Environmental Aspects of Innovative Development of Industrial Sectors

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Abstract. According to the authors, the Republic of Kazakhstan has prospects for innovative development of industries and services in the regions. The trend of innovative development is aimed at the development, first of all, of agriculture, mining and services. Innovation is becoming a specialized area of development and humanitarian aid, combining new technologies with user-centered, behavioral and lean approaches. The strategic connotations adopted by various countries include increasing the R & D budget for technological innovation, supporting the investment of talents in the field of technological innovation, encouraging open innovation activities, activating local development through technological innovation, deepening communication with growing foreign markets, expanding investment in research and development and system implementation.

Keywords: Innovative development · Industry 4.0 · Budget measures · Strategic connotations · Valuable opportunities

1 Introduction

Recalling the strategy for the development of Industry 4.0 in various countries, its promotion goals are focused on strengthening the main positions of technological innovations of enterprises, introducing new technologies to improve the use of resources and efficiency of use, as well as the creation of innovative products and business models to create more valuable opportunities, as well as increasing national research funding and strengthening research and development in key areas / research projects [1–11].

Kazakhstan has an area equal to the area of Western Europe, but with one of the lowest population densities in the world. Strategically, it connects the large and fast-growing markets of China and South Asia, as well as Russia and Western Europe, by road, rail and a port on the Caspian Sea [3, 4, 12–14].

The global economic downturn and internal structural weakness have called into question the sustainability of Kazakhstan's growth model. Sluggish productivity growth,

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excessive State involvement in the economy and growing dependence on raw materials were the main reasons for weak economic indicators [13–16].

Kazakhstan has faced a sharp decline in economic activity and an increase in unemployment and poverty, despite significant budget measures. The COVID-19 pandemic has further reinforced the urgent need for reforms to reverse the declining growth potential [14–16].

Despite the problems of national statistical accounting, tracking the growth trajectory of the digital economy is important. The information and communication technologies (ICT) industry is at the center of most of this activity, supporting the digital economy and serving as a reliable criterion for its effectiveness [15–17].

2 Methods

The technology industry faces a difficult balance: continue to promote innovative solutions and fight the side effects of these solutions in the global economy. The problem itself is not unique – every industry faces this strain as it becomes more mature – but the new variables here are the scale that technology can achieve, and the evolutionary aspect of mixing the digital and physical worlds [16, 17].

Finally, the systemic problems related to data privacy, trade and immigration faced by the sector are considered [18, 19].

The accelerated adoption of rapidly developing technologies, such as cloud computing, robotic automation, artificial intelligence (AI), machine learning, the Internet of Things (IoT) and 5G technologies, is promising for the IT industry and should contribute to continuous growth [20].

The accelerated adoption of rapidly developing technologies, such as cloud computing, robotic automation, artificial intelligence (AI), machine learning, the Internet of Things (IoT) and 5G technologies, is promising for the IT industry and should contribute to continuous growth. The IT industry is becoming increasingly dominant in the service manufacturing sector, largely due to the dynamically developing technology sector.

Automation will undoubtedly also determine the future of the IT industry. Automation makes it possible to increase productivity through the introduction of robots and artificial intelligence in the workplace. These tools will help employees to perform more tasks and use human capabilities. Automated processes and digital assistants can help increase labor productivity, bringing significant benefits for macroeconomics.

3 Results

Countries that are world leaders in creating advanced technologies and using the full production potential of their digital economy can gain a strategic competitive advantage.

Germany: adhere to the principle of non-interference in the regulation of the innovation industry, and abundant sources of funding are the key reasons for the formation of an innovation ecosystem. In the field of intelligent manufacturing, Germany's priority technology areas will focus on three technologies: cloud computing, intelligent networks and big data analysis [21–24].

United States: The ecosystem will be dominated by industry and academia, with their government playing only supporting roles. Promotion strategies include the introduction of new enterprises into university research parks, enterprise-sponsored research projects to improve the skills of industrial specialists, as well as the same training methods with the help of industry teachers to encourage young people to encourage innovation and other measures [25–27].

