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UNVEILING THE DIGITAL ECONOMY: HOW DIGITIZATION TRANSFORMS ECONOMIC STRUCTURES

Abstract: *One of the most significant processes currently underway in the modern economic system is the digital transformation, which results in the digitization of all economic sectors and creates the digital economy. This represents the current stage of economic development that affected all areas of human life and changed the way the economy functions and the way people live. The production processes, organizational relationships, distribution networks, marketing strategies, customer communication forms, and the way in which customers get goods and services have all undergone substantial change as a result of digital transformation. Consequently, the economic system is shifting from traditional markets to interconnected networks, from traditional consumers to active prosumer, from ownership-based models to access-based models, and from a consumer-driven economy to a sustainable economy (Rifkin, 2015).*

It should be mentioned that unlike traditional industries, which lack access to digital technologies, digital business and entrepreneurship can raise the rate of economic growth and create jobs in a short period of time. The digital economy has risen 2.5 times faster than the global GDP over the last 16 years (Huawei and Oxford Economics, 2017). Today, we are living in the process of the digital revolution, or the fourth industrial revolution, which has put a strong demand on individual countries to start digital transformation. This is critically important for small countries that are not rich in natural resources.

As a result, it's critical to evaluate the current stage of digital business growth, trends in the emergence of digital business models and entrepreneurial initiatives, as well as the difficulties associated with the digitization of traditional industries.

The study highlights the benefits of digital entrepreneurship and business over traditional ones. The stages of traditional businesses' digital transition are discussed, along with the models of digital business and entrepreneurship that are currently in use.

Keywords: Digital Economy, Society 5.0, Technological Revolution, Transformation

JEL classification: O3, L86.

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ციფრული ეკონომიკა: როგორ გარდაქმნის დიგიტალიზაცია ეკონომიკურ სტრუქტურას

აბსტრაქტი: ერთ-ერთი ყველაზე მნიშვნელოვანი პროცესი, რომელიც ამჟამად მიმდინარეობს თანამედროვე ეკონომიკურ სისტემაში, არის ციფრული ტრანსფორმაცია, რომელიც იწვევს ყველა ეკონომიკური სექტორის დიგიტალიზაციას და ქმნის ციფრულ ეკონომიკას. ეს წარმოადგენს ეკონომიკური განვითარების ამჟამინდელ ეტაპს, რომელმაც გავლენა მოახდინა ადამიანის ცხოვრების ყველა სფეროზე და შეცვალა ეკონომიკის ფუნქციონირება და ხალხის ცხოვრების წესი. წარმოების პროცესები, ორგანიზაციული ურთიერთობები, სადისტრიბუციო ქსელები, მარკეტინგული სტრატეგიები, მომხმარებელთა კომუნიკაციის ფორმები და მომხმარებლების მიერ საქონლისა და მომსახურების მიღების გზა. ყველამ სფერომ განიცადა არსებითი ცვლილება ციფრული ტრანსფორმაციის შედეგად. შესაბამისად, ეკონომიკური სისტემა ტრადიციული ბაზრებიდან გადადის ურთიერთდაკავშირებულ ქსელებზე, ტრადიციული მომხმარებლებიდან აქტიურ მყიდველზე, საკუთრებაზე დაფუძნებული მოდელებიდან წვდომაზე დაფუძნებულ მოდელებზე და მომხმარებაზე ორიენტირებული ეკონომიკიდან მდგრად ეკონომიკაზე (რიფკინი, 2015).

აღსანიშნავია, რომ ტრადიციული ინდუსტრიებისგან განსხვავებით, რომლებსაც არ აქვთ წვდომა ციფრულ ტექნოლოგიებზე, ციფრულმა ბიზნესმა და მეწარმეობამ შეიძლება გაზარდოს ეკონომიკური ზრდის ტემპი და შექმნას სამუშაო ადგილები მოკლე დროში.

