMMES BY FIELD OF EDUCATION WITHIN AREAS OF DIGITAL TECHNOLOGIES AND PRODUCTION OF RELATED GOODS AND SERVICES: 2020



- Computer science and engineering
- Information security
- Electronics and communications engineering
- Photonics, instrumentation engineering, optical and biomedical engineering
- Mechanical engineering
- Applied geology, mining and quarrying, oil and gas engineering, geodesy
- Engineering systems management
- Screen arts

8.5. ENROLMENT IN BACHELOR'S, SPECIALIST'S, AND MASTER'S PROGRAMMES BY FIELD OF EDUCATION WITHIN AREAS OF DIGITAL TECHNOLOGIES AND PRODUCTION OF RELATED GOODS AND SERVICES

(at the beginning of the academic year)

	2019/2020		2020/2021	
	Thousand persons	As a percentage of the total enrolment*	Thousand persons	As a percentage of the total enrolment*
Total	**415.9**	**10.2**	**443.8**	**11.0**
Engineering mathematics	32.4	0.8	33.8	0.8
Computer and information sciences	18.5	0.5	19.4	0.5
Computer science and engineering	176.5	4.3	195.3	4.8
Information security	32.4	0.8	36.7	0.9
Electronics and communications engineering	62.9	1.5	64.1	1.6
Photonics, instrumentation engineering, optical and biomedical engineering	19.1	0.5	18.6	0.5
Nuclear engineering and technology	1.1	0.0	1.0	0.0
Mechanical engineering	34.9	0.9	35.5	0.9
Engineering physics and technology	0.2	0.0	0.2	0.0
Weapons and armaments systems	2.1	0.1	2.1	0.1
Nanotechnologies and nanomaterials	4.1	0.1	4.2	0.1
Economics and management	18.4	0.5	18.7	0.5
Mass media, library and information science	3.7	0.1	4.6	0.1
Cultural studies and socio-cultural projects	3.8	0.1	3.9	0.1
Screen arts	5.7	0.1	5.6	0.1

* Enrolment in bachelor's, specialist's, and master's programmes.

8.6. ENTRANTS TO BACHELOR'S, SPECIALIST'S, AND MASTER'S PROGRAMMES BY FIELD OF EDUCATION WITHIN AREAS OF DIGITAL TECHNOLOGIES AND PRODUCTION OF RELATED GOODS AND SERVICES

	2019		2020	
	Thousand persons	As a percentage of the total number of entrants*	Thousand persons	As a percentage of the total number of entrants*
Total	**135.6**	**12.0**	**142.3**	**13.0**
Engineering mathematics	11.4	1.0	11.4	1.0
Computer and information sciences	6.4	0.6	6.4	0.6
Computer science and engineering	61.2	5.4	66.6	6.1
Information security	9.8	0.9	11.0	1.0
Electronics and communications engineering	19.0	1.7	19.1	1.8
Photonics, instrumentation engineering, optical and biomedical engineering	5.9	0.5	5.8	0.5
Nuclear engineering and technology	0.2	0.0	0.2	0.0
Mechanical engineering	10.4	0.9	10.2	0.9
Engineering physics and technology	0.0	0.0	0.0	0.0
Weapons and armaments systems	0.5	0.0	0.5	0.0
Nanotechnologies and nanomaterials	1.3	0.1	1.4	0.1
Economics and management	6.1	0.5	5.9	0.5
Mass media, library and information science	1.4	0.1	1.7	0.2
Cultural studies and socio-cultural projects	0.9	0.1	1.0	0.1
Screen arts	1.2	0.1	1.1	0.1

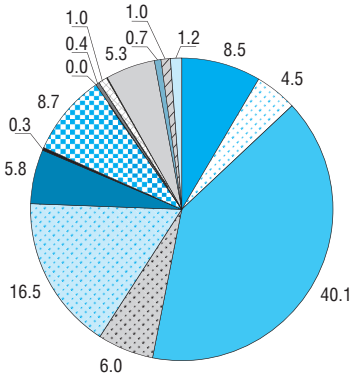
* Of the total number of entrants to bachelor's, specialist's, and master's programmes.

8.7. GRADUATES OF BACHELORS, SPECIALISTS, AND MASTER'S PROGRAMMES BY FIELD OF EDUCATION WITHIN AREAS OF DIGITAL TECHNOLOGIES AND PRODUCTION OF RELATED GOODS AND SERVICES

	2019		2020	
	Thousand persons	As a percentage of the total number of graduates*	Thousand persons	As a percentage of the total number of graduates*
Total	**77.3**	**8.5**	**75.6**	**8.9**
Engineering mathematics	6.2	0.7	6.4	0.8
Computer and information sciences	3.2	0.4	3.4	0.4
Computer science and engineering	31.0	3.4	30.3	3.6
Information security	4.5	0.5	4.6	0.5
Electronics and communications engineering	13.0	1.4	12.5	1.5
Photonics, instrumentation engineering, optical and biomedical engineering	4.6	0.5	4.4	0.5
Nuclear engineering and technology	0.3	0.0	0.2	0.0
Mechanical engineering	6.6	0.7	6.6	0.8
Engineering physics and technology	0.0	0.0	0.0	0.0
Weapons and armaments systems	0.3	0.0	0.3	0.0
Nanotechnologies and nanomaterials	0.7	0.1	0.8	0.1
Economics and management	4.8	0.5	4.0	0.5
Mass media, library and information science	0.4	0.0	0.5	0.1
Cultural studies and socio-cultural projects	0.8	0.1	0.8	0.1
Screen arts	0.8	0.1	0.9	0.1

* Of the total number of graduates of bachelor's, specialist's, and master's programmes.

8.8. PERCENTAGE DISTRIBUTION OF GRADUATES OF BACHELOR'S, SPECIALIST'S, AND MASTER'S PROGRAMMES BY FIELD OF EDUCATION WITHIN AREAS OF DIGITAL TECHNOLOGIES AND PRODUCTION OF RELATED GOODS AND SERVICES: 2020



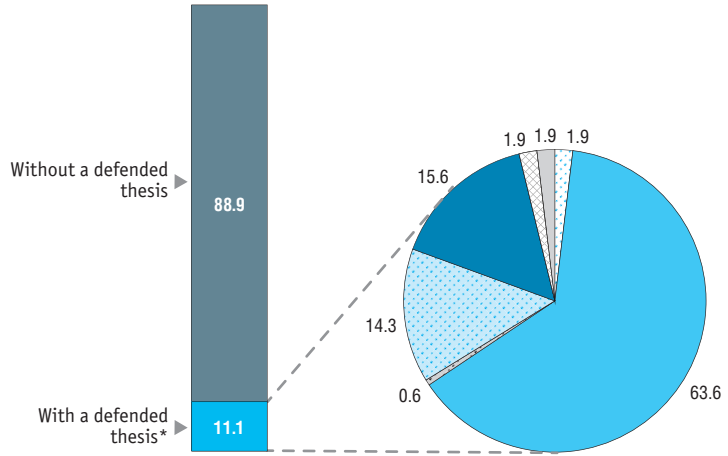
- Engineering mathematics
- Computer and information sciences
- Computer science and engineering
- Information security
- Electronics and communications engineering
- Photonics, instrumentation engineering, optical and biomedical engineering
- Nuclear engineering and technology
- Mechanical engineering
- Engineering physics and technology
- Weapons and armaments systems
- Nanotechnologies and nanomaterials
- Economics and management
- Mass media, library and information science
- Cultural studies and socio-cultural projects
- Screen arts

8.9. ENROLMENT, ENTRANTS, AND GRADUATES WITHIN POSTGRADUATE AND APPRENTICESHIP PROGRAMMES BY FIELD OF EDUCATION WITHIN AREAS OF DIGITAL TECHNOLOGIES AND PRODUCTION OF RELATED GOODS AND SERVICES: 2020

	Enrolment		Entrants		Graduates	
	Headcount	As a percentage of the total enrolment*	Headcount	As a percentage of the total number of entrants**	Headcount	As a percentage of the total number of graduates***
Total	**11288**	**12.7**	**3422**	**12.1**	**1391**	**9.7**
Computer and information sciences	331	0.4	137	0.5	35	0.2
Computer science and engineering	7216	8.1	2135	7.6	841	5.9
Information security	500	0.6	172	0.6	45	0.3
Electronics and communications engineering	1817	2.0	524	1.9	274	1.9
Photonics, instrumentation engineering, optical and biomedical engineering	978	1.1	299	1.1	131	0.9
Weapons and armaments systems	59	0.1	20	0.1	1	0.0
Nanotechnologies and nanomaterials	29	0.0	10	0.0	8	0.1
Mass media, library and information science	343	0.4	116	0.4	52	0.4
Screen arts	15	0.0	9	0.0	4	0.0

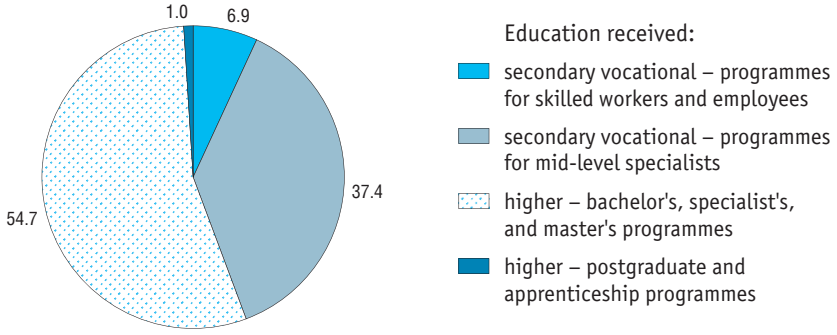
* Within postgraduate and apprenticeship programmes.
** Of the total number of entrants to postgraduate and apprenticeship programmes.
*** Of the total number of graduates of postgraduate and apprenticeship programmes.

8.10. PERCENTAGE DISTRIBUTION OF STUDENTS WHO DEFENDED THEIR POSTGRADUATE THESIS BY FIELD OF EDUCATION WITHIN AREAS OF DIGITAL TECHNOLOGIES AND PRODUCTION OF RELATED GOODS AND SERVICES: 2020



* During the years of postgraduate programme specified in the enrolment order.

8.11. PERCENTAGE DISTRIBUTION OF GRADUATES WHO STUDIED IN FIELDS OF EDUCATION WITHIN AREAS OF DIGITAL TECHNOLOGIES AND PRODUCTION OF RELATED GOODS AND SERVICES BY LEVEL OF EDUCATION RECEIVED: 2020



8.12. GRADUATES WHO RECEIVED SECONDARY VOCATIONAL EDUCATION UNDER PROGRAMMES FOR MID-LEVEL SPECIALISTS OR HIGHER EDUCATION WITHIN THE 'INFORMATION AND COMMUNICATIONS TECHNOLOGIES' SCIENTIFIC AREAS BY COUNTRY: 2020*

	Secondary vocational education – programmes for mid-level specialists (ISCED level 5)		Higher education – bachelor's, specialist's, and master's programmes (ISCED level 6 and 7)		Higher education – postgraduate programmes (ISCED level 8)	
	Thousand persons	As a percentage of the total number of graduates	Thousand persons	As a percentage of the total number of graduates	Thousand persons	As a percentage of the total number of graduates
Russia	**35.8**	**6.5**	**42.2**	**5.0**	**0.9**	**6.6**
Australia	3.9	3.2	17.0	5.1	0.4	4.2
Austria	1.1	4.1	2.5	4.6	0.1	3.7
Belgium	–	–	2.4	2.2	0.0	0.5
Canada	8.5	4.3	6.7	2.5	0.3	3.4
Chile	2.5	3.0	4.7	3.0	0.0	1.4
Colombia	12.4	8.0	10.8	3.3	0.0	2.4
Costa Rica	0.5	10.2	2.0	4.9	0.0	4.5
Czech Republic	–	–	3.7	5.0	0.1	3.1
Denmark	0.6	6.0	3.2	4.7	–	–
Estonia	–	–	0.6	6.5	0.0	11.9
Finland	–	–	3.9	7.0	0.1	7.8
France	6.3	2.9	20.8	3.7	0.7	5.2
Germany	–	–	26.6	5.0	0.9	3.1
Greece	–	–	2.1	3.1	0.0	3.9
Hungary	0.2	7.1	2.7	4.5	0.0	3.7
Iceland	0.0	12.6	0.2	4.9	0.0	3.3
Ireland	0.4	3.3	6.2	8.9	0.1	4.2
Israel	...	...	3.7	4.5	0.1	4.6
Italy	0.4	10.2	4.5	1.2	0.2	2.4
Japan	…	…	…	…	…	…

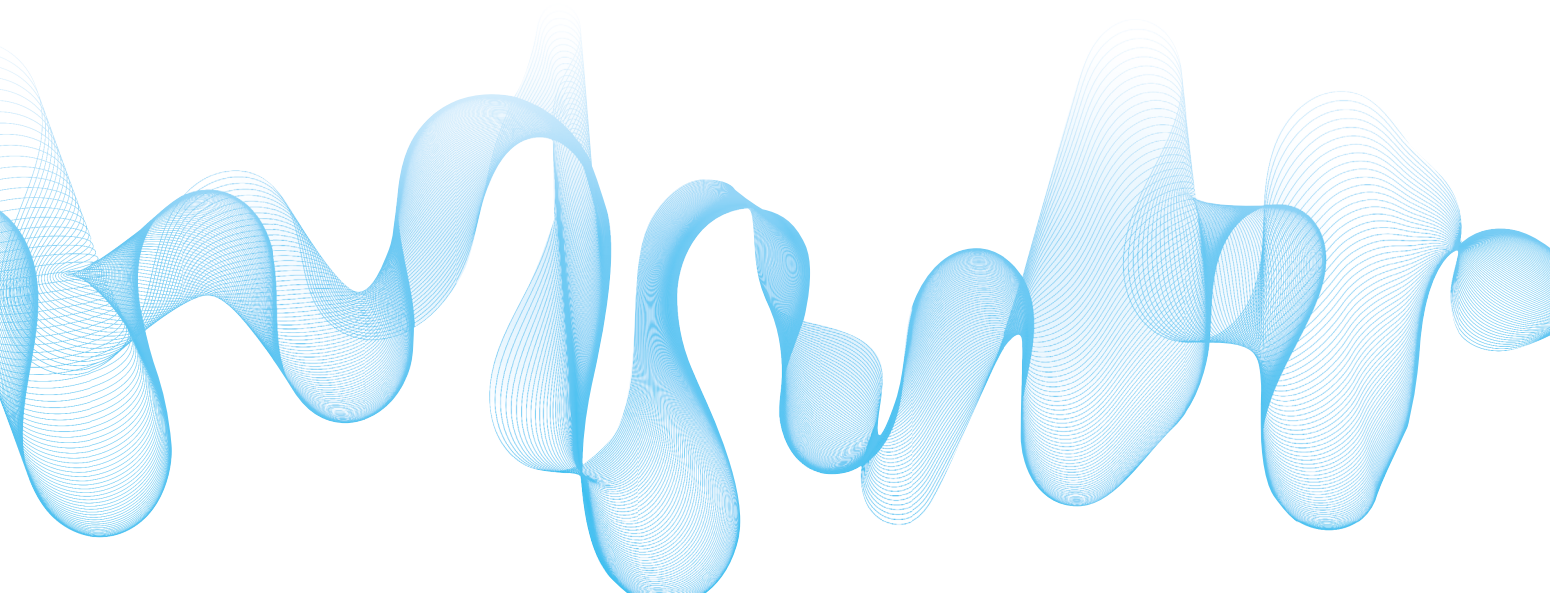
(continued)

	Secondary vocational education – programmes for mid-level specialists (ISCED level 5)		Higher education – bachelor's, specialist's, and master's programmes (ISCED level 6 and 7)		Higher education – postgraduate programmes (ISCED level 8)	
	Thousand persons	As a percentage of the total number of graduates	Thousand persons	As a percentage of the total number of graduates	Thousand persons	As a percentage of the total number of graduates
Latvia	0.2	6.2	0.5	4.3	0.0	3.3
Lithuania	–	–	0.8	3.1	0.0	1.7
Luxembourg	0.0	3.1	0.1	5.2	0.0	17.8
Mexico	5.3	10.1	35.2	4.8	0.1	0.9
Netherlands	0.1	4.2	4.3	2.8	0.1	2.1
New Zealand	1.8	8.1	3.4	6.0	0.1	4.0
Norway	0.1	1.9	2.0	4.0	0.0	1.6
Poland	–	–	17.9	3.8	0.1	1.6
Portugal	0.7	18.0	1.0	1.3	0.1	3.4
Slovakia	0.0	4.7	1.7	4.0	0.0	2.4
Slovenia	0.1	5.1	0.5	3.2	0.0	6.1
South Korea	8.3	5.0	19.3	4.5	0.5	3.4
Spain	10.9	8.4	6.4	2.0	0.8	4.8
Sweden	1.0	11.5	2.0	3.2	0.2	5.3
Switzerland	–	–	2.2	2.5	0.1	2.8
Turkey	12.6	4.0	1.4	0.3	0.0	0.5
United Kingdom	6.3	5.4	25.3	3.8	1.2	4.1
United States	36.3	3.6	132.9	4.5	2.0	2.7

* The data for countries other than Russia refer to 2018.

** The data on the 'Information and Communications Technologies' scientific areas are included in other scientific fields.

9 PERSONNEL



9.1. EMPLOYED IN ICT TASK-INTENSIVE OCCUPATIONS BY GROUP OF OCCUPATIONS

	Thousand persons		As a percentage of the total		As a percentage of the total employment	
	2019	2020	2019	2020	2019	2020
Total	**8626.7**	**9148.9**	**100**	**100**	**12.0**	**13.0**
Including:						
ICT specialists – total	**1665.5**	**1764.6**	**19.3**	**19.3**	**2.3**	**2.5**
Managers						
ICT service managers	64.1	63.5	0.7	0.7	0.1	0.1
Professionals						
Software and multimedia developers and analysts	674.5	761.5	7.8	8.3	0.9	1.1
Database and network professionals	311.8	332.4	3.6	3.6	0.4	0.5
Electronics engineers	161.4	159.4	1.9	1.7	0.2	0.2
Telecommunications engineers	88.5	92.2	1.0	1.0	0.1	0.1
ICT sales professionals	11.5	15.9	0.1	0.2	0.0	0.0
Graphic and multimedia designers	27.1	36.0	0.3	0.4	0.0	0.1
Information technology trainers	7.0	10.8	0.1	0.1	0.0	0.0
Technicians and associate professionals						
ICT operations and user support technicians	94.4	78.9	1.1	0.9	0.1	0.1
Telecommunications and broadcasting technicians	65.0	66.2	0.8	0.7	0.1	0.1
Electronics engineering technicians	50.2	43.1	0.6	0.5	0.1	0.1
Installers and services				0.0		0.0
Electronics and telecommunications technology installers and servicers	110.0	104.7	1.3	1.1	0.2	0.1

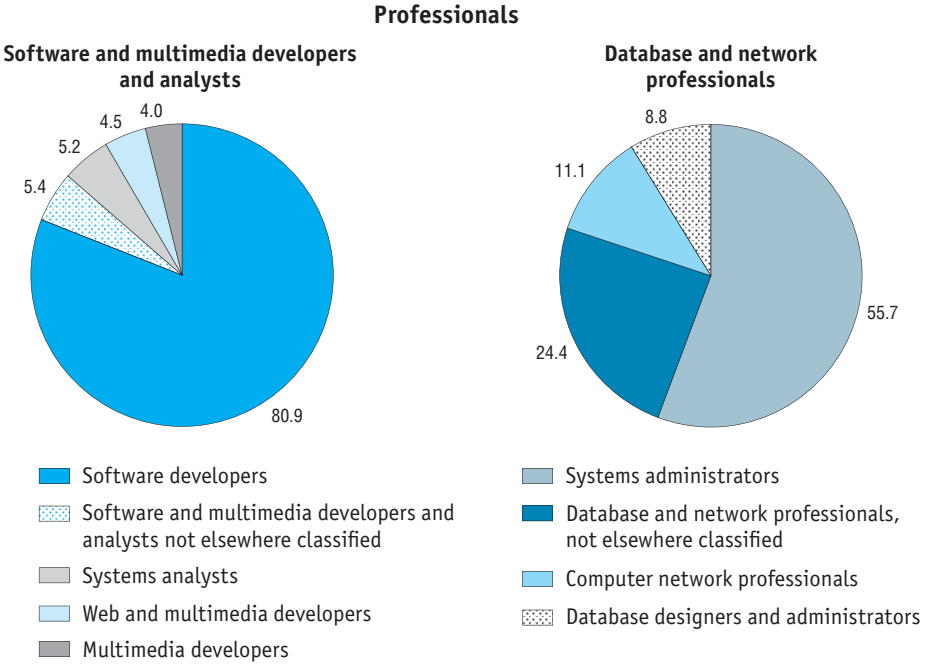
(continued)

	Thousand persons		As a percentage of the total		As a percentage of the total employment	
	2019	2020	2019	2020	2019	2020
Other ICT task-intensive occupations – total	**6961.2**	**7384.3**	**80.7**	**80.7**	**9.7**	**10.5**
Managers						
Business services and administration managers	839.7	826.6	9.7	9.0	1.2	1.2
Sales, marketing and development managers	193.5	199.5	2.2	2.2	0.3	0.3
Professional services managers	387.3	377.7	4.5	4.1	0.5	0.5
Professionals						
Physical and earth science professionals	118.4	109.9	1.4	1.2	0.2	0.2
Architects, planners, surveyors and designers	448.2	471.0	5.2	5.1	0.6	0.7
University and higher education teachers	244.9	206.6	2.8	2.3	0.3	0.3
Finance professionals	2217.0	2293.2	25.7	25.1	3.1	3.2
Administration experts	1112.0	1236.2	12.9	13.5	1.5	1.8
Sales, goods and services marketing, and PR experts	1185.7	1456.3	13.7	15.9	1.6	2.1
Electrical engineers	214.5	207.2	2.5	2.3	0.3	0.3

Sources: here and below in this section, for Russia, HSE ISSEK estimates based on Rosstat data; for countries other than Russia, Eurostat.

9.2. PERCENTAGE DISTRIBUTION OF ICT SPECIALISTS BY GROUP OF OCCUPATIONS: 2020

(as a percentage of the total employment in each field of activity)



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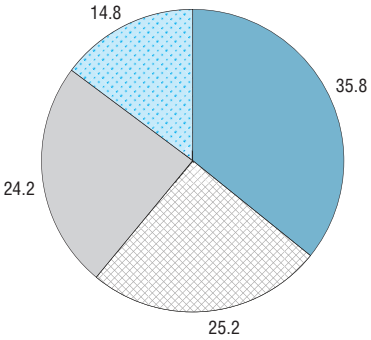
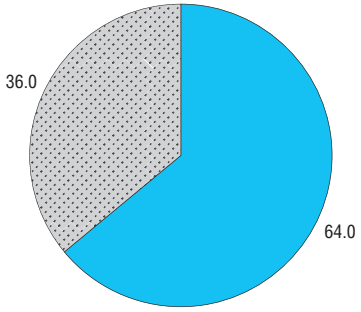
Technicians and associate professionals

ICT operations and user support technicians

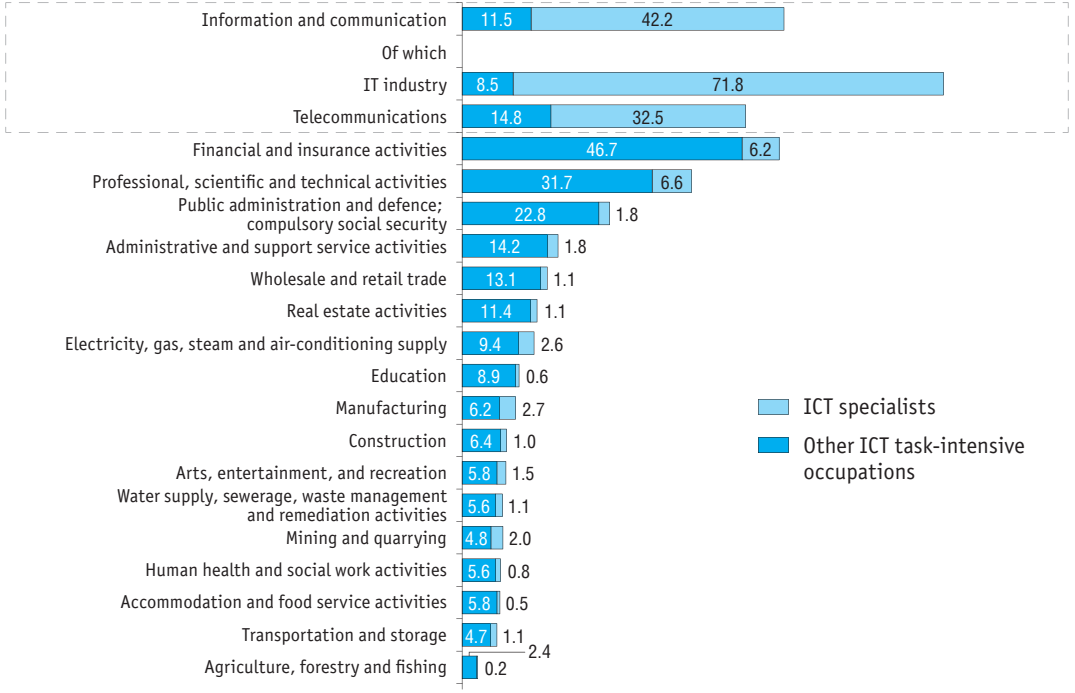


Communications Technicians



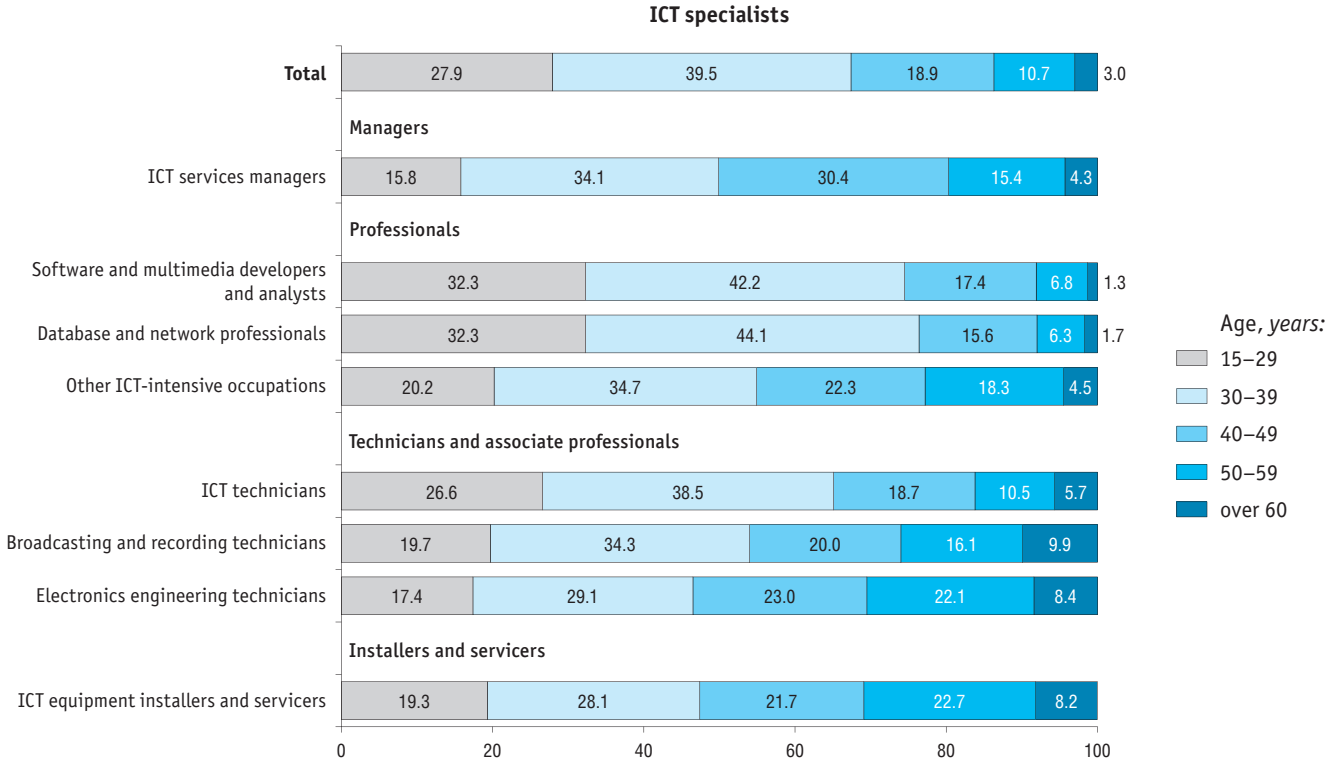
9.3. EMPLOYED IN ICT TASK-INTENSIVE OCCUPATIONS BY TYPE OF ECONOMIC ACTIVITY: 2020

(as a percentage of the total employment in each type of economic activity)



9.4. EMPLOYED IN ICT TASK-INTENSIVE OCCUPATIONS BY AGE: 2020

(as a percentage of ICT specialists in each group of occupations)



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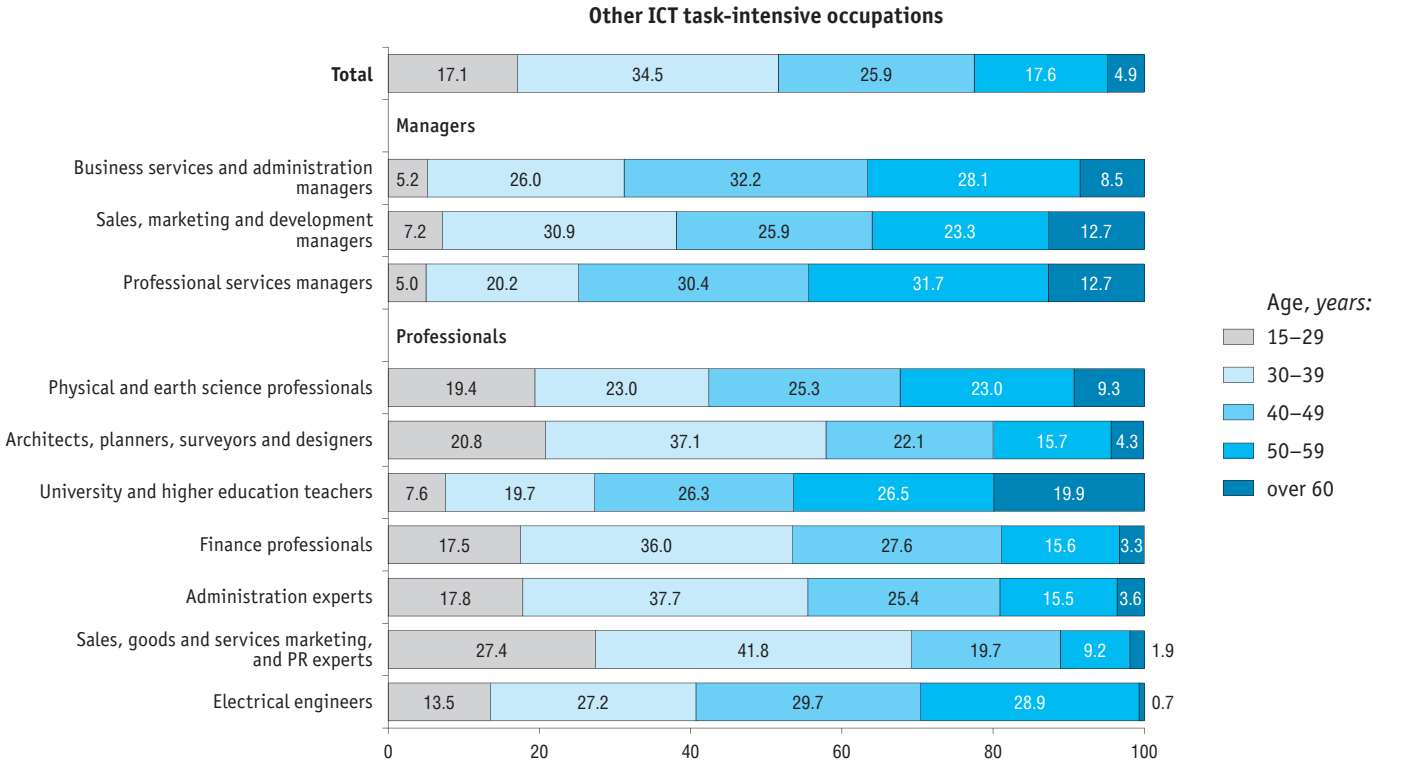
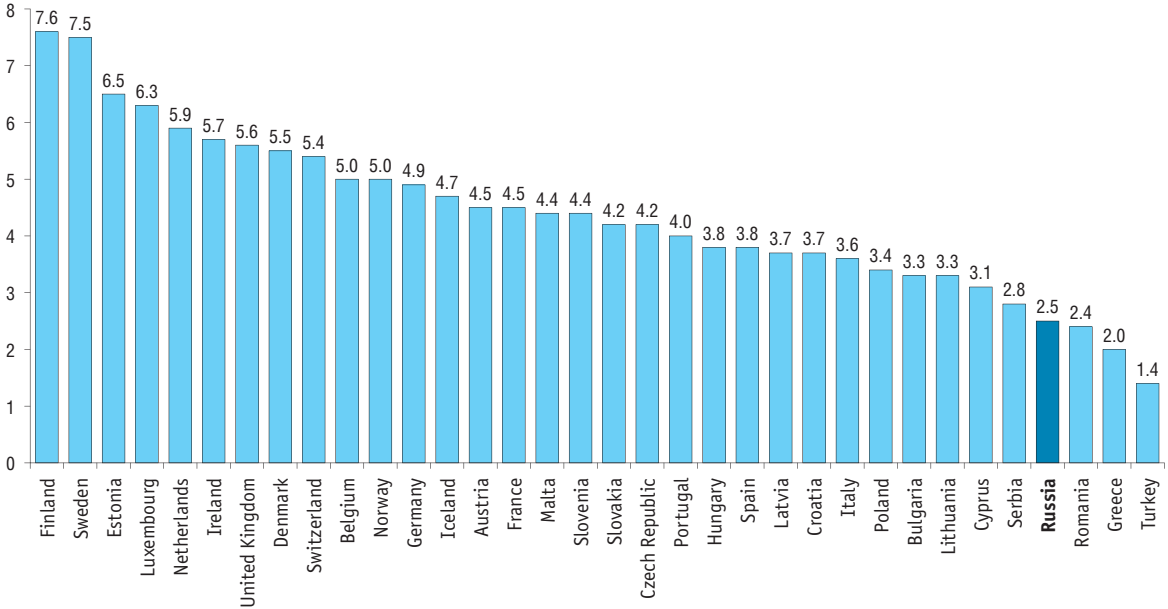

Other ICT task-intensive occupations
Total
17.1
34.5
25.9
17.6
4.9
Managers
Business services and administration managers
5.2
26.0
32.2
28.1
8.5
Sales, marketing and development managers
7.2
30.9
25.9
23.3
12.7
Professional services managers
5.0
20.2
30.4
31.7
12.7
Professionals
Physical and earth science professionals
19.4
23.0
25.3
23.0
9.3
Architects, planners, surveyors and designers
20.8
37.1
22.1
15.7
4.3
University and higher education teachers
7.6
19.7
26.3
26.5
19.9
Finance professionals
17.5
36.0
27.6
15.6
3.3
Administration experts
17.8
37.7
25.4
15.5
3.6
Sales, goods and services marketing, and PR experts
27.4
41.8
19.7
9.2
1.9
Electrical engineers
13.5
27.2
29.7
28.9
0.7
0
20
40
60
80
100
Age, years:
15–29
30–39
40–49
50–59
over 60

9.5. ICT SPECIALISTS BY COUNTRY: 2020*

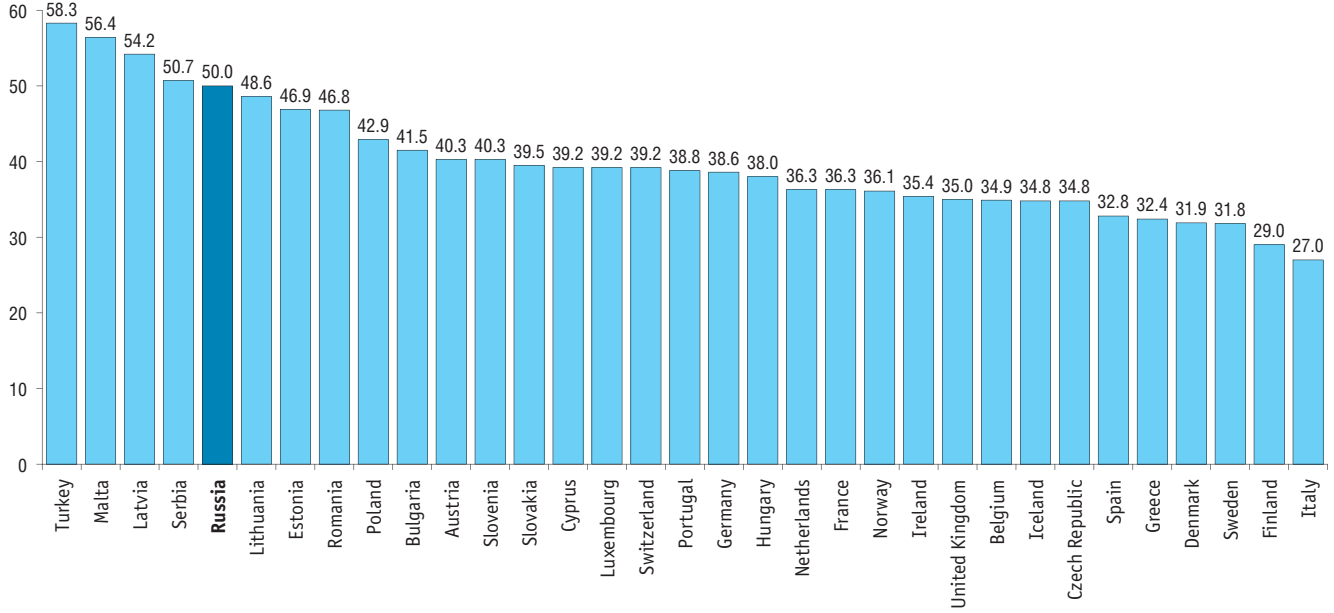
(as a percentage of the total employment)



* Or nearest years for which data are available.

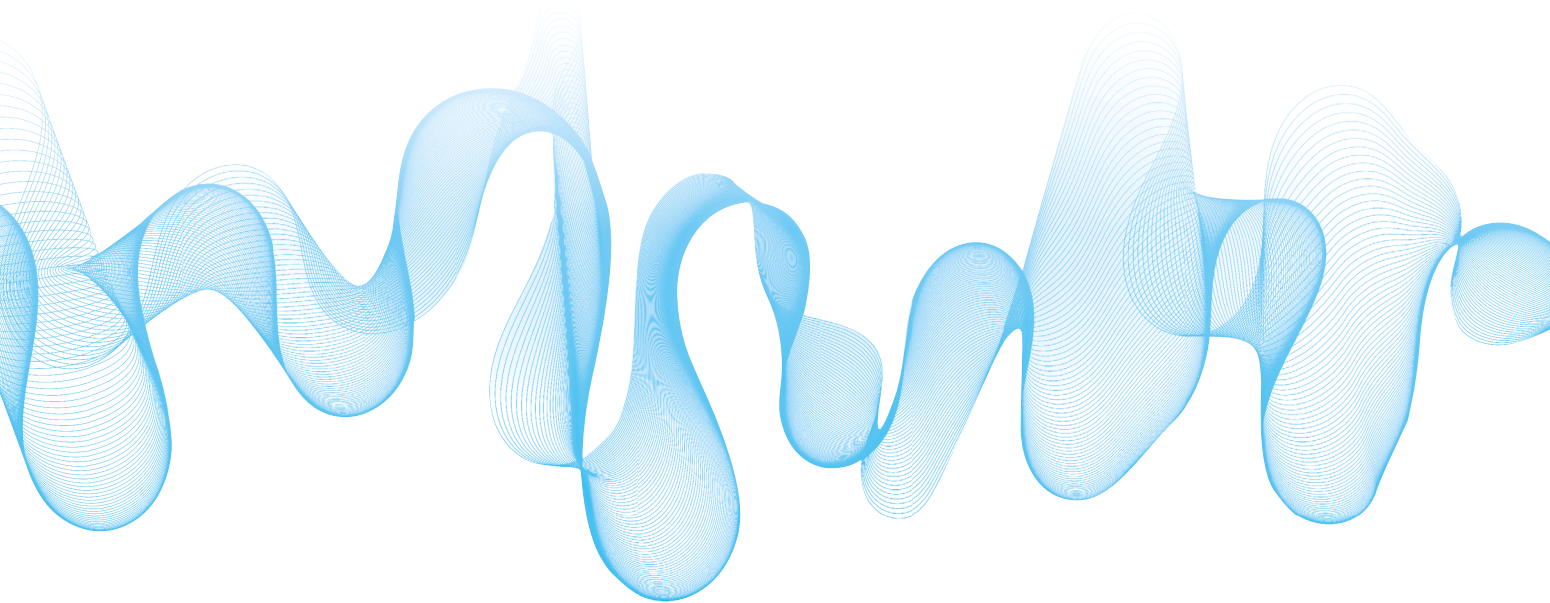
9.6. ICT SPECIALISTS UNDER 35 BY COUNTRY: 2020*

(as a percentage of all ICT specialists)



* Or nearest years for which data are available.

10 DIGITAL SKILLS OF THE POPULATION



10.1. DIGITAL SKILLS OF THE POPULATION

(as a percentage of the total population aged 15 and over)*

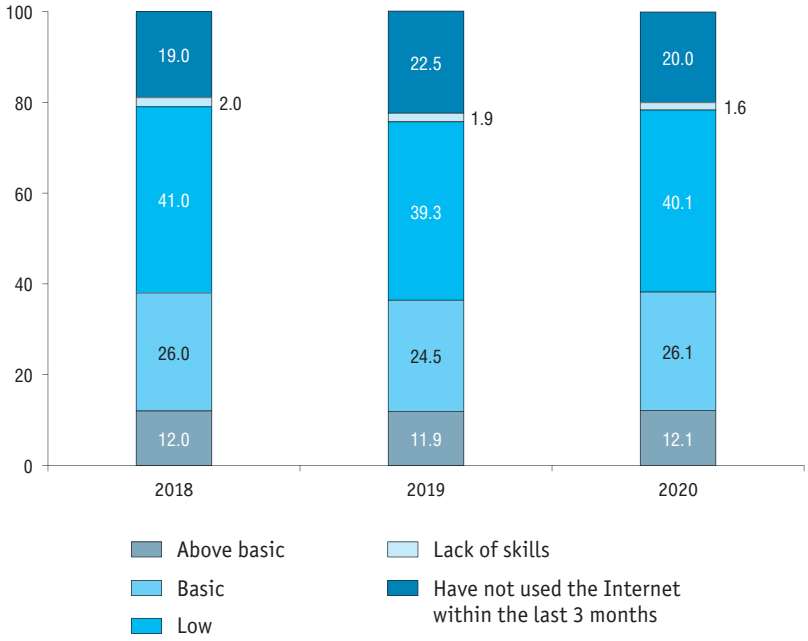
	2014	2015	2016	2017	2018	2019	2020
Transferring files via e-mail	–	–	–	–	36.8	39.7	42.2
Using word processing software	38.1	38.8	41.5	41.7	41.1	40.4	40.4
Copying or moving files or folders	–	–	–	–	34.5	36.3	37.5
Using copy/paste tools in documents	–	–	–	–	22.4	24.9	27.7
Transferring files between a computer and other devices	23.8	27.6	29.0	27.4	31.1	31.0	27.3
Using spreadsheet software	19.6	21.7	22.9	22.7	20.8	22.0	22.9
Using software to edit photos, video, or audio files	19.4	21.3	21.4	20.6	21.2	21.9	20.9
Connecting and installing new devices	7.2	8.4	8.9	9.7	9.8	15.3	14.2
Creating e-presentations using special software	6.5	7.7	8.5	9.1	8.2	9.0	9.3
Searching, downloading, installing of software, and changing software configuration settings	–	–	–	–	–	5.8	5.5
Installing or reinstalling an operating system	2.8	2.8	2.7	3.0	2.8	2.9	2.5
Writing software by oneself using a programming language	1.1	1.0	1.0	1.2	1.1	1.2	0.7

* In 2014–2016, aged 15–72.

Sources: here and below in this section, for Russia, Rosstat data (10.1, 10.3, 10.5, and 10.7), HSE ISSEK estimates based on Rosstat data (10.2, 10.4, 10.6, and 10.8); for countries other than Russia, Eurostat.

