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## **State Regulation of the ICT Sector in Ukraine in the Context of Technological Transformation of the Economy**

**Abstract**

The paper deals with the understanding of government strategies for regulating the ICT industry. The purpose of the study is to rationalise the directions of government regulation of the ICT industry in Ukraine in the context of technological transformation of the economy. Using the methodology of descriptive statistics, the authors revealed the rapid growth of the number of employees in the ICT industry in Ukraine. The authors conclude that, from the point of view of state regulation, given the fact that employment has proved to be the main factor in the success of exports, it is necessary to prevent the outflow of labour from Ukraine. This is confirmed by the competitive advantages gained by Ukrainian ICT workers in the global market, namely: price – the cost of Ukrainian coders' services is close to the prices of Indian coders and seven times less than the cost of coders' services in the US; diversity and high quality of technological competencies that allow flexible implementation of high-level ICT projects; its own research and development base, as well as materials and technologies for the implementation of complex knowledge-intensive projects, flexibility in the use and distribution of necessary resources; cultural and geographical proximity to Europe. Based on this, strategies for interaction between the state and the ICT sector are being developed. First, the state needs to create favourable conditions for the sustainable development of the industry, including reforming legal norms, improving investment policy, modernising labour legislation, strengthening the protection of intellectual property rights, and ensuring the return of labour from abroad. Second, to create comfortable conditions to reduce the outflow of intellectual resources abroad and strengthen Ukraine as a brand in the IT sector in the eyes of the international community. The main strategies for the formation of mechanisms for state support of information services are as follows: the emergence of a modern IT infrastructure accessible to all, improving the quality of information services; a strategy for creating a regulatory framework for the effective use of the network economy; a strategy for creating state indicators of the development of the network economy; a strategy for creating information security in network systems.

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**1 Introduction**

ICT is a strategic sector of the global economy. All economic systems function through network connections. This factor has a significant impact on labour productivity, production of goods and services, and global GDP growth. The global ICT industry is the most dynamic sector of the economy, so the purpose of

the study is to substantiate the main factors influencing its development and to determine the reasons for government regulation in this area. As defined by the OECD, "ICT goods must either be designed to perform information and communication functions by electronic means, including transmission and display, or use electronic processing to detect, measure, record or control physical phenomena" (OECD, 2013).

**Keywords**

IT industry, government regulation, Ukraine, export of IT services, technological transformation

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Ukraine is striving to become a universally recognised technologically advanced country that creates added value in the global economy. The Ministry for Development of Economy, Trade and Agriculture of Ukraine stated that "with rapidly growing exports, thanks to various comparative advantages, including highly qualified specialists, Ukrainian IT companies have expanded their presence in the global market" (The Ministry for Development of Economy, Trade and Agriculture of Ukraine, 2019). Certainly, ICT is one of the few industries in which Ukraine has a competitive position in the global economy. However, state regulation in Ukraine tends to slow down the development of the industry. Thus, the purpose of the study is to rationalise the directions of state regulation of the ICT industry in Ukraine in the context of technological transformation of the economy.

## 2 Literature Review

Research on government regulation of the ICT industry is scarce. They have mostly focused on analysing the experiences of different countries in order to improve the efficiency of the ICT industry. In particular, Cali et al. (2008) stated that the export of ICT services should be promoted by the government of a developing country's growth strategy because it helps the country to realise its human potential and supports its economic growth. The authors offered different types of complementary government policies as directions for regulatory reform in the ICT industry. Raihan and Cheong (2013) also highlighted that the export of ICT services has a positive impact on the domestic economy, as it leads to better employment and an increase in the overall purchasing power in a country.

The study by Kouam (2020) found a positive and statistically significant relationship between exports of ICT goods and services and GDP per capita. As a result, the author recommended "quantifiable policy changes to boost ICT exports and services, including fintech, artificial intelligence, machine learning, mobile money payments and renewable energy technologies". In contrast, Hagsten and Kotnik (2014) studied the role of different ICT capabilities in the internationalisation of SMEs.