შედეგად, გადამწყვეტია ციფრული ბიზნესის ზრდის მიმდინარე ეტაპის შეფასება, ციფრული ბიზნეს მოდელების და სამეწარმეო ინიციატივების ჩამოყალიბების ტენდენციების განხილვა, ასევე ტრადიციული ინდუსტრიების დიგიტალიზაციასთან დაკავშირებული სირთულეები.

საკვანძო სიტყვები: ციფრული ეკონომიკა, საზოგადოება 5.0, ტექნოლოგიური რევოლუცია, ტრანსფორმაცია.

JEL კლასიფიკაცია: O3, L86.

Introduction and review of literature

The digital economy is an ever-evolving and dynamic system that leads to the transformation of all sectors of the economy. Today, it is impossible to find any sector of the economy where digital technologies are not successfully employed. It is important to understand that the digital economy is not a new sector, field, or direction; it is not a system developing in parallel with the existing economic system. Instead, the digital economy is a process of digitally transforming the economy, involving more and more sectors, changing their structures, and forming a single interconnected digital system. Describing such a system requires more than simply stating that "an economy relying on digital technologies is a digital economy." We can say that the digital economy is a process in which the digital transformation of the economy radically alters traditional perspectives on how businesses are created, how consumers receive goods, services, or information, and on what the state's policies in the field of business regulation should be based (OECD, 2020).

Digitization is not an optional process but is irreversible, therefore, the ongoing transformation process will further worsen the situation of countries that do not take effective steps in this direction. Thus, every country is actively faced with the issue of responding to digital challenges and ensuring the formation of a digital, innovative ecosystem and a digital business environment. By 2025, the World Economic Forum estimates that approximately 85 million jobs in the EU countries will be transferred from humans to robots, while at the same time 97 new jobs will be created that require active human involvement (World Economic Forum, 2020).

Austrian economist Joseph Schumpeter in his work "Capitalism, Socialism and Democracy" uses the terms "creative destruction". With this term, the author describes the "technological progress that completely changes the structure of the economy, destroys the already existing models of production and replaces it with a new one" (Schumpeter, 1942). The rapid development of the digital economy, the digital transformation of all sectors of the economy, the introduction of digital technologies in the production and service sectors are the best examples of creative destruction. The digital economy has changed not only the way products are produced, distributed and consumed, but also society's way of life, culture, social relations, labor market, education system and values. Today, the digital economy has covered all areas of the economy to such an extent that we can talk about digital education, digital agriculture, digital marine industry, digital production process, digital labor market, etc.

These changes are necessary and not optional, as the process of creative destruction takes place independently of individual countries. Therefore, the question is not whether to accept the mentioned changes or whether to become a part of this process, but how to use this opportunity to get the maximum benefit. We cannot stand in front of these processes, as the system is so self-developing and independent in this direction that a single country or a group of countries cannot stop it, nor can it develop without involvement in these processes.

The digital economy went through all stages of structural changes very quickly, affected every person, business, country, set completely new requirements for them and made it impossible to conduct daily processes without digital technologies. These are disruptive changes that are inherently creative and positive, as digital transformation is characterized by increased efficiency and productivity, optimization and acceleration of processes. This is necessary for sustainable economic development in the conditions of existing limited resources.

Scholars like Brynjolfsson and McAfee (2014) and Tapscott and Williams (2016) trace the roots of the digital economy to the rise of information and communication technologies (ICTs) and widespread internet adoption. The integration of digital technologies in industries, as evidenced by research conducted by Manyika et al. (2016) and Brynjolfsson and Saunders (2018), has significantly enhanced

productivity, efficiency, and innovation. Moreover, studies by Westerman et al. (2014) and the World Economic Forum (2016) emphasize that the digital economy is a process of transformation, reshaping traditional market structures into interconnected network models. This transformation impacts customer communication, marketing strategies, and the delivery of goods and services, as investigated by Kaplan and Haenlein (2016) and Osterwalder et al. (2017). Understanding the digital economy as an evolving and interconnected system is crucial, as it fundamentally changes economic structures, and this review lays the groundwork for exploring its far-reaching implications.

