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INDUSTRY RESOURCE EFFICIENCY DRIVERS IN THE DIGITAL ECONOMY

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Abstract

The aim of this research was to investigate the drivers of resource efficiency in the industry within the context of the digital economy. The study employed a mixed-methods approach, combining quantitative and qualitative research methods. Quantitative data were collected through surveys and data analysis, providing numerical insights into the impact of digital technologies on resource efficiency in various industries. Qualitative methods, such as interviews and case studies, were utilized to gain a deeper understanding of the underlying mechanisms and specific strategies implemented by companies to enhance resource efficiency. One notable finding of the research was the significant positive correlation between the adoption of digital technologies and improvements in resource efficiency across diverse industrial sectors. The study revealed that technologies such as the Internet of Things (IoT), artificial intelligence, and data analytics played pivotal roles in optimizing resource use, reducing waste, and enhancing overall operational efficiency. The conclusion drawn from the research is that the integration of digital technologies into industrial processes is a key driver for resource efficiency. It not only improves the environmental sustainability of industries but also contributes to cost savings and competitiveness. The transformative impact of the digital economy on resource management underscores the importance of continued technological innovation and strategic adoption by businesses to achieve sustainable and efficient industrial practices.

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 (Shamsudinovich et al., 2019). 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 addressed in this research revolves around the need to identify and understand the factors influencing resource efficiency in industries amid the ongoing transition to the digital economy. As industries increasingly integrate digital technologies into their operations, there is a gap in comprehensive knowledge regarding the specific drivers and challenges associated with achieving resource efficiency in this context. The problem is characterized by a lack of a holistic understanding of

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how digitalization impacts resource utilization, waste reduction, and overall efficiency across diverse industrial sectors.

This study aims to address questions such as how different industries navigate the integration of digital technologies to optimize resource use and what challenges they encounter in this process. The research problem also encompasses the broader implications of resource efficiency on sustainability, cost-effectiveness, and competitiveness for industries operating in the digital era. By identifying these challenges and opportunities, the research aims to contribute valuable insights that can inform strategic decisions and policies for fostering resource-efficient practices in the digital economy.

3. Research Questions

The research questions for this study are designed to explore key aspects of resource efficiency drivers in the digital economy:

i. How do organizations identify and prioritize resource efficiency initiatives within the context of digital transformation?
ii. What role do emerging digital technologies play in enhancing resource efficiency across various industries, and what specific technologies show the most promise?
iii. What challenges do organizations face in implementing and sustaining resource-efficient practices in the digital era, and what strategies can be effective in overcoming these challenges?

These questions aim to uncover insights into the intersection of digitalization and resource efficiency, offering valuable perspectives for organizations navigating the complexities of the evolving 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 Shamsudinovich et al. (2019) digitalization is a driver of innovative development in all types of socio-economic activities, including production and non-production spheres (Shamsudinovich et al., 2019). 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,

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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 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 define 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 product. 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 investigate the drivers of industry resource efficiency in the digital economy. Specifically, the research aims to understand how organizations identify, prioritize, and implement resource-efficient practices in the context of digital transformation. The study seeks to provide

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insights into the role of emerging digital technologies in enhancing resource efficiency across various industries. Additionally, it aims to identify challenges faced by organizations in implementing and sustaining resource-efficient practices and explore effective strategies for overcoming these challenges. The ultimate goal is to contribute valuable knowledge that can guide organizations toward optimizing resource use in the dynamic landscape of the digital economy (Strogonova & Novikova, 2020).

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 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 employing the following methods:

i. Literature and Scientific Publication Analysis: A review of current research, articles, and literature addressing resource efficiency in industry within the context of the digital economy.
ii. Expert Interviews: Conversations with experts in the field of industrial efficiency and digital transformation to gather expert opinions and assessments.
iii. Data and Statistics Analysis: Quantitative analysis of data and statistics related to factors influencing resource efficiency in industry amid digital transformation.
iv. Industrial Case Studies: In-depth case studies to analyze specific instances of digital technology implementation and its impact on resource efficiency.
v. Surveys and Questionnaires: Surveys of industrial enterprises and professionals to collect primary information on factors affecting resource efficiency.
vi. Content Analysis of Social Media and News: Employing content analysis methods on social media and news outlets to identify public opinions and media coverage of resource efficiency and the digital economy.

The selection of regional sources is motivated by the aim to capture specific nuances and opinions within local industrial contexts (Gompers & Lerner, 2001).

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6. Findings

The findings of the study indicate a significant correlation between the adoption of digital technologies and improvements in resource efficiency within various industries. Analysis of literature, expert interviews, and case studies reveals that digitalization initiatives such as Internet of Things (IoT) applications, artificial intelligence (AI) systems, and data analytics tools contribute to optimizing resource utilization, minimizing waste, and enhancing overall operational efficiency. Moreover, surveys and content analysis suggest a growing awareness among industrial stakeholders regarding the importance of digital transformation in achieving sustainable resource management goals. These findings underscore the potential of digital technologies to serve as key drivers for enhancing resource efficiency in the digital economy.

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. 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

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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 an 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 these 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) 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 research highlights the transformative role of digital technologies in fostering resource efficiency within industries operating in the digital economy. The integration of Internet of Things, artificial intelligence, and data analytics has proven to be instrumental in optimizing resource utilization, reducing waste, and improving overall operational efficiency. The findings emphasize the increasing recognition among industry stakeholders of the significance of digital transformation for sustainable resource management. As industries continue to embrace and invest in digital solutions, the prospects for achieving resource efficiency goals in the digital economy appear promising. This study contributes to the understanding of industry resource efficiency drivers and underscores the importance of ongoing digitalization efforts in shaping a more sustainable and resource-conscious 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

Shamsudinovich, B. M., Vladimirovna, P. L., Alekseevna, K. I., Gennadyevna, D. E., & Nazhmudievich, B. A. (2019). Research On Opportunities And Development Drivers For The Digital Economy. In D. K. Bataev (Ed.), Social and Cultural Transformations in the Context of Modern Globalism. *European Proceedings of Social and Behavioural Sciences* (Vol. 58, pp. 193-200). Future Academy. https://doi.org/10.15405/epsbs.2019.03.02.23

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