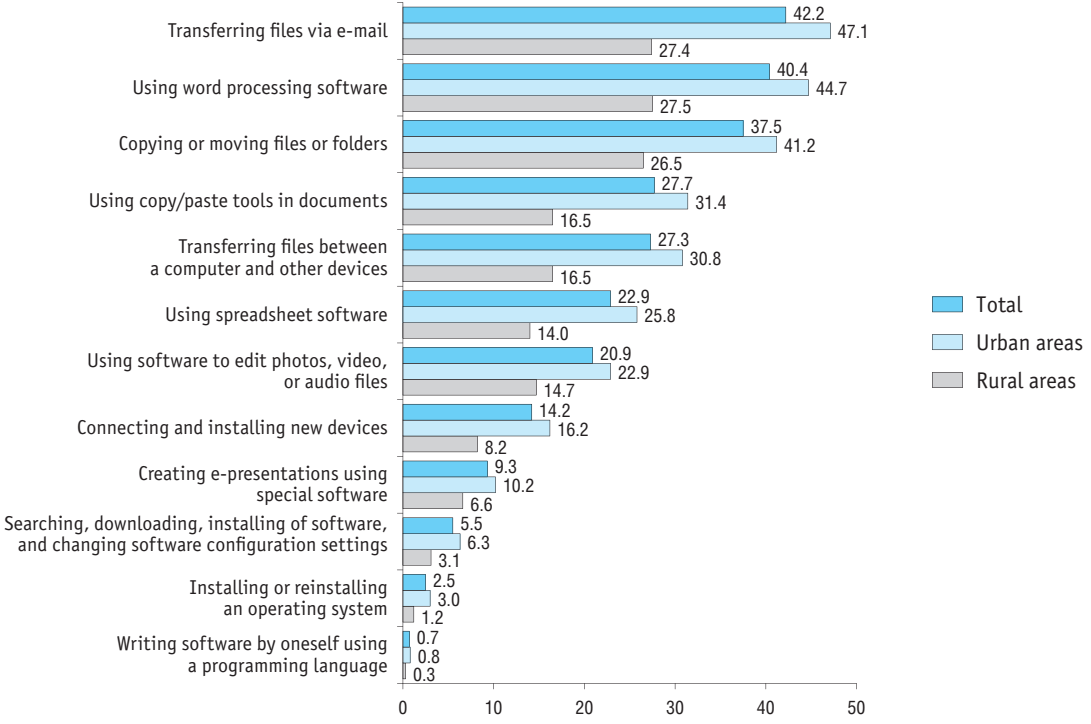
10.2. DIGITAL COMPETENCE

(as a percentage of the total population aged 15 and over)



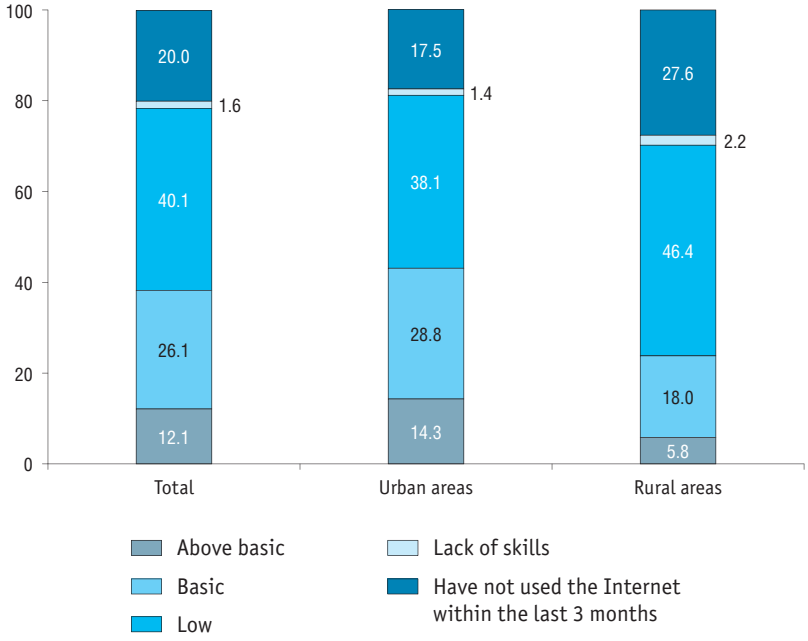
10.3. DIGITAL SKILLS OF THE POPULATION IN URBAN AND RURAL AREAS: 2020

(as a percentage of the total population aged 15 and over)



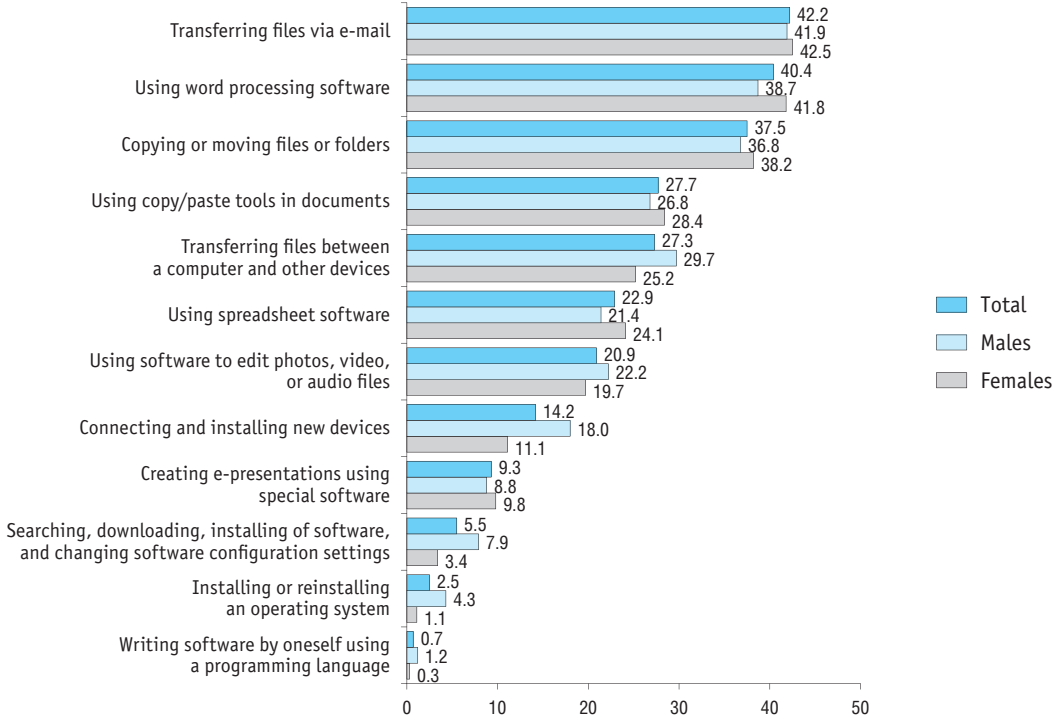
10.4. DIGITAL COMPETENCE IN URBAN AND RURAL AREAS: 2020

(as a percentage of the total population aged 15 and over)



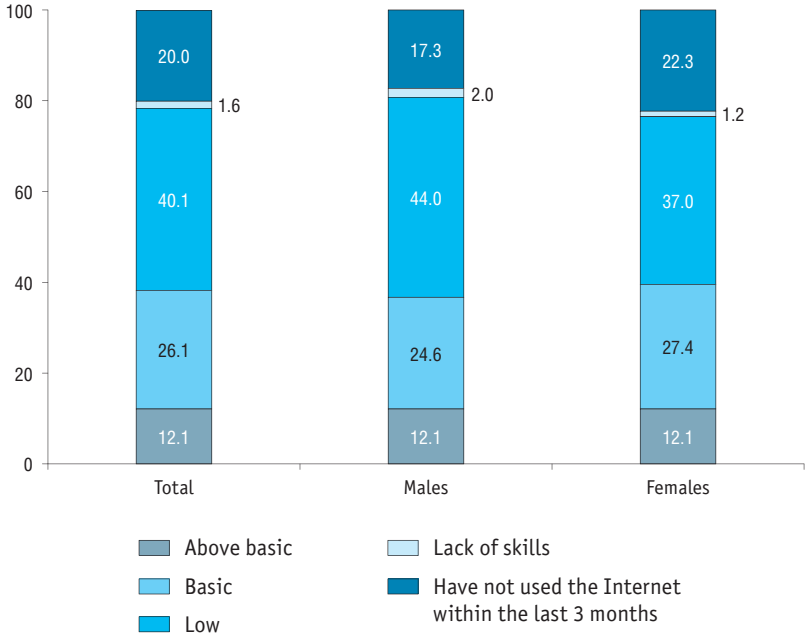
10.5. DIGITAL SKILLS OF THE POPULATION BY GENDER: 2020

(as a percentage of the total population aged 15 and over)



10.6. DIGITAL COMPETENCE BY GENDER: 2020

(as a percentage of the total population aged 15 and over)



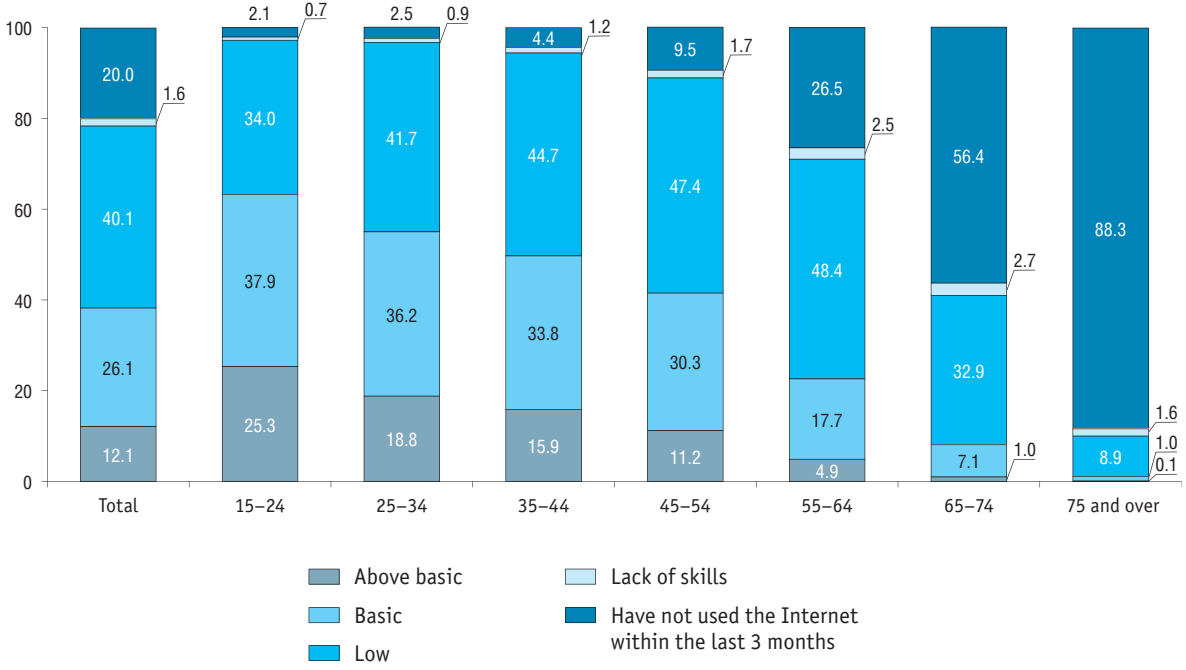
10.7. DIGITAL SKILLS OF THE POPULATION BY AGE: 2020

(as a percentage of population in each age group)

	Total (aged 15 and over)	Of whom by age, *years*						
		15–24	25–34	35–44	45–54	55–64	65–74	75 and over
Transferring files via e-mail	42.2	61.2	58.7	54.8	47.0	29.1	12.3	2.3
Using word processing software	40.4	68.3	53.6	50.1	44.0	27.3	12.2	2.1
Copying or moving files or folders	37.5	64.3	51.2	47.7	41.3	23.6	8.7	1.3
Using copy/paste tools in documents	27.7	49.4	38.1	35.7	30.1	16.2	5.5	0.8
Transferring files between a computer and other devices	27.3	46.6	40.9	34.5	27.5	15.5	6.2	1.0
Using spreadsheet software	22.9	45.3	31.6	29.0	24.2	12.3	3.1	0.3
Using software to edit photos, video, or audio files	20.9	42.8	31.7	24.3	19.0	10.5	5.2	0.7
Connecting and installing new devices	14.2	25.4	22.9	18.3	13.4	6.7	2.4	0.3
Creating e-presentations using special software	9.3	31.8	11.8	9.6	6.6	2.9	0.7	0.1
Searching, downloading, installing of software, and changing software configuration settings	5.5	11.3	9.5	6.7	4.4	2.0	0.6	0.1
Installing or reinstalling an operating system	2.5	4.4	4.8	3.5	1.9	0.8	0.2	0.04
Writing software by oneself using a programming language	0.7	1.0	1.5	0.9	0.5	0.2	0.04	0.03

10.8. DIGITAL COMPETENCE BY AGE: 2020

(as a percentage of the total population in each age group)



10.9. DIGITAL SKILLS OF THE POPULATION BY COUNTRY: 2020*

*(as a percentage of the total population aged 15 and over**)*

	Transferring files via e-mail	Using word processing software	Copying or moving files or folders	Transferring files between a computer and other devices	Using spreadsheet software
Russia	**42**	**40**	**38**	**27**	**23**
Austria	79	62	67	61	30
Belgium	84	55	57	57	22
Bulgaria	43	27	44	43	7
Croatia	66	54	59	56	25
Cyprus	66	44	48	46	15
Czech Republic	83	58	56	61	23
Denmark	96	57	68	61	34
Estonia	82	54	61	57	30
Finland	93	71	69	66	34
France	79	54	58	60	27
Germany	87	63	71	66	33
Greece	58	54	61	54	18
Hungary	75	47	52	46	25
Iceland	95	82	73	71	51
Ireland	78	49	48	43	24
Italy	59	40	45	36	21
Latvia	76	39	48	51	17
Lithuania	66	48	59	58	24
Luxembourg	84	59	59	49	31
Malta	73	51	53	50	31

(continued)

	Transferring files via e-mail	Using word processing software	Copying or moving files or folders	Transferring files between a computer and other devices	Using spreadsheet software
Netherlands	92	76	74	68	36
Norway	94	80	70	66	30
Poland	66	39	51	48	13
Portugal	68	48	49	42	30
Romania	40	20	69	69	5
Serbia	38	43	58	43	12
Slovakia	76	49	60	62	15
Slovenia	78	54	60	55	31
Spain	76	52	59	55	25
Sweden	90	67	60	53	29
Switzerland	91	75	67	64	41
Turkey	34	35	42	38	22
United Kingdom	87	69	63	56	39

(continued)

	Using software to edit photos, video, or audio files	Creating e-presentations using special software	Searching, downloading, installing of software, and changing software configuration settings***	installing or reinstalling an operating system	Writing software by oneself using a programming language
Russia	**21**	**9**	**6**	**3**	**1**
Austria	46	46	59	38	9
Belgium	30	34	47	19	4
Bulgaria	11	15	21	7	1
Croatia	35	41	54	47	9
Cyprus	21	27	44	28	4
Czech Republic	35	20	52	16	6
Denmark	43	49	65	37	14
Estonia	38	34	58	43	7
Finland	55	50	70	52	10
France	32	35	53	24	6
Germany	48	40	68	42	6
Greece	15	30	25	15	4
Hungary	26	27	36	27	4
Iceland	46	55	74	60	12
Ireland	31	38	51	35	7
Italy	24	29	35	16	6
Latvia	14	24	30	15	3
Lithuania	42	32	45	28	5
Luxembourg	41	36	57	27	7
Malta	30	36	54	26	8

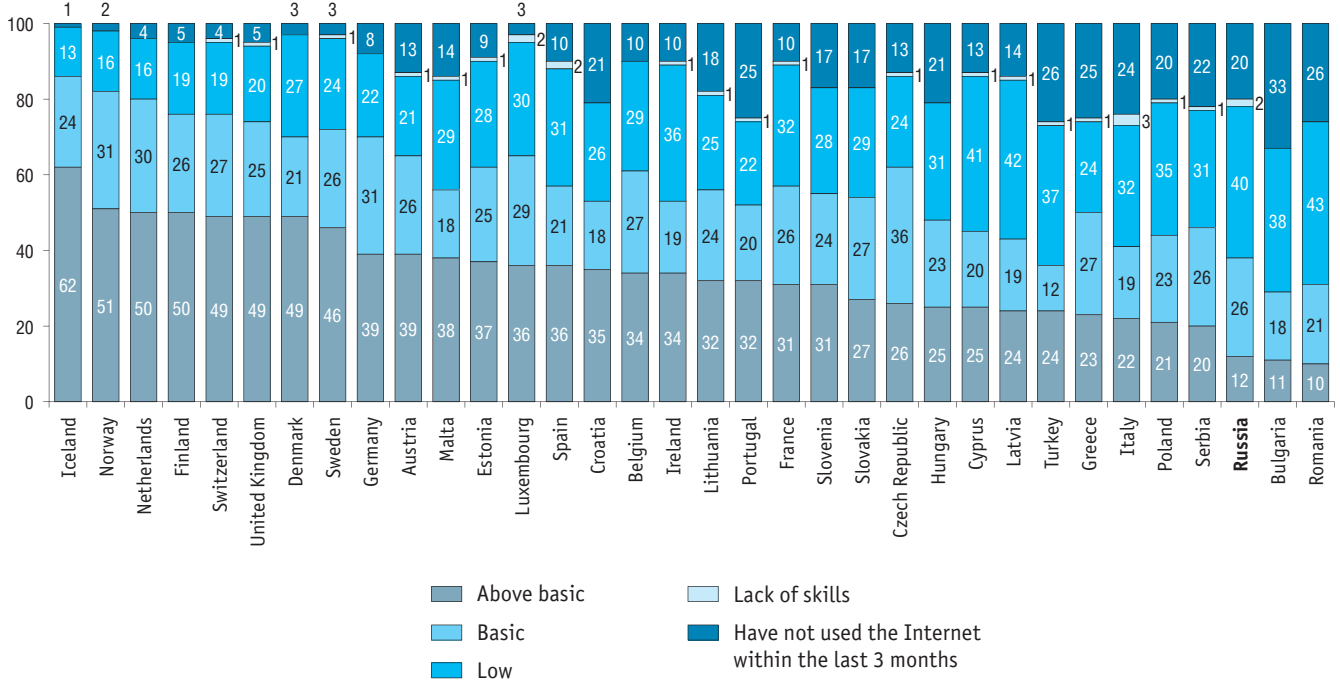
(continued)

	Using software to edit photos, video, or audio files	Creating e-presentations using special software	Searching, downloading, installing of software, and changing software configuration settings***	installing or reinstalling an operating system	Writing software by oneself using a programming language
Netherlands	48	46	75	41	10
Norway	49	50	83	42	12
Poland	26	24	39	32	3
Portugal	37	35	41	14	8
Romania	15	14	27	8	1
Serbia	18	27	35	31	4
Slovakia	26	31	33	17	4
Slovenia	27	33	31	19	5
Spain	39	41	58	23	7
Sweden	39	47	72	37	12
Switzerland	48	52	69	24	10
Turkey	17	29	40	22	3
United Kingdom	49	50	71	41	10

* Or nearest years for which data are available.
** For countries other than Russia, aged 16–74.
*** The data for foreign countries refers to the skills of installing software or applications.
**** The data for foreign countries refers to the skills of changing software configuration settings or preferences, including operating systems and security programmes.

10.10. DIGITAL COMPETENCE BY COUNTRY: 2020*

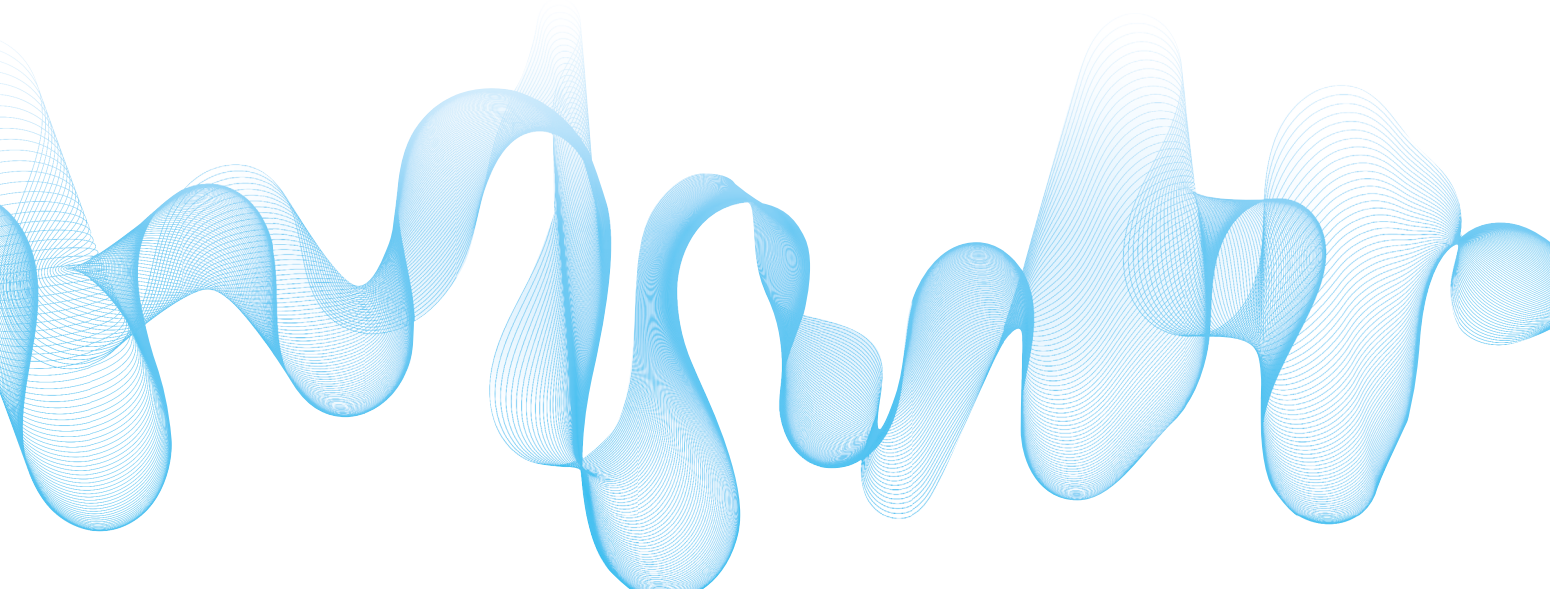
*(as a percentage of the total population aged 15 and over**)*



* Or nearest years for which data are available.
** For countries other than Russia, aged 16–74.

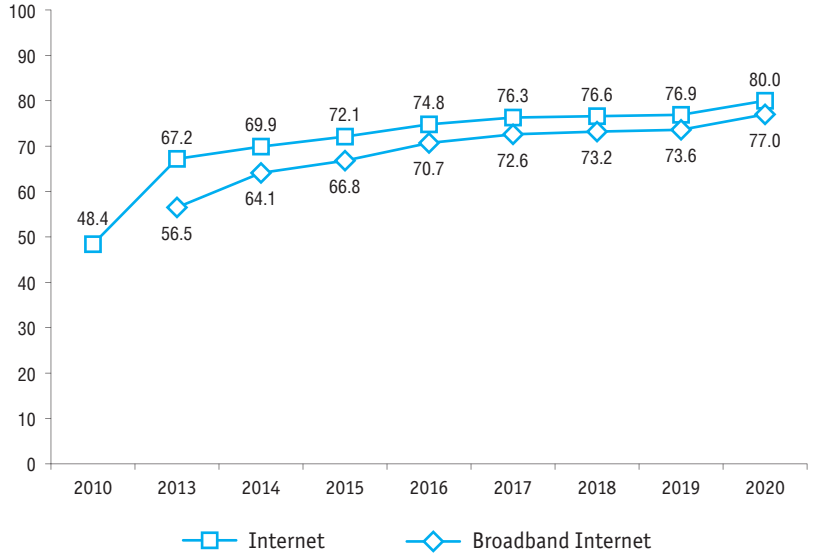
11

POPULATION IN THE DIGITAL WORLD



11.1. HOUSEHOLDS WITH INTERNET ACCESS

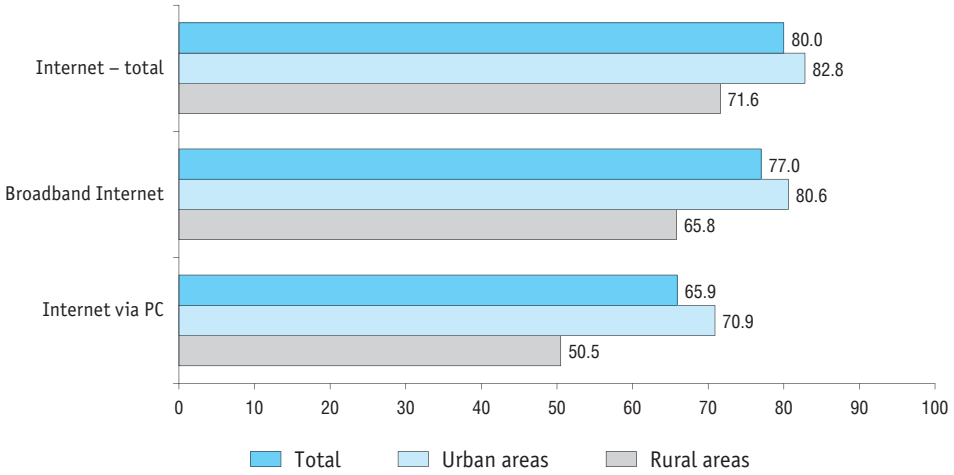
(as a percentage of all households)



Sources: here and below in this section, for Russia, Rosstat; for countries other than Russia, OECD, ITU, and Eurostat.

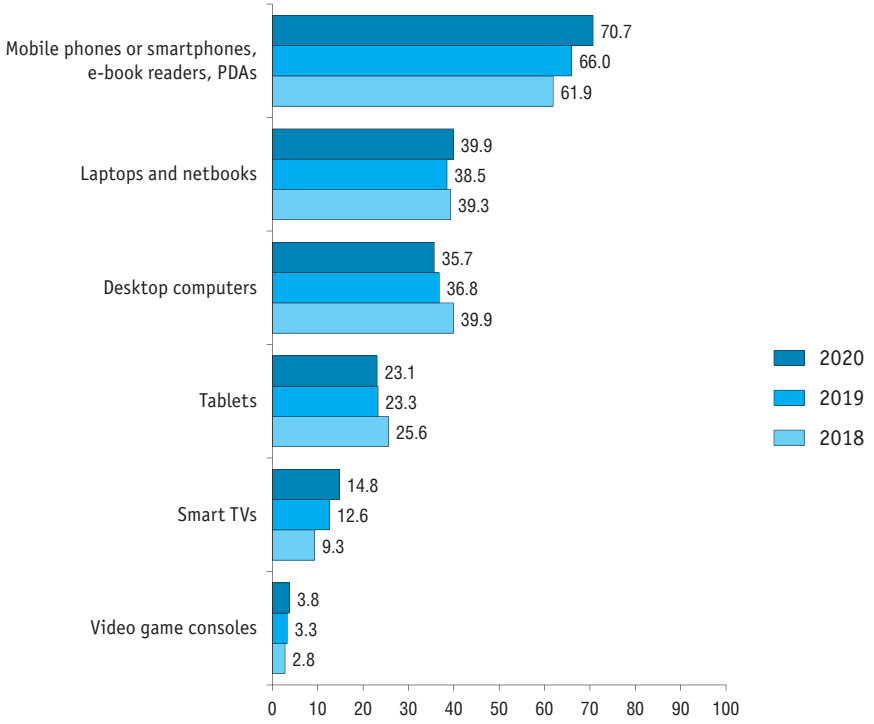
11.2. HOUSEHOLDS WITH INTERNET ACCESS IN URBAN AND RURAL AREAS: 2020

(as a percentage of all households)



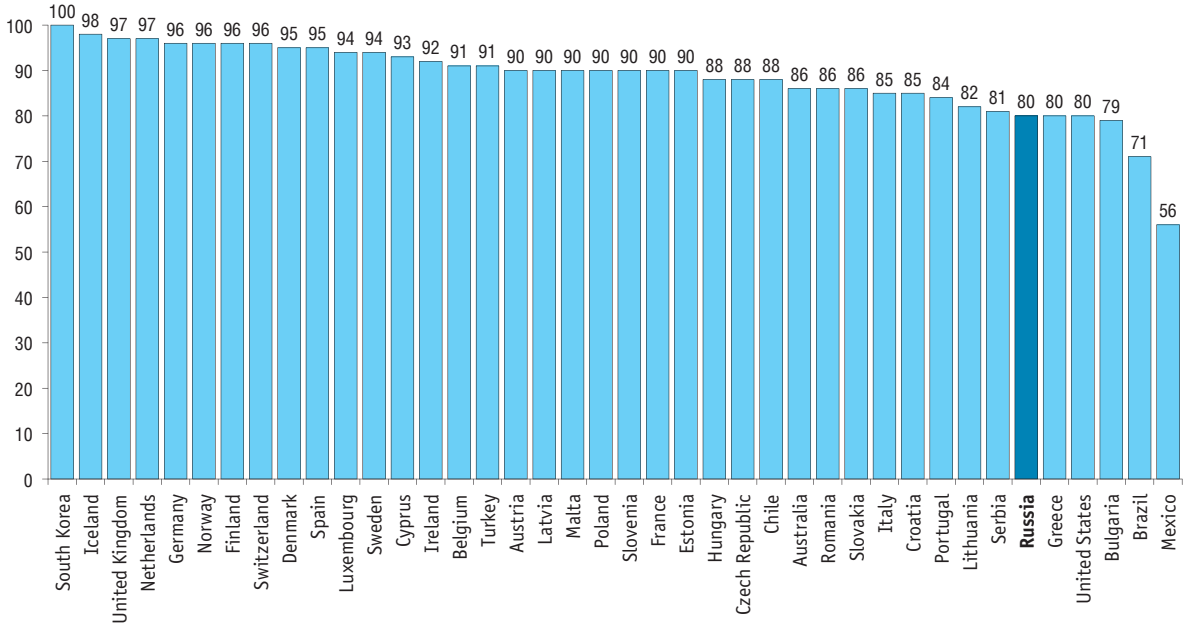
11.3. HOUSEHOLDS WITH INTERNET ACCESS BY DEVICE

(as a percentage of all households)



11.4. HOUSEHOLDS WITH INTERNET ACCESS BY COUNTRY: 2020*

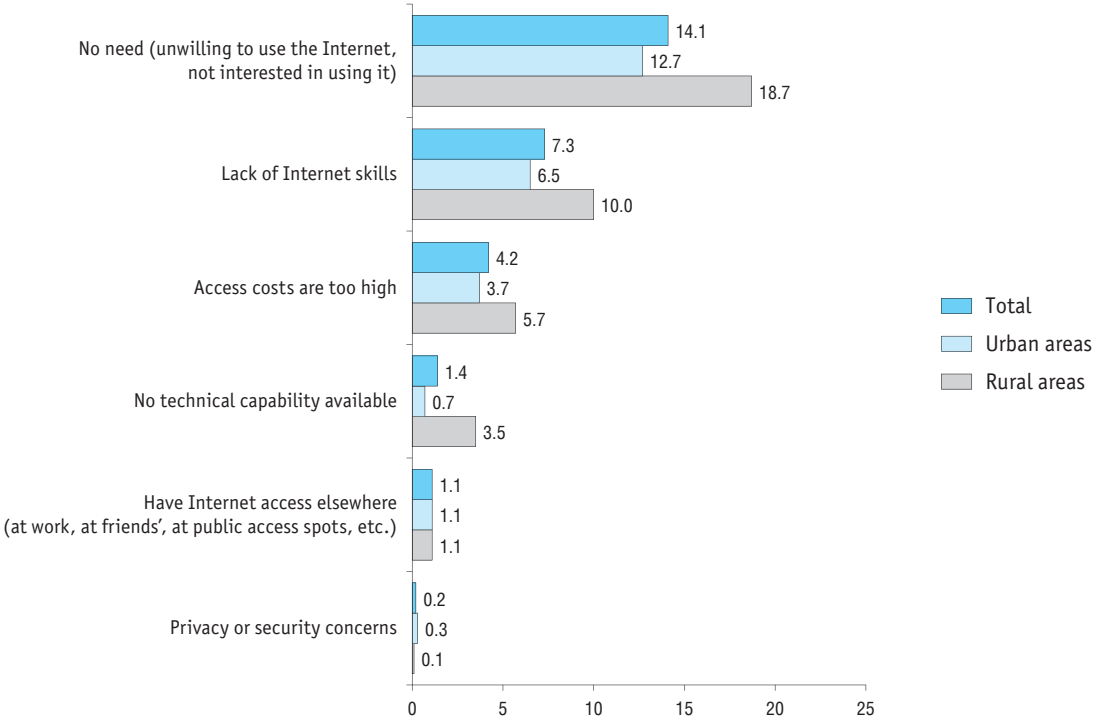
(as a percentage of all households)



* Or nearest years for which data are available.

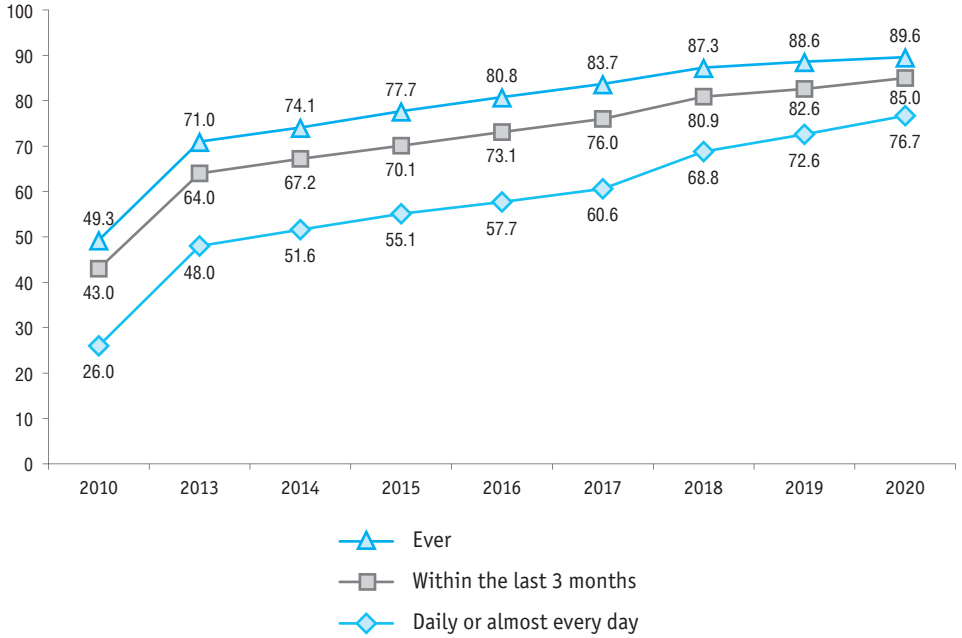
11.5. FACTORS HAMPERING HOUSEHOLDS' USE OF INTERNET IN URBAN AND RURAL AREAS: 2020

(as a percentage of all households)



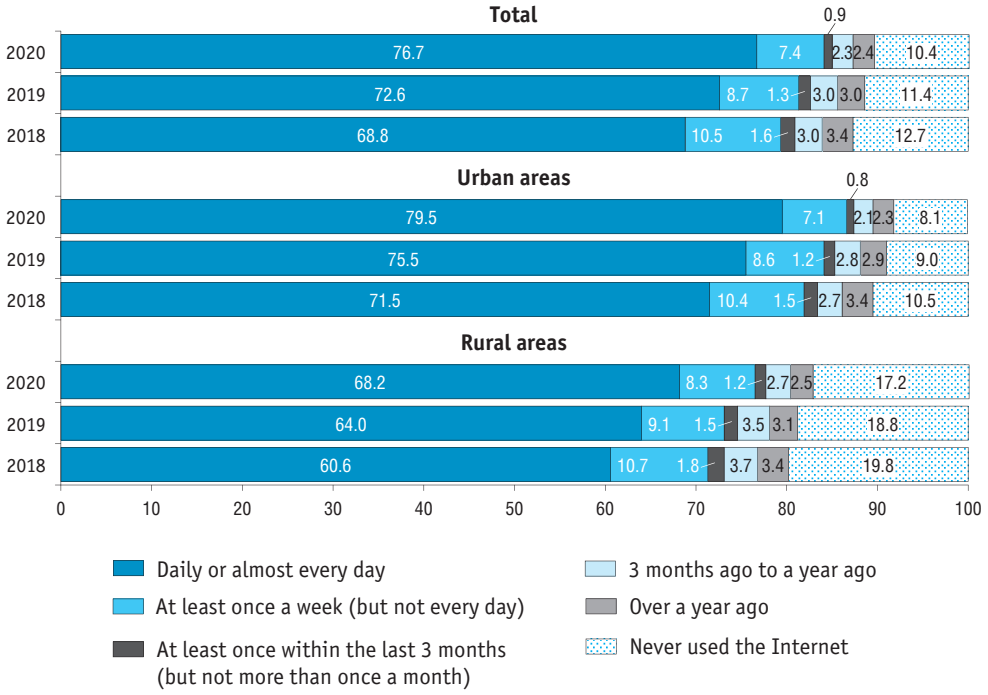
11.6. INTERNET USERS

(as a percentage of individuals aged 15–74)



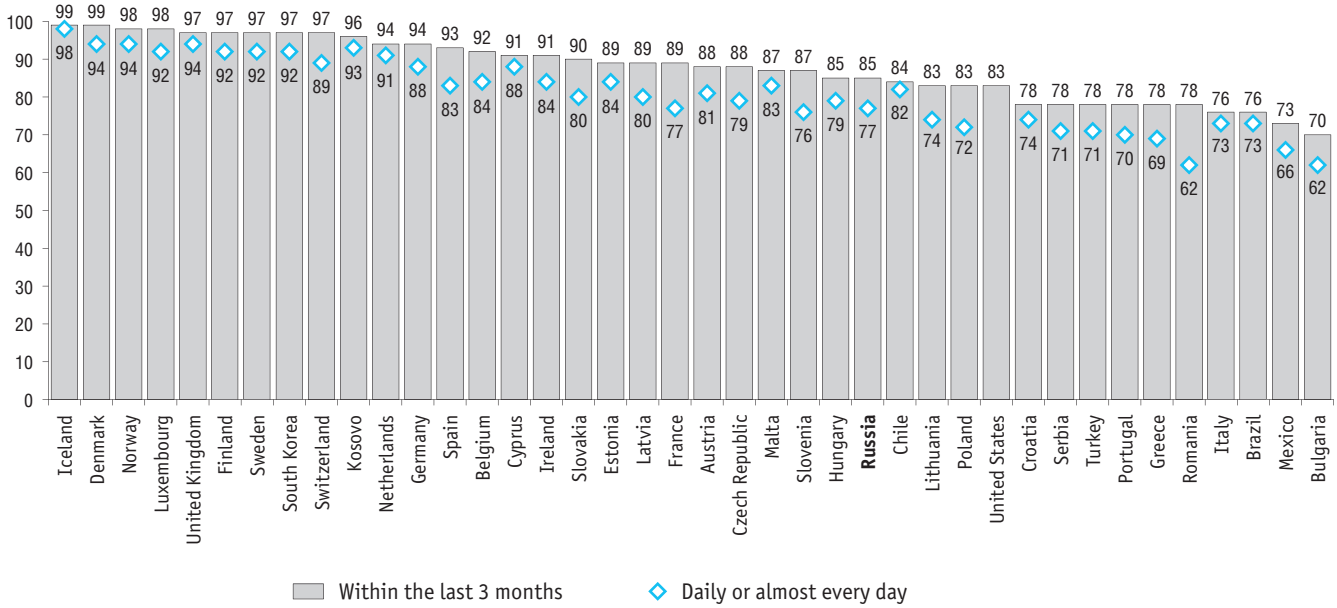
11.7. INTERNET USERS IN URBAN AND RURAL AREAS

(as a percentage of individuals aged 15–74)



11.8. INTERNET USERS BY COUNTRY 2020*

*(as a percentage of individuals aged 15–74**)*

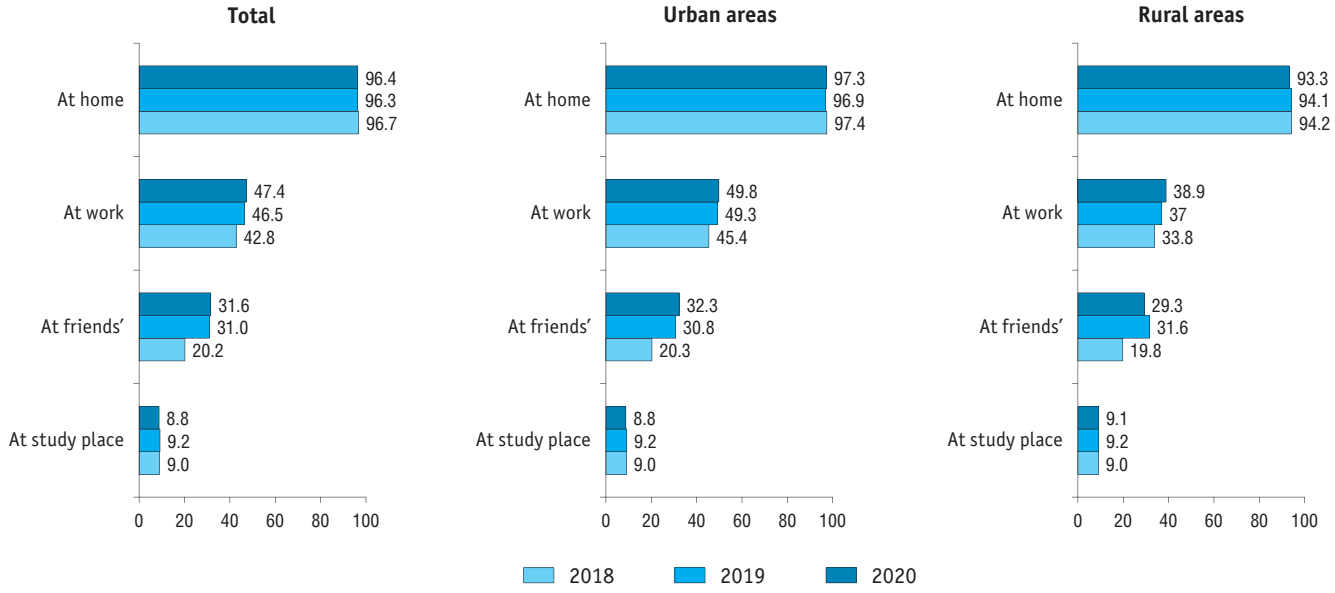


* Or nearest years for which data are available.

** For countries other than Russia, aged 16–74.

11.9. PLACES OF INDIVIDUALS' USE OF INTERNET IN URBAN AND RURAL AREAS*

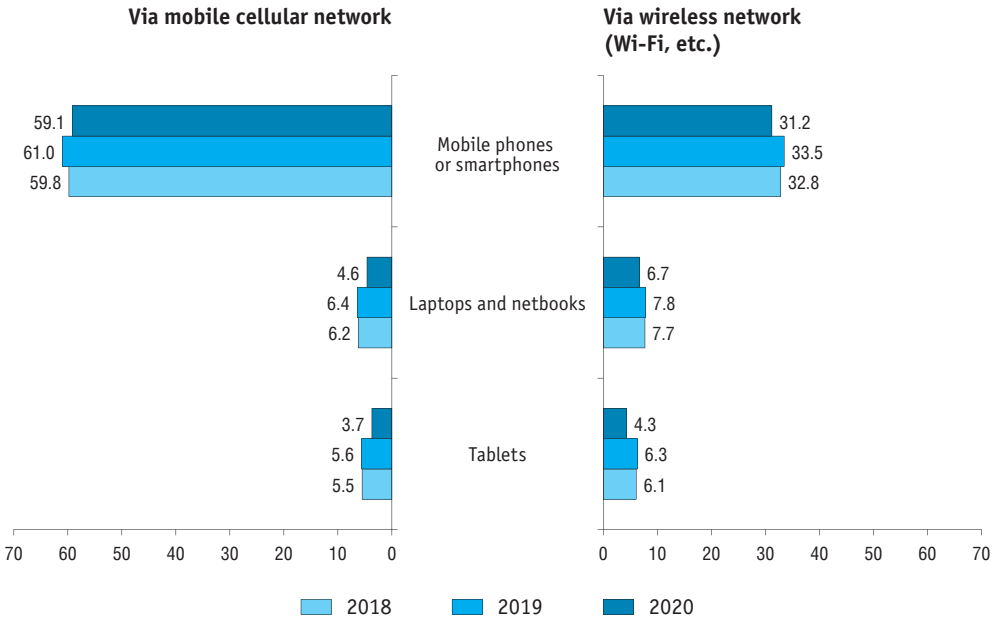
(as a percentage of individuals aged 15–74 who have used the Internet within the last 3 months)



* In 2020, 46.1% of the population used the Internet in public transport (metro, bus, tram, trolleybus, electric train, train, and taxi), in public access spots on a free-of-charge basis (in public libraries, museums, Multifunctional Public Services Centres, etc.) – 14.4%; in commercial access spots on a paid basis (in Internet cafés, hotels, etc.) – 6.0%.

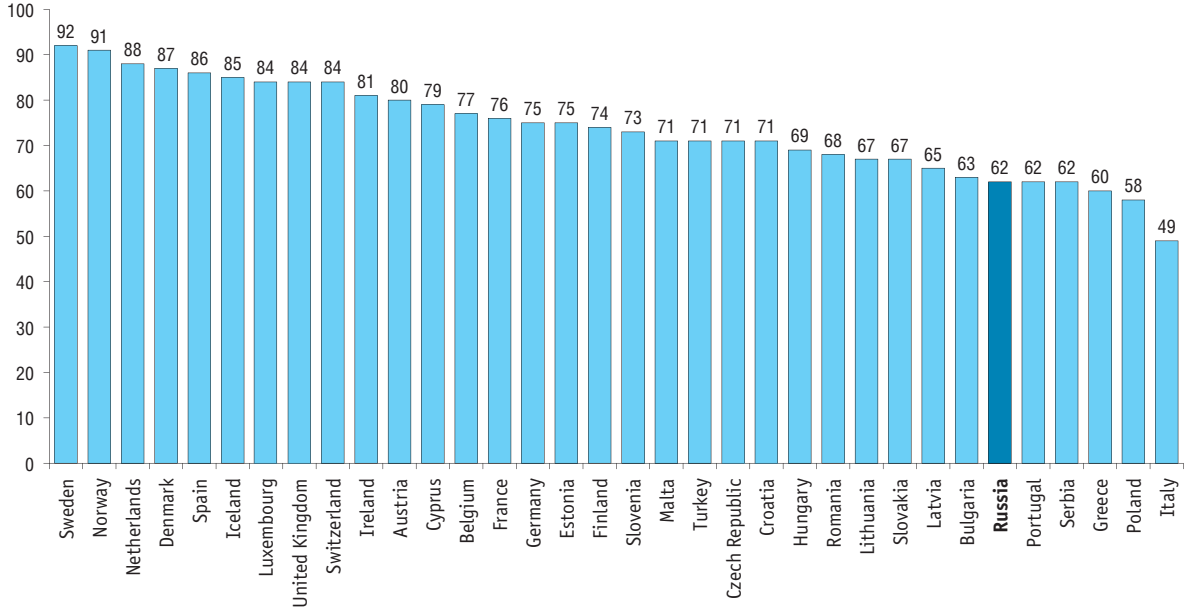
11.10. INDIVIDUALS' USE OF MOBILE DEVICES TO ACCESS THE INTERNET OUTSIDE OF HOME OR WORK

(as a percentage of individuals aged 15–74)



11.11. INDIVIDUALS' USE OF MOBILE PHONES OR SMARTPHONES TO ACCESS THE INTERNET OUTSIDE OF HOME OR WORK BY COUNTRY: 2020*

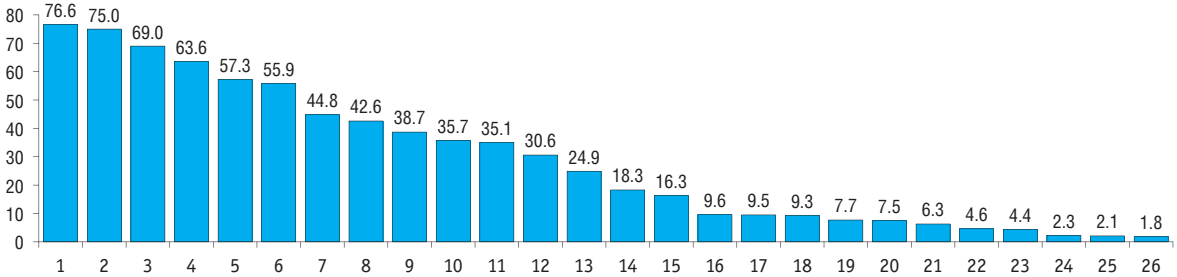
*(as a percentage of individuals aged 15–74**)*



* Or nearest years for which data are available.
** For countries other than Russia, aged 16–74.

11.12. INDIVIDUALS' INTERNET ACTIVITIES: 2020

(as a percentage of individuals aged 15–74 who have used the Internet within the last 3 months)



1 – making online telephone/video calls (e.g., via Skype, etc.)
2 – participation in social media
3 – communicating via instant messenging services (chatrooms, ICQ, QIP, etc.)
4 – watching/reading news, weather forecasts
5 – financial transactions
6 – searching for information about goods and services
7 – sending/receiving e-mails
8 – downloading movies, images, music; viewing videos; listening to music/radio
9 – searching for health-related information or healthcare services
10 – buying goods or services (including via online auction platforms)
11 – acquiring information and knowledge on general topics via Wikipedia, other online encyclopedias, etc.
12 – uploading personal files (books, articles, photos, videos, software, etc.) to publicly accessible websites, social media, or cloud storage
13 – playing/downloading video or computer games
14 – reading/downloading online newspapers, magazines, or e-books
15 – storage of documents, images, music, video clips, and other files
16 – e-learning
17 – searching for information about cultural sites or events, etc.
18 – searching for information about education, courses, trainings, etc.
19 – selling goods or services (including via online auction platforms)
20 – searching for a job
21 – downloading software (excluding computer games)
22 – participating in polls or surveys on social or political issues
23 – residential lease
24 – blogging
25 – posting one's opinions on social and poilitical issues on websites
26 – participating in professional networks or forums

11.13. INDIVIDUALS' INTERNET ACTIVITIES BY COUNTRY: 2019*

*(as a percentage of individuals aged 15–74 who have used the Internet within the last 3 months**)*

	Related to communications			Related to accessing digital content	
	Participation in social media	Making online telephone/ video calls	Sending/receiving e-mails	Playing/downloading video or computer games	Reading/downloading online newspapers, magazines, or e-books
Russia	**75**	**77**	**45**	**25**	**18**
Austria	68	68	91	29	73
Belgium	86	74	92	37	65
Bulgaria	78	83	62	16	58
Croatia	73	73	84	35	92
Cyprus	86	94	72	38	79
Czech Republic	68	52	95	25	92
Denmark	86	71	97	47	87
Estonia	72	59	91	29	89
Finland	77	80	96	45	93
France	47	53	89	33	60
Germany	58	69	92	40	81
Greece	76	72	74	32	89
Hungary	87	80	88	29	83
Iceland	94	74	96	43	96
Ireland	67	74	86	26	74
Italy	56	65	77	27	58
Japan	63	58	74	…	64
Latvia	75	66	83	26	78
Lithuania	74	77	80	23	89

(continued)

	Related to communications			Related to accessing digital content	
	Participation in social media	Making online telephone/ video calls	Sending/receiving e-mails	Playing/downloading video or computer games	Reading/downloading online newspapers, magazines, or e-books
Luxembourg	65	55	86	32	74
Malta	83	72	84	47	86
Netherlands	76	88	98	56	87
Norway	90	81	96	36	95
Poland	66	66	79	19	79
Portugal	80	70	87	38	86
Romania	82	67	59	26	55
Serbia	71	80	48	21	74
Slovakia	72	70	85	22	76
Slovenia	77	60	90	32	82
South Korea	68	63	56	…	95
Spain	69	83	82	40	81
Sweden	74	65	93	…	82
Switzerland	55	72	94	…	79
Turkey	80	88	43	37	68
United Kingdom	78	53	90	35	76
United States	79	53	91	…	…

* Or nearest years for which data are available.
** For countries other than Russia, aged 16–74.

(continued)

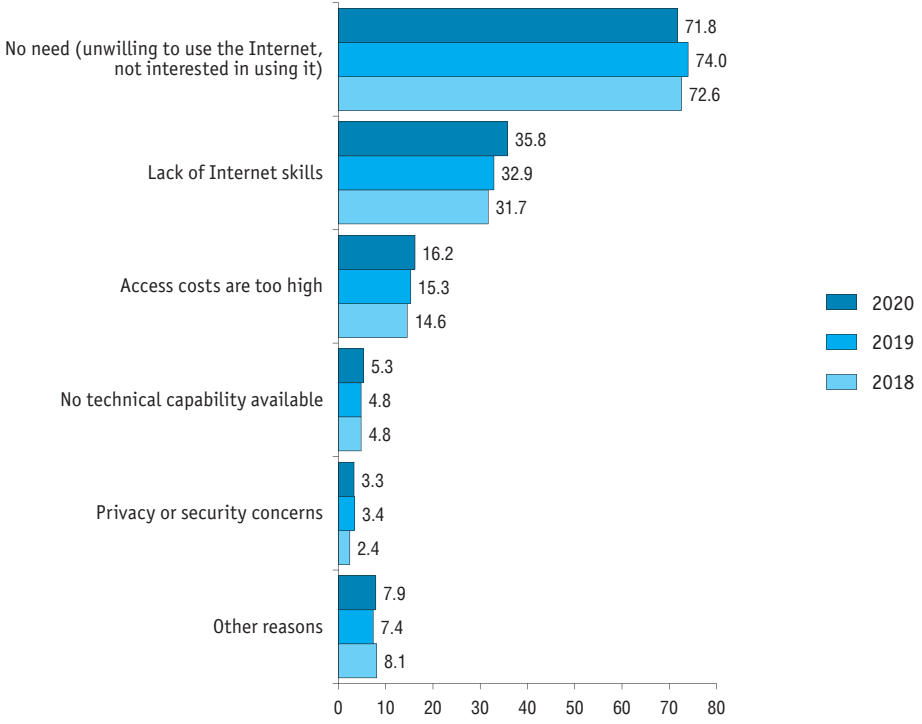
	Other activities			
	Searching for health-related information or healthcare services	Uploading personal files to publicly accessible websites, social media, or cloud storage	Financial transactions	Searching for a job
Russia	**39**	**31**	**57**	**8**
Austria	64	39	75	13
Belgium	56	38	82	14
Bulgaria	41	29	18	11
Croatia	74	39	64	18
Cyprus	67	45	57	16
Czech Republic	71	47	80	7
Denmark	73	60	96	38
Estonia	65	46	89	23
Finland	80	58	95	34
France	55	26	66	20
Germany	74	41	69	18
Greece	67	48	47	17
Hungary	74	45	61	18
Iceland	69	74	96	20
Ireland	66	39	76	19
Italy	46	30	48	18
Japan	…	…	20	8
Latvia	56	39	83	16
Lithuania	69	44	81	19

(continued)

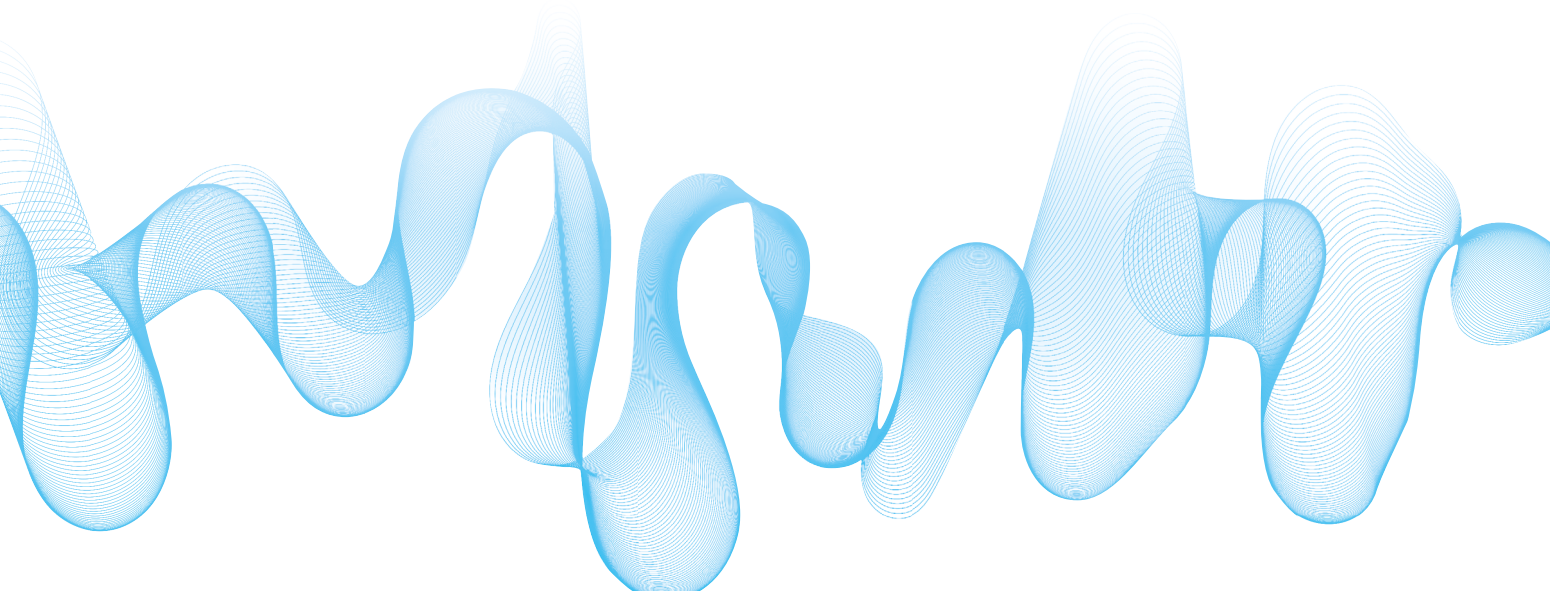
	Other activities			
	Searching for health-related information or healthcare services	Uploading personal files to publicly accessible websites, social media, or cloud storage	Financial transactions	Searching for a job
Luxembourg	60	28	73	21
Malta	74	38	69	21
Netherlands	81	53	95	26
Norway	75	53	96	27
Poland	51	22	59	11
Portugal	63	51	60	20
Romania	36	20	11	6
Serbia	57	45	20	19
Slovakia	62	28	65	18
Slovenia	67	40	60	16
South Korea	70	64	82	14
Spain	72	41	67	20
Sweden	64	41	87	31
Switzerland	69	40	75	27
Turkey	65	48	51	11
United Kingdom	65	40	83	26
United States	49	18	72	22

11.14. FACTORS HAMPERING INDIVIDUALS' USE OF INTERNET

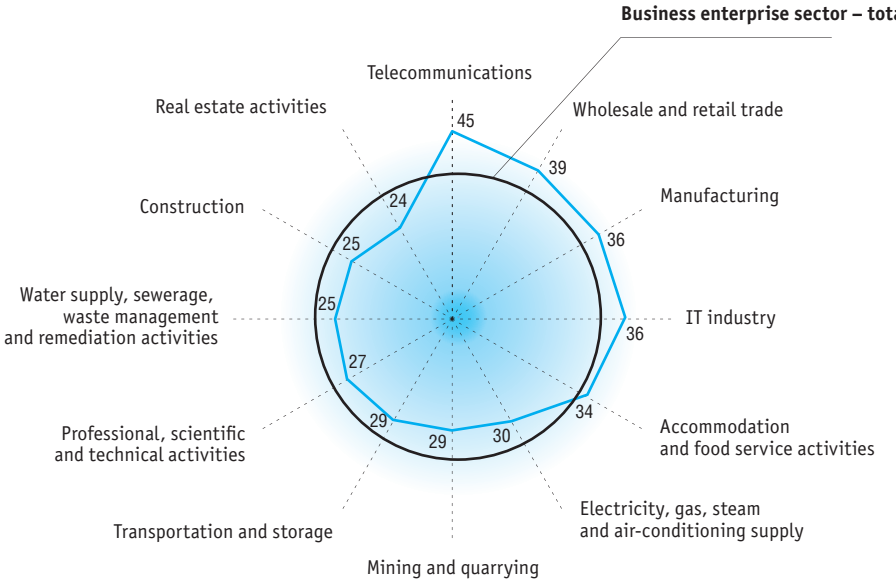
(as a percentage of individuals aged 15–74 who have not used the Internet or used it more than a year ago)



12 DIGITALISATION OF ECONOMY SECTORS, SOCIAL SPHERE, AND PUBLIC AUTHORITIES



12.1. BUSINESS DIGITALISATION INDEX: 2019*



* Here and below in 12.2–12.16, the digitalisation index of business enterprise sector, agriculture, financial sector, and social sphere characterises the use of broadband Internet, cloud computing services, RFID technologies, ERP software, and involvement in e-commerce.