The modern world is witnessing a revolutionary shift in the way economics function, driven by the widespread adoption of digital technologies. This article delves into the concept of "Digital Transformation of the Economy" – a dynamic process that is reshaping industries, societies, and consumer behavior. By exploring key sub-topics such as "Technological Means of Digital Transformation," "Industry 4.0 and Society 5.0," "Digital Two-sided Markets," "Zero Marginal Costs Economy," and the transformation of consumers into "Prosumers," we aim to provide a comprehensive understanding of the profound changes that the digital era brings to economic landscapes.

In this article, we will examine how technological advancements are the driving force behind the digital transformation, enabling businesses and industries to evolve and adapt to the demands of the digital age. We will also explore the revolutionary Industry 4.0 and Society 5.0 concepts, where intelligent automation and human-centric approaches converge to shape the future of production and human well-being. Furthermore, we will investigate the emergence of digital two-sided markets, where platforms connect buyers and sellers in innovative ways, creating new avenues for economic exchange.

Additionally, we will discuss the revolutionary concept of the zero marginal costs economy, wherein digitalization fundamentally changes cost structures, challenging traditional economic models. Moreover, we will explore the transformation of consumers into prosumers – active participants in the production process – as digital technologies empower individuals to influence and shape the products and services they consume.

Methodology

As mentioned earlier, as a result of the increasing use of information and digital technologies, the world economy is undergoing a rapid transformation. One of the main differentiating factors of the economy in recent years is the exponential growth of machine-processable information, or digital information. This process is accompanied by the development of technologies for processing large information flows, artificial intelligence (AI) and new business models (digital platforms). More and more devices are connected to the network every day, connecting more and more people to digital services. Consequently, a larger value chain is created through connected digital technologies, stimulating its development and expansion. Today, access to digital information, its processing and use has become one of the main factors of companies' competitiveness. Manufacturers, exporters, suppliers of various types of services and products are becoming increasingly dependent on digital information as most operations have moved to the digital world. They use support services that provide them with access to information relevant to the optimization of transportation, shipments, further retail distribution and its accompanying financial flows.

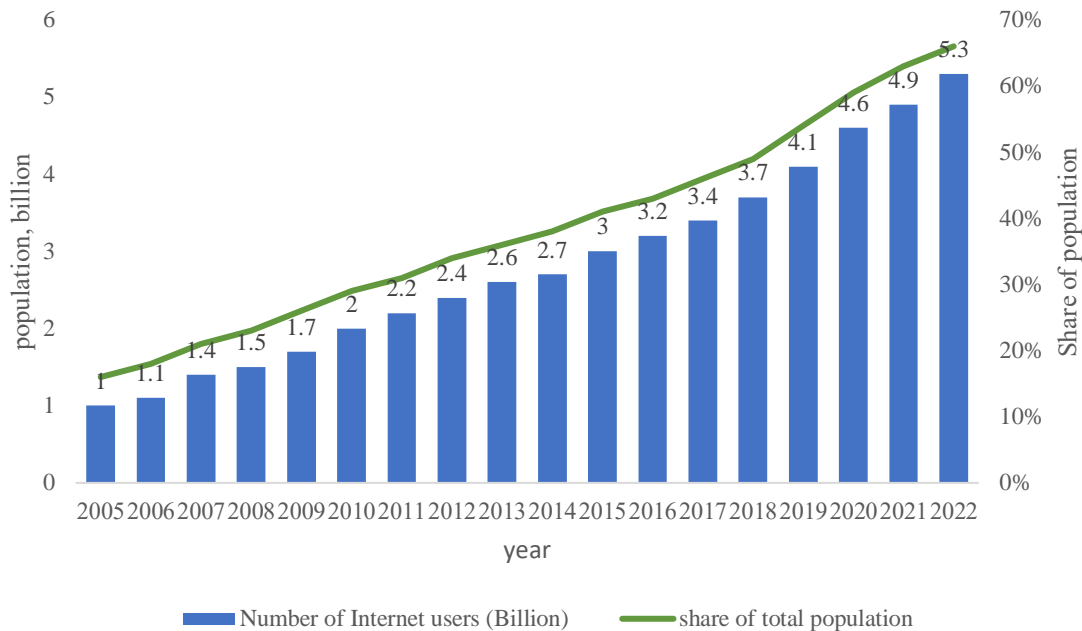
We can single out several main directions that are the basis of the digital economy, form the digital infrastructure, and at the same time create an important part of the value of the digital economy.