Japan: The government plays an important role in the innovation ecosystem. The government sets the direction of innovative development and conducts comprehensive planning of research institutions, and then large private enterprises lead the content of innovative activities.

South Korea: As for the demand for scientific and technological talent, various incentive policies can attract global scientific and technical talent to fill the shortage of technological talent in the innovation industry [19–27, 29].

Taiwan. If you look at the manufacturing industry in Taiwan, it faces two serious difficulties. Firstly, due to the late start of the development of Industry 4.0, it will lag behind the advanced countries in key technologies, so that the domestic technical level cannot meet international trends, and SMEs are undergoing transformation.

Kazakhstan. In Kazakhstan today, when the current crisis associated with the pandemic has affected almost all sectors of the economy, there is a weak activity of enterprises in the field of creating and distributing innovations.

Let's consider the income from the sale of products and services of all sectors of Kazakhstan over the past 5 years to determine the current state of products and services (Fig. 1).

Revenue from the sale of products and services for 2016–2020 has a growth trend, so in 2016 services amounted to 55350514.66 million KZT, and in 2020 already 88414632.01 million KZT, which is almost 60% more. However, in 2020 there is a slight decline compared to 2019, which is due to the crisis caused by the pandemic. Next, we will consider the share of the volume of services rendered in Kazakhstan shown in Fig. 2.

The volume of services rendered in Kazakhstan has a growth dynamics, so in 2016 services amounted to KZT 6,153,293. 5 million, and in 2020 already KZT 8,395,643. 0 million, which is an increase of 36.4%. The share of services rendered in the structure of the Gross Product by type of economic activity is considered in Fig. 3.

The leader in the structure of the Gross product by type of economic activity for 2020 is industry – 27.55%, other services 21.08% and wholesale and retail trade; repair of cars and motorcycles 16.95%. The smallest share is accounted for by information and communication–1.94%, agriculture, forestry and fisheries – 4.47%, construction–5.48%. As we can see, services occupy not a small share of the Gross Product by type of economic activity [29, 29–34].

4 Discussion

The transition of the economy of Kazakhstan to an innovative path of development is possible only on the basis of accelerated technological development of branches of the real sector of the economy [4, 25].