Sources here and below in this section, for Russia, HSE ISSEK estimates based on Rosstat data; for countries other than Russia, OECD and Eurostat.

12.2. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN BUSINESS ENTERPRISE SECTOR: 2019

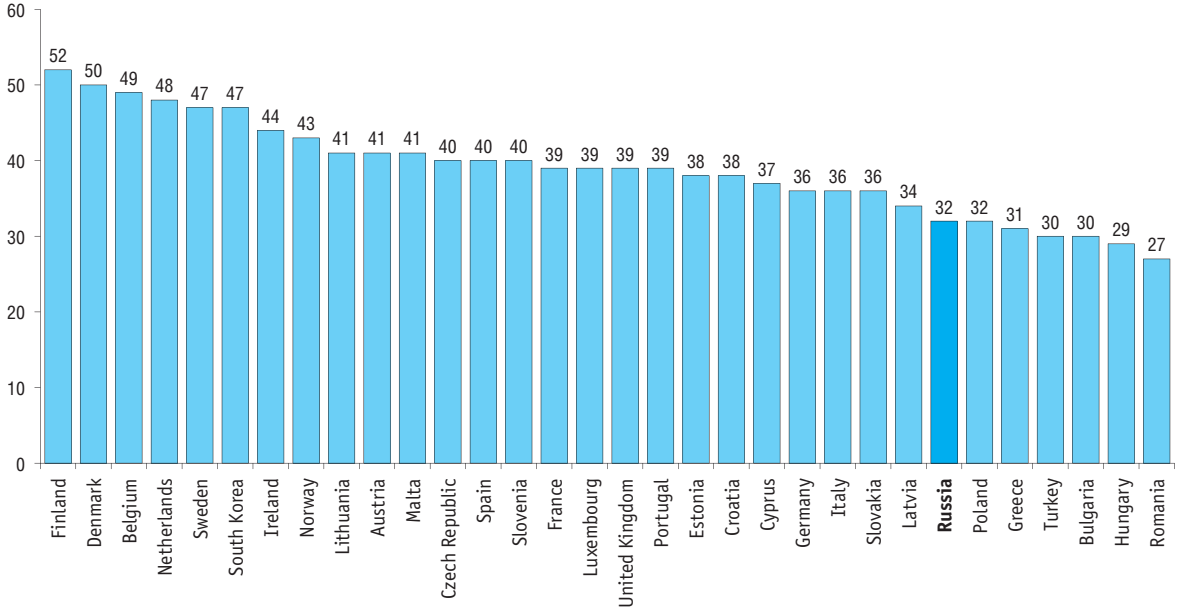
	Digitalisation Index in business enterprise sector	Enterprises using digital technologies as a percentage of the total number of enterprises in business enterprise sector				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Total	**32**	**86.0**	**29.1**	**23.3**	**14.6**	**8.2**
Mining and quarrying	29	82.6	20.7	22.7	8.7	12.2
Manufacturing	36	90.4	27.6	29.6	19.6	12.0
Electricity, gas, steam and air-conditioning supply	30	87.4	20.9	20.9	13.1	8.7
Water supply, sewerage, waste management and remediation activities	25	78.8	24.1	6.7	10.6	4.3
Construction	25	78.1	22.3	10.9	8.6	6.4
Wholesale and retail trade, repair of motor vehicles and motorcycles	39	90.0	37.8	37.5	21.7	9.0
Transportation and storage	29	80.8	22.9	20.2	11.7	11.1
Accommodation and food service activities	34	81.5	35.5	20.9	20.7	11.9
Telecommunications	45	92.0	42.4	46.1	28.1	13.9
IT industry	36	95.7	38.3	23.7	11.4	9.1
Real estate activities	24	78.8	21.7	7.5	7.1	4.1
Professional, scientific and technical activities	27	85.2	24.4	12.1	6.4	4.8

Distribution of Digitisation Index values*:

53–68 41–52 36–40 31–35 20–30

* Here and below in 12.4–12.11, 12.13–12.14, 12.16, and 12.18, the distribution of the digitalisation index is given on a single scale: 53–68, 41–52, 36–40, 31–35, 20–30, reflecting the level of digitalisation of individual economy sectors and social sphere.

12.3. BUSINESS DIGITISATION INDEX BY COUNTRY: 2019



12.4. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN BUSINESS ENTERPRISE SECTOR BY COUNTRY: 2019*

	Digitalisation Index in business enterprise sector	Enterprises using digital technologies as a percentage of the total number of enterprises in business enterprise sector				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Russia	**32**	**86**	**29**	**23**	**15**	**8**
Austria	41	98	23	43	24	19
Belgium	49	98	40	53	31	21
Bulgaria	30	89	8	23	11	18
Croatia	38	95	31	26	22	14
Cyprus	37	96	27	33	14	14
Czech Republic	40	98	26	38	30	8
Denmark	50	100	56	50	34	9
Estonia	38	95	34	26	21	12
Finland	52	100	65	43	29	23
France	39	99	19	48	19	11
Germany	36	95	22	29	20	16
Greece	31	85	13	38	11	7
Hungary	29	91	18	14	15	7
Ireland	44	96	45	28	39	11
Italy	36	96	23	35	14	13
Latvia	34	99	15	32	14	9
Lithuania	41	100	23	48	26	10

(continued)

	Digitalisation Index in business enterprise sector	Enterprises using digital technologies as a percentage of the total number of enterprises in business enterprise sector				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Luxembourg	39	97	25	41	14	18
Malta	41	95	37	32	24	17
Netherlands	48	100	48	48	27	18
Norway	43	94	51	34	28	10
Poland	32	95	11	29	16	9
Portugal	39	98	25	42	17	11
Romania	27	82	10	23	12	7
Slovakia	36	95	21	31	15	18
Slovenia	40	99	26	33	25	15
South Korea	47	100	23	49	16	46
Spain	40	98	22	43	21	15
Sweden	47	97	57	37	33	12
Turkey	30	95	10	21	11	14
United Kingdom	39	95	42	24	26	8

Distribution of Digitisation Index values:

41–52 36–40 31–35 20–30

* Or nearest years for which data are available.

12.5. BUSINESS DIGITISATION INDEX BY COUNTRY AND TYPE OF ECONOMIC ACTIVITY: 2019*

	Manufacturing	Transportation and storage	Wholesale and retail trade	Construction	Telecommunications	IT industry
Russia	**36**	**29**	**39**	**25**	**45**	**36**
Austria	46	40	44	33	…	…
Belgium	…	47	51	42	…	…
Bulgaria	29	27	31	24	…	52
Croatia	37	36	40	29	51	…
Cyprus	31	40	40	26	57	57
Czech Republic	42	35	45	31	53	53
Denmark	51	42	56	41	58	60
Estonia	38	33	42	29	59	52
Finland	59	44	55	46	…	…
France	43	38	42	30	…	52
Germany	42	31	40	27	49	54
Greece	…	…	…	24	…	…
Hungary	30	28	32	22	43	41
Ireland	51	44	43	37	68	57
Italy	37	…	40	30	53	48
Latvia	33	31	38	27	51	52

Distribution of Digitisation Index values:

53–68 41–52 36–40 31–35 20–30

* Or nearest years for which data are available.

(continued)

	Manufacturing	Transportation and storage	Wholesale and retail trade	Construction	Telecommunications	IT industry
Lithuania	43	37	45	34	51	62
Luxembourg	47	41	41	31	…	…
Malta	37	…	39	…	…	…
Netherlands	51	48	53	41	64	56
Norway	46	37	44	38	60	59
Poland	33	29	34	24	43	50
Portugal	37	…	44	…	…	…
Romania	25	22	31	21	31	44
Slovakia	38	31	40	27	53	48
Slovenia	41	38	46	26	…	58
Spain	41	39	44	31	…	…
Sweden	51	40	52	40	63	59
United Kingdom	…	39	43	34	…	53

Distribution of Digitisation Index values:

53–68 41–52 36–40 31–35 20–30

12.6. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN MANUFACTURING BY COUNTRY: 2019*

	Digitalisation Index in manufacturing	Enterprises using digital technologies as a percentage of the total number of enterprises in manufacturing				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Russia	**36**	**90**	**28**	**30**	**20**	**12**
Austria	46	97	21	62	24	28
Bulgaria	29	90	7	25	7	17
Croatia	37	93	23	29	25	17
Cyprus	31	96	19	27	6	7
Czech Republic	42	98	23	48	31	11
Denmark	51	100	55	62	28	10
Estonia	38	96	32	29	20	15
Finland	59	100	70	63	31	29
France	43	100	18	62	22	14
Germany	42	96	19	50	21	26
Hungary	30	91	17	20	15	9
Ireland	51	100	47	44	46	19
Spain	41	98	18	51	21	18
Italy	37	96	21	45	10	14

Distribution of Digitisation Index values:

53–68 41–52 36–40 31–35 20–30

* Or nearest years for which data are available.

(continued)

	Digitalisation Index in manufacturing	Enterprises using digital technologies as a percentage of the total number of enterprises in manufacturing				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Latvia	33	99	12	32	10	10
Lithuania	43	100	23	52	26	13
Luxembourg	47	98	23	62	17	37
Malta	37	93	26	39	13	15
Netherlands	51	100	41	66	26	22
Norway	46	94	49	50	28	11
Poland	33	95	10	32	18	10
Portugal	37	97	20	41	14	12
Romania	25	85	7	21	8	6
Slovakia	38	95	21	38	15	23
Slovenia	41	100	24	43	20	20
Sweden	51	98	57	51	38	11

Distribution of Digitisation Index values:

53–68 41–52 36–40 31–35 20–30

12.7. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN TRANSPORTATION AND STORAGE BY COUNTRY: 2019*

	Digitisation Index in transportation and storage	Enterprises using digital technologies as a percentage of the total number of enterprises in transportation and storage				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Russia	**29**	**81**	**23**	**20**	**12**	**11**
Austria	40	98	21	33	29	18
Belgium	47	94	30	50	34	26
Bulgaria	27	93	5	18	2	19
Croatia	36	93	34	21	23	11
Cyprus	40	98	34	34	11	22
Czech Republic	35	98	21	23	24	7
Denmark	42	100	45	27	33	7
Estonia	33	93	30	17	15	12
Finland	44	100	50	27	24	19
France	38	99	17	46	17	12
Germany	31	95	17	18	10	15
Hungary	28	90	16	11	11	10
Ireland	44	97	44	20	44	17

Distribution of Digitisation Index values:

41–52 36–40 31–35 20–30

* Or nearest years for which data are available.

(continued)

	Digitisation Index in transportation and storage	Enterprises using digital technologies as a percentage of the total number of enterprises in transportation and storage				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Latvia	31	99	8	28	8	10
Lithuania	37	100	14	42	20	10
Luxembourg	41	98	23	40	19	23
Netherlands	48	100	45	35	29	30
Norway	37	90	40	21	24	10
Poland	29	95	9	19	11	9
Romania	22	74	10	13	5	6
Slovakia	31	95	19	15	15	13
Slovenia	38	99	19	13	52	8
Spain	39	98	20	42	15	19
Sweden	40	96	47	20	28	10
United Kingdom	39	91	37	20	34	14

Distribution of Digitisation Index values:

41–52 36–40 31–35 20–30

12.8. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN WHOLESALE AND RETAIL TRADE BY COUNTRY: 2019*

	Digitisation Index in wholesale and retail trade	Enterprises using digital technologies as a percentage of the total number of enterprises in wholesale and retail trade				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Russia	**39**	**90**	**38**	**38**	**22**	**9**
Austria	44	98	22	53	31	16
Belgium	51	98	40	56	44	16
Bulgaria	31	87	7	29	18	16
Croatia	40	97	32	33	28	11
Cyprus	40	96	28	46	15	16
Czech Republic	45	97	27	48	44	7
Denmark	56	100	54	59	57	8
Estonia	42	95	34	33	38	12
Finland	55	100	57	51	49	19
France	42	99	16	53	29	11
Germany	40	95	20	37	36	12
Hungary	32	93	18	18	26	6
Ireland	43	98	36	29	43	10
Italy	40	97	25	42	23	13

Distribution of Digitisation Index values:

53–68 41–52 36–40 31–35

* Or nearest years for which data are available.

(continued)

	Digitisation Index in wholesale and retail trade	Enterprises using digital technologies as a percentage of the total number of enterprises in wholesale and retail trade				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Latvia	38	99	17	42	23	7
Lithuania	45	100	25	55	36	9
Luxembourg	41	95	23	48	24	16
Malta	39	96	32	34	23	11
Netherlands	53	100	46	56	47	17
Norway	44	93	40	39	38	10
Poland	34	95	11	32	23	7
Portugal	44	100	28	52	22	16
Romania	31	84	10	35	21	5
Slovakia	40	94	22	38	28	16
Slovenia	46	100	31	42	40	19
Spain	44	98	22	55	28	15
Sweden	52	99	52	50	51	9
United Kingdom	43	96	40	28	43	6

Distribution of Digitisation Index values:

53–68 41–52 36–40 31–35

12.9. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN CONSTRUCTION BY COUNTRY: 2019*

	Digitalisation Index in construction	Enterprises using digital technologies as a percentage of the total number of enterprises in construction				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Russia	**25**	**78**	**22**	**11**	**9**	**6**
Austria	33	99	17	29	10	12
Belgium	42	98	35	45	12	19
Bulgaria	24	92	4	11	2	9
Croatia	29	93	25	11	8	6
Cyprus	26	88	15	16	2	9
Czech Republic	31	97	21	18	16	4
Denmark	41	100	51	35	15	4
Estonia	29	95	26	11	7	5
Finland	46	100	61	30	19	21
France	30	100	13	31	3	4
Germany	27	96	14	12	4	8
Greece	24	76	16	20	2	4
Hungary	22	89	10	5	3	4
Ireland	37	99	52	17	10	6

Distribution of Digitisation Index values:

41–52 36–40 31–35 20–30

* Or nearest years for which data are available.

(continued)

	Digitalisation Index in construction	Enterprises using digital technologies as a percentage of the total number of enterprises in construction				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Italy	30	97	18	24	4	7
Latvia	27	99	11	20	2	4
Lithuania	34	100	17	36	12	4
Luxembourg	31	98	12	28	5	12
Netherlands	41	100	42	44	10	11
Norway	38	96	52	23	12	7
Poland	24	92	6	15	3	4
Romania	21	80	9	11	1	4
Slovakia	27	95	12	17	3	9
Slovenia	26	96	12	14	3	3
Spain	31	98	17	27	3	10
Sweden	40	96	58	22	12	13
United Kingdom	34	95	44	17	9	4

Distribution of Digitisation Index values:

41–52 36–40 31–35 20–30

12.10. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN TELECOMMUNICATIONS BY COUNTRY: 2019*

	Digitalisation Index in telecommunications	Enterprises using digital technologies as a percentage of the total number of enterprises in telecommunications				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Russia	**45**	**92**	**42**	**46**	**28**	**14**
Croatia	51	100	13	44	32	66
Cyprus	57	100	35	77	30	43
Czech Republic	53	100	31	53	57	24
Denmark	58	100	65	59	37	30
Estonia	59	100	60	62	35	38
Germany	49	99	41	44	25	34
Hungary	43	99	39	29	25	21
Ireland	68	97	91	51	54	49
Italy	53	100	50	62	24	28
Latvia	51	100	30	61	41	24
Lithuania	51	100	29	66	41	21
Netherlands	64	100	76	76	35	33
Norway	60	100	81	63	31	26

Distribution of Digitisation Index values:

53–68 41–52 36–40 31–35 20–30

* Or nearest years for which data are available.

(continued)

	Digitalisation Index in telecommunications	Enterprises using digital technologies as a percentage of the total number of enterprises in telecommunications				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Poland	43	100	30	46	16	25
Romania	31	85	17	32	8	15
Slovakia	53	100	50	45	40	32
Sweden	63	100	78	49	60	28

Distribution of Digitisation Index values:

53–68 41–52 36–40 31–35 20–30

12.11. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN IT INDUSTRY BY COUNTRY: 2019*

	Digitalisation Index in IT industry	Enterprises using digital technologies as a percentage of the total number of enterprises in IT industry				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Russia	**36**	**96**	**38**	**24**	**11**	**9**
Bulgaria	52	100	51	38	21	50
Cyprus	57	100	70	44	18	52
Czech Republic	53	100	60	56	33	15
Denmark	60	100	85	72	24	19
Estonia	52	100	72	44	16	28
France	52	100	66	62	18	13
Germany	54	100	63	49	27	31
Hungary	41	97	59	27	11	12
Ireland	57	100	83	47	33	23
Italy	48	98	61	52	15	14
Latvia	52	100	56	52	18	35
Lithuania	62	100	69	79	27	37

Distribution of Digitisation Index values:

53–68 41–52 36–40

* Or nearest years for which data are available.

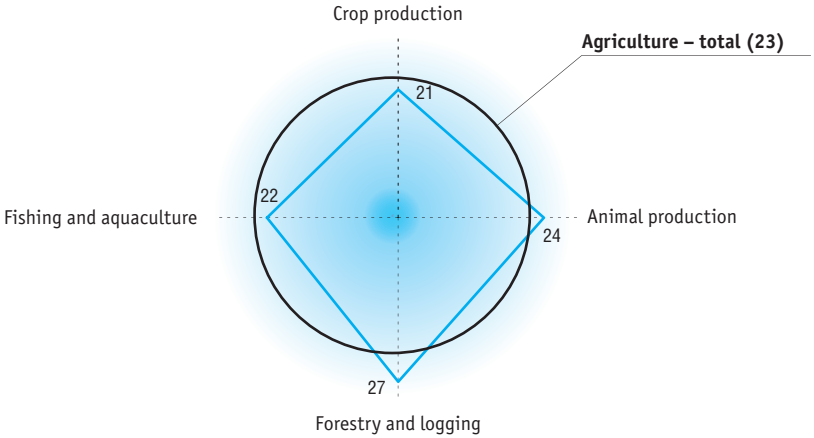
(continued)

	Digitalisation index in IT industry	Enterprises using digital technologies as a percentage of the total number of enterprises in IT industry				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Netherlands	56	100	79	59	17	26
Norway	59	100	87	63	25	21
Poland	50	100	50	50	24	26
Romania	44	94	43	35	9	37
Slovakia	48	100	53	43	13	32
Slovenia	58	100	71	65	23	29
Sweden	59	100	85	58	25	26
United Kingdom	53	99	86	46	20	16

Distribution of Digitisation Index values:

53–68 41–52 36–40

12.12. DIGITALISATION INDEX IN AGRICULTURE: 2019



12.13. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN AGRICULTURE: 2019

	Digitalisation Index in agriculture: 2019	Enterprises using digital technologies as a percentage of the total number of enterprises in agriculture				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Total	**23**	**74.3**	**20.9**	**5.5**	**8.3**	**5.5**
Crop production	21	67.4	18.7	6.4	7.0	6.7
Animal production	24	76.1	20.1	7.1	10.6	7.2
Forestry and logging	27	89.0	30.4	3.9	9.4	3.5
Fishing and aquaculture	22	74.7	18.0	5.1	6.6	4.6

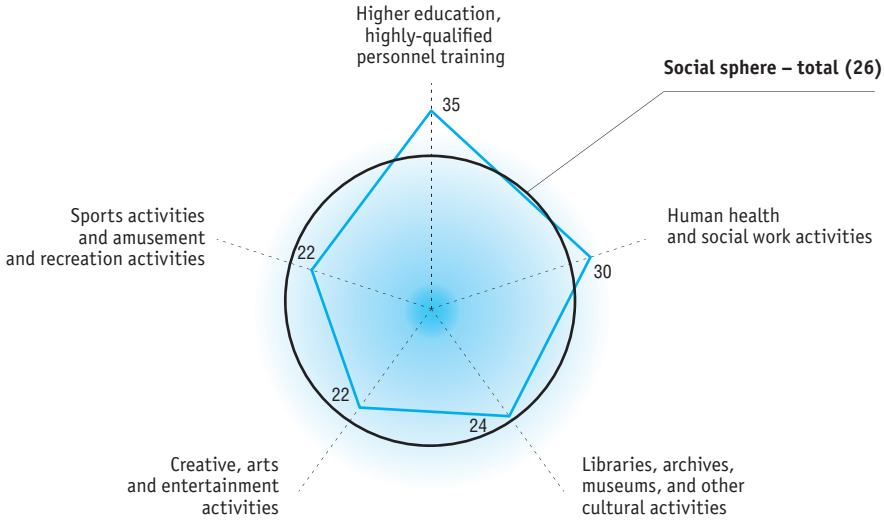
Distribution of Digitisation Index values: 20–30

12.14. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN FINANCIAL SECTOR: 2019

	Digitalisation Index in financial sector	Enterprises using digital technologies as a percentage of the total number of enterprises in financial sector				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Total	**34**	**93.8**	**38.5**	**17.0**	**13.8**	**7.6**
Financial service activities, except insurance and pension funding	35	92.9	44.2	17.2	11.9	9.3
Insurance and activities of private pension funds	32	97.9	23.1	16.9	22.1	2.3

Distribution of Digitisation Index values: 31–35

12.15. DIGITALISATION INDEX IN SOCIAL SPHERE: 2019



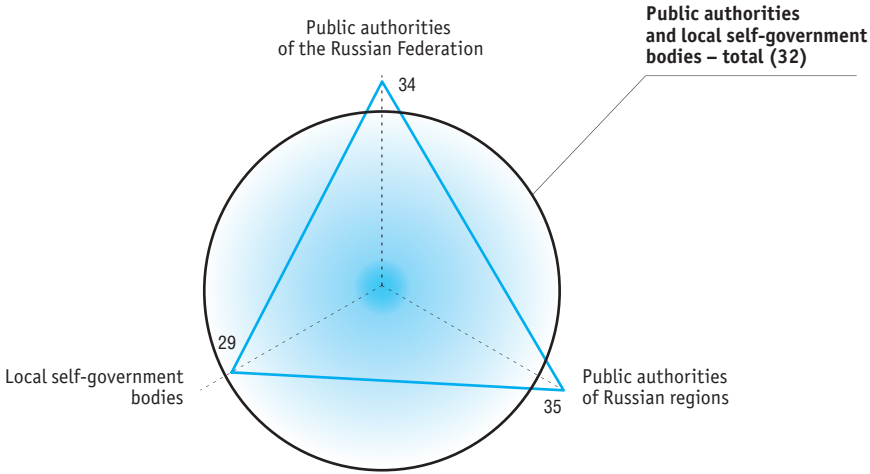
12.16. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN SOCIAL SPHERE: 2019

	Digitalisation Index in social sphere: 2019	Institutions using digital technologies as a percentage of the total number of institutions in social sphere				
		Broadband Internet	Cloud computing services	ERP software	Online sales	RFID technologies
Total	**26**	**85.3**	**27.0**	**3.9**	**8.7**	**4.2**
Higher education, highly-qualified personnel training	35	90.3	42.0	13.7	14.6	15.3
Human health and social work activities	30	92.4	34.5	5.6	11.6	4.4
Libraries, archives, museums and other cultural activities	24	85.5	21.6	1.7	4.7	4.0
Creative, arts and entertainment activities	22	77.1	19.3	1.7	7.8	2.2
Sports activities and amusement and recreation activities	22	78.9	21.2	1.9	6.3	3.2

Distribution of Digitisation Index values:

31–35 20–30

12.17. DIGITALISATION INDEX IN PUBLIC AUTHORITIES AND LOCAL SELF-GOVERNMENT BODIES: 2019*



* Here and in table 2.18, the digitalisation index of public authorities characterises the use of broadband Internet, cloud computing services, ERP software, and RFID technologies.

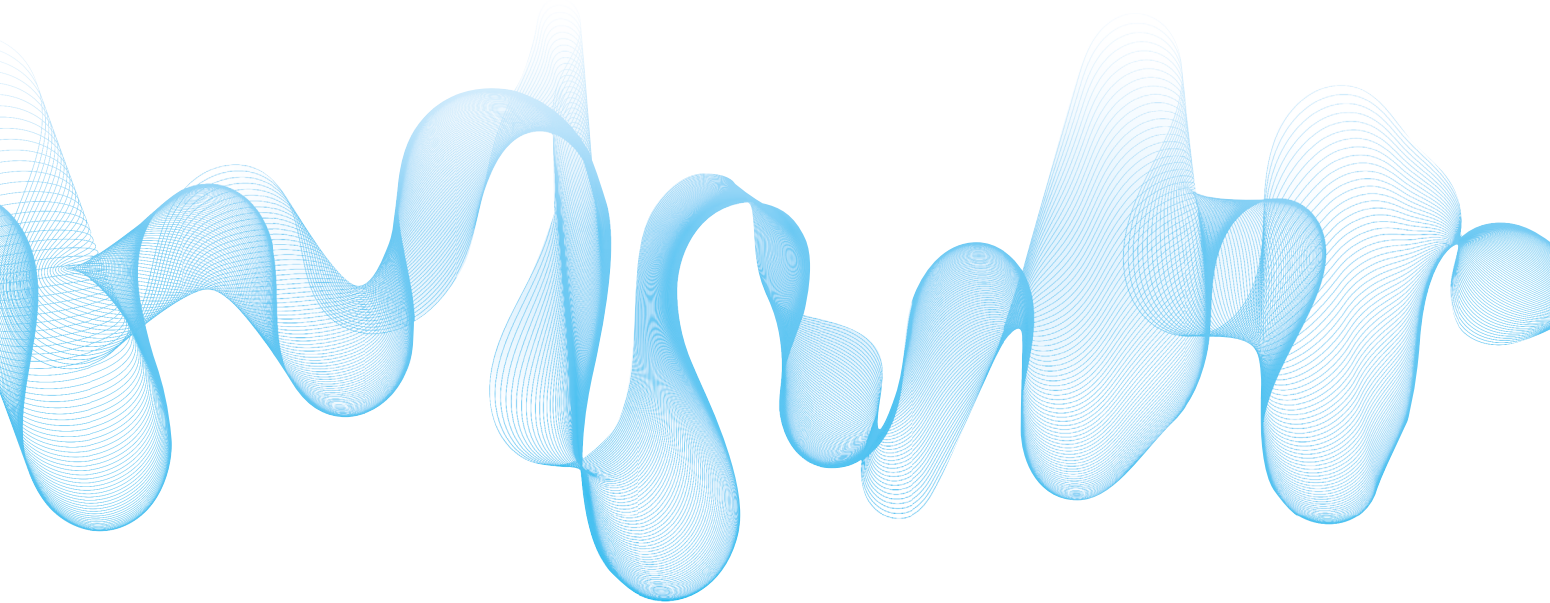
12.18. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN PUBLIC AUTHORITIES AND LOCAL SELF-GOVERNMENT BODIES: 2019

	Digitalisation index in public authorities and local self-government bodies	Authorities using digital technologies as a percentage of the total number of public authorities and local self-government bodies			
		Broadband Internet	Cloud computing services	ERP software	RFID technologies
Total	**32**	**91.1**	**28.1**	**4.3**	**4.5**
Public authorities of the Russian Federation	34	91.6	24.9	9.5	9.6
Executive branch of the Russian Federation	32	89.4	26.1	5.4	7.6
Public authorities of Russian regions	35	95.4	36.1	3.7	4.3
Executive branch of Russian regions	35	95.8	36.5	3.8	4.4
Local self-government bodies	29	87.4	23.5	2.1	2.3

Distribution of Digitisation Index values:

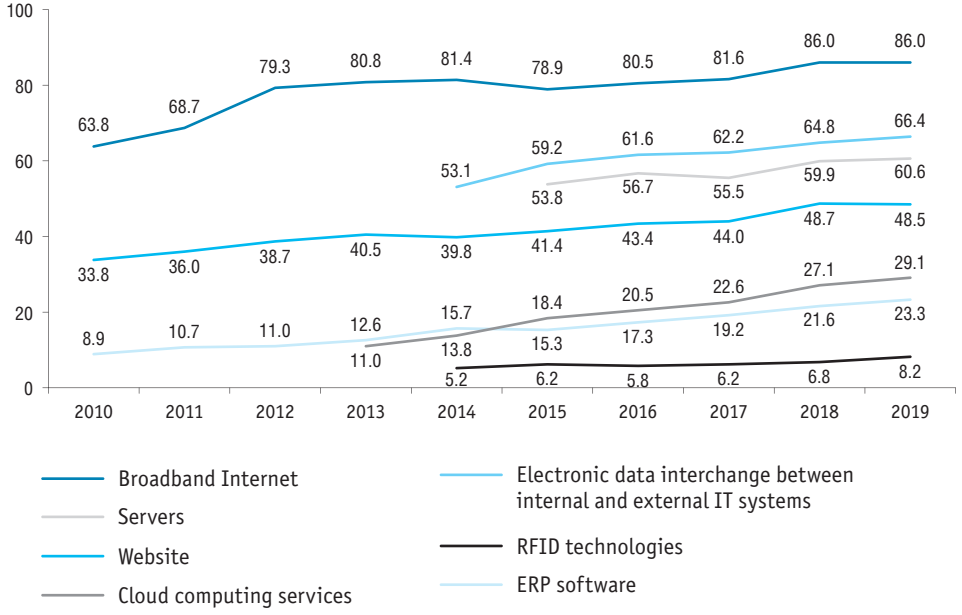
31–35 20–30

13 DIGITALISATION OF ECONOMY SECTORS



13.1. DIGITALISATION IN BUSINESS ENTERPRISE SECTOR*

(as a percentage of all enterprises in business enterprise sector)



* Here and below in this section, the data on business enterprise sector units refer to the following types of economic activity: for 2010–2016, with OKVED (ver. 1.1) codes: C, D, E, F, G, H, I, and K; for 2017–2019, with OKVED2 codes: B, C, D, E, F, G, H, I, J, L, N, 69, 70, 71, 72, 73, 74, and 95.

Sources: here and below in this section, for Russia, HSE ISSEK estimates based on Rosstat data; for countries other than Russia, OECD and Eurostat.

13.2. ENTERPRISES' USE OF INTERNET

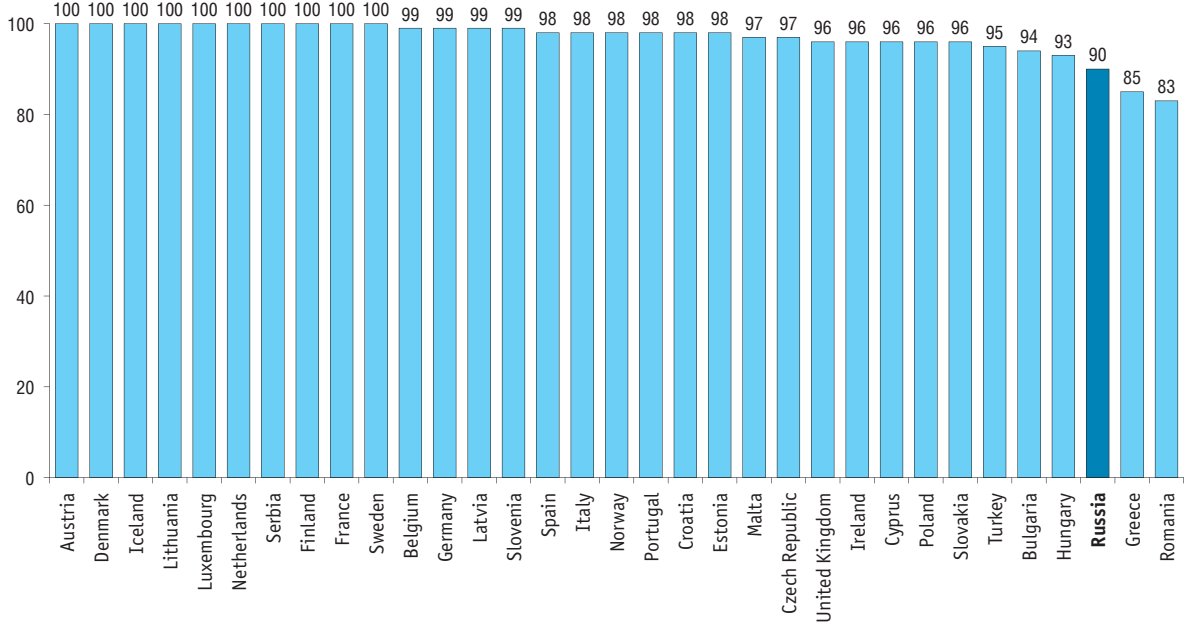
(as a percentage of all enterprises)

	2017	2018	2019
Business enterprise sector – total	**86.1**	**89.5**	**89.6**
Mining and quarrying	88.1	86.0	85.3
Manufacturing	94.2	92.8	93.2
Electricity, gas, steam and air-conditioning supply	89.6	89.1	92.5
Water supply, sewerage, waste management and remediation activities	81.9	85.8	88.1
Construction	86.5	83.6	82.7
Wholesale and retail trade	92.6	93.4	92.1
Transportation and storage	84.7	83.5	84.1
Accommodation and food service activities	85.7	84.7	86.7
Telecommunications	93.6	91.4	92.4
IT industry	95.0	95.8	96.6
Real estate activities	62.3	83.4	85.3
Professional, scientific and technical activities	89.8	89.2	89.6
Agriculture – total*	**...**	**...**	**81.7**
Crop production	...	...	73.9
Animal production	...	...	84.4
Forestry and logging	...	...	95.7
Fishing and aquaculture	...	...	81.0

* Statistical monitoring of agricultural organisations using digital technologies is carried out since 2019. The data refer to enterprises conducting the following types of economic activity according to OKVED2: agriculture (Section A), crop production (codes 01.1, 01.2, 01.3), animal production (01.4), forestry and logging (02), fishing and aquaculture (03).

13.3. ENTERPRISES' USE OF INTERNET IN BUSINESS ENTERPRISE SECTOR BY COUNTRY: 2019*

(as a percentage of all enterprises in business enterprise sector)



* Or nearest years for which data are available.

13.4. ENTERPRISES' USE OF BROADBAND INTERNET

(as a percentage of all enterprises)

	2017	2018	2019
Business enterprise sector – total	**81.6**	**86.0**	**86.0**
Mining and quarrying	85.5	83.9	82.6
Manufacturing	91.6	90.3	90.4
Electricity, gas, steam and air-conditioning supply	84.0	84.8	87.4
Water supply, sewerage, waste management and remediation activities	71.2	76.3	78.8
Construction	81.8	79.5	78.1
Wholesale and retail trade	90.2	91.3	90.0
Transportation and storage	81.1	80.3	80.8
Accommodation and food service activities	78.9	79.3	81.5
Telecommunications	91.5	89.7	92.0
IT industry	93.9	93.8	95.7
Real estate activities	54.4	77.3	78.8
Professional, scientific and technical activities	85.1	85.1	85.2
Agriculture – total	**…**	**…**	**74.3**
Crop production	…	…	67.4
Animal production	…	…	76.1
Forestry and logging	…	…	89.0
Fishing and aquaculture	…	…	74.7

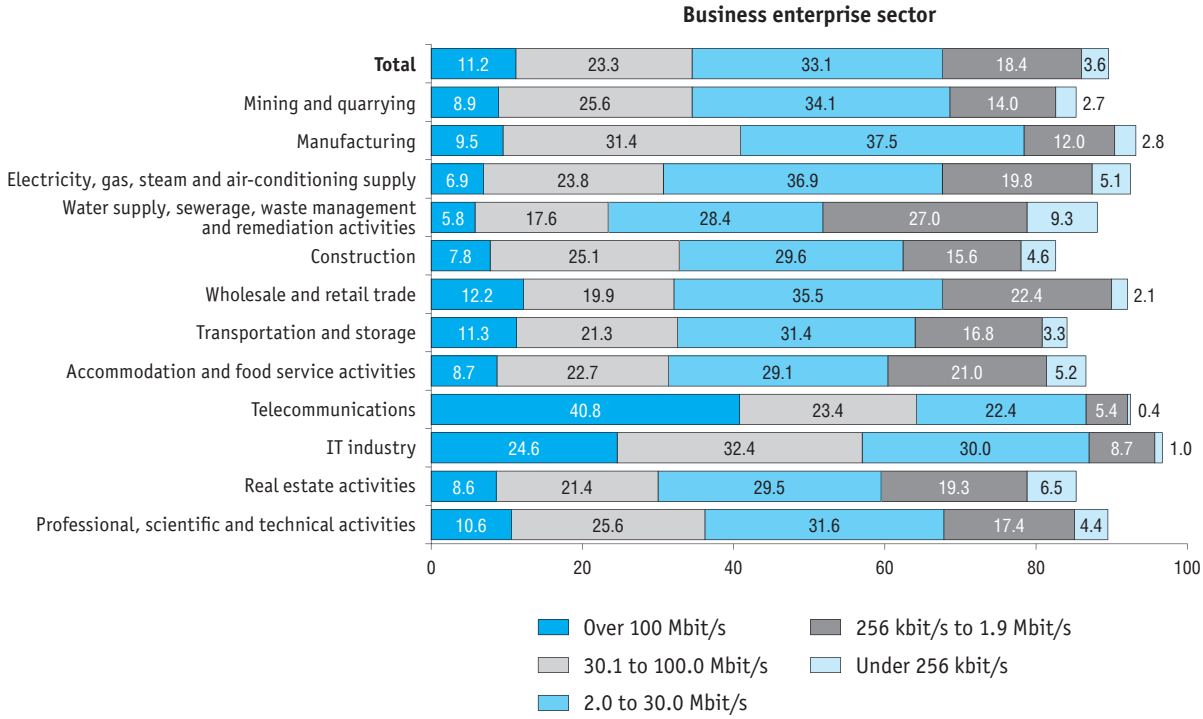
13.5. ENTERPRISES' USE OF BROADBAND INTERNET BY CONNECTION TYPE

(as a percentage of all enterprises)

	Fixed broadband access			Mobile broadband access		
	2017	2018	2019	2017	2018	2019
Business enterprise sector – total	**78.3**	**82.1**	**80.7**	**47.4**	**51.9**	**52.1**
Mining and quarrying	80.8	79.0	78.4	55.9	56.6	57.5
Manufacturing	86.4	84.6	84.0	53.4	54.6	56.5
Electricity, gas, steam and air-conditioning supply	79.5	79.8	82.3	49.3	50.3	51.9
Water supply, sewerage, waste management and remediation activities	67.1	71.4	73.5	36.4	41.3	43.3
Construction	75.3	72.9	71.0	50.4	50.6	50.9
Wholesale and retail trade	84.9	86.1	85.2	58.4	59.7	58.7
Transportation and storage	77.2	76.0	75.0	45.1	47.4	49.5
Accommodation and food service activities	72.9	73.2	74.2	51.2	52.4	54.2
Telecommunications	89.0	86.9	89.1	59.0	54.5	57.3
IT industry	88.8	88.6	89.8	48.7	48.6	54.0
Real estate activities	51.5	72.6	73.9	24.3	37.2	39.3
Professional, scientific and technical activities	80.9	80.2	79.9	43.8	45.9	46.4
Agriculture – total	**...**	**...**	**68.9**	**...**	**...**	**43.9**
Crop production	...	...	62.4	...	...	41.3
Animal production	...	...	70.0	...	...	47.8
Forestry and logging	...	...	83.7	...	...	47.2
Fishing and aquaculture	...	...	69.4	...	...	44.6

13.6. ENTERPRISES' USE OF INTERNET BY TOP ACCESS SPEED: 2019

(as a percentage of all enterprises)



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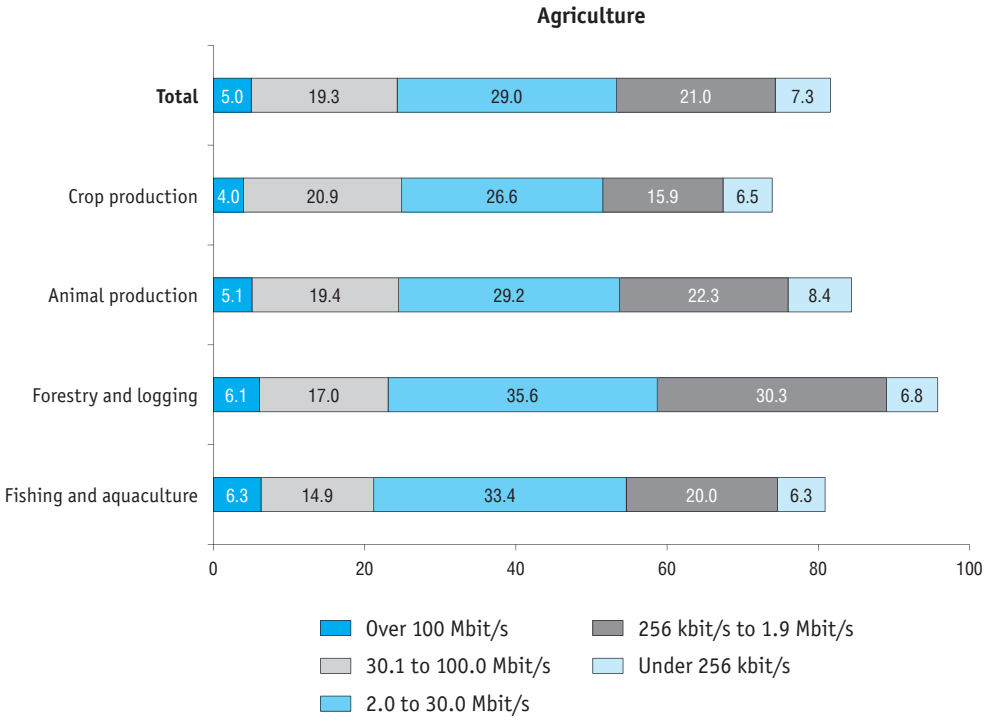
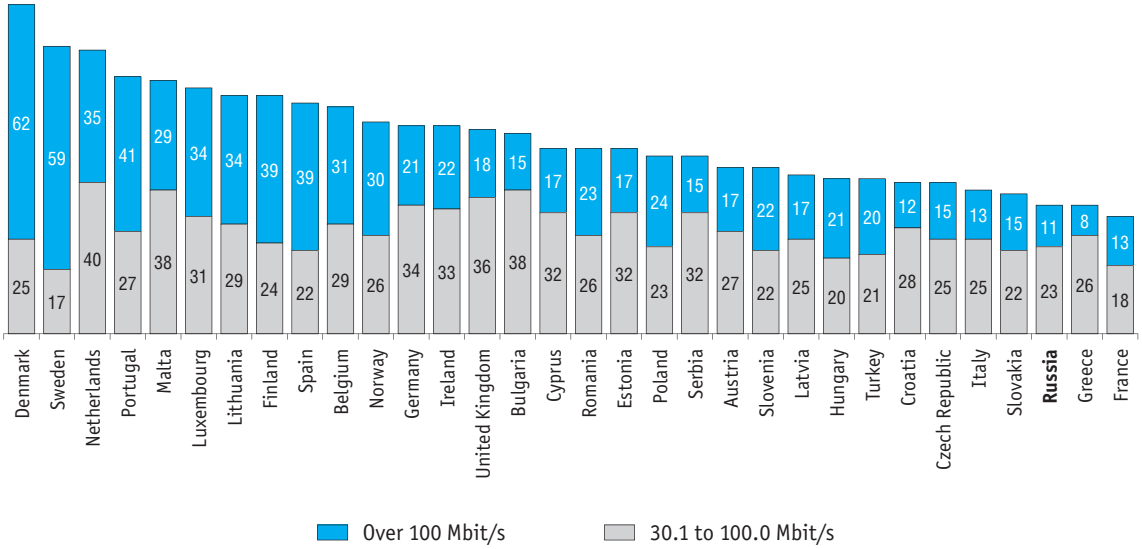

Agriculture
Total
Crop production
Animal production
Forestry and logging
Fishing and aquaculture
5.0
19.3
29.0
21.0
7.3
4.0
20.9
26.6
15.9
6.5
5.1
19.4
29.2
22.3
8.4
6.1
17.0
35.6
30.3
6.8
6.3
14.9
33.4
20.0
6.3
0
20
40
60
80
100
Over 100 Mbit/s
30.1 to 100.0 Mbit/s
2.0 to 30.0 Mbit/s
256 kbit/s to 1.9 Mbit/s
Under 256 kbit/s

13.7. ENTERPRISES' USE OF INTERNET IN BUSINESS ENTERPRISE SECTOR BY TOP ACCESS SPEED AND COUNTRY: 2019

(as a percentage of all enterprises)



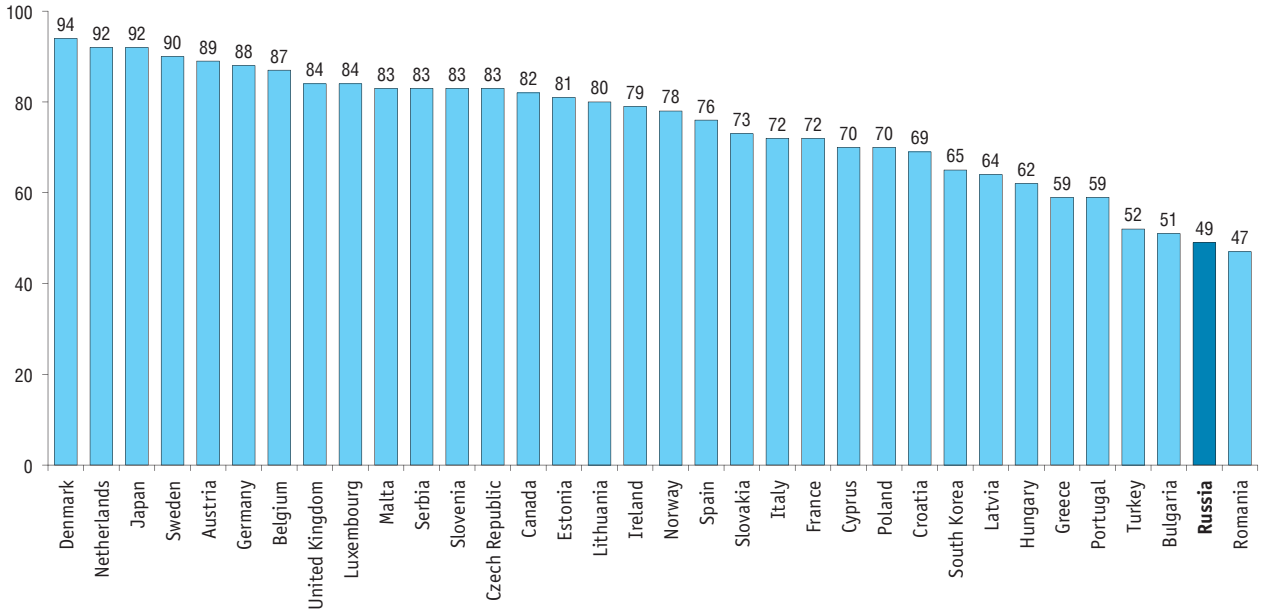
13.8. ENTERPRISES WITH WEBSITES

(as a percentage of all enterprises)

	2017	2018	2019
Business enterprise sector – total	**44.0**	**48.7**	**48.5**
Mining and quarrying	39.7	37.4	40.4
Manufacturing	63.8	61.6	63.2
Electricity, gas, steam and air-conditioning supply	47.5	47.7	51.1
Water supply, sewerage, waste management and remediation activities	30.0	32.1	35.7
Construction	38.7	37.9	39.3
Wholesale and retail trade, repair of motor vehicles and motorcycles	52.9	59.3	54.5
Transportation and storage	37.2	36.2	38.1
Accommodation and food service activities	45.4	43.2	46.0
Telecommunications	67.9	64.9	66.1
IT industry	61.3	58.3	62.4
Real estate activities	19.0	32.0	33.3
Professional, scientific and technical activities	41.4	42.2	42.3
Agriculture – total	**...**	**...**	**25.1**
Crop production	...	...	23.6
Animal production	...	...	24.3
Forestry and logging	...	...	22.0
Fishing and aquaculture	...	...	30.4

13.9. ENTERPRISES WITH WEBSITES BY COUNTRY: 2019

(as a percentage of all enterprises)



13.10. ENTERPRISES' INTERNET ACTIVITIES: 2019

(as a percentage of all enterprises)

	Emails	Online search of information	Banking and other financial transactions	Personnel training
Business enterprise sector – total	**86.8**	**86.1**	**68.2**	**45.0**
Mining and quarrying	82.8	83.7	65.5	43.4
Manufacturing	91.4	91.0	78.8	47.1
Electricity, gas, steam and air-conditioning supply	89.8	91.1	72.2	50.2
Water supply, sewerage, waste management and remediation activities	85.8	85.3	71.6	33.4
Construction	80.6	80.4	64.2	31.0
Wholesale and retail trade, repair of motor vehicles and motorcycles	89.9	86.7	68.5	52.7
Transportation and storage	79.6	81.4	56.7	47.4
Accommodation and food service activities	83.4	82.4	67.3	40.5
Telecommunications	89.0	91.5	65.4	64.9
IT industry	94.4	95.0	67.3	60.7
Real estate activities	81.5	81.3	69.3	28.9
Professional, scientific and technical activities	86.6	87.0	68.4	39.2
Agriculture – total	**80.1**	**79.1**	**68.7**	**29.9**
Crop production	72.5	71.2	59.8	23.2
Animal production	82.7	81.2	73.9	28.9
Forestry and logging	94.3	94.3	84.2	42.6
Fishing and aquaculture	79.2	78.7	60.3	29.1

(continued)

	Videoconferencing	Paid subscriptions to e-databases or e-libraries	Online telephone/ VoIP calls	Internal/external staff recruitment
Business enterprise sector – total	**44.2**	**32.0**	**42.3**	**41.6**
Mining and quarrying	47.6	39.0	47.3	42.0
Manufacturing	50.8	43.4	49.8	52.9
Electricity, gas, steam and air-conditioning supply	40.6	34.4	33.4	33.9
Water supply, sewerage, waste management and remediation activities	19.0	22.9	16.1	19.1
Construction	31.0	30.2	30.9	35.8
Wholesale and retail trade, repair of motor vehicles and motorcycles	54.1	32.1	59.2	55.2
Transportation and storage	39.2	26.8	35.2	37.1
Accommodation and food service activities	34.1	34.1	27.1	34.2
Telecommunications	64.9	48.7	60.2	62.1
IT industry	71.2	36.8	61.1	50.9
Real estate activities	23.3	23.3	20.0	23.6
Professional, scientific and technical activities	40.1	33.3	32.4	29.6
Agriculture – total	**26.5**	**23.0**	**20.4**	**20.2**
Crop production	21.9	19.6	20.0	18.4
Animal production	21.5	23.3	20.9	21.3
Forestry and logging	42.9	27.4	23.5	19.2
Fishing and aquaculture	26.8	23.3	28.9	28.9

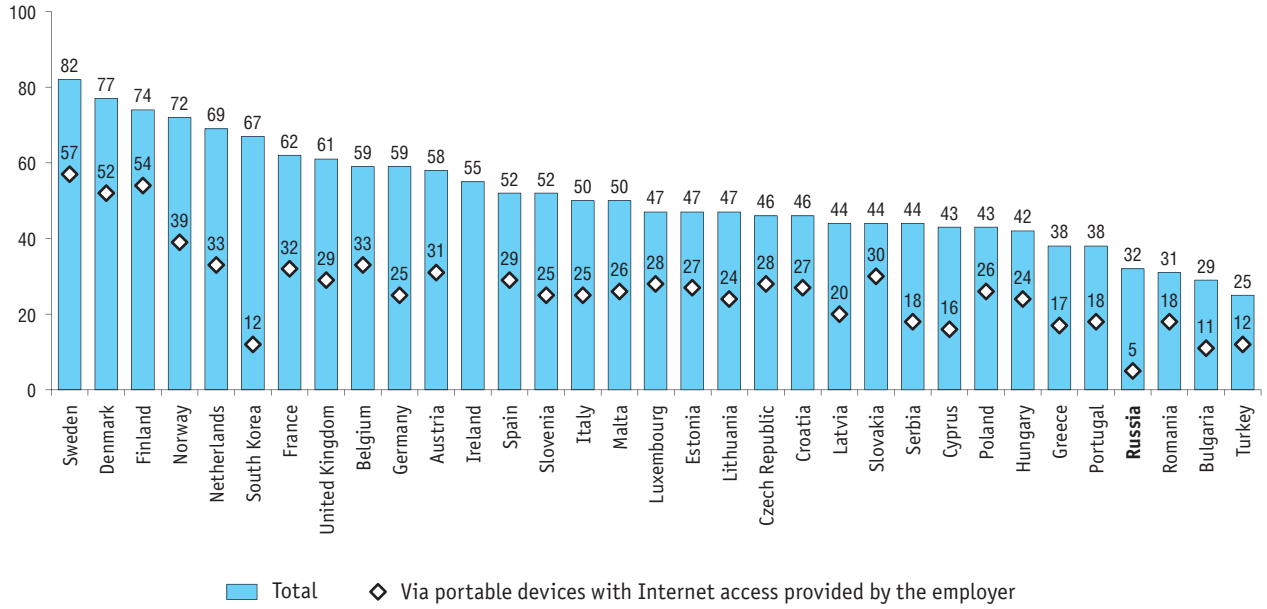
13.11. ENTERPRISES' EMPLOYEES WHO USE THE INTERNET

(as a percentage of all enterprises' employees)

	Total			Via portable devices with Internet access provided by the employer		
	2017	2018	2019	2017	2018	2019
Business enterprise sector – total	**28.5**	**30.2**	**31.5**	**4.1**	**4.6**	**5.0**
Mining and quarrying	17.2	20.4	19.5	2.5	2.9	3.1
Manufacturing	19.1	20.4	21.4	2.3	2.6	2.8
Electricity, gas, steam and air-conditioning supply	28.5	27.7	33.1	2.4	2.5	3.2
Water supply, sewerage, waste management and remediation activities	16.6	17.9	20.9	1.4	1.8	2.5
Construction	19.9	20.4	15.2	3.2	3.8	2.8
Wholesale and retail trade	43.2	46.2	48.6	8.8	9.7	9.2
Transportation and storage	21.6	22.2	23.2	2.1	2.9	3.3
Accommodation and food service activities	20.0	19.0	18.6	4.4	3.2	3.5
Telecommunications	66.4	73.8	73.1	11.3	15.8	16.9
IT industry	82.1	80.8	83.6	21.6	21.7	21.7
Real estate activities	27.4	30.2	30.5	2.5	3.2	3.8
Professional, scientific and technical activities	48.3	51.1	53.6	5.4	5.4	6.2
Agriculture – total	**…**	**…**	**13.5**	**…**	**…**	**2.0**
Crop production	…	…	11.5	…	…	2.1
Animal production	…	…	9.5	…	…	1.3
Forestry and logging	…	…	30.1	…	…	5.2
Fishing and aquaculture	…	…	22.4	…	…	2.7

13.12. ENTERPRISES' EMPLOYEES IN BUSINESS ENTRPRISE SECTOR WHO USE THE INTERNET BY COUNTRY: 2019

(as a percentage of all enterprises' employees in business enterprise sector)



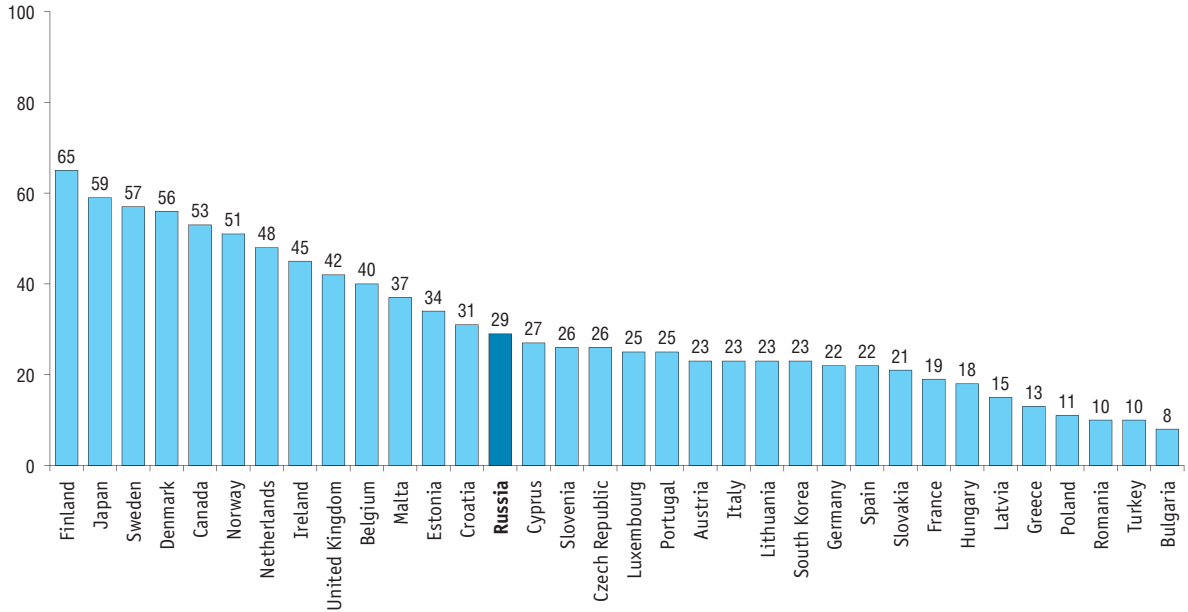
13.13. ENTERPRISES' USE OF CLOUD COMPUTING SERVICES

(as a percentage of all enterprises)

	2017	2018	2019
Business enterprise sector – total	**22.6**	**27.1**	**29.1**
Mining and quarrying	17.4	17.8	20.7
Manufacturing	25.7	26.2	27.6
Electricity, gas, steam and air-conditioning supply	16.3	17.4	20.9
Water supply, sewerage, waste management and remediation activities	21.3	21.9	24.1
Construction	22.0	21.1	22.3
Wholesale and retail trade	27.0	36.2	37.8
Transportation and storage	19.5	19.9	22.9
Accommodation and food service activities	23.0	32.3	35.5
Telecommunications	38.7	36.4	42.4
IT industry	34.8	35.5	38.3
Real estate activities	15.4	21.1	21.7
Professional, scientific and technical activities	22.1	23.1	24.4
Agriculture – total	**...**	**...**	**20.9**
Crop production	...	...	18.7
Animal production	...	...	20.1
Forestry and logging	...	...	30.4
Fishing and aquaculture	...	...	18.0

13.14. ENTERPRISES' USE OF CLOUD COMPUTING SERVICES IN BUSINESS ENTERPRISE SECTOR BY COUNTRY: 2019*

(as a percentage of all enterprises in business enterprise sector)



* Or nearest years for which data are available.

