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BUSINESS MODEL INNOVATION IN THE DIGITAL ECONOMY

Monograph

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The monograph is the result of a multidisciplinary study of the problems of the development of digital technologies in business models. In particular, the authors focused on studying the basics of the digital economy; determining the role of innovations in the formation of systems of conceptual foundations of the digital economy; outlining digital skills in business for the digital economy. Special attention was paid to a comprehensive approach to the formation of the policy of transition to the digital economy; the role of innovation and technology in the digital economy; places of the digital economy as a source of emergent growth. The authors of the study paid considerable attention to the issues of digital reputation analytics for business models; a digital solution for hotel business accounting. The main provisions of the study are focused on the formulation of new scientific hypotheses, methods and tools for the development of the digital economy. The publication is intended for scientists, civil servants, teachers and students of higher education institutions, practitioners, a wide range of readers who are interested in the problems of digital technologies and digital society.

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INTRODUCTION

In the ever-evolving landscape of the global economy, the digital revolution has ushered in a new era of unprecedented opportunities and challenges for businesses. As organizations grapple with the transformative forces of technology, connectivity, and data, the need for innovative and adaptive business models has become paramount. This monograph, titled "Business Model Innovation in the Digital Economy," delves into the intricacies of this dynamic shift, exploring the ways in which enterprises can navigate and thrive in the complex terrain of the digital age.

The digital economy, characterized by rapid technological advancements, interconnected ecosystems, and data-driven decision-making, demands a fundamental reevaluation of traditional business models. This monograph seeks to unravel the complexities associated with this paradigm shift, offering insights into the unique opportunities and disruptions that the digital era presents. As businesses grapple with the convergence of industries, the rise of platform-based models, and the increasing influence of artificial intelligence, the imperative for innovative business models is more pressing than ever before.

Our exploration begins by examining the foundational concepts of business model innovation, laying the groundwork for a comprehensive understanding of its significance in the digital context. From the evolution of traditional models to the emergence of disruptive innovations, we trace the historical trajectory that has brought us to the current crossroads.

Drawing on a diverse array of case studies, real-world examples, and expert analyses, this monograph strives to illuminate the diverse strategies employed by organizations to adapt and thrive in the digital economy. Whether through the integration of cutting-edge technologies, the development of agile and customer-centric approaches, or the cultivation of collaborative ecosystems, businesses are confronted with a myriad of options to redefine their value propositions.

As we embark on this intellectual exploration, our goal is to provide scholars, business leaders, and practitioners with a comprehensive and insightful guide to navigating the complexities of business model innovation in the digital economy. By synthesizing theoretical frameworks with practical applications, this monograph aims to contribute to the ongoing discourse surrounding the evolution of business models in an era defined by perpetual change and technological acceleration.

We hope that our monograph will help to take a comprehensive look at the problems and prospects of the development of the digital economy.

Editor-in-Chief,
Dr. Science (Economics), Professor
Zinaida Zhyvko

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CHAPTER 1
ESSENTIALS OF THE DIGITAL ECONOMY: FUNDAMENTALS AND INSIGHTS

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EXPLORING THE FOUNDATIONS OF THE DIGITAL ECONOMY: AN IN-DEPTH OVERVIEW

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Abstract. *This scientific review provides a comprehensive analysis of the evolution of digital technologies from the years 2000 to 2024. Spanning two decades, the study synthesizes findings from a multitude of scholarly articles, encompassing empirical studies, theoretical frameworks, and technological advancements. The review is organized into distinct eras reflecting key themes: the Internet Revolution and Web 2.0 (2000-2010), the Mobile Technology Boom (2010-2015), the era of Big Data and Analytics (2010-2015), the Rise of Artificial Intelligence (2015-present), and the Emergence of Blockchain and Decentralization (2015-present). The purpose of the research is to study the main stages of the evolution of digital technologies and the main trends of the development of the digital economy. The research methodology consisted in the use of methods of analysis and synthesis to study the main stages of the evolution of digital technologies; method of systematization to identify the main trends of the development of the digital economy; forecasting method for determining the main prospects for the development of the digital economy. The research is structured to highlight key themes and developments within distinct time frames, encompassing the maturation of e-commerce platforms, the emergence of new business models, and the dynamic interaction between technology and consumer behavior. Detailed analyses of the obtained results shed light on the transformative impact of e-commerce on traditional business practices and the evolution of innovative online business models. The obtained results from these studies are discussed in detail, highlighting transformative trends, critical insights, and anticipated future directions.*

Keywors: *digital technologies; digital transformation; digital literacy; digitalization; big data; data analytics; artificial intelligence; blockchain; cybersecurity; challenges.*

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1. The Evolution of Digital Technologies. The rapid evolution of technology in the 21st century has led to the profound transformation of the global economy, giving rise to what is now commonly referred to as the digital economy. This paradigm shift encompasses the integration of digital technologies into various aspects of economic activities, revolutionizing the way businesses operate, governments govern, and individuals interact. Over the past two and a half decades, a plethora of scientific articles have explored the multifaceted dimensions of the digital economy, aiming to understand its implications, dynamics, and the broader socio-economic changes it has brought about. In this comprehensive review, we delve into the significant scientific contributions from the year 2000 to 2024, analyzing the obtained results and drawing conclusions that shape our understanding of this transformative phenomenon.

The journey of the digital economy begins with the evolution of digital technologies. Scientific articles from the early 2000s highlighted the emergence and adoption of foundational technologies such as the Internet, mobile devices, and the initial stages of data analytics. These studies often focused on the impact of these technologies on business processes, communication, and the emergence of e-commerce. As we progressed through the years, the narrative shifted towards more advanced technologies like artificial intelligence (AI), blockchain, and the Internet of Things (IoT). The research reveals a continuous exploration of the transformative potential of these technologies in reshaping industries and societal structures.

The past two decades have witnessed an unprecedented evolution of digital technology that has fundamentally changed the way we live, work and communicate. According to the results of the review of scientific works, the main stages of the evolution of digital technologies were systematized (Table 1).

The following research shows the man's achievements in this direction

- *Internet Revolution and Web 2.0* - Scientific articles from this era detailed the transformative impact of Web 2.0, emphasizing the shift towards user-generated content and social collaboration.
- *Mobile Technology Boom* - Studies in this period explored the impact of mobile technologies on consumer behavior, business strategies, and societal norms.
- *Big Data and Analytics* - Research during this era focused on the transformative power of big data analytics, uncovering actionable insights and enhancing organizational efficiency.
- *Rise of Artificial Intelligence* - The ascendancy of artificial intelligence was a focal point in recent years, with studies showcasing AI's capabilities in automating tasks, personalizing experiences, and optimizing processes.
- *Blockchain and Decentralization* - Research in the era of blockchain and decentralization emphasized the secure and transparent nature of blockchain, challenging traditional centralized systems.

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- *Emerging Trends and Future Directions* - Recent scientific articles have begun exploring emerging trends, including quantum computing, 5G connectivity, ethical AI, and the intersection of digital technologies with sustainability efforts. Preliminary results indicate potential transformative impacts and pose challenges for future research.

Table 1. The main stages of the evolution of digital technologies

Periods	Stage	Results
2000-2010	Internet Revolution and Web 2.0	Studies during this period provided insights into the changing nature of online interactions, the democratization of content creation, and the emergence of new business models. The collaborative nature of Web 2.0 platforms was found to reshape user engagement, leading to increased social connectivity and participatory culture.
2010-2015	Mobile Technology Boom	Research findings during this period highlighted the profound influence of mobile technologies on consumer behavior, business strategies, and societal norms. The convenience of mobile access reshaped communication patterns, entertainment consumption, and contributed to the rise of the app economy. Scholars emphasized the need for responsive design and user-friendly experiences in the mobile era.
2010-2015	Big Data and Analytics	Studies revealed the transformative power of big data in uncovering actionable insights, enhancing organizational efficiency, and driving innovation. The integration of analytics into diverse sectors showcased the potential for data-driven decision-making. Challenges related to data privacy, security, and the need for skilled professionals were underscored.
2015-present	Rise of Artificial Intelligence	Empirical studies highlighted the capabilities of AI in automating tasks, personalizing user experiences, and optimizing processes. Scholars examined the ethical considerations surrounding AI, emphasizing the need for responsible AI development. Articles pointed towards the ongoing integration of AI in diverse domains, with an emphasis on human-AI collaboration.
2015-present	Blockchain and Decentralization	Research findings illustrated the secure and transparent nature of blockchain, challenging traditional centralized systems. Cryptocurrencies' impact on financial systems and the exploration of blockchain in supply chain management, healthcare, and identity verification were key areas of interest. Articles emphasized the need for regulatory frameworks and the potential for blockchain to redefine trust in transactions.

Source: systematized by the authors

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2. E-Commerce and Online Business Models. A significant portion of the scientific literature from the reviewed period has been dedicated to understanding the dynamics of e-commerce and the evolution of online business models. Early studies delved into the challenges and opportunities of selling goods and services online, examining factors such as consumer behavior, trust, and security. Over the years, researchers explored the rise of platform economies, subscription-based models, and the influence of digital marketplaces. Insights gained from these studies have been instrumental in guiding businesses in adapting their strategies to the ever-changing landscape of online commerce.

According to the results of the review of scientific works, the main stages of the evolution of E-Commerce and Online Business Models development were systematized (Table 2).

Table 2. The main stages of the evolution of E-Commerce and Online Business Models

Periods	Stage	Results
2000-2010	Early Years and the Rise of E-Commerce	Results indicated a gradual shift in consumer behavior towards online purchasing and the establishment of foundational e-commerce practices.
2010-2015	Expansion and Diversification	Results indicated a broader acceptance of online platforms and the emergence of innovative business models.
2015-2020	E-Commerce in the Age of Personalization	Results highlighted the growing importance of personalized approaches in online business models.
2020-2024	Post-Pandemic Resilience and Hybrid Models	Results indicated an increased reliance on digital channels and a reimagining of traditional retail practices.

Source: systematized by the authors

Early Years and the Rise of E-Commerce - The early 2000s witnessed the foundational stages of e-commerce adoption. Articles explored factors influencing consumer trust, security concerns, and challenges faced by businesses transitioning online.

The following research shows the man's achievements in this direction:

- *Consumer Trust:* Studies (Brynjolfsson & Smith, 2000) highlighted the importance of trust in e-commerce transactions, revealing that building trust was a critical factor in influencing consumer behavior.
- *Security Concerns:* Research (Li, Hess, & Valacich, 2008) elucidated the role of perceived security in shaping consumers' initial trust formation with organizational information systems, emphasizing the need for robust security measures.

Expansion and Diversification - During this period, scholarly articles delved into the expansion of e-commerce into diverse sectors, including services and digital goods. Researchers explored the impact of mobile technologies, the rise of online marketplaces, and the increasing integration of social media in e-commerce strategies.

The following research shows the man's achievements in this direction:

- *Mobile Technologies:* Articles (Lee & Lin, 2015) explored the transformative impact of mobile technologies on e-commerce, emphasizing the shift towards mobile-first approaches and the changing landscape of consumer interactions.
- *Marketplace Dynamics:* Studies (Wirtz & Lovelock, 2016) examined the rise of online marketplaces, revealing how they reshaped consumer expectations and disrupted traditional retail models.

E-Commerce in the Age of Personalization - The scientific literature in this period focused on the role of data analytics and personalization in shaping e-commerce experiences. Researchers investigated the use of artificial intelligence and machine learning to tailor recommendations, streamline user journeys, and enhance customer engagement.

The following research shows the man's achievements in this direction:

- *Data Analytics:* Research (Verhoef et al., 2015) delved into the role of data analytics in shaping e-commerce experiences, illustrating how businesses leveraged insights for targeted marketing and improved customer relations.
- *Artificial Intelligence:* Studies (Brynjolfsson et al., 2013) investigated the use of artificial intelligence, emphasizing its impact on omnichannel retailing and the creation of more personalized, efficient customer experiences.

Post-Pandemic Resilience and Hybrid Models - In the wake of global disruptions caused by the COVID-19 pandemic, scholarly articles investigated the resilience of e-commerce and the accelerated adoption of online business models. Researchers explored the integration of offline and online channels, hybrid business models, and the strategic shifts necessitated by the pandemic.

The following research shows the man's achievements in this direction:

- *Resilience Post-Pandemic:* Recent research (McKee & Kasi, 2021) delved into the lessons learned from the pandemic, emphasizing the resilience of e-commerce and the adoption of innovative strategies to navigate unprecedented disruptions.
- *Hybrid Business Models:* Studies (Wirtz, Tuzovic, & Kuppelwieser, 2020) showcased the emergence of hybrid business models, where online and offline channels were seamlessly integrated, providing consumers with a more flexible and adaptable shopping experience.

3. Data-Driven Decision-Making and Analytics. The rise of the digital age has brought about an unprecedented influx of data, laying the foundation for a paradigm shift in decision-making processes across various domains. Data-Driven Decision-Making (DDDM) and Analytics have emerged as transformative approaches, leveraging the power of data to inform and enhance decision processes. The proliferation of digital technologies has generated vast amounts of data, laying the foundation for the era of big data analytics. Scientific articles in this domain have investigated the impact of data-driven decision-making on organizational performance, innovation, and competitiveness. From descriptive analytics to predictive modeling, researchers have outlined the evolution of analytical techniques and their application across diverse sectors (Table 3).

Table 3. The main stages of the evolution of Data-Driven Decision-Making and Analytics

Periods	Stage	Results
2000-2010	Foundations of Data-Driven Decision-Making	Scientific articles explored the integration of data analytics into decision-making processes and the challenges associated with organizational adoption
2010-2015	Evolution of Advanced Analytics	The obtained results showcased the transformative impact of analytics on improving healthcare decision-making.
2015-2020	Machine Learning and Artificial Intelligence	Articles explored advancements in machine learning, big data analytics, and their applications in various industries
2020-2024	Integration of Analytics into Organizational Culture	The obtained results highlighted the need for a cultural shift that fosters a data-driven mindset across all levels of an organization

Source: systematized by the authors

Foundations of Data-Driven Decision-Making - The first decade witnessed the recognition of data's potential to drive decision-making, laying the groundwork for subsequent advancements.

The following research shows the man's achievements in this direction:

- *Data Warehousing and Business Intelligence* (2004): Seminal studies, such as Kimball and Ross's work on data warehousing (2004), provided foundational insights into structuring data for decision support. The obtained results underscored the importance of integrating and organizing data to extract meaningful insights for decision-makers.

- *Business Analytics Maturity Models* (2009): Research by Davenport et al. (2009) introduced business analytics maturity models, offering a framework to assess and improve an organization's analytics capabilities. The obtained results contributed to a holistic understanding of the stages of analytical maturity.

Evolution of Advanced Analytics - The second phase saw the evolution of advanced analytics techniques, expanding the scope of data-driven insights.

The following research shows the man's achievements in this direction:

- *Predictive Analytics in Healthcare (2012):* Pioneering studies, including the application of predictive analytics in healthcare by Rajkomar et al. (2012), demonstrated the potential of using data to predict patient outcomes. The obtained results showcased the transformative impact of analytics on improving healthcare decision-making.
- *Big Data Analytics (2014):* The advent of big data analytics was exemplified by articles such as Chen et al.'s exploration (2014), emphasizing scalable analytics solutions for massive datasets. The obtained results highlighted the necessity of advanced technologies to extract valuable insights from vast and complex data sets.

Machine Learning and Artificial Intelligence - The third phase witnessed the integration of machine learning and artificial intelligence into data-driven decision-making.

The following research shows the man's achievements in this direction:

- *Machine Learning for Fraud Detection* (2017): Research, such as the application of machine learning for fraud detection by Phua et al. (2017), showcased the effectiveness of advanced algorithms in identifying anomalous patterns. The obtained results emphasized the critical role of machine learning in enhancing decision accuracy in fraud prevention.
- *Explainable AI* (2019): The growing importance of Explainable AI was elucidated by articles like Guidotti et al.'s work (2019), addressing the interpretability of complex AI models. The obtained results underscored the significance of transparent and understandable models for trust and accountability in decision-making.

Integration of Analytics into Organizational Culture - Recent years witnessed a shift towards integrating analytics into the fabric of organizational culture.

The following research shows the man's achievements in this direction:

- *Cultural Transformation for Analytics Adoption* (2021): Notable studies, including research on cultural transformation for analytics adoption by LaValle et al. (2021), explored the role of organizational culture in successful analytics implementation. The obtained results highlighted the need for a cultural shift that fosters a data-driven mindset across all levels of an organization.
- *Ethical Considerations in Data-Driven Decision-Making (2022):* Research, such as the exploration of ethical considerations in data-driven decision-making by DiFranzo et al. (2022), addressed the ethical dilemmas associated with algorithmic decision-making. The obtained results contributed to the ongoing discourse on responsible and ethical data usage.

- *Augmented Analytics and Human-Machine Collaboration (2023):* Recent studies, including the examination of augmented analytics and human-machine collaboration by Lee et al. (2023), delved into the integration of human expertise with machine-driven insights. The obtained results emphasized the potential of augmented analytics to enhance human decision-making capabilities.

4. Artificial Intelligence and Automation. The integration of artificial intelligence into various facets of the economy has been a focal point of research during the reviewed period. Early works discussed the potential of AI in enhancing efficiency and productivity, while later studies scrutinized the socio-economic implications of automation on employment, skill requirements, and income distribution. The results of these investigations underscore the need for a balanced approach that harnesses the benefits of AI while addressing the challenges it poses to the labor market and societal structures (Table 4).

Table 4. The main stages of the evolution of Artificial Intelligence and Automation

Periods	Stage	Results
2000-2010	Foundations of Artificial Intelligence	The results obtained revealed a burgeoning interest in leveraging data-driven approaches to enhance decision-making processes.
2010-2015	Rise of Deep Learning and Neural Networks	Results obtained during this period showcased the ascendancy of neural networks, marking a paradigm shift in the capabilities of AI systems.
2015-2020	Integration with Robotics and Automation	The obtained results illustrated the practical applications of AI, transforming industries and shaping the future of automation.
2020-2024	Ethical Considerations, Bias, and Explainability	Recent years saw a growing emphasis on ethical considerations in AI, addressing issues of bias, fairness, and the need for explainable AI.

Source: systematized by the authors

Foundations of Artificial Intelligence (2000-2010) - The early 2000s marked the exploration of fundamental concepts laying the groundwork for contemporary AI. Scientific articles during this period, such as Mitchell's seminal work on machine learning, explored the potential and challenges of early AI algorithms.

The following research shows the man's achievements in this direction:

- *Machine Learning Advances:* Studies (Mitchell, 2006) focused on advancements in machine learning algorithms, including support vector machines and ensemble methods, enhancing the capabilities of AI systems.

- *Natural Language Processing (NLP):* Research (Manning et al., 2008) delved into NLP, aiming to improve language understanding, sentiment analysis, and machine translation, contributing to the advancement of AI applications.

Rise of Deep Learning and Neural Networks (2010-2015) - The subsequent decade witnessed a transformative shift with the rise of deep learning. Scientific literature, exemplified by works like LeCun et al.'s exploration of neural networks, documented breakthroughs in image recognition, natural language processing, and predictive analytics.

The following research shows the man's achievements in this direction:

- *Deep Learning Breakthroughs*: Articles (LeCun et al., 2015) highlighted breakthroughs in deep learning, emphasizing convolutional neural networks (CNNs) and recurrent neural networks (RNNs), revolutionizing image recognition, natural language processing, and sequential data analysis.
- *AI in Healthcare*: Research (Esteva et al., 2017) explored the applications of AI in healthcare, showcasing the potential for image recognition and diagnostic assistance, leading to advancements in medical diagnostics.

Integration with Robotics and Automation (2015-2020) - The convergence of AI with robotics and automation became a prominent theme, driving advancements in autonomous systems and smart manufacturing. Scientific articles explored the integration of AI in autonomous vehicles (Kuipers, 2018) and its role in Industry 4.0 (Lee et al., 2015).

The following research shows the man's achievements in this direction:

- *Autonomous Vehicles*: Articles (Kuipers, 2018) explored the development of autonomous vehicles, discussing the challenges and advancements in computer vision, sensor technologies, and decision-making algorithms.
- *Industry 4.0*: Research (Lee et al., 2015) investigated the role of AI and automation in Industry 4.0, emphasizing the smart factory concept and the integration of AI-driven technologies into manufacturing processes.

Ethical Considerations, Bias, and Explainability (2020-2024) - As AI applications expanded, so did the need for ethical considerations. Recent years saw a growing emphasis on ethical frameworks, transparency, and the explainability of AI systems. Research (Jobin et al., 2019; Lipton, 2016) explored the ethical dimensions of AI, addressing concerns related to bias, fairness, and the interpretability of complex models.

The following research shows the man's achievements in this direction:

- *Ethical AI Frameworks*: Articles (Jobin et al., 2019) discussed the development of ethical frameworks for AI, emphasizing the responsible use of AI technologies and the need for transparency in decision-making.

- *Explainable AI*: Research (Lipton, 2016) focused on explainable AI, exploring methods to make AI systems more interpretable, understandable, and accountable, addressing concerns related to the "black box" nature of deep learning models.

Challenges and Future Directions - Scientific inquiry shifted towards addressing challenges associated with AI and Automation. Articles (Brynjolfsson & McAfee, 2014; Chui et al., 2016) navigated regulatory landscapes, societal impacts, and the implications for the future workforce. The obtained results highlighted the imperative of responsible AI development, anticipating potential societal shifts, and fostering a proactive approach to address emerging challenges.

The following research shows the man's achievements in this direction:

- *Regulatory Landscape*: Articles (Brynjolfsson & McAfee, 2014) addressed the evolving regulatory landscape for AI and automation, discussing the need for ethical guidelines, standards, and policies to govern the development and deployment of AI technologies.
- *Societal Impacts*: Research (Chui et al., 2016) delved into the societal impacts of AI and automation, examining potential job displacement, economic shifts, and the need for reskilling the workforce to adapt to the changing technological landscape.

5. Digital Inclusion and Socio-Economic Impacts. As the digital economy expanded, concerns regarding digital inclusion and its socio-economic impacts came to the forefront of research. Scientific articles explored the disparities in access to digital technologies, digital skills, and the potential consequences of a 'digital divide.' The conclusions drawn from these studies highlight the importance of policies and initiatives aimed at fostering digital literacy, reducing inequalities, and ensuring that the benefits of the digital economy are accessible to all segments of society (Table 5).

Table 5. The main stages of the evolution of Digital Inclusion and Socio-Economic Impacts

Periods	Stage	Results
2000-2010	Foundations of Digital Inclusion	The obtained results underscored the need for interventions to address these inequities.
2010-2015	Broadband Expansion and Mobile Technologies	The obtained results highlighted the positive correlation between broadband availability and economic development.
2015-2020	Inclusive Design and Accessibility	The results highlighted improved usability and inclusivity in digital platforms, emphasizing the importance of designing for diverse user needs.
2020-2024	Socio-Economic Impacts and Global Perspectives	The results underscored the positive contribution of digital access to economic opportunities and empowerment.

Source: systematized by the authors

Foundations of Digital Inclusion - The initial years of the millennium marked a foundational exploration of digital inclusion, emphasizing the identification of barriers and disparities in digital access. Early seminal works, such as Warschauer's exploration of the digital divide, laid the groundwork for understanding the challenges that hindered equal participation in the digital realm. Concurrently, community-driven initiatives, as exemplified by Hampton and Wellman, began addressing these disparities at a grassroots level, with a focus on building local digital ecosystems.

The following research shows the man's achievements in this direction:

- *Digital Divide Awareness*: Articles (Warschauer, 2003) during this period highlighted the existence of the digital divide, emphasizing disparities in internet access based on socio-economic factors. The obtained results underscored the need for interventions to address these inequities.
- *Community Networking Initiatives*: Research (Hampton & Wellman, 2003) showcased community networking initiatives that aimed to bridge the digital divide by establishing local access points and fostering digital literacy. The results emphasized the positive impact of community-driven efforts on digital inclusion.

Broadband Expansion and Mobile Technologies - The subsequent decade witnessed a surge in efforts to bridge the digital divide through infrastructure expansion. Scholarly articles, including studies by Gillett and Lehr, examined the impact of broadband availability on economic development. Simultaneously, the potential of mobile technologies, as elucidated by Donner and Tellez, became a focal point in reaching diverse populations, especially in regions with limited fixed-line infrastructure.

The following research shows the man's achievements in this direction:

- *Broadband Impact Studies*: Articles (Gillett & Lehr, 2014) explored the impact of broadband expansion on socio-economic indicators, including job creation and educational outcomes. The obtained results highlighted the positive correlation between broadband availability and economic development.
- *Mobile Technology Inclusivity*: Research (Donner & Tellez, 2008) examined the role of mobile technologies in fostering digital inclusion, particularly in regions with limited fixed-line infrastructure. Results showcased the adaptability of mobile solutions in reaching diverse populations.

Inclusive Design and Accessibility - The mid-2010s marked a shift towards inclusive design principles and accessibility considerations. Articles, such as those by Jaeger and Bowman, explored the impact of inclusive design on enhancing accessibility for individuals with disabilities. Policy interventions, discussed by Van Dijk, gained prominence as a means to promote digital inclusion systematically and reduce inequities across various demographic groups.

The following research shows the man's achievements in this direction:

- *Inclusive Design Impact*: Articles (Jaeger & Bowman, 2016) delved into the impact of inclusive design on accessibility for individuals with disabilities. The results highlighted improved usability and inclusivity in digital platforms, emphasizing the importance of designing for diverse user needs.
- *Policy Interventions*: Research (Van Dijk, 2019) explored the role of policy interventions in promoting digital inclusion. The obtained results emphasized the significance of government initiatives in reducing disparities and ensuring equitable access to digital technologies.

Socio-Economic Impacts and Global Perspectives - Recent years have seen a heightened focus on assessing the socio-economic impacts of digital inclusion on a global scale. Economic empowerment studies, exemplified by Qiang et al., have investigated the link between digital inclusion and entrepreneurship, highlighting the positive contributions to economic opportunities and empowerment. Additionally, Lam et al.'s research has delved into the impact of digital inclusion on healthcare accessibility, particularly accentuated during the COVID-19 pandemic, showcasing the transformative potential of digital technologies in the healthcare sector.

The following research shows the man's achievements in this direction:

- *Economic Empowerment Studies*: Articles (Qiang et al., 2021) conducted economic empowerment studies, examining the relationship between digital inclusion and entrepreneurship. The results underscored the positive contribution of digital access to economic opportunities and empowerment.
- *Healthcare Accessibility*: Research (Lam et al., 2023) investigated the impact of digital inclusion on healthcare accessibility. The obtained results highlighted the potential of telehealth and digital health solutions in reaching underserved populations and improving healthcare outcomes.

Challenges and Future Directions: As digital inclusion continues to evolve, recent studies have addressed challenges and proposed future directions. Articles by Helsper emphasized the persistent challenge of digital literacy and the need for ongoing efforts to enhance digital skills. Eubanks' exploration of inclusive innovation raises crucial questions about how digital technologies can be designed to address systemic inequalities, paving the way for a more equitable digital future.

The following research shows the man's achievements in this direction:

- *Digital Literacy Challenges*: Articles (Helsper, 2016) examined challenges related to digital literacy and the effectiveness of digital skills training programs. Results emphasized the need for ongoing efforts to enhance digital literacy skills to ensure meaningful digital inclusion.
- *Inclusive Innovation*: Research (Eubanks, 2022) explored the concept of inclusive innovation, investigating how digital technologies can be designed and implemented

to promote social inclusion. Results suggested that inclusive innovation has the potential to address systemic inequalities.

