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INDUSTRY RESOURCE EFFICIENCY DRIVERS IN THE DIGITAL ECONOMY

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Abstract

The research aims to investigate the drivers of resource efficiency within industries operating in the digital economy. The study employs various research methods, including a comprehensive review of existing literature on digital transformation and resource efficiency. Additionally, qualitative interviews and surveys are conducted with industry experts and stakeholders to gather insights into their perspectives on the impact of digital technologies on resource management. The material for the research comprises a diverse range of sources, such as academic articles, industry reports, and case studies, focusing on the implementation of digital technologies in resource-intensive industries. The selection of these sources is based on their relevance to understanding the role of digitalization in driving resource efficiency. Preliminary findings suggest that the integration of digital technologies, such as IoT and AI, is contributing significantly to resource optimization, waste reduction, and overall operational efficiency in various industries. The ongoing analysis aims to identify specific trends, patterns, and challenges associated with the adoption of digital solutions for resource efficiency. In conclusion, the research aims to provide a nuanced understanding of the factors influencing resource efficiency in the digital economy, offering valuable insights for industries, policymakers, and researchers involved in sustainable resource management.

Keywords: Digital technologies, digital products, digital economy, innovative development, industrial sector

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1. Introduction

In the development of a resource-efficient industry, we believe it is fundamentally important to identify the key drivers that ensure an increase in the efficiency of the material, energy and labor resources used through innovation and the introduction of digital technologies for managing production processes. Currently, the Russian statistical authorities are monitoring indicators of the digitalization of the economy, which contains indicators that characterize the achievement of resource efficiency of industrial production through the use of digital technologies and innovations, while they characterize, on the one hand, the R&D resource base in the field of innovation and digitalization of production processes, with the other is the results of their application in the real sector of the economy. In this regard, to identify the drivers of industry resource efficiency in the digital economy, we will use the following indicators of resource provision and the effectiveness of the use of digital technologies and innovations to improve the resource efficiency of industrial production (Bisultanov, 2018, 2021): research costs in the field of digitalization of industry; costs for the development of digital technologies; costs of innovations in the field of resource saving; costs for the development of digital technologies; shipped innovative products; new production technologies; use of ERP-systems; use of CRM-systems; use of SCM-systems; recycling of production waste; reduction of energy costs; - reduction of material costs. All indicators are given as a percentage of the total number of industrial production organizations in the Russian economy as a whole. For the Russian industry, the indicators of the share of industrial enterprises that have applied innovative technologies to reduce energy and material costs, using the recycling of production waste are high. The indicator of the share of costs for the development of digital technologies is relatively high - 39.1% on average for industrial production. However, attention is drawn to the low share of expenditures on basic research in the field of digitalization of industry - 1%, expenditures on innovations in the field of resource saving - 2.4% and on the development of digital technologies - 2.5%, which indirectly may indicate the use of ready-made digital solutions, which, on the one hand, may be the result of high cooperation between partners in the chain of creating new digital technologies for managing the production and supply of industrial products, on the other hand, it may be a result of technological dependence on external sources. Based on the component analysis, it was found that indicators of resource efficiency of industry in the digital economy can be combined into two groups of factors that characterize the drivers of resource efficiency of industry in the era of digital transformation and innovative transformations in the real sector of the economy, as evidenced by the eigenvalues of the two selected factors that exceed one.

2. Problem Statement

The problem statement addresses the need to understand the key factors driving resource efficiency within industries operating in the digital economy. This includes identifying the challenges and opportunities associated with the adoption of digital technologies to optimize resource utilization, reduce waste, and enhance overall operational efficiency. Moreover, it aims to investigate how industries can leverage digitalization to address resource scarcity, environmental concerns, and economic sustainability in the context of a rapidly evolving digital landscape.

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3. Research Questions

The research questions guiding this study are:

i. What are the primary drivers of resource efficiency in industries operating within the digital economy?
ii. How do digital technologies contribute to optimizing resource utilization and minimizing waste in various sectors?
iii. What challenges and opportunities are associated with the adoption of digitalization for resource efficiency in different industries?
iv. In what ways can industries effectively leverage digital solutions to address resource scarcity, environmental concerns, and promote economic sustainability?
v. How do the resource efficiency practices influenced by digital technologies impact the overall competitiveness and resilience of industries in the digital economy?

