МИНИСТЕРСТВО ТРАНСПОРТА РОССИЙСКОЙ ФЕДЕРАЦИИ
ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ «РОССИЙСКИЙ УНИВЕРСИТЕТ ТРАНСПОРТА (МИИТ)»

Институт экономики и финансов

Кафедра «Экономика и управление на транспорте»

L.V. Lapidus

DIGITAL ECONOMY

Учебное пособие

Москва – 2018

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The basics of the digital economy are disclosed in this tutorial. The correlations between the concepts “digital economy”, “Industry 4.0”, “fourth industrial revolution” are substantiated. The digital economy evolution is analyzed and the transition to new models of production, distribution, exchange and consumption is justified. It is shown, that at present, the main goal is to trigger a systemic transformation, what implies the search for new mechanisms and tools to strengthen the participation of the state, business, and every citizen in the development of the digital economy in order to achieve a comprehensive result at all levels, from small businesses to the state as a whole.

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CONTENT

Introduction

To live in the era of technological change is pure luck. Digital economy, Industry 4.0, e-business, blockchain and bitcoins - every day brings new questions that you seek answers to. Everyone caught the "digital fever". Companies are launching digital transformation, restructuring business processes and designing new business models. States direct all efforts towards improving the country's competitiveness and the quality of life of the population. Citizens improve their digital literacy and develop future competencies. The world is preparing for the fourth industrial revolution.
(L.V. Lapidus)

The digital economy is a "living", constantly evolving "organism", whose behavior cannot be fully studied. Every day brings more and more new technological solutions with the according terms that are the results of the latest transformations and the need to make decisions on the choice of alternatives. The most important goal is the one of gaining, obtaining knowledge in the field of digital economics and technology, and of understanding of cause-effect links and correlations brought to light since 1990.

For example, many countries caught the real **"digital fever"**, when Bitcoin (Bitcoin, BTC), which appeared in 2009, only in 2017 showed a rapid growth from $ 800 to $ 11,000. The total capitalization of the Bitcoin market by the end of 2017 reached 300 billion US dollars. For comparison, the world turnover of bitcoins at the beginning of 2014 was estimated at 11 billion US dollars [coinmarketcap.com]. Other popular cryptocurrencies are Peercoin (PPC, 2012), Dogecoin (DOGE, 2013), Etherium (ETH, 2015), etc. The market of all cryptocurrencies at the beginning of 2018 was $573.98 billion. New terms appeared (ICO, token, mining farms, etc.). All this led to the emergence of new types of electronic services: services of crypto farms, bitcoin farms, crypto funds, etc.

According to the world practice, the evaluation of the digital economy is done with respect to the Internet markets, whereas Internet-dependent markets are appraised separately. The same practice is adopted in the Russian Federation. Thus, by the end of 2016, the share of the digital economy in the GDP of the Russian Federation was estimated at 2.8% of GDP (Internet markets) and 19% of GDP (Internet-dependent markets). The e-commerce market was estimated at 1238 billion rubles, the digital content market at 63 billion rubles, marketing and advertising - 171 billion rubles, infrastructure and software - 2000 billion rubles. 2.5 million jobs have been created in the Internet industry[1].

[1] According to the Russian Association of Electronic Communications (RAEC). Zvereva T. Internet economics: zones of stability. Thematic pages of RBC +. April 13, 2016. P. 3; Economy Runet. Study "Economics of Internet Services and Content Markets in Russia 2014–2015» / RAEC, HSE. ЭкономикаРунета.рф. P. 5.

The aim of this tutorial is to reveal the methodological foundations of the digital economy, the nature and essence of the main definitions of “digital economy”, “Industry 4.0”, “fourth industrial revolution”, and the technologies massive penetration of which will lead to the transition to Economy 4.0. Let us describe the key principles of digitalization that lie in the basis of transformation of business processes and business models of modern companies in all sectors of the economy. To substantiate the importance of digital technologies in the formation of a new technological shift and to show the role of the digital economy in launching the process of large-scale digitization of social and economic systems at all levels.

Below are links to resources where you can find additional materials:

Official Site phd L.V.Lapidus: **www.larisalapidus.ru**

Blog phd L.V.Lapidus of interdepartmental course MSU "Digital Economy: Managing e-business and e-commerce" group VKontakte: **http://vk.com/club76268050**

Blog on YouTube: **https://www.youtube.com/user/larisalapidus**

1. What is the Digital Economy?

Changes over the course of almost 30 years, pertained to the evolution of digital technologies, led to transformations that few could predict. Since 1990, since the opening of access to the Internet for all people on our planet, business has been forced to constantly respond to the challenges of the external environment, which is currently described by the highest degree of dynamism, complexity and uncertainty, regardless of industry sector[2].

As the President of the Russian Federation V.V. Putin noted, "**digital economy** is not a separate industry, in fact it is a way of life, a new basis for the development of the system of government, economy, business, social sphere and the whole society. The formation of the digital economy is a matter of national security and independence of Russia, the competitiveness of domestic companies". [3] On July 28th, 2017, the Government of the Russian Federation approved and ratified the Program titled "Digital Economy of the Russian Federation".

Understanding of **the digital economy** in the strict sense is associated with the consumption of electronic services and services, in a loose sense - with the penetration of cross-cutting digital technologies of Industry 4.0. At the end of 2016, the share of the digital economy in the GDP of the Russian Federation was estimated to be 2.8% of GDP (Internet markets) and 19% of GDP (Internet-dependent markets) [RAEC, www.rif.ru].

In terms of scale and strength of the technological impact of the external environment on business, industry and economy of the countries, the transformations that are currently in process have no analogues ((On-demand economy, Mobile economy, Sharing Economy, Wikinomics [Tapskott D., 2009, p. 104; Howe, Jeff, 2009; Lapidus LV, 2016 (a); Lapidus LV, 2017 (b)], the Hi-Tech Gift Economy [Barbrook R., 1998], Gig Economy (Gig Economy)).

In Lapidus L.V.'s opinion, **the digital economy** is a set of relationships evolving in the processes of production, distribution, exchange and consumption, based on the use of online technologies and aimed at meeting the needs with respect to life benefits, that, in turn, requires development of new ways and methods of management and effective tools of state regulation» [Lapidus LV, 2016 (g), p. 4-11].

This is primarily due to the reduction of the life cycle of innovations, that is, the acceleration of the emergence of new generation digital technologies, which allow us to increase customer value, attract the attention of an increasing number of consumers and generate additional demand

[2] Lapidus L.V. Electronic Economy: New Opportunities for Business // Prospects for the development of e-business and e-commerce. Materials of the II Interfaculty Scientific-Practical Conference of Young Scientists: Moscow, Moscow State University named after M. Lomonosov, Faculty of Economics; November 25, 2015: Reports and presentations. M .: The Faculty of Economics of the Lomonosov Moscow State University. M., 2016. P. 4–11.
[3] TASS. URL: http://tass.ru/ekonomika/4390974

for products and/or services. This is a reason why the first sector of the economy that responded quickest to the impact of changing in consumer preferences was the sector of services.

E-commerce, online banking and the media began to transform business models in 1994. [Lapidus LV, 2016 (c)] Later, the first trading digital platforms (marketplaces) and virtual exchanges are appeared. In the years 2000-2010, it was possible to observe the rapid development of new types of digital products and electronic services. Traditional business began to actively respond to the opportunities and threats of the digital economy in the early 10s. The massive penetration of Industry 4.0 technology into various industry segments began in the period 2015-2017.

Digital economy is a new business environment that forces business to respond first with respect to threats, as well as new opportunities of online technologies: reducing transaction costs, pointed targeting and wide coverage of the target audience, increasing productivity, reducing time spent on online communications with partners and customers, increasing customer satisfaction through quick and effective feedback. Omni-channeling has become a determinant of the competitiveness of online and offline companies.

Taking into account the ongoing transformations of business models, **the digital economy** should be defined as the development of business processes and business models on the basis of digital technologies and the exchange of big data, aiming at advancing business competitiveness by increasing consumer value and achieving such key results like reducing the costs and increasing in labor productivity.

We are talking about both: business models that are typical for companies that have built their businesses on the Internet, as well as traditional business that historically conduct business offline in various sectors of the economy (mining, agriculture, manufacturing, services).

2. The Reference of the Concepts of "Industry 4.0" and "Digital economy".

The dating of the first mentioning of the terms goes into the distant past: “digital economy” - 1995, “Internet of things” - 1999, “Industry 4.0” - 2011.

The term **Industry 4.0** originated in 2011 at the Hannover Fair and was intended to mean a radical transformation of global value chains[4]. Currently, the term is popular in Germany as the term for the government initiative aimed at transforming industry as an integral part of the country's strategic development.

[4] Schwab Klaus. The fourth industrial revolution / lane. from English Klaus Schwab. M .: Publishing house "E", 2017. P. 16.

According to BCG, 85% of German enterprises have already adopted or are planning to implement the principles of Industry 4.0. in the next 1-2 years[5]. The PwC report noted that Industry 4.0 implies cross-cutting digitization of all physical assets and their integration into the digital ecosystem along with the partners involved in the value chain. Over the next five years, the companies participating in the PwC survey expect an increase in annual revenue on average by 2.9% and cost reductions of 3.6% on average per year. PwC considers Industry 4.0 as a concept with the following main ideas: digitalization and integration of vertical and horizontal value chains; digitalization of products and services; digital business models and customer access[6]. Digitalization of internal operations is launched in all countries all over the world, but Japan and Germany are considered leaders in this prospect.

In author's opinion, **Industry 4.0** is a set of relations developing in processes of production, pertained to the intromission of digital technologies (Industry 4.0 technologies) and aimed at improving the competitiveness of business and the country.

From the perspective of Ludwig von Bertalanffy's system theory, **Industry 4.0** is a system consisting of a chain of interrelated production processes, an integral element of which is the exchange of data in digital form between system links (people, machines, cloud (data centers)) using digital technologies. Industry 4.0 technologies penetrate both: the production cycle of services and the production cycle of goods. Based on this definition, we can conclude that the relationship between the concepts of "Industry 4.0" and "Digital Economy" as those of a part and a whole.