Their research found a positive relationship between ICT capabilities and engagement in export activities, although the most efficient capabilities appear to vary across countries. In another study (Kotnik & Hagsten, 2018), the authors raised the question of which country characteristics can help explain the differences in the role ICT use plays in export performance. More and more services have become tradable across borders thanks to digital tools, while new types of digital services have been created (Eurostat, 2023). Therefore, both developing and developed countries are interested in understanding

better strategies for developing the ICT industry and increasing exports of ICT services to ensure economic growth.

## 3 Waves of Innovations

The global economy manifests the interconnectedness and integration of its industries. The functioning of the technology industry is the most widespread example of this trend. The technology industry affects the economic and social indices of almost all Ukrainian enterprises and industries. In Ukraine, the tech industry is a sector that can help Ukraine overcome the economic crisis due to its positive influence on banking, e-commerce, nanotechnology, etc. It is the technology industry that allows companies to become more flexible and responsive in making decisions, developing strategies, and determining operational indices.

According to the World Bank (2019), the technology sector is growing by more than 25% per year. This trend will continue for several years, helping Ukraine to overcome its economic crisis. Moreover, this trend will only be strengthened if one considers the impact of the COVID-19 pandemic, when the majority of the workforce shifted to remote working.

As a result, the Ukrainian government aims to promote the development of the industry and attract skilled workers capable of creating unique competitive technology (The Ministry of Development of Economy, Trade and Agriculture of Ukraine). Such technology will support key Ukrainian industries and help the country move to a higher level of technological development. The technology sector provides software capable of strengthening any economic industry.

The approach of the five waves of innovation (Silva, Di Serio, 2016) states that the waves are related to the phases of the development of the global economy. The sixth wave (digitalisation, robotics, automation) is coming. At the same time, Ukraine is considered only as a supplier of raw materials related to the third and fourth waves of innovation. Thus, global changes require Ukraine to move to the 5-6-7<sup>th</sup> wave of innovation (Table 1).

The main challenges that need to be addressed for the Ukrainian economy are the transition to new waves of innovation. In particular:

- To increase the efficiency of the use of material and intellectual capital;
- to optimise the amount of state funding for research and development;
- to create new state start-ups to attract the best IT specialists.

Recent data from the State Statistics Service of Ukraine show that Ukraine is exporting more low value-added goods and importing higher value-added goods due to the rapid decline of domestic industries (The State Statistics Service of Ukraine).

TABLE 1 Characteristics of technological systems

Waves of innovations					
II (1830-1890)	III(1880-1940)	IV (1930-1990)	V (1985-2035)	VI (2030-2080)	VII (2070-2130)
Steam power engineering, railways and transport logistics, coal industry, ferrous metallurgy	Power generation, heavy engineering, metalworking, power lines, inorganic chemistry	Automotive, non-ferrous metallurgy, synthetic materials, durable goods	Electronics, fibre optics, software, telecommunications, robotics, information services	Nanotechnology, molecular technology, cell technology, nanotechnology, biotechnology, nanobiology, microelectronics, nanomaterials	Robotics, artificial intelligence, biocomputers, biomedicine

Source: summarised by the authors on the basis of (Khimanen, 2006), (Masuda, 1983), (Silva, Di Serio, 2016)

Accordingly, the development of the 5<sup>th</sup> and 6<sup>th</sup> waves of innovation should become the strategic goal of economic development in Ukraine, along with the gradual modernisation of all previously created 3<sup>rd</sup> and 4<sup>th</sup> wave industries. Economic development in Ukraine can take place due to the flexible policy of price stability, as declared by the European Central Bank. As a result, all stakeholders will be able to plan their income and expenses in advance, which will allow the economy to move towards economic equilibrium. Thus, price stability can make it possible to refuse to use the solidarity-based pension system and replace it with the pension insurance system. This gives economic agents more freedom of action.

#### 4. Modern Aspects of State Regulation of the ICT Sector in Ukraine

With the development of globalisation, all economic sectors in Ukraine have to deal with the use of ICT networks. Hence, the ICT industry has an impact on all economic systems. In Ukraine, the ICT industry is a sector of the economy that has been growing since 2015 (WORLD BANK).