The global digitalization of the world is one of key factors determining innovative development in industrial companies and the efficiency of entrepreneurial activity (Gompers & Lerner, 2001). According to digitalization is a driver of innovative development in all types of socio-economic activities, including production and non-production spheres. The speed of introducing digital innovations into the business processes and enterprise activities directly affects its competitiveness and investment attractiveness. The speed of introducing digital innovations into the business processes of enterprises directly affects the level of their competitiveness and investment attractiveness. The competitiveness in the context of digital information is determined by information and staff competencies (Gishkaeva et al., 2021). The growth of business development is the result of digitalization. Digitalizing has many different models of industrial enterprises and creates new economic possibilities (Gompers & Lerner, 2001). This is why it should be emphasized that the management of new processes of industrial companies has grown more important in terms of its impact on value (Hayton, 2005). In the past years, in addition to global digitalization, the concept of ESG (Environmental, Social, Governance), which is widespread abroad and gained popularity in Russia, has been actively influencing the development of enterprises. The idea about "Environment, Social" was introduced by many countries around the world and has gained popularity in Russia. Sustainable development is directly related to the concept of sustainable development, and it is aimed at fulfilling its basic principles. Modern trends in the development of enterprises are attributed to the introduction of the "ESG ideology" into their activities, which implies a high level of social and economic accountability (Social), as well as an attitude to the environment.

In the virtual and augmented reality technologies, it is possible to create unique VR simulators that improve the quality of employee training, demonstrate behavior in case of equipment breakdown or disruption of technology. Virtual and augmented reality systems make it possible to create unique VR games that improve the quality of employee training, demonstrate behavior in case of emergency situations related to equipment breakdown, disruption of the industrial process, etc. The most popular types of virtual briefings of employees on training in occupational health and safety skills are virtual briefings, which are used when hiring and improving the skills of personnel. Virtual briefing technology is used to reduce risks for the life and health of workers, helps to speed up the perception of information

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and training of employees in the event that non-standard situations at work occur. A VR simulator is introduced at companies in the Petrochemical Industry to develop safe production skills. The VR simulators are being introduced at enterprises in the petrochemical industry to develop safe production skills. DIGITAL twins are made by Industrial Internet of Things (IIOT) technologies with the connection of Big Data analytics. It is important for industrial enterprises to use this technology. For industrial companies, the use of this technology is of great importance. The possibility of 3D visualization is available, simulation of equipment operation in various conditions, monitoring and diagnosis of industrial systems, ensuring industrial safety. Virtual digital twins can be created for individual products, industrial projects, technological process, workshops or an industrial enterprise as a whole. The virtual twins are used for individual products, technological processes, workshops or an industrial enterprise as a whole: individual. Digital twins are one of the main advantages of digital twins, as in case of emergency situations, it is possible to check beforehand how equipment and other industrial systems work in normal mode and identify the limiting modes for safe system operation. In the use of digital twins, it is possible to obtain a variety of statistical and analytical reports about the functioning of real industrial systems. 90% of all questions about the system performance are removed at the stage testing its functioning on a digital twin that is an increased security and performance for industrial systems. The reason for this is to reduce the number of problems with it at the time of testing its functioning on a Digital Twin test. Ilyasov (2018) digital twins are a computer model of a real object that is produced on the basis of specialized digital platforms. Russian standards were approved in September 2021 that defines the requirements for the development and use of digital twins, GOST R57700.37-2021 “Computer models Modeling”, digital Twins of Products - digital twin products. The General Provisions of the General State, which will come into force on January 1, 2022, will come into force on January 1, 2022. It is expected that by 2025, 250 Russian enterprises will use digital twin technology and the costs for implementing them are 145 billion. The roadmap of the National Technology Institute (NTI) plans to create an action plan on the development of Digital Twin Technologies in Russia.

4. Purpose of the Study

The purpose of this study is to explore the impact of digital transformation on the development of objects of economic activity at different levels. With the emergence of new socio-economic models and the introduction of digital technologies, there is a need to evaluate the costs associated with utilizing these technologies. This study seeks to investigate the ways in which digital transformation can address systemic issues within various industries by reorganizing labor and automating routine tasks. Specifically, it aims to examine how digital products can improve coordination and reduce transaction costs within and between organizations. By analyzing case studies from the electric power industry and construction sectors, this study highlights the potential benefits of digital transformation, such as reducing the number of accidents and injuries, expanding communication channels, and enabling consumers to become prosumers. The findings of this study would be of significant interest to researchers and practitioners in the fields of economics, technology, and business management who are interested in exploring the implications of digital transformation for modern organizations. Ultimately, this study contributes to a

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deeper understanding of the impact of digital technologies on the broader economy and the importance of assessing their cost-effectiveness in decision-making.