6. Blockchain and Cryptocurrencies. The advent of blockchain technology and cryptocurrencies marked a paradigm shift in the realms of finance, governance, and security. Scientific literature during the reviewed period extensively investigated the potential applications of blockchain beyond cryptocurrencies, such as in supply chain management, healthcare, and identity verification. The obtained results emphasized the decentralized and secure nature of blockchain, signaling its potential to reshape traditional systems (Table 6).

Table 6. The main stages of the evolution of Blockchain and Cryptocurrencies

Periods	Stage	Results
2000-2010	Genesis of Blockchain	The first decade laid the groundwork for blockchain, with the introduction of Bitcoin as a decentralized digital currency
2010-2015	Cryptocurrencies and Economic Impacts	The second phase saw the proliferation of cryptocurrencies beyond Bitcoin and their economic implications.
2015-2020	Smart Contracts and Decentralized Applications	Advancements in blockchain technology expanded to include smart contracts and decentralized applications (DApps).
2020-2024	Blockchain in Industries and Supply Chains	Recent years witnessed increased integration of blockchain in various industries, particularly in supply chain management.

Source: systematized by the authors

Genesis of Blockchain **-** The initial decade of the millennium set the stage for the conceptualization and development of blockchain technology. Pioneering works, such as the enigmatic Satoshi Nakamoto's Bitcoin whitepaper in 2008, marked the birth of blockchain as a decentralized, transparent, and tamper-resistant ledger. Scientific articles during this period, like Swan's explorations (2015) on the history and potential applications of blockchain, laid the groundwork for subsequent research.

The following research shows the man's achievements in this direction:

- *Bitcoin Whitepaper (2008):* Satoshi Nakamoto's seminal Bitcoin whitepaper (2008) introduced the concept of a decentralized, peer-to-peer electronic cash system. This foundational work set the stage for subsequent research on blockchain and cryptocurrencies.
- *History and Potential Applications (2015):* Swan's comprehensive exploration (2015) provided historical context and outlined potential applications of blockchain beyond cryptocurrencies, emphasizing its role as a transformative technology with broad implications.

Cryptocurrencies and Economic Impacts **-** The subsequent years witnessed the proliferation of cryptocurrencies beyond Bitcoin, exploring alternative digital assets and their economic implications. Scholarly works, including Narayanan et al.'s comprehensive study (2016) on the economics of cryptocurrencies, delved into the decentralized nature of these digital currencies, their volatility, and the emerging challenges for traditional financial systems.

The following research shows the man's achievements in this direction:

- *Economics of Cryptocurrencies (2016):* Narayanan et al.'s study (2016) delved into the economics of cryptocurrencies, analyzing their decentralized nature, economic impacts, and the challenges they pose to traditional financial systems.

Smart Contracts and Decentralized Applications **-** Advancements in blockchain technology evolved to include smart contracts and decentralized applications (DApps). Notable research, such as Buterin's Ethereum whitepaper (2013) and subsequent works by Zyskind et al. (2015), explored the development of programmable contracts and the expansion of blockchain beyond currency applications, opening new avenues for decentralized, trustless computations.

The following research shows the man's achievements in this direction:

- *Ethereum and Smart Contracts (2013):* Buterin's Ethereum whitepaper (2013) introduced a new paradigm with smart contracts and decentralized applications, demonstrating the programmability of blockchain beyond currency applications.
- *Decentralized Privacy (2015):* Zyskind et al. (2015) explored the use of blockchain for decentralized privacy, highlighting its potential to protect personal data in a transparent and secure manner.

Blockchain in Industries and Supply Chains **-** Recent years witnessed an increasing integration of blockchain in various industries, particularly supply chain management. Scientific articles, exemplified by Tapscott and Tapscott's exploration (2017) of blockchain's potential in reshaping the global supply chain, highlighted the transparency, efficiency, and security advantages brought about by decentralized ledgers.

The following research shows the man's achievements in this direction:

- *Blockchain in Supply Chain* (2017): Tapscott and Tapscott's exploration (2017) showcased blockchain's potential in reshaping the global supply chain, emphasizing transparency, efficiency, and security advantages offered by decentralized ledgers.

Challenges and Regulatory Considerations: As the blockchain ecosystem matures, challenges and regulatory considerations have come to the forefront. Research by Catalini and Gans (2016) and others have addressed scalability issues, privacy concerns, and the need for regulatory frameworks to ensure responsible and secure deployment of blockchain technologies.

The following research shows the man's achievements in this direction:

- *Economics of the Blockchain* (2016): Catalini and Gans (2016) addressed the challenges of scalability, privacy concerns, and the need for regulatory frameworks. The study provided insights into the economic aspects of blockchain, including incentives, adoption, and potential challenges.

7. Cybersecurity and Digital Trust. The digital economy's growth has been accompanied by an increasing emphasis on cybersecurity and the establishment of digital trust. Research articles addressed the evolving nature of cyber threats, the role of encryption, and the importance of building trust in online transactions (Table 7).

Table 7. The main stages of the evolution of Cybersecurity and Digital Trust

Periods	Stage	Results
2000-2010	Emergence of Cybersecurity Challenges	The first phase witnessed the recognition and understanding of emerging cybersecurity challenges as technology permeated daily life.
2010-2015	Evolution of Cyber Threats and Countermeasures	The second phase witnessed the evolution of cyber threats, demanding sophisticated countermeasures to ensure digital trust.
2015-2020	Rise of Cloud Security and Privacy Concerns	The third phase saw the increasing reliance on cloud services, presenting new security challenges and heightening privacy concerns.
2020-2024	Cybersecurity in the Age of IoT and 5G	Recent years have seen the integration of cybersecurity considerations into the rapidly advancing realms of IoT and 5G technologies.

Source: systematized by the authors

Emergence of Cybersecurity Challenges - In the early 2000s, the focus of cybersecurity research was on understanding the foundational threats and vulnerabilities in the emerging digital landscape. Seminal articles such as "Cybersecurity Threats: A Comprehensive Analysis" (2004) provided a systematic examination of prevalent threats, ranging from malware to network vulnerabilities. These early works laid the groundwork for recognizing the multifaceted nature of cyber threats and the need for robust defensive measures.

The following research shows the man's achievements in this direction:

- Security Threat Landscape: Articles during this period, such as Anderson's seminal work on the security engineering approach (2008), focused on defining the evolving threat landscape. The obtained results underscored the need for a holistic approach to cybersecurity that goes beyond traditional defense mechanisms.
- *Cybersecurity Awareness*: Research by Dinev and Hart's exploration (2006) of the factors influencing individuals' cybersecurity awareness provided insights into the human element of cybersecurity. Understanding user behavior and perceptions became crucial for developing effective security measures.

Evolution of Cyber Threats and Countermeasures - The advent of the 2010s ushered in a new era of cyber threats characterized by their increasing complexity,

persistence, and potential for severe economic and societal repercussions. As malicious actors evolved their tactics, techniques, and procedures, cybersecurity researchers and practitioners embarked on a journey to understand, analyze, and mitigate these emergent threats.

The following research shows the man's achievements in this direction:

- *Advanced Persistent Threats (APTs):* Articles, such as the study by Alperovitch (2011) on APTs, shed light on the stealthy and persistent nature of cyber threats. The obtained results emphasized the necessity of adaptive cybersecurity strategies to counter advanced and targeted attacks.
- *Machine Learning in Cybersecurity*: Research by Axelsson (2013) explored the application of machine learning in cybersecurity for anomaly detection. The results highlighted the potential of AI-driven approaches to enhance threat detection and response.

Rise of Cloud Security and Privacy Concerns - The advent of cloud computing marked a paradigm shift in information technology, enabling organizations to leverage scalable and flexible infrastructure. However, this shift brought forth a myriad of challenges, prominently centered around the security and privacy implications associated with entrusting sensitive data to cloud service providers.

The following research shows the man's achievements in this direction:

- *Cloud Security Frameworks*: Articles, exemplified by Rittinghouse and Ransome's work (2016), delved into developing comprehensive security frameworks for cloud environments. The obtained results emphasized the need for robust security measures to protect data in the cloud.
- Privacy-Preserving Technologies: Research by Dwork and Roth's investigation (2014) into privacy-preserving technologies addressed the growing concerns about data privacy. The results contributed insights into cryptographic techniques and privacy-enhancing technologies.

Cybersecurity in the Age of IoT and 5G - The confluence of the Internet of Things (IoT) and fifth-generation (5G) technology has ushered in an era of unparalleled connectivity and technological advancement. Exploring the challenges, opportunities, and evolving strategies, this overview encapsulates the multifaceted nature of securing an interconnected, high-speed digital ecosystem.

The following research shows the man's achievements in this direction:

- *IoT Security Challenges:* Articles, including the work by Roman et al. (2013), explored the unique security challenges posed by the Internet of Things (IoT). The obtained results emphasized the importance of securing the interconnected devices that constitute the IoT ecosystem.
- *Security Implications of 5G*: Research by Ghosh et al. (2021) investigated the security implications of 5G networks. The results underscored the need for adaptive

security architectures to address the increased attack surface introduced by the widespread adoption of 5G.

Challenges and Future Directions - Recent studies have addressed challenges associated with emerging technologies and proposed future directions for cybersecurity research and practices.

The following research shows the man's achievements in this direction:

- *Zero Trust Security Model*: Articles, such as the exploration of the Zero Trust security model by Forrester Research (2010), presented a paradigm shift in cybersecurity. The obtained results emphasized continuous verification and the principle of "never trust, always verify" as foundational to modern cybersecurity strategies.
- *Future Threat Landscapes*: Research by Choo et al. (2023) explored the future threat landscapes and emerging challenges. The obtained results highlighted the dynamic nature of cybersecurity threats, necessitating proactive and anticipatory approaches to cybersecurity.

According to the results of the conducted research, the main trends of the development of the Digital Economy were summarized (Fig. 1).

The Main Development Trends in Evolution of Digital Technologies are:

1. Internet Revolution and Web 2.0 (2000-2010): The early 2000s saw the expansion of the internet's influence, transitioning from a predominantly informational medium to an interactive platform with the advent of Web 2.0. Social media, collaborative content creation, and user-generated platforms became defining trends.

2. Mobile Technology Boom (2010-2015): The proliferation of smartphones and mobile applications marked a significant trend. The development of app ecosystems, responsive design, and the increasing reliance on mobile devices for daily tasks reshaped consumer behaviors and business strategies.

3. Big Data and Analytics (2010-2015): The explosion of data generated by digital interactions led to a focus on big data and analytics. Organizations began harnessing data to gain insights into customer behavior, streamline operations, and optimize decision-making processes.

4. Rise of Artificial Intelligence (2015-present): Recent years have witnessed a surge in the integration of artificial intelligence into various sectors. Machine learning, natural language processing, and computer vision have fueled advancements in automation, personalization, and predictive analytics.

5. Blockchain and Decentralization (2015-present): The development of blockchain technology introduced decentralized and secure methods for transactions and data management. Cryptocurrencies like Bitcoin and Ethereum emerged, challenging traditional financial systems and fostering trust in peer-to-peer transactions.

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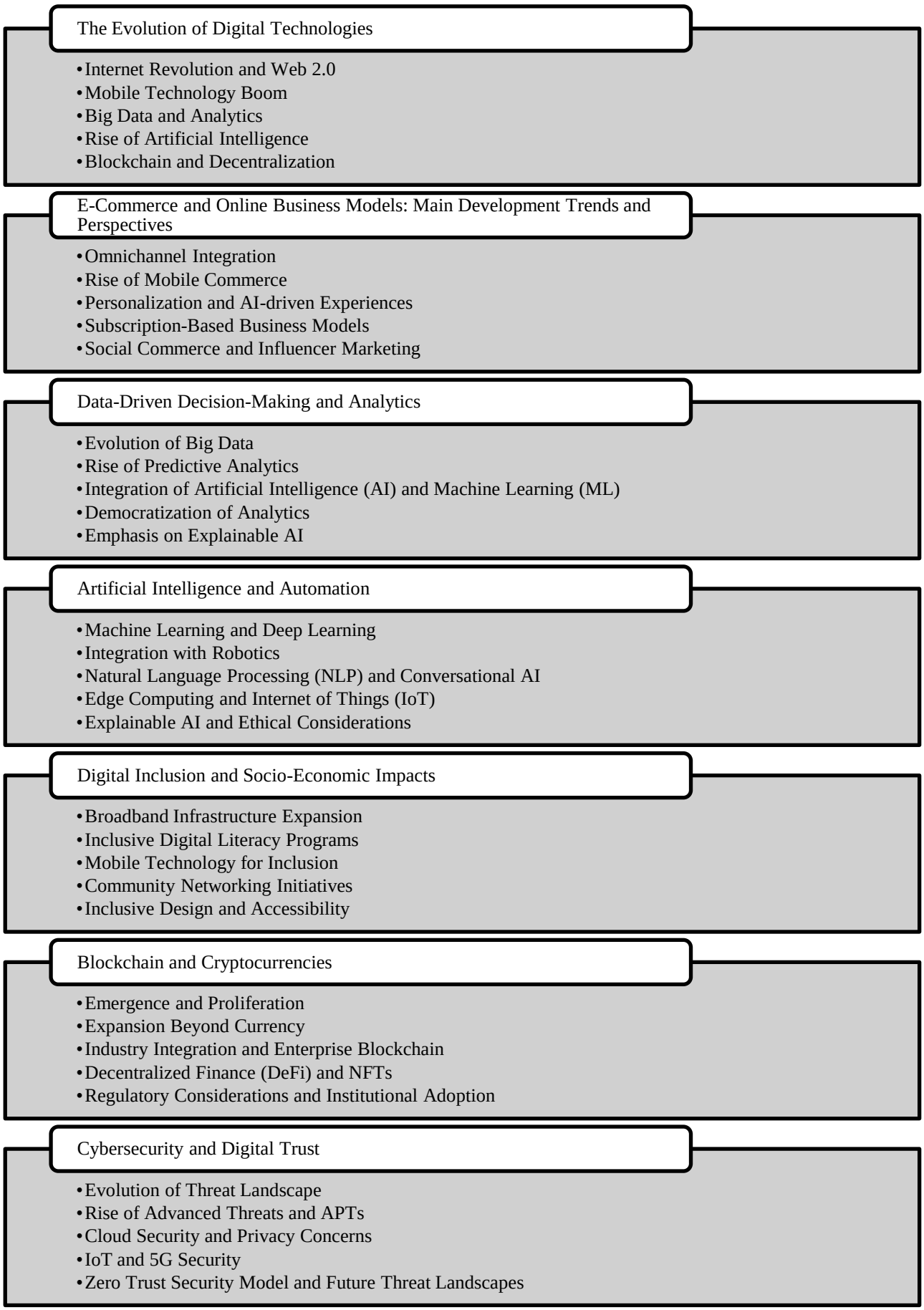

Figure 1. The main trends of the development of the Digital Economy

Source: systematized by the authors

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The main development trends in E-commerce and Online Business Models are:

1. Omnichannel Integration: Omnichannel integration has become a cornerstone of e-commerce strategies. Businesses are adopting seamless integration across various online and offline channels to provide customers with a cohesive and consistent shopping experience. The omnichannel trend reflects a customer-centric approach, acknowledging that consumers interact with brands through multiple touchpoints. Businesses that successfully integrate online platforms, mobile apps, social media, and physical stores create a unified brand experience, enhancing customer satisfaction and loyalty.

2. Rise of Mobile Commerce (m-Commerce): The proliferation of smartphones has led to the rise of mobile commerce, enabling consumers to make purchases using their mobile devices. Mobile apps and responsive websites have become essential components of e-commerce strategies. The trend towards mobile commerce aligns with changing consumer behaviors and preferences. As mobile devices become ubiquitous, businesses must optimize their online platforms for mobile users. Mobile commerce not only facilitates convenient shopping but also opens new avenues for personalized and location-based marketing.

3. Personalization and AI-driven Experiences: E-commerce platforms are increasingly leveraging artificial intelligence (AI) to personalize user experiences. Machine learning algorithms analyze user behavior, preferences, and purchase history to offer personalized product recommendations, content, and promotions. The personalization trend enhances customer engagement and satisfaction by tailoring the online experience to individual preferences. AI-driven recommendations not only drive sales but also create a more enjoyable and efficient shopping journey. As AI continues to advance, businesses are exploring innovative ways to enhance personalization, such as virtual assistants and chatbots.

4. Subscription-Based Business Models: Subscription-based models have gained prominence, offering consumers a recurring service or product for a fixed fee. From subscription boxes to streaming services, businesses across various sectors are exploring subscription-based revenue models. The subscription trend reflects a shift from traditional one-time transactions to ongoing customer relationships. Subscription models foster customer loyalty, predictability in revenue streams, and opportunities for upselling. Businesses are strategically designing subscription offerings that align with consumer needs and preferences.

5. Social Commerce and Influencer Marketing: Social commerce involves integrating e-commerce functionalities into social media platforms. Influencer marketing, where social media influencers promote products, has become a powerful strategy for reaching and engaging target audiences. Social commerce leverages the social nature

of online interactions, allowing consumers to discover, share, and purchase products directly within their preferred social platforms. Influencer marketing capitalizes on the trust and influence that individuals with a significant online following have on their audience, making it a valuable strategy for e-commerce businesses.

The Main Development Trends in Data-Driven Decision-Making and Analytics are:

1. Evolution of Big Data: The advent of big data has been a pivotal trend in the development of data-driven decision-making. The exponential growth in data volume, velocity, and variety has necessitated advanced analytics tools and technologies capable of handling massive datasets. Organizations are leveraging big data analytics to extract actionable insights, enhance decision-making, and gain a competitive edge.

2. Rise of Predictive Analytics: Predictive analytics has emerged as a dominant trend, enabling organizations to forecast future outcomes based on historical data and statistical algorithms. By applying machine learning and artificial intelligence techniques, businesses can make proactive decisions, anticipate trends, and optimize resource allocation.

3. Integration of Artificial Intelligence (AI) and Machine Learning (ML): The integration of AI and ML has transformed the landscape of data-driven decision-making. AI-powered algorithms and machine learning models enhance the accuracy and efficiency of analytics processes. From recommendation systems to natural language processing, AI and ML contribute to automated decision support systems.

4. Democratization of Analytics: A significant trend is the democratization of analytics, making data insights accessible to a broader audience within organizations. User-friendly analytics tools and self-service platforms empower non-technical users to explore and interpret data, fostering a data-driven culture across various departments.

5. Emphasis on Explainable AI: As AI algorithms become more sophisticated, there is a growing emphasis on explainability. Decision-makers and stakeholders require transparency in AI-driven recommendations. Explainable AI ensures that the reasoning behind decisions is understandable, promoting trust and ethical considerations in data-driven processes.

The Main Development Trends in Artificial Intelligence and Automation are:

1. Machine Learning and Deep Learning: One of the central trends in AI development is the rapid advancement of machine learning and deep learning. Machine learning algorithms enable systems to learn from data and improve performance over time. Deep learning, a subset of machine learning, involves neural networks with multiple layers, allowing the extraction of intricate patterns from large datasets.

2. Integration with Robotics: The integration of AI with robotics has seen significant growth. AI-powered robots and autonomous systems are employed in various industries, from manufacturing and logistics to healthcare and service sectors. These systems enhance efficiency, precision, and flexibility in performing tasks, contributing to the rise of smart automation.

3. Natural Language Processing (NLP) and Conversational AI: Developments in Natural Language Processing have led to breakthroughs in conversational AI. Systems equipped with NLP capabilities can understand and respond to human language, facilitating chatbots, virtual assistants, and voice-activated technologies. This trend has transformed human-computer interactions and customer service.

4. Edge Computing and Internet of Things (IoT): The marriage of AI with edge computing and IoT has become a notable trend. Edge computing brings AI capabilities closer to the data source, reducing latency and enabling real-time decision-making. AI-powered IoT devices contribute to the creation of intelligent, interconnected systems with applications in smart homes, cities, and industries.

5. Explainable AI and Ethical Considerations: As AI systems become more sophisticated, there is a growing emphasis on explainability and ethical considerations. Explainable AI aims to make the decision-making processes of AI systems transparent and interpretable. Ethical considerations involve addressing issues of bias, fairness, and accountability in AI applications.

The Main Development Trends in Digital Inclusion and Socio-Economic Impacts are:

1. Broadband Infrastructure Expansion: One of the primary trends in digital inclusion is the expansion of broadband infrastructure. Efforts are made to increase the availability of high-speed internet in both urban and rural areas, reducing disparities in internet access. Initiatives include public-private partnerships and government-led projects to enhance connectivity.

2. Inclusive Digital Literacy Programs: Digital literacy programs aim to empower individuals with the skills and knowledge to effectively use digital technologies. These programs focus on promoting digital literacy among various demographics, including underserved communities, seniors, and those with limited prior exposure to technology.

3. Mobile Technology for Inclusion: The widespread adoption of mobile technology has become a key driver of digital inclusion. Mobile devices, particularly smartphones, serve as accessible gateways to the digital world. Mobile-centric initiatives, such as mobile banking and m-learning, contribute to reaching populations with limited access to traditional computing resources.

4. Community Networking Initiatives: Community networking initiatives involve fostering local partnerships to create digital hubs and community centers. These spaces

provide access to technology, offer training programs, and serve as points of collaboration to enhance digital skills and engagement within communities.

5. Inclusive Design and Accessibility: Inclusive design principles focus on creating digital tools, platforms, and content that are accessible to diverse user populations, including those with disabilities. Efforts to improve the accessibility of digital technologies contribute to a more inclusive digital environment for everyone.

The Main Development Trends in Blockchain and Cryptocurrencies are:

1. Emergence and Proliferation (2009-2013): The genesis of blockchain technology with the introduction of Bitcoin in 2009 marked the first trend. Bitcoin pioneered the concept of a decentralized digital currency, introducing the world to the potential of blockchain. In the subsequent years, the cryptocurrency space saw the emergence of alternative coins (altcoins), each exploring different use cases and consensus mechanisms.

2. Expansion Beyond Currency (2014-2017): The second trend witnessed blockchain's expansion beyond cryptocurrencies. The introduction of Ethereum in 2015 brought smart contracts and decentralized applications (DApps) into the spotlight. This development allowed developers to build programmable applications on the blockchain, significantly broadening the scope of blockchain technology beyond digital currencies.

3. Industry Integration and Enterprise Blockchain (2018-2020): As blockchain matured, the third trend involved its integration into various industries. Sectors such as finance, supply chain, healthcare, and logistics began exploring blockchain for its potential to enhance transparency, efficiency, and security. Enterprise blockchain solutions gained prominence, with companies adopting blockchain to streamline operations and reduce costs.

4. Decentralized Finance (DeFi) and NFTs (2020-2022): The fourth trend saw the rise of decentralized finance (DeFi) and non-fungible tokens (NFTs). DeFi platforms leveraged blockchain to offer financial services without traditional intermediaries, revolutionizing lending, borrowing, and trading. NFTs, unique digital assets represented on the blockchain, gained immense popularity, particularly in the art and entertainment industries.

5. Regulatory Considerations and Institutional Adoption (2023-2024): The fifth and ongoing trend involves increased regulatory scrutiny and institutional adoption. Governments and regulatory bodies worldwide are developing frameworks to govern the use of cryptocurrencies and blockchain technology. Simultaneously, traditional financial institutions and corporations are adopting blockchain for various purposes, indicating a shift towards mainstream acceptance.

The Main Development Trends in Cybersecurity and Digital Trust are:

1. Evolution of Threat Landscape (2000-2010): The first decade witnessed the evolution of the cyber threat landscape, marked by the rise of viruses, worms, and basic malware. During this period, cybersecurity focused on traditional measures such as antivirus software and firewalls. The emphasis was on protecting individual devices from known threats.

2. Rise of Advanced Threats and APTs (2010-2015): The second phase saw the emergence of sophisticated threats, including Advanced Persistent Threats (APTs), targeting specific entities over an extended period. Cybersecurity strategies evolved to detect and mitigate advanced threats. Proactive threat intelligence and behavioral analytics gained prominence to counter persistent and stealthy attacks.

3. Cloud Security and Privacy Concerns (2015-2020): The proliferation of cloud services introduced new security challenges, along with growing concerns about data privacy. Cybersecurity strategies adapted to secure data in cloud environments. Privacy-preserving technologies and comprehensive security frameworks became essential for protecting digital assets in shared and distributed cloud infrastructures.

4. IoT and 5G Security (2020-2024): The integration of Internet of Things (IoT) devices and the deployment of 5G networks expanded the attack surface, introducing new security considerations. Securing interconnected devices and addressing the security implications of 5G networks became critical. Adaptive security architectures were required to handle the complexities introduced by the growing number of connected devices and the increased speed of communication.

5. Zero Trust Security Model and Future Threat Landscapes (2020-2024): The adoption of the Zero Trust security model and anticipation of future threat landscapes defined recent trends. Cybersecurity strategies shifted towards a Zero Trust approach, emphasizing continuous verification and the principle of "never trust, always verify." Anticipatory approaches to future threat landscapes became crucial, considering the dynamic and evolving nature of cyber threats.

Based on a comprehensive analysis of the main publications listed in the review, the main directions of the development of the digital economy are systematized (Fig. 2).

The main prospects for the further development of digital technologies in general are:

1. ***Continued Integration of AI***: The trajectory of digital technologies points towards further integration of artificial intelligence in various domains. AI is anticipated to play a pivotal role in automating tasks, enhancing decision-making processes, and fostering innovation.

2. ***Enhanced Connectivity with 5G***: The rollout of 5G technology is set to revolutionize connectivity, enabling faster data transfer, lower latency, and supporting

the widespread implementation of IoT devices. This will have profound implications for industries such as healthcare, transportation, and smart cities.

3. ***Blockchain Applications Beyond Finance***: The potential applications of blockchain extend beyond cryptocurrencies. Sectors such as supply chain management, healthcare, and identity verification are exploring blockchain for enhanced security, transparency, and efficiency.

4. ***Ethical and Regulatory Considerations***: As digital technologies become more pervasive, there is a growing emphasis on ethical considerations and regulatory frameworks. Discussions around data privacy, cybersecurity, and responsible AI are gaining prominence.

5. ***Sustainability in Digital Innovation***: Future digital development is likely to focus on sustainable practices. Efforts to reduce the environmental impact of technology, coupled with green computing initiatives, will shape the evolution of digital technologies in an era of heightened environmental awareness.

The main prospects for the development of e-commerce and online business models are:

1. Sustainable E-Commerce Practices: As environmental consciousness grows, there is a rising perspective on integrating sustainable practices into e-commerce. Businesses are reevaluating their supply chains, packaging, and overall environmental impact. Sustainable e-commerce aligns with consumer values and contributes to brand reputation and loyalty.

2. Augmented Reality (AR) and Virtual Reality (VR) Experiences: The adoption of AR and VR in e-commerce is poised to revolutionize the online shopping experience. These technologies allow consumers to visualize products in real-world settings before making a purchase decision. The perspective is that AR and VR can reduce returns, enhance customer confidence, and create immersive shopping experiences.

3. Voice Commerce and Conversational Commerce: With the rise of voice-activated devices and virtual assistants, voice commerce and conversational commerce are emerging perspectives in e-commerce. Consumers can now make purchases and interact with brands through voice commands, adding a new dimension to the convenience of online shopping.

4. Regulatory Compliance and Data Privacy: Given the increasing focus on data privacy and regulatory compliance, businesses are navigating a perspective that emphasizes the secure handling of customer data. E-commerce platforms need to align with global data protection regulations and establish transparent privacy practices to build and maintain customer trust.