With respect to digital economy, in the Russian Federation one should rather not adhere to the term "Industry 4.0", but "**Industry 4.0 technologies**", which are digital. The technologies of Industry 4.0 include: Big Data, neurotechnology, artificial intelligence (AI) and machine learning, quantum technologies, distributed registry systems, Internet of Things (IoT), Industrial Internet (IIoT), wireless technologies, components of robotics and sensor technology, virtual technologies and technologies of augmented and mixed reality (VR, AR, Mixed R), cloud and mobile technologies, drones, wearable gadgets, blockchain, 3D printers, Agile technologies, new production technologies, etc.

[5] BCG. Russmann M. [et al.] Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries, 2015.
[6] PwC Industry 4.0: Digital Enterprise Creation Report. World Review of the implementation of the concept "Industry 4.0", 2016.

3. What is the Fourth Industrial Revolution?

Some experts view the terms “Industry 4.0” and “the Fourth Industrial Revolution” as synonyms.[7] According to the World Economic Forum, **The Fourth Industrial Revolution** is a “mental model” for understanding and defining how the technologies change, how the value is created, shared and distributed through economic and social systems[8]. In fact, these terms are not synonyms for the reason that the perspective distinctive feature of the fourth industrial revolution is a large-scale transformation of all processes based not only on the digital technologies of Industry 4.0.

The technologies of the fourth industrial revolution are digital technologies (technologies of Industry 4.0), biotechnologies and technologies of precision medicine, new materials, neurotechnologies, new approaches to the conservation and generation of energy (Table 1).

Table 1.

Technologies of the forth Industrial Revolution

On-line technologies	**Industry 4.0 technologies**	**Technologies of the 4th Industrial Revolution**
Internet and other Web-technologies: **1990-2000** **2010-2010** **2020-2030**	Big Data, neurotechnology, artificial intelligence (AI) and machine learning, quantum technologies, distributed registry systems, Internet of Things (IoT), industrial Internet (IIoT), wireless technologies, components of robotics and sensor technology, virtual, augmented and mixed reality technologies (VR, AR, Mixed R), cloud and mobile technologies, drones, wearable gadgets, blockchain, 3D printers, Agile technologies, new production technologies, etc.	Digital technologies, Industry 4.0 technologies, biotechnologies, precision medicine technologies, new materials, neurotechnologies, new approaches to energy conservation and generation, etc.
Digital economy		**Economy 4.0**

Author: Lapidus L.V.

The fourth industrial revolution will be marked by the complex and comprehensive penetration of new technologies into all spheres of our life, which will entail a transition to the Economy 4.0.

[7] Schwab Klaus. The fourth industrial revolution / lane. from English Klaus Schwab. M .: Publishing house "E", 2017. P. 16.
[8] World Economic Forum, 2017.

4. Evolution of the Society and the new Technological shift.

The engine of any social lies in innovative technologies. As soon as the innovations appear, they begin to influence people, by changing the consumer behavior of the latter, shaping their taste, new needs, habits, and that, in turn, leads to an increase in demand and ultimately affects the structure of the economy. This formula of evolutionary development is not new. Thus, the dominance of the services sector in the structure of GDP became a characteristic feature of the developed countries economies at the end of the twentieth century. The share of the service sector in the structure of the economies of such countries like the US, France, Great Britain, Germany exceeded 70%. This trend was strengthened during the period of rapid development of Internet and information and communications technology.

Information technologies contribute to the emergence of new industries and the growth in demand for services based on IT technologies, leading to improved interpersonal communications. The impact of IT-technologies in the growth of the share of the services sector is estimated at 15%. At the same time, with innovative development, the society brings forward new demands on education.

Let us turn to the ideas of one of the authors of the post-industrial society and the author of the book “The Third Wave” Alvin Toffler, according to whom the development of mankind passed through three waves, three leaps of scientific and technical progress, which predetermined different types of society: agrarian, industrial and postindustrial.

The agrarian (pre-industrial) society, in other words, the traditional society with the dominance of agriculture (90% of the employed) and manual labor, is still inherent in some countries of Latin America and Africa. This type pf social development is marked by the fact that handicraft production did not contribute to the redistribution of the population in the structure of employment towards industry. In order for such a shift to take place, completely new technologies were needed that were necessary for the development of mass production. This shift took place later, when the industrial revolution was accompanied by accelerated processes of urbanization, the transformation of the economy, what ultimately, as a result of the transition from manufactures to machine production, led to the predominance of industrial production and the formation of **an industrial society**.

The development of industry allowed to increase the welfare of the population, which affected the consumption that began to shift towards the service sector. There is an objective law: as the welfare of the population grows, the paying capacity increases too, as well as the consumption of services. People do not want to engage in routine work - be that at work and at home, there is an active transition of certain types of work to outsourcing, and therefore the need for services begins

to increase sharply. This is the way how **the post-industrial (information) society** that includes countries with service sector share to GDP exceeding 70% was formed.

Companies increased their expenditures on information technology by more than ten times. Financing of the software development industry over the past 30 years has increased more than 130 times. New branches were formed, new markets of electronic services emerged.

Among the companies that can be called the "generators" of information innovations, we can highlight Amazon (1994), Yahoo! (1995), Yandex (1997), Google (1998), Wikipedia (2001), Skype (2003), Facebook (2004), YouTube (2005) and others. The formula is simple, new information technologies solve commercial problems and business challenges, as they contribute to cost reduction. Besides, each new information systems generation continuously generates a number of new innovative services and, therefore, predetermines technological developments of the next level.

It should be noted that the cost of new technologies at the initial stages of development is always quite high and, thus, only wealthy companies can afford to embark in their development. with technological improvement, new technologies become cheaper and more affordable for companies of different sizes. The price availability of these new technologies leads to their total coverage and their penetration not only into production models, but also into our lives. They become an integral part of our lives. Only under this condition, the processes of automation, informatization or digitalization had become and are becoming mass. In other words, technological shift does not occur at the moment of the emergence of the first technologies of a new generation, but at the stage of sufficient maturity of a technology or a group of technologies, in the period of mass demand and availability of technologies, which ensures the transition of the society to a new level of development.

5. The Digital Economy Evolution.

The evolution of the digital economy is based on the development of digital technologies: online technologies of different generations (Web 1.0, Web 2.0, Web 3.0, Web 4.0), Industry 4.0 technologies.

Since 1990, the digital economy has gone through several stages of its development (Fig. 1):

1990-2005 - "The Digital Economy formation" - consists of two phases: dotcom boom **(1990-2000)** and development of new e-services, e-business and e-commerce markets **(2000-2005)**;

2005-2010 - "The growth of the Digital Economy" - rapid growth of new types of digital products and electronic services;

2010-2015 - "The maturity of the Digital Economy" - mass embedding of online channels and the penetration of digital technologies into traditional business;

2015-2020 - "Digital fever" - chaotic reorganization of business processes and transformation of business models.

2020-2030 - "Systemic transformation" - digitalization based on the system approach, focus on qualitative systemic shifts.

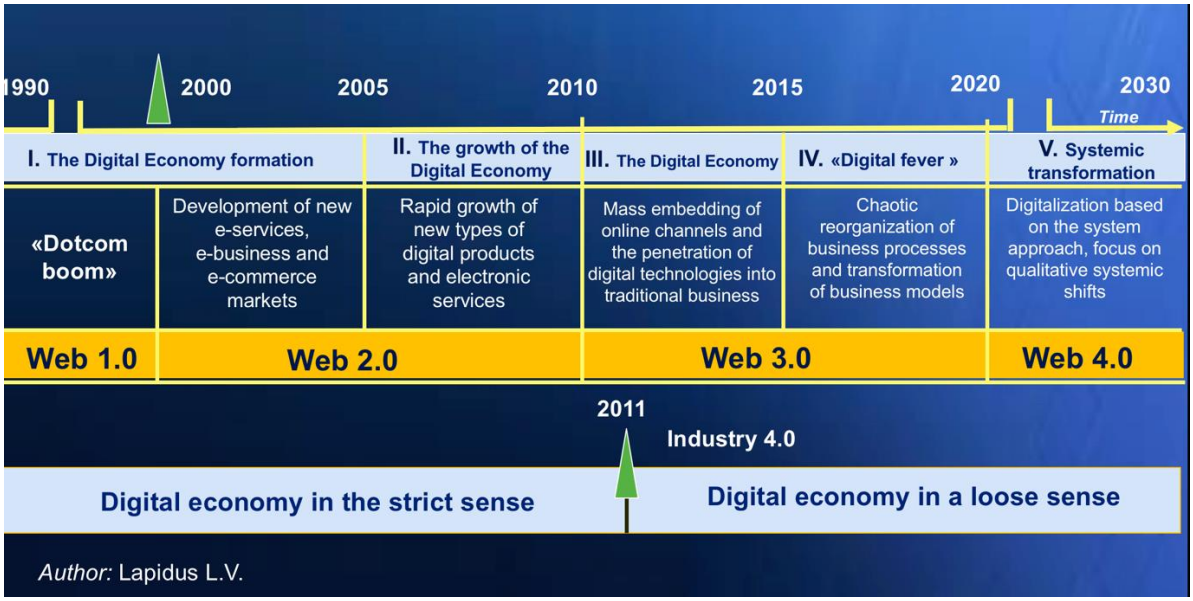

Fig. 1. The Digital Economy Evolution.

Author: Lapidus L.V.[9]

The stages were singled out on the basis of the analysis of many processes and indicators that could be arranged on the y-axis. The latter include, for example, the number of Internet users, the emergence of new forms of business, the behavior of Internet markets, the transformation of business models, online consumption, shifting to the Internet consumption made by the mobile devices, the transition to the mobile economy, when online consumption with the use of mobile devices exceeded 50% in the developed countries and many others (Fig. 2).

[9] Lapidus, L.V. The evolution of the digital economy. Annual International Scientific Conference Lomonosov Readings - 2018. Section of Economic Sciences. "Digital economy: people, technology, institutions." - ISBN 978-5-906783-92-9. - Faculty of Economics of the Lomonosov Moscow State University, 2018.