The situation has changed in the context of a full-scale war. In 2023, the IT industry brought 6.7 billion USD to the Ukrainian economy through the export of its services. This is 8.5% or 622 million USD less than in 2022. The volume of IT exports fell to the level of 2021, when it was 6.9 billion USD. In 2022, there was the lowest growth in IT exports for all years, namely +5.8% year-on-year. At the same time, despite the war and the global crisis, the figure then reached a record 7.3 billion USD (The annual volume of IT exports of Ukraine decreased for the first time).

The increase in the specific gravity of remote work and the shift to freelancing and outsourcing due to the COVID-19 pandemic have promoted part-time and remote employment. This trend significantly influences the distribution of labour resources among Ukrainian regions. When developing HR strategies, companies are now inclined to choose the strategies of remote team work, including different Ukrainian regions.

On the one hand, such a trend creates opportunities for regional employment. On the other hand, it reduces the retention rate of office staff. The trend is

also leading to an increase in the number of Ukrainians working remotely for companies in other countries. Programmers, marketers, designers, developers, testers, PR managers, financiers, outreach managers, etc. from Ukraine have been working remotely for other countries since the advent of technology.

There are several competitive advantages that Ukrainian ICT workers gain in the global market:

- Price – the cost of Ukrainian coders is close to the cost of Indian coders and seven times less than the cost of American coders (Makarenko, 2000);
- diversity and high quality of technological competences that allow flexible implementation of high-level ICT projects;
- own research and development facilities, as well as materials and technologies to implement complex knowledge-intensive projects, flexibility in the use and distribution of necessary resources;
- cultural and geographical proximity to Europe (Gimadeev, et al., 2011).

Strategies of interaction between the state and the IT sector can be divided into the following blocks:

- The state needs to create favourable conditions for the sustainable development of the industry, including reforming legal regulations, improving investment policy, modernising labour legislation, strengthening intellectual property rights, and ensuring the return of labour from abroad.
- Establishing the processes of transition of university students to their involvement in the IT sector, improving the methods of teaching disciplines at universities, raising the level of teaching foreign languages as a means of communication between potential investors and employers.
- At the regional level, it involves attracting young people to work in IT companies of local associations, raising the level of training at the bachelor's and master's levels.
- Providing knowledge of financial literacy, as well as knowledge of management and marketing, and continuous improvement of foreign language skills.
- Creation of comfortable conditions to reduce the outflow of intellectual resources abroad (necessary infrastructure, improvement of living conditions,

greening of cities, opening of information and creative complexes, and so forth).

- Strengthening Ukraine as a brand in the IT sector in the eyes of the international community, increasing opportunities for attracting investors to open IT locations in Ukraine.
- Strengthening cooperation with institutions of different countries in the field of trade to inform large companies about the investment attractiveness of Ukraine as a country with a high level of IT skills.

## 5. Conclusions

The main strategies for developing mechanisms of state support for information services include the following areas.

- The emergence of a modern IT infrastructure, accessible to all who wish to use it, and the growth in the quality of information services. This strategy is influenced by the development and the possibility of giving everyone access to the Internet. Full network coverage of all territorial links: from villages to cities. Increasing the possibilities and improving the conditions of access to information networks and resources for users, institutions and organisations. This in turn

will provide the opportunity to use all possible information technology tools. Creation of e-government and general programmes capable of informing and training all types of information services.

- The strategy for creating a regulatory and legal environment for the effective use of the network economy. Strategies for the creation of a regulatory and legal environment for the effective development of the network economy. Implementation of an adequate regulatory environment for the functioning of the network economy.
- The strategy of creation of state indicators of development of network economy. Creation of information technologies in enterprises and institutions, implementation of monitoring of the field of information and telecommunication technologies in various structures.
- The strategy of creating information security in network systems. Creation of new types of information protection and information environment. Development of standards that are of decisive importance in international organisations of the European Union in the field of development of regulations on protection of information on the network.

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