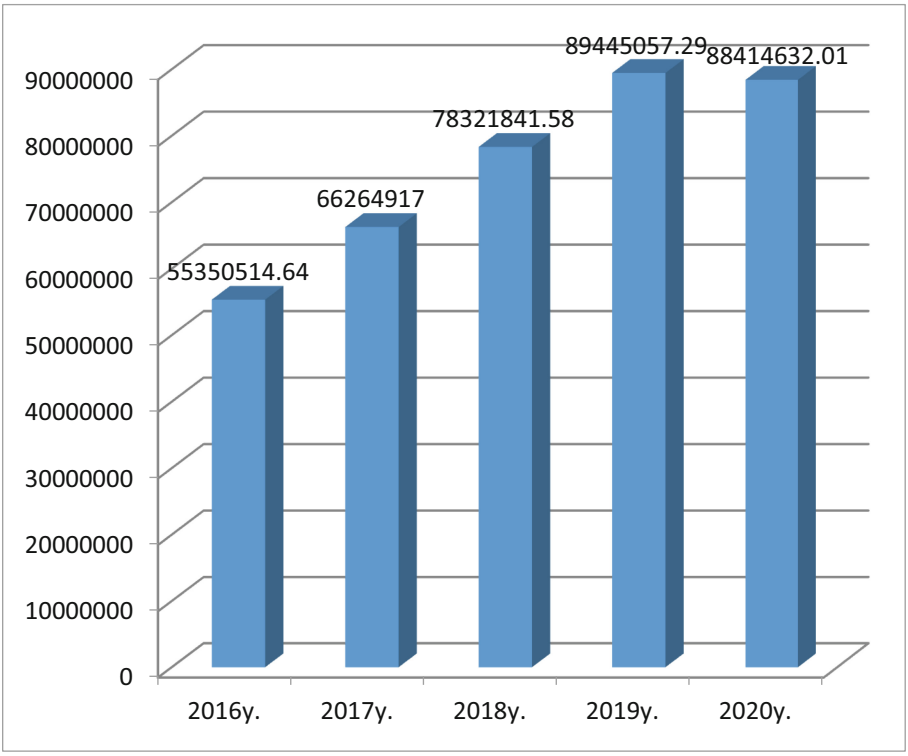

Fig. 1. Income from the sale of products and services. Source: developed by the authors based on materials. The Internet resource of the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan www.stat.gov.kz

The bulk of technology spending is related to purchases made by corporations or government agencies.

A smaller part is accounted for by household expenses, including home business. While new technologies currently account for only 17% of total global revenue, they are expected to account for almost half of the growth in new revenue. There are two caveats to this forecast. First, the nature of emerging technologies means that there is less history to make predictions for the future [11–15].

Not only can the numbers be wrong, but it is also difficult to predict which categories will take off and which will fade into the background. Secondly, the growing architecture of modern business systems blurs the boundaries between categories. While new technologies will drive growth, they need to be used in combination with more established technologies to create innovative solutions.

Countries that are world leaders in creating advanced technologies and using the full production potential of their digital economy can gain a strategic competitive advantage.

Thus, the state plays a critical role as a tool for improving the efficiency of its processes, reducing costs, as well as solving growing social and environmental problems of

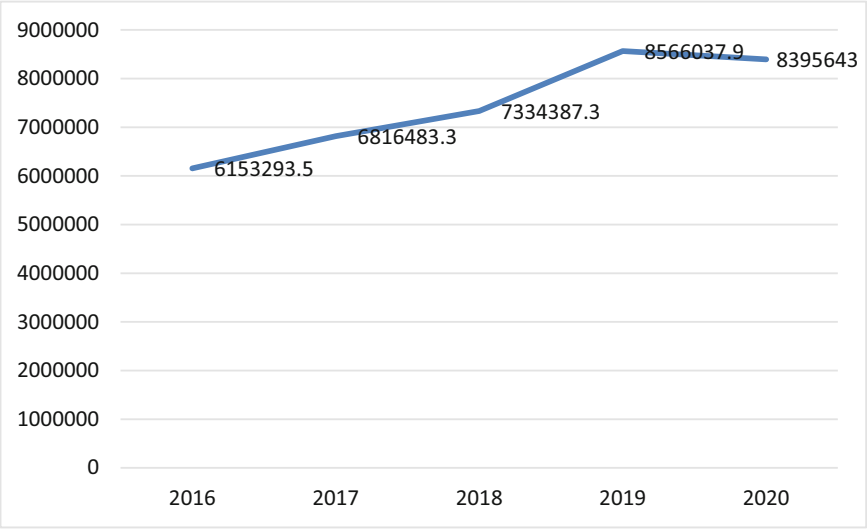

Fig. 2. The volume of services rendered for 2016–2020. Source: developed by the authors based on materials, The Internet resource of the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan www.stat.gov.kz

