



Analysis of the effectiveness of innovations in the global telecommunications services market

Shaislamova Muazzamxon Raximxodjaevna

Researcher of Tashkent State University of Economics

ANNOTATION. *The purpose of this article is to analyze the global trends in the development of innovations in the field of telecommunications, to identify their economic impact on the economy of the industry and the main problems associated with their implementation.*

Key words: Telecommunications, digital economy, information technology, communications, data transmission, Internet services, Internet roaming, mobile users, economic system, mobile app services, 3G network, CDMA2000 technology, LTE / WiMAX mobile network, Wi-Fi-Internet services.

The development of telecommunications technologies is one of the strategic directions of modernization of the economy, and investments in telecommunications infrastructure will help strengthen the strategic position of any country in the long run. The telecommunications services market is showing annual growth, gradually increasing its share in world GDP and further strengthening its position in the global economy. The future development of the telecommunications industry is directly linked to the introduction of new technologies, which are a key link in the digital economy.

In the modern world of the digital economy, the telecommunications industry plays a key role in providing the information needed to make management decisions, both at the level of individual companies and at the state level in general. In this context, the transition to the information society requires the active development of the telecommunications sector, which is a factor of development and growth of the world economy.

Currently, the most effective economic activity is based on data modification, which is the purposeful exchange of ordered data (receipt and transmission of information) with other structures and people. Today, information serves as a measure of the orderliness and stability of an economic system, which constitutes a set of human influences on certain resources to meet their needs, in the process of which data is changed several times. The interaction of any subjects has only information. It was telecommunication technologies that



determined the transition of the economy to the information stage. At this stage, telecommunication technologies and information are distributed to the main sector of the economy, where all economic activity is focused on the production of information consumption.

During the pandemic, the role of information technology and communication services increased significantly. With the introduction of quarantine, some employees of various organizations and enterprises went into remote mode, meetings were held by videoconference, and the training process was also conducted online. At the same time, the technical conditions for conducting such activities remotely are provided primarily by enterprises in the field of information technology and communications. By quarantining at home, working remotely and studying, people began to consume more communication services and the Internet, resulting in an average 10-20% increase in Internet traffic used by providers¹.

According to the analysis, in a pandemic environment, data transmission traffic has increased from 10% to 70% due to the existing congestion in different countries. In particular, the average traffic growth in Russia was 25%, which corresponds to the level of the US, but slightly higher than in the UK (+ 20%). Operators in these countries occupy a middle position between Italy and India (+ 10%), which recorded a 70% increase in traffic. As a result, the decline in operating income of the data transmission industry was 10-12%. Today, ISPs are forced to make additional investments to ensure the normal operation of the system².

Second, people's travel abroad has significantly decreased, and therefore mobile operators have been deprived of the opportunity to provide roaming services to their subscribers (roaming - walking, walking). Connecting to the roaming service allows you to use your mobile phone abroad, just like in the country, only at a special, more expensive rate, and to use voice communication (voice roaming) and access the Internet (Internet roaming).

¹Digital transformation for 2020 and beyond A global telecommunications study www.ey.com/telecommunications.

²International Data Corporation (IDC) idc.com.



Internet roaming allows the subscriber to communicate via instant messengers (Telegram, Whatsapp, Skype, etc.) abroad, if you do not have access to Wi-Fi Internet services.

Providing free Wi-Fi Internet services is common in hotels, company offices, government offices and some parts of the city, so subscribers, especially tourists, are less connected to Internet roaming than voice communication.

When a subscriber connects to roaming services, mobile communication and Internet connection abroad are automatically provided by local telephone companies, with which the mobile operator in the country has the relevant agreements for the provision of mutual roaming services. In turn, telephone companies in this country can provide communication services to foreign nationals entering the country, which is a subscriber of a foreign mobile operator-partner, and provide access to the Internet at the appropriate roaming rate.