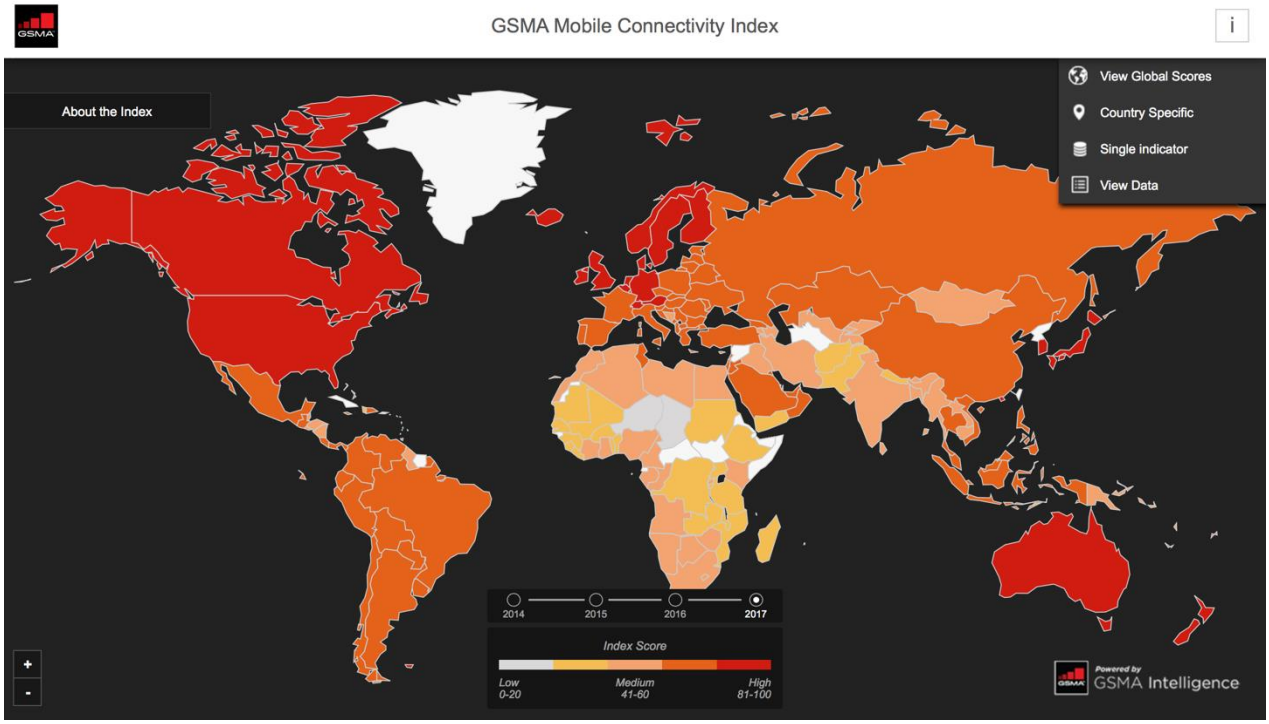

Fig. 2. GSMA Mobile Connectivity Index.

Source: GSMA Intelligence.

Consider some of the key changes. So, by 2000, banking sector, trade, media, and, later, education, public catering, etc., were considered to be the most dependent on transformations in the B2C market [Lapidus LV, 2016 (c)]. At the same time, the B2B segment had begun to shift, as the marketplaces and interbranch trade exchanges were created, what, in turn, allowed industrial giants to reduce procurement costs by 5-15%.

In the first decade of the 21st century, new markets for digital products and electronic services were rapidly developing. For the 2010-2015, the active process of penetration of Industry 4.0 technology into all sectors of the economy became a distinctive process of that time period, reflected in the emergence of new business processes for managing the life cycle and reducing operating expenses through the Internet of Things (IIoT); switching to robotic solutions, customized products and/or services and infusing crowdsourcing in production models; in marketing and targeting based on Big Data and the use of the capabilities of artificial intelligence, neural networks, VR, AR; in building digital platforms based on the technology of machine learning, etc. [Lapidus LV, 2017 (c)].

By 2015, the most inert industries were metallurgy, heavy engineering, infrastructure sectors of the economy like energetics and transport[10]. It should be noted that the connection by the due date already created the necessary conditions for increasing data transfer speeds and, thus, was transformed simultaneously with the development of the Internet.

On July 28th, 2017, the Government of the Russian Federation promptly approved and ratified the Program titled "Digital Economy of the Russian Federation" – the event that marked the transition of the Russian Economy to a new stage of digital economy development - a systemic transformation. ["Digital Economy, 2017; "On the strategy of science and technology, 2016; "On the development strategy of the information society», 2017].

Amongst the number of industries with high potential for digitalization, but a slow transition to massive transformations, are construction and agriculture. The question of that being the sign of underdevelopment and backwardness can be determined only by the research. In industries like these, justification of the investment decisions is utmost important with little attention to the race for technology for the sake of technology. The same can be said with respect to the pursuit of indices that some experts try to link with the assessment of the digitalization level of enterprises, regions, etc., while ignoring many important factors, such as unemployment growth forecasts in the regions with city-forming production systems.

At present, the main goal is to trigger a scale systemic transformation, what implies the search for new mechanisms and tools to strengthen the participation of the state, business, and every citizen in the development of the digital economy. Despite the fact that digital technologies are "cross-cutting", it is qualitative shifts determine the priority of decisions on the implementation of these technologies.

6. The Origin of Online Business and The Dotcom Crisis.

Since 1990, widespread Internet penetration and the development of Internet technologies have stimulated the emergence of new types of electronic services: online commerce, online advertising, social networks, online sales of airline / train tickets, online hotel booking, etc.

Thus, if in 1992, the number of computers connected to the Internet was around a million computers in the world, in 1996 this number hit 10 million. Moreover, during this time period, in the mid-1990s, web browsers like The Netscape Navigator and Internet Explorer have appeared. **Web browsers** are programs that allow access to the Internet.

[10] Lapidus, L.V. The evolution of the digital economy. Annual International Scientific Conference Lomonosov Readings - 2018. Section of Economic Sciences. "Digital economy: people, technology, institutions." - ISBN 978-5-906783-92-9. - Faculty of Economics of the Lomonosov Moscow State University, 2018.

By the end of the 90s, Internet reached high speeds, and by 2009, 1 billion people had already become Internet users. Currently, this number is amounted to 4 billion (Fig. 3).

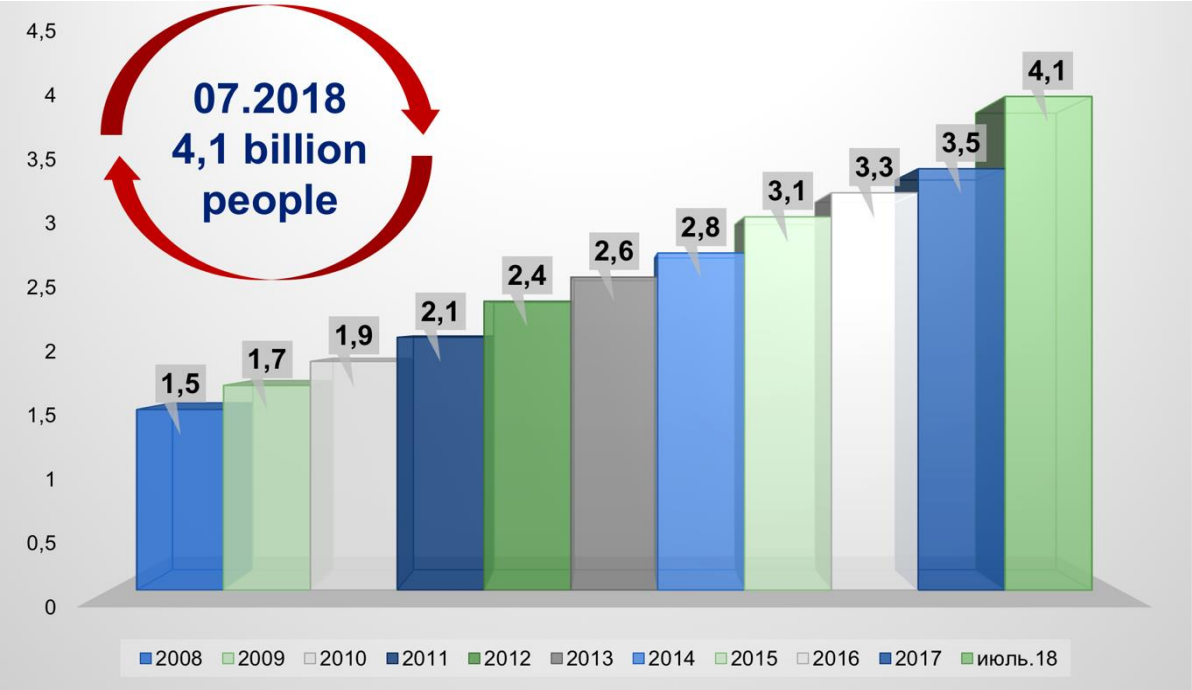

Fig. 3. Number of Internet users worldwide, 2008-2018.

Source: Statista, 2018.

The changes and new opportunities that Internet brought with its development attracted more and more businessmen to start-up companies in the online space. Among the first Internet companies that later became widely known were the online store Amazon (1994), search engine Yahoo (1995), Internet auction eBay (1995), search engines Yandex (1997) and Google (1998).

This kind of companies was called “dotcoms”, since their activities required not only the postal address that all other companies had, but also the web address. And since the web address of the first Internet companies was formed with the use of the company name, dot and com, they were called dotcoms. For example, eBay.com, amazon.com, etc. And if we use these names in web browser, we get to the sites of the companies stated.

Thus, **dotcom (dot.com)** is a company that conducts business fully on the Internet. Any online store, taxi aggregator, ordering, wikipedia electronic library – they are all dotcoms.

The Golden Time for dot-coms came in 1995. It was marked by the explosive emergence of new companies created on the Internet. In the period from 1995 to 2000, the rise in the value of the shares of the dot-com had no logical ground. Investors invested money in the development of dotcoms, not fully understanding how this kind of business works, how these companies should be managed and what factors are crucial for the market value of such companies. Many believed in a miracle that such investments would bring them great returns in the future. As a result, this belief

rushed the demand for the dotcoms shares and, consequently, led to an overestimation of their market potential, which was the reason for "financial bubble", so called **the "dot-com bubble"** (eng. **Dot-com bubble**). This could not last long, and in 2000 the **"dot-com crisis"** began.