Information and Communication Technologies (ICT)

All types of equipment and services that enable broadcasting, computing, telecommunications, information processing and display (OECD, 2020). ICT includes any communication equipment: radio,

television, mobile phones, computer and network equipment and satellite systems. Information and communication technologies are the basis of the digital economy. At the initial stage of the development of the digital economy, the level of ICT distribution and utilization was evaluated, as well as its share in the GDP. Although it does not fully reflect the digital economy, it provides important information about it. In this direction, it is important for society to have access to the Internet, which remains a problem in less developed countries.

Figure 1. Number of Internet users and their share of the total population worldwide, 2005-2022.



Source: ITU, 2023

The Internet has long been an opportunity for personal fulfillment, professional development, and value creation. Due to the COVID-19 pandemic, it has become essential to work, study, access basic services and communicate. During the pandemic, the number of Internet users has increased significantly. In 2019, 4.1 billion people (49% of the world's population) used the Internet (ITU, 2021). In 2020, the number of users reached 4.6 billion (54% of the world population), (ITU, 2021). However, this means that approximately 3.3 billion people do not have access to the Internet, 96% of whom live in developing countries.

Big data

Data characterized by high volume, speed and variety. Big data can be defined as a set of data whose size and type are beyond the ability of traditional databases to collect, manage and process data in a short period of time. The sources that enable the formation of big databases are becoming more complex as artificial intelligence (AI), mobile devices, social media, and the Internet of Things (IoT) enable their formation.

These databases can be used to develop new products, optimize services and processes, develop artificial intelligence, improve decision-making mechanisms, forecasting and market research. The volume of information generated in the digital economy is growing at a rapid pace.

Artificial intelligence (AI)

The term "artificial intelligence" was previously used to describe machines that exhibited "human" cognitive, learning, and problem-solving abilities. This definition was soon rejected and AI was defined as the ability of a machine, a robot, to act in response to external factors to achieve a goal.

The development of artificial intelligence has become possible based on the processing of a large amount of information, which allows the development of behavioral algorithms and scenarios. A good example of artificial intelligence is self-driving cars, search engines, etc. One of the first companies that successfully uses artificial intelligence in the creation of self-driving cars is Tesla (TESLA). With the help of artificial intelligence, the car can identify all objects on the road, determine the trajectory of their action and make a response decision.

An ideal characteristic of artificial intelligence is its ability to rationalize and take actions that have the best chance of achieving a particular goal. A subset of artificial intelligence is machine learning, which refers to the concept that computer programs can automatically learn and adapt to new data without the help of humans. Deep learning techniques allow the machine to use a huge amount of unstructured information (text, image, video) in the learning process.

Internet of Things (IOT)

IOT refers to interconnected devices that form a single intelligent ecosystem, where communication between devices included in the ecosystem is established through the sensors in the devices. It is a smart ecosystem that can be managed remotely via the Internet (Body of European Regulators for Electronic Communications, 2019). The IOT system can monitor a very wide range of processes and, if necessary, make a decision independently without human intervention. IOT systems are successfully used to manage the existing infrastructure within the business, for the smooth operation of security systems, to regulate traffic flows on roads and to monitor soil, humidity, weather and other related processes in agriculture. McKinsey Global Institute estimates that artificial intelligence has the potential to increase the world's gross domestic product by 26% until 2030. Also interesting is the fact that the number of interconnected devices connected to the Internet is much higher than the number of unique users. In the first quarter of this year (2023), the number of unique mobile network subscribers was 5.5 billion, with 11.7 billion devices connected to the network (GSMA, 2023).