The Financial Times published an article in its April 2020 issue entitled “The Fall of the Roaming Empire,” which reported that international telecommunications companies could lose up to \$ 25 billion in 2020 due to reduced roaming costs for subscribers due to declining tourist activity. The world will lose about \$ 12 billion in the 2020 summer holiday season, which is likely to happen without an influx of tourists in many countries.

By 2020, global revenues of mobile operators are expected to reach about \$ 820 billion, while roaming services in them will be insignificant. For example, due to the abolition of roaming charges within the EU in 2017, roaming revenues from European mobile operators now account for around 1% of total revenues. Roaming charges are now charged from European subscribers only when making calls outside the EU or from their incoming calls to the EU.

There are also no national roaming charges in the United States, but there are data limits between different operators within the country, the excess of which will result in additional charges. In Russia, intranet roaming was abolished across the country in December 2018, but many Russians use roaming when they go beyond their borders. At the same time, more than 50% of Russians traveling abroad use voice and 20% use Internet roaming. In India, payments for national roaming services within the country have been abolished since 2017, and in China since 2018³.

³<https://www.lastmile.su/journal/article/8436>



The global market for telecommunications services continues to undergo significant changes due to the trend of consolidation, as well as the fact that the innovative development of society places high demands on the industry.

In order to operate effectively in a global pandemic, telecommunications companies need to evaluate and possibly revise their strategies, solutions offered to customers, market communication channels, and the use of technology platforms, as well as organizational structure, business processes, and new management models. They should also reconsider the corporate culture. In a pandemic environment, companies equipped with high-tech tools, mainly with effective management systems, as well as constantly engaged in innovative activities, benefit from the ability to quickly adapt to changes in the market and make effective use of new opportunities.

In a pandemic, countries need to introduce innovative economies. The main characteristic of the innovative economy is that the growth of gross domestic product is provided mainly through the production and sale of products and services that require science and ingenuity. A distinctive feature of innovation is the availability of innovation, i.e. radically new features of product, raw material, technological process, management, organizational techniques, etc., but the company or production is interested not only in innovation, but also in its efficiency, primarily economically. Increasing profits, competitiveness and firm rating in the competitive market by telecommunications companies is determined by the level of innovation activity and introduction of innovative services.

We analyze the effectiveness of innovations in the global telecommunications services market through the following areas. First of all, it is expedient to study the development trends of the direct telecommunications services market.

The global telecommunications services market, including paid TV services, was worth \$ 1.63 billion in 2019, up 0.8 percent from 2018, according to research by U.S. analyst firm International Data Corporation (IDC). Telecommunications services accounted for more than half of the mobile market. This is directly related to the decline in sales of voice services and SMS as a result of increased demand for mobile data transmission and M2M solutions⁴.

⁴International Data Corporation (IDC) www.idc.com.