The bubble burst, the value of the dotcom stock fell. Thus, on March 20th, 2000, the index of the American electronic stock exchange for trading securities of high-tech companies NASDAQ (National Association of Securities Dealers Automated Quotation) reached 5,132.52 points and fell to 5,048.62 at closing. Later the fall continued to 1,100 points recorded by the end of 2002. Many Internet companies were on the verge of bankruptcy; some of them collapsed and were forced to leave the market. Fig. 4 depicts Amazon.com, Inc. Interactive Stock Chart.

Fig. 4. Amazon.com, Inc. Interactive Stock Chart.

Source: http://www.nasdaq.com/symbol/amzn/interactive-chart?timeframe=1m.

Investors were disappointed as their dreams did not come true. Over the following years, almost no one believed in Internet business: neither businessmen nor investors.

Despite the low activity of businessmen, after 2000, new dotcoms began to appear, including Wikipedia (2001), Skype (2003), Facebook (2004), YouTube (2005), etc. Since 2005, Internet companies have conducted several large transactions, for example, in 2005 eBay bought Skype for $ 2.1 billion. Another example is the Google acquisition of YouTube in 2006, for $ 1.65 billion.

After 2010 began a new era of dotcom activity. The digital economy has opened up the possibility for businesses to quickly enter the global market, new markets and an IPO. Such rapid growth in traditional business was virtually impossible. This explains the fact that companies doing business on the Internet are at the top of market capitalization ratings. Thus, if it took about 20 years for a traditional business to reach a capitalization of $ 1 billion, over the years these time frames decreased up to a few months.

The most significant purchase in the history of Internet companies was carried out in 2014, when the social network Facebook bought the well-known messenger WhatsApp for $ 19 billion. In the period from 2014 to 2017, the value of Internet services again began to grow at a tremendous rate, which led to rumors about the new financial bubble. For example, the cost of Uber rose from $ 3.8 billion to $ 70 billion.

Until 2017, the term "dotcom crisis" was rarely used. However, over the past few months, we could repeatedly hear about this phenomenon due to the rush around cryptocurrency. And it is not by chance that this topic has become so popular, as the direction of Bitcoins development is marked by the signs of a "financial bubble", very similar to the one observed with the dot-coms. And what came of it, we already know.

7. The Digital Products and Electronic Services New markets.

The emergence of the Internet and the evolution of e-commerce technologies have been accompanied by market transformation and changes in business models, including the following:

1. the purely new markets for electronic services are formed;
2. the new markets for electronic services based on the transformation of existing markets are formed;
3. the new markets for traditional goods and services are appeared;
4. the new markets are appeared that threatened existing markets, often playing the role of "disruptive" innovations.

Thus, the new markets were formed, existing ones were transformed, traditional ones were grew with the development of the Internet.

The e-commerce, online advertising, online banking were the one of the very first e-services markets.

The global e-commerce market is growing steadily (Fig. 5).

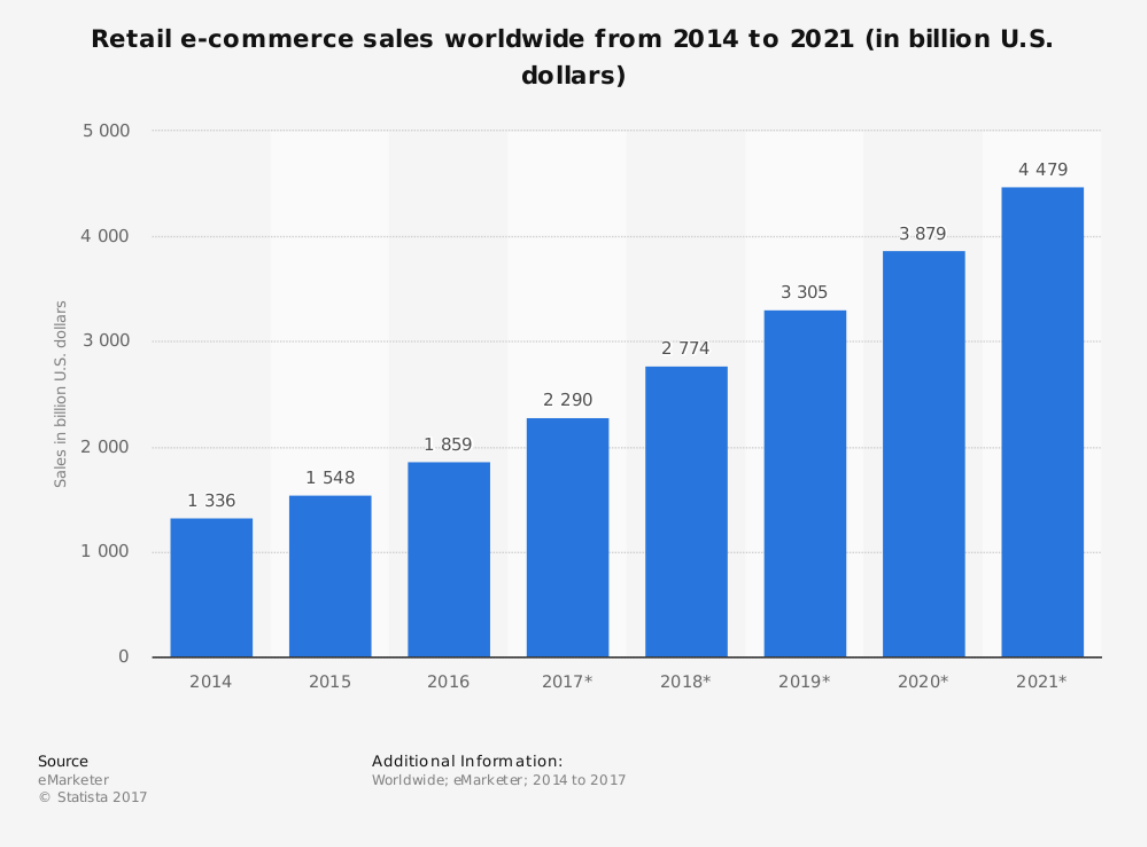

Fig. 5. The global e-commerce market, 2014-2021.

Source: eMarketer, Statista, 2017.

The national companies Amazon and Alibaba are the leaders on the US and Chinese markets, respectively (Fig. 6).

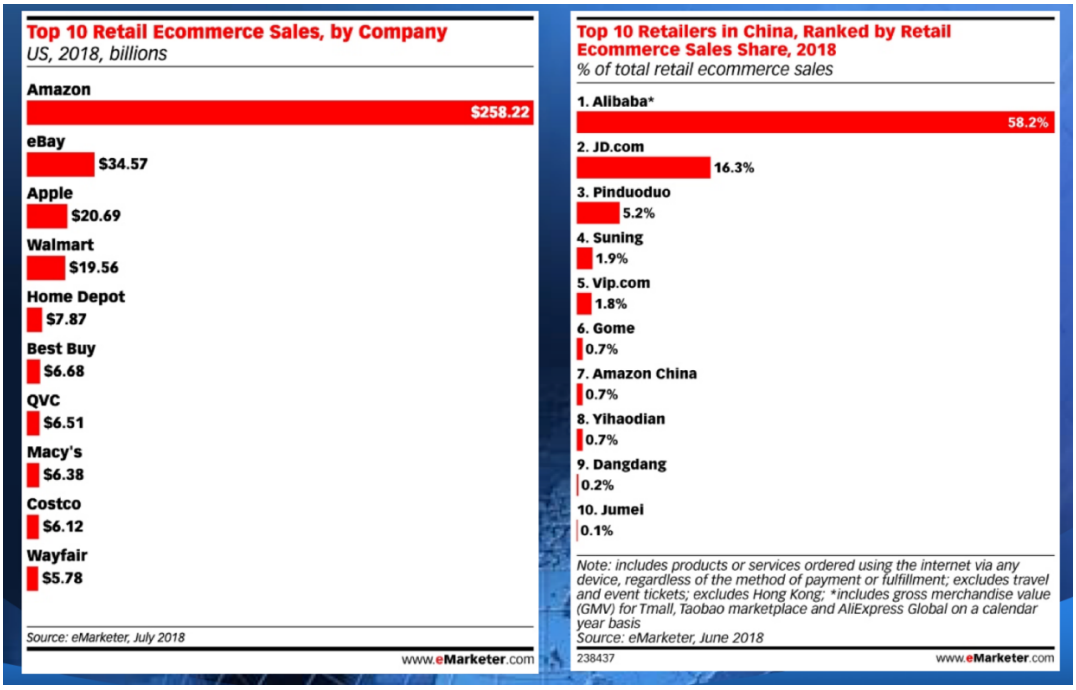

Fig. 6. Top 10 retailers in America and China, 2018.

Source: eMarketer.com.

Digital Industry 4.0 Technologies is starting to influence on the consumer behavior of young buyers on the online trading market (Fig. 7).

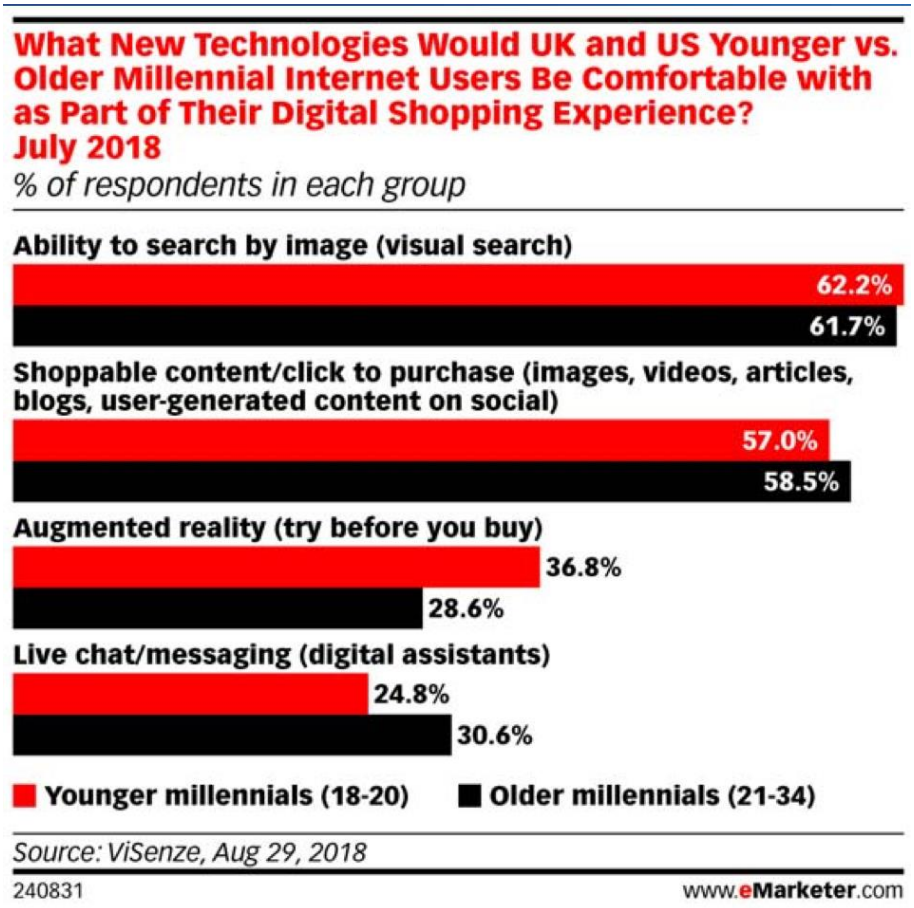

Fig. 7. The consumer behavior of young buyers on the online trading market, UK and US, 2018.