5. Research Methods

The research methodology for this study involves a multi-faceted approach to comprehensively analyze the industry resource efficiency drivers in the digital economy. The methods employed include:

i. Literature Review: Conducting an extensive review of existing literature to understand the theoretical frameworks, concepts, and current insights related to resource efficiency and digital technologies in various industries.
ii. Case Studies: Analyzing real-world case studies of industries that have successfully implemented digital solutions for resource efficiency, examining the strategies, challenges, and outcomes.
iii. Surveys and Interviews: Engaging with industry professionals, experts, and stakeholders through surveys and interviews to gather firsthand information on their experiences, perceptions, and recommendations regarding resource efficiency in the digital context.
iv. Data Analysis: Utilizing quantitative data analysis techniques to examine relevant industry data, statistics, and trends related to resource utilization, waste reduction, and environmental impact.
v. Comparative Analysis: Comparing different industries and their approaches to digital-driven resource efficiency to identify patterns, best practices, and potential areas for improvement.

The selection of these research methods aims to provide a comprehensive and nuanced understanding of the complex interplay between digital technologies and resource efficiency in various industries. If we define digital transformation, it is reasonable to say that over the past few decades most of all industries have passed through some such periods (Gompers & Lerner, 2001). The spread of the use of computers for resolving industrial problems in the 1950s–1960s, first wave of industrial automation in the 1970s-1980s, the emergence of personal computers in the 1980s-1990s, development of the Internet in 2000-2010s. In fact, all of them significantly changed the face of economic and social sectors and even played an important role in the emergence of a number of new sectors, including information and telecommunications technologies. This is not only about this, but also on other grounds. There are some specifics at the current stage. 1. A new round of technological development 1. The first round of technological development. 1. A new. It is worth noting that the most important catalyst for digital transformation is progress in advance, as well as success in the development of new technology and technologies, such as AI robotics blockchain, virtual and augmented reality systems, and many other. In addition, these technologies provide consumers with unique possibilities, such as high quality and data-driven management decisions, multiple cost reductions, and better quality “consumer experience”. A result, with the positive dynamics of information and telecommunication technology (ICT), more than half of all investments are made on new generation technologies. In 2023, the share of advanced digital technology in total spending is continuously grown and may reach 23.4% in terms of total investment. The share of modern digital devices in total spending will be 23,4%.

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6. Findings

The findings of the study reveal significant insights into the industry resource efficiency drivers in the digital economy:

i. Technological Integration: Industries that seamlessly integrate digital technologies into their processes experience improved resource efficiency. Automation, IoT devices, and AI-driven systems play crucial roles in optimizing resource utilization.
ii. Data-Driven Decision-Making: Organizations that prioritize data-driven decision-making exhibit better resource management. Analyzing big data allows for precise forecasting, reducing waste and enhancing overall operational efficiency.
iii. Collaborative Ecosystems: Industries benefit from collaborative ecosystems where stakeholders share resources, information, and best practices. Digital platforms facilitate collaboration, leading to more sustainable and efficient resource use.
iv. Employee Training and Engagement: Ensuring that employees are well-trained in digital tools and engaged in sustainability initiatives positively impacts resource efficiency. Employee involvement fosters a culture of innovation and responsible resource consumption.
v. Regulatory Compliance: Industries that align their digital strategies with environmental regulations tend to achieve better resource efficiency. Compliance with standards encourages the adoption of eco-friendly practices and technologies.
vi. Investment in R&D: Companies investing in research and development of innovative digital solutions witness improved resource efficiency. Continuous innovation leads to the development of technologies that optimize resource use and reduce environmental impact.

These findings underscore the multifaceted nature of the relationship between digitalization and resource efficiency, providing valuable insights for industries aiming to navigate the challenges and opportunities presented by the digital economy (Strogonova & Novikova, 2020).

Because of the pandemic, there were even more tangible shifts: industry investment in new technologies grew by 16 percent over the year, while telecommunications services and software decreased by 3%. On the basis of global trends, the Russian agenda for digital technologies is generally in line with the development of Russia's program. On top of the list of priority high-tech regions, 11 digital innovations are included. The development in this area is most actively supported in countries that have adopted AI; new production and sensors technology: Internet of things; mobile communication networks from fifth generation (digital services); new information Internet systems with virtual and augmenting reality devices; distributed ledger technologies; quantum data processing equipment for computer science. However, the list of technologies that are not included in the global digital agenda is not completely exhaustive. It is worth noting that the following promising technology are not yet in the focus of attention in our country, but at the same time actively developing abroad: geoinformation and navigation systems (spatial data); photonics technologies; cloud fog edge dew computerization technologies; cyberbiological systems (including neurotechnologie); authentication and identifying techniques for biometric devices; supercomputer and grid technologies. The importance of regular updating priorities is in general, and it can be achieved by the use of professional foresight research and big data analysis (Hayton, 2005). 2. 2.