13.15. ENTERPRISES' USE OF ELECTRONIC DATA INTERCHANGE BETWEEN INTERNAL AND EXTERNAL IT SYSTEMS

(as a percentage of all enterprises)

	2017	2018	2019
Business enterprise sector – total	**62.2**	**64.8**	**66.4**
Mining and quarrying	59.4	58.3	60.3
Manufacturing	72.5	71.0	73.1
Electricity, gas, steam and air-conditioning supply	62.6	60.7	67.1
Water supply, sewerage, waste management and remediation activities	62.4	65.0	68.9
Construction	60.2	58.2	60.0
Wholesale and retail trade	69.5	69.1	67.8
Transportation and storage	58.3	57.9	61.3
Accommodation and food service activities	64.0	62.4	67.8
Telecommunications	62.0	59.9	65.6
IT industry	69.0	69.1	72.1
Real estate activities	42.6	61.4	64.6
Professional, scientific and technical activities	63.3	63.5	64.8
Agriculture – total	**...**	**...**	**63.8**
Crop production	...	...	58.0
Animal production	...	...	67.4
Forestry and logging	...	...	78.5
Fishing and aquaculture	...	...	55.9

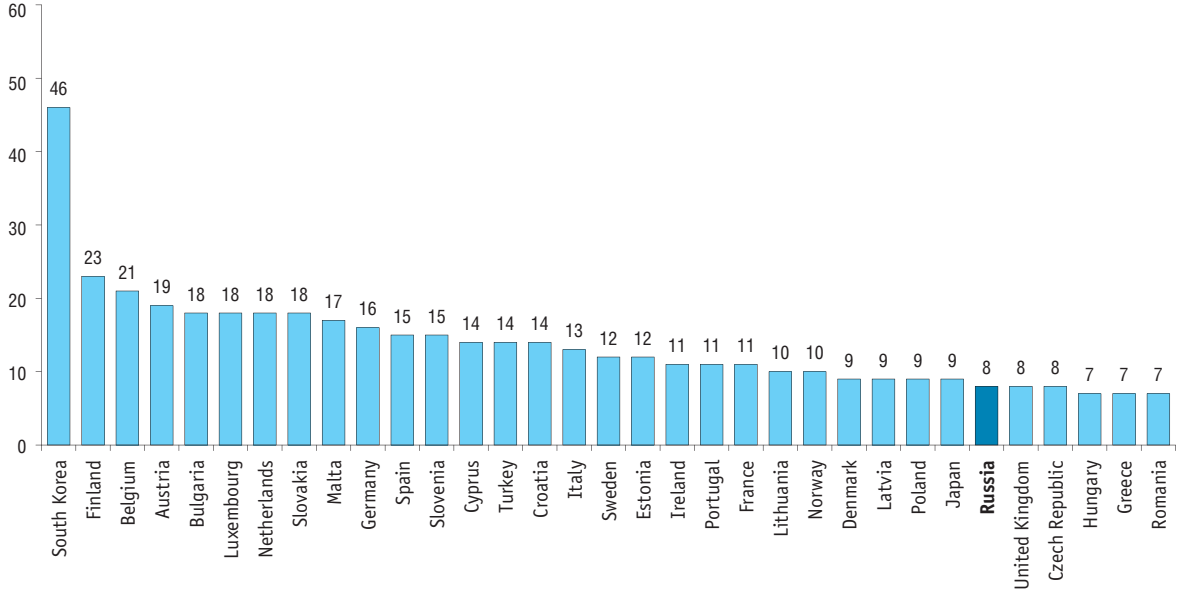
13.16. ENTERPRISES' USE OF RFID TECHNOLOGIES

(as a percentage of all enterprises)

	2017	2018	2019
Business enterprise sector – total	**6.2**	**6.8**	**8.2**
Mining and quarrying	10.2	10.9	12.2
Manufacturing	10.7	11.4	12.0
Electricity, gas, steam and air-conditioning supply	6.8	7.6	8.7
Water supply, sewerage, waste management and remediation activities	3.5	4.0	4.3
Construction	5.3	5.9	6.4
Wholesale and retail trade	7.8	6.8	9.0
Transportation and storage	7.1	7.6	11.1
Accommodation and food service activities	7.8	8.7	11.9
Telecommunications	10.4	12.5	13.9
IT industry	8.6	8.8	9.1
Real estate activities	1.8	3.2	4.1
Professional, scientific and technical activities	4.6	4.8	4.8
Agriculture – total	**…**	**…**	**5.5**
Crop production	…	…	6.7
Animal production	…	…	7.2
Forestry and logging	…	…	3.5
Fishing and aquaculture	…	…	4.6

13.17. ENTERPRISES' USE OF RFID TECHNOLOGIES IN BUSINESS ENTERPRISE SECTOR BY COUNTRY: 2019

(as a percentage of all enterprises in business enterprise sector)



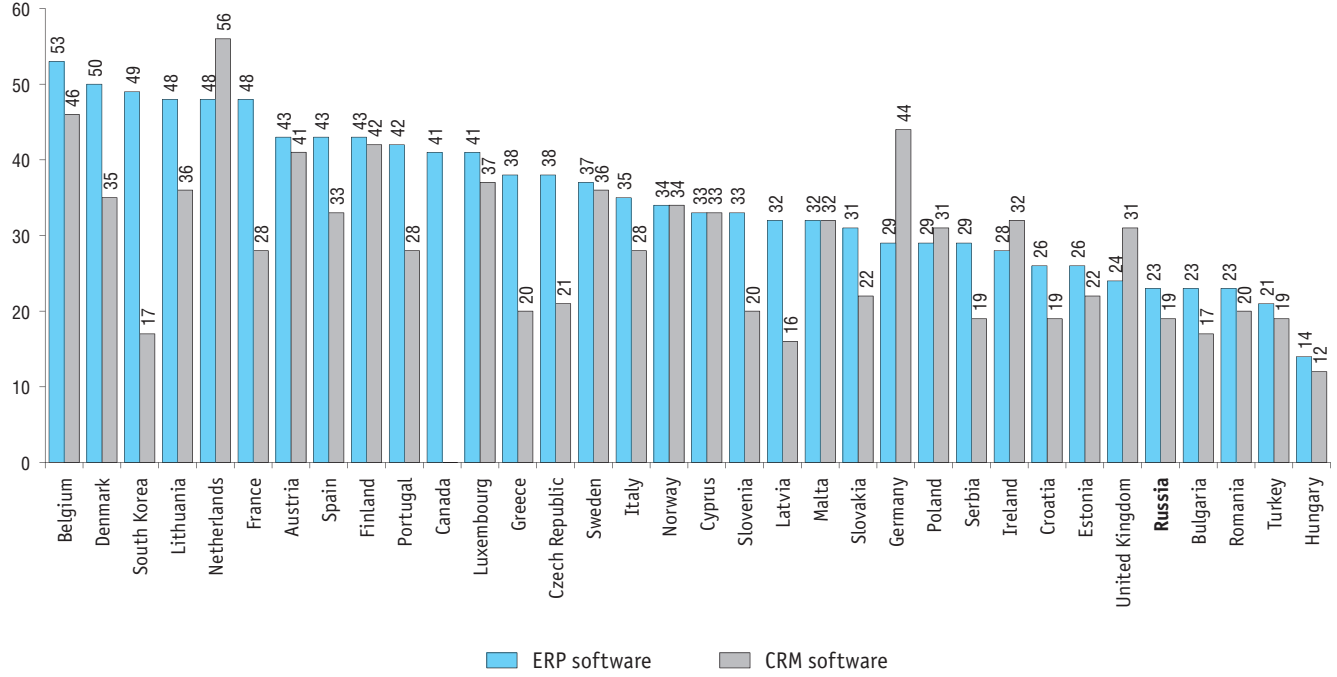
13.18. ENTERPRISES' USE OF CRM, ERP, SCM SOFTWARE

(as a percentage of all enterprises)

	ERP software			CRM software			SCM software		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
Business enterprise sector – total	**19.2**	**21.6**	**23.3**	**13.0**	**17.6**	**18.6**	**7.1**	**10.1**	**10.6**
Mining and quarrying	25.6	23.0	22.7	12.5	10.4	11.9	8.2	7.3	7.7
Manufacturing	27.1	27.6	29.6	17.6	17.3	18.5	6.9	6.7	6.9
Electricity, gas, steam and air-conditioning supply	17.9	19.8	20.9	13.9	13.4	10.6	5.0	4.9	4.8
Water supply, sewerage, waste management and remediation activities	6.1	6.7	6.7	4.1	5.1	4.9	3.1	3.4	2.6
Construction	9.2	10.1	10.9	6.8	6.4	7.7	3.7	3.1	3.4
Wholesale and retail trade	33.6	34.5	37.5	21.5	32.4	33.2	14.3	22.7	23.7
Transportation and storage	18.5	18.5	20.2	9.9	10.3	12.4	6.9	6.1	6.8
Accommodation and food service activities	17.1	17.4	20.9	12.1	12.3	13.3	9.0	8.2	8.8
Telecommunications	45.9	41.4	46.1	43.8	40.7	43.1	15.0	11.9	13.0
IT industry	22.9	23.5	23.7	17.9	19.9	22.3	6.2	6.0	6.2
Real estate activities	2.9	7.1	7.5	2.5	5.4	6.7	1.2	1.8	2.4
Professional, scientific and technical activities	12.0	12.1	12.1	8.2	8.8	9.5	3.5	3.3	3.7
Agriculture – total	**…**	**…**	**5.5**	**…**	**…**	**3.6**	**…**	**…**	**2.1**
Crop production	…	…	6.4	…	…	3.7	…	…	2.1
Animal production	…	…	7.1	…	…	4.5	…	…	2.7
Forestry and logging	…	…	3.9	…	…	3.4	…	…	2.0
Fishing and aquaculture	…	…	5.1	…	…	3.5	…	…	2.0

13.19. ENTERPRISES' USE OF ERP AND CRM SOFTWARE IN BUSINESS ENTERPISE SECTOR BY COUNTRY: 2019*

(as a percentage of all enterprises in business enterprise sector)



* Or nearest years for which data are available.

13.20. ENTERPRISES' USE OF SPECIALISED SOFTWARE: 2019

(as a percentage of all enterprises)

	Electronic document management systems	Electronic payment transactions	Computer-aided management systems	Legal reference systems
Business enterprise sector – total	**67.3**	**58.1**	**57.2**	**55.3**
Mining and quarrying	63.0	54.9	55.6	58.7
Manufacturing	70.3	67.7	64.9	66.0
Electricity, gas, steam and air-conditioning supply	77.2	64.3	61.4	62.5
Water supply, sewerage, waste management and remediation activities	66.4	56.0	48.0	40.2
Construction	58.4	52.1	49.0	49.7
Wholesale and retail trade	67.1	60.5	61.2	56.6
Transportation and storage	72.1	53.0	61.1	57.8
Accommodation and food service activities	63.1	58.8	51.4	48.6
Telecommunications	74.2	59.9	68.4	68.8
IT industry	75.9	53.4	60.7	58.1
Real estate activities	63.8	53.7	47.6	45.6
Professional, scientific and technical activities	64.7	55.2	50.9	55.2
Agriculture – total	**61.5**	**50.5**	**41.8**	**39.6**
Crop production	52.6	42.8	36.5	34.7
Animal production	65.5	53.5	44.9	40.8
Forestry and logging	81.2	68.3	53.0	47.9
Fishing and aquaculture	47.8	46.6	44.8	46.1

(continued)

	Procurement and sales management systems	Access to databases through global information networks	Plant automation and/or process/ unit automation
Business enterprise sector – total	**46.1**	**31.2**	**23.1**
Mining and quarrying	34.9	24.2	34.4
Manufacturing	50.0	28.8	43.5
Electricity, gas, steam and air-conditioning supply	46.9	29.2	29.9
Water supply, sewerage, waste management and remediation activities	37.1	26.5	14.2
Construction	26.3	21.8	14.1
Wholesale and retail trade	65.6	41.5	23.4
Transportation and storage	38.9	25.8	34.2
Accommodation and food service activities	47.8	32.6	17.0
Telecommunications	51.5	40.1	48.6
IT industry	40.9	34.9	20.5
Real estate activities	28.4	21.7	9.3
Professional, scientific and technical activities	31.1	23.6	12.4
Agriculture – total	**26.5**	**23.7**	**13.9**
Crop production	20.0	20.1	15.1
Animal production	23.9	24.8	20.9
Forestry and logging	44.6	36.1	7.9
Fishing and aquaculture	21.3	17.2	6.6

(continued)

	Computer-aided design	E-learning software	Editorial and publishing software	Research software
Business enterprise sector – total	**20.1**	**19.3**	**9.7**	**6.5**
Mining and quarrying	28.8	25.8	5.0	5.0
Manufacturing	34.2	16.2	6.8	6.4
Electricity, gas, steam and air-conditioning supply	25.7	24.5	4.6	1.8
Water supply, sewerage, waste management and remediation activities	11.1	8.3	3.3	2.2
Construction	30.2	9.5	4.3	2.6
Wholesale and retail trade	21.8	27.1	16.8	11.7
Transportation and storage	14.9	29.8	6.2	1.9
Accommodation and food service activities	8.7	14.8	3.9	1.0
Telecommunications	35.3	40.7	15.6	6.5
IT industry	15.5	19.2	5.1	3.8
Real estate activities	10.3	6.9	2.9	1.5
Professional, scientific and technical activities	18.9	11.5	5.5	9.4
Agriculture – total	**4.8**	**6.1**	**2.6**	**2.4**
Crop production	3.6	4.4	2.6	1.8
Animal production	4.0	6.3	3.0	2.4
Forestry and logging	6.9	9.8	2.4	2.2
Fishing and aquaculture	4.8	9.6	4.1	1.3

13.21. ENTERPRISES' USE OF OPEN SOURCE OPERATING SYSTEMS

(as a percentage of all enterprises)

	2017	2018	2019
Business enterprise sector – total	**20.2**	**22.2**	**22.2**
Mining and quarrying	20.6	20.4	21.0
Manufacturing	28.2	27.8	28.1
Electricity, gas, steam and air-conditioning supply	23.4	24.1	21.6
Water supply, sewerage, waste management and remediation activities	8.7	9.9	10.2
Construction	15.9	16.0	15.4
Wholesale and retail trade	27.3	27.5	26.8
Transportation and storage	19.6	19.7	20.2
Accommodation and food service activities	20.7	19.4	21.4
Telecommunications	53.8	46.7	51.6
IT industry	36.4	37.7	36.6
Real estate activities	5.9	12.2	13.0
Professional, scientific and technical activities	17.0	17.2	17.1
Agriculture – total	**...**	**...**	**8.8**
Crop production	...	...	8.4
Animal production	...	...	9.9
Forestry and logging	...	...	8.5
Fishing and aquaculture	...	...	14.4

13.22. ENTERPRISES' EXPENDITURE ON THE PURCHASE OF SOFTWARE OR IN-HOUSE ADAPTATION AND MAINTENANCE OF SOFTWARE: 2019*

	Total, *million roubles*	Of which Russian software	
		Million roubles	As a percentage of the total expenditure on the purchase of software
Business enterprise sector – total	**376954.8**	**226132.6**	**60.0**
Mining and quarrying	6763.4	1976.1	29.2
Manufacturing	35546.5	14814.9	41.7
Electricity, gas, steam and air-conditioning supply	8624.1	3432.7	39.8
Water supply, sewerage, waste management and remediation activities	823.3	400.6	48.7
Construction	5614.4	3433.7	61.2
Wholesale and retail trade	26589.5	6655.4	25.0
Transportation and storage	17433.0	4644.6	26.6
Accommodation and food service activities	1201.3	139.1	11.6
Telecommunications	69429.2	20548.4	29.6
IT industry	17785.3	5355.6	30.1
Real estate activities	3872.6	1088.8	28.1
Professional, scientific and technical activities	176968.3	161651.8	91.3
Agriculture – total	**1016.3**	**491.6**	**48.4**
Crop production	292.5	53.2	18.2
Animal production	556.6	346.3	62.2
Forestry and logging	63.8	35.0	54.8
Fishing and aquaculture	61.2	24.1	39.4

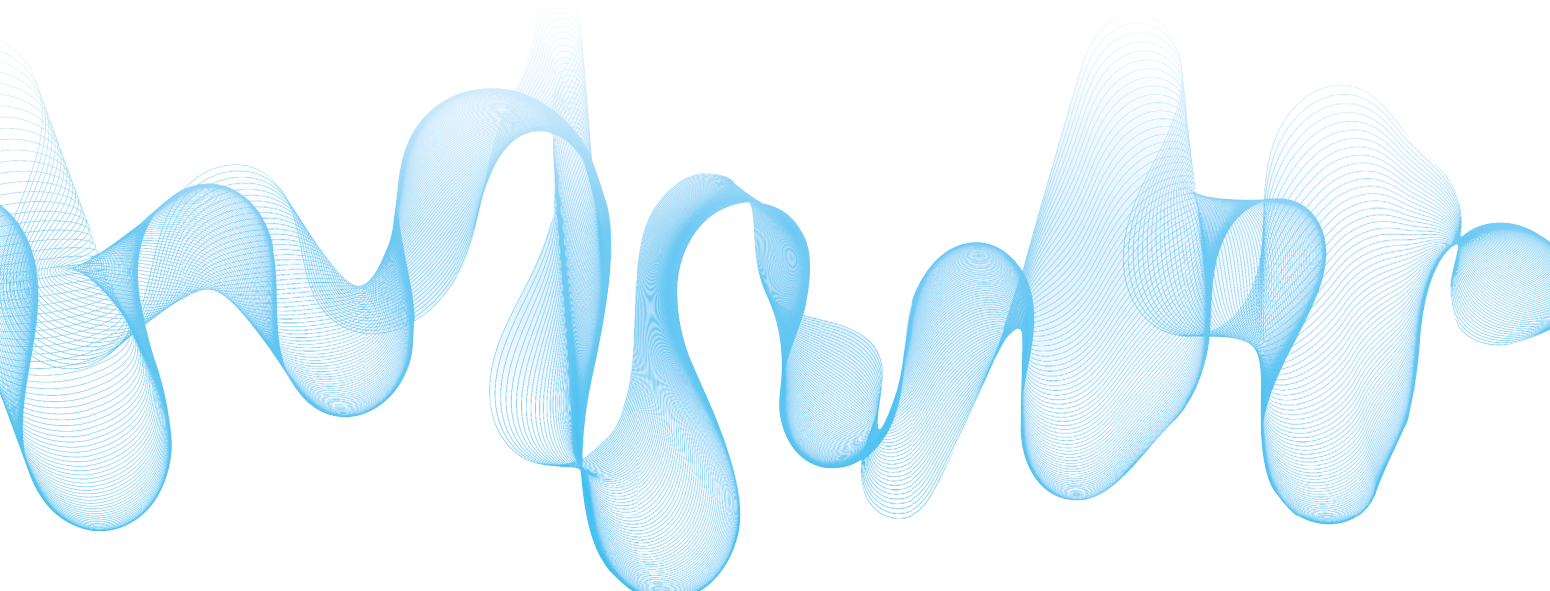
* Here and in table 13.23, excluding small businesses.

13.23. PAYMENTS FOR THIRD-PARTY SERVICES RELATED TO THE DEVELOPMENT, RENTAL, MAINTENANCE, REVISION, TECHNICAL SUPPORT, AND UPDATING OF SOFTWARE: 2019

	Total, *million roubles*	Including the rental of software	Of which Russian software	
			Million roubles	As a percentage of the total expenditure on the rental of software
Business enterprise sector – total	**146459.0**	**11542.8**	**6200.4**	**53.7**
Mining and quarrying	12978.9	1319.5	910.0	69.0
Manufacturing	29525.6	3006.5	1489.4	49.5
Electricity, gas, steam and air-conditioning supply	6043.5	344.3	125.3	36.4
Water supply, sewerage, waste management and remediation activities	1032.5	76.0	40.5	53.3
Construction	1067.5	111.5	69.6	62.4
Wholesale and retail trade	26105.9	3432.3	2348.6	68.4
Transportation and storage	16358.3	1057.3	441.5	41.8
Accommodation and food service activities	301.0	29.3	12.7	43.4
Telecommunications	9618.2	89.3	21.6	24.2
IT industry	14119.6	507.0	184.8	36.4
Real estate activities	5480.6	160.2	62.0	38.7
Professional, scientific and technical activities	16645.5	1333.5	461.7	34.6
Agriculture – total	**853.1**	**35.3**	**26.2**	**74.3**
Crop production	99.4	8.5	8.2	97.2
Animal production	338.7	14.3	10.0	69.9
Forestry and logging	33.5	7.3	4.5	61.2
Fishing and aquaculture	49.1	4.1	2.7	66.4

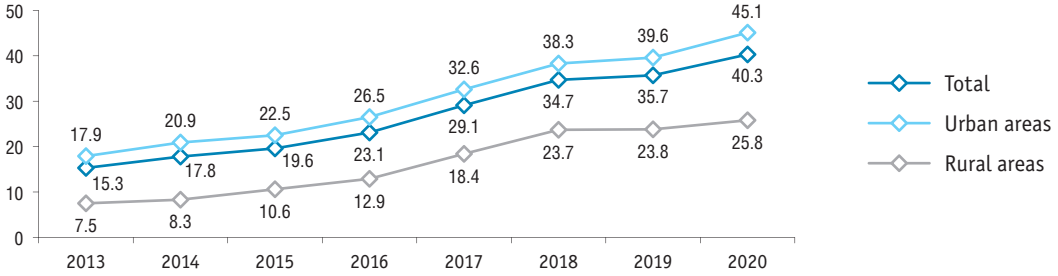
14

E-COMMERCE



14.1. INDIVIDUALS' INTERNET ACTIVITIES RELATED TO ORDERING GOODS OR SERVICES ONLINE IN URBAN AND RURAL AREAS

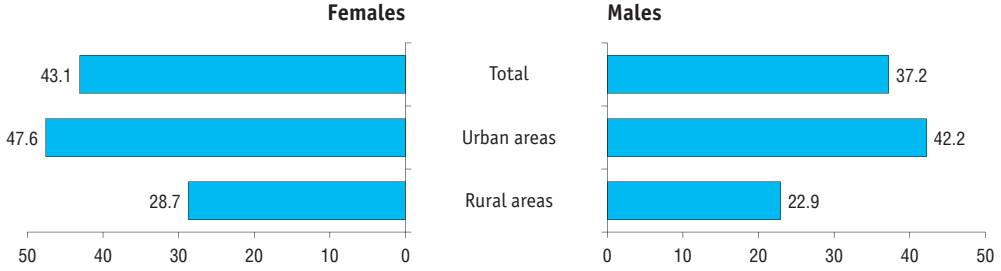
(as a percentage of individuals aged 15–74)



Sources: here and below in the section, for Russia, Rosstat data (14.1–14.7, and 14.9), HSE ISSEK estimates based on the data of the Bank of Russia (14.8) and Rosstat (14.10–14.16); for countries other than Russia, OECD and Eurostat.

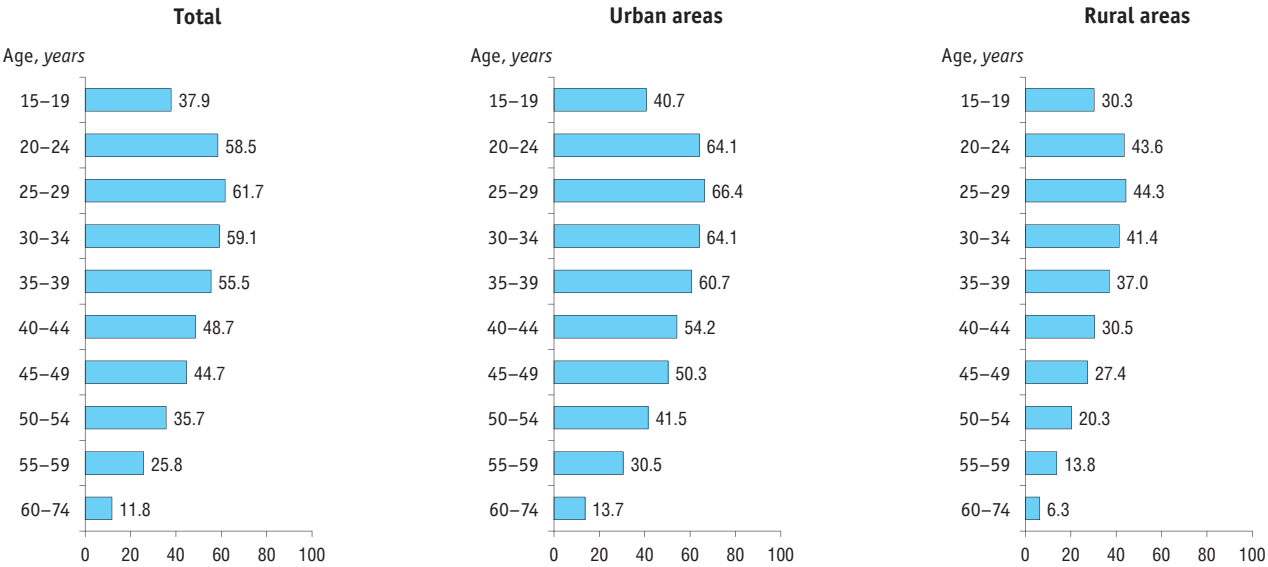
14.2. INDIVIDUALS' INTERNET ACTIVITIES RELATED TO ORDERING GOODS OR SERVICES ONLINE IN URBAN AND RURAL AREAS BY GENDER: 2020

(as a percentage of individuals in each group)



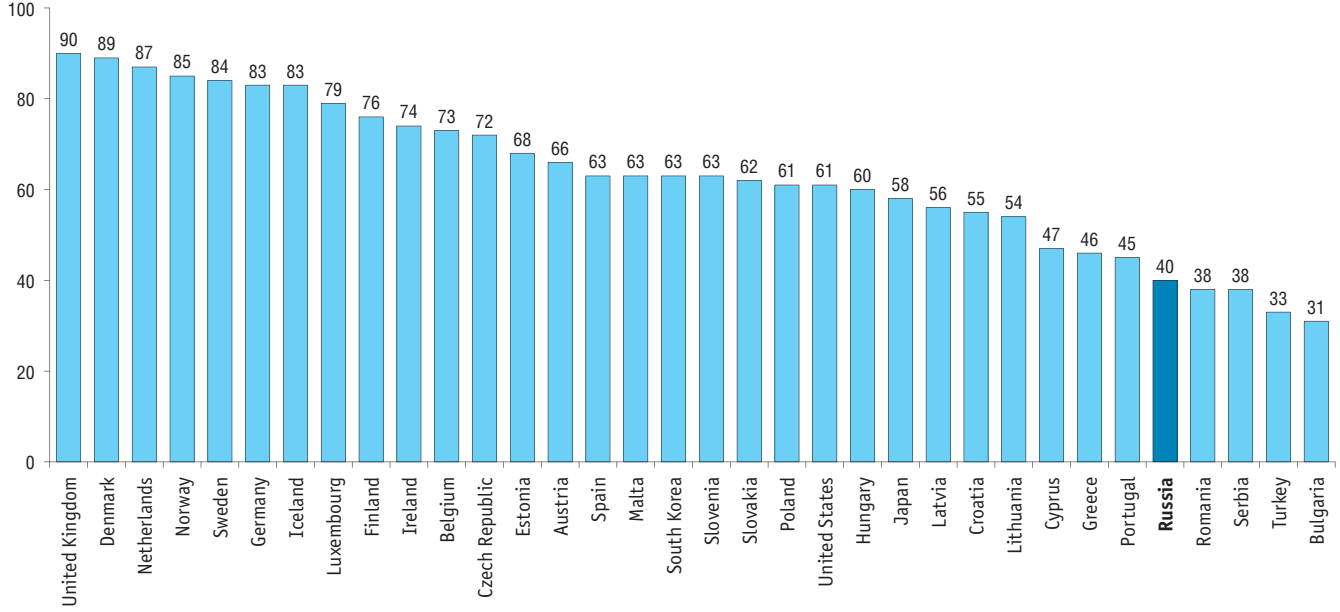
14.3. INDIVIDUALS' INTERNET ACTIVITIES RELATED TO ORDERING GOODS OR SERVICES ONLINE IN URBAN AND RURAL AREAS BY AGE: 2020

(as a percentage of individuals in each age group)



14.4. INDIVIDUALS' INTERNET ACTIVITIES RELATED TO ORDERING GOODS OR SERVICES ONLINE BY COUNTRY: 2020*

*(as a percentage of individuals aged 15–74**)*

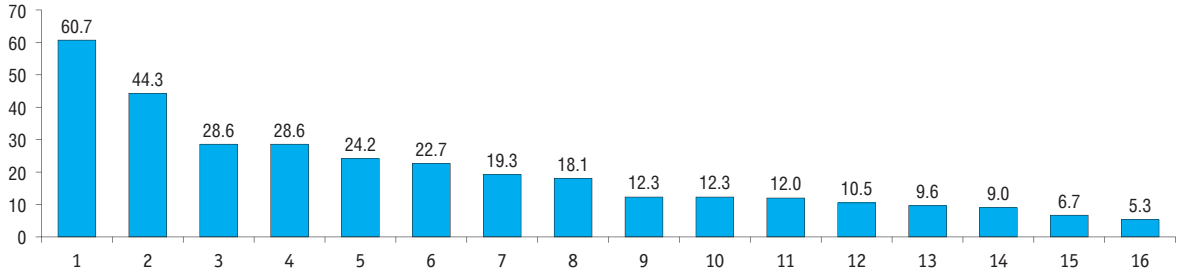


* Or nearest years for which data are available.

** For countries other than Russia, aged 16–74.

14.5. INDIVIDUALS' INTERNET ACTIVITIES RELATED TO ORDERING GOODS OR SERVICES ONLINE BY TYPE: 2020

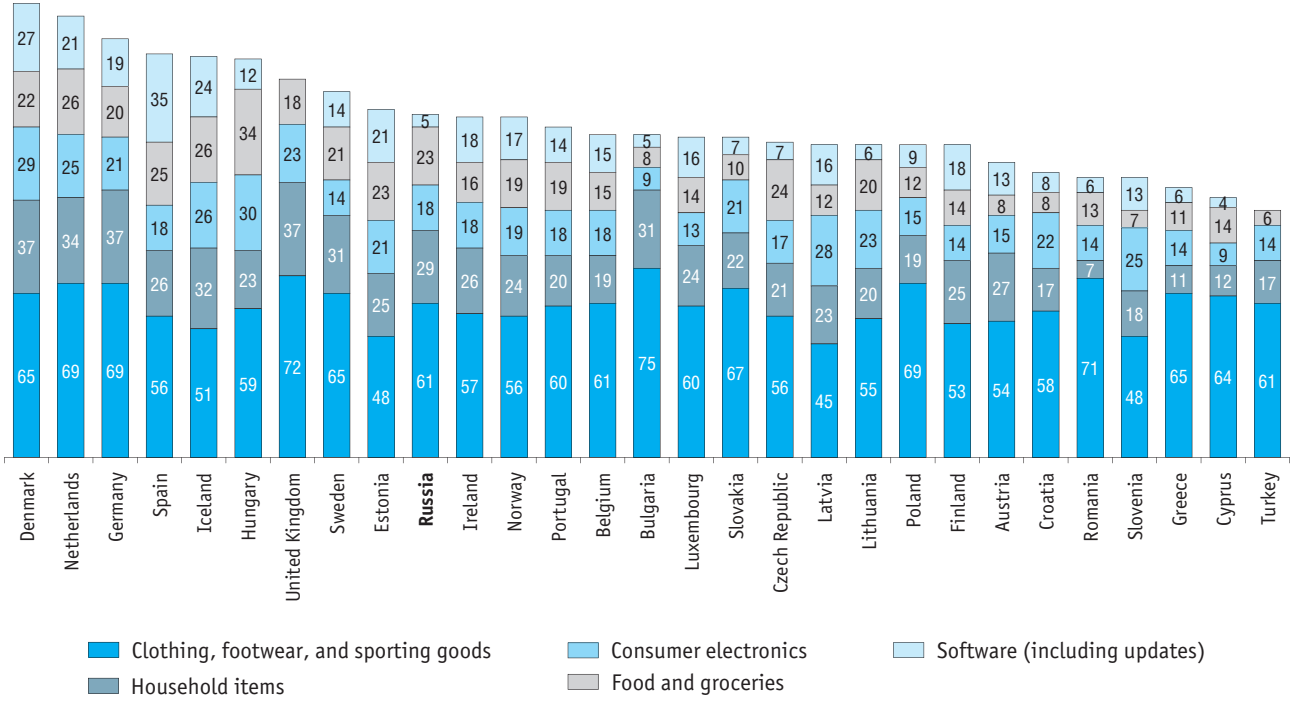
(as a percentage of individuals aged 15–74 years who ordered goods and services online)



1 – clothing, footwear, and sporting goods
2 – financial services
3 – household items
4 – telecommunication services
5 – cosmetics and perfumes
6 – food and groceries
7 – medicine
8 – consumer electronics
9 – computer equipment
10 – tickets to entertainment events
11 – travel services
12 – movies and music
13 – books, magazines, and newspapers (including e-books, e-magazines, and online newspapers)
14 – creative arts & crafts and hobby items
15 – computer games and their updates
16 – software (including updates)

14.6. INDIVIDUALS' INTERNET ACTIVITIES RELATED TO ORDERING GOODS OR SERVICES ONLINE BY TYPE AND COUNTRY: 2020

*(as a percentage of individuals aged 15–74 years who ordered goods and services online**)*



* Or nearest years for which data are available.

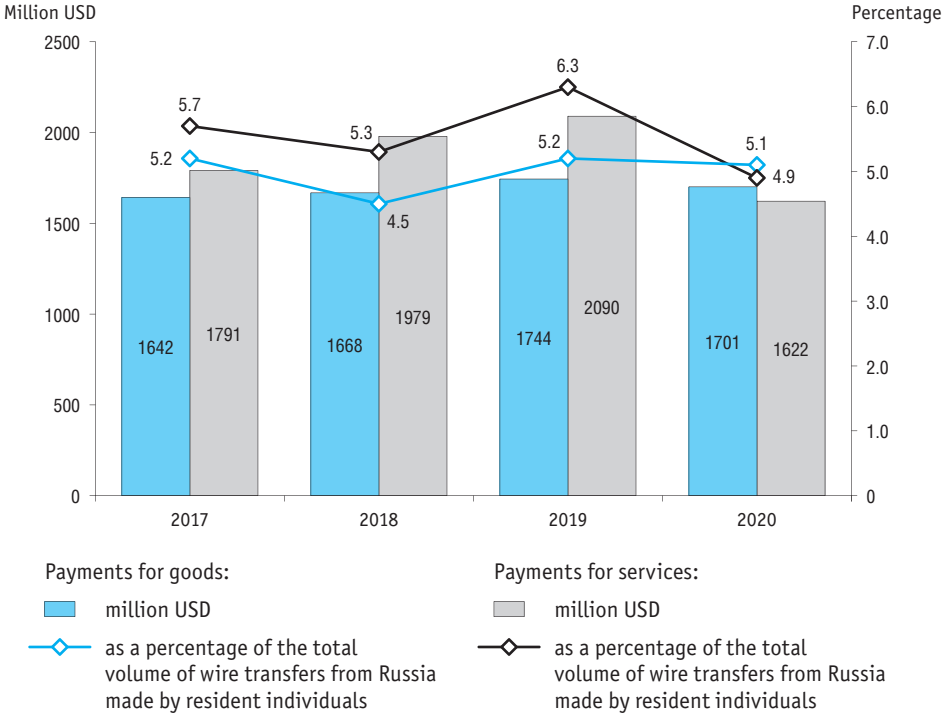
** For countries other than Russia, aged 16–74.

14.7. INDIVIDUALS' PAYMENT METHODS FOR GOODS AND SERVICES ORDERED ONLINE

(as a percentage of individuals aged 15–74 years who ordered goods and services online)

	2013	2014	2015	2016	2017	2018	2019	2020
Bank card	39.3	47.2	60.2	68.4	75.9	80.0	85.2	89.3
Cash on delivery	45.4	43.6	38.3	36.7	33.9	35.5	36.3	35.3
Via ATM or POS terminal	20.3	13.7	13.7	13.2	14.2	11.0	10.3	7.1
By visiting Russian Post office	19.2	14.4	13.5	12.7	13.6	11.8	11.9	11.3
Via e-wallet	10.7	11.1	10.4	8.7	8.0	5.4	6.0	4.6
Via mobile phone	4.6	5.1	7.1	7.6	10.2	9.9	10.6	9.7
By visiting a bank office	7.3	4.8	4.9	4.6	5.9	4.8	4.8	3.7
By visiting goods/services distributor	1.9	1.5	1.8	2.4	2.6	2.4	3.4	3.0
By visiting goods manufacturer/services provider	2.6	1.2	1.3	1.8	1.5	1.7	2.1	1.8

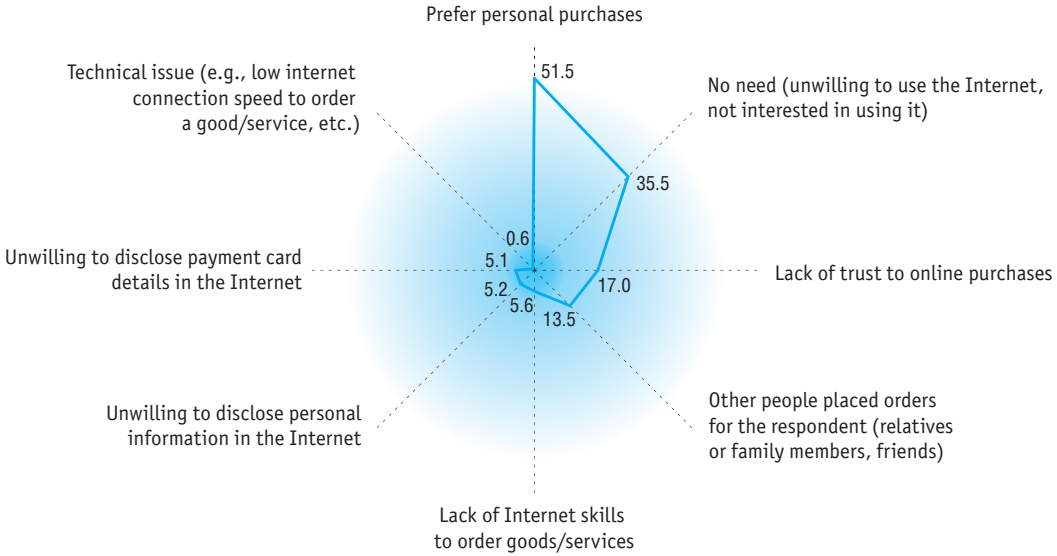
14.8. RESIDENTS' INTERNATIONAL WIRE TRANSFERS FROM RUSSIA FOR GOODS AND SERVICES ORDERED ONLINE*



* The data of the Bank of Russia.

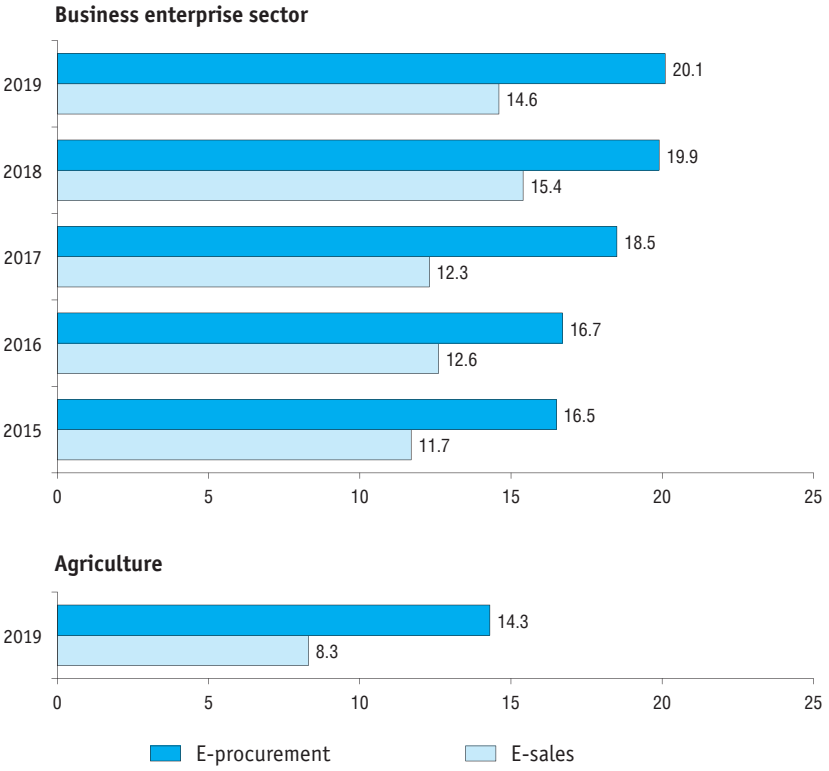
14.9. FACTORS HAMPERING INDIVIDUALS' USE OF INTERNET TO ORDER GOODS AND SERVICES ONLINE: 2020

(as a percentage of individuals aged 15–74 years who have not used the Internet to order goods and services)



14.10. ENTERPRISES' E-SALES AND E-PROCUREMENT

(as a percentage of all enterprises)



14.11. ENTERPRISES' E-PROCUREMENT BY TYPE OF TECHNOLOGY USED

(as a percentage of all enterprises)

	Total			Of which using					
				special forms posted on the website or extranet			EDI systems		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
Business enterprise sector – total	**18.5**	**19.9**	**20.1**	**16.0**	**17.2**	**17.1**	**8.6**	**11.2**	**9.5**
Mining and quarrying	14.7	15.8	16.8	14.1	14.8	15.6	6.2	5.7	7.0
Manufacturing	20.1	20.6	21.6	17.6	18.0	18.7	8.7	9.4	10.0
Electricity, gas, steam and air-conditioning supply	29.7	28.7	34.2	28.7	27.7	32.8	8.6	9.2	11.2
Water supply, sewerage, waste management and remediation activities	22.9	24.3	24.7	21.4	22.7	22.6	8.5	9.5	10.2
Construction	16.3	16.0	16.6	15.1	14.8	15.2	5.9	5.8	7.1
Wholesale and retail trade	19.9	27.4	18.2	14.7	21.7	12.6	13.7	22.0	11.9
Transportation and storage	20.6	20.7	23.0	18.1	18.2	20.5	7.7	7.8	8.9
Accommodation and food service activities	27.6	25.5	26.4	26.1	24.4	24.9	12.6	12.6	13.6
Telecommunications	29.1	29.1	30.4	28.8	28.8	29.7	9.4	9.1	9.7
IT industry	20.7	27.8	24.0	18.8	24.2	21.6	6.8	9.4	8.0
Real estate activities	8.7	16.1	17.7	7.9	15.0	16.3	3.7	6.3	7.4
Professional, scientific and technical activities	20.1	14.6	17.2	18.8	13.6	17.5	7.1	4.5	6.6
Agriculture – total	**…**	**…**	**14.3**	**…**	**…**	**12.2**	**…**	**…**	**7.2**
Crop production	…	…	9.3	…	…	7.1	…	…	5.4
Animal production	…	…	11.4	…	…	8.9	…	…	7.3
Forestry and logging	…	…	26.3	…	…	24.1	…	…	11.9
Fishing and aquaculture	…	…	13.2	…	…	12.4	…	…	5.3

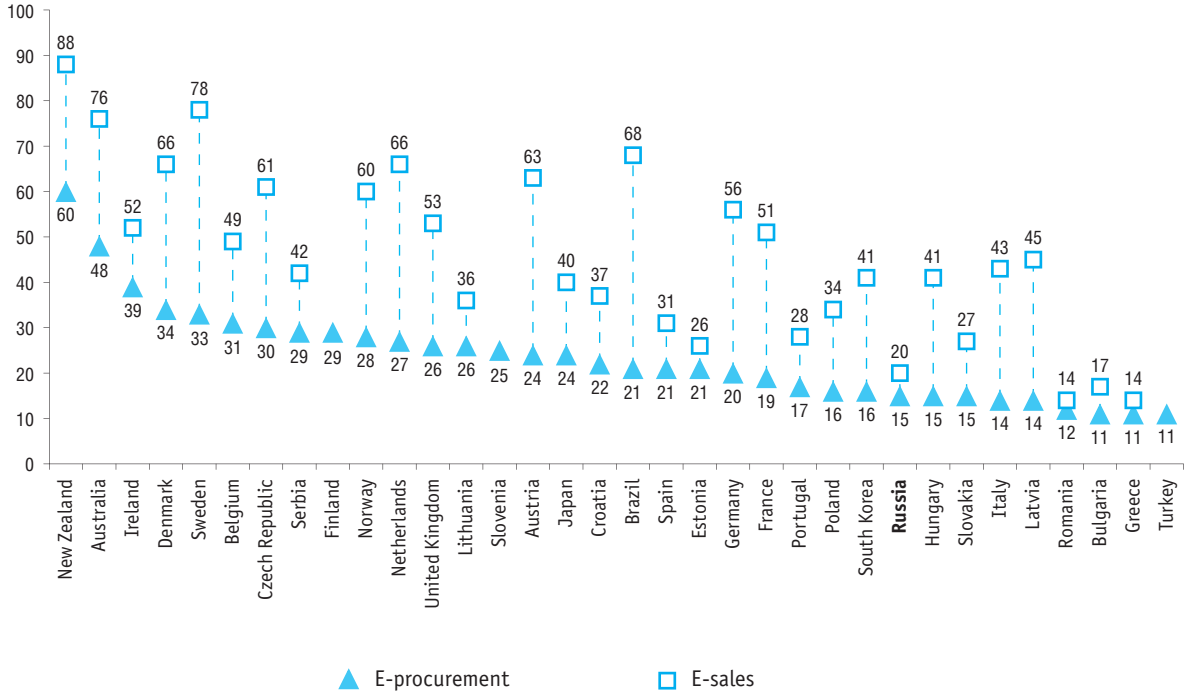
14.12. ENTERPRISES' E-SALES BY TYPE OF TECHNOLOGY USED

(as a percentage of all enterprises)

	Total			Of which using					
				special forms posted on the website or extranet			EDI systems		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
Business enterprise sector – total	**12.3**	**15.4**	**14.6**	**10.0**	**13.1**	**11.9**	**6.4**	**9.5**	**7.2**
Mining and quarrying	6.9	7.1	8.7	5.9	6.0	7.5	3.4	3.1	4.4
Manufacturing	19.5	19.6	19.6	13.6	13.5	13.9	12.3	12.8	13.0
Electricity, gas, steam and air-conditioning supply	10.1	9.6	13.1	9.1	8.6	11.5	4.3	4.2	5.4
Water supply, sewerage, waste management and remediation activities	10.0	10.8	10.6	8.5	9.1	8.7	5.1	5.4	5.5
Construction	8.8	7.9	8.6	7.5	6.9	7.4	4.2	3.7	4.4
Wholesale and retail trade	19.7	28.6	21.7	16.3	25.5	18.4	10.2	19.5	9.6
Transportation and storage	11.0	11.0	11.7	8.8	8.8	9.4	5.4	5.5	5.9
Accommodation and food service activities	20.1	20.0	20.7	14.6	14.6	13.8	11.4	11.2	13.1
Telecommunications	26.0	27.3	28.1	25.5	26.7	26.6	10.0	9.4	9.1
IT industry	10.6	13.8	11.4	9.1	10.8	9.7	4.1	6.6	4.7
Real estate activities	3.3	6.2	7.1	2.8	5.5	6.0	1.9	3.0	3.7
Professional, scientific and technical activities	6.3	4.9	6.4	5.3	4.3	5.4	3.1	1.9	2.9
Agriculture – total	**…**	**…**	**8.3**	**…**	**…**	**5.8**	**…**	**…**	**5.8**
Crop production	…	…	7.0	…	…	4.2	…	…	5.2
Animal production	…	…	10.6	…	…	7.0	…	…	8.2
Forestry and logging	…	…	9.4	…	…	7.8	…	…	5.7
Fishing and aquaculture	…	…	6.6	…	…	5.1	…	…	4.3

14.13. ENTERPRISES' E-PROCUREMENT AND E-SALES IN BUSINESS ENTERPRISE SECTOR BY COUNTRY: 2019*

(as a percentage of all enterprises in business enterprise sector)



* Or nearest years for which data are available.