Source: eMarketer.com.

E-advertising market began to form in the early 1990s, several years after the occurrence of the first companies doing business in the Internet. During the "dotcom" crisis market growth has stopped, but soon the online advertising began to grow again. The budgets for advertising in the Internet were increased not only by the companies of e-business, but also by traditional companies, which attracted a broader scope of consumers, competitive pricing models of electronic advertising accommodation and high efficiency of advertising exposure by targeting and BIG DATA opportunities.

The Russian market of Internet advertising was estimated at $ 27.3 billion in January - March 2016. This segment showed the highest growth compared to the same period of the previous year (31%) (Table 2.)

Table 2.

Change in the e-market advertising in Russia in comparison with the traditional advertising market

Segments	January-December 2015 г., bln. rubles	2015 to 2014, %	January-March 2016 г., bln. rubles	January - March 2016 to January - March 2015, %
Television	136,7	-14%	36,2	19%
Radio	14,2	-16%	2,9	12%
Press	23,3	-29%	4,4	-14%
Outdoor advertising	32	-21%	7,8	7%
Internet	97	15%	27,3	31%
Others	4,2	-19%	0,7	8%
Total:	307,5	-10%	75,5	18%

Source: akarussia.ru

E-marketing system construction directly depends on what the company does: advertise their products / services, and then advertising - the center of losses; advertise products / services of other companies, i.e. earns on advertising (advertising - the center of revenues), or do both, and others.

If conduct the analysis, the larger share of traditional business companies could be attributed to the first group, and smaller - to the second. The first group includes all companies that sell products / services. The second group includes advertising agencies, design studios, offices and others. With the transition to the era of e-economy all was radically changed, today the main source of income for many companies doing business in the Internet has become an advertisement. But it isn't called advertising agencies and advertising is not its' main line of business. For example, "online acquaintance service *PlentyOfFish* was established in Canada in 2003. By the end of 2006, it had 300,000 users every day viewed 600 million pages per month. Only one employee, service founder Markus Frind designed and wrote the code for the site and used the services of Google *AdSense* for advertising accomodation that brought him $ 10 000 per day. Consumers used the service free of charge". [Carr, 2014, p. 19]

Many companies get main income from advertising, for instance, context (search) advertising brings the main income for Google, social networking site Facebook offers targeted advertising and earns on conversion ("clicks" on advertisements from its website). In 2013, the company earned on advertising $ 7 billion. For comparison, similar incomes were estimated at $ 0.74 billion in 2009, two years later, at$ 3.80 billion in 2011. [*eMarketer*]

The refusal of companies from their own IT infrastructure and software, Big data management through the cloud contributed to the emergence of cloud storage services and the formation of a new growing market (cloud technologies, virtualization services) are popular now. The popularity of various types of cloud infrastructure by its ownership (type of owner), management and operation: private cloud, public cloud, community cloud and hybrid cloud.

The following types of cloud services are distinguished:

- *Software as a Service, SaaS*: cloud storage services, file sharing systems, backup systems, etc.
- *Platform as a Service, PaaS.*
- *Artificial Intelligence as a Service, AIaaS.*
- *Infrastructure as a Service, IaaS*: virtual server (own / dedicated); virtual data center (own / dedicated); colocation (hosting your own server); data center / server rental.

Cloud services are most convenient for small and medium businesses. According to iKS Consulting, the volume of the cloud services market amounted to almost 13 billion rubles in 2014. Leadership retained IaaS services[11]. Experts predict that the SaaS services market volume will reach 51 billion rubles and almost equal in terms of money with the IaaS-market by 2018. At the same time, these services will remain on the first place in the total volume of cloud services. The IaaS market will grow at an average annual growth rate by 20% and will reach 56 billion rubles. ($ 1.047 million).[12] By 2018, the Russian web presence and web applications market will grow to 16.0 billion rubles. (301 million dollars) with an average annual growth rate of 14%.[13]

One of the attractive sides of cloud storage is data security, which is shifted from the responsibility of the client companies to the services of the service provider companies. A further decrease in the cost of these services is predicted and their transfer to the category of affordable for small and medium businesses.

The Rostelecom, Russian Railways, VimpelCom Group, Yandex, Sberbank of Russia, COMCOR (Akado Telecom trademark), Gidrometsentr and others have the corporate data centers in Russia.

Aggregating companies (GettTaxi, Yandex.Taxi) made adjustments to the work of transport companies and made their services available to consumers. Electronic business has become popular due to the fact that electronic transactions have allowed companies not only to build effective relationships with consumers and suppliers, but also to reduce costs.

[11] ccording to Economics Runet. Study “Economics of Internet Services and Content Markets in Russia 2014–2015”. RAEC, HSE. P. 28.
[12] Ibid. P. 28.
[13] Ibid. P. 28.

According to Cargemini, the mobile money, e-wallets and virtual currencies accounted for up to 10.5% of the world market for cashless payments in 2016. Among the leading countries were the UAE, China and Turkey. The share of mobile shopping accounted for 24, 21 and 19% of all online purchases in these countries, respectively[14]. According to Data Insight, if there is a need to make a payment online, 30% of respondents will choose payments from e-wallets, 26% will pay with credit cards and only 9% will make payments via Internet banking.

Assessing the state of the markets is a real problem. The volume of cross-border e-commerce paid through PayPal is practically impossible to evaluate.

8. Industry 4.0 Technologies and Business Benefits.

The important part of the transformations that occur under the influence of technology Industry 4.0, besides introduction of digital technology, is the improving of **customers value** (**value chain**). That is a reason why Industry 4.0 technology markets are amongst growing markets and are attractive for investors and start-ups. Thus, according to Bank of America Merrill Lynch, by 2020, the market of artificial intelligence will grow to $ 153 billion[15].

From 2015 to 2021, the annual growth of IoT (Internet of things and Internet of connections) will be, on average, 23%, and in 2021 - 16 out of 28 billion connected devices will be accounted for by IoT devices, which will be equipped with sensors and will represent the system of Internet of things. For comparison: just a few years ago, in 2012, 8.7 billion devices were connected to the Internet. According to various forecasts, in the period from 2017 to 2025, the number of sensors of all types will grow to reach the number estimated from 1 trillion to 10 trillion[16]. According to experts, the Internet of Things (IoT) is the largest market that will only demonstrate growth in the near future. If we compare the markets of the Internet of Things, Big Data and others, then, according to BCG, by 2020 the global market of the Internet of Things will reach 1.9 billion euros and thus, will take a leading position[17].

Digi Capital estimates the entire AR market to hit $ 90 billion by 2020. According to Goldman Sachs, sales of software for augmented reality alone will amount to $ 9 billion by 2025[18]. According to IDC estimates, by 2020, the VR and AR market will reach $ 162 billion[19]. Among the

[14] Zvereva T. E-commerce: growth in spite of. Thematic pages of RBC +. April 13, 2016. p. 6.
[15] According to the article: Osipov I. Artificial Intelligence. RBC, January – February 2017. pp. 38–39.
[16] Ibid. pp. 38–39.
[17] Evans F., Fort P. Map of Borges. Search your way in the digital revolution. BCG The Boston Consulting Group, 2015. P. 74.
[18] The technology with history. RBC, July 15, 2016 № 125 (2381).
[19] Citation by: Arkhangelsk E. Augmented Reality. RBC, January-February 2017. pp. 40–41.

most perspective trends of these technologies development is the so-called hybrid reality technology (mixed reality, MR).

In 2015–2016 investments in drones manufacturers amounted to more than $ 830 million[20] – the value that is almost 4.5 times bigger than the cumulative investments for the previous three years.

According to the experts, by 2025 the introduction of mass robotization will lead to the increase in work efficiency and labor productivity in industrial sectors by 25% and 30% respectively[21]. For example, "according to one of the Wall Street analysts, thanks to the robots, Amazon will reduce the costs of preparing orders by 40%"[22]. The creation of the universal robots capable to adapt to conditions of a short product life cycle will take a place of the most serious issue[23].

9. Signs of the Digital Economy.

The digital economy led to the nature of companies changing: the transition from **"brick and mortar"** to **"click and mortar"** and **"click business"** [Lapidus L.V., 2018 (а), (в)]. The process of its formation was accompanied by the continuous development of new products and/or services, new markets of digital products and electronic services, etc. The change in consumer behavior first gave rise to competition with respect to the number of Internet users covered, and with the flourishing of the mobile economy – for the mobile Internet users as well.

In the later stages of the digital economy evalution the competition and the competitive pattern underwent different changes as well, which explains the transition **from competition to cooperation (coopetition)**.

The digital economy also brought a rapid the growth for "click and mortar" and "click business" companies and contributed to their achievement of leading positions in the ratings. The rapid growth of companies' capitalization is also observed. The largest transactions from 2000 to the present were made in the e-business market.