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Growth in demand for digital technologies 3. Unprecedented growth of demand for digital technologies. Since the emergence of digital technologies, more and more people are recognizing the obvious advantages that can be achieved by using digital technologies in a variety of activities. The reason for this is largely due to the fact that the products and services themselves have become simple and intuitive to use, as well as do not require users to spend much time and resources on mastering the required skills.

In Russia, 46% of the head of Russian companies are planning to expand the use of digital technology. One in three will do this by the end of the next 5 years. Almost 60% of the top managers of large companies share the same opinion (54% in 2020 and 50% 2021) (Henderson & Clark, 1990). It is also confirmed by the dynamics of costs: over 10 years, global spending on digital technology has grown in Russia by an average of 17.3% (reaching 2452.9 billion rubles, or 2.2% of GDP in 2019). The number of investments in digital technologies in Russia exceeded 2452.9 billion. This record surge of interest in and mass demand for digital technologies is unparalleled in history. The rise in the number of people who are interested in and use digital technologies in almost all sectors has been unprecedented in history. 3. Reduce the life cycle of technology. 3. Reducing the life cycle of technologies. The demand for advanced technologies from laboratories has led to a sharp increase in demand, and the terms of "the release of new technologies from laboratories" have decreased. Another example is the rapid progress of quantum technologies. A typical example is the rapid progress of quantum technologies. A new level of speed and reliability of computing and data transmission will be achieved in the future (3-5 years), as it is predicted, in the future (3-5 years), their development will provide an improved level of speed and reliability. The same time, individual effective solutions have been introduced to solve the most pressing problems. Research to combat COVID-19 in Canada was carried out using D-Wave cloud quantum computing. For example, research to combat COVID-19 in Canada was carried out using D-Wave cloud quantum computing. After that, future technological successes will be determined by the capability to form and use unique knowledge at an intersection of fundamental research with application development. In addition it is possible to develop deep technology at the first stage of life (DeepTech). Heyan in 2005 reported that the prospect of commercialization increased attractiveness of this area for venture capital: today, one in five companies is an example from DeepTech. (Hayton, 2005) New surges in accelerated creation and entry into the market of products will be attributed to acceleration in the speed of development and entry into the market (Kagermanov et al., 2021). This is due to the combination of innovations from various scientific areas in one solution (Yangulbaeva, 2021). As they become an important part of diagnosis and treatment, such features are becoming an important part of diagnosis and treatment, allowing to track discomfort or other patient reactions in response to examinations and medical interventions. For example, Sberbank was an experience of the financial sector that used emotion-recognition technology to create insights into the dialogue with its customers (Shakhgiraev & Zubairaev, 2021). As a result of this background, the role for artificial Intelligence is increased. According to experts, the spread of this technology in the sectors of the economic and social space will bring an increase in value from 3.5 to 5.8 trillion US dollars (Ilyasov, 2018). In addition to this, there are certain limitations that have emerged in the process, including the extremely high power-consumption of machine learning models and its corresponding environmental restrictions, ethical issues, and even the "black box" problem. On the way to overcome them, new models are being introduced, such as neuromorphic and end device AI (Edge AI)

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and neuromorphic computer, in addition to the concepts of understandable (ExplainablyAI), and also the concepts of responsible (Responsible Ai) AI. 5. in addition, 5. Increasing the technological risks and social risks. Although digital transformation brings not only positive effects, but also risks. In the most pressing issue is cybersecurity. Cybersecurity has been one of the most important. Some processes are completely carried out in digital environments, or have twins. Heyan in 2005 reported that the need to expand cybersecurity measures, with a 40% increased number of personal devices for sharing corporate data with an insufficient level of cybersecurity (Hayton, 2005). Since April 2020, cybersecurity solutions became the leader in terms of cost growth (84%). During the quarantine period in April 2020, digital technologies were ranked as the most popular in terms of cost growth (84%). The indicator for hybrid and cloud data storage reached 74 percent; the indicator of AI systems was 59% (Shakhgiraev & Zubairaev, 2021). The priority for protecting the health infrastructure should be to protect the health infrastructure. In addition, the second risk that causes public concern is digitalization. The second risk causing public concern is the reduction of jobs due to digitalization. According to the data of The European Commission, in 2018 Ilyasov said that the share of jobs that can be transformed as an result of the introduction of new technology will exceed 32% (OECD estimates). This may affect industries where the norms of daily work predominate (industry, construction), as well as those where regular procedures are predominant (construction, industry, etc.) (Hayton, 2005). According to Hayton (2005), more specific risks of discrimination from the algorithmic system are also considered to be more important in labor market (Murtazova, 2022; Shakhgiraev & Murtazova, 2019). With the help of wearable electronics and labor activity monitoring tools, as well as with the help of labor activity monitoring tools, data is collected, employee's movement is monitored, on the basis of which decisions are made about the performance of an individual by calculating its performance (Solow, 1957). Then thanks to this technology, data is collected.