14.14. ENTERPRISES' ONLINE INTERACTION WITH SUPPLIERS: 2019

(as a percentage of all enterprises)

	Inquiring about goods or services	Informing about enterprise's demand for goods or services	Paying for goods or services	Purchasing electronic products
Business enterprise sector – total	**66.4**	**48.6**	**47.2**	**34.8**
Mining and quarrying	66.1	47.8	45.2	39.5
Manufacturing	80.0	59.2	56.4	40.8
Electricity, gas, steam and air-conditioning supply	73.4	58.0	52.1	41.1
Water supply, sewerage, waste management and remediation activities	60.4	41.8	51.4	28.2
Construction	62.6	40.1	45.4	29.1
Wholesale and retail trade	68.2	53.1	49.4	38.2
Transportation and storage	63.4	45.4	40.3	32.0
Accommodation and food service activities	65.9	50.4	43.0	27.3
Telecommunications	76.8	58.7	54.9	50.9
IT industry	77.3	53.0	45.4	43.9
Real estate activities	56.2	36.3	43.1	24.0
Professional, scientific and technical activities	60.2	41.7	42.7	32.4
Agriculture – total	**56.9**	**37.9**	**47.3**	**24.1**
Crop production	48.9	29.2	40.8	21.2
Animal production	60.9	37.4	51.8	25.8
Forestry and logging	68.3	53.2	58.1	29.6
Fishing and aquaculture	58.7	40.5	39.5	27.1

14.15. ENTERPRISES' ONLINE INTERACTION WITH CONSUMERS: 2019

(as a percentage of all enterprises)

	Informing about the enterprise and its goods or services	Electronic payments transactions	Aftersale support	Selling of electronic products
Business enterprise sector – total	**54.1**	**36.1**	**9.5**	**8.1**
Mining and quarrying	45.3	29.3	6.2	3.1
Manufacturing	68.6	43.0	12.1	6.5
Electricity, gas, steam and air-conditioning supply	56.6	36.8	4.4	3.0
Water supply, sewerage, waste management and remediation activities	49.7	35.7	2.6	2.2
Construction	42.7	28.3	4.8	3.4
Wholesale and retail trade	64.2	49.8	13.2	11.3
Transportation and storage	45.0	27.0	7.3	7.1
Accommodation and food service activities	53.5	34.6	6.9	3.6
Telecommunications	66.9	46.9	33.0	27.5
IT industry	57.8	26.1	24.3	20.7
Real estate activities	38.1	25.4	3.6	2.8
Professional, scientific and technical activities	42.3	22.6	5.6	5.3
Agriculture – total	**39.3**	**30.3**	**3.8**	**3.0**
Crop production	34.5	27.4	3.8	2.8
Animal production	42.3	37.9	4.0	3.5
Forestry and logging	44.1	29.6	3.8	3.1
Fishing and aquaculture	39.7	24.6	4.6	2.0

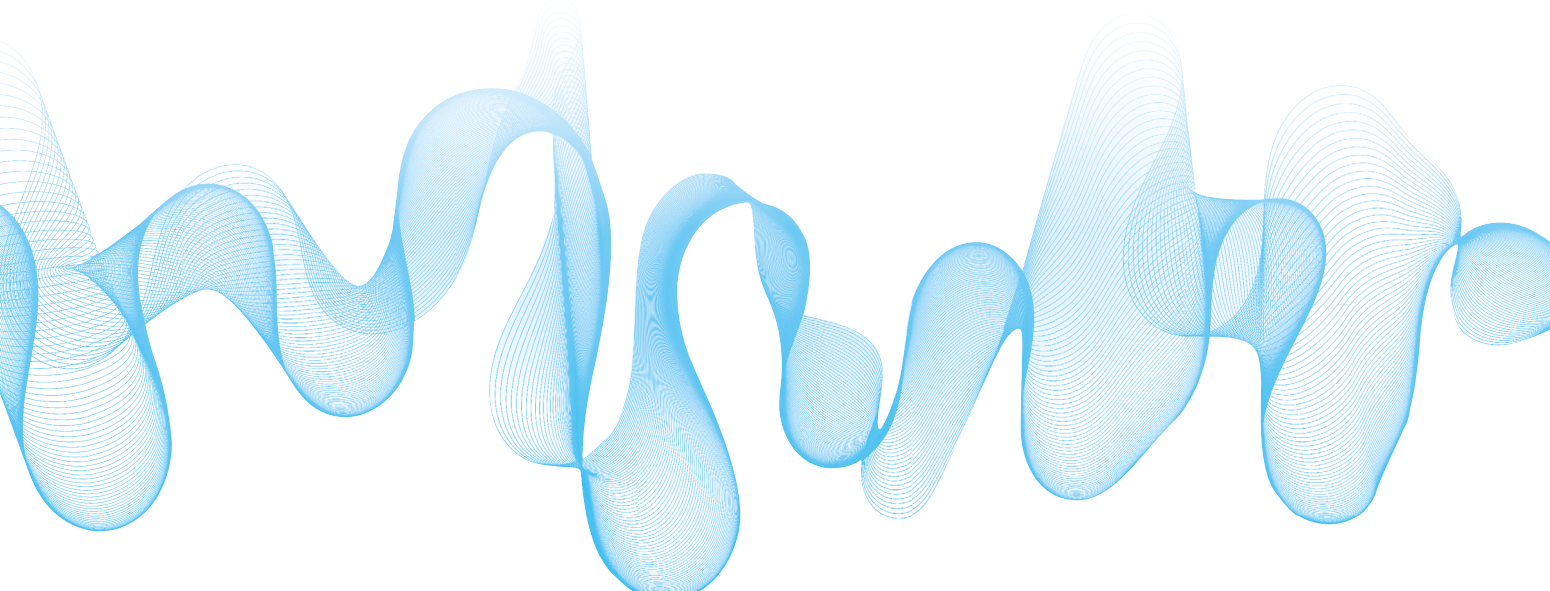
14.16. ONLINE INTERACTION WITH CONSUMERS VIA WEBSITES: 2019

(as a percentage of all enterprises)

	Publication/posting on the website		
	catalogues of goods or services/ price lists	online payment system	order tracking
Business enterprise sector – total	**28.5**	**11.9**	**11.1**
Mining and quarrying	14.8	4.9	3.2
Manufacturing	43.0	9.3	8.8
Electricity, gas, steam and air-conditioning supply	25.7	14.4	7.3
Water supply, sewerage, waste management and remediation activities	18.5	9.3	4.5
Construction	15.0	5.9	3.3
Wholesale and retail trade	39.7	19.1	19.8
Transportation and storage	21.7	8.8	12.4
Accommodation and food service activities	32.8	11.0	9.8
Telecommunications	49.6	34.6	32.6
IT industry	29.1	10.2	10.5
Real estate activities	15.1	6.7	3.9
Professional, scientific and technical activities	16.6	5.3	4.3
Agriculture – total	**9.2**	**5.0**	**2.5**
Crop production	7.1	5.1	2.1
Animal production	10.2	6.4	3.2
Forestry and logging	7.5	4.5	2.5
Fishing and aquaculture	14.2	4.1	2.5

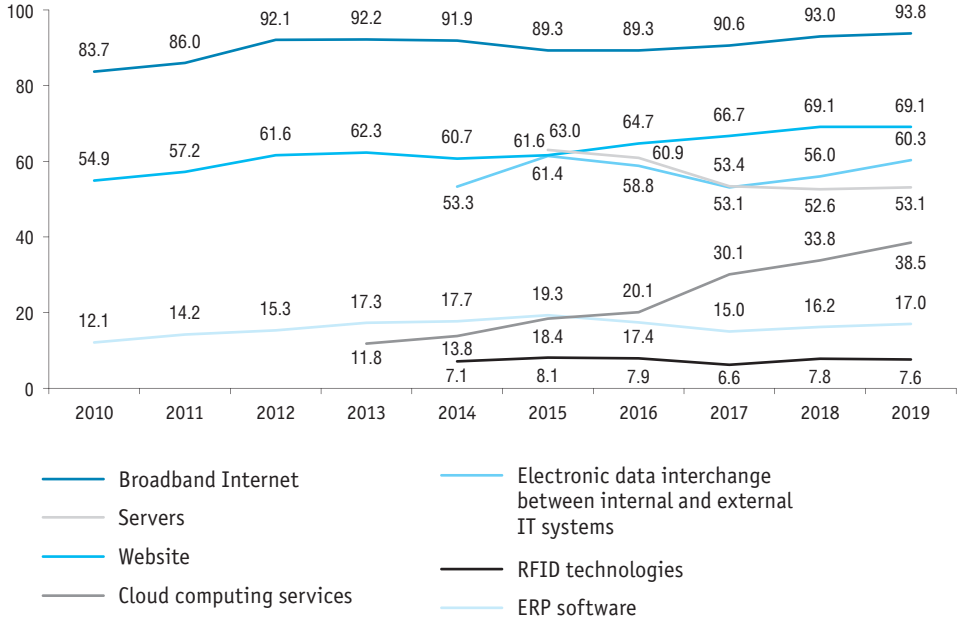
15

DIGITALISATION OF FINANCIAL SECTOR



15.1. DIGITALISATION OF ENTERPRISES IN FINANCIAL SECTOR*

(as a percentage of all enterprises)



* Here and below in this section, the data for enterprises in financial sector refer to the following types of economic activities: for 2010–2016, Section J 'Financial Intermediation' of the OKVED (ver. 1.1); for 2017–2019, Section K 'Financial and Insurance Activities' of the OKVED2.

Sources: here and below in this section, HSE ISSEK estimates based on the data of Rosstat (15.1–15.11) and the Bank of Russia (15.12–15.16).

15.2. ENTERPRISES' USE OF BROADBAND INTERNET IN FINANCIAL SECTOR

(as a percentage of all enterprises in financial sector)

	2017	2018	2019
Financial sector – total	**90.6**	**93.0**	**93.8**
Financial service activities, except insurance and pension funding	89.3	92.6	92.9
Insurance and activities of private pension funds	95.0	94.5	97.9
Activities auxiliary to financial services and insurance activities	90.4	91.7	92.3

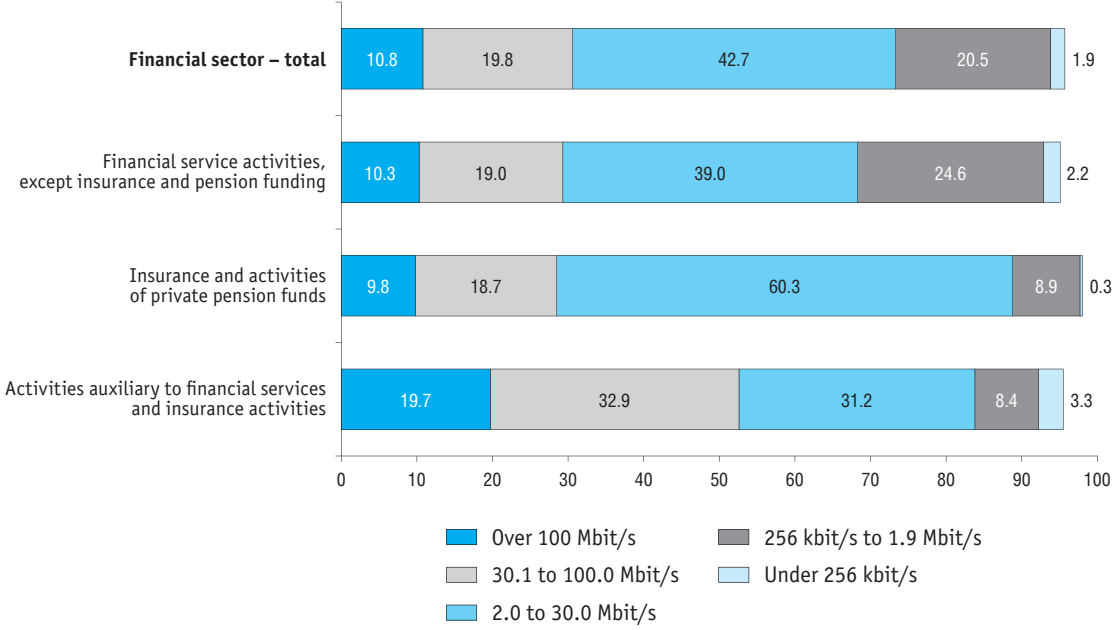
15.3. ENTERPRISES' USE OF BROADBAND INTERNET IN FINANCIAL SECTOR BY CONNECTION TYPE

(as a percentage of all enterprises in financial sector)

	Fixed broadband access			Mobile broadband access		
	2017	2018	2019	2017	2018	2019
Financial sector – total	**86.8**	**88.9**	**89.2**	**45.5**	**60.2**	**65.1**
Financial service activities, except insurance and pension funding	85.3	87.9	87.8	44.9	64.3	68.5
Insurance and activities of private pension funds	92.0	92.3	94.8	47.0	49.3	55.5
Activities auxiliary to financial services and insurance activities	87.2	87.5	88.2	48.0	51.7	55.0

15.4. ENTERPRISES' USE OF INTERNET IN FINANCIAL SECTOR BY TOP ACCESS SPEED: 2019

(as a percentage of all enterprises in financial sector)



15.5. ENTERPRISES' USE OF INTERNET IN FINANCIAL SECTOR: 2019

(as a percentage of all enterprises in financial sector)

	Online search of information	Emails	Videoconferencing	Online telephone/ VoIP calls
Financial sector – total	**93.9**	**92.4**	**70.8**	**68.5**
Financial service activities, except insurance and pension funding	93.4	91.3	69.1	65.8
Insurance and activities of private pension funds	95.7	96.5	80.6	80.1
Activities auxiliary to financial services and insurance activities	93.8	92.5	60.6	64.0

	Personnel training	Internal/external staff recruitment	Paid subscriptions to e-databases or e-libraries
Financial sector – total	**66.7**	**65.8**	**51.8**
Financial service activities, except insurance and pension funding	66.0	68.2	54.9
Insurance and activities of private pension funds	71.3	60.9	41.3
Activities auxiliary to financial services and insurance activities	60.8	52.9	47.6

15.6. ENTERPRISES' EMPLOYEES WHO USE THE INTERNET IN FINANCIAL SECTOR

(as a percentage of all enterprises in financial sector)

	Total			Via portable devices with Internet access provided by the employer		
	2017	2018	2019	2017	2018	2019
Financial sector – total	**65.1**	**65.1**	**66.0**	**10.5**	**11.8**	**10.8**
Financial service activities, except insurance and pension funding	61.1	62.1	62.3	11.1	12.7	11.1
Insurance and activities of private pension funds	88.6	84.9	91.3	5.1	5.5	7.0
Activities auxiliary to financial services and insurance activities	77.5	83.3	80.3	17.4	10.3	15.8

15.7. ENTERPRISES' USE OF CLOUD COMPUTING SERVICES IN FINANCIAL SECTOR

(as a percentage of all enterprises in financial sector)

	2017	2018	2019
Financial sector – total	30.1	33.8	38.5
Financial service activities, except insurance and pension funding	34.0	39.4	44.2
Insurance and activities of private pension funds	20.0	20.0	23.1
Activities auxiliary to financial services and insurance activities	17.6	19.3	18.2

15.8. ENTERPRISES' USE OF ELECTRONIC DATA INTERCHANGE BETWEEN INTERNAL AND EXTERNAL IT SYSTEMS IN FINANCIAL SECTOR

(as a percentage of all enterprises in financial sector)

	2017	2018	2019
Financial sector – total	**53.1**	**56.0**	**60.3**
Financial service activities, except insurance and pension funding	51.8	68.8	58.6
Insurance and activities of private pension funds	55.6	56.5	63.8
Activities auxiliary to financial services and insurance activities	62.2	54.7	68.8

15.9. ENTERPRISES' USE OF RFID TECHNOLOGIES IN FINANCIAL SECTOR

(as a percentage of all enterprises in financial sector)

	2017	2018	2019
Financial sector – total	**6.6**	**7.8**	**7.6**
Financial service activities, except insurance and pension funding	8.3	9.7	9.3
Insurance and activities of private pension funds	1.4	2.9	2.3
Activities auxiliary to financial services and insurance activities	4.5	3.6	4.9

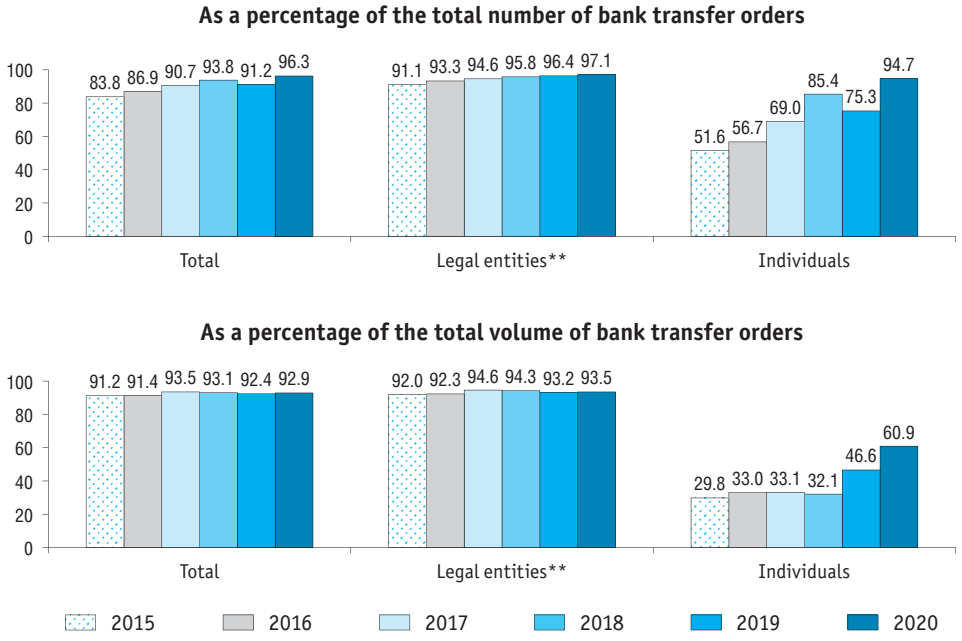
15.10. ENTERPRISES' EXPENDITURE ON THE PURCHASE OF SOFTWARE OR IN-HOUSE ADAPTATION AND MAINTENANCE OF SOFTWARE IN FINANCIAL SECTOR: 2019

	Total, *million roubles*	Including for Russian software	
		Million roubles	As a percentage of the total expenditure on the purchase of software
Financial sector – total	**87102.1**	**44601.5**	**51.2**
Financial service activities, except insurance and pension funding	83437.8	43526.5	52.2
Insurance and activities of private pension funds	2637.3	656.1	24.9
Activities auxiliary to financial services and insurance activities	1027.0	418.7	40.8

15.11. PAYMENTS FOR THIRD-PARTY SERVICES RELATED TO THE DEVELOPMENT, RENTAL, MAINTENANCE, REVISION, TECHNICAL SUPPORT, AND UPDATING OF SOFTWARE IN FINANCIAL SECTOR: 2019

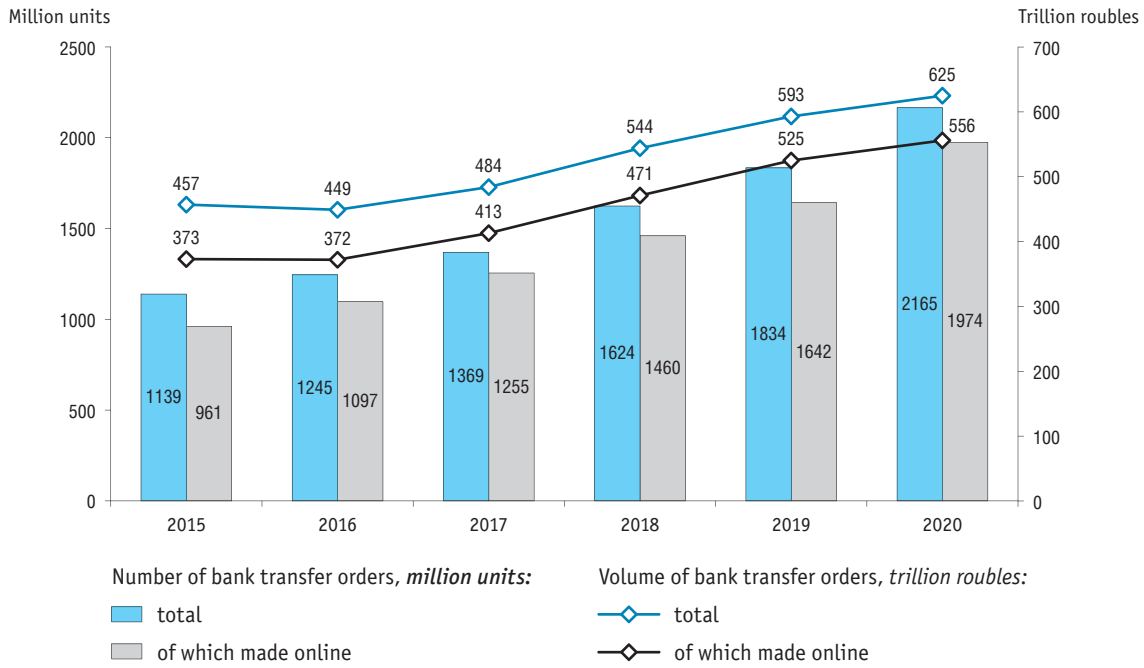
	Total, *million roubles*	Including for the rental of software	Of which Russian software	
			Million roubles	As a percentage of the total expenditure on the rental of software
Financial sector – total	**113372.4**	**11777.8**	**715.4**	**6.1**
Financial service activities, except insurance and pension funding	102687.6	10157.9	651.5	6.4
Insurance and activities of private pension funds	9080.5	1601.2	45.9	2.9
Activities auxiliary to financial services and insurance activities	1604.3	18.7	18.0	96.7

15.12. PAYMENTS MADE BY CUSTOMERS OF CREDIT INSTITUTIONS USING BANK TRANSFER ORDERS RECEIVED IN DIGITAL FORM*



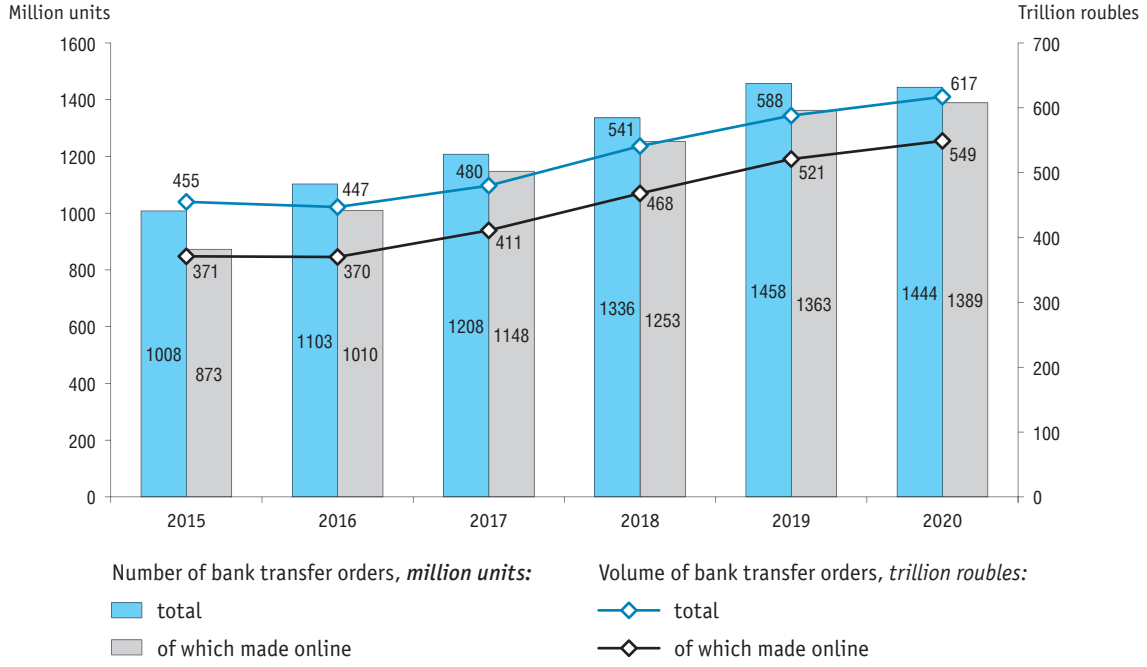
* In Russian roubles.
** Non-credit institutions.

15.13. BANK TRANSFER ORDERS RECEIVED BY CREDIT INSTITUTIONS UNDER INSTRUCTIONS IN DIGITAL FORM*



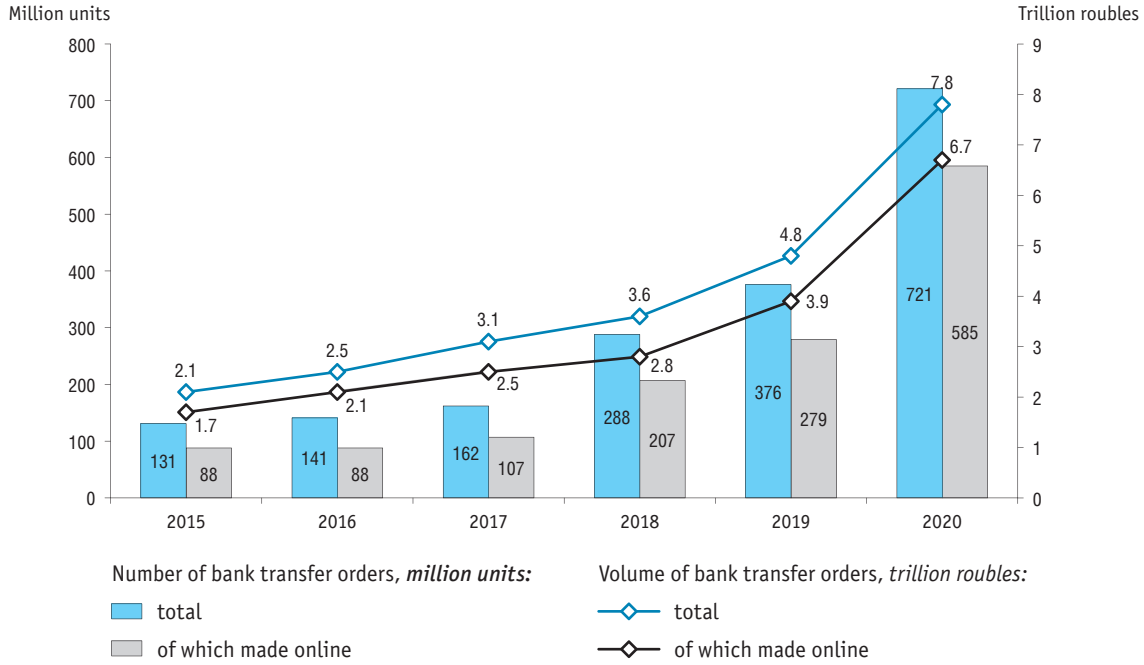
* In Russian roubles.

15.14. BANK TRANSFER ORDERS RECEIVED BY CREDIT INSTITUTIONS FROM LEGAL ENTITIES UNDER INSTRUCTIONS IN DIGITAL FORM*



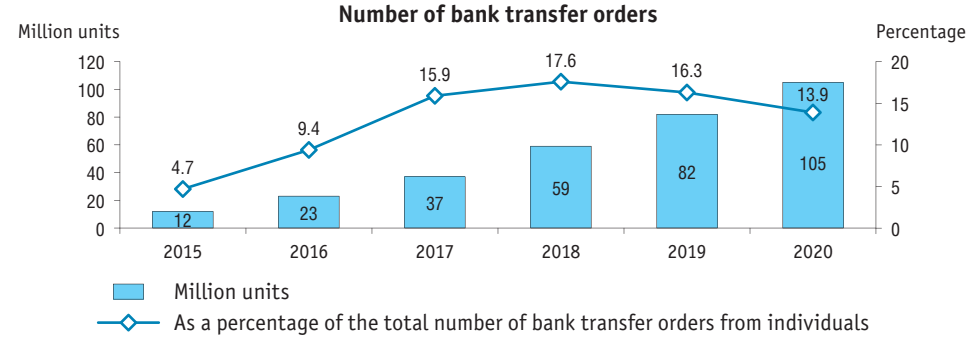
* In Russian roubles, from legal entities that are non-credit institutions.

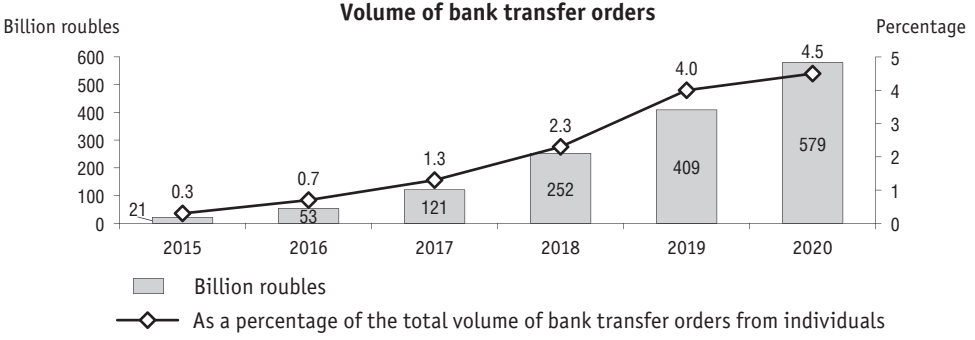
15.15. BANK TRANSFER ORDERS RECEIVED BY CREDIT INSTITUTIONS FROM INDIVIDUALS UNDER INSTRUCTIONS IN DIGITAL FORM*



* In Russian roubles.

15.16. BANK TRANSFER ORDERS RECEIVED BY CREDIT INSTITUTIONS FROM INDIVIDUALS VIA MESSAGES USING MOBILE CELLULAR TELEPHONE DEVICES*

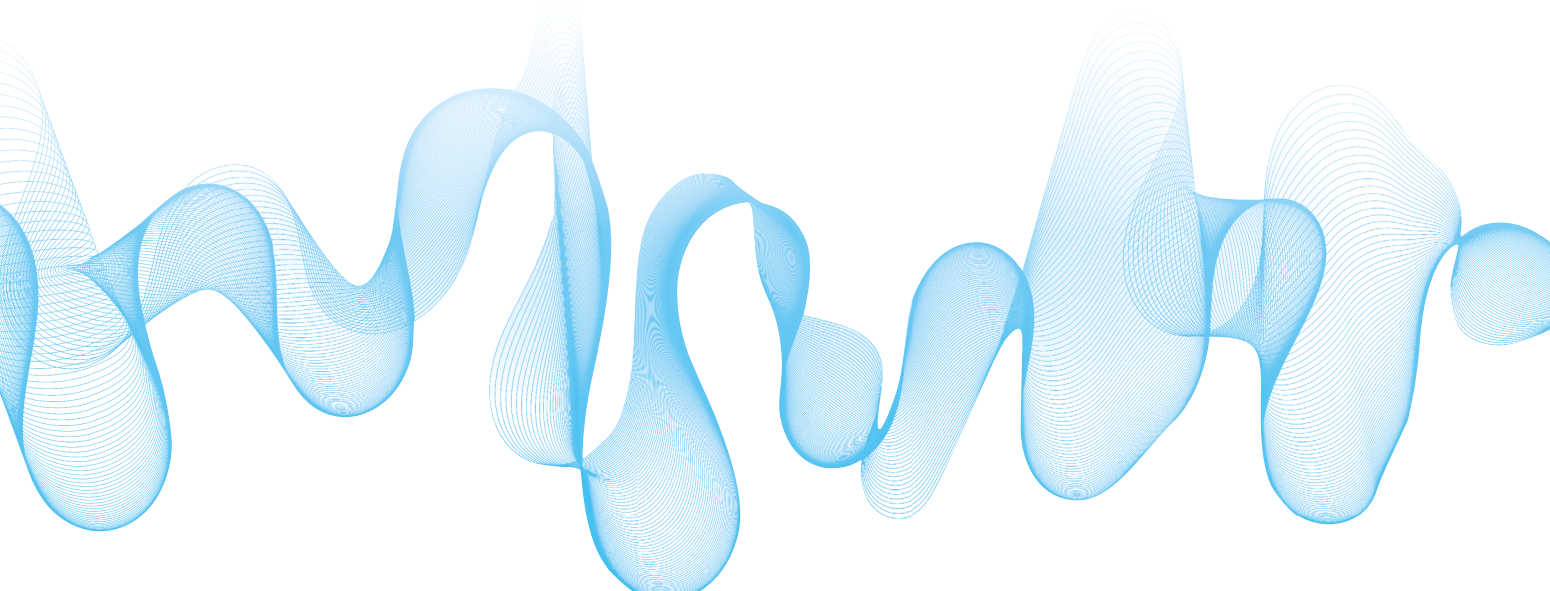




* In Russian roubles.

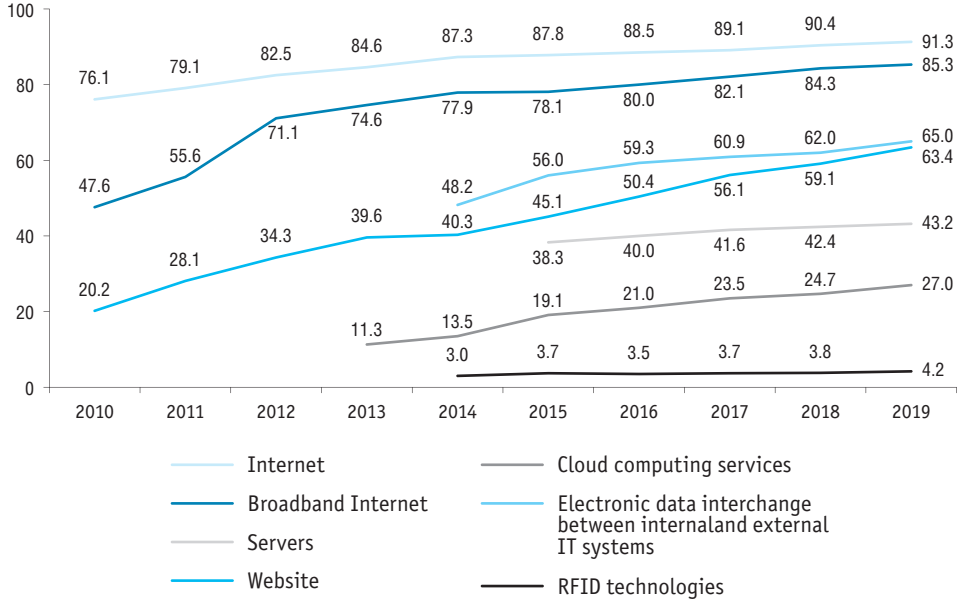
16

DIGITALISATION OF SOCIAL SPHERE



16.1. DIGITALISATION OF INSTITUTIONS IN SOCIAL SPHERE*

(as a percentage of all institutions in social sphere)



* Here and below in this section, the data refer to higher education institutions (OKVED2 code 85.22), institutions implementing highly-qualified personnel training (85.23), human health and social work activities (Section Q), art, entertainment and recreation (Section R).

Sources: here and below in this section, HSE ISSEK estimates based on the data of Rosstat (16.1–16.11 and 16.20), Ministry of Science and Higher Education of the Russian Federation (16.12–16.14), Ministry of Culture of the Russian Federation (16.15–16.18), and Ministry of Health of the Russian Federation (16.19).

16.2. INSTITUTIONS' USE OF INTERNET IN SOCIAL SPHERE

(as a percentage of all institutions in social sphere)

	2017	2018	2019
Social sphere – total	**89.1**	**90.4**	**91.3**
Higher education, highly-qualified personnel training	97.1	95.5	94.7
Human health and social work activities	94.9	95.4	96.0
Libraries, archives, museums and other cultural activities	88.1	89.8	92.5
Creative, arts and entertainment activities	79.9	83.6	86.5
Sports activities and amusement and recreation activities	84.6	86.2	85.8

16.3. INSTITUTIONS' USE OF BROADBAND INTERNET IN SOCIAL SPHERE

(as a percentage of all institutions in social sphere)

	2017	2018	2019
Social sphere – total	**82.1**	**84.3**	**85.3**
Higher education, highly-qualified personnel training	96.0	92.7	90.3
Human health and social work activities	90.7	92.1	92.4
Libraries, archives, museums and other cultural activities	78.5	81.9	85.5
Creative, arts and entertainment activities	69.3	73.3	77.1
Sports activities and amusement and recreation activities	76.2	78.9	78.9

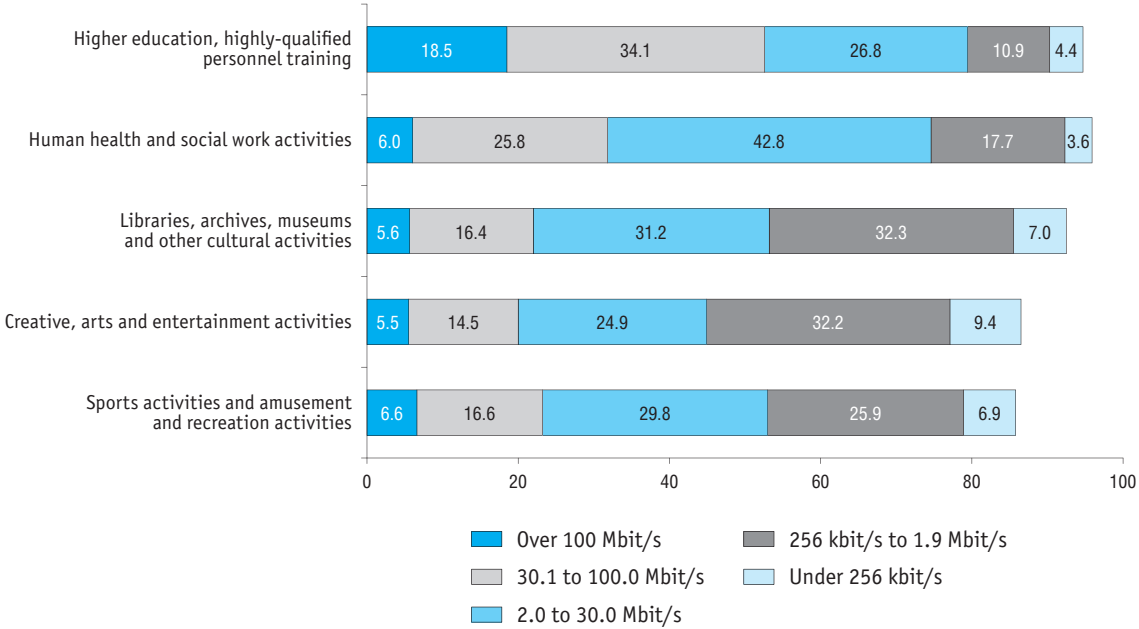
16.4. INSTITUTIONS' USE OF BROADBAND INTERNET IN SOCIAL SPHERE BY CONNECTION TYPE

(as a percentage of all institutions in social sphere)

	Fixed broadband access			Mobile broadband access		
	2017	2018	2019	2017	2018	2019
Social sphere – total	**78.6**	**80.5**	**81.5**	**36.4**	**38.8**	**41.1**
Higher education, highly-qualified personnel training	93.1	88.5	86.4	53.3	50.6	51.4
Human health and social work activities	87.5	88.5	88.9	36.2	38.5	39.8
Libraries, archives, museums and other cultural activities	74.8	78.2	81.6	37.5	39.8	42.7
Creative, arts and entertainment activities	65.9	69.8	73.1	31.2	35.0	39.9
Sports activities and amusement and recreation activities	71.6	73.9	74.1	36.7	38.8	41.0

16.5. INSTITUTIONS' USE OF INTERNET IN SOCIAL SPHERE BY TOP ACCESS SPEED: 2019

(as a percentage of all institutions in social sphere)



16.6. INSTITUTIONS WITH WEBSITES IN SOCIAL SPHERE

(as a percentage of all institutions in social sphere)

	2017	2018	2019
Social sphere – total	**56.1**	**59.1**	**63.4**
Higher education, highly-qualified personnel training	87.9	83.0	84.8
Human health and social work activities	72.5	75.0	80.9
Libraries, archives, museums and other cultural activities	44.4	48.8	54.3
Creative, arts and entertainment activities	35.9	39.0	45.1
Sports activities and amusement and recreation activities	46.0	49.6	51.8

16.7. INSTITUTIONS' INTERNET ACTIVITIES IN SOCIAL SPHERE: 2019

(as a percentage of all institutions in social sphere)

	Emails	Online search of information	Banking and other financial transactions	Personnel training
Social sphere – total	**89.2**	**89.4**	**61.1**	**45.5**
Higher education, highly-qualified personnel training	93.5	93.4	79.5	63.6
Human health and social work activities	94.8	94.7	82.7	64.1
Libraries, archives, museums and other cultural activities	90.1	90.8	40.1	37.0
Creative, arts and entertainment activities	82.9	83.8	43.1	27.6
Sports activities and amusement and recreation activities	83.5	83.3	51.6	29.1

(continued)

	Videoconferencing	Internal/external staff recruitment	Online telephone/ VoIP calls	Paid subscriptions to e-databases or e-libraries
Social sphere – total	**35.6**	**24.0**	**19.0**	**25.8**
Higher education, highly-qualified personnel training	69.2	43.0	46.9	61.0
Human health and social work activities	59.4	38.1	29.1	35.8
Libraries, archives, museums and other cultural activities	23.8	12.2	11.1	19.9
Creative, arts and entertainment activities	12.0	10.1	7.4	12.4
Sports activities and amusement and recreation activities	12.3	15.1	9.4	15.6

16.8. INSTITUTIONS' USE OF CLOUD COMPUTING SERVICES IN SOCIAL SPHERE

(as a percentage of all institutions in social sphere)

	2017	2018	2019
Social sphere – total	**23.5**	**24.7**	**27.0**
Higher education, highly-qualified personnel training	43.8	39.0	42.0
Human health and social work activities	29.5	31.2	34.5
Libraries, archives, museums and other cultural activities	18.2	19.3	21.6
Creative, arts and entertainment activities	16.1	17.3	19.3
Sports activities and amusement and recreation activities	19.8	19.7	21.2

16.9. INSTITUTIONS' USE OF ELECTRONIC DATA INTERCHANGE BETWEEN INTERNAL AND EXTERNAL IT SYSTEMS IN SOCIAL SPHERE

(as a percentage of all institutions in social sphere)

	2017	2018	2019
Social sphere – total	**60.9**	**62.0**	**65.0**
Higher education, highly-qualified personnel training	77.0	73.1	73.6
Human health and social work activities	72.8	73.0	77.1
Libraries, archives, museums and other cultural activities	51.1	52.1	55.4
Creative, arts and entertainment activities	50.5	51.7	55.8
Sports activities and amusement and recreation activities	52.6	55.9	56.9

16.10. INSTITUTIONS' USE OF RFID TECHNOLOGIES IN SOCIAL SPHERE

(as a percentage of all institutions in social sphere)

	2017	2018	2019
Social sphere – total	**3.7**	**3.8**	**4.2**
Higher education, highly-qualified personnel training	16.2	13.3	15.3
Human health and social work activities	3.8	4.2	4.4
Libraries, archives, museums and other cultural activities	3.1	3.4	4.0
Creative, arts and entertainment activities	2.0	2.0	2.2
Sports activities and amusement and recreation activities	3.0	2.7	3.2

16.11. INSTITUTIONS' USE OF SPECIALISED SOFTWARE IN SOCIAL SPHERE: 2019

(as a percentage of all institutions in social sphere)

	Electronic document management systems	Legal reference systems	Computer-aided management systems	E-learning software	Electronic payment transactions	Access to databases through global information networks	Editorial and publishing software
Social sphere – total	**67.2**	**45.6**	**47.5**	**11.6**	**53.1**	**30.4**	**4.4**
Higher education, highly-qualified personnel training	71.1	68.9	69.0	63.4	68.4	38.5	26.3
Human health and social work activities	79.5	62.6	62.8	11.6	72.6	34.7	3.1
Libraries, archives, museums and other cultural activities	59.1	39.1	34.2	10.8	35.6	30.8	5.3
Creative, arts and entertainment activities	58.9	26.3	34.2	5.8	38.1	25.6	2.8
Sports activities and amusement and recreation activities	58.3	32.2	37.1	5.2	42.5	22.6	2.5

16.12. INSTITUTIONS' USE OF SPECIALISED SOFTWARE IN HIGHER EDUCATION: 2019

(as a percentage of all institutions in higher education; at the end of the year)

	2017	2018	2019
E-libraries systems	96.5	97.3	97.8
Legal reference systems	93.3	95.0	95.9
Electronic textbooks on selected topics	94.0	94.6	95.8
Electronic handbooks, encyclopedias, dictionaries, etc.	92.5	93.3	94.4
Educational software on selected subjects, topics, or specialisations	90.0	91.6	92.3
Specialised software for management systems (except electronic document management systems)	87.2	89.5	90.8
Examination software	88.4	89.6	90.1
Web content filtering tools	82.4	84.9	87.3
Electronic document management systems	79.4	81.6	84.1
Specialised research software	57.4	59.6	61.1
Training or educational software, simulators, etc.	50.9	53.8	56.7

16.13. E-LEARNING IN HIGHER EDUCATION INSTITUTIONS*

(at the beginning of the academic year)

	Enrolment with e-learning mode of educational programme implementation				Including with the use of exclusively e-learning mode of educational programme implementation			
	Thousand persons		As a percentage of the total enrolment		Thousand persons		As a percentage of the total enrolment	
	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021
E-learning – total	**839.9**	**1530.9**	**20.5**	**37.5**	**17.2**	**36.7**	**0.4**	**0.9**
Including within educational programmes:								
bachelor's	610.1	1028.3	21.7	36.8	14.0	29.3	0.5	1.0
specialist's	112.1	296.8	14.9	38.2	0.6	2.3	0.1	0.3
master's	117.7	205.8	22.1	40.2	2.6	5.1	0.5	1.0

* Here and below in table 16.14, including research institutes implementing master's programmes.

