

THE SIGNIFICANCE OF INNOVATION IN THE TRANSFORMATION OF THE DIGITAL ECONOMY

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Annotation. The distribution of innovations and investments within the digital economy holds a crucial position in advancing this sector. Implementing innovations in the digital economy involves the practical use of digital technologies, cutting-edge software tools, and outcomes from experimental and design initiatives, all of which demand ongoing investment. A key focus in fostering the growth of the digital economy lies in analyzing the innovations and investments of leading global nations, identifying primary development directions, and enhancing education and training in this field.

Key words. Digital Economy, Innovation, Investment, Research & Development (R&D), Productivity, Technology, Telecommunications, IT Sector.

Introduction

In the advancement of the digital economy, the challenge of introducing and evolving innovative technologies persists as a global concern. The development of this sector increasingly focuses on enhancing the implementation of innovative technologies in telecommunications, ensuring their financial stability, and boosting their attractiveness. Integrating innovations and technological advancements across various sectors, alongside applying scientific research to production, serves as a crucial driver for progress. In today's global market economy, innovations that enhance efficiency and product quality are essential. However, their implementation must align with socio-economic and cultural contexts. For instance, market-ready products with new consumer benefits or improved production efficiency illustrate the practical application of innovation.

In the digital economy, such innovations act as a catalyst for digital society development, enabling groundbreaking solutions across multiple sectors and leading to transformative changes in economic landscapes.

Research methodology

The term and concept of "innovation" were first introduced into scientific research by Austro-American economist J.W. Schumpeter. According to his definition, innovation is not merely any novelty or change but specifically a factor that significantly enhances the efficiency of a functioning production system. Many scholars have since examined the concept of innovation. B. Twiss, for example, defines innovation as "the process by which an invention or new idea gains economic value." Similarly, M. Kluceck classifies innovation as a combination of technical advancements and natural science materials.

Other researchers, such as A.I. Prigogin, view innovation as a multifaceted process encompassing the creation, implementation, and commercialization of new consumer-oriented goods, equipment, technologies, and organizational systems. B.B. Santo describes innovation as a socio-economic process that transforms ideas and inventions into superior products and technologies, ultimately yielding economic benefits and generating additional income upon market entry.

From these perspectives, innovation can be understood as a process involving novel inventions, ideas, and developments aimed at significantly improving production efficiency. These advancements often require substantial investment in research and development. In the context of the digital economy, such inventions, proposals, and studies are crucial, as they serve as foundational elements driving its growth and evolution.

Research methods

Various methods were employed to explore the role and significance of innovation in the advancement of the global digital economy. These included scientific abstraction, logical reasoning, comparative analysis, monographic research, dynamic studies, data grouping, and techniques such as comparison, correlation, and regression analysis

Analysis and results

An analysis of the factors influencing the growth of the global digital economy reveals that innovation and investment are pivotal drivers of progress in this sector, with their importance increasing year by year. For instance, the annual research expenditures of the world's 1,000 largest companies were estimated at \$400 billion in 2005. By 2017, this figure had risen to \$700 billion, reflecting an average annual growth rate of 4.8% in recent years (Figure 1).

