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Assessment of Trends in the Development of the It Market

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Abstract

The demand for information technology in a new way forced us to reconsider our views on the state of the information and communication technology market. The analysis of the trend in the development of the information space is necessary for the formation of a scenario for the formation of a stable information and communication industry in the hotel state. The article proposes the structure of the IT market, defines the role of its main parts and concludes about their impact on the further development of the IT industry. A brief overview of the components of the modern IT market is presented. The greatest influence is provided by cloud solutions, the Internet of Things market and digital products in the field of artificial intelligence. Observation of changes in the IT market allows us to predict further events related to digitalization. In conclusion, possible ways of developing the IT market are given.

Keywords

Information Technologies, IT Market, Trend, Digitalization, Software Products

1. Introduction

The development of the information technology (IT) sphere, caused by the development of new, improved computing systems and processes, has expanded the essence of the concept of digital development. The concept of "digitalization", introduced by computer scientist Nicolas Negroponte [1], is actively used in the market of IT services and IT outsourcing. Digitalization has affected most of the main areas of public life, among which economic systems are considered to be the most common.

Advanced technologies in the development of new computer hardware, soft-

ware and information security have created a transition to a new information environment. The modern IT services market requires innovative technological developments due to the constant demand for high-quality software, cloud technologies and anti-virus protection systems. The created digital technologies require either modernization or strengthening of existing functions. The improvement of IT products directly affects the economic performance in the field of information technology in individual states. So, for example, the development of the Higher School of Economics can be considered a well-known strategy for the development of the IT industry. According to the project, the share of the information technology market in the national GDP will grow from 0.9% to 4% by 2019, and 10 companies will appear with a market capitalization of $1 billion or more [2].

Watanabe (2016), Brynjolfsson (2018), Nakamura (2018), Moulton (2018), and many other experts acknowledge the difficulty of precisely evaluating a digital economy characterized by rapidly changing products and services. Researchers estimate that "the digital economy is worth $11.5 trillion globally, equivalent to 15.5 percent of global GDP and has grown two and a half times faster than global GDP over the past 15 years [3]."

The digital economy is growing at a staggering pace due to its ability to collect, use and analyze huge amounts of digital data in any format and from any area of our society. According to experts, the volume of global traffic by 2022 grow more than 3 times to 150,700 gigabytes per second. Such a large-scale growth has ensured the expansion of the geography of users and the beginning of the widespread introduction of IoT and artificial intelligence technologies [4].

NRU HSE plans to implement the program until 2030; its plans include measures for the transition to fundamentally new educational programs. It is assumed that such a transition should be based on a wide range of automated tools and services [5].

2. Investigation and Evaluation

The main direction of IT markets can be considered the promotion of tools and tools in the field of Internet of Things, big data, digitalization of the economy. The focus is on client and mobile operating systems, and ensuring the security of user data. Thus, forecasting the direction of IT markets is an important step towards the formation of a sustainable large info communication industry.

The development of the IT market can be assessed through an analysis of its internal structure. The IT market broadly includes both digital technologies and communication-related devices (see **Figure 1**). Each component of this structure has a significant impact on the state of the IT market [6]. So, for example, the volume of the Russian IT market in 2022 decreased by $12.1 billion compared to 2021 due to a shortage of technological equipment and the difficulty of creating local alternatives to foreign software products [7].

Forecasts for the IT services market, as an indicator of information stability in the state, determine the level of development of each of its main components.

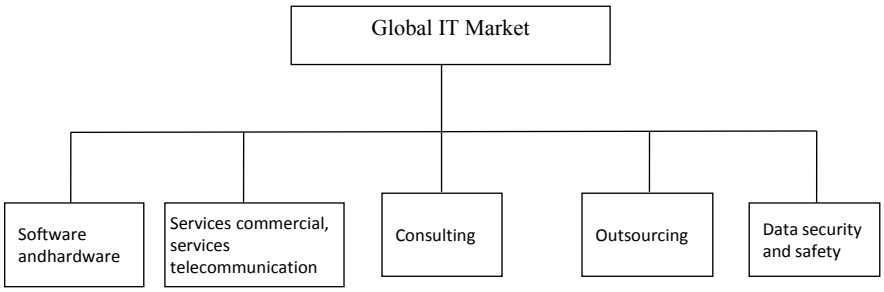

Figure 1. Structure of the global IT market.

Representatives of various IT companies at the end of 2021 concluded that the development of custom software has become a priority among the services of the information market. At the same time, the development of a software package for cloud services, applications for remote work and anti-virus protection have received great demand.