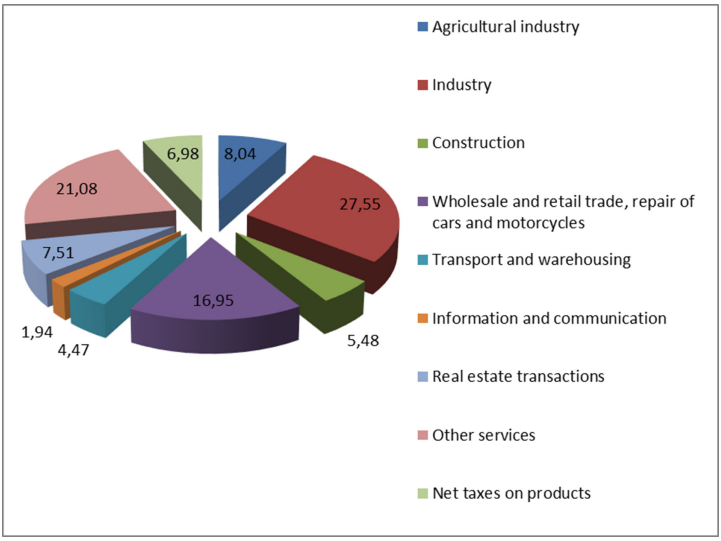

Fig. 3. The structure of the Gross product by type of economic activity for 2020. Source: developed by the authors based on materials. The Internet resource of the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan www.stat.gov.kz [31]

communities and authorities. Technological progress was also crucial for the development of new deposits in more complex scenarios: lower ore contents, extreme weather

conditions, deeper deposits, harder rock mass and a high-stress environment [23–27, 29, 29–33].

The article analyzes the process of digital transformation that the industry is going through, as well as other current trends that are likely to determine the extraction of minerals in the future.

Over the past decades, the mining industry has faced a difficult scenario of its activities. Increased productivity to overcome natural factors such as lower ore content, deeper deposits and a harder rock mass, combined with increased environmental and social awareness, has prompted the industry to constantly work to improve its processes throughout the value chain.

In this regard, innovation plays a crucial role, as it provides suitable solutions to overcome these difficulties, ensuring the continuity and sustainability of mining activities [7–14].

The mining industry is in the early stages of implementing these new technologies. The full potential of their applicability for mining processes has yet to be revealed.

The first and most obvious is a major technological shift taking place in all industries: the so-called Fourth Industrial Revolution or simply Industry 4.0 as a transition to the digital era. In addition, social and environmental problems are already forcing the mining industry to look for safer, more efficient and sustainable ways of doing business. Reducing energy and water consumption, reducing emissions and waste generation are all factors that will underlie the «mine of the future».

The role of the service sector in the modern economy is due to the fact that the fundamental factors of economic growth are formed in this sector, namely: new scientific knowledge, intellectual capital, information technologies, financial sector services, consulting, etc. [2, 27, 29, 29–33].

To accelerate, companies are quickly learning both the best practices of the past and new trends in the field of development. The user experience is a good example of the latter, as mobile apps have revised expectations for usability and reliability.

Artificial intelligence is another evolution, albeit at much earlier stages. Quality assurance is arguably a topic that unites both sides – a practice that has always been part of software development, but it has changed dramatically since cloud computing led to the emergence of a microservice architecture [32–34].

But not every company is ready to manage huge amounts of data consolidated from several streams, but every company can start using its existing data to get information.

For those firms that are quickly starting to apply data processing methods, database administration is the starting point for a more formal approach. The trend may be moving in the right direction, but the gap for Kazakhstan is so large that it will take considerable time and deliberate changes to close it.

5 Conclusion

Thus, strategic actions and additional measures for the innovative development of industries and services:

- Addressing gaps / linkages in industry supply chains

- Expand the domestic market base to allow industries to achieve economies of scale and exports
- Development of programs for the development and training of human resources for professional development and establishing links with universities and educational institutions.
- Support the development of small and medium-sized businesses by creating common services and incubators.
- Support for innovation and R&D.
- Promoting green growth: green industry, the use of clean technologies in industrial production, improving the efficiency of resource and energy use, improving water and waste management.
- Implement aggressive promotion and marketing programs to attract more foreign direct investment, especially those that will bring new technologies.
- Continue to solve the problem of high cost of electricity and domestic transportation, smuggling and implementation of measures to optimize and automate state procedures and regulations.
- Set a more competitive exchange rate.

It is extremely important to strengthen overall planning and political support to create a comprehensive environment that promotes the vigorous development of new industries, innovative development ideas, improving the quality of development and accelerating development and growth. The promotion of new support industries and the development of strategically new industries have become a powerful driving force for economic and social development. Innovations in new methods of industry supervision and the construction of a legal system are relatively lagging behind and still do not meet the requirements of economic development.

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