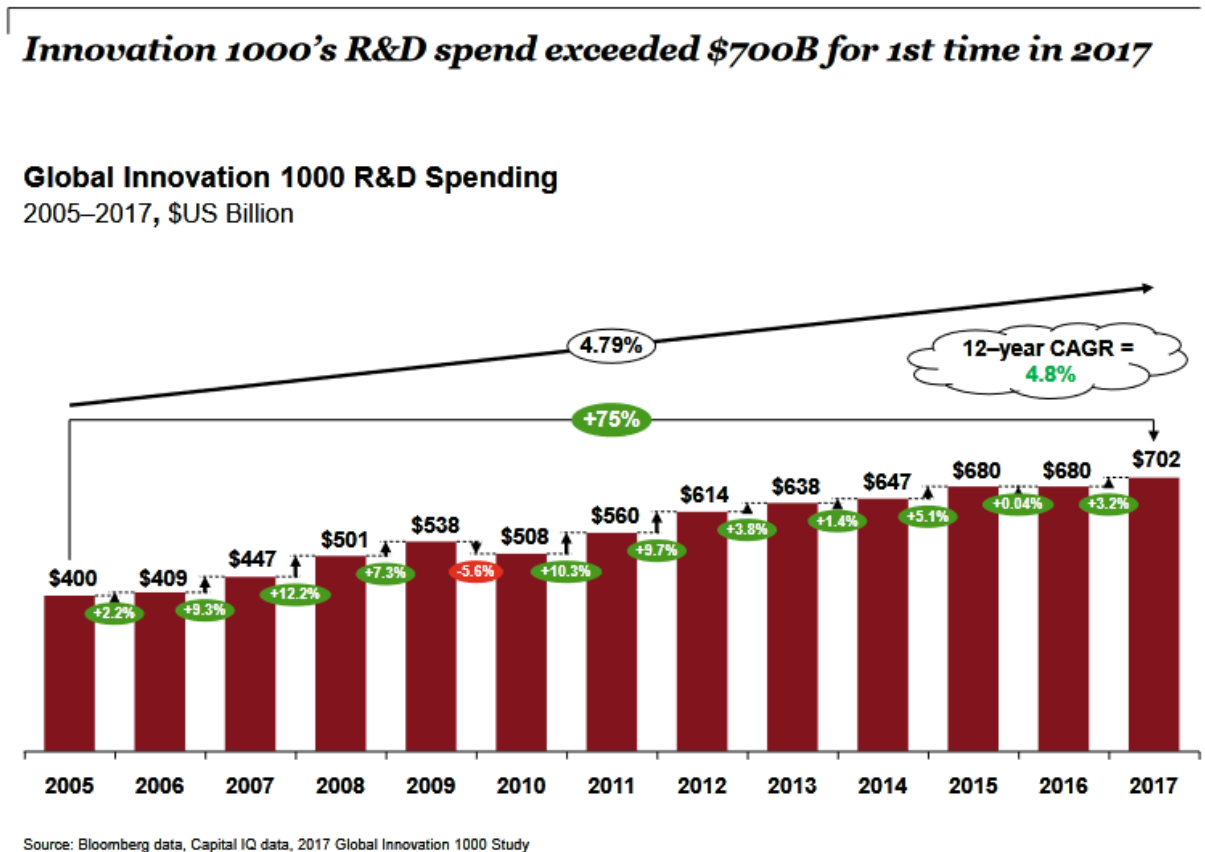


Figure 1. The annual research costs of the world's 1,000 largest companies are projected to reach \$ 700 billion in 2017. Dollars

Source: <https://www.strategyand.pwc.com/uk/en/media/2017-global-innovation-1000-fact-pack.pdf>

The growing competition across various markets, coupled with the emergence of new companies and industries, has led to a consistent increase in research and development (R&D) expenditures. The data indicates that while R&D spending has grown steadily since 2005, it experienced a slight decline following the 2009 economic crisis. On average, R&D expenditures have increased by 4.8% annually.

The graph highlights that the world's largest companies are making substantial investments in innovation, the adoption and advancement of new technologies, and research initiatives to remain competitive. Notably, a significant portion of these

investments comes from the top 25 companies, many of which are based in the United States, including a considerable number of globally recognized IT firms (Figure 2).

An analysis of R&D expenditures reveals that the majority of these investments are allocated toward addressing key objectives and priorities within research and innovation efforts.

- ✓ Increase in productivity;
- ✓ Improving product quality;
- ✓ Product adaptation for a specific market;
- ✓ Create a product with unique features;
- ✓ Creation of cheap products for production (reduction of costs);
- ✓ Creation of products that are universal for different markets;
- ✓ Increase the speed of product launching;
- ✓ Increase in the number of inventive products, etc.