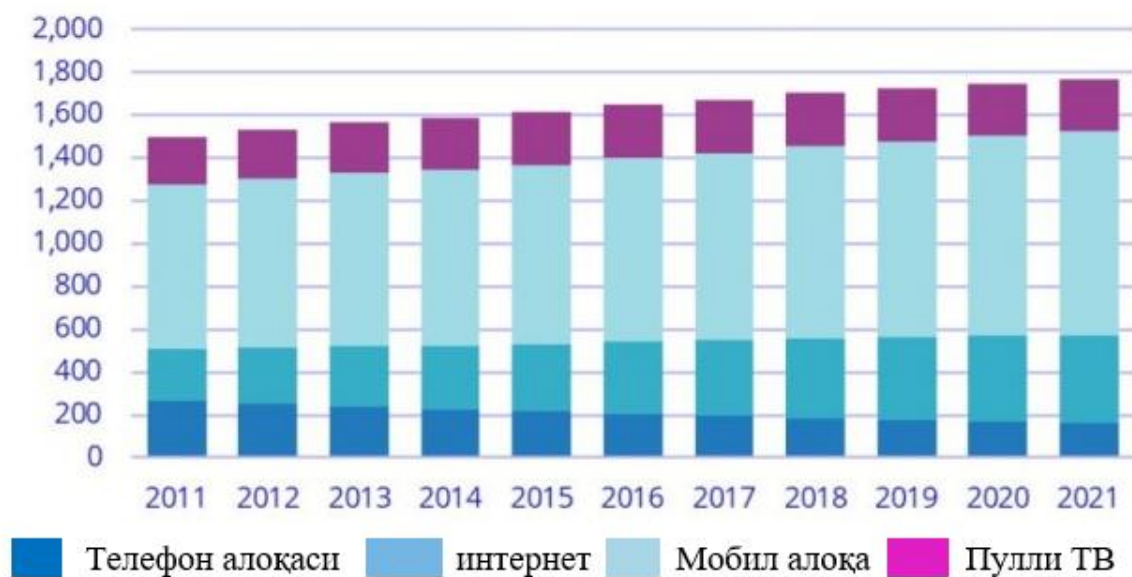


Figure 1. Telecommunications services market development trend

Due to the high demand for high-speed Internet access services, landline services will account for 21.7% of telecom costs in 2019.

The largest demand for telecommunications services remains in the US, where corresponding expenditures in 2019 will reach \$ 630 billion, an increase of 0.7% over the previous year.

According to IDC forecasts, by 2023, global mobile and landline prices will increase by 1.3% and 2.6% annually.

The author has studied the distribution of the telecommunications services market around the world. The studies were conducted on the four most advanced types of services. Mobile communication, telephone communication, wired and wireless internet.

The analysis of the global telecommunications services market is shown in Figure 2.

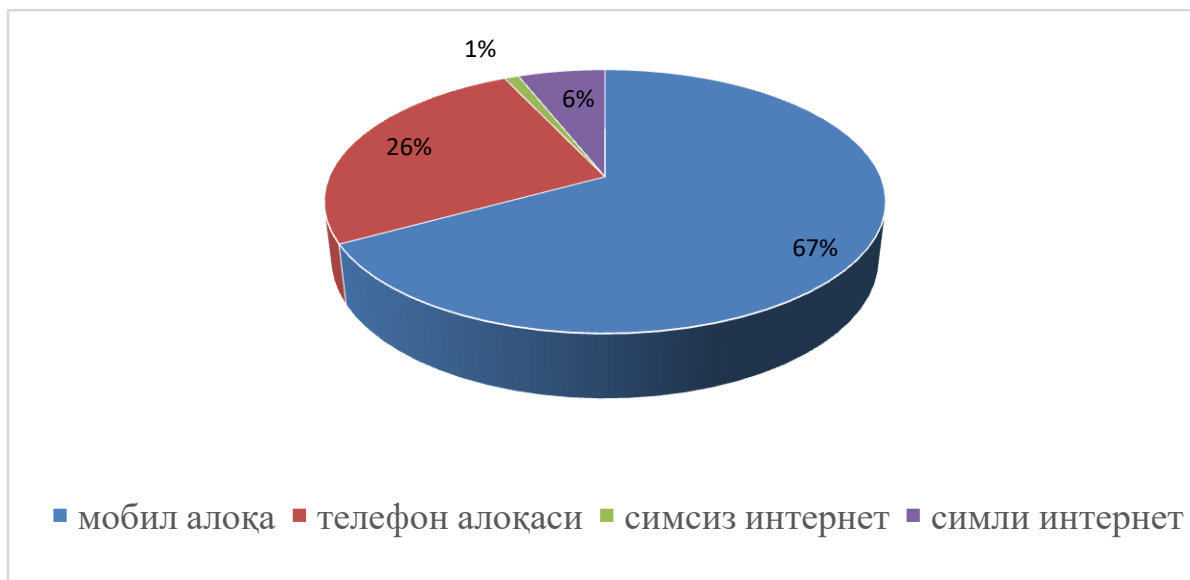


Figure 2. Analysis of the global telecommunications services market

According to the analysis of the global telecommunications services market, in 2020 mobile services will occupy 67% of the market. Telephone communication accounts for 26%. The share of Internet services in general is 7%. As a result of the analysis, it provides mobile services as the most effective innovative service in the field of telecommunications⁵.