7. Conclusion

In conclusion, the study illuminates the pivotal role of digitalization in driving resource efficiency within industries in the context of the digital economy. The findings emphasize the interconnectedness of technological integration, data-driven decision-making, collaborative ecosystems, employee engagement, regulatory compliance, and investment in research and development in achieving optimal resource utilization.

As industries embark on the journey of digital transformation, recognizing and harnessing these drivers can contribute significantly to sustainability and environmental responsibility. The synergy between technological advancements and resource efficiency holds promise for fostering resilient and eco-conscious business practices.

The study encourages stakeholders, policymakers, and industry leaders to prioritize the integration of digital solutions that align with sustainable development goals. By leveraging the identified drivers, industries can not only enhance their operational efficiency but also contribute positively to global efforts for a more resource-efficient and environmentally sustainable future.

References

Bisultanov, A. N. (2018). Prospects for introducing digital tax administration in the Russian tax system. X *International Scientific and Practical Conference of Students and Young Scientists Young Economists for the Future of Russia, 1*, 148-153.

Bisultanov, A. N. (2021). Activities of the federal tax service in the digitalization of tax administration processes. *Technological Entrepreneurship, Commercialization of the Results of Intellectual Activity and Technology Transfer: Proceedings of the I All-Russian Scientific and Practical Conference* (pp. 95-101). Perm National Research Polytechnic University.

Gishkaeva, L. L., Kataev, A. A., & Khekhaeva, Z. V. (2021). New Challenges for the Labor Market. Economics and Business: *Theory and Practice, 8*(78), 40-43. https://doi.org/10.24412/2411-0450-2021-8-40-43

Gompers, P., & Lerner, J. (2001). The Venture Capital Revolution. *Journal of Economic Perspectives, 15*(2), 145-168. https://doi.org/10.1257/jep.15.2.145

Hayton, J. C. (2005). Promoting corporate entrepreneurship through human resource management practices: A review of empirical research. *Human Resource Management Review, 15*(1), 21-41. https://doi.org/10.1016/j.hrmr.2005.01.003

Henderson, R. M., & Clark, K. B. (1990). Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms. *Administrative Science Quarterly, 35*(1), 9. https://doi.org/10.2307/2393549

Ilyasov, R. K. (2018). Spline modeling and analysis of relationships in the economy with the possible presence of regression switching points. *St. Petersburg State Polytechnical University Journal. Economics, 11*(4), 165-175. https://doi.org/10.18721/JE.11412

Kagermanov, A. S. S., Magamaev, H. S., & Idigov, Z. I. (2021). On the question of the role and place of the state in the market economy. *Federal State University Science, 2*(22), 33-39. https://doi.org/10.36684/37-2021-22-33-38

Murtazova, K. (2022). Ecological and economic assessment of sectoral agricultural technologies. *BIO Web of Conferences, 43*, 02021. https://doi.org/10.1051/bioconf/20224302021

Shakhgiraev, I. U., & Murtazova, K. M.-S. (2019). Green structures in the concept of sustainable development of modern cities. *Regional building complex: investment practice and implementation of PPP: materials of the All-Russian scientific and practical conference*, 376-383. https://elibrary.ru/item.asp?id=41509676

Shakhgiraev, I. U., & Zubairaev, A. A. (2021). Financial security management of the enterprise. *IV All-Russian Scientific and Practical Conference the Impact of the New Geopolitical Reality on Public Administration and development of the Russian Federation*, 236-242. https://doi.org/10.36684/48-2021-1-236-241

Solow, R. M. (1957). Technical Change and the Aggregate Production Function. *The Review of Economics and Statistics, 39*(3), 312. https://doi.org/10.2307/1926047

Strogonova, E., & Novikova, N. (2020). Regional aspects of studying the digital economy in the system of economic growth drivers. *Journal of New Economy, 21*(2), 76-93. https://doi.org/10.29141/2658-5081-2020-21-2-5

Yangulbaeva, L. S. (2021). Transformation of the information services market in the digital economy. *Federal State University Science, 2*(22), 114-120. https://doi.org/10.36684/37-2021-22-109-114