2018 Rank	Company Name	Country	Industry group	R&D Expenditures (\$US Billions)		Revenue (\$US Billions)		R&D Intensity	
				2017	2018	2017	2018	2017	2018
1	Amazon.com, Inc.	United States	Retailing	16.1	22.6	136.0	177.9	11.8%	12.7%
2	Alphabet Inc.	United States	Software and Services	13.9	16.2	90.3	110.9	15.5%	14.6%
3	Volkswagen Aktiengesellsc...	Germany	Automobiles and Compone...	13.8	15.8	260.9	277.0	5.3%	5.7%
4	Samsung Electronics Co., L...	South Korea	Technology Hardware and ...	14.3	15.3	189.0	224.3	7.6%	6.8%
5	Intel Corporation	United States	Semiconductors and Semic...	12.7	13.1	59.4	62.8	21.5%	20.9%
6	Microsoft Corporation	United States	Software and Services	13.0	12.3	85.3	90.0	15.3%	13.7%
7	Apple Inc.	United States	Technology Hardware and ...	10.0	11.6	215.6	229.2	4.7%	5.1%
8	Roche Holding AG	Switzerland	Pharmaceuticals, Biotechn...	11.8	10.8	54.0	57.2	21.9%	18.9%
9	Johnson & Johnson	United States	Pharmaceuticals, Biotechn...	9.1	10.6	71.9	76.5	12.7%	13.8%
10	Merck & Co., Inc.	United States	Pharmaceuticals, Biotechn...	10.1	10.2	39.8	40.1	25.4%	25.4%
11	Toyota Motor Corporation	Japan	Automobiles and Compone...	9.8	10.0	267.4	259.8	3.7%	3.9%
12	Novartis AG	Switzerland	Pharmaceuticals, Biotechn...	9.6	8.5	49.4	50.1	19.4%	17.0%
13	Ford Motor Company	United States	Automobiles and Compone...	7.3	8.0	151.8	156.8	4.8%	5.1%
14	Facebook, Inc.	United States	Software and Services	5.9	7.8	27.6	40.7	21.4%	19.1%
15	Pfizer Inc.	United States	Pharmaceuticals, Biotechn...	7.9	7.7	52.8	52.5	14.9%	14.6%
16	General Motors Company	United States	Automobiles and Compone...	8.1	7.3	149.2	145.6	5.4%	5.0%
17	Daimler AG	Germany	Automobiles and Compone...	7.8	7.1	184.0	197.3	4.2%	3.6%
18	Honda Motor Co., Ltd.	Japan	Automobiles and Compone...	6.5	7.1	137.5	131.8	4.7%	5.4%
19	Sanofi	France	Pharmaceuticals, Biotechn...	6.2	6.6	41.7	43.5	14.9%	15.1%
20	Siemens Aktiengesellschaft	Germany	Capital Goods	5.8	6.1	94.1	98.2	6.2%	6.2%
21	Oracle Corporation	United States	Software and Services	6.8	6.1	37.0	37.7	18.4%	16.1%
22	Cisco Systems, Inc.	United States	Technology Hardware and ...	6.3	6.1	49.2	48.0	12.8%	12.6%
23	GlaxoSmithKline plc	United Kingdom	Pharmaceuticals, Biotechn...	4.9	6.0	37.7	40.8	13.0%	14.8%
24	Celgene Corporation	United States	Pharmaceuticals, Biotechn...	4.5	5.9	11.2	13.0	39.8%	45.5%
25	Bayerische Motoren Werke...	Germany	Automobiles and Compone...	5.2	5.9	113.1	118.5	4.6%	5.0%

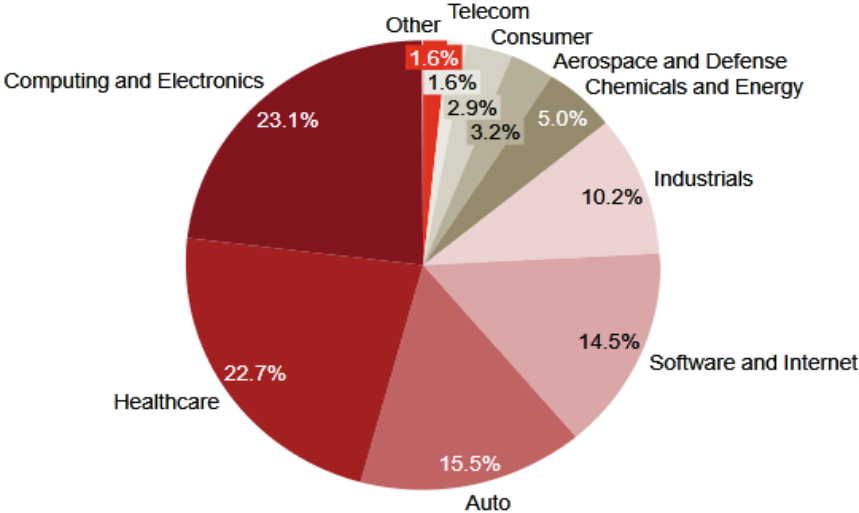
Fig. 2 Table of cost analysis of the 25 largest companies in the world for 2017-2018
Source: 2017 Strategy & Global Innovation 1000

A sociological survey of the 1,000 largest companies in the United States highlights that the largest portion of research expenditures is allocated toward enhancing productivity and product quality. Analytical research further reveals the distribution of these expenditures across various economic sectors, including information technology and telecommunications (ICT), healthcare, automotive, and others.

As illustrated in Figure 3, IT and telecommunications, healthcare, and automotive sectors constitute the top three industries in terms of R&D spending. This distribution aligns with the annual growth trends in research developments, reflecting consistent investment in these leading sectors to drive innovation and maintain competitive advantages.

Computing & Electronics, Healthcare, and Auto contributed 61.3% of R&D spending in 2017, almost the same as in 2016

2017 R&D Spending by Industry
Total = \$701.6 US Billions



Source: Bloomberg data, Capital IQ data, 2017 Global Innovation 1000 Study

Rice. 3. The structure of expenditures for research and development
Source: <https://www.strategyand.pwc.com/uk/en/media/2017-global-innovation-1000-fact-pack.pdf>

The analysis of the above data shows that in the structure of expenditures on research and development, 23.1% are spent on electronics and computers, 22.7% on health, 14.5% on programming and Internet development, and 15.5% on automotive. This means that the total expenditure on the development of electronics and computing, programming and the Internet is 37.6%, or 263.8 billion US dollars. Currently, 5.5%

of world GDP is accounted for by the ICT sector, and McKinsey estimates that by 2020 this figure will reach 9%. However, the share of this sector in GDP does not fully reflect the huge impact of ICT on economic growth and all aspects of human activity, including various health, social and educational services, depending on the nature of the product.