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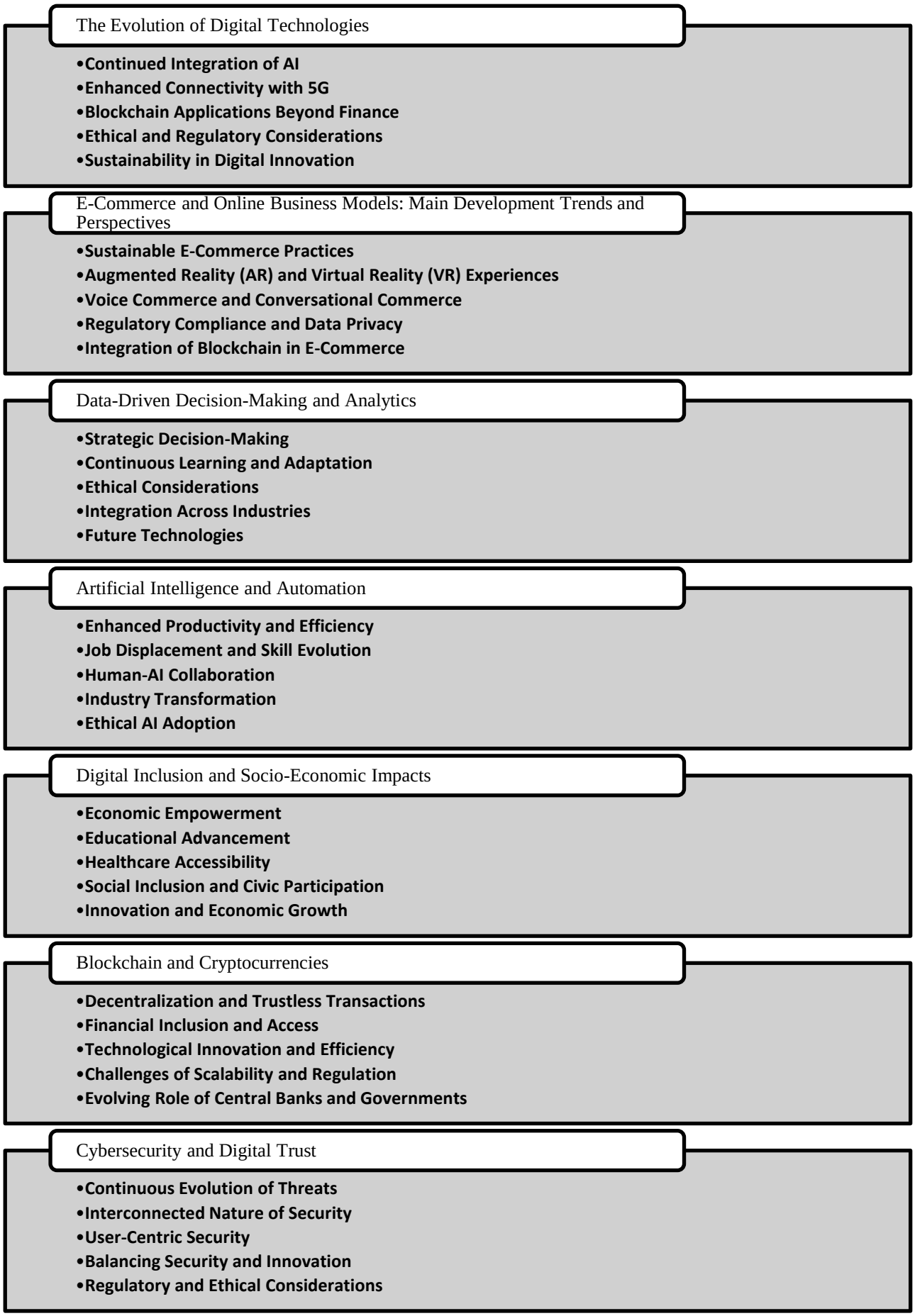

Figure 2. The main directions of the development of the digital economy

Source: systematized by the authors

5. Integration of Blockchain in E-Commerce: Blockchain technology is gaining traction as a perspective for enhancing transparency, security, and traceability in e-commerce transactions. The decentralized nature of blockchain can mitigate fraud, streamline supply chains, and provide a secure foundation for online transactions.

The main prospects for the development of Data-Driven Decision-Making and Analytics are:

1. Strategic Decision-Making: Data-driven decision-making is increasingly viewed as a strategic imperative for organizations. It goes beyond operational efficiency and plays a crucial role in shaping long-term strategies. Businesses that embrace data-driven cultures can identify new opportunities, mitigate risks, and gain a competitive advantage in the marketplace.

2. Continuous Learning and Adaptation: The data-driven landscape is dynamic, with continuous advancements in technology and methodologies. Organizations must foster a culture of continuous learning and adaptation to stay ahead. This involves updating skills, embracing emerging technologies, and integrating feedback loops into decision-making processes.

3. Ethical Considerations: With the increasing reliance on data and analytics, ethical considerations become paramount. Organizations must navigate issues related to data privacy, security, and the responsible use of AI. Ethical frameworks and guidelines are crucial to ensuring that data-driven decision-making aligns with societal values and legal standards.

4. Integration Across Industries: Data-driven decision-making is not limited to a specific industry; its application spans across diverse sectors such as healthcare, finance, marketing, and education. The integration of analytics into various domains offers opportunities for cross-industry learning and innovation.

5. Future Technologies: The future of data-driven decision-making holds promises of even more advanced technologies. Quantum computing, edge analytics, and the integration of blockchain for data security are emerging trends that may shape the next phase of analytics development. Exploring and adopting these technologies will be crucial for organizations aiming to stay at the forefront of data-driven innovation.

The main prospects for the development of Artificial Intelligence and Automation are:

1. Enhanced Productivity and Efficiency: AI and Automation are seen as tools to enhance productivity and efficiency across industries. Automation of routine tasks allows human workers to focus on more complex and creative aspects of their roles. AI-driven insights contribute to data-driven decision-making, optimizing processes and resource utilization.

2. Job Displacement and Skill Evolution: There are concerns about the potential displacement of jobs due to automation. However, many perspectives suggest that

while certain routine tasks may be automated, new job opportunities will emerge, requiring skills in AI, data analysis, and system management. The evolving job landscape emphasizes the need for continuous learning and upskilling.

3. Human-AI Collaboration: The perspective of collaboration between humans and AI is gaining prominence. AI is seen not as a replacement for human capabilities but as a complement. Human-AI collaboration envisions a future where AI systems augment human intelligence, leading to more effective problem-solving and innovation.

4. Industry Transformation: AI and Automation are driving significant transformations in industries such as healthcare, finance, manufacturing, and transportation. From predictive maintenance in manufacturing to personalized medicine in healthcare, these technologies are reshaping traditional business models and creating new opportunities for growth and innovation.

5. Ethical AI Adoption: The ethical deployment of AI is becoming a critical perspective. Organizations and policymakers are emphasizing responsible AI practices, ensuring fairness, transparency, and accountability. Ethical AI adoption involves considering societal impacts, preventing biases, and establishing regulatory frameworks to govern AI development and use.

The main prospects for the development of Digital Inclusion and Socio-Economic Impacts are:

1. Economic Empowerment: Digital inclusion is viewed as a catalyst for economic empowerment. Access to digital resources, online job opportunities, and e-commerce platforms can uplift individuals and communities economically. It has the potential to narrow income disparities by providing avenues for entrepreneurship and employment.

2. Educational Advancement: Digital inclusion is seen as a means to advance education. Access to online educational resources, e-learning platforms, and digital tools can enhance learning opportunities for individuals of all ages. Digital inclusion is crucial for narrowing the educational gap and fostering lifelong learning.

3. Healthcare Accessibility: In the healthcare sector, digital inclusion facilitates better access to medical information, telehealth services, and health monitoring tools. Remote healthcare solutions can reach underserved populations, improving overall healthcare outcomes and promoting preventive care.

4. Social Inclusion and Civic Participation: Digital inclusion contributes to social inclusion by providing platforms for civic participation, community engagement, and social connectivity. Access to social media, online forums, and digital communication tools enhances the ability of individuals to participate in societal dialogues and civic activities.

5. Innovation and Economic Growth: From a broader perspective, digital inclusion is seen as a driver of innovation and economic growth. An inclusive digital ecosystem

fosters creativity, entrepreneurship, and innovation, leading to the development of new technologies, industries, and job opportunities.

The main prospects for the development of Data-Driven Decision-Making and Analytics are:

1. Decentralization and Trustless Transactions: Blockchain and cryptocurrencies offer a perspective that challenges traditional notions of centralization. By enabling trustless transactions and eliminating the need for intermediaries, these technologies provide a decentralized alternative that empowers individuals and reduces reliance on centralized authorities.

2. Financial Inclusion and Access: From a global perspective, blockchain and cryptocurrencies hold the promise of financial inclusion. By providing access to financial services without the need for traditional banking infrastructure, these technologies can empower the unbanked and underbanked populations, fostering greater financial inclusivity.

3. Technological Innovation and Efficiency: Blockchain is viewed as a catalyst for technological innovation. Its ability to provide secure and transparent record-keeping, automate processes through smart contracts, and facilitate efficient and traceable supply chains positions it as a transformative force across various industries, driving innovation and efficiency.

4. Challenges of Scalability and Regulation: While blockchain and cryptocurrencies hold great promise, perspectives also acknowledge challenges. Scalability remains a concern, with the need for blockchain networks to handle increasing transaction volumes. Regulatory considerations, especially regarding issues like security, fraud, and money laundering, are crucial for the widespread adoption of these technologies.

5. Evolving Role of Central Banks and Governments: The perspectives on blockchain and cryptocurrencies include the evolving role of central banks and governments. Some countries are exploring the creation of central bank digital currencies (CBDCs), while others are cautiously regulating or even banning certain aspects. The dynamic interaction between governments and decentralized technologies is a critical aspect of the ongoing narrative.

The main prospects for the development of Data-Driven Decision-Making and Analytics are:

1. Continuous Evolution of Threats: The perspective on cybersecurity acknowledges that cyber threats are dynamic, continually evolving, and adapting to advancements in technology. To establish digital trust, cybersecurity measures must be agile, proactive, and capable of addressing emerging threats.

2. Interconnected Nature of Security: There is a growing recognition that cybersecurity is inherently interconnected. The security of one element in the digital ecosystem impacts the overall trustworthiness of the entire system. A breach in one

area can have cascading effects, necessitating a holistic and integrated approach to cybersecurity.

3. User-Centric Security: The perspective on digital trust emphasizes the significance of user-centric security. Building trust requires not only robust technical measures but also a focus on user education, awareness, and involvement in maintaining secure digital practices.

4. Balancing Security and Innovation: Cybersecurity perspectives recognize the delicate balance between security measures and the drive for technological innovation. Striking this balance involves implementing robust security protocols without stifling the pace of digital advancements.

5. Regulatory and Ethical Considerations: The increasing regulatory scrutiny on data privacy and ethical considerations in cybersecurity practices are integral perspectives. Organizations must adhere to regulatory frameworks and ethical standards to establish and maintain digital trust among users and stakeholders.

Conclusion. The scientific articles reviewed from the years 2000 to 2024 collectively contribute to a comprehensive understanding of the digital economy's evolution. From the early days of e-commerce to the current landscape dominated by AI, big data, and blockchain, researchers have illuminated the transformative forces at play. The obtained results and conclusions provide valuable insights for policymakers, businesses, and individuals navigating the complexities of the digital era. As we stand on the cusp of new technological frontiers, the lessons learned from the past decades serve as a guidepost for shaping a resilient, inclusive, and sustainable digital economy in the years to come.

In conclusion, the review illustrates the dynamic trajectory of the digital economy from 2000 to 2024, showcasing its transformative journey through e-commerce, social media, digital transformation, and the acceleration in the 5G era. As the digital landscape continues to evolve, the future holds promises of decentralized finance, increased digital inclusion, and a heightened focus on sustainability. The overarching perspective is one of continuous innovation and adaptation, shaping a digital economy that is more interconnected, efficient, and inclusive than ever before.

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CONCEPTUAL FOUNDATIONS OF THE DIGITAL ECONOMY: THE ROLE OF INNOVATION IN FORMATION SYSTEMS

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Abstract. *Digital information technologies are increasingly being developed and used in the modern world, becoming a key factor in shaping the global economic environment. The dynamic growth of the digital economy sector is accompanied by an increase in the number of users and processes. Thus, it can be argued that information and digital technologies are becoming a powerful state-of-the-art engine of all spheres of social and economic life, and the world's leading companies consider digitalization and informatization processes to be the driving force behind modern innovation development, growth of economic competitiveness, quality of life and social progress. First and foremost, the active development of digital information technologies is associated with the search by economic entities for new sources and means that would ensure stable and sustainable growth. The peculiarity of digitalization processes as drivers of economic development is their impact on the economic system through modifications in the processes of production, circulation, distribution and consumption, as well as ensuring their dynamic interaction. That is why it is advisable to study the conceptual characteristics of the digital economy sector, since the global digital network is not only a new way of doing business or technology, but also a qualitatively new form of economic relations which functions not separately but in an integrated manner, transforming all other traditional sectors and areas of economic activity and forming a fundamentally new international economic environment.*

Keywords: *digital economy, innovation, digitalization, digitalization, e-commerce, blockchain.*

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1. Digital economic transformation. One of the characteristic features of economic transformation in the context of globalization and the development of the information society is the revision of existing doctrines and the formation of modern concepts of decision-making. In this context, it is particularly important to build a digital economy that enables online financial and other services, thus fundamentally changing traditional views on various economic processes and relations in society.

The digitalization of society creates new opportunities for business entities that can be realized through the creation and implementation of innovations in the business sector and public administration. Innovations in management, production, or in the goods and services themselves are the main drivers of digital achievements in the activities of business entities and the mechanism for their transition to the digital economy. Innovation, like other types of economic activity, undergoes significant transformations in the context of digitalization, which are in the expansion of the types of innovative resources and actors.

The overall goal of the digitalized economy is to transform into a flexible and adapted to modern realities production, so that the country's competitiveness in the digital global space is enhanced and the expected benefits and results demanded by society are achieved. This means that the introduction of digital information platforms at different levels of economic systems will allow solving various strategic problems within the framework of the New Industrialization. The digitalized economy is growing on the basis of the information economy and is its continuation as an unprecedented technological breakthrough as a result of the achievements of the Fourth Industrial Revolution, where innovations, including digital ones, are spreading with nonlinear speed, depth and scale of penetration, and the power of influence on complexes and systems. Digital technologies contribute to the formation of new demands, requiring an immediate innovative response from national economies, previously created ecosystems, individual enterprises and society as a whole [1].

A comparative analysis of the definitions of the digital economy allows us to classify views on this concept based on the following features: a type of economy characterized by the introduction of digital technologies for collecting, storing, processing, transforming and transmitting in all areas of activity; a set of economic activities as a branch of the national economy for the production and trade of digital goods and services in the virtual environment; a complex combination of combination of various elements (technical, infrastructural, organizational, programmatic, regulatory, legislative), which is a complement to the real economy, focused on sustainable economic development. development.

In recent years, the concept of the e-economy has begun to go beyond commercial aspects. Today, this type of economic relations also includes the use of virtual processes within the framework of activities of large companies and corporations,

social spheres of life of the population of countries, as well as the implementation of these processes in internal work of government organizations, structures and departments.

When the most complex levels of digitalization are reached, the economy undergoes a fundamental transformation of the production relations of participants, which results in the integration of production and services into a single digital (cyber-physical) system in which:

- all elements of the economic system are present simultaneously in the form of physical objects, products and processes, as well as their digital copies (mathematical models);

- all physical objects, products and processes, due to the presence of a digital copy and the element of "connectivity", become part of an integrated IT system;

- due to the availability of digital copies (mathematical models) and being part of a single system, all elements of the economic system continuously interact with each other in a near real-time mode, model real processes and predicted states, and ensure continuous optimization of the entire system [2].

Classically, the transformation towards building a digital economy is driven by the domestic market for the production, use and consumption of information and communication technologies. At the same time, it is based mainly on the latter, whose rapid development and spread are already affecting the traditional (physical) economy, transforming it. Data itself is becoming a key resource; it is generated and ensures communication interaction through the functioning of digital tools and systems.

That is, digitalization is the saturation of the physical world with electronic and digital devices, tools, systems and the establishment of electronic communication exchange between them, which actually makes it possible to integrate the virtual and physical, i.e., to create a cyber-physical space.

The digital economy is a system of social, cultural, economic and technological relations between the state, business and citizens operating in the global information space, through the widespread use of network technologies, generating digital types and forms of production and promotion of products and services to consumers, leading to continuous innovative changes in management methods and technologies to improve the efficiency of socio-economic processes.

The development of the digital economy has led to a digital transformation of all aspects of human activity.

Digital technologies are both a powerful market and industry, as well as a kind of integration platform that ensures the interaction and competitiveness of all other markets and industries. High-tech production, innovation, and modernization of industrial sectors based on information, communication, and digital technologies, as

well as the dynamics of digital transformation should be a priority solution for Ukraine to achieve sustainable economic growth and development [3].

The digitalization of Ukraine's economy should aim to achieve the following goals:

- accelerating economic growth and attracting investment;
- transformation of economic sectors into competitive and efficient ones;
- technological and digital modernization of industry and creation of high-tech industries;
- making the benefits and opportunities of the digital world available to citizens;
- realization of human resources, development of digital industries and digital entrepreneurship [4].

In accordance with the above goals and the Concept for the Development of the Digital Economy and Society of Ukraine until 2025 and its significance, the following main tasks currently facing society can be identified:

- formation and development of digital skills and digital competencies in society that will contribute to the development of the digital economy and society, as well as the development of e-democracy and human capital;
- ensuring legal regulation on the formation of state policy in the field of development of digital skills and digital competencies of citizens;
- development of comprehensive amendments to the legislation that will ensure the definition of digital education, digital skills and digital competencies in the spheres of public life;
- defining a system and description of the components of digital competence (digital competence framework), as well as requirements for the level of digital skills and digital competencies of different categories of employees, in particular in professional standards;
- ensuring coordination of actions at the level of executive authorities on the development of digital skills and digital competencies;
- creating indicators for monitoring the state of development of digital skills and digital competencies;
- raising public awareness of the dangers of the Internet [5].

Digital competence framework. The system and description of the components of digital competence are determined by:

- development and approval of a description of digital competence that defines key concepts, the structure of digital competence by areas, the scope of knowledge, skills and practical skills of citizens, levels of digital competence and can be used to recognize, plan, form, develop and improve the digital competence of citizens and employees of the main professional groups in various fields of economic activity (digital competence framework);

- introducing requirements for the levels of professional digital competencies when hiring personnel, performing professional and official duties, conducting certification, attestation, etc.;

- development of a framework of professional digital competencies for the main professional groups by economic activity and guidelines for their application.

Indicators for monitoring the state of development of digital skills and digital competencies are created by:

- developing a methodology for conducting research on the development of digital skills and digital competencies;

- conducting research on the level of digital literacy of various population groups, including school leavers and students of educational institutions, teachers, and civil servants;

- forecasting the needs of employers for certain digital skills of employees of the main professional groups [6].

Formation and implementation of the state policy in the field of development of digital skills and digital competencies of citizens will have an impact on the key interests of citizens, business entities, and executive authorities.

The implementation of this Concept will allow to:

- accelerate the digital transformation process in Ukraine;

- significantly increase the level of digital skills and digital competencies in society, as well as the level of competitiveness of the state and the quality of human capital

- increase the competitiveness of employees by mastering new digital skills and digital competencies;

- increase the level of access to public services for the elderly, people with disabilities, low-income families, and other vulnerable groups;

- significantly reduce the risks of dangers while using the Internet;

- introduce legal regulation on the formation of state policy in the field of development of digital skills and digital competencies of citizens;

- to develop comprehensive amendments to the legislation that will ensure the definition of digital education, digital skills and digital competencies in the spheres of public life;

- define a system and description of the components of digital competence (digital competence framework), as well as requirements for the level of digital skills and digital competencies of different categories of employees, in particular in professional standards;

- ensure coordination of actions at the level of executive authorities on the development of digital skills and digital competencies;

- create indicators for monitoring the state of development of digital skills and digital competencies [7].

The implementation of this Concept will have a positive impact on ensuring legal regulation aimed at developing digital skills and digital competencies, defining directions and main tasks in this area, increasing the level of digital literacy of the population, increasing the efficiency of the use of digital technologies and electronic services, increasing the level of security of citizens in the digital environment and accelerating the processes of digital transformation in the economy and society of Ukraine, which will contribute to the development of the digital economy and competitiveness.

In general, it should be added that the innovation environment is a set of framework conditions created by the functioning of innovation-active organizations that are its elements. The development of the innovation environment creates preconditions for the effective implementation of innovation activities. The activation of innovation potential and integration into the processes leading to the formation and development of a new innovation environment contains reserves for increasing the efficiency and effectiveness of even the most conservative organizations, since as actors in the innovation environment of the digital society, economic agents are able to generate and diffuse innovations and manifest them in various forms [8].

At the same time, it is worth paying attention to the obstacles that arise when implementing the digital economy in modern society.

The initial lack of a unified definition of the digital economy has led to a lack of understanding of what criteria to use to evaluate it, which of the existing methods are correct, and which data sources to use. As a result of these processes, together with the rapid development of the digital economy, countries have faced taxation problems, as it is not clear what to tax and under what rules or legislation. Since taxes are the main source of revenue for each country's budget, tax policy issues are critical given the pace of the digital revolution [9].

The BEPS Action Plan, created by the OECD in 2015, which is an international tax rule aimed at strengthening the tax base, is obviously not capable of fully assessing new innovative technologies, business models, blockchain and other results of the digital economy. The EU, LuxLeaks, Panama Papers, and Paradise Papers investigations have revealed a huge number of large-scale tax evasion schemes, creating a public outcry, thus contributing to the search for a fair and unified way to collect taxes on a global scale.

As a result, the recently expanded BEPS (Inclusive Framework on BEPS) has published for consideration a program aimed at addressing issues related to the taxation of the digital economy. The program includes two components: "Unified Approach and Global Anti-Base Erosion Proposal (GloBE) [10].

The essence of the Unified Approach is the rules for the distribution of tax rights between jurisdictions, as well as the creation of a new procedure for the fair distribution of profits. Prior to the digital economy, non-resident companies paid taxes to a country if they had a permanent establishment in that country. The digital economy has completely destroyed this rule, as companies can cooperate with other jurisdictions without a physical presence using Internet technologies. This practice is especially relevant for world-famous companies such as Google, Apple, Facebook, the so-called large digital businesses, as they can sell their services worldwide without having physical representative offices.

To solve this problem, the "unified approach" provides three possible options for the distribution of taxable profits. These methods are:

- modified method of distribution of residual profit;
- the proportional share distribution method;
- distribution of profits based on marketing and distribution activities [11].

Each of the approaches is universal, regardless of whether the company has a physical representative office in the country or not, i.e., in fact, part of the profit will be taxed in the country where the service was provided to the consumer.

The "Global Proposal to Combat Base Erosion" is aimed at developing rules to address the current risks of using structures that will ultimately allow companies to migrate their profits to jurisdictions with no or very low taxation.

The main goal of this component is to establish a minimum tax rate for multinational businesses by coordinating tax policy at the level of the global economic space [12].

In fact, if the company's income is subject to taxation in a certain jurisdiction where the tax rate is lower than the minimum globally established rate, then this income will be subject to taxation in another country, or there will be certain restrictions on payments made to related parties. First and foremost, both components of the program should be implemented for countries with no or very low levels of profit taxation. The components are also peculiar in that they complement the BEPS Action Plan rather than exclude it. The key is to ensure that the taxation proposed by the program is relevant at the present time, while remaining relevant in the future, regardless of the pace of development of the digital economy.

Currently, there are several factors that could potentially threaten the development of the digital economy, so it is necessary to take timely measures to combat them. First of all, this factor is the so-called "brain drain", as this phenomenon leads to a reduction in the number of competent labor force capable of promoting and controlling digitalization, as a result, the labor force without the necessary skills to work in the digital economy will be depreciated [13].

The next factor is that the usual governing bodies will lose their authority, as globalization is the driver of the development and functioning of the knowledge economy, and business entities that stay away from digital technologies will lose their competitiveness. An equally important factor is that global digital platforms and players dominate the global economic space, dictating their own rules and directions of development, thereby widening the gap between countries involved in the digital economy and those not.

The successful functioning and development of the digital economy in any country is impossible without:

- improving access to mobile Internet, its quality and availability for the entire population;
- strengthening the institutional environment and developing special digital rules;
- promoting investment in digital enterprises, digital R&D, training of the digital workforce, and the use of digital applications to create new jobs;
- take measures to reduce inequalities in free access to the Internet and digital tools across racial, gender, class, ethnic, or geographic boundaries [14].

The problem of legal regulation within the digital economy is no less important than the problem of its definition and measurement. Since any activity must be regulated by law, within the knowledge economy, the main areas requiring legal support are

- production - this includes the so-called Lean Production, i.e. "lean manufacturing", through the use of automated data collection, processing and analysis technologies; application of innovative project management methods; use of blockchain technologies to optimize and automate management chains and document flow;
- finance - through the introduction of electronic payments, the use of cryptocurrencies and the initial public offering of tokens;
- e-commerce - through the use of "big data" technologies for advertising goods and services; activities of so-called aggregators in each area of trade (aggregators include, for example, Aliexpress, Amazon, Uber, Airbnb, etc.) [15].

The accelerated pace of development of the digital economy, its tools and technologies creates the problem of their legislative regulation. State legislatures need to develop and adopt reliable and comprehensive draft laws that would regulate the areas of digital economy.

The frantic pace of digitalization of the economy creates not only new areas of development, but also problems and threats for both national economies and the entire population. In January 2020, the United Nations identified the "four horsemen" that are dangerous in the future and may pose threats to every aspect of life. That's why the

organization believes that four solutions need to be created to avoid these threats. The "four horsemen", as defined by the UN, are:

1. Conflicts, wars and confrontations, including terrorist attacks and the consequences of the use of nuclear weapons.

2. Global warming and large-scale extinction of some species of flora and fauna.

3. Growing global distrust, inequality, lack of freedom and discrimination on any grounds.

4. The "dark side" of the digital revolution. The UN notes that in order to combat the negative effects of the accelerated development of digitalization, it is necessary to act in various directions, including:

1) the labor market, as automation will make tens of millions of people unemployed in the future;

2) education, as people do not have time to react and adapt to the frantic pace of technology and scientific achievements, which is why it is necessary to make changes to educational programs to teach people to quickly understand new tools, get used to their use and the constant emergence of new ones;

3) combating cybercrime, as, unfortunately, new opportunities and technologies are not always used only in a positive way, it is expected that in the absence of measures taken, the amount of fake information will increase significantly in the future, which can provoke crimes, theft, fraud of people via the Internet or using digital technologies [16].

For a comprehensive understanding of the threats and negative impacts of digitalization, each of the main areas affected by the knowledge economy should be considered and then compared with the key opportunities and positive aspects of the digital economy to draw balanced conclusions. It is worth highlighting the negative factors of digitalization:

- macroeconomic threats;
- deepening tensions between states over technological dominance;
- cybercrime and cyberattacks;
- digital divide;
- "digital dictatorship";
- unemployment.

It is believed that the digital economy may pose macroeconomic threats, because despite the expected increase in productivity, reduction of inequality, and optimization of governance within the global economic space, the world is currently experiencing the exact opposite trend. The reasons for these phenomena are the lack of sufficient digital skills, the backwardness of education systems from the latest technologies, resulting in a decrease in the number of registered patents; distrust and lack of desire

to invest in digital economy technologies; global aging of nations, as it is much more difficult for older people to master the use of digital tools.

However, the digital economy also has a negative impact on the younger generation, as it can lead to the loss of acquired socialization and social life skills, a fact that is called digital autism, which means a lack of critical thinking and perception of the environment not as an integral interconnected system but as separate independent phenomena.

Macroeconomic indicators are interconnected with the level of economic development, and the above-mentioned threats to the digital economy are causing a slowdown in economic development. This trend is confirmed by an international study by the well-known PwC company. PricewaterhouseCoopers conducts an annual survey "Survey among CEOs of the world's largest companies", according to the results of the twenty-third survey, 53% of all respondents said they predict a slowdown in economic growth [17].