Digital technologies have provided companies with easier access to overseas markets through digital platforms, cheaper online access to new markets without the company's physical presence in a given region. New business models like **Freemium-model, Free-to-Play, Print-on-Demand, Full-Crowdsourcing, Donation**, etc. allowed companies to conduct business without

[20] URL: https://www.rbc.ru/magazine/2017/01/5853e39e9a79475ffbe03884
[21] BCG. Russmann M. [et al]. Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries, 2015.
[22] Ford M. Robots come: technology development and the future without work. P. 39; Bensinger G. Before Amazon's Drones Come the Robots // Wall Street Journal. 2013. December 8.URL: http://online.wsj.com/news/articles/SB10001424052702303330204579246012421712386.
[23] Ford M. Robots come: technology development and the future without work. P. 31.

their own IT infrastructure and software (cloud technologies), warehousing (**dropshipping model**), property (**Sharing Economy**) – the process that is called an "**uberization**", though it is narrow understanding of the undergoing transformations.

Signs of the digital economy in terms of business environment are:

1. Changing the nature of companies: "click and mortar" and "click business".
2. Transition to digital products and electronic services.
3. Building digital platforms.
4. Changing the nature of competition.
5. Changing in the consumer behavior.
6. The formation of new production models.
7. New business models: Freemium-model, Free-to-Play, Print-on-Demand, Full-Crowdsourcing, Donation, etc.
8. Transformation of the traditional companies' business models under the pressure of Industry 4.0 technologies.

The digital economy has generated new socio-economic models, such as Sharing Economy; Mobile Economy and Gig Economy.

In the conditions of large-scale penetration of digital technologies, business models transformation and the formation of a new economic environment for doing business, the popularity of various types of partial and non-standard employment is growing. An open labor market and gig economy are the most important signs of digital economy.

10. Transformation of Business Models.

The nature of companies and the nature of competition have changed. New business models like Freemium-model, Free-to-Play, Print-on-Demand, Full-Crowdsourcing, Donation, etc. allowed companies to conduct business without having their own IT infrastructure and software ("**business in the cloud**"), without warehousing (**dropshipping model**), without tangible assets (**Sharing Economy**). [Lapidus L.V., 2016 (в)].

The capitalization of companies has become directly dependent on the number of Internet subscribers, users, community members. [Lapidus L.V., 2016 (с); 2016 (г); Lapidus L.V., 2018; "Development prospects, 2016].

Taking into account the ongoing transformations of business models, the **digital economy** should be defined as the development of business processes and business models on the basis of digital technologies and the exchange of big data, aiming at advancing business competitiveness by

increasing consumer value and achieving such key results like reducing the costs and increasing in labor productivity.

We are talking about both: business models that are typical for companies that have built their businesses on the Internet, as well as traditional business that historically conduct business offline in various sectors of the economy (mining, agriculture, manufacturing, services).

Fig. 8 presents the directions of the organizations development and transformations based on digital technologies with respect to main functional subsystems (production, research and development, personnel, marketing, finance, information systems (digital platforms and cybersecurity)) that are common for all organizations in the digital economy, regardless of the size and type of their main activity.

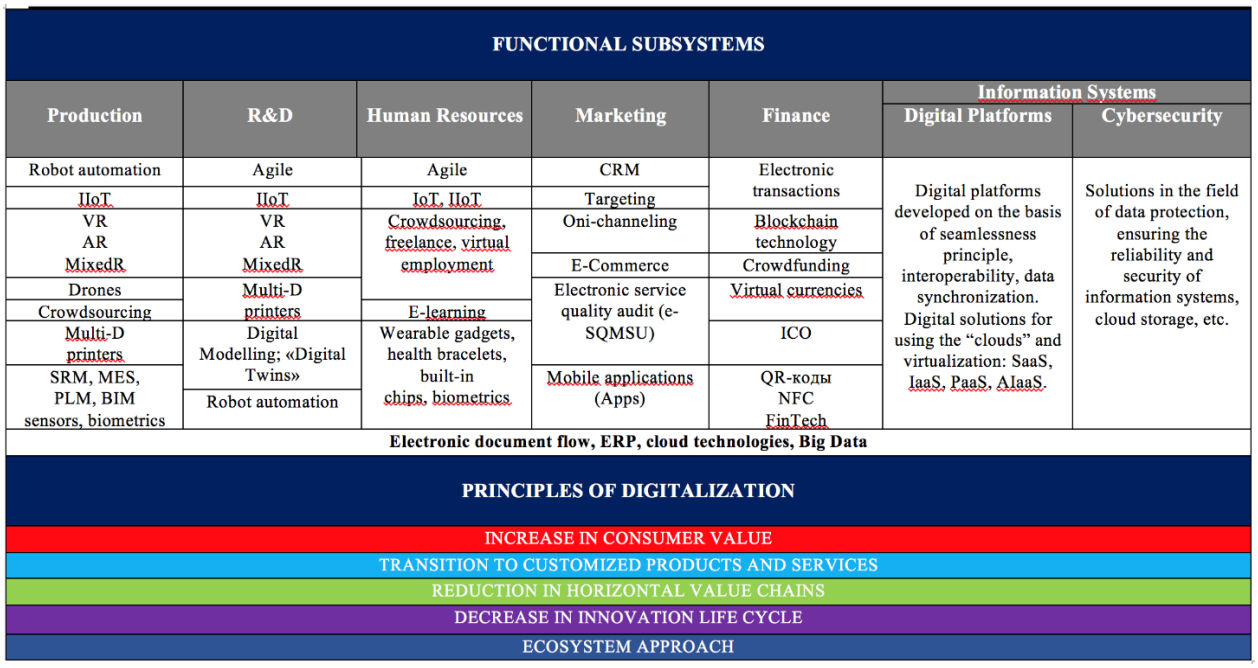

Fig. 8. Business Model and Business Process Transformation.

Author: Lapidus L.V.

As noted earlier, the large-scale transformation of business models has spread to traditional companies. The companies that build their exchange patterns, resources movement from one owner to another, without having their own warehouses, using the On-demand model, are getting more and more popular.

The cost reduction and the increase in profitability were achieved due to reduction of horizontal value chains, organization of business processes according to the dropshipping model, i.e., abandoning its own warehouse infrastructure, increasing consumer value by focusing on custom products, services, transition to personalized service.

11. Decentralized production.

3D printers are an integral attribute of Industry 4.0. In practice, three-dimensional printing is called "**additive technology**", whereas industrial use of 3D printing - "layering" - the additive manufacturing (AM). With respect to Markets & Markets estimates, the market volume of additive technologies will grow annually by 29.2% till 2022.

Currently, 3D printers allow aircraft to reduce the weight of the aircraft, since the components are made of special materials that are much lighter than the ones produced in the traditional way.

3D printers play an important role in the design of new mechanisms (in creating prototypes), enhancement and modernization of the made developments in real-time mode, i.e. when designing is an integral part of the production process. Currently, these technologies are already used in the production process through making detailed changes in the design or in case of a defect, it is possible to quickly make adjustments and produce product of higher quality. Among other advantages of additive technologies are the reduction of the product flow time and of transport costs, the ability to produce small lots of products on a by-order basis.

It can be assumed that 3D printers will change production models and will be able to bring producers closer to consumers, especially in mass production and production in small lots. This type of production has already received the name of **decentralized production** – distributed manufacturing.[24]

Currently, scientists are working on **MultiD printers**, when parts printed from materials with desired properties are able to take on completely different forms after a certain period of time.

12. Digital Leadership Strategies and Business Prospects.

Digital leadership strategy is a business development strategy that leads to long-term market leadership and relies on digital technology.

At present, the business environment can be described by a high level of complexity, dynamism and uncertainty. Its condition is determined by the digital turbulence of a new technological shift, which some traditional companies have not even noticed. Speed is now becoming an economic category.

If before companies needed more than a dozen years to achieve a capitalization of $ 1 billion, today this process can take only a few months, so the digitalization of the economy is becoming increasingly important in the era of digital transformation and modification of business models.

[24] По данным статьи: Захаров А. *3D* - промышленность. РБК, январь-февраль 2017. С. 36-37.

Even Klaus Schwab, the founder and president of the World Economic Forum in Davos, quotes: “In the new world it is not the big fish which eats the small fish, it's the fast fish which eats the slow fish” can be added with the following words: “but also **the big fish become the fast fish with digital strategy**”.

Сейчас наибольший интерес представляют крупные российские компании, которые с помощью цифровых стратегий способны стать быстрыми, без потери репутации и клиентов. Now the biggest interest is represented by large Russian companies, which have the digital strategies and can become fast fish without losing their reputation and customers. For example, a number of Russian companies, JSC Russian Railways, RosAtom, Gazpromneft, PJSC Sberbank of Russia, have actively embarked on the path of digital transformation of business models.

They have all the prerequisites to become big and fast fish. “Fast” means the ability to quickly respond to changing business conditions, accumulate competencies in the development and implementation of digital technologies, create multilateral markets, and enter non-core business that will enhance the company's sustainability in a turbulent digital environment with rapidly changing consumer behavior in this context.

There are four areas of digital transformation as the basis for digital strategies of online and traditional (offline) companies:

1). Optimization of internal business processes.

2). Product diversification (in particular, the company's exit from the title business).

3). Expansion into new digital markets (the digital products and the electronic services).

4). Search for the new technology with export potential, etc.

Среди основных результатов цифровой трансформации бизнеса:

1). cost reduction;

2). increase in productivity;

3). increasing consumer value;

4). encreased levels of customer satisfaction and loyalty;

5). yield growth, etc.

It is necessary to study a new digital environment of the company, the opportunities and threats of digital technologies, industry-specific features of digital transformation from the perspective of a systems approach in order to develop and begin to implement a digital strategy / strategy of digital transformation,

The digital economy evolution has shown that a distinctive features of this historical stage are the unobvious relationships between various processes, which sometimes proceed so quickly that earlier decisions are at risk for the future of the company. The complexity is determined by the nature of digital products and electronic services, digital platforms, speeds of connecting things to

the Internet (by 2025 25 billion things will be connected to the Internet, while in 2018 there were only 9 billion) (Fig. 9), cyber security problems and other technological risks.