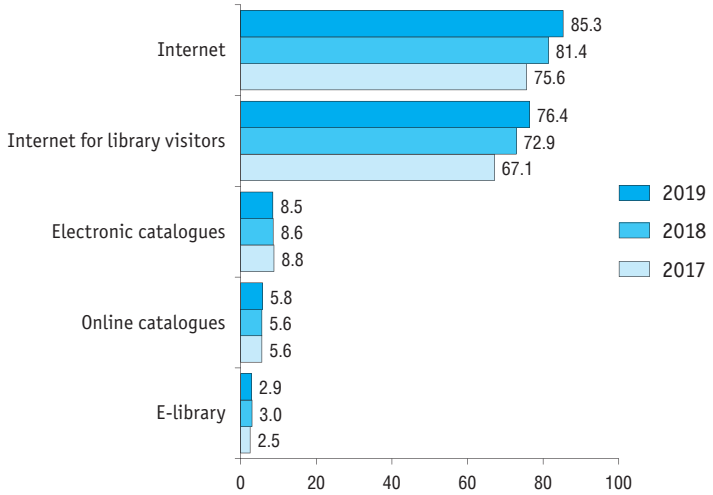
16.14. DISTANCE LEARNING TECHNOLOGIES IN HIGHER EDUCATION INSTITUTIONS

(at the beginning of the academic year)

	Enrolment with distance learning mode of educational programme implementation				Including with the use of exclusively distance learning mode of educational programme implementation			
	Thousand persons		As a percentage of the total enrolment		Thousand persons		As a percentage of the total enrolment	
	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021
Distance learning technologies – total	**534.4**	**1936.9**	**13.0**	**47.4**	**40.0**	**74.2**	**1.0**	**1.8**
Including within educational programmes:								
bachelor's	396.3	1318.5	14.1	47.2	35.2	55.1	1.3	2.0
specialist's	59.7	366.1	7.9	47.1	0.7	11.1	0.1	1.4
master's	78.4	252.3	14.8	49.2	4.1	8.0	0.8	1.6

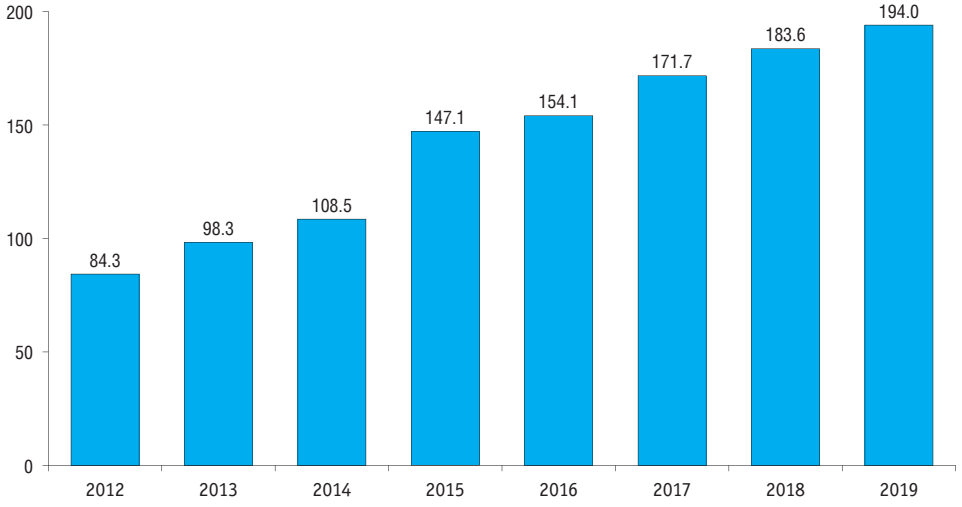
16.15. DIGITALISATION OF LIBRARIES

(as a percentage of all libraries)

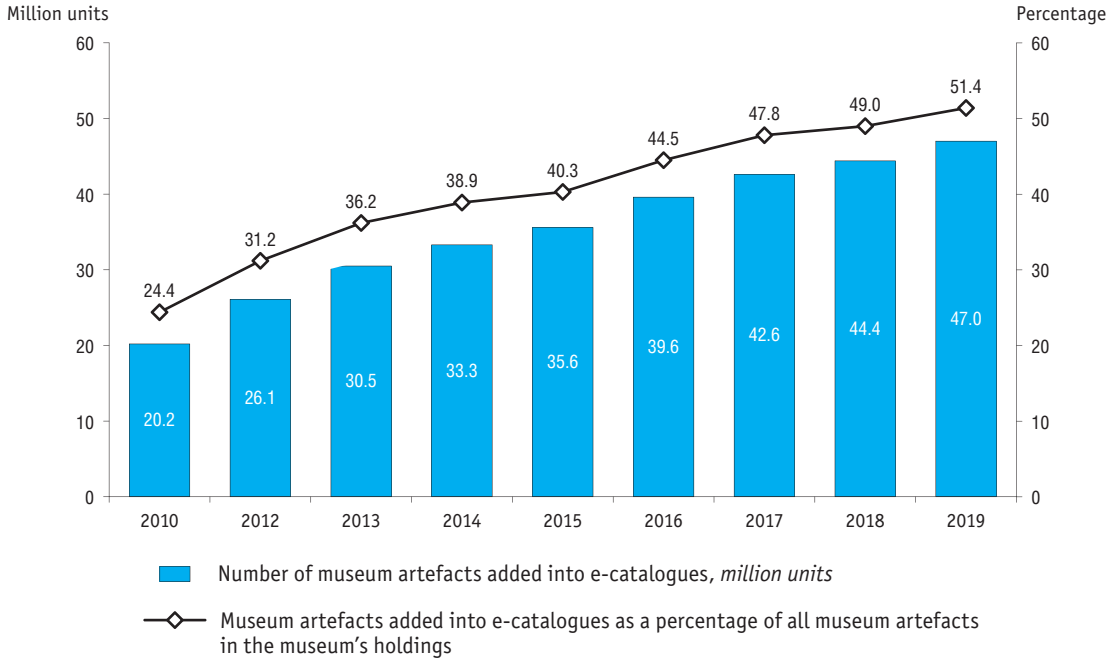


16.16. ONLINE E-LIBRARY CATALOGUES

(million records)

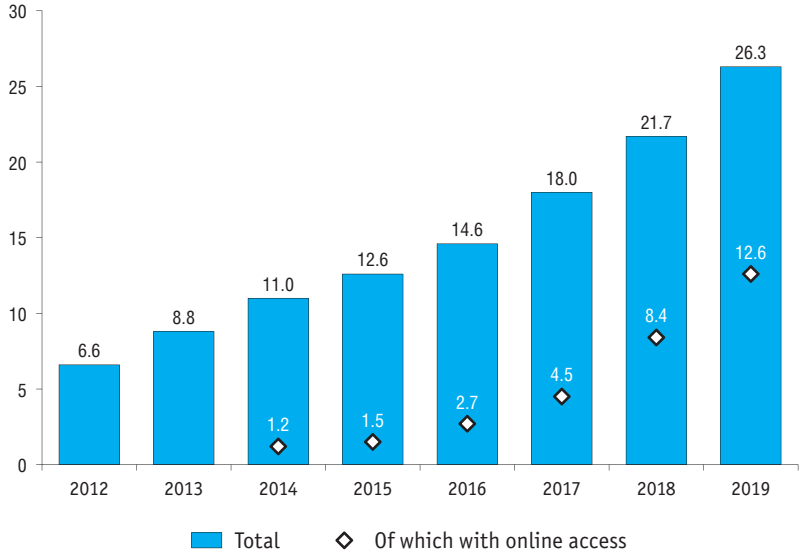


16.17. DIGITALISATION OF MUSEUM CATALOGUES AND HOLDINGS



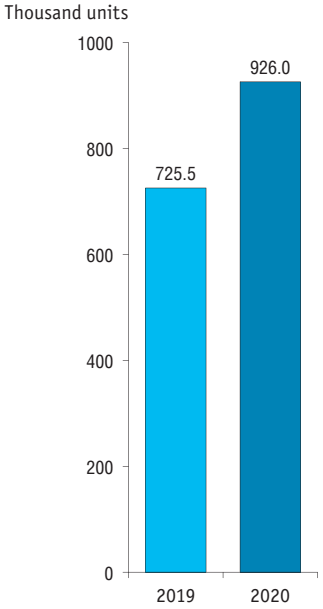
16.18. MUSEUM ARTEFACTS ADDED INTO E-CATALOGUES AND HAVING DIGITAL IMAGES

(as a percentage of all museum artefacts in the museum's holdings)

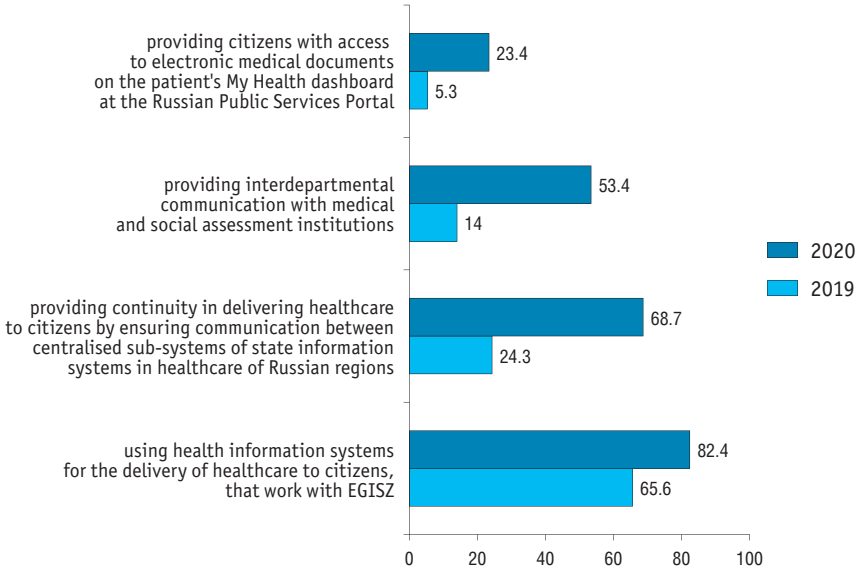


16.19. INDICATORS OF THE NATIONAL HEALTH INFORMATION SYSTEM (EGISZ) DEVELOPMENT

Number of healthcare work stations with access to health information systems



Healthcare instituitions (as a percentage of the total number of healthcare institutions within public and municipal healthcare systems)



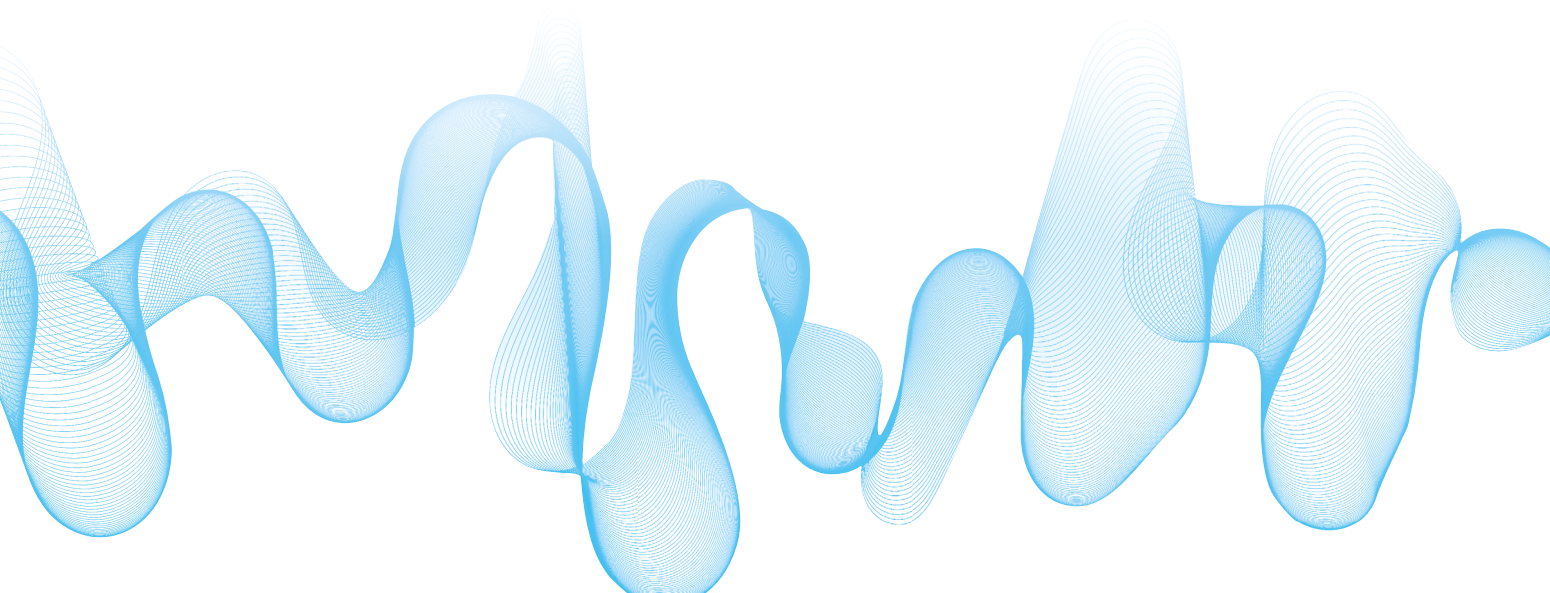
16.20. DIGITALISATION OF HOSPITALS

(as a percentage of all hospitals)

	2010	2012	2013	2014	2015	2016	2017	2018	2019
Internet	86.8	95.4	96.2	96.4	96.9	97.4	96.9	96.5	97.8
Of which broadband	56.2	87.5	90.5	91.4	92.1	94.0	95.3	95.2	96.8
E-mails	81.8	94.3	95.2	91.7	92.5	96.2	96.4	96.1	97.5
Website	20.7	59.3	69.3	68.3	74.1	80.7	85.1	86.5	91.3
Electronic data interchange between internal and external IT systems	…	30.8	33.7	62.4	71.8	75.2	76.6	76.5	80.9
Mobile Internet devices provided by the employer	…	10.8	20.0	25.2	30.7	32.0	31.0	38.6	35.9
RFID technologies	…	…	…	4.1	4.7	4.9	5.1	5.0	5.5
Cloud computing services	…	…	18.0	20.7	29.1	30.9	35.2	36.0	40.1

17

E-GOVERNMENT



17.1. INDIVIDUALS' INTERACTION WITH PUBLIC AND MUNICIPAL AUTHORITIES

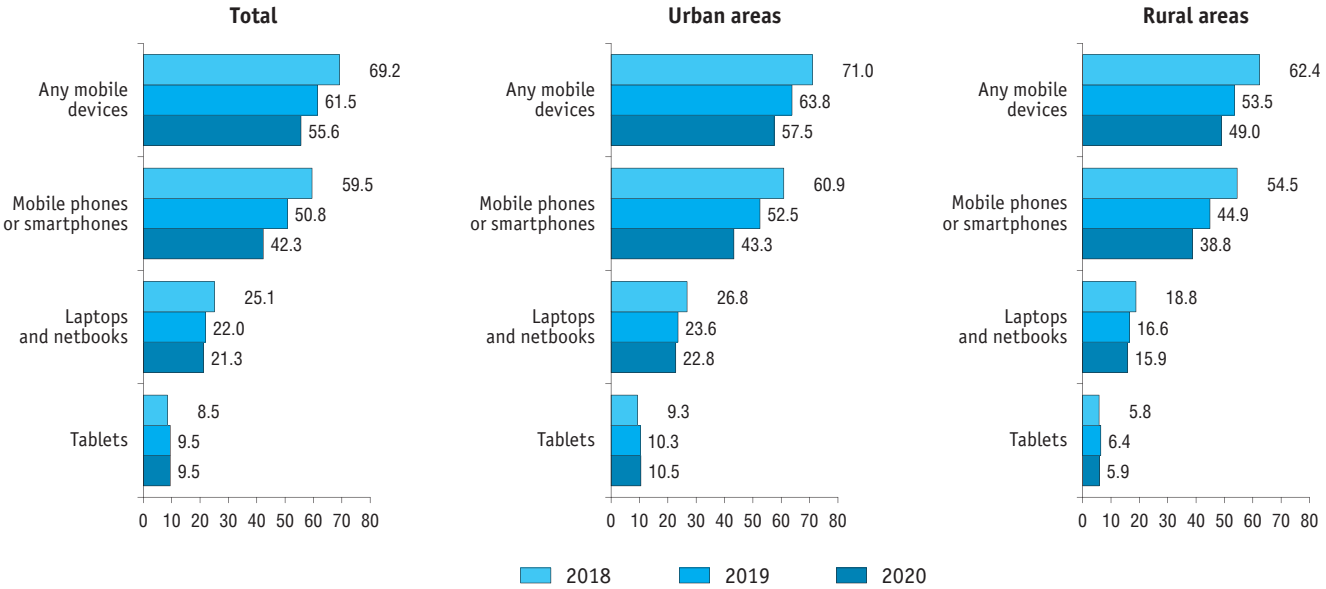
(as a percentage of all individuals aged 15–72)

	2015	2016	2017	2018	2019	2020
Interacted – total	46.4	56.1	65.7	72.9	74.0	72.5
Of whom:						
online (via official websites and portals)	18.4	28.8	42.3	54.5	57.5	58.7
via Multifunctional Centres (MFC) of public services provision	7.1	11.8	18.9	19.6	22.5	19.6
through in-person visits	21.2	22.5	24.0	21.5	21.8	18.1
Did not interact	53.6	43.9	34.3	27.1	26.0	27.5

Sources: here and below in the section, for Russia, Rosstat (17.1–17.11), HSE ISSEK estimates based on Rosstat data (17.12–17.16); for countries other than Russia, Eurostat.

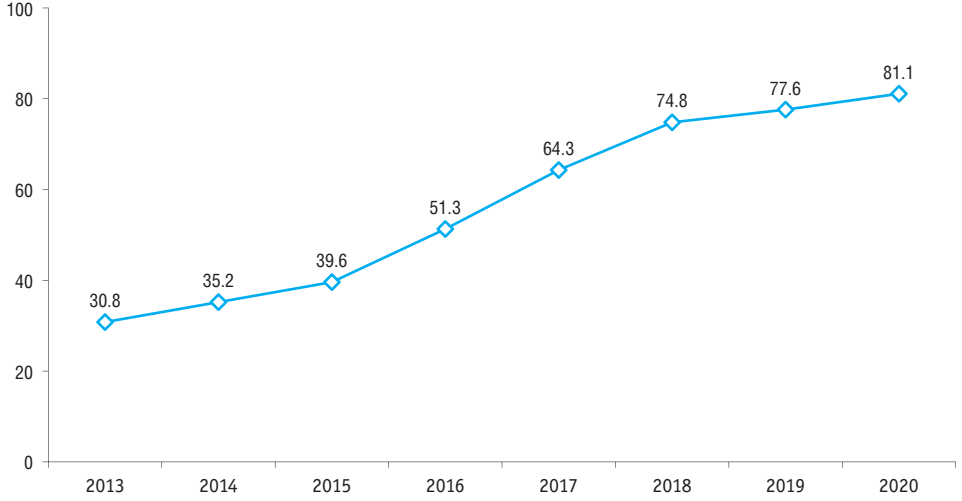
17.2. INDIVIDUALS' USE OF MOBILE DEVICES TO ACCESS OFFICIAL WEBSITES AND PORTALS OF PUBLIC AND MUNICIPAL SERVICES

(as a percentage of individuals aged 15–72 years who have received public and municipal services)



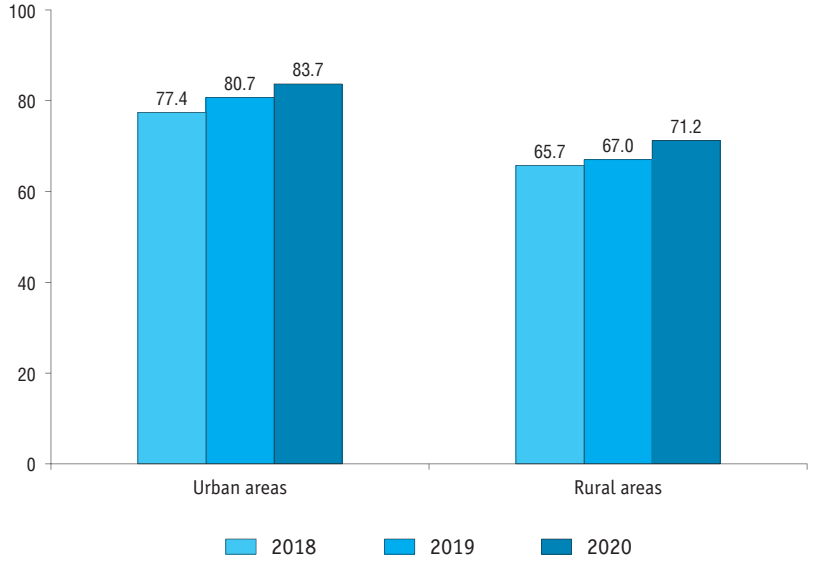
17.3. PUBLIC AND MUNICIPAL SERVICES RECEIVED BY INDIVIDUALS IN DIGITAL FORM

(as a percentage of individuals aged 15–72 years who have received public and municipal services)



17.4. PUBLIC AND MUNICIPAL SERVICES RECEIVED BY INDIVIDUALS IN DIGITAL FORM IN URBAN AND RURAL AREAS

(as a percentage of individuals aged 15–72 years who have received public and municipal services)



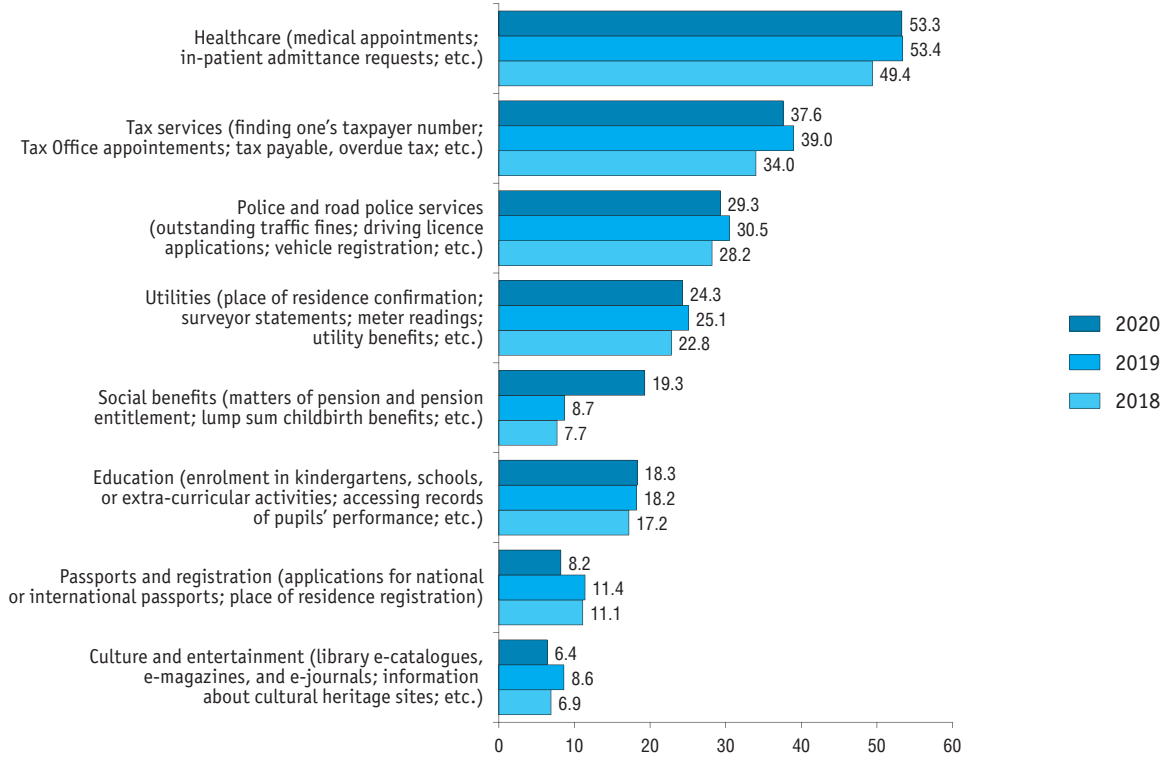
17.5. PUBLIC AND MUNICIPAL SERVICES RECEIVED BY INDIVIDUALS IN DIGITAL FORM BY AGE

(as a percentage of individuals in each age group who have received public and municipal services)

Age, *years*	2013	2014	2015	2016	2017	2018	2019	2020
Total (15–72)	**30.8**	**35.2**	**39.6**	**51.3**	**64.3**	**74.8**	**77.6**	**81.1**
15–19	42.3	50.3	46.6	58.5	71.7	82.5	82.0	88.6
20–24	42.9	48.7	50.1	64.3	76.6	84.9	86.8	88.7
25–29	45.3	51.8	53.4	67.7	78.7	86.7	88.5	91.0
30–34	42.4	50.6	52.6	67.7	78.5	86.7	86.4	91.5
35–39	40.2	46.3	52.2	65.9	77.4	85.2	88.0	90.9
40–44	36.3	42.1	49.3	61.5	73.3	83.3	85.5	88.7
45–49	32.1	34.8	41.3	55.1	68.7	79.5	83.0	86.8
50–54	23.3	25.4	31.9	41.9	59.0	72.8	77.8	79.8
55–59	17.6	19.3	23.7	31.7	47.2	63.6	69.3	72.1
60–72	8.0	8.0	11.1	15.5	30.1	42.2	48.1	50.8

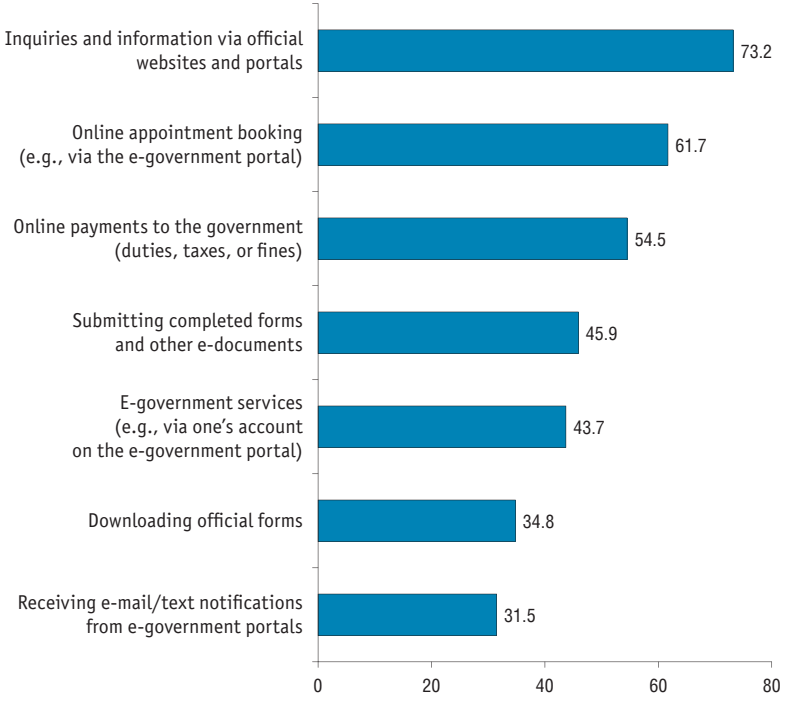
17.6. PUBLIC AND MUNICIPAL SERVICES MOST FREQUENTLY SOUGHT BY INDIVIDUALS IN DIGITAL FORM BY CATEGORY

(as a percentage of individuals aged 15–72 years who have received public and municipal services)



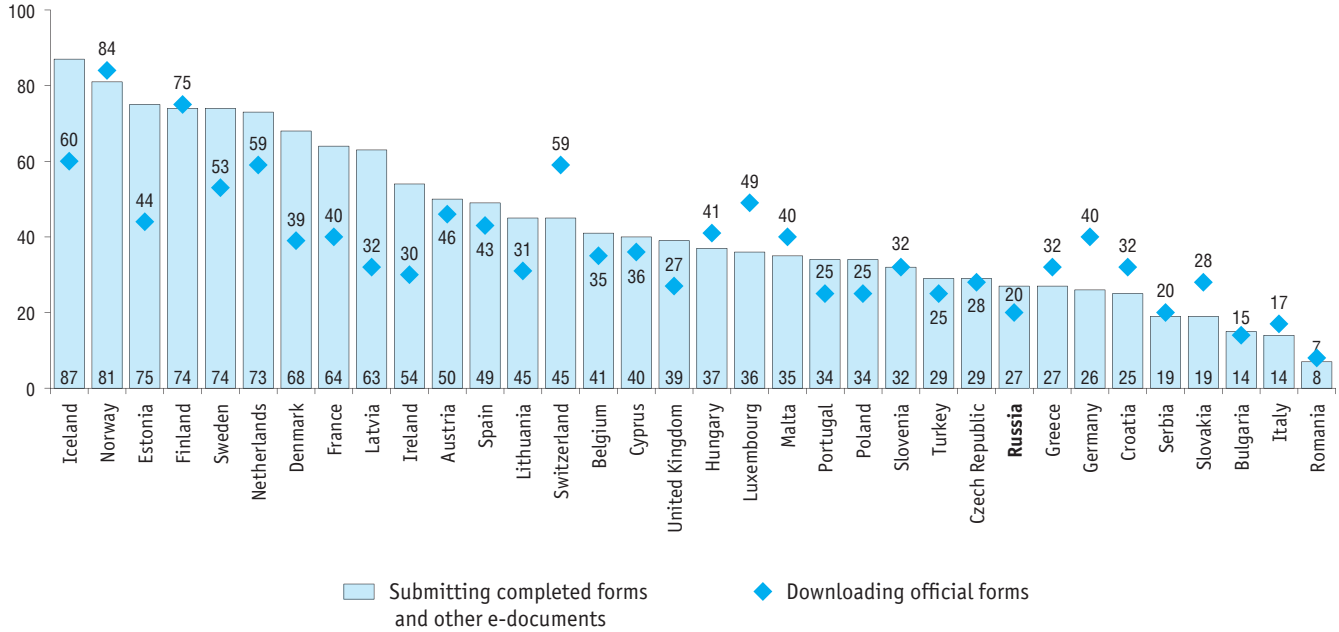
17.7. REASONS FOR INDIVIDUALS' ONLINE INTERACTION WITH PUBLIC AND MUNICIPAL AUTHORITIES: 2020

(as a percentage of individuals aged 15-72 years who use the Internet to receive public and municipal services)



17.8. INDIVIDUALS' ONLINE INTERACTION WITH PUBLIC AUTHORITIES BY COUNTRY: 2019*

*(as a percentage of all individuals aged 15–72**)*

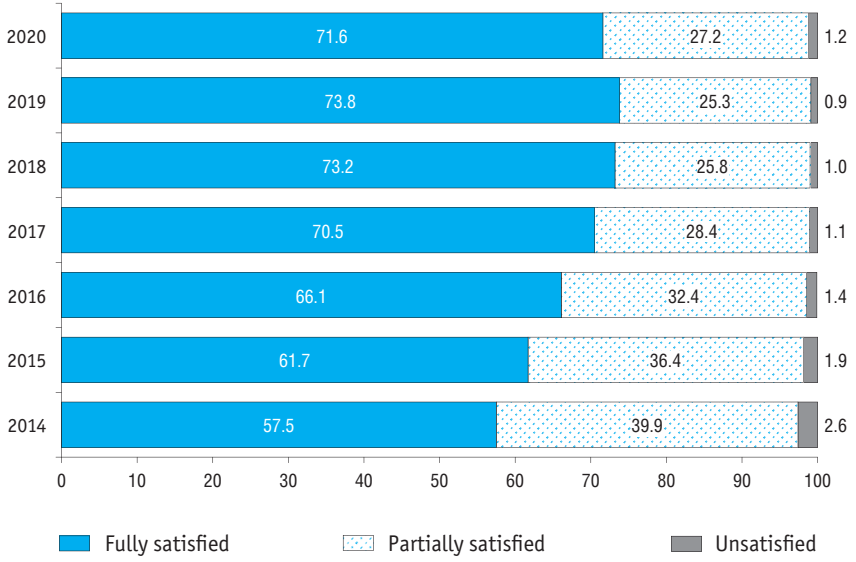


* Or nearest years for which data are available.

** For countries other than Russia, aged 16–74.

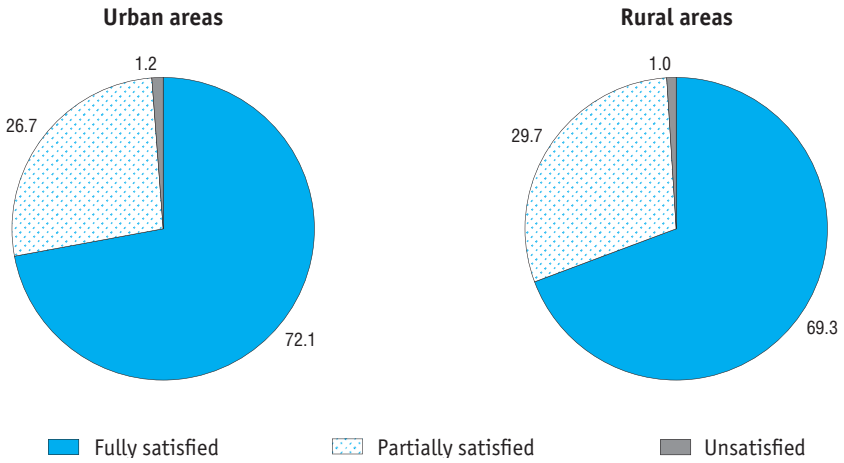
17.9. PUBLIC OPINION ON THE QUALITY OF PUBLIC AND MUNICIPAL SERVICES RECEIVED IN DIGITAL FORM

(as a percentage of individuals aged 15-72 who have used the Internet to receive public and municipal services)



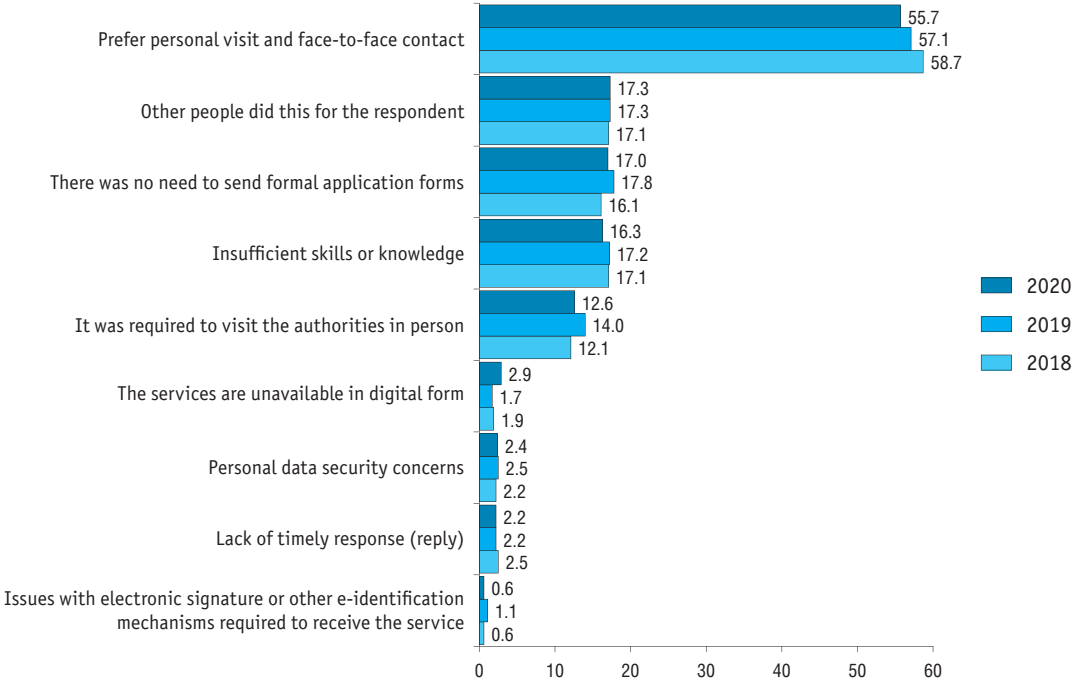
17.10. PUBLIC OPINION ON THE QUALITY OF PUBLIC AND MUNICIPAL SERVICES RECEIVED IN DIGITAL FORM IN URBAN AND RURAL AREAS

(as a percentage of individuals aged 15-72 years who have used the Internet to receive public and municipal services)



17.11. INDIVIDUALS' REASONS TO REFRAIN FROM RECEIVING PUBLIC AND MUNICIPAL SERVICES IN DIGITAL FORM

(as a percentage of individuals aged 15-72 years who who have not used the Internet to receive public and municipal services)



17.12. ENTERPRISES' ONLINE INTERACTION WITH PUBLIC AND MUNICIPAL AUTHORITIES IN BUSINESS ENTERPRISE SECTOR

(as a percentage of all enterprises in business enterprise sector)

	2010	2012	2013	2014	2015	2016	2017	2018	2019
Submitting completed forms online	66.6	69.3	70.2	71.2	69.4	69.4	67.8	69.4	71.5
Downloading official forms (such as statistical or tax return forms)	68.8	70.4	71.1	70.6	69.5	69.6	67.6	68.9	70.7
Obtaining information from websites or apps	51.2	54.9	56.0	57.4	57.7	58.8	58.0	60.2	61.7
Obtaining public and municipal services in digital form (completely paperless)	…	31.5	34.3	34.3	36.3	38.3	39.7	41.9	44.4
E-procurement	24.5	22.4	24.9	25.9	28.7	26.9	26.2	26.0	26.9

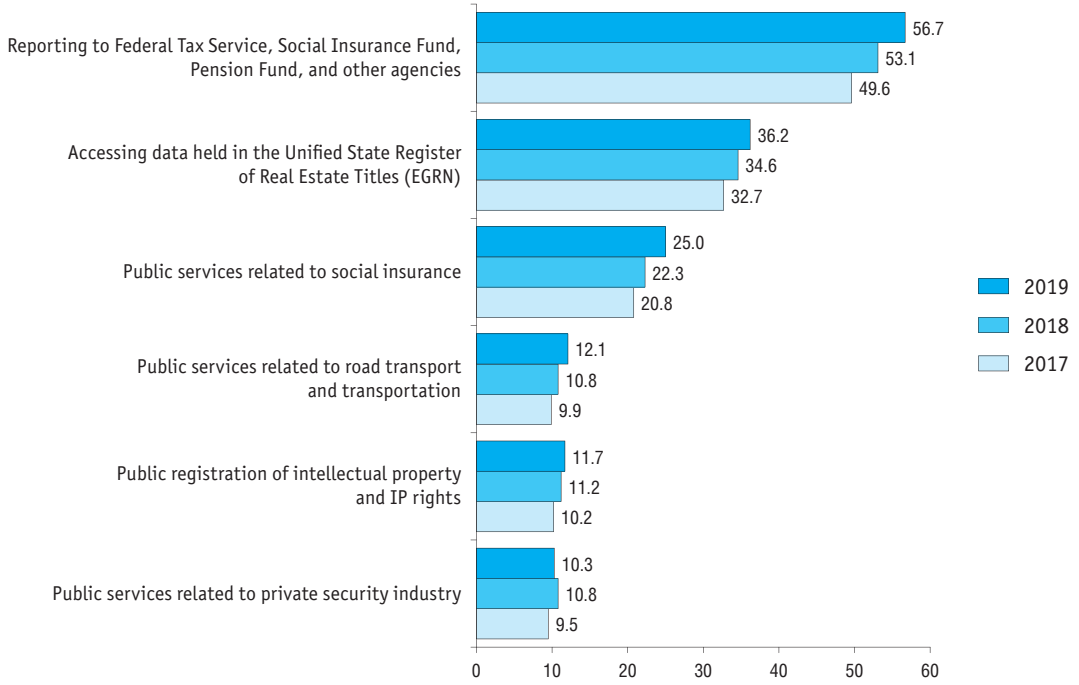
17.13. ENTERPRISES' ONLINE INTERACTION WITH PUBLIC AND MUNICIPAL AUTHORITIES

(as a percentage of all enterprises in business enterprise sector)

	Submitting completed forms online	Downloading official forms (such as statistical or tax return forms)	Obtaining information from websites or apps	Using public and municipal services completely in digital form	E-procurement
Business enterprise sector – total	**71.5**	**70.7**	**61.7**	**44.4**	**26.9**
Mining and quarrying	70.3	70.5	60.7	46.3	14.7
Manufacturing	81.9	80.8	68.8	52.5	25.3
Electricity, gas, steam and air-conditioning supply	79.8	80.2	73.0	50.9	42.4
Water supply, sewerage, waste management and remediation activities	78.1	78.1	64.9	48.3	45.9
Construction	67.3	66.6	56.5	45.1	28.2
Wholesale and retail trade	66.2	64.8	57.2	37.8	14.4
Transportation and storage	66.9	66.9	58.1	40.7	25.7
Accommodation and food service activities	66.1	66.2	57.4	40.2	33.0
Telecommunications	72.8	75.9	68.2	45.4	40.7
IT industry	74.3	74.6	68.7	48.7	31.9
Real estate activities	73.8	71.9	60.8	46.9	29.7
Professional, scientific and technical activities	74.3	73.4	64.6	47.7	35.0
Agriculture – total	**72.3**	**71.4**	**55.7**	**49.8**	**25.5**
Crop production	64.3	63.0	48.7	43.6	12.4
Animal production	76.6	76.1	57.5	55.4	15.8
Forestry and logging	88.7	86.8	71.5	57.7	57.2
Fishing and aquaculture	61.5	64.6	55.4	42.5	16.2

17.14. ENTERPRISES' ONLINE INTERACTION WITH PUBLIC AND MUNICIPAL AUTHORITIES IN BUSINESS ENTERPRISE SECTOR

(as a percentage of all enterprises in business enterprise secto)



17.15. ENTERPRISES' ONLINE INTERACTION WITH PUBLIC AND MUNICIPAL AUTHORITIES: 2019

(as a percentage of all enterprises)

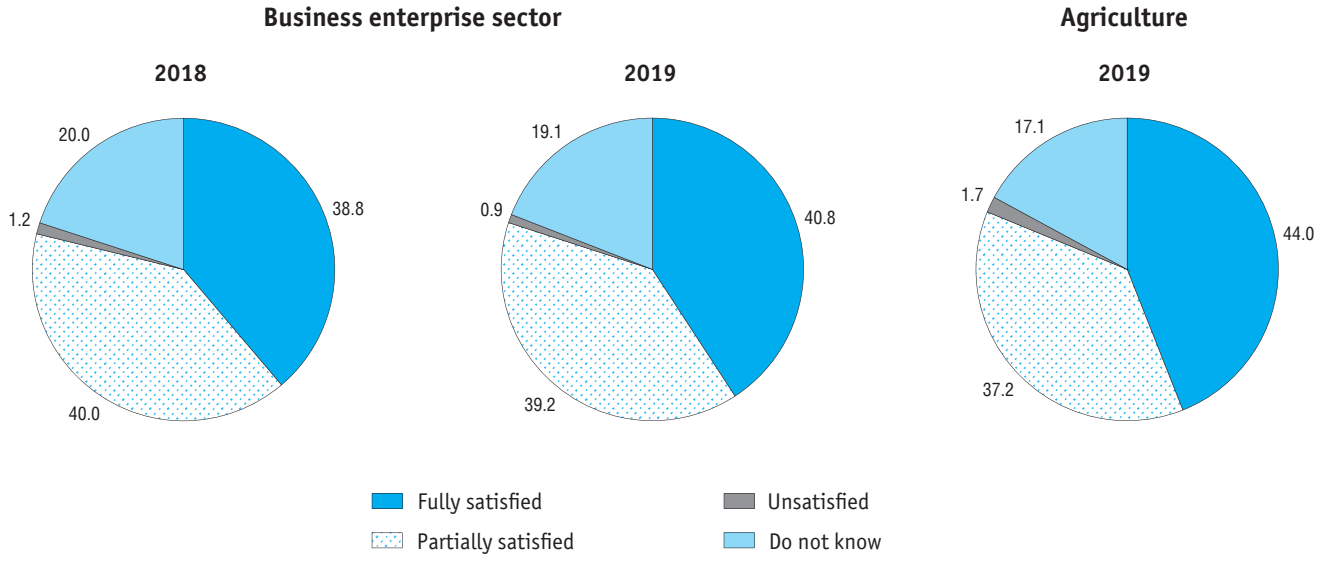
	Reporting to Federal Tax Service, Social Insurance Fund, Pension Fund, and other agencies	Accessing data held in the Unified State Register of Real Estate Titles (EGRN)	Public services related to social insurance
Business enterprise sector – total	**56.7**	**36.2**	**25.0**
Mining and quarrying	59.0	37.8	29.6
Manufacturing	66.0	43.7	36.0
Electricity, gas, steam and air-conditioning supply	65.2	45.8	35.8
Water supply, sewerage, waste management and remediation activities	64.4	35.9	32.2
Construction	55.4	34.9	26.7
Wholesale and retail trade	51.8	37.0	17.2
Transportation and storage	51.9	31.5	26.6
Accommodation and food service activities	45.1	26.7	20.3
Telecommunications	51.4	37.1	29.0
IT industry	56.5	29.4	27.0
Real estate activities	60.0	44.4	24.6
Professional, scientific and technical activities	59.8	32.6	25.2
Agriculture – total	**63.7**	**43.4**	**36.5**
Crop production	57.3	42.1	33.5
Animal production	70.1	49.9	45.4
Forestry and logging	74.0	46.1	38.5
Fishing and aquaculture	48.6	27.8	22.8

(continued)

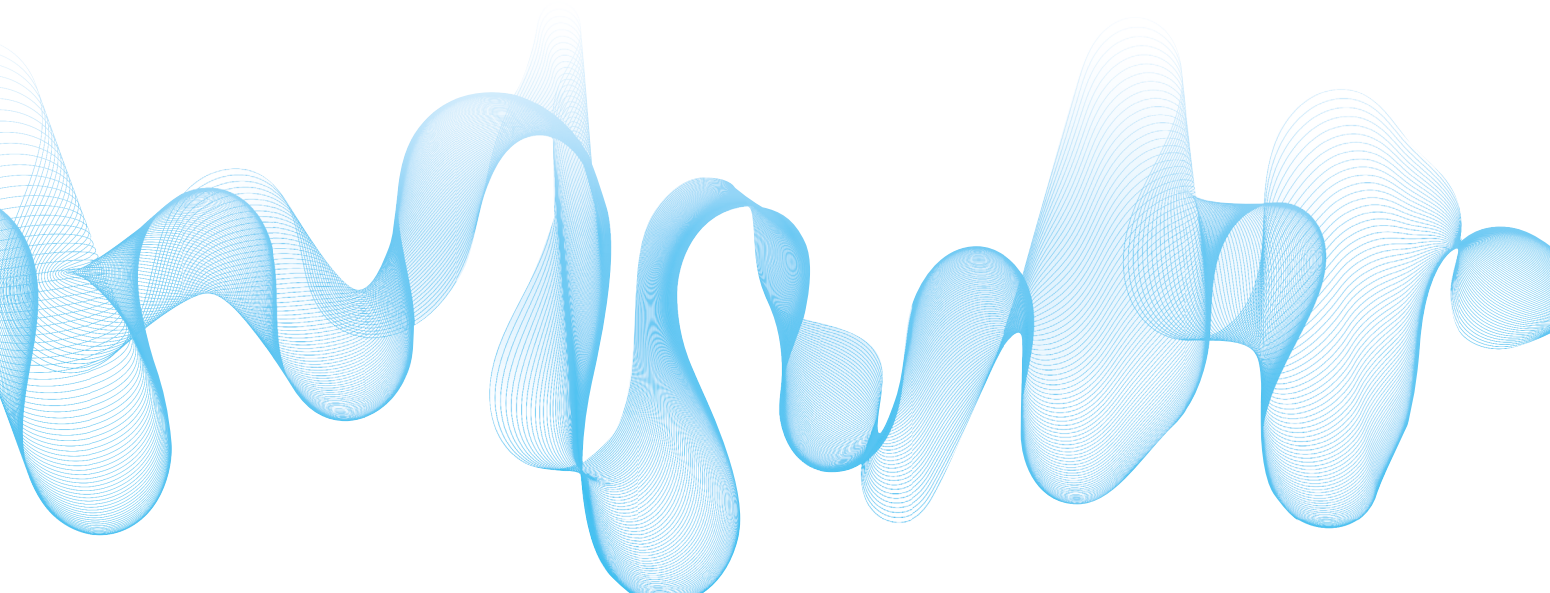
	Public services related to road transport and transportation	Public registration of intellectual property and IP rights	Public services related to private security industry	Other public and municipal services
Business enterprise sector – total	**12.1**	**11.7**	**10.3**	**32.0**
Mining and quarrying	17.6	10.9	8.2	31.0
Manufacturing	20.6	14.0	9.2	34.1
Electricity, gas, steam and air-conditioning supply	16.2	9.7	9.3	39.6
Water supply, sewerage, waste management and remediation activities	13.5	6.8	7.7	35.1
Construction	17.3	7.8	7.6	28.6
Wholesale and retail trade	9.6	16.2	15.6	32.8
Transportation and storage	18.4	5.4	7.6	28.1
Accommodation and food service activities	6.4	5.6	5.7	24.6
Telecommunications	19.8	19.4	11.1	26.4
IT industry	8.0	13.7	8.2	31.1
Real estate activities	8.0	7.1	6.9	30.7
Professional, scientific and technical activities	7.9	10.5	6.8	31.3
Agriculture – total	**19.0**	**7.8**	**5.9**	**32.0**
Crop production	19.0	6.7	5.8	27.0
Animal production	24.2	8.6	5.4	32.8
Forestry and logging	16.7	10.0	8.2	42.6
Fishing and aquaculture	14.2	6.6	4.3	29.9

17.16. ASSESSMENT OF ENTERPRISES ON THE QUALITY OF PUBLIC AND MUNICIPAL SERVICES RECEIVED IN DIGITAL FORM

(as a percentage of enterprises that assessed online services quality)



18 CYBERSECURITY



18.1. INDIVIDUALS EXPERIENCING CYBERSECURITY ISSUES

(as a percentage of individuals aged 15–74 who have used the Internet within the last 12 months)

	2013	2014	2015	2016	2017	2018	2019	2020
Total	**56.8**	**51.1**	**34.2**	**31.1**	**28.8**	**27.9**	**29.5**	**29.1**
Unsolicited e-mails (spam)	27.2	24.5	19.0	18.4	18.5	19.7	22.3	21.8
Malware infections leading to data loss and/or time spent to remove them	44.5	37.7	17.1	13.3	11.4	8.9	7.5	6.4
Unauthorised access to e-mail	2.5	2.1	1.9	1.4	1.8	1.4	1.5	1.4
Unauthorised access to mobile phone	0.7	0.7	0.4	0.7	0.8	0.7	0.8	0.6
Children visiting unsafe websites or communicating with potentially adverse persons online	–	0.8	0.7	0.8	0.8	0.7	0.7	0.8
Unauthorised access to e-mail	–	–	0.6	1.7	0.9	0.7	0.6	0.5
Cash larceny or identity theft	0.2	0.2	0.3	0.2	0.3	0.2	0.3	0.2

Sources: here and below in this section, for Russia, Rosstat (18.1–18.3), HSE ISSEK estimates based on Rosstat data (18.4–18.7); for countries other than Russia, Eurostat.