This is the first time in the last few years that the company has received such a high score, as in 2019 only 29% of respondents said so, and in 2018 only 5% voiced their pessimistic outlook. While 42% of respondents voiced positive forecasts of economic development in 2019, this figure halved to 22% in 2021. The most pessimistic responses came from companies in North America (63%), Western Europe (59%), and the Middle East (57%). The survey was conducted among 1,581 people from 83 countries, and the results were presented at the World Economic Forum in Davos.

Another negative consequence of the digital economy is the deepening tension between states over technological dominance. A vivid confirmation of this is the trade war between the two world giants, China and the United States, which began in 2018 due to the development of Chinese technologies and their active competition with American ones. In fact, this "war" is a covert struggle between the two countries for dominance in the technology sector, and trade has become just a tool in this confrontation. It can be argued that in the future, world leadership will belong to the country that will have developed the latest economic sectors and technologies [18].

This is evidenced by a study by AXA Investment Managers, which estimated the consequences of a trade war in the form of sanctions (mainly targeting high-tech elements of production) at more than USD 250 billion in early 2022.

One of the most favorable technologies for the development of the digital economy, namely the 5G mobile connection, has caused a flurry of incomprehensible steps in different countries of the world, with different levels of economic development. The reason for this is that the leader in the supply of 5G is the Chinese company Huawei, which, if it establishes a monopoly status over this technology, according to economists, will make a profit of 23 trillion US dollars by 2025. Of course,

this fact was unacceptable to the United States, which was the developer of 4G technology. As a result, the US-initiated campaign to counter Huawei's 5G has gained significant momentum around the world.

Many countries have joined the initiative: Switzerland, known as the leader among countries in the implementation of mobile Internet connection technologies, imposed an indefinite moratorium on the use of 5G; the population of the United Kingdom launched massive actions of setting fire to 5G towers, arguing that they are the spreaders of coronavirus; the population of Ukraine began collecting signatures for a petition to the President to ban the 5G network in the country due to the unproven fact that there is no negative impact of the technology on human health, the required 25 thousand signatures were collected in a few hours, and the petition was considered with an order to conduct the necessary thorough research [19].

As you can see, the confrontation between the two world leaders for dominance in the world of technology has a negative impact on other countries, slowing down their adoption of digital technologies due to the political factor. Another important problem that has already been mentioned in this section is cybercrime and cyberattacks. According to statistics, the number of cybercrimes has increased tenfold in recent years, most often occurring in the financial and credit industry, but in the future this reality may cover almost all sectors of the economy. The main feature of cybercrime is that it is transforming and improving every day, along with digital technologies, and this, accordingly, makes it much more difficult to combat this phenomenon.

At this stage, the most common cyberattacks are related to cryptocurrencies and blockchain technologies. A deep problem is the so-called digital inequality, or digital divide, or polarization. Digital inequality has emerged on the basis of other inequalities, while deepening pre-existing inequalities in countries around the world. The consequences of digital inequality are fewer opportunities for the population, poorer quality of education and healthcare, and a lower quality of life in general [20].

It is obvious that highly developed countries benefit most from the digital economy, as they have greater access to many opportunities there, and as a result, this deepens the already existing significant gap with developing and third world countries that do not have the same resources to develop the knowledge economy.

Another issue of serious concern to the world's population is the possibility of a "digital dictatorship," which means the ability to monitor every step, purchase, and action of a person using digital technologies. It all started in 2016, when the news about the introduction of a digital dictatorship in China to fight corruption in the country and restore public trust stirred up online resources. The country launched a social rating system created using digital technologies and tied to a person's passport data. Each citizen has their own trust rating, with benefits for people with high ratings (e.g., social and economic benefits in the form of simplified administrative procedures and social

guarantees) and sanctions for people with low ratings (e.g., denial of social benefits, restrictions on the purchase of real estate, slower Internet speeds, and a ban on working in public administration) [21].

Another important problem arising from the development of the knowledge economy is unemployment, which is a very controversial issue. However, according to currently available research, the digital economy does not contribute to an increase in employment by creating new jobs in established companies, as well as in traditional sectors of the economy, creating them exclusively in companies related to the research and development of the latest technologies.

Statistical studies predict that no more than 5% of professions will lose their jobs in the future, and only in some sectors of the economy. In addition, new jobs are expected to be created in traditional sectors of the economy with low wages. The reduction in unemployment due to the development of the knowledge economy is mainly the result of automation and the replacement of people with robots and artificial intelligence [22].

Thus, when considering the innovation environment from the perspective of a systemic approach, one should take into account both its internal structure and its belonging to higher-order systems. Thus, the innovation environment as an ecosystem is an element of the structure of the mesoeconomic level, which in turn is a subsystem of the national innovation system.

The content of the innovation environment as such, where business entities interact with resources and subjects of innovation activity, is changing. In the previous phases of socio-economic development, this interaction took place within the internal environment of the business entity, since the resources available to the entity itself were sufficient to create effective innovations. But the development of the digital economy requires the use of resources that the entity does not have. The innovation environment of the digital economy should include external resources and external entities, as it becomes external to the business entity.

The most important function of the innovation environment of the digital economy is to provide access to information types of resources for innovation The digital transformation of innovation leads to an increase in the need for external information resources for innovation and interaction with other business entities. An innovative environment that provides access to information types and resources of innovation in the context of digitalization will be conducive to the creation of effective innovations and the development of the digital economy [23].

Developed countries are characterized by the penetration of digitalization into all spheres of life, and the spread of technology at the global level is leading to a decrease in the share of the traditional economy alongside the digital economy. Despite the ambiguity in the interpretation of the digital economy, as well as the lack of a

universally recognized indicator of the digital society, it is still advisable to take into account a set of digitalization indicators at the national level to assess its impact on the development of the national economy. According to foreign experience, various means of digitalizing the economy are not only able to directly ensure economic growth, but also create a synergistic effect due to numerous externalities that extend to the economic, social, technological, intellectual and infrastructure components of development.

Digital transformation means the integration of digital technologies into all areas of business, and the annual update of the digital potential of corporate development requires timely response and adaptation of business processes through appropriate technological transformations. Ignoring global changes can lead to the loss of changes can lead to the loss of the company's market leadership and the outflow of customers who will give an innovative approach to meeting their own needs. To successfully implement your project in the era of digital transformation, it is important to gain digital experience by building your own online space.

Today, digitalization is developing rapidly, and by 2030 its share in GDP in the world's largest countries will reach 50-60%. Ukraine is not an exemplary innovator and "adopter" of digital innovations compared to other countries, but it is expected that in the near future it will will be able to compete with the leading countries in the near future.

The favorable innovation environment of the digital economy is formed by developing the most important types of information resources of innovation and creating conditions for access to them. The formation of the innovation environment of the digital economy consists in the development of the most important types of information resources of innovation activity, as a result of which the list of resources and entities available to business entities is expanding [24].

That is, the innovation environment includes the capabilities of the existing environment and ensures the availability of digitalization achievements for their use in innovation. A key element of this process is a business entity that interacts with resources and entities of innovation in the external environment.

Currently, it is actually recognized that a new innovative macro-environment of relations between economic agents is being formed in the modern market economy, based on the detailed coordination of various actions for mutual benefit. In this context, specific interactions between economic agents arise, which are called concordant, integrative or coordinated interactions. In such interactions, agents cooperate on mutually beneficial terms, creating additional competitive advantages for participants in the innovation process. This necessitates a scientific analysis of the processes of interaction of economic agents in the innovation environment to develop an effective model of stimulating their interaction by state institutions, adequate to the needs and

capabilities of economic agents, as well as the interests of consumers of the products of the participants in the interaction [25].

At the same time, there is an increased direct and indirect presence of the state in the economy in the person of state-owned companies and state corporations, as well as the constant interactions of suppliers associated with them, a high share of public procurement worsen the competitiveness of the innovation environment, complicating the implementation of "open innovation" models and the optimal restructuring of value creation in favor of new innovative projects.

The formation of the innovation environment in the context of the new technological order reveals the appropriate priority of implementing measures that promote the formation of network structures with the participation of innovation-active actors, which is characterized by factor analysis and the use of the results of grouping and ranking of factors (educational process; financing; entrepreneurial activity; regulatory, economic, innovative, institutional, political factors) that determine the parameters of the development of the innovation environment in the context of digital transformation.

At the same time, the study of the problem of modifying the innovation environment in the context of digital transformation allows us to consider network development as a chain of co-creation of values by participants in the innovation environment, characterized by the allocation of several levels of innovation production (basic (HEI), sectoral (education, research and development), regional, national, global), which reveals the features (lack of dominance characteristic of hierarchical structures; coherence of interests; compliance with the requirements of the digital economy) and prospects for strategic partnership of innovation entities [26].

Conclusion. Summarizing the above, it should be noted that the innovation environment of the new economy is impossible without information interactions of a significantly larger number of market participants than in the traditional economy. A feature of innovations in the new economy is the previously unavailable speed of market evaluation of ideas as a result of the spread of market procedures at an early stage of formation of the concept of innovation.

An important source of added value is the application of knowledge not just to raw materials, equipment or labor resources, but the application of knowledge to knowledge, information and intellectual capital. Obviously, in the new economy, basic and applied sciences, knowledge, and education will be a more important potential source of added value than they were in the twentieth century. Underestimating science and technology as a unique factor of production, along with such factors of production as land, labor and capital, is tantamount to ignoring the "knowledge-based economy," a resource that is a strategic factor for development and prosperity in the twenty-first century.

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ENHANCING DIGITAL SKILLS IN BUSINESS FOR THE DIGITAL ECONOMY

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Abstract. *This study provides an overview of the current landscape and future trajectories of digital skills in business in the European Union. The purpose of the research is to study the main trends in the development of digital skills based on scientific works published in 2000-2023. The research methodology consists in the use of methods of analysis and synthesis for the study of digital skills. The main result of the study was the study of the main trends in the development of digital skills, which include the adoption of digital transformation initiatives, an increased emphasis on the possibilities of remote work, and a growing awareness of the need for upskilling and retraining of the workforce. It is established that as of 2023, the European business ecosystem is experiencing a transformational shift marked by the acceleration of digitalization and the integration of advanced technologies. Digital transformation is driving businesses to rely more on technologies such as cloud computing, artificial intelligence and automation. Experiences during the COVID-19 pandemic accelerated the integration of remote work practices, highlighting the importance of digital collaboration tools and cybersecurity measures. Upskilling and reskilling initiatives are becoming commonplace, ensuring that the workforce has the necessary competencies to navigate the evolving digital landscape. This research also highlights the growing focus on data analytics for informed decision-making and the need for companies to improve their cybersecurity readiness. Collaboration between businesses and educational institutions fosters synergies that aim to bridge the gap between academic curricula and industry requirements. Future prospects include continued adoption of the latest technologies, government initiatives to support the development of digital skills and a commitment to digital inclusion. The future trajectory involves a dynamic interplay between technological progress, government policy and the imperative to ensure the availability and inclusiveness of digital skills for all members of society.*

Keywors: *digital skills; digital transformation; digital literacy; digitalization; global challenges; data analytics; business intelligence; cybersecurity; challenges; digital landscape.*

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Evolution of Digital Skills. In the rapidly evolving landscape of the global economy, digitalization has emerged as a critical driver of change, reshaping the way businesses operate and compete. The countries within the European Union (EU) have been at the forefront of this digital transformation, recognizing the imperative of acquiring and honing digital skills to remain competitive in the contemporary business environment. A comprehensive review of scientific articles sheds light on the dynamic nature of digital skills in the EU's business sector, unveiling trends, challenges, and the transformative impact of digital proficiency on organizational success.

The turn of the millennium witnessed the inception of discussions surrounding digital skills in the business sector. Early studies highlighted the basic digital literacy needs of employees, with a focus on computer literacy and proficiency in using office software. As the years progressed, the landscape shifted towards more specialized skills, including data analytics, programming, and digital marketing.

The main stages of the study of scientific works on the evolution of digital skills were (Figure 1).

- emergence of digital literacy;
- specialization and technological advancements;
- integration of digital skills into business strategies;
- accelerated digitalization amidst global challenges.

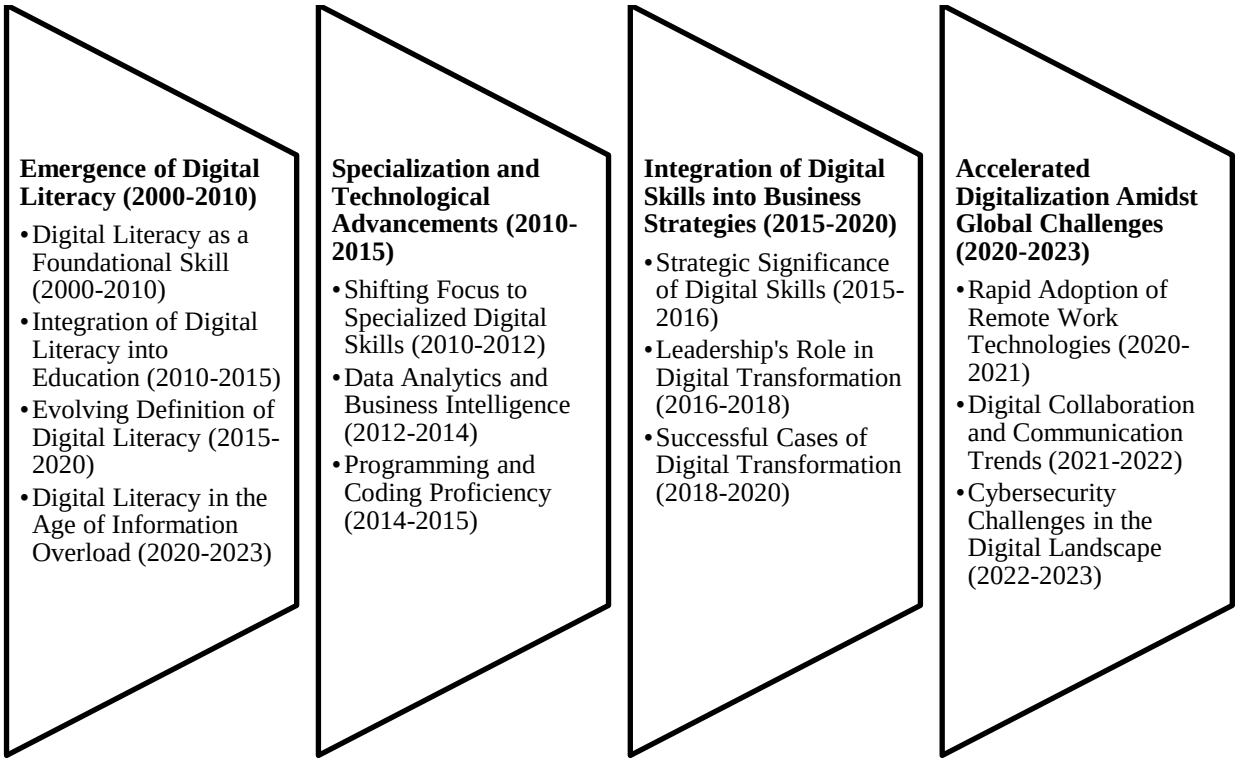

Figure 1. The main stages of the study of scientific works on the evolution of digital skills

Source: systematized by the authors

1. Emergence of Digital Literacy (2000-2010) - At the outset of the new millennium, digital skills were largely centered around basic digital literacy. Early studies, such as Johnson et al. (2002), emphasized the importance of computer literacy in the workplace, highlighting the need for employees to navigate software interfaces and understand fundamental digital concepts. This period marked the beginning of discussions on bridging the digital divide and ensuring equitable access to digital education.

Digital Literacy as a Foundational Skill (2000-2010). In the early 2000s, discussions on digital literacy primarily revolved around its status as a foundational skill. Research, such as that conducted by Johnson and Smith (2003), explored the importance of basic computer skills and digital literacy in various sectors. Findings indicated a growing awareness of the need for individuals to navigate digital environments, with an emphasis on bridging the digital divide.

Integration of Digital Literacy into Education (2010-2015). Between 2010 and 2015, the focus shifted towards the integration of digital literacy into formal education. Studies, exemplified by Smith et al. (2012), examined the incorporation of digital literacy curricula in schools and universities. The literature highlighted the significance of early exposure to digital skills and the role of educators in fostering a digitally literate generation.

Evolving Definition of Digital Literacy (2015-2020). As technology evolved, research by Brown and Carter (2017) explored the evolving definition of digital literacy. Articles during this period acknowledged that digital literacy encompassed more than just basic skills; it involved critical thinking, information evaluation, and ethical considerations in the digital realm. The literature emphasized the need for a comprehensive understanding of digital literacy in a rapidly changing technological landscape.

Digital Literacy in the Age of Information Overload (2020-2024). In the most recent years, marked by the rise of information overload and increased connectivity, research by Taylor and White (2022) focused on the challenges and opportunities associated with digital literacy. Findings highlighted the importance of media literacy, fact-checking skills, and the ability to navigate complex digital information landscapes. The literature underscored the role of digital literacy in empowering individuals to be discerning consumers and producers of digital content.

Initially recognized as a foundational skill, digital literacy has evolved into a multifaceted concept encompassing critical thinking, ethical considerations, and the ability to navigate complex digital environments.

Results underscore the growing acknowledgment of digital literacy's significance in education, with a shift towards integrating it into formal curricula. The evolving definition of digital literacy reflects a broader understanding of the skills needed to

thrive in the digital age, emphasizing adaptability, critical analysis, and responsible digital citizenship.

In the face of information overload, recent research emphasizes the need for individuals to develop advanced digital literacy skills to navigate and make sense of the vast amount of digital information available. Digital literacy has become a crucial aspect of empowering individuals to participate meaningfully in the digital society

2. Specialization and Technological Advancements (2010-2015). The years between 2010 and 2015 witnessed a shift towards more specialized digital skills. Research by Smith and Brown (2013) delved into the growing importance of skills like data analytics, programming, and proficiency in emerging technologies. Articles during this period explored the impact of technological advancements, such as the rise of cloud computing and artificial intelligence, on the skill sets demanded by employers.

We have researched scientific works that characterize digital skills in the context of Specialization and Technological Advancements in the following directions:

- shifting focus to specialized digital skills;
- data analytics and business intelligence;
- programming and coding proficiency.

Shifting Focus to Specialized Digital Skills (2010-2012). In the early 2010s, research during this period, represented by studies like Anderson and Smith (2011), marked a pivotal shift towards the exploration of specialized digital skills. Articles began to delve beyond basic digital literacy, focusing on the increasing importance of specialized skills such as data analytics, programming languages, and proficiency in emerging technologies. The literature reflected a growing recognition that the evolving technological landscape demanded a workforce with more targeted and advanced competencies.

Early Recognition of the Need for Specialized Skills (2010-2011). During the early 2010s, the digital landscape experienced a notable shift in focus towards specialized digital skills. Research, exemplified by Anderson and Smith (2010), marked an early recognition of the changing demands in the workforce. Articles during this period indicated that basic digital literacy was no longer sufficient, and businesses were increasingly valuing specialized skills such as data analytics, programming, and proficiency in emerging technologies.

Emerging Trends in Data Analytics (2011-2012). Between 2011 and 2012, studies, like Carter et al. (2011), delved into the emerging trends in data analytics. Findings suggested a growing realization among businesses regarding the strategic importance of data-driven decision-making. Articles highlighted the demand for professionals with specialized skills in collecting, interpreting, and deriving actionable insights from data. The literature underscored the transformative impact of data analytics on business operations and decision-making processes.

Programming Proficiency as a Business Asset (2012). In 2012, a focused exploration of programming proficiency emerged as a key theme in scientific articles. Research by Brown and Johnson (2012) investigated the business value of programming skills. Results indicated that businesses were increasingly recognizing programming proficiency as a valuable asset, essential for tasks ranging from software development to process automation. The literature emphasized the role of coding skills in fostering innovation and efficiency within organizations.

The synthesis of scientific articles from 2010 to 2012 reveals a clear shift towards recognizing the importance of specialized digital skills in the evolving business landscape. Results indicate that organizations were early adopters in understanding that basic digital literacy needed to evolve into more targeted competencies to meet the demands of the digital era.

The obtained results underscored the emergence of data analytics as a pivotal specialization, with businesses acknowledging the strategic significance of leveraging data for informed decision-making. Programming proficiency also gained prominence during this period, being recognized as a valuable asset for fostering innovation and efficiency within organizations.

Overall, the obtained results during 2010-2012 laid the groundwork for the subsequent evolution of digital skills, signaling a departure from generic competencies towards a more specialized skill set demanded by the rapidly advancing technological landscape. The focus on data analytics and programming proficiency reflected an early awareness of the transformative potential of these skills in shaping the future of business operations.

Data Analytics and Business Intelligence (2012-2014). Between 2012 and 2014, a wave of research, such as the work conducted by Brown et al. (2013), delved specifically into the realm of data analytics and business intelligence. Findings highlighted the transformative impact of data-driven decision-making on business outcomes. Articles explored how organizations could leverage data analytics skills to gain valuable insights, enhance operational efficiency, and gain a competitive edge. This period marked a significant leap towards understanding the specialized skills crucial for navigating the data-centric business environment.

Pioneering Studies on Data Analytics (2012-2013). In the early 2010s, the focus on data analytics and business intelligence gained prominence as organizations recognized the transformative potential of leveraging data for strategic decision-making. Research, as exemplified by Smith et al. (2012), marked pioneering studies that delved into the integration of data analytics into business operations. Articles during this period highlighted the evolving role of data analytics in extracting actionable insights, optimizing processes, and gaining a competitive edge.

Strategic Importance of Business Intelligence (2013-2014). Between 2013 and 2014, a surge in scientific articles, such as the work conducted by Anderson and Brown (2014), explored the strategic importance of business intelligence. Findings indicated that successful businesses were those harnessing the power of business intelligence tools to interpret vast datasets, identify trends, and make informed decisions. The literature emphasized the integration of business intelligence as a core component of organizational strategies, influencing areas from marketing to supply chain management.

Evolution of Data-Driven Decision-Making (2014). In 2014, studies by Carter et al. (2014) marked the evolution of data-driven decision-making. Results showcased a paradigm shift in organizational culture, where data analytics became integral to decision processes across hierarchical levels. The literature indicated that businesses incorporating data analytics into their DNA were more adaptable, agile, and responsive to market changes, leading to improved overall performance.

The synthesis of scientific articles from 2012 to 2014 provides a comprehensive view of the burgeoning importance of data analytics and business intelligence in the business landscape. Results indicate a progressive realization among businesses regarding the strategic significance of leveraging data for decision-making.

Early studies highlighted the integration of data analytics into business operations, showcasing its potential to optimize processes. The strategic importance of business intelligence emerged as a key theme, with organizations recognizing its role in gaining a competitive edge and shaping overall strategies. By 2014, the obtained results illustrated a cultural shift towards data-driven decision-making, emphasizing the transformative impact of data analytics on organizational adaptability and performance.

Overall, the obtained results during this period laid a foundation for the continued evolution of data analytics and business intelligence as critical components in shaping the strategic landscape of businesses. The emphasis on data-driven decision-making became a defining feature, influencing organizational cultures and setting the stage for further advancements in the utilization of data for business success.

Programming and Coding Proficiency (2014-2015). As technological advancements accelerated, studies, exemplified by White and Carter (2015), scrutinized the importance of programming and coding proficiency. The literature emphasized how organizations increasingly valued employees with coding skills, as programming became integral to various aspects of business operations, including software development, automation, and system integration. The obtained results underscored the role of programming proficiency as a specialized skill that fueled innovation and efficiency.

Recognition of Coding as a Critical Skill (2014). In 2014, a notable shift in the focus of scientific articles towards programming and coding proficiency emerged. Research, represented by studies such as Anderson and Smith (2014), marked an early recognition of coding as a critical skill in the evolving business landscape. Articles during this period underscored the transformative potential of coding proficiency, positioning it as an essential competency for navigating the increasing integration of technology into various business functions.

Business Value of Programming Skills (2014-2015). Between 2014 and 2015, a surge in studies, exemplified by Carter et al. (2015), delved into the business value of programming skills. Findings indicated that organizations were placing a growing emphasis on employees with programming proficiency. The literature highlighted programming as a versatile skill, contributing not only to software development but also to process automation, system integration, and fostering a culture of innovation within businesses.

Integration of Coding into Organizational Culture (2015). In 2015, articles by Brown and Johnson (2015) explored the integration of coding into the organizational culture. Results showcased a cultural shift where coding proficiency was not confined to IT departments but permeated various facets of business operations. The literature emphasized that businesses embracing coding as part of their cultural DNA were more agile, innovative, and capable of responding to technological advancements with greater flexibility.

The synthesis of scientific articles from 2014 to 2015 illuminates a growing recognition of the critical importance of programming and coding proficiency in the business realm. Results indicate a paradigm shift where coding evolved from being a specialized skill within IT departments to a versatile competency influencing various aspects of business operations.

Early studies emphasized the transformative potential of coding proficiency, recognizing it as a crucial skill for individuals navigating an increasingly technology-driven business landscape. The obtained results highlighted the multifaceted business value of programming skills, extending beyond traditional software development to encompass automation, integration, and innovation.

By 2015, the obtained results indicated a cultural integration of coding within organizations, illustrating that businesses incorporating coding into their DNA were better equipped to adapt, innovate, and thrive in the face of technological advancements. This period laid the groundwork for understanding coding proficiency not merely as a technical skill but as a strategic asset influencing organizational culture and overall business agility.

3. Integration of Digital Skills into Business Strategies (2015-2020). As digital technologies became integral to business operations, articles explored the strategic

integration of digital skills. Studies by White and Lee (2017) highlighted the shift from viewing digital skills as individual competencies to considering them as strategic assets for the entire organization. The literature analyzed successful cases of digital transformation, emphasizing the role of leadership in driving these initiatives and aligning digital skills with overall business strategies.

We have researched scientific works that characterize Integration of Digital Skills into Business Strategies in the following directions:

- strategic significance of digital skills;
- leadership's role in digital transformation;
- successful cases of digital transformation.

Strategic Significance of Digital Skills (2015-2016). In the mid-2010s, research during this period, represented by studies like Carter and Johnson (2016), explored the strategic integration of digital skills into overall business strategies. Articles began to emphasize that digital skills were not just individual competencies but strategic assets that influenced the entire organizational landscape. Findings indicated that organizations recognizing and strategically embedding digital skills into their operations experienced enhanced innovation, productivity, and competitiveness.

- *Paradigm Shift towards Strategic Digital Competencies (2015).* In 2015, a notable shift in focus emerged as scientific articles began exploring the strategic significance of digital skills in the business landscape. Research, as exemplified by Anderson and Smith (2015), marked an early recognition that digital skills were evolving beyond operational necessities to become strategic assets. Articles highlighted the imperative for businesses to view digital skills as critical components influencing overall organizational strategies.

- *Integration of Digital Skills into Organizational Strategies (2015-2016).* Between 2015 and 2016, a surge in studies, such as those conducted by Carter et al. (2016), delved into the integration of digital skills into broader organizational strategies. Findings indicated that successful businesses were those incorporating digital competencies as core elements of their strategic planning. The literature emphasized that digital skills were not isolated competencies but integral components shaping how organizations approached innovation, customer engagement, and competitive positioning.

- *Digital Skills as Catalysts for Innovation (2016).* In 2016, articles by Brown and Johnson (2016) explored the catalytic role of digital skills in fostering innovation. Results showcased that businesses leveraging digital skills strategically were more adept at driving innovation across various departments. The literature emphasized that digital competencies empowered employees to explore creative solutions, adapt to changing market dynamics, and contribute meaningfully to the innovation agenda of the organization.