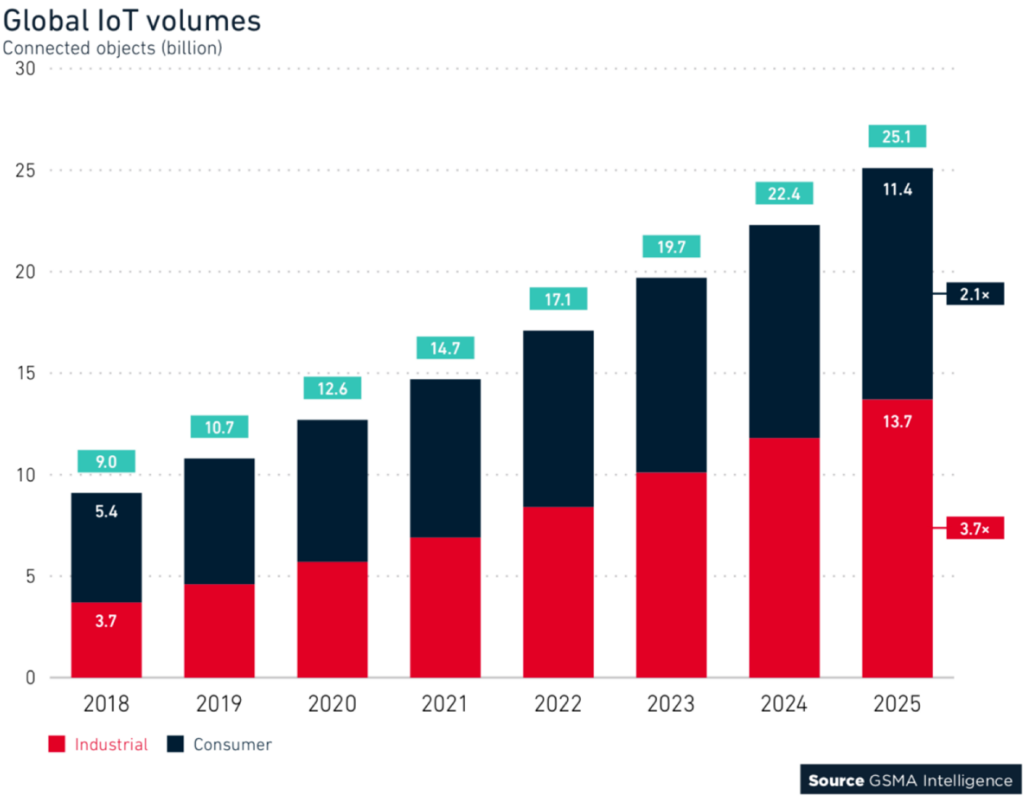

Fig. 9. Global IoT volumes.

Source: GSMA Intelligence.

Each socio-economic model is formed under the influence of the digital economy. It reflected in the trajectory of the digital business transformation and the digital strategy, which, first of all, was aimed at improving the competitiveness and sustainability of the business.

The Sharing Economy is growing not only due to the emergence of new sharing platforms, but the growing needs of the population in reducing the costs of maintaining movable and immovable property, as well as extracting additional income from ownership of certain assets. For example, with the average American using a car for no more than 40 minutes a day. Nowadays, people are more prone to give up owning their own property. At the same time, the traditional companies that were threatened by the changes carried, made their own decisions to enter new markets. So, Volkswagen, Mercedes Benz and other car makers invested in sharing

Earlier, IBM, Hewlett Packard, and Microsoft, in response to the challenges of the Data Centers, were forced to enter a new segment for them to operate in - the cloud services market.

An analysis of digital leadership strategies has shown that:

1). Internet companies have become high-tech giants.

2). Large companies have become fast fish (Amazon, Facebook, Apple, etc.), that allowed them to take a leading position in world rankings.

3). Long-term digital leadership can be achieved through the use of both market resources and digital capabilities.

4). Leadership in the market is only possible due to the strategic vision of the top management of the company a few steps ahead of others in new digital conditions.

5). The role of the research and development department (R&D) is being strengthened, in particular industry science.

6). Competition for the employees with digital competencies and technological unemployment is still ahead.

Responsible persons of a business that has taken the path of the modernization should feel well about digital trends, be able to make predictions, understand what a particular innovation means to the company and where to go next step.

13. The Industry Features of Digital Transformation.

First of all, the transformation affected producers who appreciated the possibility of reducing the horizontal value chains by creating online stores, virtual trading markets. At the same time, it was an ability to reduce transaction costs and procurement costs by 5-10% due to the creation of industry-specific virtual exchanges. Among the benefits for companies were the reduction of transaction costs and personnel costs related to the labor of crowdsourcers and shifting to the gig economy.

The core of the transition to mass transformations is the consumer value, meaning that the justification for introducing certain digital technologies was determined by the increase in consumer value and, as a result, the growth of CSI and NPS, which, in turn, are the sources for the competitiveness rise.

An interesting fact is that traditional companies that were threatened by the new markets had to enter those markets themselves. For example, Volkswagen and Mercedes-Benz entered the market of sharing economy, and Ford - the market of drones.

The degree and the rate of digital technology penetration in each industry is different (Table 3).

Table 3.

Technology penetration in different industries

Industry	Priority technologies 2024	Priority technologies 2030
Farming	**Digital Farming**	
	Mobile applications **Apps.** **Omni-channeling.** **E-Services.** **Artificial Intelligence.** ***Big Data*** **Cloud Technologies.** Marketplaces. Smart Farms. Smart Greenhouses.	**Internet of Things, *IoT*.** **Virtual and Augmented Reality Technologies, VR, AR.** **Robotic solutions.** **Sharing Economy Technologies.** "Smart agricultural technical equipment". Unmanned technologies: unmanned combine, unmanned farm. Small satellites. Drones.
Transport	**Digital Transport**	
	Mobile applications **Apps.** **Omni-channeling.** **E-Services.** **Artificial Intelligence.** ***Big Data.*** **Cloud Technologies.** Marketplaces. Sharing Economy Technologies.	**Internet of Things, *IoT*.** **Virtual and Augmented Reality Technologies, VR, AR.** **Robotic solutions.** **Sharing Economy Technologies.** Unmanned technologies. Blockchain technology.
Healthcare	**Digital Healthcare**	
	Mobile applications **Apps.** **Omni-channeling.** **E-Services.** **Artificial Intelligence.** ***Big Data.*** **Cloud Technologies.** Electronic Medical Records. Nurse robots. Biometrics. Telemedicine.	**Internet of Things, *IoT*.** **Virtual and Augmented Reality Technologies, VR, AR.** **Robotic solutions.** **Sharing Economy Technologies.** Nanorobots. Exoskeletons. Telemedicine.
Industry	**Digital Industry**	
	Mobile applications **Apps.** **Omni-channeling.** **E-Services.** **Artificial Intelligence.** ***Big Data.*** **Cloud Technologies.**	**Internet of Things, *IoT*.** **Virtual and Augmented Reality Technologies, VR, AR.** **Robotic solutions.** **Sharing Economy Technologies.** «Digital Twins». Industrial Internet of things, *IIoT.*

	Integrated digital platforms. Marketplaces.	Additive technologies. Blockchain technology. Cobots. Digital Factories.

Author: Lapidus L.V.

Highlight the priority directions of digital transformation in various industry segments:

I. Digital Farming:

1. Precision agriculture.
2. Individually-oriented veterinary.
3. Individual livestock feeding rations.
4. Digital agricultural market.

II. Digital Transport:

1. Seamless transport system: the station - the city, one ticket for all types of transport.
2. Metro - supermarket.
3. Car-sharing.
4. Smart locomotive, smart car.

III. Digital Healthcare:

1. Individually-oriented (precision) medicine.
2. Remote health monitoring.
3. Nurse robots, exoskeletons.
4. Telemedicine.

IV. Digital Industry:

1. Digital Factory.
2. The “man-machine” collaboration, “car-machine”.
3. Additive technologies: the manufacturer is closer to the consumer.
4. Customized production: “digital twins”.

So, the Internet, mobile technologies and technologies of industry 4.0 have affected all sectors of the economy: primary, secondary, tertiary. “Digital Fever” has encompassed the mining and manufacturing industries, agriculture, and even the construction industry.

Today, traditional business, regardless of the industry, is forced to respond and switch to online sales channels while dealing with both: B2C and B2B market segments. **Digital platform** is the main infrastructure solution for creating an ecosystem of the digital economy, for all types of transactions: information (i.e. digital data); finance (making payments); services and services.

14. The Key Principles of Digitalization and Industry 4.0.

The key principle of digitalization at all levels is the **ecosystemic approach**, that is, the creation of an **ecosystem of the digital economy in the Russian Federation**, that consists, in turn, of region, industries ecosystems, as well as the ecosystems of different enterprises and organizations.

Among the principles of digitalization, we can outline:

1. The increase in customer value.

2. Transition to customized products and services.

3. Omni-channeling.

4. Reducing of the horizontal value chains.

5. Reduction of the transaction costs.

6. Reducing the life cycle of innovation.

7. The entrance of traditional companies into new e-services markets.

8. Providing high quality of electronic services [Lapidus et al., 2017 (a); Lapidus L.V., 2016 (b)].

9. Cross-cutting penetration of Industry 4.0 technologies.

10. Ecosystematicity.

These exact principles of digitalization are fundamental for business transformation. They will determine the future of modern companies.

The key principles of industry 4.0 are the following:

1). Competition with the transition to greater cooperation (ecosystem creation) – platform-forming (inter-industry, industry, corporate digital platforms).

2). Seamlessness.

3). Interoperability.

4). Data synchronization.

5). Agility.

15. System Digital Transformation: Objectives and the Necessary Conditions for Successful Transformation.

According to the "Road Map" of the national technology initiative TexNet, by 2035, 40 new generation factories ("the factories of the future") will be built as well as 25 new modern test sites and 15 experimental digital certification centers.

The factories of the future include:

a). **"digital factories"**, meaning that all processes, from design to testing, take place in a virtual mode, in digital format;

b). **“smart factories”** - factories with the use of unmanned technologies, based on robots, artificial intelligence and industrial Internet technologies (IIoT);

c). **“virtual factories”**, the distinctive feature of which is their absolute independence in terms of location (it might be located anywhere in the world) and their incorporation into any production chains using the IIoT industrial Internet.

As for the sources of funding, 50% of the amount needed come from budgetary allocations made on a returnable basis and another 50% are funded by extra-budgetary resources.