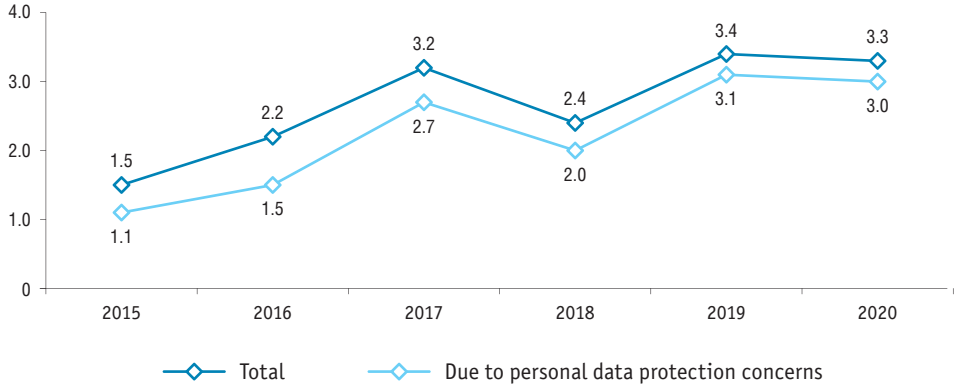
18.2. INDIVIDUALS' USE OF CYBERSECURITY TOOLS

(as a percentage of individuals aged 15–74 who have used the Internet within the last 12 months)

	2013	2014	2015	2016	2017	2018	2019	2020
Total	**84.7**	**83.8**	**85.8**	**85.3**	**83.4**	**83.4**	**78.5**	**75.7**
Anti-virus software	82.7	81.5	83.2	83.3	81.1	81.6	76.0	73.2
Spam filters	14.6	14.5	17.0	18.0	20.5	18.1	18.5	16.2
Parental control and content filtering	1.9	1.9	2.1	2.3	2.9	2.5	2.6	2.3
Other cybersecurity tools	2.6	2.5	2.4	2.1	3.2	1.7	2.1	1.7

18.3. INDIVIDUALS REFUSING TO USE THE INTERNET DUE TO SECURITY CONCERNS

(as a percentage of individuals aged 15–74 who have not used the Internet within the last 12 months)



18.4. ENTERPRISES' USE OF CYBERSECURITY TOOLS IN BUSINESS ENTERPRISE SECTOR

(as a percentage of enterprises in business enterprise sector that have used the Internet)

	2010	2012	2013	2014	2015	2016	2017	2018	2019
Automatically updated anti-virus software	…	84.0	87.4	87.4	86.2	87.6	87.8	88.5	88.2
Electronic signature tools	78.7	82.7	84.5	83.5	83.3	85.3	83.7	83.4	81.9
User authentication tools	…	52.1	57.3	57.1	64.7	64.4	64.6	67.4	68.7
Firewalls (software and hardware)	…	51.6	56.4	58.0	63.3	64.0	64.8	68.0	68.1
Strong password authentication protocols	…	45.0	47.7	46.4	57.6	59.1	61.4	64.2	65.5
Spam filters	…	42.8	47.4	52.5	55.0	57.5	59.3	62.5	62.7
Data encryption for confidentiality facilities	46.6	47.6	47.7	47.1	49.5	50.7	51.3	52.6	48.9
Intrusion detection systems	…	34.9	37.7	38.7	42.1	43.7	45.0	47.5	48.5
Automated IT security control and analysis software	…	26.3	27.5	30.6	33.7	33.8	34.9	38.5	39.6
Off-site data backups	…	27.0	28.0	26.7	31.9	31.2	30.7	33.5	35.4
Biometric user identification and authentication tools	…	6.7	5.0	5.4	6.6	5.2	5.7	8.9	10.1

18.5. ENTERPRISES' USE OF CYBERSECURITY TOOLS: 2019

(as a percentage of enterprises that have used the Internet)

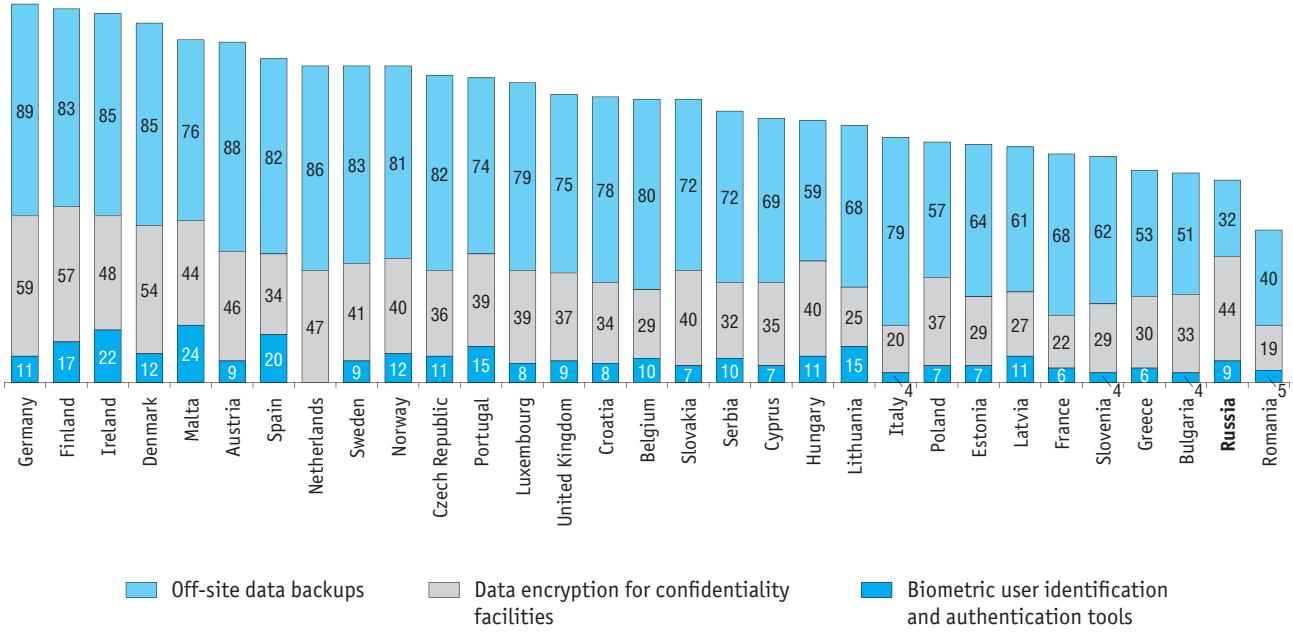
	Automatically updated anti-virus software	Electronic signature tools	User authentication tools	Firewalls (software and hardware)	Strong password authentication protocols
Business enterprise sector – total	**88.2**	**81.9**	**68.7**	**68.1**	**65.5**
Mining and quarrying	92.3	82.7	71.3	76.4	71.8
Manufacturing	89.8	89.7	73.2	73.0	64.6
Electricity, gas, steam and air-conditioning supply	90.3	91.4	73.3	70.1	64.2
Water supply, sewerage, waste management and remediation activities	77.2	91.5	63.3	42.1	42.7
Construction	84.2	83.8	64.5	60.3	56.6
Wholesale and retail trade	89.2	66.7	65.7	75.4	71.6
Transportation and storage	97.6	92.5	74.5	76.2	76.3
Accommodation and food service activities	82.9	88.2	65.4	58.0	59.0
Telecommunications	98.9	84.6	74.4	87.6	87.1
IT industry	90.9	86.2	78.0	78.7	74.0
Real estate activities	78.7	91.6	69.6	51.2	51.6
Professional, scientific and technical activities	84.2	87.0	67.0	60.7	58.7
Agriculture – total	**79.2**	**89.0**	**65.2**	**44.8**	**48.0**
Crop production	78.0	87.5	62.8	46.8	48.3
Animal production	78.0	91.4	66.3	45.1	47.5
Forestry and logging	82.6	95.2	71.0	41.1	49.8
Fishing and aquaculture	86.9	74.4	58.4	57.8	45.6

(continued)

	Spam filters	Data encryption for confidentiality facilities	Intrusion detection systems	Automated IT security control and analysis software	Off-site data backups	Biometric user identification and authentication tools
Business enterprise sector – total	**62.7**	**48.9**	**48.5**	**39.6**	**35.4**	**10.1**
Mining and quarrying	69.8	53.7	51.2	42.0	32.6	4.8
Manufacturing	65.4	55.1	50.2	36.6	34.1	6.2
Electricity, gas, steam and air-conditioning supply	58.6	54.0	44.8	37.0	26.8	3.4
Water supply, sewerage, waste management and remediation activities	34.7	35.6	25.6	23.6	23.0	3.7
Construction	54.5	43.0	43.2	33.4	30.5	4.0
Wholesale and retail trade	74.9	47.1	57.1	47.8	44.9	20.5
Transportation and storage	65.3	57.3	54.2	42.9	33.8	5.3
Accommodation and food service activities	56.3	41.7	41.3	35.3	35.7	14.5
Telecommunications	80.3	71.4	69.8	66.6	46.6	12.2
IT industry	72.0	70.2	61.9	51.9	37.6	6.7
Real estate activities	44.9	40.1	33.6	27.8	25.6	3.7
Professional, scientific and technical activities	54.4	47.2	40.9	32.4	28.8	4.3
Agriculture – total	**37.5**	**34.5**	**28.9**	**24.0**	**27.4**	**4.1**
Crop production	39.9	34.9	31.3	24.3	30.1	4.7
Animal production	38.9	34.0	30.2	24.9	30.5	3.8
Forestry and logging	34.6	35.8	25.8	23.4	24.5	4.5
Fishing and aquaculture	47.2	35.6	39.1	27.5	20.9	4.7

18.6. ENTERPRISES' USE OF CYBERSECURITY TOOLS IN BUSINESS ENTERPRISE SECTOR BY COUNTRY: 2019

(as a percentage of all enterprises in business enterprise sector)



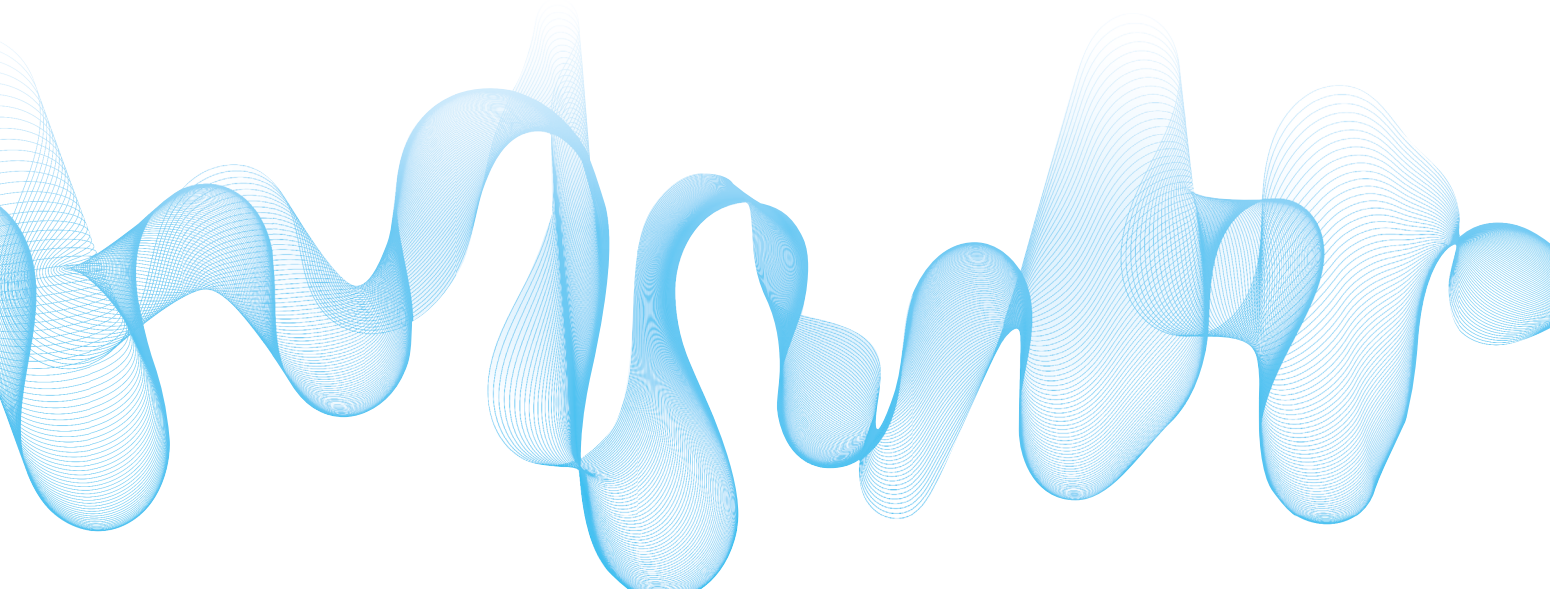
18.7. ENTERPRISES' EXPENDITURE ON CYBERSECURITY GOODS AND SERVICES: 2019**

	Total		As a percentage of the total expenditure on implementation and use of digital technologies
	Million roubles	As a percentage of the total	
Business enterprise sector – total	**86785.2**	**100**	**5.5**
Mining and quarrying	2246.4	2.6	4.7
Manufacturing	4693.4	5.4	2.3
Electricity, gas, steam and air-conditioning supply	1868.1	2.2	3.8
Water supply, sewerage, waste management and remediation activities	205.6	0.2	2.7
Construction	333.9	0.4	1.5
Wholesale and retail trade	19206.9	22.1	12.7
Transportation and storage	2582.8	3.0	2.6
Accommodation and food service activities	84.6	0.1	1.6
Telecommunications	2109.9	2.4	0.7
IT industry	4825.6	5.6	3.4
Real estate activities	390.5	0.4	1.0
Professional, scientific and technical activities	43459.0	50.1	10.3
Agriculture – total	**497.4**	**100**	**4.2**
Crop production	97.0	19.5	3.2
Animal production	111.3	22.4	2.0
Forestry and logging	28.5	5.7	3.9
Fishing and aquaculture	17.7	3.6	1.6

* Excluding small enterprises.

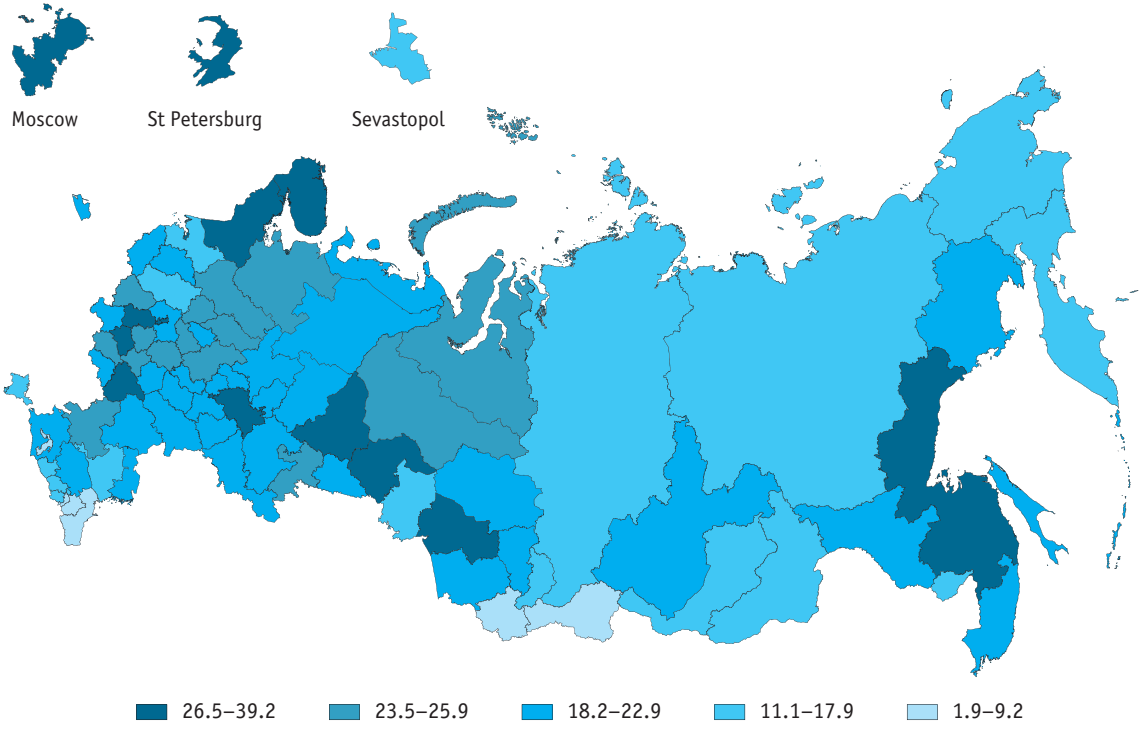
19

MAIN DIGITAL ECONOMY INDICATORS OF RUSSIAN REGIONS



19.1. FIXED BROADBAND SUBSCRIPTIONS IN RUSSIAN REGIONS: 2020

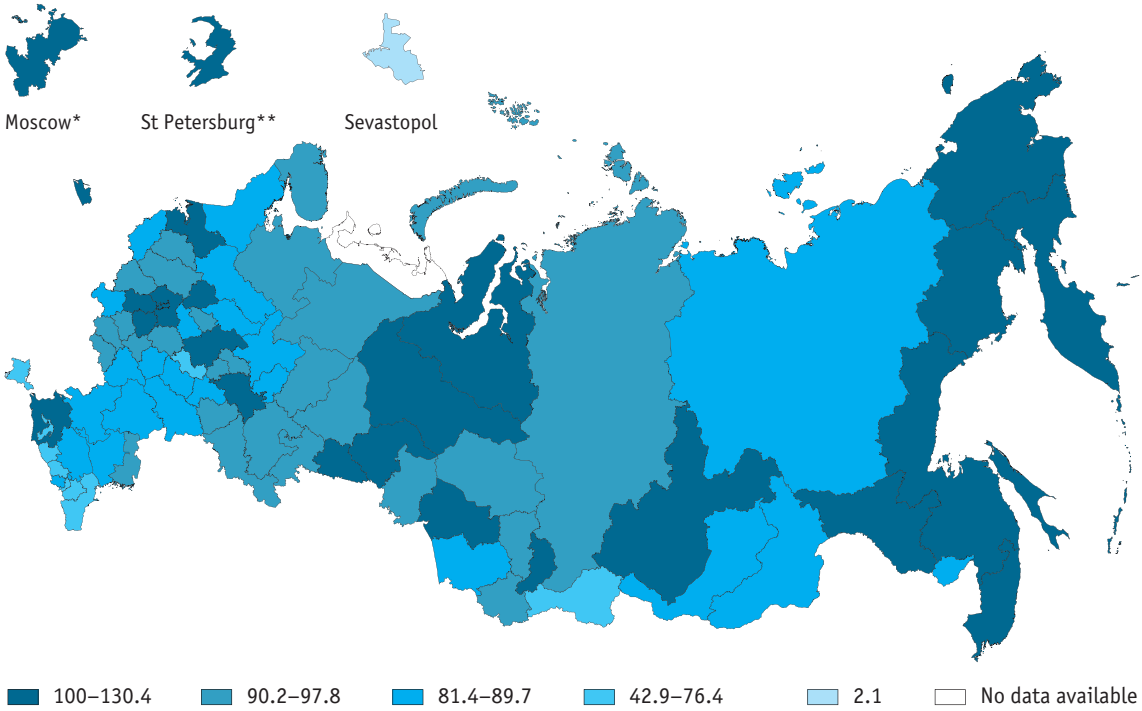
(units per 100 inhabitants; at the end of year)



Sources: here and below in this section, HSE ISSEK estimates based on data provided by Rosstat and the Ministry of Digital Development, Communications, and Mass Media of the Russian Federation.

19.2. MOBILE BROADBAND SUBSCRIPTIONS IN RUSSIAN REGIONS: 2020

(units per 100 inhabitants; at the end of year)

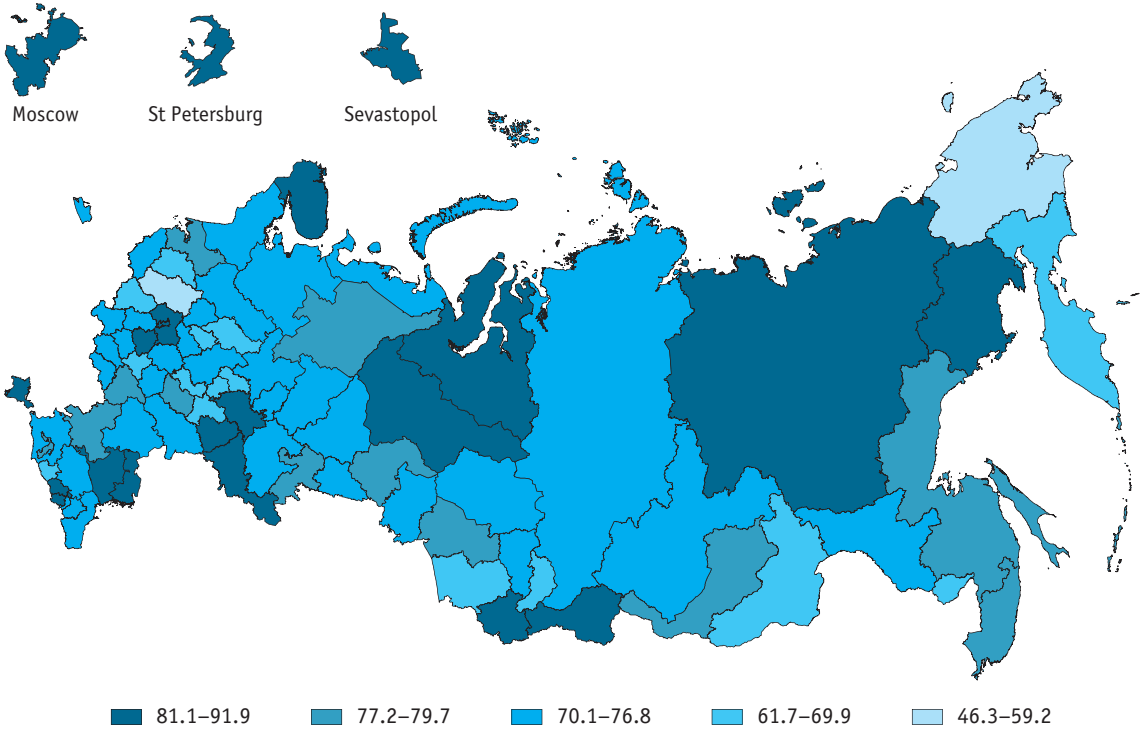


* Aggregated data for Moscow and Moscow Region.

** Aggregated data for St Petersburg and Leningrad Region.

19.3. HOUSEHOLDS WITH BROADBAND ACCESS IN RUSSIAN REGIONS: 2020

(as a percentage of all households)



19.4. TELECOMMUNICATIONS INFRASTRUCTURE AND USE OF INTERNET BY HOUSEHOLDS AND INDIVIDUALS IN RUSSIAN REGIONS: 2020

	Broadband subscriptions per 100 inhabitants, *units*		Households with broadband access as a percentage of all households	Individuals using the Internet		
	fixed	mobile		as a percentage of all individuals aged 15–74	to order goods/services as a percentage of all individuals aged 15–74	to receive public and municipal services in digital form as a percentage of all individuals aged 15–72 who have received public and municipal services
Russia	**23.0**	**99.8**	**77.0**	**89.6**	**40.3**	**81.1**
Central Federal District	**27.8**	**111.0**	**79.6**	**91.8**	**49.0**	**88.5**
Belgorod Region	20.6	92.1	70.6	83.1	43.7	88.6
Bryansk Region	22.9	84.0	73.9	87.3	33.3	81.8
Ivanovo Region	20.2	97.7	67.4	90.1	33.2	93
Kaluga Region	27.4	102.0	74.5	88.5	22.5	65
Kostroma Region	25.5	88.5	63.7	82.4	38.8	68.6
Kursk Region	24.2	92.9	74.0	86.6	33.8	75.9
Lipetsk Region	25.9	91.8	68.8	83.4	27.5	82.3
Moscow Region	22.4	127.4*	86.0	96.6	59.3	93.4
Orel Region	27.5	91.7	70.7	79.9	25.7	71.4
Ryazan Region	24.9	92.5	72.7	85.0	26.6	75
Smolensk Region	23.5	96.9	69.9	88.3	37.3	85.8
Tambov Region	20.4	82.0	72.8	86.2	36.2	76.9
Tula Region	25.6	101.7	89.1	93.6	54.0	86.6
Tver Region	16.7	94.6	59.2	82.2	35.2	68.1
Vladimir Region	24.1	88.1	75.5	84.5	48.1	84.2

(continued)

	Broadband subscriptions per 100 inhabitants, *units*		Households with broadband access as a percentage of all households	Individuals using the Internet		
	fixed	mobile		as a percentage of all individuals aged 15–74	to order goods/services as a percentage of all individuals aged 15–74	to receive public and municipal services in digital form as a percentage of all individuals aged 15–72 who have received public and municipal services
Voronezh Region	28.5	89.7	79.6	87.1	42.0	80.1
Yaroslavl Region	24.9	107.9	72.5	83.8	37.4	84.9
Moscow	36.8	127.4*	87.5	97.6	60.5	93.7
North-Western Federal District	**24.7**	**111.0**	**79.3**	**89.7**	**45.0**	**75.5**
Komi Republic	22.8	95.8	78.2	85.8	36.3	70.4
Republic of Karelia	33.7	87.9	76.5	89.4	37.6	75.4
Arkhangelsk Region	23.6	88.9	75.3	85.0	39.2	75.0
including:						
Nenets Autonomous Region	21.7		72.5	88.8	50.7	77.3
Arkhangelsk Region excluding the Autonomous Region	23.7	92.5	75.4	84.9	38.8	74.9
Kaliningrad Region	21.7	103.3	72.4	87.8	34.9	69.6
Leningrad Region	12.3	128.0**	77.2	88.0	40.0	67.4
Murmansk Region	30.8	97.8	84.2	92.2	50.9	70.5
Novgorod Region	18.7	90.2	66.0	79.0	35.2	74.7
Pskov Region	21.1	85.8	72.5	84.1	35.5	66.7
Vologda Region	23.6	88.2	70.2	86.0	41.8	81.2
St Petersburg	29.6	128.0**	87.0	94.4	54.0	81.1

(continued)

	Broadband subscriptions per 100 inhabitants, *units*		Households with broadband access as a percentage of all households	Individuals using the Internet		
	fixed	mobile		as a percentage of all individuals aged 15–74	to order goods/services as a percentage of all individuals aged 15–74	to receive public and municipal services in digital form as a percentage of all individuals aged 15–72 who have received public and municipal services
Southern Federal District	**19.8**	**90.1**	**76.6**	**89.7**	**34.9**	**82.0**
Republic of Adygea	9.2	55.0	78.4	84.5	16.7	81.0
Republic of Crimea	14.5	42.9	81.6	91.3	27.3	76.4
Republic of Kalmykia	14.2	81.4	82.6	88.5	33.0	72.6
Astrakhan Region	18.2	91.4	87.3	91.5	39.3	90.8
Krasnodar Region	20.5	119.5	71.4	87.5	30.1	73.9
Rostov Region	23.8	89.0	78.1	90.9	43.5	86.3
Volgograd Region	18.8	86.1	74.7	91.3	35.1	88.1
Sevastopol	17.9	2.1	82.7	92.4	52.4	87.3
North Caucasian Federal District	**10.2**	**70.8**	**75.8**	**91.6**	**36.9**	**74.5**
Chechen Republic	6.0	62.1	74.6	94.5	26.2	61.7
Kabardino-Balkarian Republic	11.1	76.4	86.6	91.6	21.9	83.1
Karachay-Cherkess Republic	11.2	68.4	68.7	87.0	22.7	82.2
Republic of Dagestan	4.2	58.4	74.2	94.1	48.0	72.2
Republic of Ingushetia	1.9	51.8	76.3	84.6	28.6	78.7
Republic of North Ossetia–Alania	17.9	84.0	83.2	95.9	29.8	73.8
Stavropol Region	18.4	88.4	74.1	88.4	40.0	79.6

(continued)

	Broadband subscriptions per 100 inhabitants, *units*		Households with broadband access as a percentage of all households	Individuals using the Internet		
	fixed	mobile		as a percentage of all individuals aged 15–74	to order goods/services as a percentage of all individuals aged 15–74	to receive public and municipal services in digital form as a percentage of all individuals aged 15–72 who have received public and municipal services
Volga Federal District	**22.7**	**96.3**	**75.1**	**87.8**	**36.3**	**79.7**
Chuvash Republic	22.3	91.4	68.2	80.6	32.3	74.3
Mari El Republic	18.3	91.5	66.6	85.4	27.8	74.1
Republic of Bashkortostan	22.0	91.9	70.5	86.1	30.7	73.1
Republic of Mordovia	19.2	75.9	63.0	84.7	28.2	79.0
Republic of Tatarstan	28.0	108.6	82.9	93.4	36.9	90.2
Udmurt Republic	21.1	89.5	73.7	82.2	40.5	68.6
Kirov Region	21.3	86.3	75.3	83.3	43.2	71.3
Nizhny Novgorod Region	24.0	118.1	75.1	86.1	46.0	81.0
Orenburg Region	19.2	94.9	82.5	91.4	39.5	85.4
Penza Region	19.9	88.0	78.2	88.1	35.0	79.9
Perm Region	22.0	94.8	71.9	87.3	37.2	76.1
Samara Region	22.9	94.7	81.1	91.5	38.7	87.4
Saratov Region	22.5	88.5	72.5	90.2	37.6	75.6
Ulyanovsk Region	21.7	86.8	68.6	83.7	15.8	84.2
Ural Federal District	**25.6**	**101.0**	**78.3**	**89.3**	**44.6**	**78.3**
Chelyabinsk Region	25.5	94.6	78.5	88.5	45.5	77.0
Kurgan Region	21.3	101.6	76.8	82.1	25.4	77.8
Sverdlovsk Region	26.5	96.2	73.1	88.9	40.8	74.2

(continued)

	Broadband subscriptions per 100 inhabitants, *units*		Households with broadband access as a percentage of all households	Individuals using the Internet		
	fixed	mobile		as a percentage of all individuals aged 15–74	to order goods/services as a percentage of all individuals aged 15–74	to receive public and municipal services in digital form as a percentage of all individuals aged 15–72 who have received public and municipal services
Tyumen Region	25.4	105.8	85.9	92.1	52.5	83.3
including:						
Khanty-Mansi Autonomous Region – Yugra	24.1	112.3	90.9	96.7	60.8	81.4
Yamal-Nenets Autonomous Region	24.0	130.4	91.9	96.9	71.9	92.6
Tyumen Region excluding autonomous regions	27.4	105.8	78.4	85.1	36.2	82.0
Siberian Federal District	**21.4**	**96.7**	**72.8**	**86.9**	**31.6**	**74.2**
Altai Republic	8.6	90.6	84.2	85.5	29.0	66.4
Republic of Khakassia	13.6	109.4	67.2	86.9	22.7	72.2
Republic of Tuva	6.9	62.1	91.8	94.9	27.9	94.8
Altai Region	19.0	89.7	68.5	85.6	32.4	71.4
Irkutsk Region	20.2	106.1	71.2	87.9	35.2	76.2
Kemerovo Region	18.3	92.0	73.5	83.7	25.6	72.1
Krasnoyarsk Region	16.8	95.3	70.1	87.5	27.8	76.4
Novosibirsk Region	39.2	103.2	77.5	88.0	34.8	73.4
Omsk Region	17.0	96.1	74.0	88.8	36.8	75.3
Tomsk Region	21.1	95.9	74.2	86.3	34.1	72.6

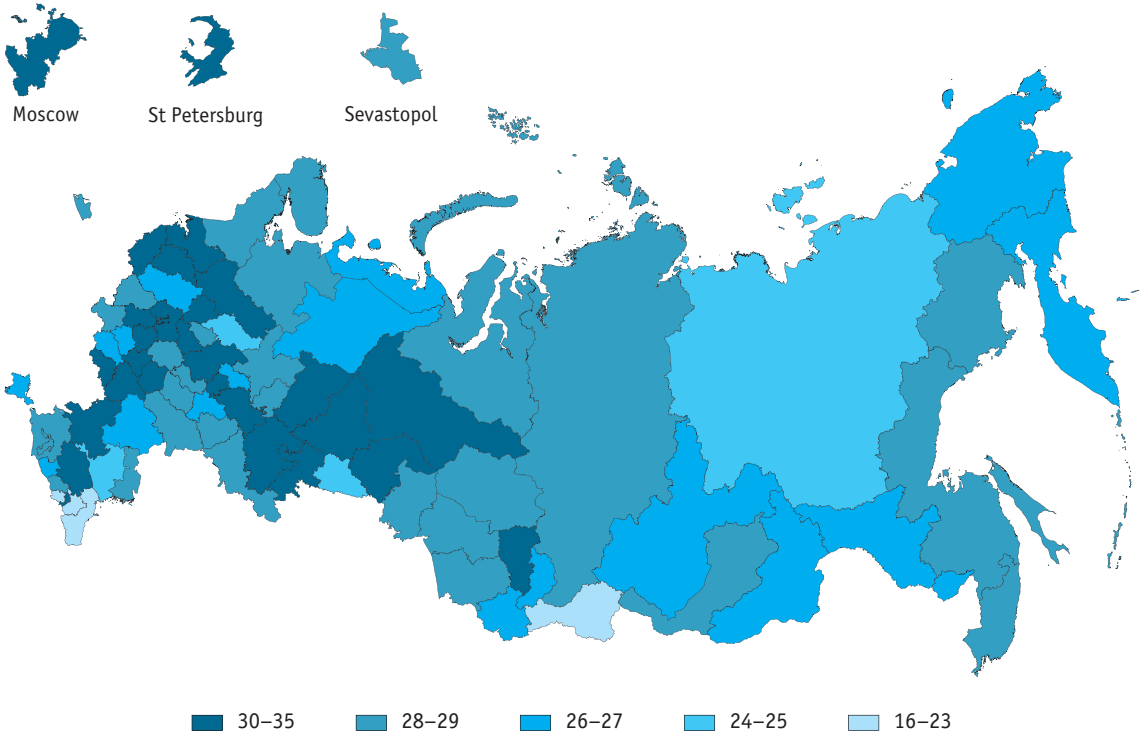
(continued)

	Broadband subscriptions per 100 inhabitants, *units*		Households with broadband access as a percentage of all households	Individuals using the Internet		
	fixed	mobile		as a percentage of all individuals aged 15–74	to order goods/services as a percentage of all individuals aged 15–74	to receive public and municipal services in digital form as a percentage of all individuals aged 15–72 who have received public and municipal services
Far Eastern Federal District	**19.0**	**98.7**	**75.7**	**89.0**	**31.4**	**72.8**
Republic of Buryatia	15.5	86.7	77.6	85.6	40.9	67.3
Republic of Sakha (Yakutia)	17.3	89.3	81.5	95.6	36.8	80.1
Amur Region	18.9	100.0	72.4	88.0	25.6	85.8
Chukotka Autonomous Region	12.0	102.3	46.3	96.1	43.6	61.3
Jewish Autonomous Region	16.4	83.7	65.8	85.1	25.0	52.3
Kamchatka Region	16.9	105.8	69.6	91.4	43.0	65.0
Khabarovsk Region	26.5	104.9	79.7	92.7	32.1	71.2
Magadan Region	20.7	102.0	86.5	91.3	37.2	49.1
Primorsky Region	18.3	107.3	79.3	88.7	28.5	73.0
Sakhalin Region	18.4	110.8	77.4	88.7	38.2	93.1
Trans-Baikal Region	17.6	88.5	61.7	82.0	19.4	63.5

* Aggregated data for Moscow and Moscow Region.

** Aggregated data for St Petersburg and Leningrad Region.

19.5. BUSINESS DIGITALISATION INDEX IN RUSSIAN REGIONS: 2019*



* The digitalisation index is calculated for enterprises, institutions, and authrorities of the business enterprise and financial sectors, agriculture, social sphere, public and municipal authorities (OKVED2 code: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, Q, R (excluding 84.23.4, 84.24), 85.22, 85.23, and 95).

19.6. DIGITALISATION INDEX AND USE OF DIGITAL TECHNOLOGIES IN BUSINESS ENTERPRISE SECTOR IN RUSSIAN REGIONS: 2019

	Digitalisation index	Enterprises using digital technologies as a percentage of the total number of enterprises				
		Broadband Internet	Cloud computing services	ERP software	E-sales	RFID technologies
Russia	29	**86.6**	**28.1**	**14.8**	**11.3**	**6.3**
Central Federal District	31	**88.5**	**31.5**	**17.5**	**11.8**	**6.7**
Belgorod Region	32	92.0	31.8	17.1	14.9	6.6
Bryansk Region	28	90.0	22.1	11.1	10.4	4.0
Ivanovo Region	29	87.3	29.9	12.1	10.5	5.0
Kaluga Region	31	87.7	31.9	17.7	11.5	4.5
Kostroma Region	25	78.9	17.9	12.1	9.5	5.5
Kursk Region	27	80.2	29.3	13.0	8.4	5.7
Lipetsk Region	30	91.0	28.9	14.0	11.4	6.5
Moscow Region	33	86.3	35.0	24.3	13.1	7.9
Orel Region	27	84.8	24.3	10.7	8.7	5.6
Ryazan Region	29	85.6	28.6	14.6	11.2	5.5
Smolensk Region	29	86.8	27.2	12.4	11.4	5.4
Tambov Region	33	95.2	39.7	13.2	8.8	5.6
Tula Region	30	85.3	28.3	17.5	11.3	7.1
Tver Region	27	84.0	24.6	11.7	9.4	4.6
Vladimir Region	30	91.6	28.1	12.5	11.7	4.7
Voronezh Region	30	87.8	28.8	16.3	11.1	6.1
Yaroslavl Region	32	90.7	29.7	17.9	13.0	6.5
Moscow	35	93.8	37.9	21.1	13.5	8.8

Distribution of Digitisation Index values:

30–35 28–29 26–27 24–25 16–23

(continued)

	Digitalisation index	Enterprises using digital technologies as a percentage of the total number of enterprises				
		Broadband Internet	Cloud computing services	ERP software	E-sales	RFID technologies
North-Western Federal District	30	**88.9**	**28.5**	**15.6**	**12.4**	**6.7**
Komi Republic	27	87.1	24.0	12.8	6.4	5.7
Republic of Karelia	28	89.0	23.0	13.0	8.9	5.3
Arkhangelsk Region	28	84.2	27.1	14.4	10.3	6.1
including:						
Nenets Autonomous Region	26	84.2	22.9	8.7	8.7	3.7
Arkhangelsk Region excluding the Autonomous Region	29	84.2	27.6	15.1	10.5	6.4
Kaliningrad Region	29	90.3	26.3	12.4	8.1	7.2
Leningrad Region	31	89.6	27.2	16.1	14.4	6.5
Murmansk Region	29	93.1	25.7	12.9	8.6	6.2
Novgorod Region	33	86.6	42.6	19.5	10.3	5.3
Pskov Region	30	85.6	28.7	14.0	13.6	6.2
Vologda Region	30	93.7	25.8	13.2	11.6	6.3
St Petersburg	33	89.4	31.3	19.2	17.4	8.3
Southern Federal District	29	**86.6**	**26.4**	**13.0**	**10.8**	**6.3**
Republic of Adygea	29	89.9	27.8	11.9	11.8	6.1
Republic of Crimea	27	87.2	26.6	6.3	9.3	4.6
Republic of Kalmykia	25	86.3	17.1	9.9	7.4	2.5
Astrakhan Region	29	88.9	26.0	14.1	10.3	6.5
Krasnodar Region	29	87.5	25.8	14.2	10.9	6.7

Distribution of Digitisation Index values:

30–35 28–29 26–27 24–25 16–23

(continued)

	Digitalisation index	Enterprises using digital technologies as a percentage of the total number of enterprises				
		Broadband Internet	Cloud computing services	ERP software	E-sales	RFID technologies
Rostov Region	31	89.4	29.5	15.8	12.6	6.1
Volgograd Region	27	80.0	25.0	12.4	10.3	6.9
Sevastopol	28	88.0	26.4	5.4	7.8	11.3
North Caucasian Federal District	**23**	**74.5**	**24.9**	**7.2**	**7.4**	**3.4**
Chechen Republic	23	70.0	37.7	3.7	0.1	2.3
Kabardino-Balkarian Republic	28	87.0	32.7	8.8	6.8	3.6
Karachay-Cherkess Republic	27	85.3	25.4	8.9	9.6	4.3
Republic of Dagestan	16	58.5	12.8	2.7	5.2	1.6
Republic of Ingushetia	34	95.6	32.7	9.1	28.9	4.7
Republic of North Ossetia–Alania	21	67.9	19.9	8.0	7.2	3.2
Stavropol Region	30	89.8	28.7	13.5	12.2	5.9
Volga Federal District	**30**	**88.7**	**28.5**	**15.6**	**11.8**	**6.1**
Chuvash Republic	30	93.5	25.5	13.8	12.1	6.3
Mari El Republic	27	86.9	24.3	11.3	9.6	4.7
Republic of Bashkortostan	30	87.0	26.8	16.0	12.2	6.3
Republic of Mordovia	29	93.8	25.7	12.6	9.8	4.6
Republic of Tatarstan	34	91.3	38.9	16.6	15.9	7.4
Udmurt Republic	28	88.2	22.9	13.8	10.5	5.4
Kirov Region	28	91.3	23.5	12.1	9.1	4.4
Nizhny Novgorod Region	32	92.3	29.6	16.2	14.1	6.8

Distribution of Digitisation Index values:

30–35 28–29 26–27 24–25 16–23

(continued)

	Digitalisation index	Enterprises using digital technologies as a percentage of the total number of enterprises				
		Broadband Internet	Cloud computing services	ERP software	E-sales	RFID technologies
Orenburg Region	29	95.2	23.4	12.2	8.2	4.9
Penza Region	28	86.7	24.2	12.6	10.3	5.4
Perm Region	34	89.7	38.8	23.1	11.1	6.3
Samara Region	29	82.8	25.6	16.3	12.8	6.8
Saratov Region	28	81.7	25.7	14.7	11.0	6.3
Ulyanovsk Region	26	85.4	20.8	13.5	6.3	4.8
Ural Federal District	30	**86.3**	**27.2**	**17.3**	**13.6**	**7.2**
Chelyabinsk Region	30	86.8	27.8	17.0	12.9	6.5
Kurgan Region	24	76.2	21.0	10.5	9.8	4.4
Sverdlovsk Region	32	89.6	30.4	17.4	14.5	7.4
Tyumen Region	30	85.5	25.7	19.1	14.1	8.1
including:						
Khanty-Mansi Autonomous Region – Yugra	31	86.9	25.5	18.9	14.7	7.3
Yamal-Nenets Autonomous Region	29	84.5	23.8	17.0	11.6	7.5
Tyumen Region excluding autonomous regions	31	84.5	27.0	20.6	14.9	9.6
Siberian Federal District	28	**83.8**	**25.9**	**13.0**	**10.5**	**6.4**
Altai Republic	26	88.6	23.0	5.8	8.5	4.2
Republic of Khakassia	27	84.3	24.5	11.3	10.4	6.1
Republic of Tuva	23	73.2	20.0	6.5	9.3	4.3

Distribution of Digitisation Index values:

30–35 28–29 26–27 24–25 16–23

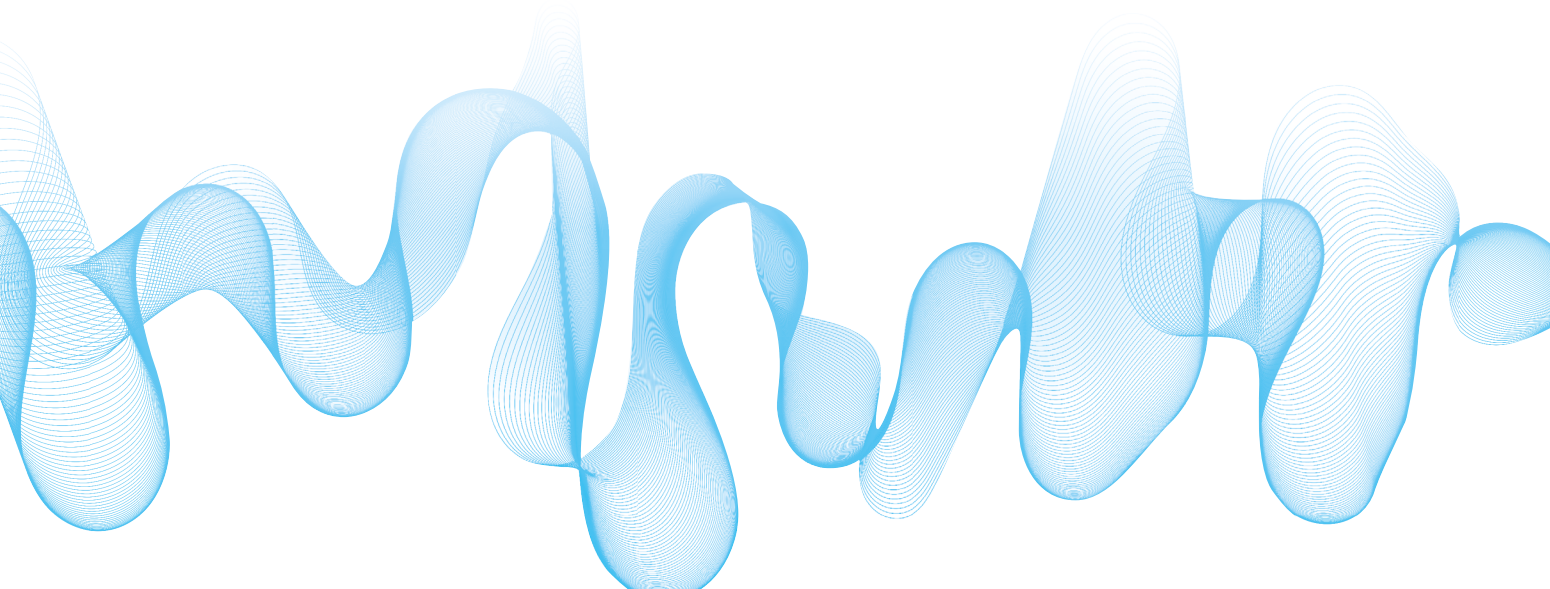
(continued)

	Digitalisation index	Enterprises using digital technologies as a percentage of the total number of enterprises				
		Broadband Internet	Cloud computing services	ERP software	E-sales	RFID technologies
Altai Region	28	85.6	26.2	11.1	13.3	6.0
Irkutsk Region	26	78.8	26.8	11.8	6.0	5.4
Kemerovo Region	30	85.9	25.7	16.3	12.8	8.5
Krasnoyarsk Region	28	86.1	26.4	12.9	10.9	6.1
Novosibirsk Region	29	82.6	28.1	14.8	11.5	6.3
Omsk Region	28	88.5	22.1	12.0	8.6	6.4
Tomsk Region	28	80.2	26.9	15.0	12.8	7.4
Far Eastern Federal District	27	**84.6**	**24.3**	**10.2**	**9.4**	**6.1**
Republic of Buryatia	28	81.7	28.0	11.1	12.7	7.0
Republic of Sakha (Yakutia)	24	74.2	22.6	6.9	9.8	4.3
Amur Region	27	84.4	22.4	10.4	9.3	6.7
Chukotka Autonomous Region	27	94.6	20.9	7.3	4.6	7.1
Jewish Autonomous Region	26	83.3	20.6	10.5	8.0	6.4
Kamchatka Region	26	91.4	22.6	7.9	2.8	4.8
Khabarovsk Region	29	90.2	24.5	12.3	11.1	6.7
Magadan Region	28	88.8	26.7	9.4	9.4	4.1
Primorsky Region	28	87.6	26.2	12.2	9.1	6.7
Sakhalin Region	28	87.4	24.0	11.3	11.0	6.1
Trans-Baikal Region	26	83.2	25.1	9.3	7.7	6.6

Distribution of Digitisation Index values:

30–35 28–29 26–27 24–25 16–23

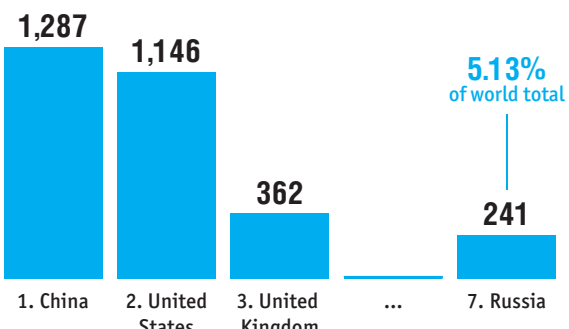
20 DIGITAL TECHNOLOGIES



20.1. QUANTUM TECHNOLOGIES

Number of publications*: 2020

4,695
world total

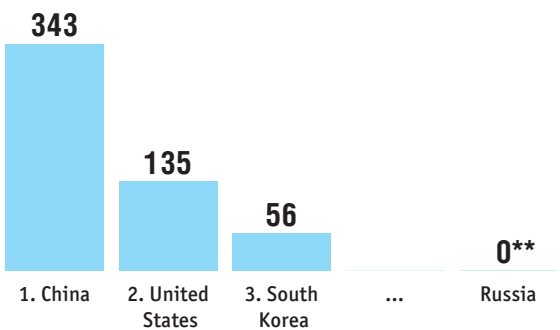


* Here and below in this section the term 'publication' refers to Scopus-indexed documents of the following types: articles, reviews, conference papers, books, book chapters, notes, letters.

Sources: here and below in this section, HSE ISSEK estimates based on Scopus data as at March 11, 2021.

Number of patent applications: 2018

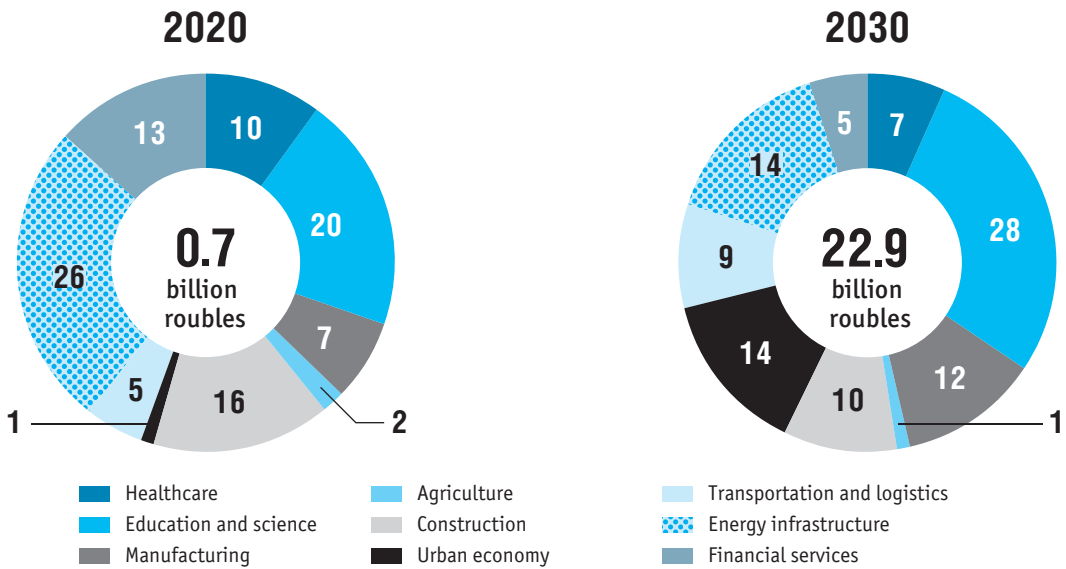
601
world total



** *For reference:* in 2017, Russian applicants filed 3 patent applications related to quantum technologies (0.93% of the world total).

Sources: here and below in this section, HSE ISSEK estimates based on PatStat Global data as at April 01, 2021.

Percentage distribution of demand in economy sectors and social sphere*

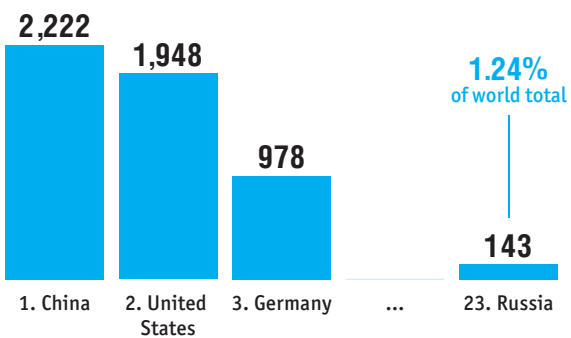


* Here and below in this section, the volume of demand on digital technologies was calcualted by HSE ISSEK for priority sectors of the economy and social sphere (Decree of the President of the Russian Federation of July 21, 2020 no. 474 'On the 2030 National Development Goals of the Russian Federation') in April 2021.

20.2. ROBOTICS COMPONENTS AND SENSORICS

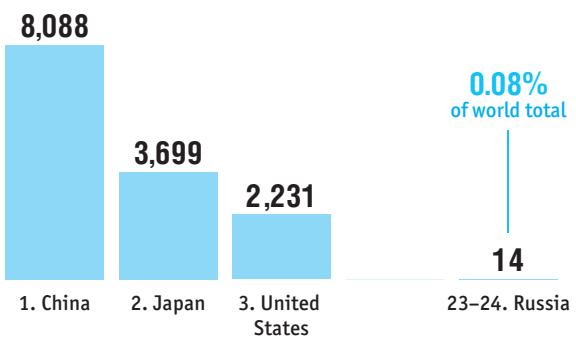
Number of publications: 2020

11,497
world total



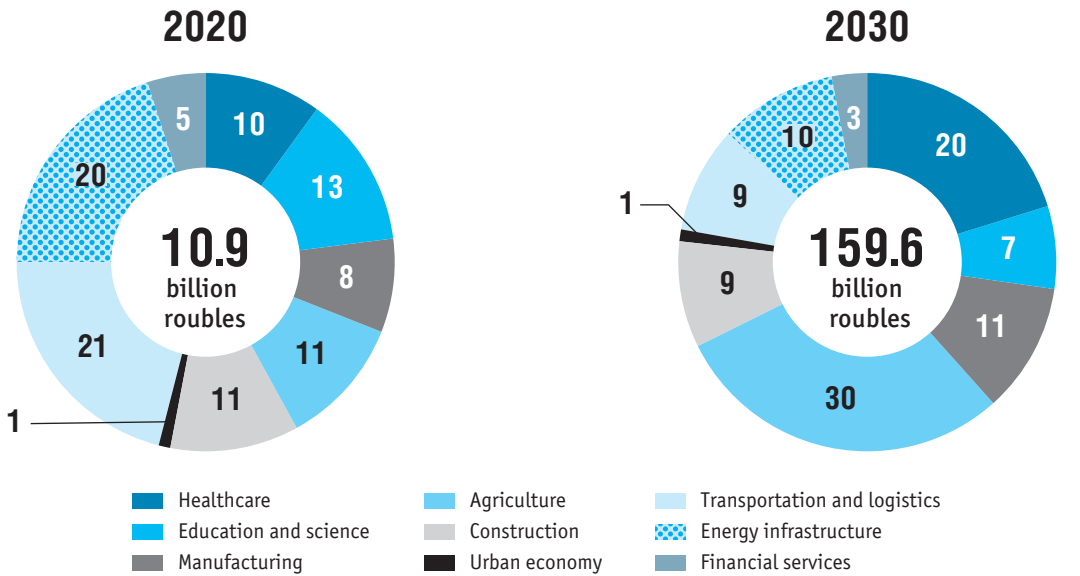
Number of patent applications: 2018*

17,548
world total



* Due to changes in methodology, the 2017 data are unsuitable for comparison.