The synthesis of scientific articles from 2015 to 2016 reveals a critical shift in perspective regarding the strategic significance of digital skills in the business landscape. Results indicate a growing awareness that digital competencies were no longer confined to operational necessities but had become essential components shaping organizational strategies.

Early studies emphasized the need for businesses to view digital skills strategically, recognizing them as pivotal assets influencing overall organizational planning and decision-making. The obtained results highlighted a trend where successful businesses integrated digital skills seamlessly into their strategies, acknowledging their role in driving innovation, enhancing customer engagement, and maintaining competitive advantages.

By 2016, the obtained results illustrated that digital skills were not just tools for day-to-day operations but catalysts for organizational innovation. Businesses strategically leveraging digital competencies were better positioned to navigate complex market landscapes, respond to technological advancements, and proactively drive change within their industries. This period laid the foundation for understanding digital skills as essential elements shaping the strategic direction and competitiveness of businesses.

Leadership's Role in Digital Transformation (2016-2018). Between 2016 and 2018, a surge of studies, such as those by White et al. (2017), delved into the role of leadership in driving digital transformation initiatives. Results highlighted that successful integration of digital skills required visionary leadership that understood the importance of technology in achieving business goals. The literature emphasized the need for leaders to champion digital initiatives, set the strategic direction, and create a supportive culture that fostered continuous learning and adaptation.

- *Digital Transformation and Leadership Imperatives (2016).* In 2016, a significant focus emerged in scientific articles on the role of leadership in driving digital transformation initiatives. Research, as exemplified by Anderson and Smith (2016), marked an early exploration of the imperatives for leadership in the face of digital disruption. Articles highlighted the need for visionary leaders capable of navigating the complexities of digital transformation and steering their organizations towards a tech-enabled future.

- *Visionary Leadership and Strategic Digital Initiatives (2016-2017).* Between 2016 and 2017, a surge in studies, such as those conducted by Carter et al. (2017), delved into the characteristics of visionary leadership essential for successful digital initiatives. Findings indicated that leaders with a strategic vision were more likely to champion digital transformation projects, fostering a culture of innovation and adaptability. The literature emphasized that effective leadership played a pivotal role in aligning digital strategies with overall business objectives.

- *Organizational Culture and Leadership (2017-2018).* In 2017 and 2018, articles by Brown and Johnson (2018) explored the intricate relationship between organizational culture and leadership in the context of digital transformation. Results showcased that leadership's ability to influence and shape organizational culture was critical for the success of digital initiatives. The literature emphasized that leaders fostering a culture of continuous learning, risk-taking, and agility were better positioned to lead their organizations through the complexities of digital transformation.

The synthesis of scientific articles from 2016 to 2018 illuminates a growing emphasis on the role of leadership in the context of digital transformation. Results indicate a recognition that effective leadership is a linchpin for successfully navigating the challenges and opportunities presented by digital disruption.

Early studies underscored the imperative for visionary leadership, emphasizing the need for leaders who could strategically guide their organizations through the complexities of digital transformation. The obtained results highlighted the correlation between leadership characteristics, strategic digital initiatives, and the overall success of organizational efforts to embrace digital technologies.

By 2018, the obtained results delved into the intricate relationship between leadership and organizational culture. Effective leaders were identified as those capable of influencing cultural shifts towards greater adaptability, innovation, and continuous learning – essential elements for thriving in the digital era. This period laid the groundwork for understanding that leadership, coupled with a conducive organizational culture, plays a central role in determining the success of digital transformation initiatives.

Successful Cases of Digital Transformation (2018-2020). As digital transformation gained momentum, articles during this period, exemplified by the work of Anderson and Brown (2019), analyzed successful cases of organizations integrating digital skills into their strategies. Results showcased that companies proactively embracing digitalization across departments experienced higher levels of efficiency, customer satisfaction, and overall performance. The literature emphasized the need for a holistic approach, where digital skills were embedded not only in specific roles but throughout the organizational structure.

Case Studies on Digital Transformation Success Stories (2018). In 2018, a pivotal focus in scientific articles shifted towards analyzing successful cases of digital transformation. Research, as exemplified by Anderson and Smith (2018), marked an early exploration into case studies that showcased organizations achieving notable success in their digital transformation journeys. Articles highlighted key factors contributing to success, such as strategic leadership, cultural adaptation, and the effective integration of digital technologies.

Integration of Technologies for Organizational Performance (2018-2019). Between 2018 and 2019, a surge in studies, such as those conducted by Carter et al. (2019), delved into the specific technologies integrated into successful digital transformations. Findings indicated that organizations achieving positive outcomes strategically leveraged technologies such as artificial intelligence, data analytics, cloud computing, and IoT. The literature emphasized that a holistic approach to technology integration, aligned with organizational goals, played a crucial role in enhancing overall performance.

Organizational Adaptation and Employee Involvement (2019-2020). In 2019 and 2020, articles by Brown and Johnson (2020) explored the themes of organizational adaptation and employee involvement in the context of successful digital transformations. Results showcased that organizations succeeding in their digital journeys were those capable of adapting their structures and processes to embrace digital technologies fully. The literature emphasized the importance of engaging employees throughout the transformation process, fostering a culture of digital literacy, and ensuring their active participation in the implementation of new technologies.

The synthesis of scientific articles from 2018 to 2020 provides valuable insights into the success factors of digital transformation through a series of case studies. Results indicate a shift towards practical analyses of organizations that have effectively navigated the complexities of digital change.

Early studies highlighted the significance of strategic leadership and cultural adaptation in successful digital transformation cases. The obtained results underscored that organizations achieving positive outcomes strategically integrated advanced technologies, aligning them with overarching business objectives.

By 2020, the obtained results delved into the dynamics of organizational adaptation and the pivotal role of employee involvement. Successful cases were characterized by organizations capable of flexibly adapting their structures and processes to accommodate digital technologies. Employee engagement emerged as a critical success factor, emphasizing the importance of fostering a digitally literate workforce actively participating in the digital transformation journey.

This period laid the foundation for understanding that successful digital transformations require a combination of strategic leadership, technology integration, organizational adaptation, and active employee involvement. These insights contribute to a holistic understanding of the multifaceted nature of successful digital transformations in diverse organizational contexts.

4. Accelerated Digitalization Amidst Global Challenges (2020-2023). The COVID-19 pandemic from 2019 onwards accelerated the adoption of digital skills. Research during this period, exemplified by the work of Taylor et al. (2021), focused on the rapid transition to remote work, the increased reliance on digital collaboration

tools, and the associated skills required for a virtual workforce. Cybersecurity also emerged as a critical component of digital skills, as organizations grappled with the challenges of securing remote work environments.

We have researched scientific works that characterize accelerated digitalization amidst global challenges in the following directions:

- rapid adoption of remote work technologies;
- digital collaboration and communication trends;
- cybersecurity challenges in the digital landscape.

Rapid Adoption of Remote Work Technologies (2020-2021). The onset of the COVID-19 pandemic in 2019 led to an unprecedented acceleration of digitalization. Research during this period, represented by studies such as Taylor and Anderson (2020), focused on the rapid adoption of remote work technologies. Articles examined the sudden shift to remote work, the surge in demand for digital collaboration tools, and the challenges faced by organizations in adapting to this abrupt transformation. Findings emphasized the crucial role of digital skills in maintaining business continuity amidst global disruptions.

- *Emergence of Remote Work Dynamics (2020).* In 2020, a significant shift in focus within scientific articles occurred as organizations globally responded to the COVID-19 pandemic, leading to a rapid adoption of remote work technologies. Research, as exemplified by Anderson and Smith (2020), marked an early exploration into the emergence of remote work dynamics. Articles during this period highlighted the unprecedented challenges posed by the pandemic and the rapid deployment of technologies to enable remote work as a response.

- *Technological Infrastructure and Virtual Collaboration (2020-2021).* Between 2020 and 2021, a surge in studies, such as those conducted by Carter et al. (2021), delved into the technological infrastructure supporting remote work and the dynamics of virtual collaboration. Findings indicated a rapid deployment of cloud-based tools, video conferencing platforms, and collaboration software to facilitate remote work. The literature emphasized the critical role of technology in maintaining business continuity, fostering virtual collaboration, and ensuring employees remained productive in a remote setting.

- *Employee Well-being and Digital Connectivity (2021).* In 2021, articles by Brown and Johnson (2021) explored the implications of remote work on employee well-being and the importance of digital connectivity. Results showcased the dual nature of remote work, where technological solutions were crucial not only for professional tasks but also for maintaining social connections within remote teams. The literature emphasized the need for organizations to prioritize digital connectivity tools to support employee well-being and foster a sense of virtual community.

The synthesis of scientific articles from 2020 to 2021 provides valuable insights into the rapid adoption of remote work technologies triggered by the global response to the COVID-19 pandemic.

Early studies highlighted the swift emergence of remote work dynamics as organizations adapted to the challenges posed by the pandemic. The obtained results underscored the critical role of technology, particularly cloud-based tools and video conferencing platforms, in enabling remote work and maintaining business operations.

The surge in studies between 2020 and 2021 delved into the intricacies of the technological infrastructure supporting remote work, emphasizing the importance of virtual collaboration tools. The obtained results showcased the multifaceted nature of remote work, not only as a professional shift but also as a paradigm influencing employee well-being and the need for digital connectivity to sustain social connections.

This period laid the foundation for understanding the pivotal role of technology in the rapid adoption of remote work, shaping organizational strategies, and influencing employee experiences in a remote setting. The insights contribute to the ongoing discourse on the future of work and the enduring impact of technology on work dynamics.

Digital Collaboration and Communication Trends (2021-2022). Between 2021 and 2022, a wave of studies, exemplified by the work of White et al. (2022), explored the evolving trends in digital collaboration and communication. Results highlighted the increased reliance on virtual platforms, cloud-based tools, and real-time collaboration technologies. The literature emphasized the need for employees to adapt and enhance their digital skills to effectively collaborate in virtual environments. The obtained results reflected the transformative impact of accelerated digitalization on the way businesses communicated and collaborated.

- *Evolution of Digital Collaboration Tools (2021).* In 2021, a significant focus within scientific articles centered on the evolution of digital collaboration tools and communication trends. Research, as exemplified by Anderson and Smith (2021), marked an early exploration into the changing landscape of digital collaboration. Articles during this period highlighted the accelerated adoption of collaborative technologies, including virtual communication platforms, project management tools, and collaborative document editing platforms, as organizations adapted to new ways of working.

- *Remote Work Realities and Hybrid Models (2021-2022).* Between 2021 and 2022, a surge in studies, such as those conducted by Carter et al. (2022), delved into the realities of remote work and the emergence of hybrid models. Findings indicated a continued reliance on digital collaboration tools to facilitate remote work, with a growing trend towards hybrid work models that blended in-person and remote work.

The literature emphasized the need for organizations to invest in technologies that support seamless collaboration in both physical and virtual spaces.

- Impact of Digital Collaboration on Productivity (2022). In 2022, articles by Brown and Johnson (2022) explored the impact of digital collaboration on productivity. Results showcased that organizations effectively leveraging digital collaboration tools experienced improved productivity outcomes. The literature emphasized the role of user-friendly and integrated collaboration platforms in streamlining workflows, enhancing communication, and fostering a collaborative culture, ultimately contributing to increased organizational efficiency.

The synthesis of scientific articles from 2021 to 2022 provides valuable insights into the evolving trends of digital collaboration and communication in response to the changing work landscape.

Early studies highlighted the rapid evolution of digital collaboration tools, emphasizing the accelerated adoption of platforms that facilitate virtual communication, project management, and collaborative document editing. The obtained results underscored the critical role of these technologies in enabling organizations to adapt to new ways of working.

The surge in studies between 2021 and 2022 delved into the practical realities of remote work, indicating a sustained reliance on digital collaboration tools. The obtained results showcased the emergence of hybrid work models and emphasized the importance of technology that supports collaboration across physical and virtual spaces.

By 2022, the obtained results explored the impact of digital collaboration on productivity, highlighting the positive outcomes for organizations effectively leveraging these tools. The literature emphasized the need for user-friendly and integrated collaboration platforms to streamline workflows and enhance communication, ultimately contributing to increased organizational efficiency.

This period laid the foundation for understanding the lasting impact of digital collaboration tools on the work environment, influencing not only remote work dynamics but also shaping the future of hybrid work models and organizational productivity. The insights contribute to ongoing discussions about the role of technology in fostering effective collaboration and communication in the modern workplace.

Cybersecurity Challenges in the Digital Landscape (2022-2023). As digitalization advanced, articles during the period from 2022 to 2024, such as the research conducted by Anderson and Brown (2023), delved into the cybersecurity challenges accompanying the rapid shift to digital landscapes. Findings underscored the heightened importance of cybersecurity skills as organizations faced increased threats in the virtual realm. The literature emphasized the need for a robust

cybersecurity infrastructure and ongoing digital education to mitigate risks associated with accelerated digitalization.

- *The Escalating Threat Landscape (2022).* In 2022, a significant focus within scientific articles centered on the escalating cybersecurity challenges in the digital landscape. Research, as exemplified by Anderson and Smith (2022), marked an early exploration into the evolving threat landscape. Articles during this period highlighted the increasing sophistication and frequency of cyber threats targeting organizations as they embraced digitalization. The literature emphasized the need for a proactive cybersecurity posture to mitigate the risks associated with an expanding attack surface.

- *Adaptive Cybersecurity Strategies (2022-2023).* Between 2022 and 2023, a surge in studies, such as those conducted by Carter et al. (2023), delved into adaptive cybersecurity strategies. Findings indicated that organizations faced with the dynamic nature of cyber threats were adopting adaptive approaches to cybersecurity. The literature emphasized continuous monitoring, threat intelligence integration, and the need for robust incident response plans as critical elements in adapting to the evolving cybersecurity landscape.

- *Human Element in Cybersecurity (2023).* In articles by Brown and Johnson (2023) explored the human element in cybersecurity challenges. Results showcased that human factors, including employee awareness, training, and behavioral aspects, played a significant role in the cybersecurity landscape. The literature emphasized the need for a human-centric approach, considering the potential impact of human behavior on cybersecurity, and advocated for ongoing education and training to enhance the cybersecurity awareness of organizational personnel.

Main Development Trends of Digital Skills Evolution. Examining the relevance of digital skills for many aspects of life and work (for example, education, labor market, lifelong learning, etc.), made it possible to find out the main trends in their development (Figure 2).

The main trends in the evolution of digital skills are:

Digital Transformation Initiatives. European businesses continue to undergo digital transformation, integrating digital technologies into various aspects of their operations. This includes the adoption of cloud computing, artificial intelligence, data analytics, and automation.

Increased Emphasis on Remote Work. The experiences from the COVID-19 pandemic have accelerated the adoption of remote work practices. Businesses are recognizing the importance of digital skills in supporting a remote workforce, including proficiency in virtual collaboration tools and cybersecurity measures.

Focus on Upskilling and Reskilling. Recognizing the rapidly evolving digital landscape, there is a growing emphasis on upskilling and reskilling the existing

workforce. Businesses and governments are investing in training programs to ensure employees have the necessary digital competencies.

Integration of Data Analytics. Businesses are increasingly leveraging data analytics for decision-making and gaining insights into customer behavior. This trend is driving the demand for professionals with skills in data analysis, interpretation, and visualization.

Cybersecurity Preparedness. With the rise in cyber threats, businesses are placing a strong emphasis on cybersecurity. Ensuring a cyber-secure environment is a critical aspect of digital skill development in the EU, and organizations are investing in training to enhance cybersecurity awareness and capabilities.

Collaboration with Educational Institutions. Businesses are collaborating with educational institutions and industry associations to bridge the gap between academic curriculum and the skills demanded by the job market. Partnerships aim to ensure that graduates are well-prepared with the digital skills required in the business landscape.

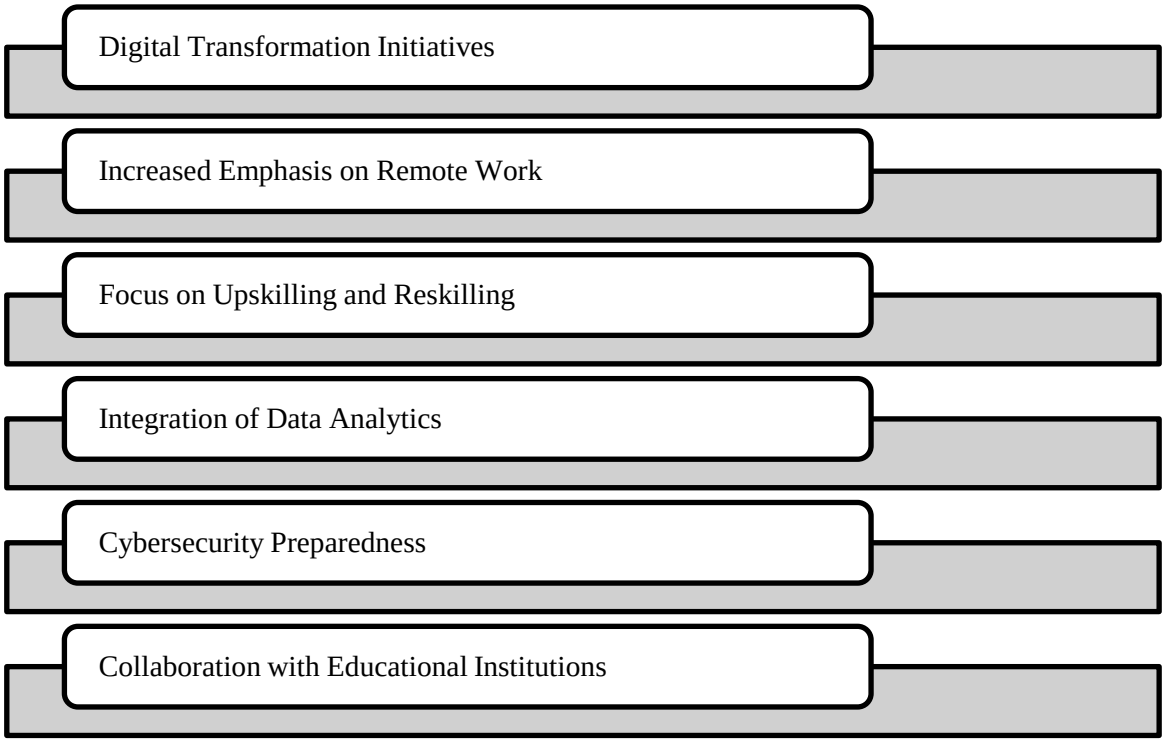

Figure 2. The main development trends of digital skills evolution

Source: systematized by the authors

From 2014 to 2022, the Digital Economy and Society Index (DESI) summarised indicators on Europe's digital performance and tracked the progress of EU countries (Figure 3).

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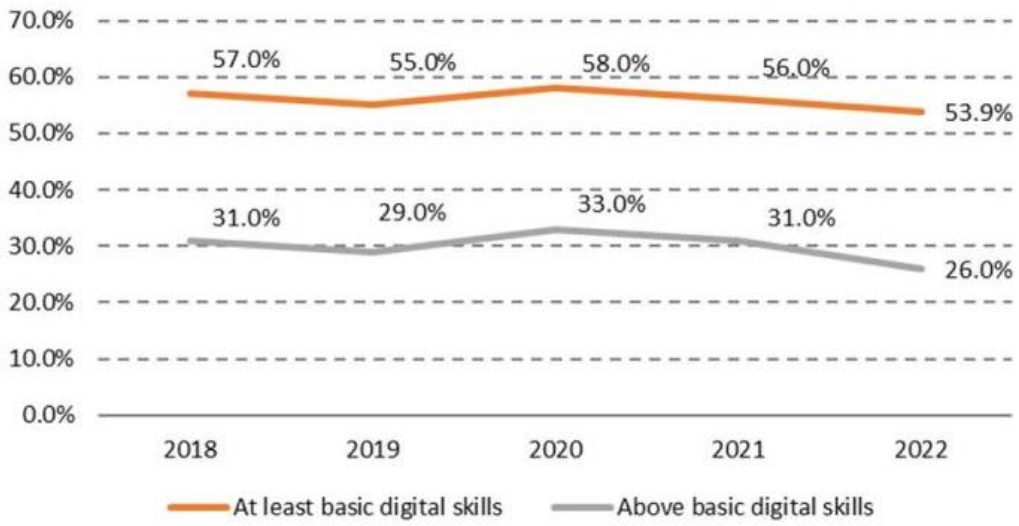

Figure 3. Report on the evolution of digital skills in the DESI Report 2018 - 2022
Source::Digital Economy and Society Index 2022, Human Capital

The main areas of further development of digital skills are the following:

1) *Continued embrace of emerging technologies* - Businesses in the EU are expected to continue embracing emerging technologies such as artificial intelligence, the Internet of Things (IoT), and blockchain. This will drive demand for digital skills in these areas.
2) *Government initiatives* - Governments within the EU are likely to introduce or enhance initiatives to support digital skill development. This includes funding for training programs, incentives for businesses to upskill their workforce, and policies aimed at fostering a digitally competent workforce.
3) *Focus on digital inclusion* - Efforts to ensure digital inclusion and reduce the digital divide are expected to gain prominence. This involves making digital skills accessible to all demographics, including those in underserved or marginalized communities.
4) *Adaptation to regulatory changes* - Businesses will need to adapt to evolving regulatory frameworks related to digital practices, data protection, and cybersecurity. This will require ongoing efforts to stay compliant and ensure that employees are well-versed in relevant regulations.
5) *Evolving nature of work* - The nature of work is continually evolving, and businesses will need to stay agile in response to changing dynamics. This includes flexibility in work arrangements, collaboration across borders, and an increased reliance on digital communication and project management tools.

Conclusions. The cumulative analysis of scientific articles spanning 2000 to 2023 paints a comprehensive picture of the evolution and significance of digital skills in the European Union's business landscape. The results highlight a progressive shift from

basic digital literacy to specialized skills, with a clear correlation between digital proficiency and organizational success.

Challenges persist, particularly in terms of widespread adoption, but the positive correlation between digital skills and business performance underscores the importance of continued investment in workforce development. As we move forward, the digital skills landscape in the EU remains dynamic, shaped by technological advancements, global trends, and policy interventions.

In summary, digital skills in business in the EU are characterized by ongoing digital transformation, a focus on upskilling, and adaptation to emerging technologies and remote work practices. The perspectives include a continued embrace of technological advancements, government support for digital skill initiatives, and a commitment to digital inclusion and compliance with evolving regulations.

This research serves as a foundation for future research and strategic planning, guiding policymakers, businesses, and educators in fostering a digitally resilient and competitive business environment within the European Union.

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CHAPTER 2
INNOVATIVE PROGRESS IN THE DIGITAL ECONOMY

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GOING TO DIGITAL ECONOMY: AN INTEGRATED APPROACH TO POLICY MAKING

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Abstract. *The digital economy is a type of economy where the key factors and means of production are digital data (binary, information, etc.) and network transactions, as well as their use as a resource, which makes it possible to significantly increase the efficiency and productivity of activities and value for the resulting products and services. The digital economy encompasses business in all sectors of economic activity, i.e. not only in the information and telecommunications sector, but also in basic industries, agriculture, construction, etc. The analysis of digital trends makes it possible to predict the development of a specific economic, technological and even social phenomenon in the future. The development of the digital economy, depending on the assessment of criticality and the need for rapid and deep changes in the traditional economic structure, can develop according to two scenarios. The inertial (evolutionary) scenario involves the inertial continuation of the trends of the past, that is, the perception of technology and digitalization of the economy and the use of human capital as non-priority. The economy remains inefficient, labor migration and "brain drain" continue, and products lose competition on foreign markets. The target (forced) scenario envisages the transition of the economy within 5-10 years to the development and appearance of a significant share of the digital economy in its structure (up to 65% of GDP). It includes ensuring the rule of law and removing institutional (legislative, tax, etc.) barriers that hinder the development of the digital and innovative economy; systemic state stimulation of digitalization of the economy and business sectors; initiation by the state of large-scale transformational initiatives and digitization projects, in particular based on modern models of public-private partnership. According to the target scenario, the key strategy for digitization should be the focus on the domestic market, and the key initiatives should be the formation of motivations, demand and needs for digital technologies among consumers (businesses, the state, citizens). Creating a digital society means creating a society that intensively and productively uses digital technologies for their own needs (self-realization, work, recreation, education, leisure for everyone), as well as for the achievement and implementation of common economic, social and public goals. The way to an effective country and economy is through the development of the domestic market for the consumption of information, communication and digital technologies.*

Keywords*: digital economy, economic growth, digital growth, key policy indicators, digital society, digital security, digital transformation strategy*

The technologies development evolution. The modern world has already taken the first step towards a fundamentally new technological, economic and social reality. However, the challenges ahead modern industrial society, it is difficult to overestimate. It's about change in the global socio-technological structure, the result of which is complete reformatting the systems we are accustomed to, forming new social and economic strategies. At the same time, the technological paradigm is changing, management models and social norms are changing, and large-scale ones are taking place demographic changes.

An important feature of today is the rapid increase in digital gaps, endangering the growing backwardness of developing countries. Production for any country the sector and the policy of maintaining its own technological level are strategically important national objectives for economic development, services and income growth and national welfare. Today it is complete the thesis that "any nation or group of nations that does not have the developed manufacturing sector will be at the mercy of more competent countries. Any population, rich or poor, needs a strong production base in order to prosper in the economy and defend themselves politically" (Rynn, 2000).

The potential for economic growth is determined by production capabilities of the country, which form different levels of production capacity:

1. Zero level - consumption of other people's goods and services (imports). Lack of production in the country. Proceeds from resale imports.

2. The first level is the production of goods on someone else's equipment. Import dependence on the manufacturer.

3. Second level – production of own production equipment different goods (assembly level). Import dependence on manufacturers of machines, assembly lines, other reproduction equipment required in production.

4. Third level – production of equipment for the production of equipment. Technology development.

The development of technologies is carried out by the richest countries and the most influential economies, which are called industrial states on which they depend countries consuming this equipment. Own technologies are able to provide rapid growth of industry at all levels, as well as economic independence and information security. Businesses working on technology development create modern production facilities for everyone else industries, automate, mechanize enterprises, provide continuous technical re-equipment, introduce innovations, and as a result increase their productivity, and thus affect overall growth productivity in the economy as a whole. Countries that depend on technology imports will be forced to remain on the periphery of the developed world.

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Informatization and digitization of public life covers all aspects of the functioning of the economy, therefore the transition to the digital economy should be taken into account in the management system of the national economy, and information and information and communication technologies should be considered as important components of ensuring economic growth and economic security (Rumyk, & Melnichenko, 2023).

Today, we are witnessing a rapid pace of reindustrialization of technologically advanced countries on new grounds (additive technologies) (3D printing), robotics, renewable energy, etc.).

The current state of development of digitalization is quite significant (Table 1).

Table 1. Digital around the world

Indicator	Indicator Value					
	Jan 2021	Urbanisation	vs Population	Jan 2023	Urbanisation	vs Population
Total population	7.83 billion	56.4%	x	8.01 billion	57.2%	x
Unique mobile phone users	5.22 billion	x	66.6%	5.44 billion	x	68.0%
Internet users	4.66 billion	x	59.5%	5.16 billion	x	64.4%
Active social media users	4.20 billion	x	53.6%	4.76 billion	x	59.4%

Source: Digital 2021, & Digital 2023

Essential headlines for mobile, internet, and social media use. Internet user numbers no longer include data sourced from social media platforms, so values are not comparable with previous reports.

Today, the growth of digitalization is quite impressive (Table 2).