Automation and robotization

Today, automation of processes by means of robots is an integral part of production, which significantly increases productivity. In turn, the development of robotics and its increasingly widespread implementation in the production process reduces the demand for low-wage labor. Accordingly, developing countries face a significant challenge, where low-paid labor force is one of the important factors of foreign capital inflow. According to the International Federation of Robotics, the number of industrial robots has been steadily increasing by an average of 10% annually since 2010, reaching 3,014,879 by 2020 (The International Federation of Robotics, 2021).

There is a misconception in society about the increase in unemployment due to automation. Robots are actually creating new, high-paying jobs that require skilled workers. At the same time, they replace low-skilled workers and provide automation of processes. For example, according to Deloitte research, over the past 15 years in England, 800,000 jobs have been lost through automation and robots, but 3.5 million new, much higher paying jobs have been created in the same period (Deloitte,

2015). In America, between 2010 and 2015, the automotive industry introduced 60,000 robots, while the number of employees increased by 230,000 during the same period.

Zero Marginal Costs Economy

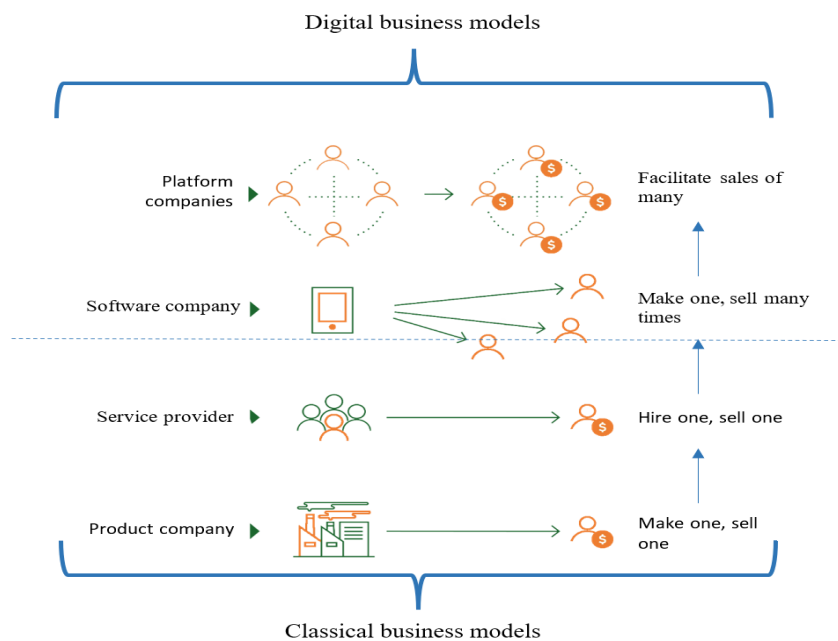
Marginal cost is the increase in total costs when production volume increases by one unit. It is the cost of producing each additional unit of goods or services when all fixed costs are covered. As we know in classical economics, it is believed that with the increase of the produced products, the marginal costs increase, as the production of each additional unit requires more resources than each previous unit, therefore the production cost of each additional unit, or the marginal cost, also increases.

According to classical economic doctrine, marginal costs are decreasing in the short run, and increasing or constant in the long run, depending on the type of business, production process, and other factors. Also, it is believed that the company can maximize profit at the point of production where marginal cost equals marginal revenue.

The zero marginal cost theory contrasts with the classical view of marginal cost and implies a situation where the cost of producing each additional unit is decreasing and approaches zero. Diminishing marginal costs increase production efficiency and the firm's ability to increase output without increasing marginal costs. The term zero marginal cost was first used by economist Jeremy Rifkin in 2014. Jeremy Rifkin is the author of *The Zero Marginal Cost Society: The Internet of Things*. Zero-marginal cost models are designed so that a company can produce a product or service only once and receive value over time. This allows to maximize the value that the firm can get from the given product.

Consider the following figure, which will help us better understand the essence of business transformation from a high marginal cost to a zero marginal cost model.