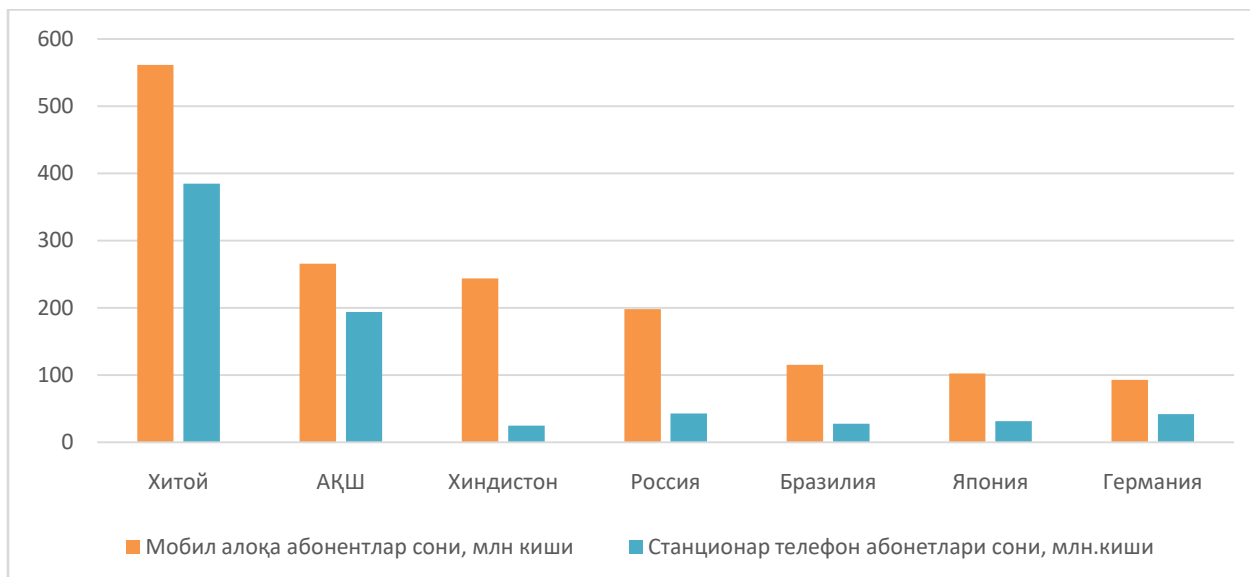


Figure 3. Analysis of the largest markets for telecommunications services in the world

⁵Интернет маълумотлари асосида муаллиф томонидан ишлаб чиқилган.



The largest telecommunications services market includes China, the United States, India, Russia, Brazil, Germany and Japan. The article analyzes the main ICT indicators for the regions over the years. The indicators that make up these indicators were studied:

- Analysis of users of fixed telephone communication by regions, mln. person.
- Analysis of mobile phone users by regions, mln. person.
- - Analysis of the number of active broadband mobile subscribers by regions, mln. person
- Analysis of the coverage of the population with the mobile network by regions, mln. person
- Analysis of the coverage of the population with at least 3G networks by regions, mln. person
- Analysis of coverage of the population with at least LTE / WiMAX mobile network by regions, mln. person
- Analysis of international bandwidth by regions, Tbit/s
- Analysis of the number of Internet users in the regions, mln. person
- Analysis of the share of households with computers in the regions,%
- Analysis of the share of households connected to the international network by regions, %.