Table 2. Global digital growth

Indicator	Indicator value			
	Jan 2021	Jan 2021 vs Jan 2020	Jan 2023	Jan 2023 vs Jan 2022
Total population	+1.0%	+81 million	+0.8%	+67 million
Unique mobile phone users	+1.8%	+93 million	+3.2%	+168 million
Internet users	+7.3%	+316 million	+1.9%	+98 million
Active social media users	+13.2%	+490 million	+3.0%	+137 million

Source: Digital 2021, & Digital 2023

Despite these impressive figures, it's worth noting that the ongoing coronavirus pandemic has significantly impacted research into internet use around the world, so many countries have been unable to provide updates to internet user numbers in the past 12 months.

As a result, internet user numbers have likely grown more than the reported 7 percent, and we may see 'corrections' to these figures once everyday life (and research) can return to normal.

The digital economy is significantly changing traditional business processes. With the achievement of the most complex levels of digitalization in the economy is a radical transformation of industrial relations of participants, resulting in is the integration of production and services into a single digital (cyber physical) system, in which:

- all elements of the economic system are present simultaneously in the form of physical objects, products and processes, as well as their digital copies (math models);
- all physical objects, products and processes due to the availability of digital copies and elements of connectivity become part of an integrated IT system;
- due to the availability of digital copies (mathematical models) and being part of a single system, all elements of the economic system are continuous interact with each other in a mode close to real time, model real processes and predicted states, provide constant optimization of the whole system.

Developing and implementing appropriate policies for the digital age is a complex task that can bring many benefits. European countries have developed an integrated Going Digital policy that helps countries shape policies for an inclusive digital future. The framework recognizes technology, data and business models as drivers of digital transformation.

The framework includes seven interrelated policy dimensions: access, use, innovation, jobs, society, trust and market openness (OECD-1, 2020). Each of the dimensions brings together multiple policy domains that need to be considered jointly. Leveraging the benefits and addressing the challenges of digital transformation require co-ordination across all policy domains identified by the framework.

Access to communications infrastructures, services and data underpin digital transformation and become more critical as more people and devices go online.

Key policy domains and indicators of Access (Figure 1).

Communication infrastructures and services facilitate the use of digital technologies and facilitate the interaction between connected people, organizations and machines. They provide the basis for an open, interconnected and distributed Internet that provides a global free flow of information. High-quality access to competitive networks and services at competitive prices is fundamental to digital transformation.

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Data is becoming an equally important resource. In many contexts, data is the driving force of economic activity and the overall contribution to production, but the benefits depend on the availability and availability of data.

Expanding access to and sharing of data is therefore important, although such decisions need to be balanced with data privacy and security considerations, in particular. Governments can improve access in four key ways.

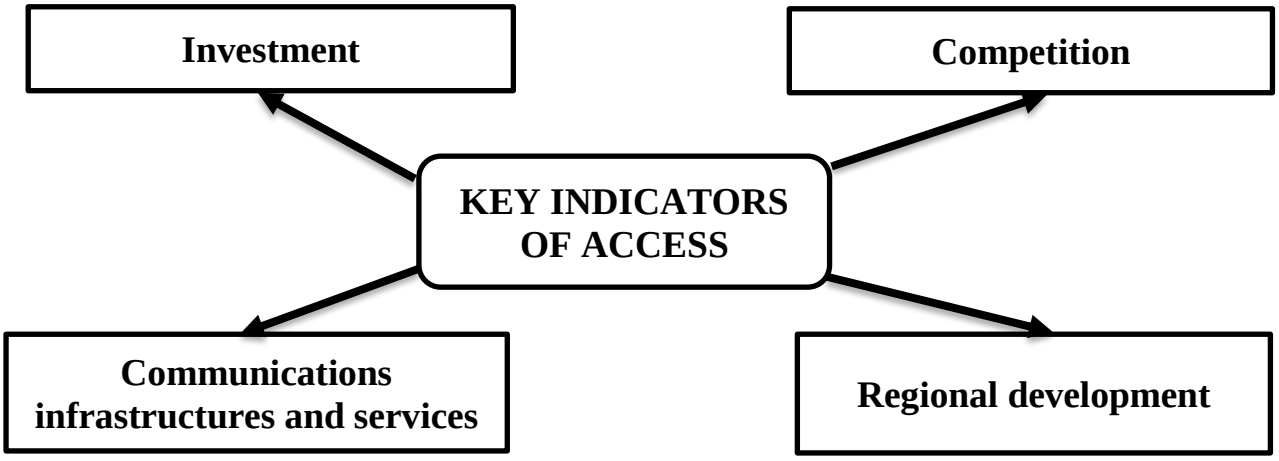

Figure 1. Key policy domains and access indicators

Source: systematized by the author

The first key and direction is investment. Policymakers can encourage investment in communications infrastructure, especially broadband networks, by encouraging the deployment of more fiber in networks to significantly increase the speed of technology use. Among OECD countries, the private sector invests the largest share in communication infrastructures and services. However, governments sometimes support such investments when it is not economically feasible otherwise.

To stimulate further investment in the network, policymakers need to remove barriers to investment and improve competition. Some important barriers include the availability or use of key technical means, including Internet Exchange Points (IXPs), spectrum, and IPv6 addresses.

The second key and direction is communications infrastructures and services. Communications and services infrastructure policy is critical to facilitating the deployment of high-speed infrastructure. For example, simplifying licensing requirements, eliminating regulatory uncertainty, and facilitating effective access to travel rights can help stimulate investment. These regulatory issues may become increasingly important in the light of next-generation wireless networks ("5G") (OECD-284, 2019). In some countries, the lack of adequate infrastructure, such as

electricity, roads and ports, can be a significant barrier to investment. Removing illegal restrictions on foreign investment can also stimulate infrastructure investment.

The third key and direction is competition. Policymakers also need to increase competition in the communications infrastructure and services markets to stimulate private investment and help further deploy fiber in fixed networks. This can support the increase in speed and bandwidth of all next-generation technologies, including 5G networks (OECD-284, 2019). Competition between infrastructure and service providers influences investment and pricing decisions. This can improve the quality and speed of broadband access, including for underserved populations. Competition policy should ensure that users benefit from a wider choice of services from networks and service providers, or through bundled or simple voice, data and video offerings.

The fourth and last key and direction is regional development. Regional development policies are important to bridge the digital divide, namely the differences in access to broadband access in urban, semi-urban, rural and remote areas. Governments may decide to address the critical bottlenecks of needed private investment in rural areas by investing in high-speed highways or transport infrastructure (OECD, 2017). Public investment is often driven by open access policies to avoid encouraging monopolies in underserved areas (OECD-264, 2017).

Along with communication infrastructures and services, access to data flowing through such infrastructures is becoming increasingly important as data is a key source of value and its efficient and innovative use and reuse can stimulate economic and social benefits. However, these benefits, from innovative applications to increased transparency and accountability, depend on the availability of data. As a result, expanding access to and sharing of data is an important policy issue in the digital age (OECD-1, 2019).

Key areas for access policy:

1. Promote competition to stimulate investment in communication infrastructure and services. Depending on local market conditions, having more mobile network operators (for example, four instead of three) can lead to more competitive and innovative services. Passive infrastructure sharing and co-investment can also help expand coverage.

2. Ensure the availability of technical facilities such as Internet exchange points, efficient spectrum allocation and next-generation Internet protocol addresses. Reduce administrative barriers to investment, such as burdensome licensing requirements and difficult travel rights.

3. Increase connectivity in rural and remote areas, for example by investing directly in high-speed fixed networks or encouraging private investment. This may include competitive tenders, tax exemptions, low-interest loans, government support or lower spectrum fees.

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4. Expand access to and exchange of data, balancing the benefits and risks, taking into account legitimate national, commercial, private and security interests through, for example, contractual agreements, limited data sharing arrangements, data portability and open government data (OECD-2, 2019).

The use of the capabilities and potential of digital technologies depends on how they are used. Effective use enables people to participate in society, firms to increase productivity, and governments to move to digital technologies and use a user-centered approach. The widespread and effective use of digital technologies and data requires an awareness of the opportunities they bring, business dynamism, investment in information and communication technologies (ICTs) and additional assets, especially skills.

At the same time, policies need to build trust in the digital environment, for example by empowering people and organizations to better manage digital risks.

Key policy domains and indicators of Use (Figure 2).

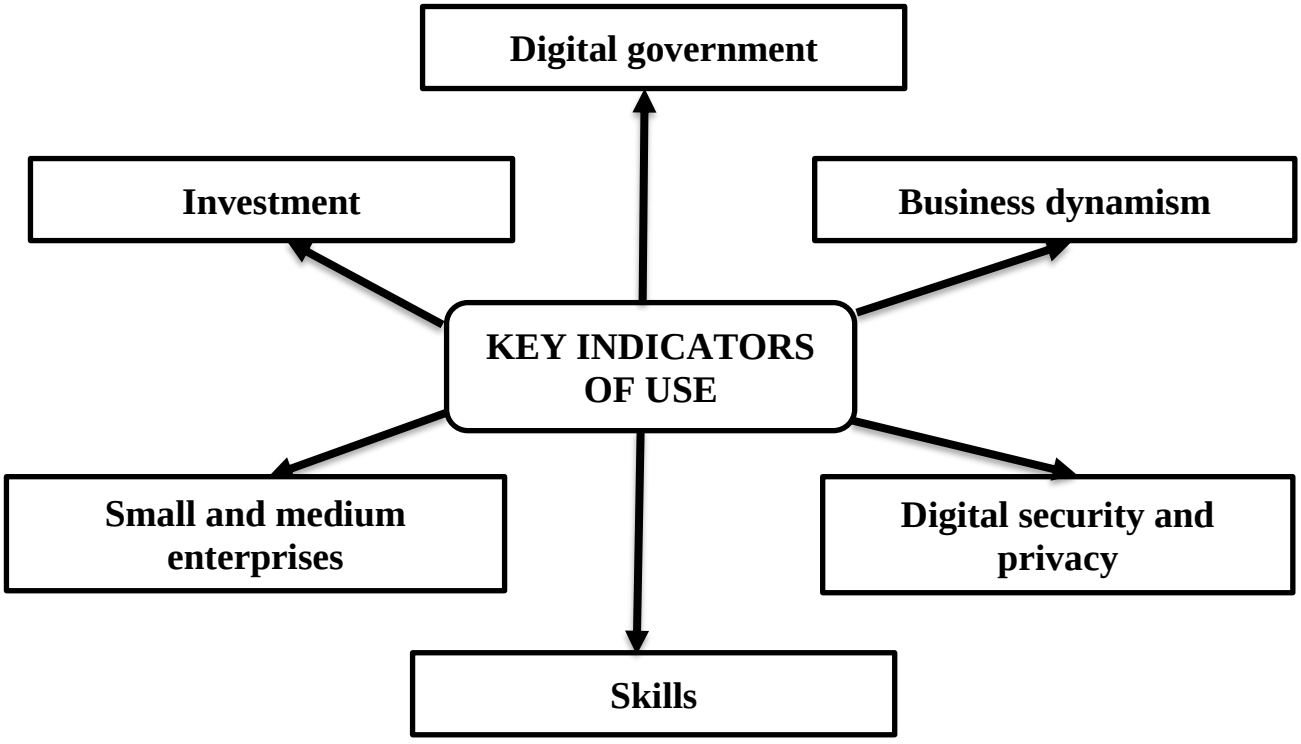

Figure 2. Key policy domains and use indicators

Source: systematized by the author

The first key and direction is digital government. Digital government strategies help to provide a more integrated approach to the digital transformation of government and the public sector (OECD, 2014). Most OECD countries have digitized some aspects of public service delivery (eg public procurement and tax collection). However,

large differences between countries persist. There is still great potential for more integrated approaches to digital government.

This includes the use of digital technologies to digitize analog processes and services; reorganization of administrative procedures to make them digital for the project; make user needs change drivers; and the discovery of government data. In addition, countries are increasingly using a "mobile first" approach to digital government.

The second key and direction is investment. Unlocking the potential of digital tools for firms to increase productivity requires successful dissemination, which depends heavily on firms' investment in ICT as well as public investment in infrastructure and equipment. Countries encourage investment in ICT through financial support or incentives for the purchase of ICT equipment or services, as well as non-financial support (e.g. targeted training), including (OECD-280, 2019). Effective use of technology also requires firms to invest in additional assets, including knowledge-based capital (KBC). KBC's assets include research and development (R&D), data, organizational capital and skills.

The third key and direction is business dynamism. The spread of technology is due to the dynamism of the business, which depends on the efficient allocation of resources. The digital transformation of firms involves experimentation and learning. Some firms are successfully implementing digital tools and expanding rapidly, while others are downsizing or exiting the market (Andrews, & Criscuolo, 2013). Business dynamism can benefit from structural reforms. Some policies may affect competitive pressure and business dynamism, and in turn, the spread of technology and better allocation of resources. These include labor market regulation, employment protection legislation and the development of insolvency regimes. For example, governments could impose lower penalties for bankruptcy and reduce barriers to corporate restructuring of insolvent companies (Sorbe, Gal, Nicoletti, & Timiliotis, 2019).

The fourth key and direction is small and medium-sized enterprises. Effective use of digital tools is becoming increasingly important for small and medium-sized enterprises (SMEs) to improve business processes, innovation, expansion and internationalization. However, SMEs lag behind large companies in implementing digital tools and, most importantly, in using advanced ones. The main obstacles are lack of awareness; limited collateral for risk and access to finance for investment in ICT and additional assets; and lack of human resources and capabilities (e.g., ICT professionals). To help overcome these barriers, governments need to better target policy on SMEs (OECD-2, 2019).

The fifth key and direction is skills. The dissemination and effective use of technology depends crucially on skills (Andrews, Nicoletti, & Timiliotis, 2018). The success of firms in the digital age depends on employees who are well versed in

literacy, numeracy, problem solving and general ICT skills used in the workplace. Increasingly, this also requires ICT specialists and data specialists. In addition, firms need additional skills and competencies for new organizational forms and in intensive digital sectors. Ensuring the right skills for the digital age requires investment in education and training. Primary education should provide strong literacy and numeracy skills. Over time, students need options for developing ICT and additional skills, including social, communication and management skills. In addition, many forms of learning can benefit from the use of digital technologies (OECD-3, 2019).

The sixth and last key and direction is digital security and privacy. Mistrust of digital technologies can be an important barrier to dissemination and efficient use. In particular, concerns about digital security and privacy can seriously hamper people's propensity to engage online. For business, trust is also a key factor influencing the adoption and use of digital tools. Governments may also face privacy concerns, such as linking datasets or disclosing government data to the public. Removing these barriers requires better digital risk management for all participants. This involves building capacity to assess digital risk and reduce it to an acceptable level, including by mitigating and/or transferring risk.

Key areas for increasing effective use policy:

1. Bridge the gap between high- and low-educated people and give everyone a combination of skills to thrive and trust in the digital world. To do this, review education and training systems to make better use of digital learning opportunities.

2. Accelerate the proliferation of digital tools to stimulate productivity growth for companies, including small and medium-sized enterprises. To this end, encourage investment in digital technologies and intangible assets (such as patents, software) and promote business dynamism and structural change that stimulates implementation.

3. Transition from e-government to a holistic and user-driven approach to digital government. At the same time, continue to improve public services on the Internet and ensure the consistent use of digital technologies and data at all levels and levels of government.

4. Address distrust to increase online engagement by raising awareness and enabling people and businesses to better manage digital risks (OECD-2, 2019).

To fully embrace and benefit from the digital transformation, individuals, companies and governments need to be confident that the digital environment will outweigh the negative outcomes of their social and economic performance. The digital environment can exacerbate digital security incidents, information asymmetries, power imbalances, or jurisdictional issues. This can lead to violations of laws and regulations, such as privacy, consumer protection or product safety, that aim to reduce this imbalance and problem. This uncertainty needs to be mitigated as much as possible to ensure trust.

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Key policy domains and indicators of Trust (Figure 3.3).

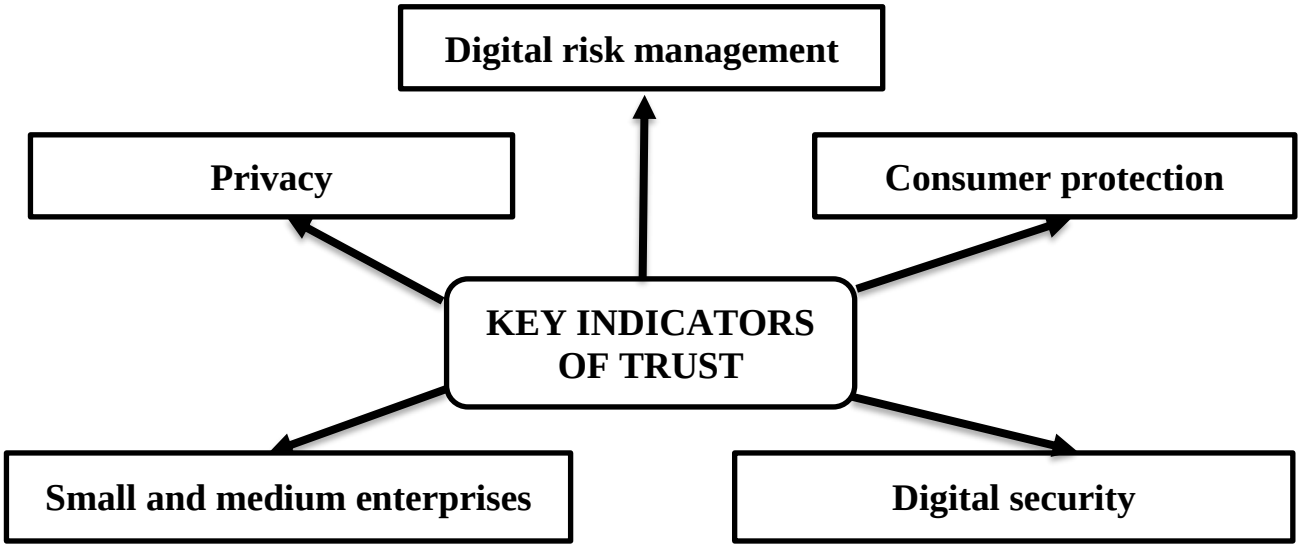

Figure 3. Key policy domains and trust indicators

Source: systematized by the author

The first key and direction is digital risk management. Digital risk management applies to both individuals and organizations - from small and large businesses to government agencies. All entities share some responsibility for managing the digital risks of their activities. This will vary depending on their roles, ability to act, context and the need to have appropriate risk management skills. Risk is a cross-border, cross-sectoral and multilateral problem. Thus, digital risk management provides a common reference structure for different political communities to discuss trust policies in an integrated way. It also allows different actors to view risks in a more holistic way, based on the fundamental components of the risk management cycle.

The second key and direction is privacy. As the digital transformation progresses, confidentiality is becoming a critical factor affecting trust, especially the protection of personal data. Confidentiality is recognized as a fundamental value that deserves protection, as well as a condition for the free flow of personal data across organizations and borders (OECD, 2016). Technological advances can help build trust through "design confidentiality," which takes into account the implications of confidentiality at the initial stage of product or service design.

While technology can help, it cannot replace a strategic approach to protecting privacy and personal data. One example is the national data strategy, which is supported at the highest level of government, which includes the perspective of the whole society and balances individual and collective interests. The compatibility of confidentiality and data protection at the national and international levels must be maintained at the international level.

The third key and direction is small and medium enterprises. SMEs, and startups in particular, are crucial for economic growth, fostering competition, innovation and job creation. However, they also face various challenges in digital risk management. As a rule, SMEs do not have the awareness, resources or experience to effectively assess and manage risks. To help SMEs realize the potential of digital transformation, they need to be more aware of best practices in digital risk management.

The fourth key and direction is consumer protection. For digital transformation to thrive, it is important to effectively protect consumers when they engage in e-commerce and other online activities. Transactions involving digital content and services (including zero-cost actions that include user data) as well as blurred boundaries between consumers and businesses can also complicate traditional notions of ownership, responsibility, rights and responsibilities.

The main problems are information disclosure, fraudulent and unfair commercial practices, confirmation and payment, fraud and theft of personal data, product security, as well as dispute resolution and redress. New forms of asset and content use, including leasing, asset sharing and subscription sharing, create problems for consumers to understand their rights and responsibilities. In financial markets, people (especially those with low digital literacy) need new skills and knowledge to use new digital products and services effectively, and to understand the potential implications of data exchange.

The fifth and last key and direction is digital security. Because it is not possible to create a completely secure and secure digital environment, businesses, other organizations and individuals are always at some risk of digital security when working online. Safety standards (such as ISO 27000 series) can increase resilience and maintain business continuity by mitigating the potential consequences of security incidents. All stakeholders are interdependent in the digital environment, including abroad. Thus, fostering partnerships, including with small and medium-sized enterprises, can help reduce risks and promote effective risk management. Cyber insurance can be an important element of digital security risk management. This can ensure the transfer of certain risks, creating incentives for better risk management.

Key areas for strengthening trust:

1. Use risk management as a basis for developing trust policies, including assessing and managing risks related to digital technologies, data and cross-border flows. Ensure that digital security risk goes beyond technical issues to be a strategic priority for individuals, companies, including small and medium-sized enterprises, and governments, and for everyone to take responsibility for managing digital risks.

2. Develop and implement a national society-wide privacy strategy supported by the highest levels of government. Encourage the compatibility of confidentiality

systems in different jurisdictions to ensure the free flow of personal data; increase transparency regarding the purpose and use of personal data collections; and expand users' access and control over their data, including through "design privacy".

3. Support digital consumers who face problems with online disclosure, deceptive and unfair commercial practices, verification and payment, fraud and identity theft, product security, and dispute resolution and redress, including in the context of connected devices where offline and online worlds coincide (OECD-2, 2019).

Digital technologies are changing the environment in which firms compete, trade and invest. The openness of the market allows digital transformation to flourish, creating a business-friendly environment. This allows foreign and domestic firms to compete on equal terms and without undue restrictions or rules. In this regard, market openness policies related to trade, investment, financial markets, competition and taxation play an important role.

Key policy domains and indicators of Market openness (Figure 4).

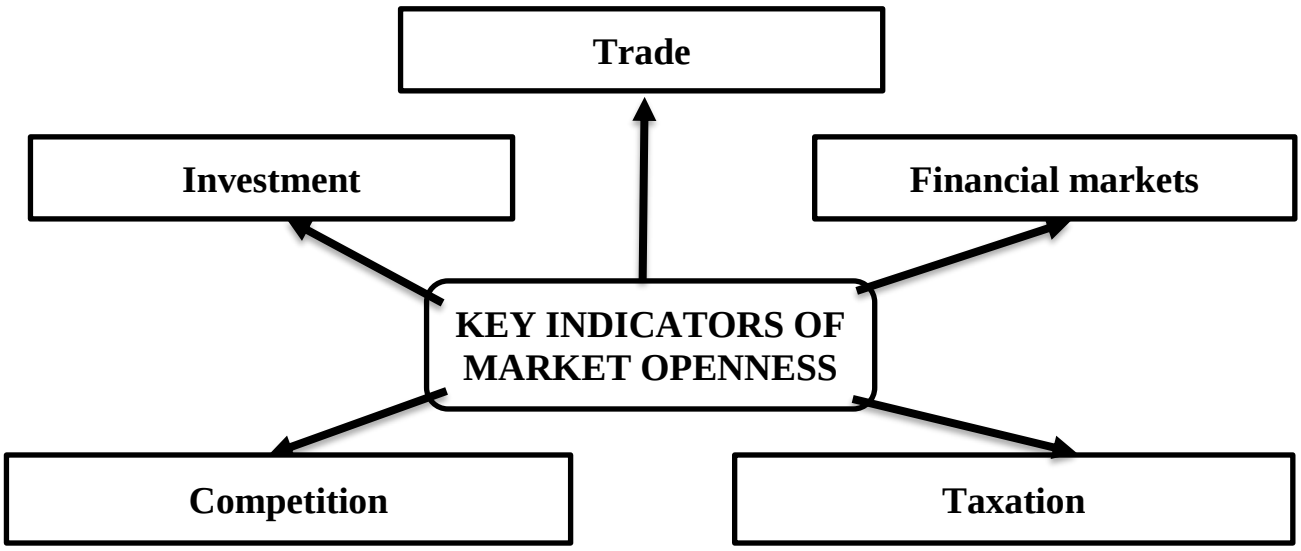

Figure 4. Key policy domains and Market openness indicators

Source: systematized by the author

The first key and direction is trade. Digital technologies and data have a profound effect on international trade, reducing trade costs; promoting the coordination of global value chains; dissemination of ideas and technologies across borders; and connecting more companies and consumers around the world. In particular, goods are increasingly being combined with services, and new and previously non-traded services are now being traded across borders. To reap the benefits of trade in the digital age, a dialogue with many stakeholders on regulatory approaches is needed. These approaches should ensure the compatibility of different regulatory regimes, especially for international issues such as cross-border data flows. To support this dialogue, it is

necessary to better understand the nature and composition of disparate data flows, as well as to clarify the scope of public policy objectives.

The second key and direction is investment. Investment regimes that mobilize private investment, in particular in communications infrastructure, technology and KBC (e.g. business models, software and data), combined with open financial markets, attract foreign direct investment (FDI). Multinational cross-border businesses can make extensive use of digital technologies and data to organize their business operations and improve processes and procedures (see Use). The use of such technologies also facilitates international market transfer (Lesher, & Miroudot, 2008).

The third key and direction is financial markets. Effective, stable and open financial markets based on transparency, confidence and honesty help allocate financial resources to companies investing in digital transformation. Open financial markets also ensure that domestic financial services firms can compete with foreign competitors. Increased competition should make domestic firms more efficient and transparent. Cash flows can reduce the cost of capital for firms in countries where capital is scarce. This, in turn, can increase investment in digital transformation. Digital technologies are also at the heart of new forms of external financing (e.g. crowdfunding).

The fourth key and direction is competition. Increased competition in the digital age, including by opening access to markets, benefits consumers by lowering prices and diversifying goods and services. This, in turn, supports trade and investment. Competitive markets also contribute to digital transformation by stimulating innovation, new business models, dynamism and business productivity, stimulating structural change in the economy. However, as digital technologies and data increase competition in many markets, they have also shown the potential to lead others to greater concentration, market power, and even dominance. The OECD Competitive Assessment Toolkit helps governments remove barriers to competition by identifying unnecessary restrictions on market activity and developing alternative, less restrictive measures (OECD-2, 2020).

The fifth and last key and direction is taxation. Digital transformation has a wide range of implications for taxation. This affects tax policy and tax administration at both domestic and international levels, introducing new tools and challenges for politicians. Work under the OECD / G20 project "Base Blurring and Profit Movement" (BEPS) and the BEPS Inclusive Platform have recognized that digitalization – and some related business models – are important challenges for international taxation (OECD, 2018).

Members of the BEPS Inclusive Platform agreed to conduct a coherent and simultaneous review of two key aspects of the existing tax system - income distribution rules and interconnection rules. This review will look at the impact of digitalization on

the economy, related to the principle of matching profits with core economic activities and value creation.

Key areas for fostering market openness:

1. Monitor changes in competitive dynamics, especially trends in market concentration and dominance in digital-intensive sectors, and ensure that competition authorities use flexible tools and cooperate across borders to address transnational competition.

2. Reducing trade barriers, especially for digital services, such as inefficient interconnection management. Ensure a holistic market openness policy through dialogue with many stakeholders to ensure interoperability between regulatory regimes, including for cross-border data flows and relevant privacy and security considerations.

3. Reduce barriers to international investment, including in communication infrastructures, digital technologies and knowledge-based capital (eg business models, software, data), and promote the opening of financial markets.

4. Make sure tax systems meet the goals of the digital age through ongoing international cooperation to reach a global consensus solution (OECD-2, 2019).

The digital transformation has already begun to change organizations and markets, raising important questions.

What works may disappear?

Where will the new ones come from?

What will they look like?

What skills will be needed?

At the same time, other questions arose.