The share of specialists and persons interested in ensuring the digitalization of industries has a significant place in the IT market. The effects of the pandemic have created a huge demand for highly skilled IT professionals.

Andrey Kelmanzon, the manager of the Outsourcing and Services segment, notes that limitations and changes in the relationships between business entities and within the companies themselves served as a catalyst for making non-standard decisions to optimize business processes.

The temporary transition to remote work and the foreign economic processions of 2019-2021 improved the dynamics of the IT services market. Many experts agreed on the growth of the IT market, its share was, according to various estimates, from 5% to 30% relative to 2020. We note the following important areas in the IT market:

1) Growth of the information security outsourcing market. The stability and sustainability of sales of information security outsourcing services, according to some estimates, guarantees its preservation and improvement in the future.

2) Noticeable changes in the software development segment. The volume of software industry products in 2021 has grown by 30% compared to previous years.

3) Growth in demand for the development of cloud technologies.

4) The volume of orders related to online services and mobile applications in 2021 increased 3 times compared to 2019.

Using the data of the TAdviser Internet portal, we will build a distribution schedule for the volume of the Russian IT services market in the period from 2016 to 2021 (**Figure 2**).

Analyzing the data from the graph, we can conclude that in the period from 2016 to 2021 there was an increase in the volume of IT market products, which could be due to both the restrictions introduced (related to the pandemic) and the development of digital products. Moreover, it is also necessary to consider the key IT companies that actively promoted a variety of services. Among them

Figure 2. Growth rates of the IT services market in the period from 2016-2021.

are Russian companies T1, CROC, Jet Infosystem, Digital Economy League and Tegrus. Let's enter data on revenue for 2019-2020 and key IT services into the table (**Table 1**).

After analyzing the data from **Table 1**, we can conclude that all selected Russian IT companies received more revenue in 2020 compared to 2019, which indicates a high demand for digital products [8]. The League of Digital Economy achieved impressive results, which, in comparison with other companies, was able to receive a larger percentage of revenue. These companies play a key role in creating a stable information space in the Russian IT market as a whole.

At the end of 2021, the analytical agency Forrester Research highlighted the main trends in the IT market. Among them, a special role is played by:

1) Cloud solutions.

2) Market for the Internet of Things.

3) Designing artificial intelligence systems.

Let us determine the impact of these decisions on the development of the IT market.

Cloud services greatly simplify workflow processes by creating virtual spaces for easy file management. The goals of the cloud space can be varied. Cloud services operate in three functional segments: application (Software as a Service, SaaS), platform (Platform as a Service, PaaS) and infrastructure (Infrastructure as a Service, IaaS). Currently, popular cloud services are Yandex. Disk, One Drive and GoogleDrive. Let's evaluate cloud services according to the following characteristics: the amount of disk space, the maximum size of uploaded files, the limit of folders and files, change control, viewing files and editing through the interface, change control (**Table 2**). According to the author, these parameters can reveal the functionality of each cloud service, because file manipulation and the amount of space are priority functions.

Capacity, as well as functionality and degree of protection play a decisive role when choosing one or another storage. Currently, such services are actively developing, additional functionality is emerging. The advantages of "Yandex.Disk" include the low cost of the tariff, high synchronization speed and large volume;

Table 1. The largest IT service providers in Russia.

Company	Revenue from IT services for 2020, million rubles	Revenue from IT services for 2019, million rubles	IT services provided
T1	30,800	26,518	Software development, creation of cloud services
CROC	20455.1	17261.8	System integration, consulting
Infosystem Jet	19460.6	18046.4	Service and outsourcing, integration, consulting, software development
League of Digital Economy	16,771	11,230	System integration, consulting
Tegrus	18,300	18,200	Design, implementation and support of engineering systems,

Table 2. Comparison of cloud storage.

Characteristics/service	"Yandex.Disk"	OneDrive	GoogleDrive
Volume disk space	5 - 10 GB	15 GB	15 GB
Maximum file upload size	10 GB	250 GB	Maximum single file size limit for uploading to Shared Drive: 5 TB
Folder and file limit	The maximum size of a single file for uploading to Drive: 1 GB for the free plan.	For all folders and files, you can define the level of access, from exclusively personal to public	400,000, hierarchy of 20 subfolders
Change control	No	No	Yes
Viewing files and editing through the interface	No editing, can view office documents	Files can be viewed	File viewing is possible (more than 30 formats)

to the advantages of regular updates, high security and a large amount of space; The advantages of GoogleDrive are a clear interface, reliable data protection and getting quick access to previously downloaded files. The cloud can be used to store the data of large business companies. Volume, according to VK Cloud Solutions, about 40% of IT companies place data in a private cloud, and about 60% are considering using a private cloud for internal resources and company processes.