In the transition to unmanned production, management will go back to the use of "black box" management model. At the same time, socio-economic systems, in contrast to closed technological ones, will remain open. They will be even harder to manage. Managers that are able to manage cyber-physical systems and new collaborative processes "man-man, man-machine, machine-machine" will be required.

First of all, successful transformation is only possible with the government support and direct participation of the business and every citizen in shaping the conditions of the transformation. In our country **the Strategy for the Development of the Information Society in the Russian Federation for 2017–2030** was approved in May 2017 by Decree of the President of the Russian Federation[25]. On July 28th, 2017, the Government of the Russian Federation approved the Program titled **“Digital Economy Program of the Russian Federation”[26]**. These documents determine the state policy of the Russian Federation in terms of creating the needed conditions for the development of the digital economy and a knowledge society in the Russian Federation as well as to increase the competitiveness of the country, the welfare and quality of life of citizens, enhance the security of the country.

The main goal is to increase the availability of goods and services produced with the use of digital technologies, increase digital literacy and improve the availability and quality of public services. **The Strategy of the Scientific and Technological Development of the Russian Federation**, approved on December 1st, 2016, by the Decree of the President of the Russian Federation[27], will contribute to the achievement of these goals.

According to “Digital Economy of the Russian Federation” program, “**data in digital form** is a key factor of production in all areas of socio-economic activity, which increases the country's

[25] Стратегия развития информационного общества в РФ на 2017– 2030 годы. Утверждена Указом Президента РФ от 9 мая 2017 г. № 203.
[26] Программа «Цифровая экономика Российской Федерации». Утверждена Правительством РФ 28 июля 2017 г.
[27] Стратегия научно-технологического развития Российской Федерации. Утверждена Указом Президента РФ от 1 декабря 2016 г. № 642.

competitiveness, quality of life of the citizens, ensures economic growth and national sovereignty".[28]

The implementation of the program is aimed at:

1). the elimination of legal barriers to the introduction of advanced technologies;

2). infrastructure development for the digital economy (networks, data centers, hardware);

3). education system improvement;

4). launching support for domestic companies that are competence centers in the field of digital technologies, etc.

The objectives of the program are:

1). to create an ecosystem of the digital economy of the Russian Federation;

2). to create the conditions for the development of the digital economy - institutions and infrastructure;

3). to increase competitiveness of the Russian Federation on the global market.

Nowadays, the shaping of management science in the digital economy is facing several complications:

a) the distinctive traits of digital transformation processes of socio-economic systems do not have historical analogues;

b) significant differences in consumer behavior with respect to the country;

c) the presence of gaps - first, second and third kind (Gap 1, Gap 2, Gap 3);

d) the scale of the transformations;

e) the lack of systematized knowledge of the digital economy with the increasing complexity of the processes;

f) non-formed hybrid competences of many scientists (technology + economics).

Among the necessary conditions for successful transformation is the pace of digital transformation, the availability of the competent managers at all levels and the rate of acquiring them, infrastructure readiness (Internet penetration, quality of communication and data transfer, investments, etc.) and legislative support.

[28] Программа «Цифровая экономика Российской Федерации». Утверждена Правительством РФ 28 июля 2017 г.

Conclusion

Online technologies have led to a reduction in spatial gaps between sellers and buyers (online commerce), students and audiences of world universities (online education), world-class physicians and patients (telemedicine), employers and employees (teleworking), drivers and consumers (additive technologies). The Internet of Things (IoT) provided the new tools for instantly collecting reliable data on the state of production processes and allowed monitoring to be done at the lowest costs and risks associated with human factors.

Digital technologies have opened up the possibility for companies to scale up their business without their own IT infrastructure and software. Even artificial intelligence can be ordered with the use of "cloud."

Currently, the population of the planet is about 7.5 billion people, out of which 4.0 billion are Internet users. The number of mobile devices exceeds the population of our planet and is 8.1 billion units. The changing consumer behavior under the influence of digital technology is a constant process.

Digital economy is a a complex system, whose behavior cannot be fully studied. Every day brings new technological solutions with the according terms that are the results of the latest transformations and the need to make decisions, which, in turn, require knowledge in the field of economics and technology, and of cause-effect links and correlations that can be determined by the processes started in the beginning of this century.

In general, in the field of digital economy nothing can be simplified and reduced to a single point. Just as in the whole, the digital economy cannot be reduced only to Big Data or to electronic services. The key task is the formation of system knowledge in the field of digital economy and digitalization.

The pace of business digital transformation is the most important condition for maintaining the company’s market positions and leadership prospects. Digitization of economic processes entails an increase in the competitiveness of companies, a reduction in production costs, an increase in labor productivity, the creation of new jobs, an increase in customer value and satisfaction due to the quality of digital customer services.

Each company must independently select the appropriate digital strategy. The barrier to business restructuring may be a lack of competence. Already, the labor market has a shortage of specialists with specialized knowledge and able to determine the trajectory along which the company will move in the near future.

The key task is to create the ecosystem of the digital economy of the Russian Federation.

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Glossary

Additive technologies, 3D printers are Industry 4.0 technology. In practice, three-dimensional printing is called “additive technology”, and industrial use of 3D printing is called “layered production” - **additive manufacturing** (AM).

API-Economy is an economy based on the ubiquitous use of the program interface (Application Programming Interface, API) of interaction of the systems.

Artificial Intelligence (AI) is the science and technology of Industry 4.0 that forms the basis of intelligent machines development.

Artificial Intelligence as a Service (AIaaS) is a type of cloud services.

Big Data is a clientonomics tool.

Business model is a set of key and auxiliary business processes that allow companies to conduct business and achieve their goals.

Capitalization - the market value of all shares of any company.

Clientonomics is an economic model whose distinctive feature is the focus on the customer.

Commercial crowdsourcing – is an inclusion of people (“crowds”, crowdsourcers) in the process of creating, financing, manufacturing, promoting a project, product, service on a voluntary basis in order to gain profit by adding customer value and creating additional demand for a project using crowdsourcing platform on the Internet.

Company's business model is the way that the company uses in order to create value and make a profit, i.e. this is an idea of how an organization earns or intends to earn.

Consumer value is the benefits that the consumer receives when purchasing the goods or services.

Coopetition model is a model of interaction between counterparties in the market, based on finding a balance between cooperation and competition.

Customization - orientation on the individual needs of the customer.

“Digital Fever” is a digital economy stage, whose distinctive trait is a chaotic reorganization of business processes and the transformation of business models.

Digital transformation (digitalization) - the use of online and innovative digital technologies by all participants of the economic system, from individuals to companies and states. It is a necessary condition for maintaining competitiveness of each and every country.

Digital economy, Internet economy, web-economy - is a set of relations developing in the processes of production, distribution, exchange and consumption, based on the use of online technologies and aimed at meeting the needs of the society with respect to life benefits, which, in turn, requires new ways and methods of management and effective tools of state regulation.

Digital platform is a kind of electronic resource that provides an open assess to various companies that, in turn, can use it for their own web-representation in order to interact with suppliers and/or actual and potential consumers of products/services.

“Digital Twin” is a digital model of a physical device that reflects all processes, parts, parameters, and other characteristics of a real object.

Dot.com are companies that conduct business on the Internet**.**

"Financial bubble" arises as a result of the rush demand for goods or securities, which leads to a sharp increase in the value of an asset that does not correspond to a fair level.

Hygonomics or gig economy is a new socio-economic model based on the general dissemination of new types of part-time employment and short-term employment contracts instead of long-term employment relationships with an employer on the basis of full-time employment.

Hype is a matter of agiotage, buzz, the agiotage around some in-trend phenomenon.

Industrial Internet of Things (IIoT) - Internet of things, used for industrial purposes.

Industry 4.0 is a set of relations developing in production processes related to the penetration of digital technologies (Industry 4.0 technologies) aimed at improving the competitiveness of business and the country. For Russia, in contrast to the German state initiative aimed at the “Internetization” of the industriesy, the term "Industry 4.0" means a digital transformation of all sectors of the economy.

Interoperability - technical compatibility.

Instant messengers - services for sending instant messages**.**

Labor productivity is an indicator of labor efficiency. The number of products released by the employee per unit of time.

Mobile economy - a set of electronic transactions with the use of mobile devices, such as laptops, mobile phones, PDAs, mainly through wireless communication (i.e. e-commerce but with the use of mobile services).

NASDAQ (National Association of Securities Dealers Automated Quotation) is a US electronic exchange for trading shares of high-tech companies.

Online technologies, digital technologies - technologies based on the idea of using Internet to carry out transactions/communications (financial, information, services).

Robotization is the use of artificial intelligence in the technological process**.**

Structured data is clearly organized and comes from identified sources in unified formats. To process this kind of data, it is easy to compile correlation relationships and force the machine to analyze data for a given task by means of the set algorithms,.

System transformation is the stage of the digital economy, whose distinctive trait is the digitalization based on the system approach.

Technologies Industry 4.0 - digital technologies: Big Data, neurotechnology, artificial intelligence (AI) and machine learning, quantum technologies, distributed registry systems, Internet of Things (IoT), industrial Internet (IIoT), wireless technologies, components of robotics and sensor technology, virtual, augmented and mixed reality technologies (VR, AR, Mixed R), cloud and mobile technologies, drones, wearable gadgets, blockchain, 3D printers, Agile technologies, new production technologies, etc.

The ecosystem of the digital economy in the Russian Federation - consists of region, industries ecosystems, as well as the ecosystems of different enterprises and organizations.. The infrastructural basis of the ecosystem is digital platforms (intersectoral, industry, corporate).

The Fourth Industrial Revolution creates a world in which virtual and physical production systems flexibly interact with each other at the global level, which ensures the complete adaptation of products and the creation of new operating models.

The Fourth Industrial Revolution is a “mental model” for understanding and defining how the technologies change, how the value is created, shared and distributed through economic and social systems [World Economic Forum, 2017].

Unstructured data - unordered data from different sources, not always identified, in different formats, which complicates the process of collecting, processing, matching and analyzing the data

Value chain - the term was introduced into scientific circulation by Michael Porter in 1985 in his work “Competitive Advantages”. The concept of M. Porter makes it possible to evaluate the types of activities (processes) carried out in an organization, aimed at making profits.

Value chain added is a set of processes aimed at creating value for the consumer.

Web-technologies - online technologies of different generations: web 1.0; web 2.0; web 3.0; web 4.0.

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