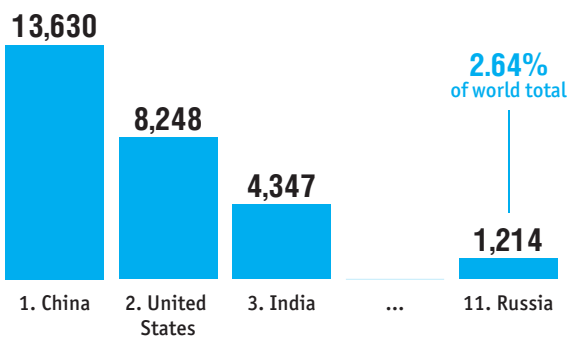
Percentage distribution of demand in economy sectors and social sphere



20.3. NEUROTECHNOLOGIES AND ARTIFICIAL INTELLIGENCE

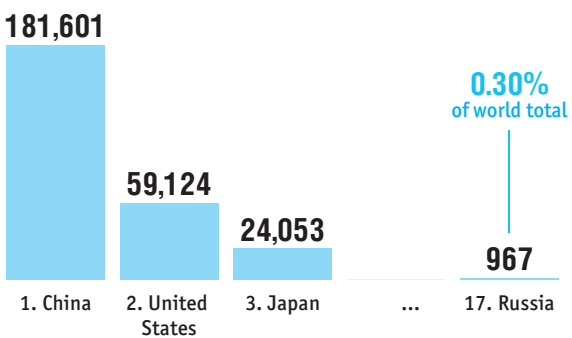
Number of publications: 2020

46,053
world total

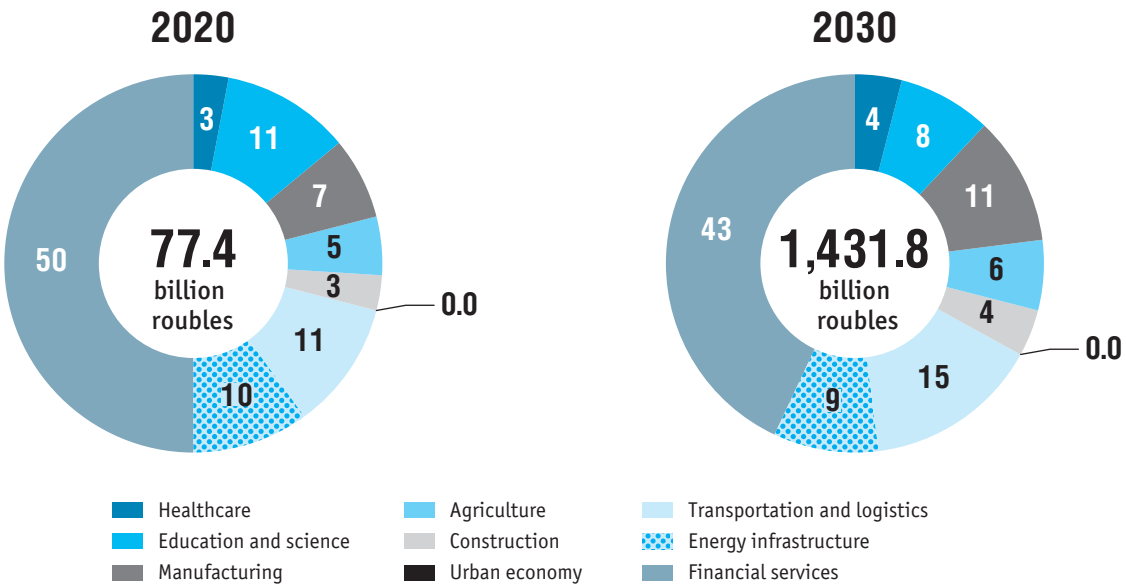


Number of patent applications: 2018

327,879
world total



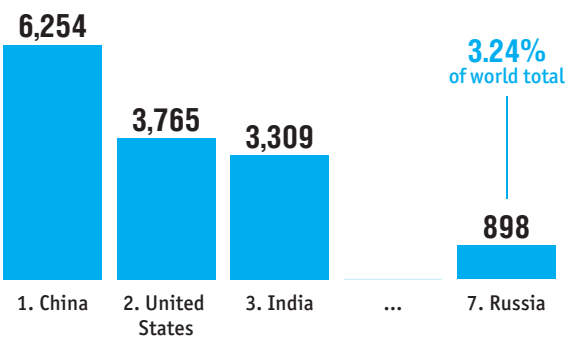
Percentage distribution of demand in economy sectors and social sphere



20.4. ADVANCED MANUFACTURING TECHNOLOGIES

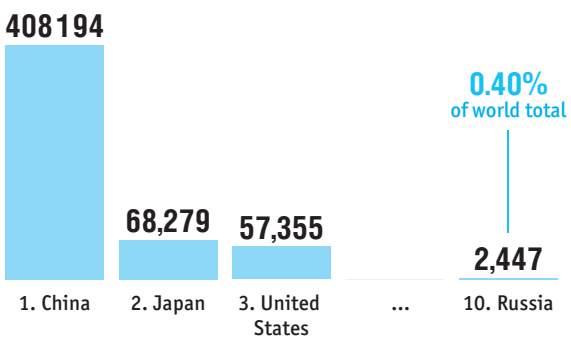
Number of publications: 2020

27,679
world total

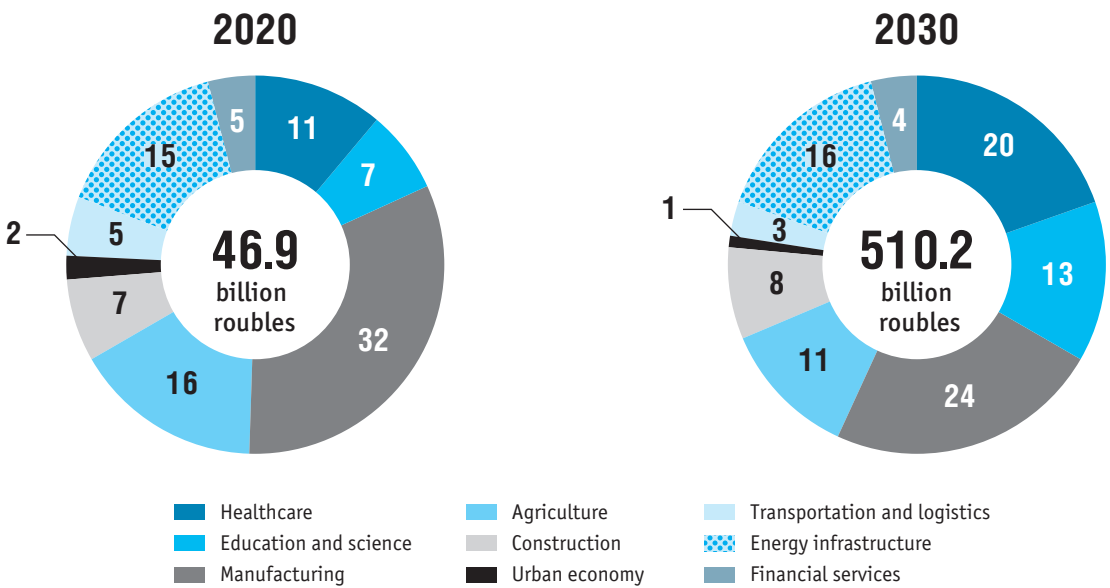


Number of patent applications: 2018

644,924
world total



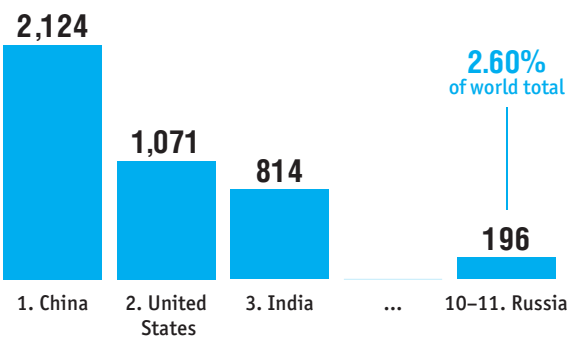
Percentage distribution of demand in economy sectors and social sphere



20.5. DISTRIBUTED LEDGER SYSTEMS

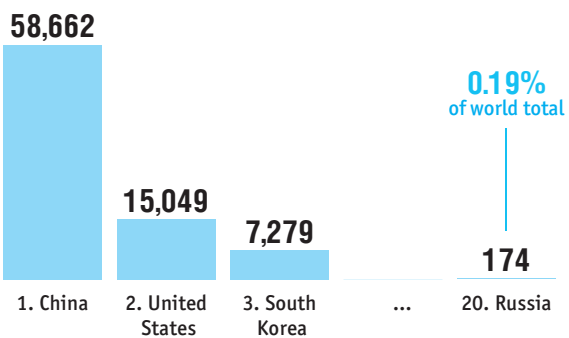
Number of publications: 2020

7,547
world total

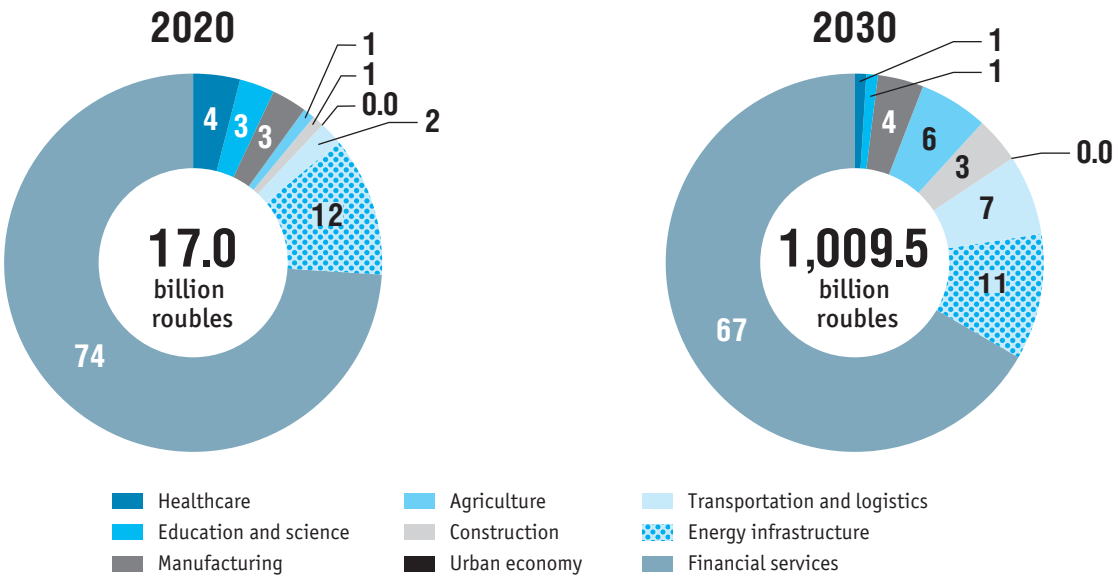


Number of patent applications: 2018

94,009
world total



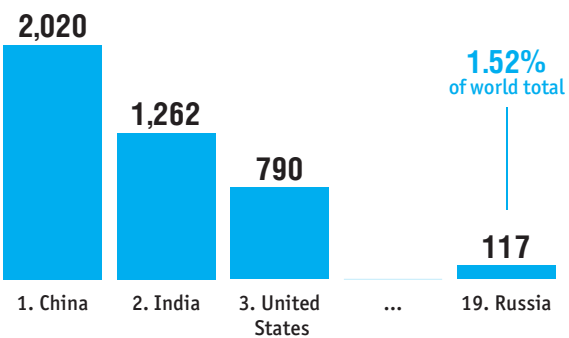
Percentage distribution of demand in economy sectors and social sphere



20.6. WIRELESS COMMUNICATION TECHNOLOGIES

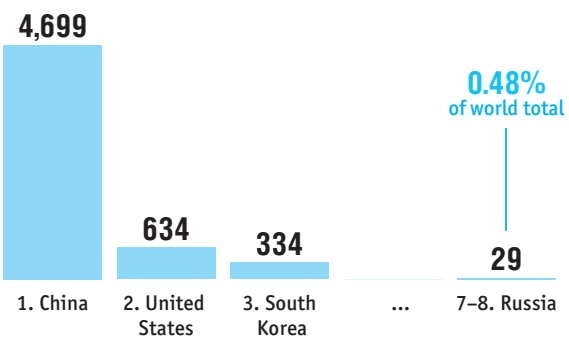
Number of publications: 2020

7,714
world total

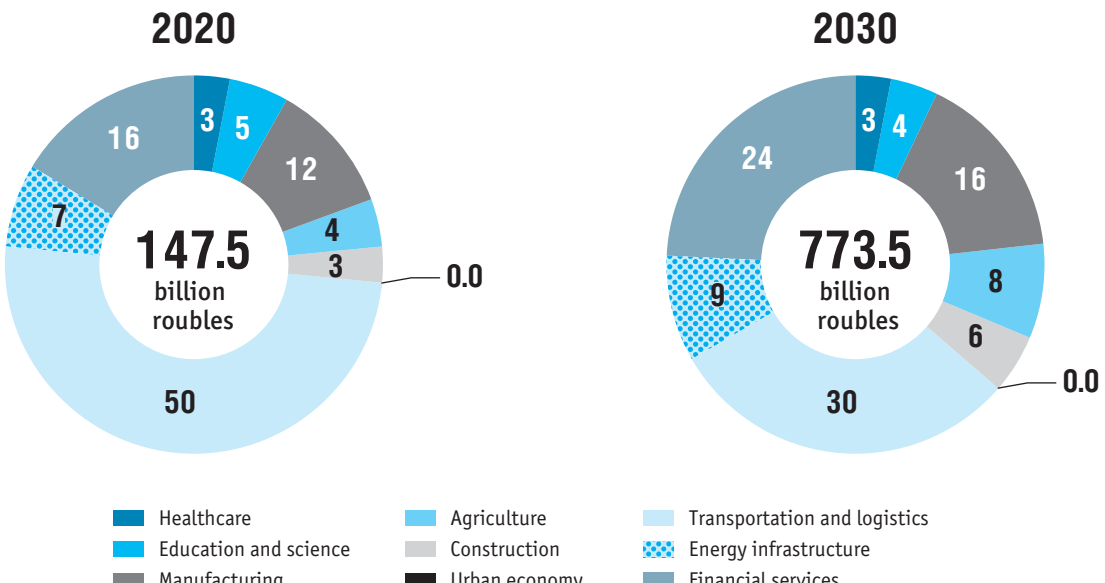


Number of patent applications: 2018

6,095
world total



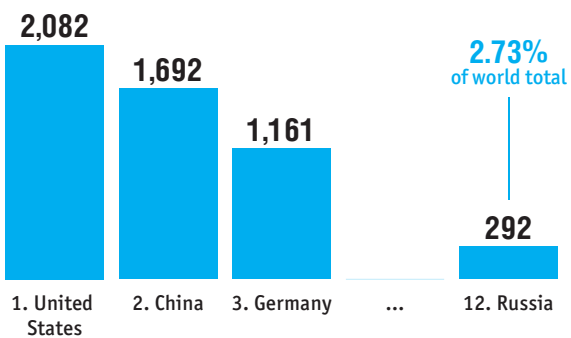
Percentage distribution of demand in economy sectors and social sphere



20.7. VIRTUAL AND AUGMENTED REALITY TECHNOLOGIES

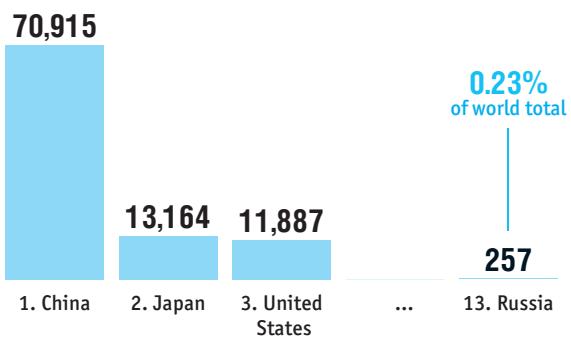
Number of publications: 2020

10,687
world total

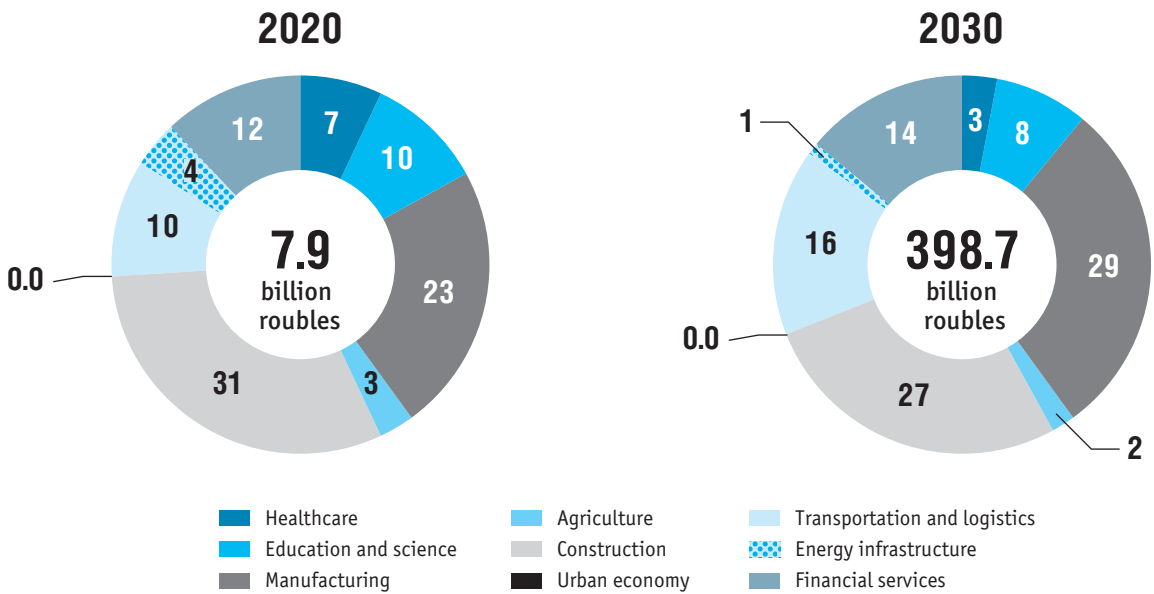


Number of patent applications: 2018

110,678
world total



Percentage distribution of demand in economy sectors and social sphere



TECHNICAL NOTES

Active subscriptions to telecommunications services are subscribers who used telecommunications services at least once within the last three months or paid the subscription fee at least once during the same period.

Advanced manufacturing technology are production processes technologies that ensure efficient utilisation of resources, design and manufacture of individualised objects, the cost of which is comparable to the cost of mass-produced goods.

Advanced manufacturing technology is defined as computer-controlled, microelectronics- or digital technology-based process or equipment used in the design, manufacture or handling of a product, including organisation of such processes. In 2020, due to the changes made in methodology of the federal statistical monitoring Form no. 1-technology, the list of advanced manufacturing technologies was updated. It includes 75 technology groups, of which 44 are ICT-related.

Anti-virus software is specialised software designed to detect computer viruses and malware, to restore any files infected (modified) by such malware and to prevent infection (modification) of files or operating system by malicious content.

Artificial Intelligence (AI) is a hardware and software system that mimics human intelligence processes (including self-education and solution search without pre-programmed algorithms) and obtains results from performing specific tasks at least comparable to results of human intelligence. A set of technological solutions includes information and communication infrastructure, software (including those using machine learning methods), processes and services for data processing and solution search (in accordance with Presidential Decree no. 490 of October 10, 2019 'On the Development of Artificial Intelligence in the Russian Federation').

Augmented Reality technologies are visualisation technologies based on adding information or visual effects to the physical world by superimposing graphics or audio content thereon in order to enhance user experience and interaction capabilities.

Average monthly salary is determined by dividing the payroll fund by the year's average headcount and further dividing it by 12. The payroll fund comprises monetary and non-monetary compensations and benefits for the time worked and for time off, including bonuses, one-off incentives, and regular meals and lodging allowances.

B2C E-Commerce Index evaluates the capabilities of countries to conduct e-commerce in the business-to-consumer (B2C) segment. It is calculated by the United Nations Conference on Trade and Development (UNCTAD). The Index is an arithmetic mean of four indicators: Share of individuals using the Internet; Share of individuals with an account; Secure Internet servers; and UPU Postal Reliability Score. In 2020 the Index was calculated for 152 countries. The 2020 results are published in the analytical report 'The UNCTAD B2C E-Commerce Index 2020 Spotlight on Latin America and the Caribbean': https://unctad.org/system/files/official-document/tn_unctad_ict4d17_en.pdf.

Big Data are methods used to collect, process and store structured and unstructured information assets whose huge volume and high variation of data (including real-time variation) require the use of specialised technical architectures and analytical methods.

Broadband access includes xDSL-technologies, cable TV connection, leased line connection, fibre optic connection, satellite connection, extended fixed wired and wireless access (WiMax connection, etc.), high-speed cellular network, and other types of access with the promised top access speed of 256 kbit/s and higher.

Business enterprise sector includes enterprises of manufacturing; electricity, gas, steam and air conditioning supply; water supply, sewerage, waste management and remediation activities; construction; wholesale and retail activities; transportation and storage; accommodation and food service activities; information and communication; real estate activities; professional, scientific and technical activities. Indicators of ICT use in the business enterprise sector are formulated in accordance with OKVED2: for 2010–2016, Sections C, D, E, F, G, H, I, K, OKVED (ver. 1.1) codes 92.1, 92.2, 92.4; for 2017–2019, Sections B, C, D, E, F, G, H, I, J, L, N, OKVED2 codes 69, 70, 71, 72, 73, 74, 95.

Business process innovation is a new or improved business process that differs significantly from the firm's previous business processes and that has been brought into use by the firm.

Cloud computing services is distributed data processing technologies, where computer resources and capacities are provided to users as Internet services.

Content and Media sector is a set of enterprises engaged in activities related to production, publication and/or distribution of content (information, culture and entertainment products). Pursuant to Order no. 515 issued by the Ministry of Digital Development, Communications and Mass Media of Russian Federation of December 7, 2015, the following types of economic activities are included into the Content and Media sector as per the National Classification of Economic Activity (OKVED2):

- publishing of books, periodicals and other types of publishing activities (OKVED2 code: 58.1);
- motion pictures, video and television programme production activities (59.1);
- sound recording and music publishing activities (59.2);
- radio broadcasting (60.1);
- TV broadcasting (60.2);
- news agency activities (63.91);
- other information-related activities (63.99).

CRM (Customer Relationship Management) software is a system that helps manage the company's interactions with customers. It is used to collect and process information on different aspects of customers' activity: availability of/demand for goods and services, sales cycles, prices, etc.

Data interchange between internal and external IT systems is data exchange that enables sending and receiving of messages (such as payment documents, tax returns, orders, etc.) in a pre-agreed or standard format (EDIFAST, EANCOM, ANSI X12; XML-based, such as ebXML, RosettaNet, UBL, papiNET; agreed proprietary standards, etc.) and their automatic processing.

Digital economy is the activity on development, dissemination, and use of digital technologies and related goods and services.

Digital technologies are technologies for collecting, storing, processing, searching, transmitting and representing data in digital form.

Digitalisation index developed by the HSE ISSEK measures the use of a certain set of digital technologies that create the launch environment for digitalisation. The Index is calculated for the economy as a whole, business enterprise sector, agriculture, financial sector, social sphere, and public authorities. The digitalisation indices of the economy, agriculture, financial sector, social sphere, and business enterprise sector demonstrate the use of broadband Internet, cloud computing services, RFID technologies, ERP software, and involvement of enterprises in e-commerce. The digitalisation index of public authorities is used to assess the use of broadband Internet, cloud computing services, RFID technologies, ERP software. The digitalisation index is calculated as the arithmetic mean of indicators of the specific weight of enterprises (as a percentage the total number of enterprises in economy sectors) using the corresponding types of digital technologies (rounded to an integer value).

Distributed ledger technologies are algorithms and protocols of decentralised storage and processing of transactions structured as a sequence of interlinked blocks, which prevents unauthorised subsequent modification of such transactions.

Education and training in the field of digital technologies and production of related goods and services mean systematic and organised education and graduation of skilled personnel with special knowledge and expertise in the field of digital technologies and related goods and services. Pursuant to Order of the Ministry of Science and Higher Education of the Russian Federation no. 1199 of October 29, 2013, the following professions and qualifications of the secondary vocational education programmes are attributed to the field of digital technologies and production of related goods and services:

Key general groups of professions and qualifications	Professions/Qualifications
Programmes for skilled workers and employees	
Computer science and engineering	All qualifications
Electronics and communications engineering	Radio-electronic equipment installer Radio technician Communication equipment installer Communication equipment operator Electronic equipment maintenance engineer
Mechanical engineering	Control and instrumentation maintenance engineer Control and instrumentation technician

(continued)

Key general groups of professions and qualifications	Professions/Qualifications
Programmes for mid-career professionals	
Computer science and engineering	All qualifications
Information security	All qualifications
Electronics and communications engineering	All qualifications
Photonics, instrumentation engineering, optical and biomedical engineering	Aircraft instruments Radio-electronic devices Optical and optoelectronic instruments and systems Biomedical instruments and systems Medical equipment assembly, maintenance and repair
Mechanical engineering	Industrial process automation (by industry sector) Additive technologies Mechatronics and mobile robotics (by industry sector) Operation and maintenance of industrial robots
Applied geology, mining and quarrying, oil and gas engineering, geodesy	Information systems for urban planning
Engineering systems management	All qualifications
Screen arts	All qualifications

Pursuant to Order of the Ministry of Science and Higher Education no. 1061 of September 12, 2013, the following **professions and qualifications of bachelor's, specialist's and master's degree programmes are attributed to the field of digital technologies and production of related goods and services**:

Key general groups of professions and qualifications	Professions/Qualifications
Engineering mathematics	Applied mathematics and computer science
	Applied mathematics
Computer and information sciences	All qualifications
Computer science and engineering	All qualifications*
Information security	All qualifications*
Electronics and communications engineering	All qualifications*
Photonics, instrumentation engineering, optical and biomedical engineering	All qualifications*
Nuclear engineering and technology	Electronics and automation of physical installations*
Mechanical engineering	Engineering mechanics Industrial process automation Mechatronics and mobile robotics
Engineering physics and technology	All qualifications
Weapons and armaments systems	All qualifications Professions: aircraft gun armament; artillery and missile armament; design, production, and testing of ship armaments and information management systems
Nanotechnologies and nanomaterials	All qualifications
Economics and management	Business informatics
Mass media, library and information science	Television Media communications
Cultural studies and socio-cultural projects	Stage and event management
Screen arts	All qualifications

* Including data of a federal statistics monitoring of professions from the List of Higher Education Professions and Qualifications, approved by Order of Russian Ministry of Science and Higher Education no. 1060 of September 12, 2013.

Pursuant to Order of the Ministry of Science and Higher Education no. 1061 of September 12, 2013, the following **professions and qualifications of postgraduate and apprenticeship programmes are attributed to the field of digital technologies and production of related goods and services:**

Key general groups of professions and qualifications	Professions/Qualifications
Postgraduate programmes	
Computer and information sciences	All qualifications
Computer science and engineering	All qualifications
Information security	All qualifications
Electronics and communications engineering	All qualifications
Photonics, instrumentation engineering, optical and biomedical engineering	All qualifications
Weapons and armaments systems	All qualifications
Nanotechnologies and nanomaterials	All qualifications
Mass media, library and information science	All qualifications
Apprenticeship programmes	
Screen arts	All qualifications

International comparisons of graduates in secondary vocational education – mid-career professional programmes and higher education programmes in 'Information and Communications Technologies' area are provided in accordance with the levels of education comprised by the International Standard Classification of Education (ISCED 2011) and fields of education and training (ISCED-F 2013) (published in 2014 by the UNESCO Institute for Statistics: P.O. Box 6128, Succursale Centre-Ville Montreal, Quebec H3C 3J7 Canada). For Russia, the provided data concern secondary vocational education occupations within key general groups of professions and qualifications of secondary vocational education, approved by Order of the Russian Ministry of Science and Higher Education no. 1199 of Octo-

ber 29, 2013; higher education professions and qualifications within key general groups of professions and qualifications of higher education, approved by Order of the Russian Ministry of Science and Higher Education no. 1061 of September 12, 2013 with the help of Russian Joint Academic Coding System OK 009-2016 (approved and signed into law by Order of Federal Technical Regulation and Metrology Agency no. 2007-st of December 11808, 2016), containing ISCED-F 2013 comparisons. Equivalence of scientific areas in the field of ICT in ISCED-F 2013 and the Russian classification of professions and qualifications in the field of ICT are as follows:

ISCED-F 2013 scientific area	Russian equivalent – key general groups / groups from the list of professions and qualifications of secondary vocational education and list of professions and qualifications of higher education
06 Information and Communication Technologies (ICTs)	Computer and information sciences (code 02.00.00)
0611 Computer use	Computer science and engineering (code 09.00.00)
0612 Database and network design and administration	Information security (code 10.00.00)
0613 Software and applications development and analysis	Business informatics (codes 38.03.05 and 38.04.05)
	Additive technologies (code 15.02.09)
	Information Systems Designed for City Planning (code 21.02.06)

E-Government Development Index (EGDI) measures the readiness and capacity of national institutions to use ICTs to deliver public services. It is calculated by the United Nations Department of Economic233 Digital Economy Indicators in the Russian Federation and Social Affairs (UN DESA) on the basis of three sub-indices: Online Service Index, Telecommunication Infrastructure Index, and Human Capital Index. In 2020, the Index was calculated for 193 countries. The 2020 results are published in the analytical report 'E-Government Survey 2020 Digital Government in the Decade of Action for Sustainable Development': https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E-Government%20Survey%20(Full%20Report).pdf.

E-libraries in higher education institutions are databases containing textbooks, courseware, and other literature used in education.

Employed in ICT task-intensive occupations are the employed who are highly likely to be professionally engaged in performance of ICT-assisted tasks (from simple surfing of the Internet, use of spreadsheets to programming). This category includes ICT specialists, managers and professionals in finance, economics, management, sales, marketing, development, social services; physicist and chemists, ar-

chitects, design engineers, surveyors, and designers; and faculty staff of higher education institutions. The list of occupations is provided by the OECD experts: https://doi.org/10.1787/9789264311992-en. https://doi.org/10.1787/9789264311992-en. **ICT specialists** are employees who are able to develop, operate and maintain ICT, for whom ICT-related activities are the main part of their professional activity. In accordance with the Russian Classification of Occupations (RCO), they include:

- managers – Information and Communications Technology Services Managers (RCO code: 133);
- professionals – Software and Applications Developers and Analysts (code 251); Database and Network Professionals (252); other ICT professionals (Electronics Engineers (2152); Telecommunications engineers (2153); Graphics and Multimedia Designers (2166); Information Technology Trainers (2356), and ICT Sales Professionals (2434);
- technicians – ICT Operations and User Support Technicians (code: 351); Telecommunications and Broadcasting technicians (352), and Electronics Engineering Technicians (3114);
- mechanics and servicers – Electronics and Telecommunications Installers and Repairers (742).

E-procurement (e-sales) by enterprises – procurement (sales) of goods or services through orders placed (received) via special online forms (whether posted on the company's website or in the extranet) using electronic data interchange (EDI) systems. This procurement (sales) does (do) not include orders placed via telephone, fax, or e-mail.

ERP (Enterprise Resource Planning) software is a system that consists of one or several software applications that integrate the enterprise units' information and business processes (workflow). Typically, an ERP system integrates planning, procurement, sales, marketing, customer interface, finance, human resources, etc.

Exports (imports) of ICT goods is formed on the basis of the Commodity Nomenclature of Foreign Economic Activity (HS) in accordance with the OECD classification of ICT goods based on the Harmonized Commodity Description and Coding System (HS) of 2007, and includes the following commodity groups:

- computers and related equipment (FEACN codes: 844331, 844332, 847050, 8471, 847290, 847330, 847350, 852351, 852842, 852852, 852862);
  - including computers (8471);
- communication equipment (8517, 852550, 852560, 853110);
  - including telephone and telegraph equipment (8517);
- consumer electronic equipment (8518, 8519, 8521, 8522, 852580, 8527, 852849, 852859, 852869, 852871, 852872, 852873, 990450);
  - including TVs (852871, 852872, 852873);
- other ICT and related goods (852321, 852329, 852341, 852352, 852359, 852380, 8529, 8534, 8540, 8541, 8542, 9013).

Exports (imports) of telecommunications services, computer services, and information services lists are compiled by the Bank of Russia. According to the Manual on Statistics of International Trade in Services 2010 (MSITS 2010), **telecommunications services** include the broadcast or transmission of sound, images, data, or other information by telephone, telex, telegram, radio and television cable transmission, radio and television satellite, electronic mail, facsimile, etc., including business network services, teleconferencing and support services; **computer services** include services

related to hardware, software and data processing; **information services** are broken down into news agency services and database services, such as database conception, data storage, and the dissemination of data and databases (both online and on magnetic, optical or printed media) and web search portals, also include direct non-bulk subscriptions to newspapers and periodicals, whether by mail, electronic transmission or otherwise, as well other information services.

Field-Weighted Citation Impact (FWCI) Index (on country level) is the ratio of the average number of citations per publication of a specific subject area, for a specific period and document type(-s) to the average number of citations per publication of the world total within the same subject area, period document type(-s). If FWCI value is over 1.0, the citation level (impact) of a specific country in a specific subject area exceeds the global average.

Financial sector includes enterprises engaged in the provision of financial, insurance, and pension services (except for mandatory social security), auxiliary activities in the field of financial and insurance services (provision of services that are part of or closely related to financial intermediation activities or fund management activities). Indicators of the use of digital technologies in the financial sector for 2010–2016 were formed in accordance with the OKVED (ver. 1.1) under Section J 'Financial Activity', for 2017–2019, in accordance with the OKVED2 under Section K 'Financial and Insurance Activities.'

Fixed (wired) broadband subscriptions are active broadband subscriptions for any wired technology, for which the access speed mentioned in the subscription agreement is 256 kbit/s or above.

Fixed (wired) Internet subscriptions are Internet subscriptions with any fixed (wired) Internet access with a dedicated channel, given the unlimited Internet traffic.

Fixed (wired) Internet subscriptions are Internet subscriptions with any fixed (wired) Internet access, including dial-up, regardless of bandwidth.

Fixed capital investment is the expenditure on property construction or rebuilding (including expansions and overhauls) which increase its original value, acquisition of machinery, equipment, vehicles, production and household inventory which were accounted as investments in non-current assets, intellectual property or cultivated biological resources.

Global Competitiveness Index measures competitiveness of national economies. It is calculated by the World Economic Forum on the basis of 12 sub-indices: Institutions, Infrastructure, ICT Adoption, Macroeconomic Stability, Health, Skills, Product Market, Labour Market, Financial System, Market Size, Business Dynamism, Innovation Capability. In 2019 the Index was calculated for 141 countries. The 2019 results are published in the analytical report 'The Global Competitiveness Report 2019': http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf. In 2020 the World Economic Forum has released a report that does not contain a rating of countries by Global Competitiveness Index. The rating of countries was suspended due to the difficult economic situation around the world caused by the COVID-19 pandemic: http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2020.pdf.

Global Connectivity Index allows us to assess the level and dynamics of the development of the ICT infrastructure, as well as to trace the relationship between the development of digital technologies in the country

and economic growth. It is calculated by Huawei on the basis of 40 indicators as the arithmetic mean of four sub-indices: Demand, Supply, Experience, and Potential. It is calculated for 79 countries. The 2020 rankings are published in the analytical report 'Shaping the New Normal with Intelligent Connectivity': https://www.huawei.com/minisite/gci/assets/files/gci_2020_whitepaper_en.pdf?v=20201217v2.

Global Innovation Index is an integral indicator determining the level of the national innovation system development. It is developed by Cornell University, INSEAD Business School, and World Intellectual Property Organisation (WIPO) based on 80 indicators that reflect the key innovative development factors of countries. The Index is calculated on the basis of seven sub-indices: Institutions, Human Capital & Research, Infrastructure, Market Sophistication, Business Sophistication, Knowledge & Technology Outputs, and Creative Outputs. In 2020 the Index was calculated for 131 countries. The 2020 results are published in the analytical report 'The Global Innovation Index 2020: Who Will Finance Innovation?': https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf.

Gross domestic expenditure on digital economy development means total enterprises' domestic expenditure on performance of works and provision of services concerning development, dissemination, and use of digital technologies and related goods and services, and total household expenditure on use of digital technologies and related goods and services. Enterprises' domestic expenditure on development, dissemination, and use of digital technologies and related goods and services, including domestic expenditure on R&D in the field of digital technologies, is domestic expenditure on the development of digital economy from all sources of funds.

Gross domestic expenditure on R&D is the actual expenditure on research and development in the country (including R&D funded from abroad but excluding payments made abroad) in monetary form. The value of these activities is determined based on statistical reporting on the expenditure on enterprises in-house R&D activities within the reporting year, regardless of the funding source.

Gross value added is determined by taking the value of goods and services produced/rendered and subtracting from it any intermediate consumption within industries and sectors of the economy. Value of goods and services produced/rendered is the aggregate value of goods and services produced/rendered by the nation's residents within the reporting period. Intermediate consumption is the total value of goods and services consumed or transformed in the production process within the reporting period. Fixed capital is not part of intermediate consumption.

Household expenditure on use of digital technologies and related goods and services the actual expenditure of household members on the purchase, operation, and repair of equipment related to digital technologies or payment for telecommunications services. The methodology for calculating gross domestic expenditure on digital economy development was approved by the Digital Economy Subcommittee under the Government Commission on the Digital Development, Use of Information Technologies for Improving Quality of Life and Business Environment (session protocol no. 557pr of September 27, 2019).

ICT sector involves economic activities related to production of goods and provision of services intended for processing of information (or enabling such processing) and communication via electronic devices, including transmission and display of information. Pursuant

to Order no. 515 of December 7, 2015 issued by the Ministry of Digital Development, Communications and Mass Media of the Russian Federation, the following types of economic activities are assigned to the ICT sector (according to OKVED2):

- manufacture of electronic components and boards (OKVED2 code: 26.1);
- manufacture of computers and peripheral equipment (26.20);
- manufacture of communication equipment (26.30);
- manufacture of consumer electronics (26.40);
- manufacture of magnetic and optical media (26.80);
- wholesale of computers, computer peripheral equipment and software (46.51);
- wholesale of electronic and telecommunications equipment and parts (46.52);
- software publishing (58.2);
- wired telecommunications activities (61.10);
- wireless telecommunications activities (61.20);
- satellite telecommunications activities (61.30);
- other telecommunications activities (61.90);
- computer programming activities (62.01)
- computer consultancy activities (62.02);
- computer facilities management activities (62.03);
- other information technology and computer service activities (62.09);
- data processing, hosting and related activities (63.11);
- web portals (63.12);
- repair of computers and periphery equipment (95.11);
- repair of communication equipment (95.12).

ICT-related patent applications are calculated on the data of the World Intellectual Property Organisation (WIPO) ICT includes the following areas: audio-visual technology, telecommunications, digital communication, basic communication processes, computer technology, IT methods for management, semiconductors. List of ICT-related areas is compiled on the basis of OECD taxonomy (Inaba T., Squicciarini M. (2017) ICT: A New Taxonomy Based on the International Patent Classification / OECD Science, Technology and Industry Working Papers, 2017/01. Paris: OECD Publishing) and WIPO Classification of Technological Areas (Schmoch U. (2008) Concept of a Technology Classification for Country Comparisons: Final Report to the World Intellectual Property Organization. Karlsruhe: Fraunhofer Institute for Systems and Innovation Research). **Patent activity indicators in the field of digital technologies** are calculated based on PatStat Global database. The search for patent documents for each digital technology was carried out using specialised lists of keywords and/or codes of the International Patent Classification. At the same time, one patent application may belong to several digital technologies simultaneously.

Inclusive Internet Index was created to assess and compare Internet coverage in 100 countries. It is calculated by The Economist Intelligence Unit journal on the basis of four sub-indices: Availability, Affordability, Relevance, and Readiness. The 2021 results were published on the portal 'The Inclusive Internet Index': https://theinclusiveinternet.eiu.com/explore/countries/performance.

Individuals' digital competence is determined based on the information about 22 types of actions performed when working on a computer or online, which are grouped into four sets of skills: information, communication, problem-solving skills and software skills. The calculation

is carried out in two stages: at the first stage, the level of proficiency of each group of skills is assessed, at the second stage – integral assessment is performed. The general level of digital competence is structured as follows: 'above basic' – skills in all areas at 'above basic' level; 'basic' – skills in all areas, provided that at least one of the competence areas is 'basic'; 'low' – the lack of skills in one, two or three areas; 'skills are absent' – the lack of skills in all four areas (this category also includes people who have not used the Internet within the last three months). The assessment is made for persons aged 15 years and older in accordance with the Eurostat methodology.

Individuals' digital skills are the competencies of people in the field of using personal computers, the Internet, and other types of ICT.

Individuals' international wire transfers are non-cash transfers of resident individuals across border (receipts in favour of resident individuals) made with or without opening an account through credit organisations, including wire transfers through payment systems and Russian Post.

Industrial Internet of Things is data networks in the industrial sector which link various sensor-equipped devices that are able to communicate with one another without human involvement.

Information and communication technologies (ICT) are microelectronics technologies used to assemble, store, process, search, transmit, and represent data, texts, images, and sounds.

Innovation activity of enterprises describes the involvement degree of enterprises (organisations) in general or specific innovative activity during a given period of time. Innovation activity of enterprises is calculated as a ratio of the number of innovation-active enterprises to the total number of surveyed enterprises in the reporting year. The methodology for calculating this indicator was approved by Rosstat Order no. 818 of December 27, 2019. Any changes in 2017 data are due to the recalculation indicators according to the specified method.

Innovation expenditure is the actual expenditure in monetary form, connected with the implementation of different or all types of innovative activities (research and development, acquisition of machinery and equipment, engineering, etc.) performed within an organisation. Innovation expenditure includes current expenditure and capital expenditure. At the same time, the stage of the innovation process does not matter, whether at the final stage, when the equipment is already commissioned and mastered in operation, i.e., production is organised and goods (works or services) are produced, or at the initial or intermediate stage, for example, when new equipment is still being installed or only ready for operation, but has not been put into work, has not been tested and has not been used in the production of goods (works or services).

Innovative activity includes all developmental (R&D), financial or commercial activity related to creation of technologically new or significantly improved goods or services that have been introduced on the market and differ significantly from the previously produced goods and services; or technologically new or significantly improved business processes that differ significantly from the previously used business processes.

Innovative goods and services are new or significantly improved goods or services that have undergone various degrees of technological changes within the last three years (including the reporting period). According to the degree of novelty, there are two types of innova-

tive goods and services – those newly introduced (or those that have undergone substantial technological changes) and those significantly improved.

Internet (broadband) subscriptions are individuals or legal entities having entered into a services provision contract/contracts on the use of data transmission network at the end of the reporting period.

Internet is a worldwide (global) network of independent computer networks connected with each other to exchange data via standard open protocols.

Internet use for downloading official forms includes data usage to obtain blank forms for their subsequent completion and submission to relevant public authorities. Such forms can be found on public authorities' websites, sent via e-mail or other data transmission methods.

Internet use for e-procurement includes networks usage to submit auction bids, enter into supply or services contracts with the federal or municipal governments.

Internet use for submitting completed forms online includes completing forms directly on public authorities' websites or sending completed forms via e-mail or other data transmission methods.

IT industry is a set of enterprises providing services mainly intended for (or contributing to) electronic data collection, processing, storage, and presentation. By Order no. 502 of December 30, 2014 issued by the Ministry of Telecom and Mass Communications of the Russian Federation, the following types of economic activities are included into IT industry as per OKVED2:

- computer programming activities (OKVED2 code: 62.01);
- computer consultancy activities (62.02);
- computer facilities management activities (62.03);
- data processing, hosting and related services (63.11).

Local Online Service Index (LOSI) is an integral index calculated by UN DESA as part of the global E-Government Development Index in order to assess e-government intensity on municipal level. The Index was calculated in 2020 for 86 global cities (evaluation was conducted for 100, but 14 of them did not have sufficient data). The index includes 80 indicators grouped in 4 groups. Technology indicators measuring the city website's convenience; Content provision indicators measuring the relevancy of information presented therein; Service provision indicators measuring the provision of basic services via the city's website; and Participation and Engagement indicators measuring municipal engagement mechanisms nd initiatives channelled via that website. The 2020 results are published in the analytical report 'E-Government Survey 2020 Digital Government in the Decade of Action for Sustainable Development': https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E.

Mobile Internet subscription fee is the subscription fee for using the unlimited mobile Internet on a mobile phone or smartphone in 2G–4G cellular operator networks (Beeline, MTS, Megafon) without taking into account the cost of the initial connection of the service. Calculated for a full month.

Mobile Internet subscriptions are active mobile cellular subscriptions with Internet access services.

Mobile phone is a telephone with an installed SIM-card.

Mobile wireless broadband subscriptions are active mobile wireless subscriptions with advertised top access speed of 256 kbit/s or above.

Museum artefacts added into e-catalogues are museum artefacts whose details are added to museums' e-catalogues.

Network Readiness Index (NRI) measures the development of digital technologies and their impact on the economic growth of countries. Since 2019, it is developed by the Portulans Institute. The Index is calculated on the basis of 60 indicators as the arithmetic mean of four sub-indices: Technology, People, Governance, and Impact. In 2020 the Index was calculated for 134 countries. The 2020 results are published in the analytical report 'The Network Readiness Index 2020: Accelerating Digital Transformation in a post-COVID Global Economy': https://enterprise.press/wp-content/uploads/2020/11/NRI-2020-Final-Report.pdf.

Neurotechnologies are cyberphysical systems that partially or completely replace / complement the functioning of the nervous system of a biological object, including those based on Artificial Intelligence.

Number of employees (employment) is estimated based on the materials of a sample labour survey conducted by Rosstat. Employed population (employment) are individuals aged 15 and over who were involved in any activities (taking at least one hour per week) over the surveyed period, related to manufacturing of goods or rendering of services for a payment or profit. The number of the employed population also includes those who were temporarily absent at the workplace of time but retained working activity during absence.

Parental control filtering tools are a set of rules and measures to prevent the negative impact of Internet and computers on the person under care (usually a minor).

Patent is a title of protection granted for an invention that certifies inventor's priority, inventorship, and the right of exclusive use of this invention during patent's term of validity. Invention is a technical and/or engineering solution pertaining to a product (a device, a material, a germ strain, plant or animal cell culture) or to a method (a process of manipulating material objects through material means), including to the use of the product or a method for a specific purpose. An **invention** must be new, innovative, and applicable for industrial use.

Payments made by customers of credit institutions using bank transfer orders received in digital form are data on transactions using bank transfer orders received by a credit institution (its branch) in digital form. Include orders placed through the Internet (including via the Client-Bank system providing the use of the Internet); through messages using subscriber's mobile devices (mobile phones, smartphones, communicators, etc.); through other methods of remote access to Bank accounts (e.g., telephone banking, Client-Bank system, not involving the use of the Internet).

Product innovation is a new or improved good or service that differs significantly from the firm's previous goods or services and that has been introduced on the market.

Public and municipal services in digital form mean public and municipal services rendered through data exchange and technological interaction, including via unified and (or) regional public and municipal services portals. Public and municipal services are considered to be rendered in digital form if the applicant uses the ESIA, the Unified Identification and Authentication System, when receiving the service used on the Unified Public and Municipal

Services Portal and (or) regional portals of public and municipal services.

Publication activity indicators are calculated based on Scopus database and Elsevier's Scival web-based analytical tool. Publications may be issued in Scopus-indexed scientific journals, books book series, conference proceedings, and trade publications. A publication is considered to be affiliated with a specific country if this country name is stated in the author's or a co-author's work address(-es) in 'Affiliations' field and country name is correctly recognised by Scopus affiliation- and country name recognition algorithms. If at least one co-author or the sole author of a specific publication has stated two or more countries in the work address(-es) in 'Affiliations' field, such publication is considered as internationally collaborated. When analysing ICT-related publications, the term 'publication' refers to Scopus-indexed documents of the following types: articles, conference papers, reviews, books, and book chapters. As ICT-related publications are considered publication that are attached to at least one of the following Scopus subject categories: Artificial Intelligence; Computational Mechanics; Computational Theory and Mathematics; Computer Graphics and Computer-Aided Design: Computer Networks and Communications; Computer Science (miscellaneous); Computer Science Applications; Computer Vision and Pattern Recognition, Computers in Earth Sciences; Control and Systems Engineering; General Computer Science; Hardware and Architecture; Health Informatics; Health Information Management; Human-Computer Interaction; Information Systems; Information Systems and Management; Library and Information Sciences; Signal Processing; Software: Theoretical Computer Science. One publication may refer to several Scopus subject categories. When analysing publications on digital technologies, the term 'publication' refers to Scopus-indexed documents of the following types: articles, reviews, conference papers, books, book chapters, notes, letters. The search for Scopus-indexed publications for each digital technology was carried out on the basis of specialised sets of keywords (ontologies) associated with it. One publication may refer to several digital technologies simultaneously.

Quantum technology is a technology that creates computing systems based on new principles (quantum effects) allowing to radically transform mass data transmission and processing.

RFID technologies are automatic identification and data capture technologies which enable reading or recording data stored in RFID tags by means of radio signals.

Robotics components (industrial robots) production systems with three or more degrees of mobility (freedom) built on the basis of sensors and artificial intelligence able to control their actions, monitor the environment and adapt to its changes.

Scientific specialisation index (for ICT-related publications by Russian authors) is calculated as the ratio of the share of publications in a specific ICT-related Scopus subject category in the total number of all publications by Russian authors indexed in Scopus to the share of publications in this subject category in the world total number of all publications indexed in Scopus. If the index value is above 1.0, the specific ICT-related Scopus subject category is considered as area of scientific specialisation of Russia.

SCM (Supply Chain Management) software is a system that ensures an automatic connection with suppliers/customers' ordering systems.

Sensorics is the technology and activity related to creation, manufacture, and use of sensors that collect and transmit information about the environment through data networks.

Servers are industrially manufactured or assembled server equipment (except personal computers and PC-based network servers). Servers include standard servers, servers based on reduced instruction set computer (RISC) architecture (IBM Power, Oracle T series), supercomputers, special hardware and software suites (HP Superdome, Oracle Exadata).

Social sphere includes higher education institutions, highly-qualified personnel training institutions, hospitals, libraries, archives, museums, and other cultural institutions; arts, entertainment and recreation institutions. Indicators of the use of ICT in social sphere organisations are formed in accordance with OKVED: for 2010–2016, Section N, OKVED (ver. 1.1) codes 80.3 and 92; for 2017–2019, Sections Q, R, OKVED2 codes 85.22 and 85.23.

Spam filters are specialised software or software function intended for filtering and hiding unwanted advertisements when visiting Internet sites, receiving e-mail, and using messaging programmes.

Subscription fee for a cellular service package is a monthly fee for using the minimum service package of cellular operators (minutes of conversation, SMS, mobile Internet). It is allowed to register fees for packages that exclude SMS.

Technological trend is a development in a subject area which emerged completely or partly in the past and is very likely to persist in the future. This Data Book includes information about technological trends related to end-to-end digital technologies stated as priority areas in the national Digital Economy Programme (approved by Directive 1632-r of the Government of Russia of July 28, 2017).

Top access speed of data transmission via Internet is bandwidth, the maximum rate of data transfer across a given path, measured in bits per second (bit/s).

Virtual Reality technologies are technologies of computer-aided 3D modelling of images or spaces whereby humans can interact with a synthesised (virtual) reality and receive sensory feedback therefrom.

Web content filtering tools include hardware devices with integrated software that restrict access to Internet resources which are harmful for pupils' education and character development.

Website is an Internet site which has a specific address and an owner, and comprises web pages. For statistical purposes, an enterprise is considered to have a website if it has at least one web page displaying regularly updated information (at least once every six months).

Wireless data technologies are methods of data transmission over standard radio interface without any fixed lines.

World Digital Competitiveness Ranking assesses the development and application of digital technologies by countries that lead to the transformation of public administration, business models and society as a whole. Calculated by the International Institute for Management Development (IMD) for 63 countries. The Ranking includes 51 indicators and represents the arithmetic mean of three sub-indices: Knowledge, Technology and Future Readiness. The 2020 results are published in the analytical report 'IMD World Digital Competitiveness Ranking 2020 (WDCR)': https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2020/.

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Data Book

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