The Internet of Things (IoT) is actively involved in the development of the Internet space. The Internet of Things system includes sensors and devices that interact through a cloud connection. Figure 3 shows the main functions of the Internet of Things.

Integration into the global information network of household items that can interact with each other and with the external environment made us take a fresh look at this concept. IoT is used in industry, infrastructure and personal consumer applications. A striking example of a consumer application is the automation of in-house household appliances, such as heating, air conditioning systems, and video surveillance systems. There are problems in the way of introducing such technologies into the IT market, lack of chips, high price, limited access.

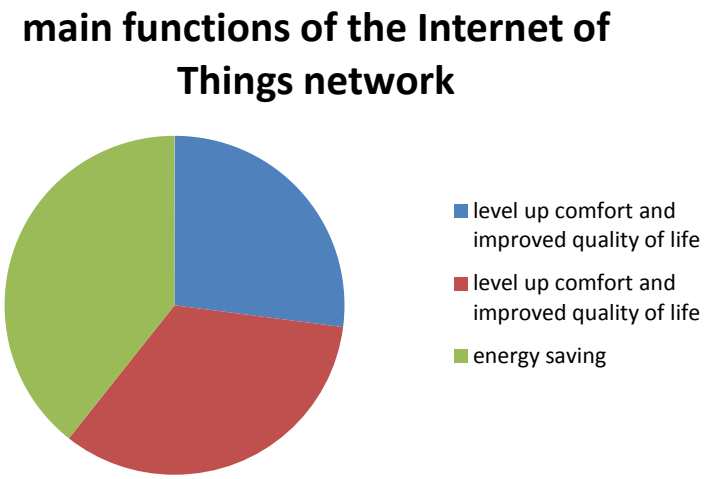

Figure 3. The main functions of the network "Internet of Things".

Table 3. Events related to AI in Russia for 2019-2022.

Year	Highlights related to AI
2019	In Russia, 33% of managers are actively implementing artificial intelligence in their business. Growth of the market for 48% to $139 million. More than 41% of investments in the financial sector are directed to the development of artificial intelligence systems. Standards in the field of artificial intelligence have been established, GOST 58776-2019.
2020	There has been an almost 3-fold increase in the number of scientific studies related to AI. The volume of IT, the market increased by $290 million. The concept of legal regulation of AI has been created.
2021	Creation of Codex (OpenAI). Instead of cookies, Chromme uses Federated learning (FL), a machine learning technique that allows you to train models on multiple decentralized servers without centralizing training data. AI received the first patent, a food container locking system.
2022	Creation by Russian scientists of a biologically plausible memory model for AI systems. Trend, "Generative artificial intelligence" Revenue of the largest AI providers increased by two-thirds.

But, according to Forrester's forecast, more than 40% of financial resources will be invested in infrastructure that has recovered from the pandemic and political situations, which will resume "smart" technologies.

A large number of studies are related to the topic of artificial intelligence (IT), and it continues to be relevant today. Due to the fairly good knowledge of the theoretical aspects of this topic, we present the most important events in the period from 2018-2022 related to AI (Table 3).

As can be seen from Table 3, technologies in the field of artificial intelligence are improving every year, the volume of the IT market is increasing due to new digital products, and new solutions are emerging. It can be seen that the number of scientific research and technical solutions in the field of AI is growing. The analysis of AI technologies by Tadviser made it possible to estimate the pace of development, which is stable at 20% - 30%.

3. Conclusions

In the process of work, a brief overview of the components of the modern IT market was carried out. The greatest influence is provided by cloud solutions, the Internet of Things market and digital products in the field of artificial intelligence. Observation of changes in the IT market allows us to predict further events related to digitalization. The level of development of new and previously created information technologies makes it possible to assess the state of the IT market. In this regard, we highlight the following main trends in the development of the IT market in 2022 and later:

1) Growth of the role of outsourcing and cloud solutions.

2) Growth in demand for highly qualified IT specialists.

3) Increasing demand for custom software products.

It is also necessary to highlight the problems that stand in the way of the development of the IT market:

1) The issue of shortage of personnel, imbalance in the law of supply and demand is not resolved.

2) New technologies require large financial resources for general distribution. The problem of restricting citizens' access to high technologies, for example, "smart home".

3) Lack of hardware due to stressful events.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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