The analysis shows that spending on electronics, the Internet and programming is increasing year by year, which ensures that the development of the digital economy grows in a highly competitive environment.

Analysis and results

The scope and self-spread of modern information technologies (high-speed Internet, mobile broadband, computer services, etc.) is the cause of self-economic growth, improving and accelerating the process of interaction between people, increasing labor productivity, additional socio-economic benefits gives According to McKinsey Consulting, even a single direction - raising the level of mobile broadband connectivity in developing countries to the level of developed countries - could increase global GDP growth to \$ 300-420 billion and create about 10-14 million new jobs in various industries (e.g. and in the manufacture of equipment), offshore services and outsourcing. The role of the IT sector in ensuring economic growth has increased significantly during the period of sharp struggles of states with the consequences of the global financial and economic crisis. U.S. President Barack Obama, in particular, reported in 2009: "Increasing the cost of broadband, introducing health electronic records, investing in green energy, new computers for schools and libraries are effective ways to keep America's investment and competitiveness new jobs." Former British Prime Minister Gordon Brown also announced his government's efforts to develop digital infrastructure "in the area of rail, road and bridge construction, which has been intensively carried out in recent years to stimulate the economy". The countries on the list are not alone in their aspirations. South Korea, for example, has long been a leader in broadband investment. Today, many countries, from Greece to Malaysia, are investing heavily in national IT development.

According to a recent study of consumer markets by international consulting firm McKinsey, ICT is one of the top four economic sectors in terms of the intensity of its

impact on modern society alongside healthcare, agriculture and infrastructure. Figure 3 shows the sectors that have the greatest impact on social development.

A study of the level of development of the world's most innovative countries shows that per capita expenditures on innovation in these countries are high, averaging \$ 50.8 thousand per year. In Uzbekistan, the figure is 2.1 thousand US dollars, which is 24.1 times less than the average. The Global Innovation Index of Innovative Development has a coefficient of 57.8 in developed countries and 29.1 in Uzbekistan, publication of articles in international journals is 4455.7 in developed countries and 11.2 in Uzbekistan. These analyzes show the need to strengthen innovative development in our country.

Table 1. Countries with high level of innovation development Source: Based on data from the World Bank and the State Statistics Committee

Countries	Level of evolution		Innovative development indicators		
	Gross domestic product (1000 \$ per person)	Gross domestic product (PPS , 1000 \$ per person)	Global innovation index	Export of high-tech goods (from industrial export %)	Articles in international journals
Switzerland	79,9	63,9	66,3	27,1	2534,4
United States	57,6	57,6	61,4	20	1265,7
Singapore	53,0	87,8	59,2	67,4	2007,0
Ireland	64,2	71,5	59,0	29,8	1431,8
The Netherlands	45,6	50,5	58,3	-	1759,8
Average value by country	50,8	53,8	57,8	21,4	4455,7
Uzbekistan	2,1	6,5	29,1	4,7	11,2
Difference between Uzbekistan and average (times)	24,1	8,3	2.0	4,5	397,5

Uzbekistan's global innovation index is almost 30 points (100 points) and the country is ranked 80-90 in the WEF ranking of global competitiveness. For the leading countries, the difference in the average score of this indicator (57.8) is about 2 times.

Comparing the indicators of conditions and factors of innovative development in Uzbekistan with world indicators allows us to conclude that the main factors hindering

the transition to an innovative economy in Uzbekistan are underdeveloped institutions in this area and insufficient funding of science and new technologies.

Conclusion

Research and analysis of the impact of innovation on the economy, investment in research shows that the introduction of innovation in the digital economy can accelerate its development in the country. Developed countries and mega-companies today are benefiting greatly from innovations in the digital economy. According to the Decree of the President of the Republic of Uzbekistan "On measures to introduce the digital economy and e-government", by 2023 the share of the digital economy in GDP will double and the volume of services in this area will triple to \$ 100 million. At the same time, in 2020-2022 it is planned to implement a total of 268 projects for the further development of the park of e-government, telecommunications and software products and information technology, the widespread introduction of digital technologies in the real sector. Thus, in accordance with the Decree of the President of the Republic of Uzbekistan dated April 28, 2020 No PP-4699 "On measures for the widespread introduction of digital economy and e-government" in 2020-2022, the total value of data in the field of technology and communications will reach 17.6 trillion. It is planned to implement 35 priority projects worth UZS. It is planned to implement 44.8% of these projects through foreign direct investment and unsecured loans, and 33% through government-guaranteed loans. The implementation of these tasks will undoubtedly have a significant impact on the development of the digital economy of our country.

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