Figure 2. A shift from high marginal cost to low marginal cost



Source: Alex Moazed & Nicholas L Johnson, 2020

Digital business models are completely changing the structure of consumption. In the zero-marginal-cost model, we are no longer talking about ownership, but about the right to access. Users have access to a variety of services (car rental, platforms, software packages, etc.) but do not physically own them. For example: A platform is a business model that acts as a mediator in the exchange of value between multiple users. Platforms focused on creating value that connect consumers and suppliers.

From Customer To prosumer

The term prosumer was first mentioned in 1980 by the American writer and futurist Alvin Toffler. Producer-consumers are people who are both consumers and producers, producing certain products or services for their own consumption and that of others (Alvin Toffler, 1980). The origin of the term is related to technological progress, which increases the user's involvement in the production process and gives him the opportunity to become a producer himself.

Recent technological changes, the formation of Web 2.0, have contributed to the spread of the producer-consumer culture. WEB 2.0 - refers to the current state of Internet development, the share of user-created content (YouTube, blogs, Facebook, websites, etc.) has significantly increased. WEB 2.0 does not imply any technical change in the Internet space, but implies the culture of using the Internet by society. If in WEB 1.0 the user was only receiving information, in WEB 2.0 the user is active, receives information, services and creates digital products himself. For example, through web 2.0, users create a market where users themselves are both suppliers and consumers (WILL KENTON, 2022).

Today, several million hobbyists, thousands of small businesses and startups use 3D printers to create their own products or components. The size of the 3D printer market will be \$16.75 billion in 2022 and is growing at a high rate every year (Grand View Research, 2023). 3D printer manufacturing technology is also evolving, making it more affordable and thus facilitating the spread and use of industrial and consumer 3D printers.

Also, free software is an important direction, within the framework of which people jointly create a program, share it with a wider group of society, which on the one hand gives more people the opportunity to use the said program, and on the other hand contributes to the refinement and development of the program. For example, such programs include the Linux operating system and the statistical program R.

Through technological progress, the producer-consumer concept has the potential to be introduced in almost all sectors of the economy and increase consumer involvement in the creation of the products and services they consume.

Results and Conclusions

The digital transformation of the economy is an ongoing and irreversible process that has already redefined the economic landscape and human interactions. Embracing this transformation is no longer a choice but a necessity for countries, businesses, and individuals to remain competitive and thrive in the digital age.

The convergence of technological means like ICT, AI, big data, IoT, and robotics has laid the foundation for a digital economy that operates on unprecedented scales and speeds. This transformation has led to increased efficiency, optimized processes, and the creation of entirely new business models. Businesses must adapt to this digital ecosystem by adopting agile strategies and leveraging technology to deliver personalized experiences to consumers.

The concepts of Industry 4.0 and Society 5.0 encapsulate the potential of the digital transformation to shape the future of production and societal well-being. Companies need to embrace smart manufacturing and harness digital technologies to unlock new opportunities for growth and

sustainability. Governments must develop policies that foster innovation, protect privacy, and ensure equitable access to digital technologies for all citizens.

The rise of digital two-sided markets presents both opportunities and challenges for businesses. Platforms must balance the interests of consumers and suppliers while maintaining trust and transparency in data usage. Harnessing the power of user data responsibly will be a key determinant of success in the digital economy.

The concept of a zero marginal costs economy disrupts traditional notions of scarcity and abundance, prompting businesses to reevaluate pricing strategies and revenue models. Companies must focus on providing value-added services and experiences to customers in this abundant digital environment.

The transformation of consumers into prosumers signifies a paradigm shift in consumer behavior and demands. Businesses must actively involve consumers in the co-creation of products and services, fostering a sense of ownership and loyalty. Embracing open-source initiatives and user-generated content can drive innovation and customer engagement.

In conclusion, the digital transformation of the economy is an ongoing journey that requires continuous adaptation, innovation, and collaboration. Embracing technological advancements, understanding new economic paradigms, and engaging consumers as active participants will enable businesses and societies to navigate this transformative era successfully. By harnessing the power of the digital economy, countries can unlock new avenues for economic growth, social progress, and sustainable development.

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