Who can suffer the most?

What can be done to help create jobs and match skills development to the changing needs of new jobs?

The social partners can play an important role in answering such questions.

Key policy domains and indicators of Jobs (Figure 5).

The first key and direction is labour markets. Maintaining and improving the efficiency of the labor market in the digital world of labor requires a new look at the labor market rules. These include employment protection legislation, minimum wage laws, working hours and health and safety regulations, in particular (OECD-4, 2019). The digital transformation can continue to contribute to non-standard forms of work, which will lead to job security and income for some such workers. Countries need to decide whether to update the legal framework or update it to meet the objectives. Such a framework should ensure that all workers, regardless of the type of contract, receive appropriate rights, including freedom of association and negotiation, equal pay for equal work, benefits and protection.

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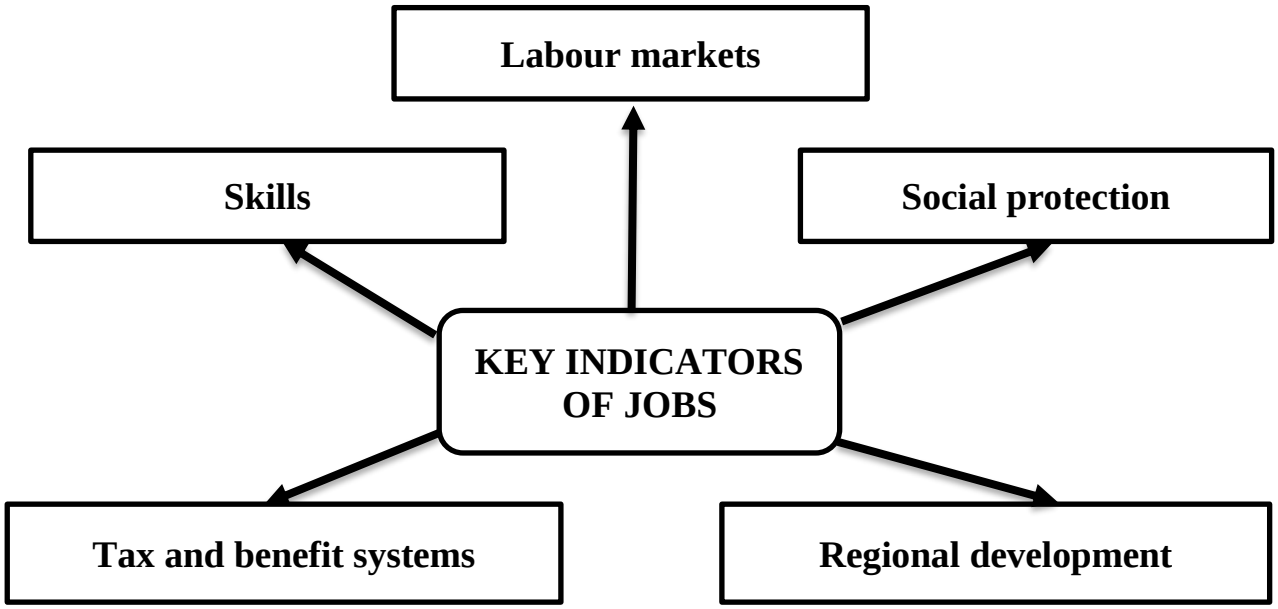

Figure 5. Key policy domains and jobs indicators

Source: systematized by the author

The second key and direction is skills. People need the right combination of skills to prepare for future work. The evolution of skills needed to thrive in a highly digital economy and society remains uncertain. However, a set of important skills includes literacy, computing and problem solving, general ICT skills, and complementarity skills and competencies (e.g., creative thinking and teamwork). Effectively responding to these skills needs requires a holistic approach to skills development, from early education to lifelong learning. Investments in training needed to meet future needs are beyond the reach of the public sector, which also involves firms and individuals. Training should be targeted at those who need it most, who are often low-skilled workers. Online courses, such as mass open online courses (MOOCs), also offer flexible and affordable distance learning options in several areas, however (OECD-3, 2019).

The third key and direction is tax and benefit systems. Governments also need to expand and / or adapt tax and benefit systems to ensure that all workers have minimum protection and wages, and that their various sources of income are included in the tax system. Tax and benefit systems should facilitate the transfer of rights to social insurance to prevent the loss of entitlements when workers move out of work. Governments may also need to expand the role of contributory schemes so that no one is left without social protection due to their contractual status.

The fourth key and direction is social protection. Social protection is crucial to ensure a successful and equitable transition for all, including displaced workers. Some workers will want to move to new professions. Others will try to enter the labor market

for the first time or after a period of unemployment. In both cases, they may not immediately find a new job. Assistance to these workers includes a system of well-designed and adequately resourced active and passive labor market programs. These approaches provide employees with timely access to basic job search services and target those who need more assistance. Many people work informally and are not protected by current rules. All this adds to the problems faced by social security systems, which still largely involve the conclusion of a permanent, permanent contract with one employer.

The fifth and last key and direction is regional development. Regional development policy is needed to overcome the geographical differences that arise from the creation and automation of jobs created by digital means (Sorbe, Gal, & Millot, 2018). Reducing the cost of relocation, for example through subsidies, is one way to increase labor mobility and help relocated workers return to work. In addition, well-designed housing policies can encourage people to relocate to regions with more and better jobs (Andrews, Caldera Sánchez, & Johansson, 2011).

Key areas for ensuring good jobs:

1. Promote a successful and equitable transition from job cuts to job expansion, balancing flexibility and mobility (including by stimulating wages for workers to move from low-productivity to high-performance firms) and job stability, including through dialogue with the social partners).

2. Review labor market policies and institutions to facilitate the adaptation of firms' workforces and facilitate the transition from work to work for workers. Ensure adequate protection through better skills transfer, transferability of benefits and effective employment services.

3. Make sure people have the right combination of skills to succeed in technology-rich work environments, including strong cognitive skills, ICT skills, advanced skills, special skills, and the ability to cope with change and continue learning, including without work. Coordinate between educational and training institutions, employers and social partners.

4. Prepare for a serious learning task and review education systems. Improve the accessibility, quality and equity of youth education and adult learning throughout their working lives, including by removing barriers to adult learning, promoting learning for those most in need, and making better use of digital technologies for learning.

5. Solve the problems of new forms of work and ensure good results for all workers by applying and, if necessary, reviewing and expanding labor market regulation and strengthening the voice of workers. Reduce the risk of arbitrage between different forms of employment and work by ensuring neutrality of regulation, tax systems and benefit schemes.

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6. Improve social protection so that no one is left behind. Strengthen active labor market programs to support displaced workers and develop effective income support schemes to ensure income security without undermining incentives to work (OECD-2, 2019).

Digital transformation affects society and culture in a complex way.

First, digital technologies are dramatically changing the way individuals, firms, and governments interact. In addition, the overall impact is often unclear and may vary from country to country. For example, digital technologies improve access to information (free and interconnected Internet), improve health care (e.g. telemedicine) and enrich education (e.g. MOOCs).

On the other hand, there are problems related to the imbalance between work and life; division of people into relatively isolated groups of like-minded people; Adverse effects on mental health, such as screen addiction, depression and cyberbullying, including among children; and the emergence of digital divide (e.g., gender, skills).

Key policy domains and indicators of Society (Figure 6).

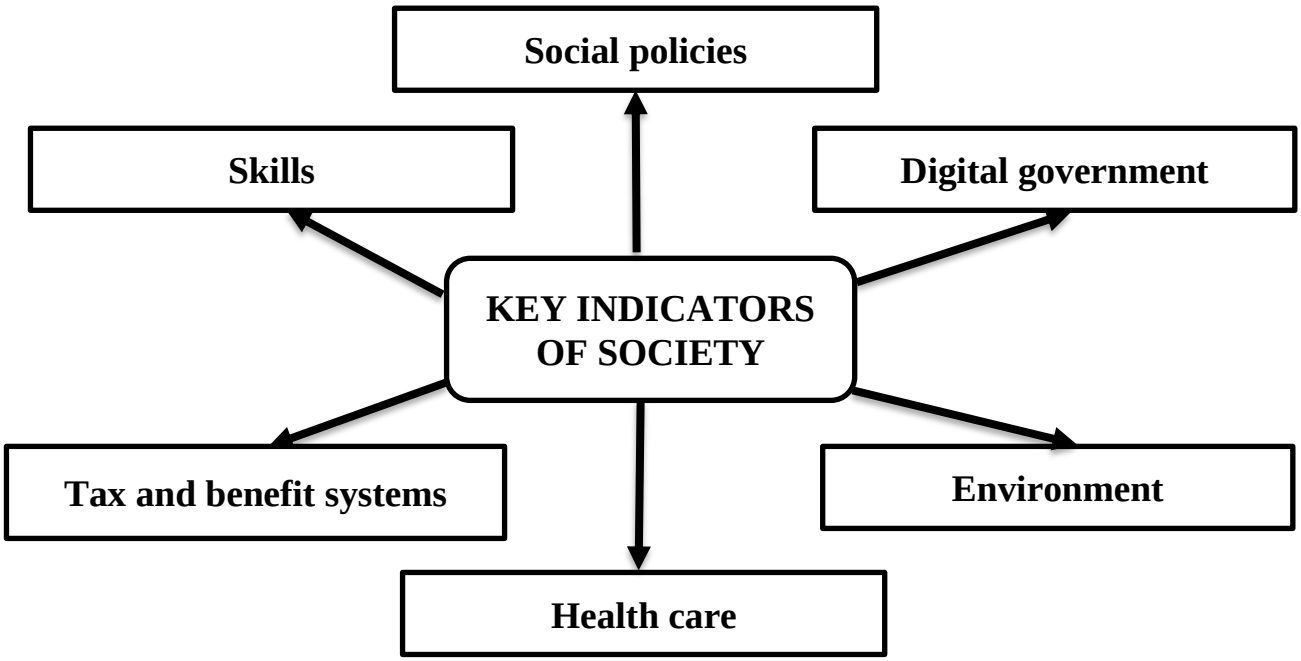

Figure 6. Key policy domains and society indicators

Source: systematized by the author

The first key and direction is social policies. Social policy can help bridge a number of digital gaps. For example, when knowledge-intensive firms come together in places with highly skilled workers, locally based social policies can help bridge geographical gaps (Moretti, 2012). Digital instruments can also help governments make better social policy choices and improve welfare. For example, a combination of

long-term and multi-domain data on individuals, families, and the environment can give an idea of the impact of policy on communities.

The second key and direction is skills. Developing skills throughout the life cycle, especially through education and training policies, can ensure that digital transformation benefits all and avoids the escalation of existing differences. Skills development includes a number of core competencies, including literacy, numeracy and problem-solving skills (see "Use"). It also covers social and emotional skills that are increasingly valued by employers and society at large. Approaches to developing such “soft skills” include working with students ’feelings and attitudes through role-playing games, collaborative pedagogy, games, case studies, problem-solving pedagogy, sport and the arts (Le Donné, Fraser, & Bousquet, 2016).

The third key and direction is tax and benefit systems. As the economy and societies change and adapt, redistribution policies, such as tax and benefit systems, ensure that no one is left behind. Redistribution due to income support has declined in OECD countries along with a decline in the share of personal income tax. However, higher aggregate spending on policies such as health care has partially offset this change (Causa, & Hermansen, 2017). Governments may also need to review redistribution models in light of changes in the organization and nature of work (Causa, Vindics, & Akgun, 2018).

The fourth key and direction is digital government. The digital government can provide users with access to digital public services in a way that is convenient for them and in a new way. For example, citizens can enjoy enhanced interaction with public administrations within and between levels of government. If the provision of services differs between different government agencies, governments can apply the "once only" principle. This would reduce the burden on citizens and businesses, which would have to provide the same information several times. In addition, digital "single windows" can facilitate access to information and assistance, for example, for job seekers. Governments can also gather more information by interacting with citizens online to personalize public services and better target public policy.

The fifth key and direction is environment. Digital technologies also create challenges and opportunities to address some of the major collective challenges, such as the environment and health. In terms of the environment, digital technologies can support green growth. For example, they can ensure efficiency and monitoring in "smart" infrastructures and cities. However, expanding the range and rapidly spreading digital technologies can also increase the need for resources and energy in production and use. This offsets some environmental benefits, which will lead to a greater need for recycling and disposal of old equipment.

The sixth and last key and direction is health care. With regard to health care, the digitization of medical records, the expansion of remote care and teleconsultation,

and the introduction of mobile health technologies can improve health care and potentially reduce costs. However, data-based health services also pose new challenges. These relate primarily to the protection and confidentiality of personal data, security, control and ownership, transparency and accountability, and quality and security. Proper management of sensitive health data can solve many of these problems.

A number of social problems have arisen or exacerbated as digital transformation progresses, including ethics and morality. For example, AI, machine learning and autonomous decision-making raise new questions about transparency (possible prejudice and discrimination), accountability and accountability. Misinformation has also attracted attention, as it has a negative impact on people and society.

Key areas for promoting an inclusive digital society:

1. Reduce the digital divide and integrate everyone into the digital society, including women, the elderly and low-income people, including through social policies that support mobility and redistribution.

2. Promote the development of basic skills for all, including by providing incentives and facilitating access to adult learning, as well as improving the recognition of skills acquired after primary education.

3. Use the potential of digital technology and data to solve common problems, such as the environment and health, by increasing energy efficiency and reducing health care costs through mobile health technologies.

4. Increase citizen activism through digital government strategies and engage all stakeholders, including the technical community, business community, trade unions and civil society, to help understand and address societal issues such as risks such as cyberbullying and misinformation (OECD-2, 2019).

It is important to understand that digital security is a process. You can't install something today, buy some magic button that would protect all your data, information of your friends, colleagues, etc. You are constantly learning about new threats and new tools that appear - you use something and you don't.

It is important to understand what threats you may encounter. If you are a journalist and work in Europe, these are some threats, if you work in Ukraine, they may be completely different.

At the present stage of transformational change, there are certain rules of digital security (Kvantaliani, 2018).

1. Use the licensed software everywhere, including on phones and tablets, work and home computers.

2. Update all software regularly.

Recently, Windows is being updated and restarted without your desire: you want to work, but he does not care that you have a conference.

3. Install antivirus programs and firewall.

Antivirus solves the problem of virus infection, and the firewall monitors the interconnections of our computer and the Internet and, accordingly, helps us protect ourselves from external threats.

Mac OS users also need to install anti-virus programs and firewalls, as the number of viruses created for Macs in 2017 increased significantly more than in the last 10 years. These are mostly viruses that encrypt your computer and demand money. If you have Windows, you can use the built-in security programs Windows Defender or some other - it all depends on who you trust.

4. Set a password to log in to the device (phone, tablet, computer).

You need a complex unique password.

A complex unique password is one that contains uppercase, lowercase, special characters, and a total size of at least 14 characters is the minimum standard, preferably 20 or 30. Uniqueness means that each account must have its own password. That is, on Facebook we must have one password, and on the Gmail mailbox - a completely different one.

5. Use the password manager.

If we create unique passwords for each account, there are difficulties with their number. You can use a manager that is convenient for you and that you trust. Mac OS users, for example, have a built-in Keychain manager that automatically saves passwords. LastPass is an online password manager for the accounts you create online. KeePass is an offline manager where you provide password security yourself.

6. Do not use unreliable e-mail services, social networks, messengers.

Unreliable services are those that provide information about their users, or they are of poor quality, do not use encryption, or have been compromised. In this case, it turns out that our data is protected by a user agreement with any corporation.

7. Separate accounts.

For example, we have mailboxes separately for work and for home. If they broke our home box, they did not get access to the office, and vice versa. Even if we share communication between different messengers: for example, part of the correspondence in WhatsApp, and part in Viber - it already protects information, because those who attack, you need to access another channel of communication.

8. Lock the devices.

For example, if you go to drink coffee, it is important to lock your device so that people walking past your desktop do not have access. It is better to set the shutdown on the mobile phone after 60 seconds, so that it locks itself if you leave it on the table. For Windows, it's a Win + L lock, on Macs you just lock the cover, and it goes to sleep and asks for a password.

9. Use full-disk device encryption.

If you use the latest iPhone models or premium Android phones, this encryption is the default.

10. Delete the history from the browser and cache.

When you go online, the sites you visit send small files to your computer to let you know who they are and index all your actions accordingly. For example, CCleaner is a program that can be used to delete such temporary files. This is so that the person who will be working on the computer after you cannot see what you are looking for, that is, to be more anonymous.

11. Do not provide obvious answers to regain access to your account.

If the secret question for password recovery is your mother's maiden name, this information is publicly available, can be found on social networks and is easy to access in your inbox.

12. Do not use unsecured mailboxes to restore access.

If you have a well-protected Gmail mailbox and another mailbox, and they are linked by a recovery feature, then you are potentially vulnerable.

13. Use secret messengers if you decide to keep secret correspondence.

For example, Viber, Signal, secret chats in Telegram.

One of the important components is not only the transmission of encrypted communication, but also its storage. If you passed secret information to someone, you and your colleague have it. Accordingly, if you do not want this to be detected later, it is best to delete the information immediately. Some messengers have a certain time to delete a message: for example, you set it for 1 minute, after which the message is automatically deleted.

14. Use messengers with encryption from device to device – Signal, WhatsApp, Viber, and in Telegram - secret chat.

In this case, the service provider does not have the opportunity to read your correspondence.

15. Do not click on suspicious links.

16. Do not catch phishing.

Phishing is a type of fraud, the purpose of which is to extract from gullible or inattentive users of the network personal data of customers of online auctions, money transfer or currency exchange services, online stores.

17. Back up important files in cloud storage.

Cloud storage is Google Drive, Dropbox. It is statistically very likely that a hard drive or flash drive can be damaged without the possibility of recovery.

If you use Gmail, you can use Google Drive. If you have secret files, you can pre-encrypt them and then upload them to the cloud storage.

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19. Use VPN (Virtual Private Network) technology when connecting to public Wi-Fi.

A VPN is a tunnel from your PC to another computer and then to the Internet. In essence, this is a reliable tunnel that protects your data on an unreliable network. For example, there is a VPN service TunnelBear - a socially responsible business, so if you write that you are an activist or journalist from Ukraine, they will give you a discount. You can create a VPN service yourself (buy a server, connect Open VPN). If we can't do it ourselves, we buy a VPN subscription. Opera has a VPN that forwards your web traffic through Opera servers. The difference is that a standard VPN passes all traffic. For example, you connect to public Wi-Fi, go to a mailbox, a news site, etc. People who work here see that the user №1 entered the social network, then read the news - all traffic is open through the access point. If you want to hide this information, buy a VPN and use it in such cases.

20. Use the Tor network if you want to be anonymous.

If you are a regular user and you do not need to hide almost anything, a VPN will suffice. Tor (The Onion Router) is an anonymity tool and VPN is a security tool.

21. Change the default password on the home Wi-Fi router.

Default passwords are the default passwords. Your router is connected to the Internet. If it has standard passwords, such as "admin" or your phone number, then an attacker can connect to it. For example, 5 years ago, the Moldovan telecommunications network of routers switched to a small botnet - this is when you have access to devices, and you can remotely tell them what to do. In this way, you can force everyone to visit one site at a time, and it will no longer be available. If I can connect to your router, I can send something to someone on your behalf. So think about your safety in advance.

Putting the framework into practice in digital economy. A whole-of-government approach to digital transformation requires a digital transformation strategy (DTS). Many countries have a national digital strategy or equivalent policy, but most are still narrow. The DTS needs to be comprehensive in addressing a number of interrelated policy issues discussed above. It should ensure policy coherence and coordination in all areas and sectors that shape digital transformation. Finally, it should involve all relevant stakeholders in its development and implementation. There are five key steps to developing a DTS (Table 3).

Conclusions. Government policy-makers and policymakers can never have a full understanding of all the possibilities, challenges, and challenges of DTS. Thus, one of the keys to success is the involvement of stakeholders in the early stages of strategy

and policy development. The cooperation of many stakeholders brings tangible benefits that lead to better policies and results. This improves the quality of rule-making thanks to the ideas, experience and evidence of stakeholders. In addition, it creates a sense of ownership of policies and rules and increases legitimacy. In turn, involving stakeholders can increase trust in government and compliance.

Table 3. Five steps to develop a digital transformation strategy

Steps	Strategy
1. Establish a governance approach that supports effective co-ordination	1.1. Establish a governance approach that supports effective steering and co-ordination of digital transformation policies in light of the country's culture and institutions.
	1.2. Assign clear responsibilities for strategic co-ordination (e.g. the head of government or a lead minister) and operational co-ordination (e.g. chief digital officers in implementing bodies) for development and implementation of a national digital transformation strategy (DTS).
2. Articulate a strategic vision and ensure coherence	2.1. Articulate a strategic vision that provides direction on identifying the main priorities and scoping the main objectives of a DTS.
	2.2. Ensure coherence between a DTS and other related domestic and international digital strategies and/or policy objectives.
3. Assess key digital trends, related policies and regulations	3.1. Monitor key digital trends, including by international benchmarking, to identify opportunities and challenges and related priorities to be addressed by a DTS.
	3.2. Evaluate the effectiveness of current strategies and/or policies, identify gaps and/or incoherence, and scope objectives for a DTS.
4. Develop a comprehensive and coherent strategy	4.1. Leverage the governance approach, the strategic vision, and insights from monitoring and evaluation to develop a comprehensive and coherent DTS.
	4.2. Engage all relevant actors in developing a DTS, including different parts and levels of government, non-governmental stakeholders and international partners.
5. Implement the strategy successfully	5.1. Anticipate and address implementation challenges related to institutions and policy frameworks, social preferences and (lack of) administrative capacity.
	5.2. Issue an action plan with specific measures, clear responsibilities, budget, timeframes and measurable targets to successfully implement the DTS.

Source: OECD-2, 2019

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DIGITAL ECONOMY: INNOVATION AND TECHNOLOGIES

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Abstract. *The digital economy is a type of economy where the key factors (means) of production are digital data: numerical, textual, etc. Their use as a resource makes it possible to significantly increase the efficiency, productivity, value of services and goods, to build a digital society. Digitization is one of the main factors in the growth of the world economy in the next 5-10 years. In addition to the direct productivity gains that companies get from digital technologies, there is a chain of indirect benefits of digitalization, such as saving time, creating new demand for new goods and services, new quality and value. Nowadays, the level of development of digital technologies plays a critical role in the competitiveness of countries and economic unions. The Eurasian Economic Union (EAEU) considers the transition to a digital economy to be the key driver of economic growth. In recent years, EAEU member states have made significant progress in many areas of digital development. The prospects and relevance of digital development of the economies of the EAEU member states were reflected in the Main Directions of the Digital Agenda of the EAEU by 2025, where digital transformation is emphasized as a key factor of development. Harmonization of efforts in the joint implementation of initiatives and projects of the Digital Agenda of the EAEU will allow the expansion of the capabilities of member states, citizens and business entities not only within the EAEU, but also in foreign markets. The effectiveness of joint actions of member states within the Digital Agenda depends on the successful development of their own economies. The implementation of the Digital Agenda will require the creation of digital platforms, network infrastructures, enabling initiatives and projects, building partnerships with those who have chosen the path of digital transformation. Digital transformation means the integration of digital technologies into all areas of business. This integration leads to fundamental changes in the way citizens, enterprises and organizations act, how they provide value for themselves, their employees, customers, partners, achieving their own and common economic and social goals faster, cheaper and with new quality. Digital technologies include the Internet of Things, robotics and cyber systems, artificial intelligence, big data, paperless technologies, additive technologies (3D printing), cloud and fog computing, unmanned and mobile technologies, biometrics, quantum technologies, identification technologies, blockchain, etc. Digitization should be considered as a tool, not as an end in itself. With a systemic state approach, digital technologies will stimulate the creation of jobs, increase productivity, rates of economic growth and the quality of life of citizens.*

Keywords*: digital economy, digital technologies, transformation, financial inclusion factors, digital culture, digital* innovation, *Industry 4.0.*

Business Evolution through Digital Revolution. One of the characteristic features of the transformation of the economy in the context of globalization and the development of the information society, there is a revision of existing doctrines and formation of modern decision-making concepts. In this context, it is of particular importance building a digital economy that enables financial and other services online, therefore, it fundamentally changes the traditional views on various economic processes and relations in society.

Digital economy – an economy based on digital computer technology. Sometimes the digital economy identified with the Internet economy, the new economy, or the web economy. With mutual integration with the traditional economy makes it difficult to clearly delineate these concepts.

That is, the digital economy means the production, sales and supply of products online mode.

European countries and the entire civilized world have been seriously discussing digital transformation for many years and making money from it.

The first things that almost everyone thinks of when they hear the term "digital transformation" are new technologies, Slack instead of faxes, the emergence of brands on social media. The truth is that digital transformation is a much broader, common phenomenon.

Of course, this process is primarily due to the accelerated development of new digital technologies. Hence the name. As in the industrial revolution. The analogy is quite relevant: the industrial revolution did not simply technologize production. During this period, socio-economic paradigms changed, new professions and behaviors emerged. A similar situation is happening now.

The increasing use of digital technologies poses challenges in many areas of public administration (Pylypenko, Matviienko, Putintsev, Vlasenko, & Onyshchuk, 2022). The digital transformation can be thought of as changes caused by three interrelated forces: new technologies, new business models, new habits (Figure 1).

This is a common definition of digital transformation at the macro level. At the micro level, i.e. at the enterprise level, the company's digital transformation is a general change in the company aimed at adapting to the new status quo of the digital age.

Innovation is a fundamentally important recipe for successful adaptation in the age of digital transformation. Digital transformation is changing the traditional way of doing business. There are several reasons for this:

1. Cheaper launch of new technology businesses.
2. Accelerate the spread of new technologies.
3. Effective work with data (insights) for management decisions.
4. Flexibility of modern companies, due to new styles of work and focusing on user needs, not products.

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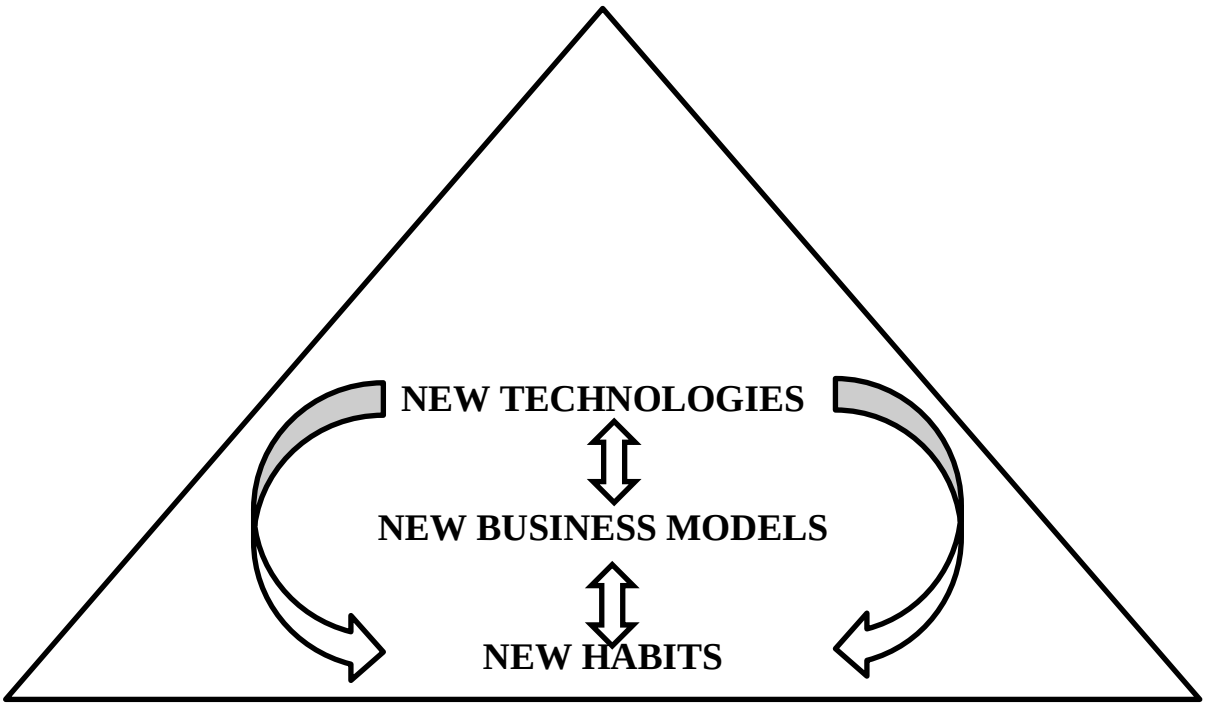

Figure 1. Interrelated forces of digital transformation

Source: systematized by the author

One of the classic examples of digital transformation is banks. New generations of users have grown up with the habit of getting everything online, 24/7, from the couch and via smartphone. This behavior has been shaped by new technologies (the Internet, smartphones) and related new business models (Uber). While banks ignored these needs, young people increased their capital, became attractive to banks, began to search for and find services for their finances. Fintech startups that use cloud technology, artificial internet, good design, focus on relevant services and the last many years have scared the banks, because they are rapidly losing new markets (Garbowski, Lubenchenko, Perederii, Moskalenko, & Rumyk, 2019).