We will analyze the given indicators separately. As a result of the analysis, it will be possible to determine the direction of development of telecommunications services in our country on the basis of foreign experience. Table 1 provides an analysis of landline telephone users by region

Table 1

Analysis of users of fixed telephone communication by regions, mln. person ⁶

Name of regions	2015	2016	2017	2018	2019
Name of regions	10	11	11	9	7
Africa	30	32	33	35	37
Arab countries	439	412	403	392	386
Asia and the Pacific	51	48	47	45	42

⁶<http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx> .



CIS	251	246	241	233	226
Europe	249	245	235	227	216
America	1 031	993	970	941	914

According to the analysis of landline telephone users in the regions listed in Table 1, in 2019, a total of 914.0 million people worldwide were landline telephone users.

This figure is declining from year to year as mobile and internet services develop. If in 2015 the number of landline telephone users was 1,031.0 million, in 2016 it was 993.0 million. people, in 2017 it was 970.0 million. people and in 2018 amounted to 941.0 million.

At the end of 2019, the highest figure was in Asia and the Pacific, ie the number of landline users was 386.0 million. formed a person.

The lowest rate was in the African continent, where 7.0 people used this type of service.

The number of users of this service in the CIS countries is also declining from year to year, if in 2015 it was 51.0 million. By 2019, that number had dropped to 9.0 million, compared to 42 million in the previous year. formed a person.

Demand for this type of service will also decrease due to the introduction of new modern services in the telecommunications sector, the rapid development of mobile communications and the Internet.

The next part of the analysis analyzes the number of mobile users who are the most popular among the services. The analysis of mobile users by regions is given in Table 2.

Table 2

Analysis of mobile users by regions, mln. person⁷

Name of regions	2015	2016	2017	2018	2019	2020
Africa	714	714	725	785	836	882
Arab countries	419	417	417	416	424	454
Asia and the Pacific	3 778	4 094	4 331	4 497	4 709	4 952
CIS	325	329	331	333	354	389
Europe	809	808	812	813	818	847

⁷<http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx>



America	1 103	1 114	1 104	1 124	1 139	1 352
Total around the world	7 148	7 476	7 719	7 967	8 279	8 876

According to the analysis of mobile users in the regions shown in Table 2, a total of 8,876.0 million people worldwide are mobile users. The fact that this figure is higher than the world population shows how attractive this type of service is. In terms of regions, the largest number of mobile users is in Asia and the Pacific. In 2020, a total of 4,952.0 million people in the region used mobile communications. This means 56% of the total users worldwide. The next place is occupied by 1,352.0 million mobile users in the Americas. Mobile phone users had the lowest rate in the CIS. In 2020, 389.0 million people were mobile users. This is 135% of the total population. Although the figure is low in the overall analysis, it is much higher than the number of permanent residents. 97.5% of the world's population are users of mobile services. In general, the type of mobile service is the fastest growing and most popular type of service in the world.

The next analysis is a mobile internet analysis. The analysis of the number of active subscribers in broadband mobile communication by regions is given in Table 3. The analysis of the number of active subscribers in broadband mobile communication shows the state of development of mobile internet in the world.

Table 3

Analysis of the number of active broadband mobile subscribers by regions, mln. person⁸

Name of regions	2015	2016	2017	2018	2019	2020
Africa	180	213	253	303	335	362
Arab countries	168	184	222	245	265	294
Asia and the Pacific	1 554	1 932	2 588	2 971	3 220	3 546
CIS	143	155	174	186	209	235
Europe	465	533	588	630	669	692
America	771	844	894	950	1 001	1 150
Total around the world	3 280	3 860	4 719	5 284	5 699	6 279

⁸<http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx>



According to the analysis of the number of active broadband mobile subscribers in the regions, a total of 6,279.0 million people worldwide are active broadband mobile subscribers. This represents 71% of the total mobile users worldwide. This type of service is the most used in Asia and the Pacific. The number of active broadband mobile subscribers in the Asia-Pacific region is 3,546.0 million. This represents 72% of the total mobile users. As a result of the development of the digital economy, the importance of mobile communication is also growing. All manufacturers or service providers are launching online service or product sales through mobile apps. Mobile app services have become a safe and inexpensive way in a pandemic environment. The analysis of the indicators of the mobile sector will be followed by the analysis of the coverage of the population with the mobile network in the regions listed in Table 4.

Table 4

Analysis of the population coverage by mobile network by regions, mln. person ⁹

Name of regions	2015	2016	2017	2018	2019	2020
Africa	812	843	867	905	926	947
Arab countries	370	381	394	399	407	415
Asia and the Pacific	3 961	4 018	4 100	4 146	4 210	4 244
CIS	213	219	223	225	238	239
Europe	674	677	680	682	684	688
America	935	944	956	962	965	972
Total around the world	6 964	7 082	7 219	7 318	7 430	7 505

According to the analysis of the coverage of the population with the mobile network in the regions listed in Table 4, a total of 7,505.0 million people were covered worldwide. The Asia-Pacific region had the highest coverage with 4,244.0, while the CIS region had the lowest with 239.0 million.

In terms of regions, the coverage of the population with a mobile network reflects, in short, the number of people living in settlements where access to mobile services is available. If we measure this figure as a percentage, then we get the following results. By

⁹<http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx>



2020, the population of the African region - 88.4%, Arab countries - 95.1%, Asia and the Pacific - 98.6%, the CIS countries - 98.6%, European countries - 99.6% and the Americas 95.5% were covered by mobile services.

Let's take a look at the development of the mobile network. The 2G network standard for mobile communication appeared in 1991 and is the GSM digital mobile standard. The second generation of wireless communication was able to send SMS in addition to encrypted calls. In recent times, especially the pandemic, mobile phones have completely changed the world, and the mobile phone - the smartphone - has become an integral companion of man, which must be in constant communication. According to researchers, it was the crises and pandemics that led to the development of the mobile Internet and the popularity of smartphones, otherwise it would have remained a "big screen" phone. We continue the mobile coverage analysis with the most popular standard coverage analysis. Table 5 shows the analysis of the coverage of the population with at least 3G communication network by regions.

Table 5

Analysis of the coverage of the population with at least 3G networks by regions, mln. person¹⁰

Name of regions	2015	2016	2017	2018	2019	2020
Africa	481	570	635	730	788	829
Arab countries	296	337	358	378	388	396
Asia and the Pacific	3 280	3 613	3 817	3 976	4 096	4 139
CIS	165	176	191	195	212	215
Europe	639	666	670	673	675	679
America	891	914	934	944	964	972
Total around the world	5 751	6 275	6 605	6 895	7 124	7 230

¹⁰<http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx>



According to the analysis, the 2G standard was the sole leader from 1991-2003. Since 2003, 3G has started to develop. At the same time, the quality of voice communication improved, video communication services began to be offered, but the demand was not high enough because of the high cost, and most of the phones with cameras at the top of the screen were not available. U.S. operator AT&T has warned users that 2G networks will be shut down. This means that support for the basic functionality of devices like the first generation of the iPhone has come to an end. Thus, it will no longer be possible to make calls and send SMS via obsolete mobile devices.

The coverage of the world's population with at least 3G communication network is 96% of the total mobile network coverage. This also shows that working with the new standards creates convenience for the population.

In terms of regions, by 2020, the population of the African region - 77.4%, Arab countries - 90.8%, Asia and the Pacific - 96.1%, the CIS countries - 88.7%, European countries - 98, 3% and 95.5% of the population of the American region have access to mobile services with at least 3G network.

Interestingly, the 3G network, which is available to 96% of the world's population, is expected to close in the United States. Well-known US operator Verizon has announced the closure of its 3G network. It should be noted that the 3G mobile communication in the network of this company is not like ours, but is actually based on the second generation CDMA2000 technology. But in the U.S., it has been accepted as a third-generation standard, and, in any case, the operator intends to phase it out completely in December 2022. By the way, the connection to this network was closed in 2018, and now only one percent of Verizon subscribers use it. Other operators in the U.S. are also looking to end real 3G networks soon. In particular, AT&T plans to abandon the service in this standard in February 2022. T-Mobile plans to shut down its third-generation mobile network in January next year. The main reason for this is the creation and launch of 4G, 5G and 6G communication networks called LTE / WiMAX mobile network.

In order to meet strong competition in the field of mobile communications and the rapidly growing needs of consumers, 4G and 5G communication networks have been created. With the launch of the first 4G networks in 2009, unimaginable possibilities opened up. Major mobile operators are focusing on the development of a future standard called



LTE-networks and 5G, which will appear on the market in 2020. The analysis of the coverage of the population with at least LTE / WiMAX mobile network by regions is given in Table 6.

Table 6

Analysis of the coverage of the population with at least LTE / WiMAX mobile network by regions, mln. person¹¹

Name of regions	2015	2016	2017	2018	2019	2020
Africa	89	158	221	282	383	475
Arab countries	74	110	206	253	265	270
Asia and the Pacific	1 715	3 016	3 650	3 868	3 998	4 057
CIS	101	124	145	161	194	196
Europe	499	589	612	639	668	671
America	711	765	812	863	894	903
Total around the world	3 188	4 761	5 644	6 066	6 401	6 571

In terms of regions, a total of 6,571.0 million people worldwide are covered by at least LTE / WiMAX mobile network, according to the analysis of population coverage with at least LTE / WiMAX mobile network. This means 88% of the population has access to mobile communication. 4G and 5G networks are the future mobile networks. 5G is the fifth mobile network, an advanced version of the 4G network. In the new network, data is transmitted 100 times faster than in 4G - in theory, the speed reaches tens of gigabytes per second. Another distinctive feature of 5G is the very short wait time (i.e., the very short time spent on data, where the computation is measured in national seconds) and the ability to transfer data directly between devices. What he sees clearly is the ability to download information faster to a phone or computer. For example, an 8 gigabyte movie in HD quality can be downloaded via a 5G network in six seconds, while in 4G it takes a few minutes.

We will start the analysis of internet-related indicators by finishing the mobile part of the analysis here.

Table 7

**International permeability across regions
ability analysis, Tbit/s¹²**

¹¹<http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx>



Name of regions	2015	2016	2017	2018	2019	2020
Africa	2	2	5	6	9	11
Arab countries	6	8	13	18	24	35
Asia and the Pacific	52	78	118	168	211	301
CIS	5	8	11	11	13	19
Europe	49	56	62	86	120	153
America	39	47	52	71	101	141

According to the analysis of international capacity in the regions shown in Table 7, the highest speed is in the Asia-Pacific region, ie 301 Tbit/s, followed by the European region with 153 Tbit/s and the American region with 141 Tbit/s. . The lowest international bandwidth belongs to Africa, 11 Tbit/s. In the CIS, the international bandwidth is 19 Tbit/s. With this indicator we can see the internet speed in the regions directly. The higher the speed of the Internet, the faster it will introduce new mobile standards and the process of digitization. This, in the end, will allow to quickly and positively address the needs of the population and businesses.

Now we move on to the part of the analysis that is directly related to the Internet.

Table 8

Analysis of the number of people using the Internet by regions, mln. person¹³

Name of regions	2015	2016	2017	2018	2019
Africa	190	215	246	268	299
Arab countries	151	169	195	214	234
Asia and the Pacific	1 412	1 529	1 619	1 766	1 901
CIS	143	151	158	168	176
Europe	496	511	530	551	568
America	615	675	717	748	774
Total around the world	3 007	3 250	3 464	3 714	3 952

¹²<http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx>

¹³<http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx>



For the first decade, the international network was largely limited to the activities of the personal electronic lines of the military and major scientists. The unparalleled pace of development of the Internet has depended on the specific overall financial and intellectual share of government, education, academic and social structures. One of the centers of nuclear research in Switzerland has developed a much more sophisticated way to “connect” distributed computers of a multimedia system to a single network. It is reflected in the World Wide Web. This system turned the Internet into a unique media, and it gained access to information technology, broadcasting, and telecommunications. Now the Internet is able to transmit not only text, but also image, pictures, images, sound and video, directly from the scene. The Internet is a source of information and knowledge for all traditional information systems - telecommunications, television and radio broadcasting, active exchange of information at the international level, etc., combining technological capabilities; mass media, a system of information services related to all spheres of human activity (including educational, political, social, economic, cultural, tourism, etc.); serves as a tool that allows prospective market and national companies to enter the international information space and the world market in the most economical and fast way.

According to the analysis of the number of Internet users in the regions listed in Table 8, it is 3,952.0 million people. In terms of regions, by 2020 the population of the African region - 28.6%, Arab countries - 54.6%, Asia and the Pacific - 44.5%, CIS countries - 72.8%, European countries - 82 , 5% and 76.7% of the population of the American region use the Internet. The analysis of the share of households with computers by region is given in Table 9.

Table 9

Households with computers in the regions

share analysis, %¹⁴

Name of regions	2015	2016	2017	2018	2019
Africa	7,2	7,4	7,4	7,7	7,7
Arab countries	44,0	46,6	48,5	51,0	52,8
Asia and the Pacific	36,7	37,9	39,2	40,4	41,1

¹⁴<http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx>



CIS	65,5	67,4	67,4	66,3	65,4
Europe	76,0	76,8	77,1	77,5	77,7
America	60,5	61,7	61,5	61,2	60,7

According to the analysis of the share of households with a computer in the region shown in Table 9, the highest rate was in the European region and in 2019 was 77.7%. 65.4% of the population of the CIS countries have a household computer. The lowest rate was 7.7% for the African region.

The next analysis is devoted to the analysis of households connected to the international network by regions. This analysis is based on the analysis of the share of households connected to the international network by regions in Table 10.

Table 10

Analysis of the share of households connected to the international network by regions, %¹⁵

Name of regions	2015	2016	2017	2018	2019
Africa	12,4	13,7	14,2	14,4	14,3
Arab countries	45,5	47,8	51,8	54,6	58,9
Asia and the Pacific	41,2	44,3	47,9	51,1	53,4
CIS	69,3	72,2	73,4	74,2	76,4
Europe	76,7	79,0	80,9	82,9	85,0
America	60,7	63,3	66,7	68,7	69,8

According to the analysis of the share of households connected to the international network by the regions listed in Table 10, 85.0% of European countries and 76.4% of CIS countries are connected to the international network.

REFERENCES

- [1] Digital transformation for 2020 and beyond A global telecommunications study by www.ey.com/telecommunications.

¹⁵<http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx>



- [2] Data used by International Data Corporation (IDC) [idc.com](http://www.idc.com) by the author.
- [3] <https://www.ft.com/content/18b853b6-c9fa-4821a5f3-29fb09899312>.
- [4]Used <https://www.lastmile.su/journal/article/8436>. [5]Data from the International Data Corporation (IDC) www.idc.com were used by the author.
- [6] The author used data from <http://www.itu.int/en/ITUUD/Statistics/Pages/definitions/regions.aspx>. [7] The author used data from <http://www.itu.int/en/ITUUD/Statistics/Pages/definitions/regions.aspx>.
- [8] The author used data from <http://www.itu.int/en/ITUUD/Statistics/Pages/definitions/regions.aspx>.
- [9] Ramazanovna G. D. Role of innovation in the sphere of information and communication technologies //Archive of Conferences. – 2021. – C. 6-9.