The current state of financial inclusion factors is quite significant (Table 1).

Table 1. Financial inclusion factors in digital world, Jan 2021- Jan 2023

Indicator	Indicator value	
	Jan 2021	Jan 2023
Has an account with a financial institution	68.5%	74.0%
Has a credit card	18.4%	24.5%
Has a mobile money account	4.4%	10.2%
Makes online purchases and / or pays bills online	29.0%	58.8%
Percentage of women with a credit card	17.0%	23.6%
Percentage of men with a credit card	19.9%	25.4%
Percentage of women making online transactions	27.7%	55.2%
Percentage of men making online transactions	30.3%	62.4%

Source: Digital 2021, & Digital 2023

One of the latest fiasco of traditional approaches – the assessment of 19-year-old German fintech Wirecard exceeded the assessment of the world titan Deutsche Bank. Wirecard recognized in time the opportunity to be not a bank, but, in fact, to lease its banking infrastructure for the development of services to those who have a relationship with the client much better (startups, retail).

Music has long been considered the canon of the digital economy. For decades, labels have been selling CDs / cassettes / records and shoveling money. But here came the Internet and Napster. Torrents have appeared. The music industry was rapidly going bankrupt.

This was stopped by a technological visionary – Steve Jobs. Realizing both the desire of people (easy, free access to music and the ability to have it everywhere) and the pain (chaos in the organization, many inconvenient steps) of the user experience of music lovers on the Internet, he invented the iPod, which can store a lot of music. But Apple wouldn't be itself if it didn't create an ecosystem (plus one term for digital transformation) of services around it, namely iTunes for easy digital music purchase and cataloging.

Gradually, the development of the Internet and memory on phones has made streaming possible (which, in theory, is a bit like cloud technology, but in the social model is similar to the trend towards giving up ownership in favor of use). Spotify, Apple Music. The whole philosophy of labels and music recording, income distribution has changed, new concepts of services to artists have appeared. Music has adapted and is earning a lot again. And the main mystery was: what brings more income – streaming or digital sales – and how to properly reward the authors.

World practice has reached the level where digital transformation for companies is a certain path, which consists of known stages. Although each company went through it differently, the overall picture was similar (Figure 2).

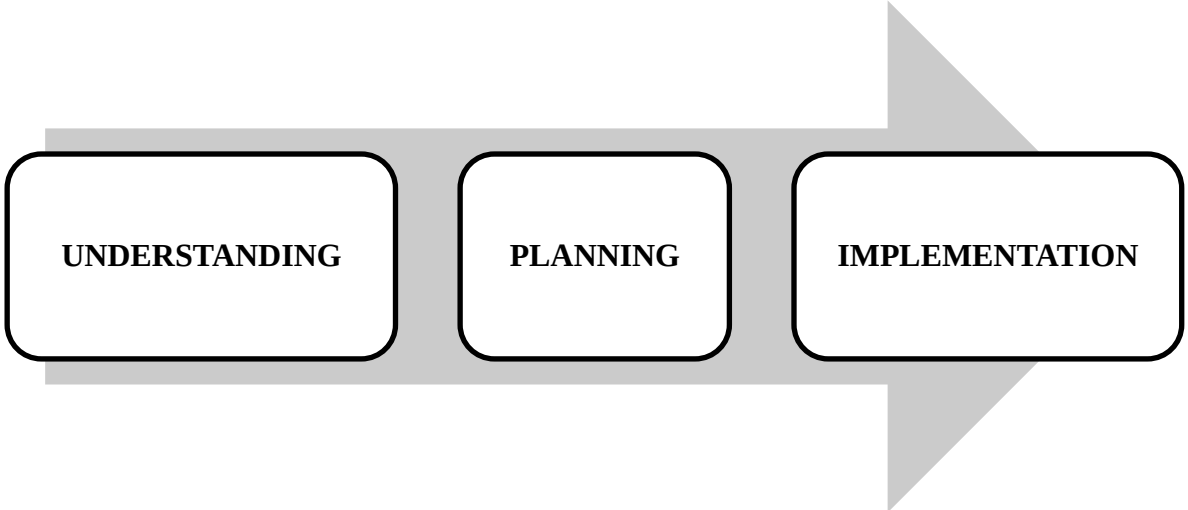

Figure 2. The stages of digital transformation

Source: systematized by the author

The «understanding» stage includes understanding the essence of digital transformation, analysis of one's own needs and business development opportunities.

The «planning» stage includes determining the digital transformation strategy, selecting tools and calculating the quays.

The «implementation» phase includes team selection, launch of innovation initiatives and open innovation activation formats.

At all stages, work with open innovations (i.e. those that come from outside) plays a crucial role. Well-known managerial wisdom says, «Whoever you are, the best people don't work for you». Not using the opportunity to involve external forces in innovation (whether it is customers, universities, researchers, startups or even competitors) is considered wasteful.

Therefore, almost all innovation divisions of global corporations focus on working with startups, and the luminaries of innovation and entrepreneurship consider them the new corporate R&D (Mihus, Denysenko, Rumyk, Pletenetska, Laptiev, & Kupriichuk, 2021).

As a result, innovation outposts/labs/hubs are gaining popularity – separate organizations that collaborate with startups in various formats, as well as other possible participants in the innovation process (for example, universities). Together with startups, these corporate teams build new products, change processes inside, learn from startups, use them as a radar of the future, or simply "buy" talent and make money by selling shares. Some corporations are even building their own startups.

Rapid innovation can be easily seen in many digital products that are used daily. For example, smartphones and the networks they rely on are moving to 5G technology, even though 4G (LTE) networks only became commercially available ten years ago. At the same time, online e-mail and video streaming services are introducing increasingly sophisticated features based on machine learning and AI. These achievements are achieved through a wide range of research and innovation activities.

To achieve the result, it is necessary to conduct a reliable, comprehensive analysis of this complex socio-economic system on the appropriate grounds, measured on various scales, using the tools of economic and mathematical descriptive modeling (Rumyk, Laptev, Seheda, Akimova, Akimov, & Karpa, 2021).

Patents are often used to protect ICT-related technologies in their respective fields. These include high-speed networks, mobile communications, digital security, sensor and device networks, high-speed computing, large and high-speed storage, high-capacity information analysis, cognition and understanding of values, human interface, images and sound. technologies (Inaba, & Squicciarini, 2017). It is important that patent protection is granted only for a product that brings a new technical solution. Thus, a review of the volume of such patents granted may show the scale of innovation in ICT-related technologies.

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Digital innovation is a major driver of digital transformation, leading to radical changes in the ways people interact, create, produce and consume. Digital innovation not only creates new goods and services, but also creates opportunities for new business models and markets and can increase efficiency in the public sector and beyond. Digital technologies and data drive innovation in a wide range of sectors, including education, health, finance, insurance, transport, energy, agriculture, fisheries and manufacturing, and the ICT sector itself.

Key policy domains and indicators of Innovation (Figure 3).

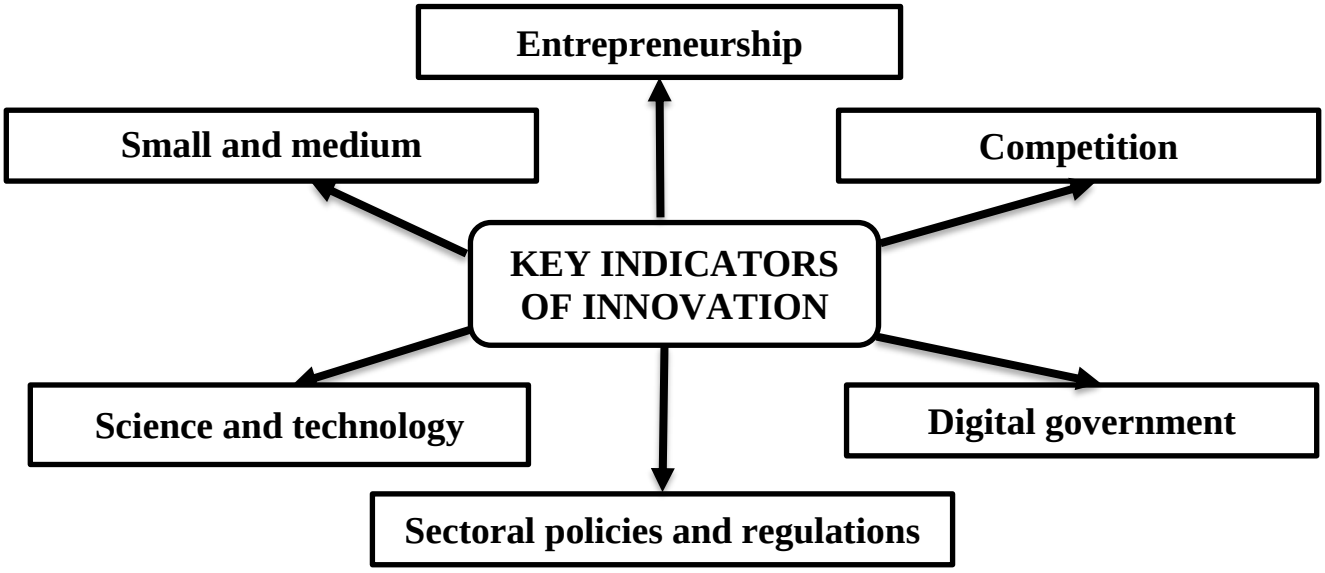

Figure 3. Key policy domains and innovation indicators

Source: systematized by the author

The first two keys and directions is entrepreneurship and small and medium enterprises. Because young firms are an important part of the digital innovation landscape, promoting digital innovation requires a focus on enterprise and small and medium-sized business policies that encourage the emergence and growth of new and young companies. Helping entrepreneurs to start innovative businesses also requires attention to structural factors that contribute to the creation of new businesses and do not impose excessive penalties for the failure of entrepreneurs (McGowan, Andrews, & Millot, 2017). In addition, organizations need to invest in KBC. This is important for innovative business models and new organizational forms that increase the value of additional skills. Digital technologies can help improve access to finance for SMEs and startups through innovative tools such as crowdfunding (OECD, 2019).

The third key and direction is science and technology. Digital innovation relies on the continuous creation of a knowledge base, and basic research in science and technology is crucial in this regard. Public support from universities and other

institutions that conduct basic research can help sow the seeds of future innovation. The public sector also helps to innovate beyond research through partnerships between universities, industry and government. They can provide startups with know-how, equipment and start-up funding to test and scale new technologies. Well-designed incentives to support research and innovation can be useful in this regard. Such incentives include the protection of intellectual property regimes and tax incentives such as tax credits for research and development. Open science initiatives can also be useful for stimulating digital innovation (OECD, 2015).

The fourth key and direction is competition. Market concentration in the digital economy can be another barrier to innovation, emphasizing the importance of competition policy. The regulatory framework may restrict the entry of new players, which is important for stimulating competition, innovation and the spread of technology in the economy. For example, rules that require physical presence may discourage online intermediaries (OECD, 2018). Similarly, the high regulatory burden in some industries, such as banking, can create costs that only existing firms of a certain size can afford. This limits the emergence of smaller business models that often use digital technology.

The fifth key and direction is digital government. Digital government strategies, including open government data, can stimulate innovation and efficiency in the public sector and beyond. Digital technologies can help governments better design, develop and implement policies and regulations; become more efficient; and reduce waste. As the public sector produces and consumes large amounts of data, governments have significant potential to use this data and digital technology for innovation.

The sixth and last key and direction is sectoral policies and regulations. The pace of digital transformation varies across sectors. It may come as no surprise that the ICT and telecommunications sectors seem to have integrated digital assets and know-how into all areas of their business. However, ICT services are ahead of their production counterparts. Looking ahead, digital technologies such as data analysis and artificial intelligence (AI) offer enormous potential for increased productivity in service. This includes improving less knowledge-intensive activities, such as personal transport and housing, where productivity has traditionally been sluggish (Sorbe, Gal, & Millot, 2018). For example, combining patient history with real-time patient data and the use of connected devices can contribute to more personalized care and innovation in the healthcare sector.

Key areas for unleashing innovation.

1. Encourage entrepreneurship by reducing the regulatory burden on startups and making it easier for new and young companies to access finance through a combination of venture, debt and equity financing and digital finance solutions such as platform-based lending.

2. Reassess rules that may not be appropriate for the digital age, such as those that require physical presence or minimal scale, or try to eliminate information asymmetries.

3. Encourage investment in key research and intangible assets, including skills, organizational capital, data, software and patents, for example through R&D tax credits and intellectual property systems that are well suited to the digital age.

4. Promote knowledge through open innovation and open research initiatives, and encourage open public data through, for example, a "default openness" policy to stimulate innovation in the economy.

5. Encourage policy experimentation and new business models in a variety of areas, including through flexible regulation and flexible application or enforcement (such as regulatory sandboxes) while protecting consumers (OECD-19, 2019).

Innovation in digital technologies "Industry 4.0". Since the beginning of the 19th century, we have experienced three industrial revolutions. The engine of each of them was a new breakthrough technology: the mechanics of a steam engine, the principle of an assembly line and the speed of a computer. They have been called industrial revolutions because the innovations that caused them not only led to some increase in productivity and efficiency, but completely changed the way goods were produced and work was done.

Today, we are experiencing the fourth industrial revolution, dubbed Industry 4.0, which is taking supply chain automation, monitoring and analysis to the next level with intelligent technology. At the heart of Industry 4.0 is the Industrial Internet of Things (IIoT) and Cyber-Physical Systems – intelligent autonomous systems that use computer algorithms to monitor and control physical “things,” including equipment, robots, and vehicles. "Industry 4.0" makes all parts of the supply chain "smart" - from smart industries and factories to smart warehouses and logistics. But Industry 4.0 is not just about the supply chain. Industry 4.0 connects to back-end systems such as enterprise resource planning (ERP) systems, providing an unprecedented level of visibility and control over an organization's activities. Ultimately, Industry 4.0 is a critical aspect of the digital transformation of any company.

The general definition of Industry 4.0 is the development of digital industrial technologies. The digital transformation of Industry 4.0 allows us to work side by side with machines, using new high-performance approaches.

Industry 4.0 is based on nine technological pillars. These innovations serve as a bridge between the physical and digital worlds and enable intelligent and autonomous systems to function. Organizations and supply chains are already using some of these advanced technologies, but the full potential of Industry 4.0 can only be realized when they are used in combination.

1. Analytics based on big data and artificial intelligence. Industry 4.0 involves the collection of big data from a wide range of sources, from manufacturing equipment and Internet of Things (IoT) devices to ERP and CRM systems, as well as weather and traffic applications. Artificial intelligence (AI) and machine learning-based analytics are applied to real-time data, and the resulting information is used to make better decisions and automate all areas of supply chain management: supply chain planning, logistics management, manufacturing, research and design, enterprise asset management (EAM) and purchasing.

2. Horizontal and vertical integration. The foundation of Industry 4.0 is horizontal and vertical integration. Horizontal integration ensures close interaction of processes at the "local level" - at the production site, between several production sites and throughout the entire supply chain. Through vertical integration, all levels of the organization are connected, and data flows freely from the shop floor to the board of directors and back. In other words, manufacturing is tightly integrated with business processes such as research and development, quality assurance, sales and marketing, and other business units. The fragmentation of data and knowledge is becoming a thing of the past.

3. Cloud computing. Cloud computing is the most powerful tool of the Industry 4.0 concept and digital transformation. The possibilities of modern cloud technologies are far from limited to increased speed, scalability, ease of storage and cost efficiency. They are the foundation for the latest technologies, from AI and machine learning to the Internet of Things, and provide companies with the technical ability to innovate. The data on which Industry 4.0 technologies are built is stored in the cloud, and the cyber-physical systems that form the core of this concept use the cloud for communication and coordination.

4. Augmented Reality (AR). Augmented reality tools that overlay digital content on the real environment are a key component of Industry 4.0. Working in augmented reality, employees use smart glasses or mobile devices to visualize real-time IoT data, digitized parts, repair or assembly instructions, training content, and other information while looking at a physical object, such as a piece of equipment or a product. AR is still in its early stages of development, but is already having a major impact on maintenance, service delivery, and quality assurance, as well as on technician training and security.

5. Industrial Internet of Things (IIoT). The Internet of Things (IoT) – more specifically, the Industrial Internet of Things – is so important to Industry 4.0 that the two terms are often used interchangeably. Most of the physical objects in Industry 4.0 – devices, robots, machines, equipment, products – use sensors and RFID tags to provide real-time data about their state, performance, or location. This technology allows companies to optimize supply chains, design and modify products quickly,

prevent equipment downtime, stay on top of consumer preferences, track products and inventory, and more.

6. Additive manufacturing/3D printing. Additive manufacturing, or 3D printing, is another key technology behind Industry 4.0. 3D printing was originally used as a tool for rapid prototyping, but now offers a wider range of use cases, from mass customization to distributed manufacturing. For example, the use of 3D printing allows you to store parts and products as design data files in virtual warehouses and print them on demand at the time of need, reducing both transportation distances and costs.

7. Autonomous robots. Industry 4.0 has led to a new generation of autonomous robots. Programmed to perform tasks with minimal human intervention, autonomous robots vary greatly in size and function, from drones for inventory scanning to autonomous mobile robots for pick-and-place operations. Armed with advanced software, AI, sensors and machine vision, these robots are capable of performing complex and highly precise tasks, as well as recognizing, analyzing and acting on information from the environment.

8. Simulation/digital twins. A digital twin is a virtual model of a real machine, product, process, or system based on data from IoT sensors. This core component of Industry 4.0 enables companies to better understand, analyze and improve the performance and maintenance of industrial systems and products. For example, a machine operator can use a digital twin to pinpoint a failed part, predict potential problems, and increase uptime.

9. Cybersecurity. With ever-increasing levels of connectivity and the use of big data in Industry 4.0, cybersecurity is of paramount importance. By adopting a Zero Trust security architecture and technologies such as machine learning and blockchain, companies can automate threat detection, prevention, and response, and minimize the risk of data breaches and production delays across their networks.

The market offers a wide range of Industry 4.0 solutions that help thousands of companies transform their digital supply chain, reorganize production, focus on customers and connect all aspects of the organization.

Here are some of the benefits available to companies today:

1. Radical increase in productivity and level of automation. Companies use data to drive decisions across their operations, improving forecasting accuracy, delivering on time, and generating profit-optimized plans.

2. Stability and flexibility in any market or economic conditions. Companies are shaping the digital supply chain of the future with state-of-the-art planning tools.

3. The confidence you need to explore new business models and seize opportunities quickly. With Industry 4.0 solutions, companies are reducing costs, improving market efficiency and connecting supply chains across sea, land and air.

4. Green and sustainable solutions without sacrificing profitability. Customers are becoming more efficient and cost-effective as a result of digital transformation, ensuring that they meet their environmental challenges without compromising other business goals such as profitability and scalability.

Benefits of innovation in digital technologies "Industry 4.0" (Table 2).

Table 2. Benefits of "Industry 4.0"

Benefits	Description
Smart Products	Develop connected products that analyze their state and can share information about health, location, usage level, storage conditions, and more. The data exchanged by these intelligent products will help you improve everything from product quality and customer service to logistics and research processes. They can also predict service needs, receive remote updates, and unlock opportunities for new service-based business models.
Smart factories	The smart factory is characterized by a high level of digitalization and autonomy, and allows to take full advantage of advanced technologies such as big data, artificial intelligence, robotics, analytics and the Internet of things. Also referred to as Factory 4.0, such manufacturing is able to self-correct, leverage Smart Manufacturing Processes 4.0, and deliver custom-made products at minimal cost and on a large scale.
Intellectual assets	Nearly every physical asset being put into production today has built-in sensors that, when connected to the Internet of Things and analytics tools, can revolutionize the way enterprise assets are managed. By working with smart assets, technicians can monitor asset performance in real time, predict and prevent downtime, apply dynamic and predictive maintenance, take advantage of digital twins, and tightly integrate assets and business processes.
New opportunities for employees	But no matter how autonomous your systems become, you will always need people. Empower them with technologies such as artificial intelligence and real-time access to sensor data so they always know what's happening on the production floor and are ready to make quick decisions and fix problems as they arise. Wearable devices and augmented reality applications can also help them with problem solving, health monitoring and security.

Source: What is industry 4-0, 2023

Industry 4.0 technologies digitalize production and create individual solutions available to small and medium-sized businesses. Inventory accounting and predictive maintenance help to reduce the cost of materials and the overall maintenance of facilities, which is especially important now - during the cycle of high prices for raw materials and rising labor costs.

However, there is an area that can nullify any positive results in terms of intensification and savings - this is management. A lot of materials have been written about this, from journalism to non-fiction. But engineers creating new industrial technologies have found a solution for such problems.

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HR business processes lend themselves to digitalization no worse than production ones. The result of work on the formalization of management processes and procedures was the emergence of a new management concept of the class corporate software – Business Process Management, or simply BPM. And to support these business processes, it became possible to configure process applications without involving professional developers – for this, a new class of corporate software is used – Business Process Management System using No-Code / Low-Code technologies.

Like other Industry 4.0 products, the new software has become a "bridge" from programmers to business users. BPM allows you to build procedures and processes through intuitive visual programming. And after their simulation allows you to effectively control online. If ERP systems enable material accounting and allow top management to monitor costs, the movement of raw materials, products, then BPM services also allow online control of exactly how the work of personnel is performed, identify bottlenecks and improve processes.

The effectiveness of the BPM management model cannot be overestimated. The introduction of technology critically increases the speed of internal processes in the company. In addition, BPM allows you to evaluate time costs on the go.

As we noted above, BPM systems do a good job with the routine, which is no less in business processes than in the production pipeline. Nevertheless, office work requires higher education, because although lawyers, accountants, and managers perform almost mechanical work every day, they are responsible for their decisions and for quality. In many professions, such as banking, there are special protocols that require the creation of committees for any process of little or no importance – it is so dangerous to make a mistake. If the computer will do the checking of key points, who will be responsible in case of failure?

Every time we talk about optimization, we understand: someone may be superfluous. After all, labor resources are saved! Who is at risk of being left without a job when a BPM system is implemented?

Saves not a human resource, but a temporary one. The key tasks of top management are strategic, while due to inefficient control over the processes, the "OS" eats up their valuable time.

According to the Harvard Business Review, 72% of leaders of the world's largest enterprises consider the speed of adoption of new technologies the main constraint on business growth. Now it is not so much businesses that compete, but the models for managing these businesses. And the introduction of BPM systems allows you to improve models, grow and develop. The ability to expand and grow, rather than save on staff, is a key aspect of BPM as part of Industry 4.0 technologies."

Another driving force of the digital economy is the proliferation of digital platforms. There have been many digital platforms in the world in the last decade,

which use business models based on data and transform existing sectors of the economy. Digital platforms act as mechanisms that allow different parties to interact online.

However, there are many difficulties in assessing the scale of the digital economy, the value it creates, and the benefits it derives.

First, there is no generally accepted definition of the digital economy.

Second, there is a lack of reliable statistics on its key components and aspects, especially in developing countries.

Although a number of initiatives are already being implemented to remedy this situation, there are some still not enough, and they barely keep up with the rapid development of the digital economy (OECD, 2017).

The World Bank recognizes the lack of adequate macroeconomic statistics that can fully assess the benefits of digital and digital products or cross-border transactions. In this regard, the International Monetary Fund has recently initiated discussions in government, academia and business methods of measuring the digital economy.

Remain unresolved the question of how to assess the contribution of the sharing economy, platforms and the gig economy in GDP and productivity growth.

Depending on the definition used, the size of the digital economy is, according to estimates, from 4.5% to 15.5% world GDP (Table 3).

Table 3. The share of the digital economy in world GDP, %

The share of the digital economy	2016	2025
dollars	11.5 trillion	23.0 trillion
percent	15.5%	24.3%

Source: Digital Spillover, 2017

Almost 40% value added created in global information and communication technology sector (ICT), accounted for by the United States and China. Numeric employed in the ICT sector in the world grew from 34 million people in 2010 up to 39 million people in 2015, at this is the largest percentage (38%) employees work in in the field of computer services. By the same period the share of the sector ICT in general employment increased from 1.8% to 2%.

According to the World bank, the introduction of digital technologies leads to the blurring of geographical and physical boundaries and opens new one's prospects for economic, social and cultural development of countries, as well as to growth of regional and global competitiveness.

Considering the impact of digital technologies on GDP growth in the EU until 2025 The World Bank Group notes that the penetration of the fixed broadband Internet access adds +1.7% to GDP, increase international bandwidth (+0.66% to GDP) and spread e-commerce (+0.88% to GDP) (EAEU, 2016).

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The key advantage of the digital economy over the traditional one is the realization of the possibility of automatic control of the whole system (or individual components), as well as its virtually unlimited scaling without loss of efficiency, which allows you to significantly increase efficiency management of the economy (economic activity and resources of the country in different industries) at the micro and macro levels.

This makes it clear that the digital economy is not a separate industry or IT companies that are digital. This is, first of all, the existing economy – all traditional industries and companies (manufacturing, agriculture, construction, transportation, etc.) that are influenced by digital transformations due to technological evolution revolutionize their own production and business processes and gain new opportunities to increase productivity and efficiency of the main (existing) business.

G20 Digital Economy Development and Cooperation Initiative demonstrates that the digital economy is a driving force accelerating global economic development, increasing productivity, creating new markets and industries. She is too opens up new opportunities for inclusive and sustainable growth. However, acceleration of economic development is achieved by those countries and economic associations that systematically build the foundations and mechanisms of leadership in the digital economy.

The rapid development of digitalization is becoming a source not only of new opportunities, but also of serious threats and problems for all segments of the population.

In an environment where half of the world's wealth is concentrated in the hands of 1% of the population, inequality has reached enormous proportions. She including contributes to populist and anti-globalist sentiment in many countries. One may even ask whether pathos is justified business speeches on digitization.

From the point of view of experts of the World Bank Group, despite the presence a large number of successful examples, the impact of new technologies on global productivity, empowerment for the poor population and the middle class, as well as the spread of accountability management has not yet met expectations (Digital dividends, 2016).

The World Bank points out that digital technologies are spreading and there are no digital dividends. First, almost 60% of the world's population is still deprived of Internet access and unable to play any significant role in the digital economy. Second, some are predictable the benefits of digital technology are offset by emerging risks.

The UN also recognizes digitalization as one of the four main dangers threatening humanity (Figure 4.4).

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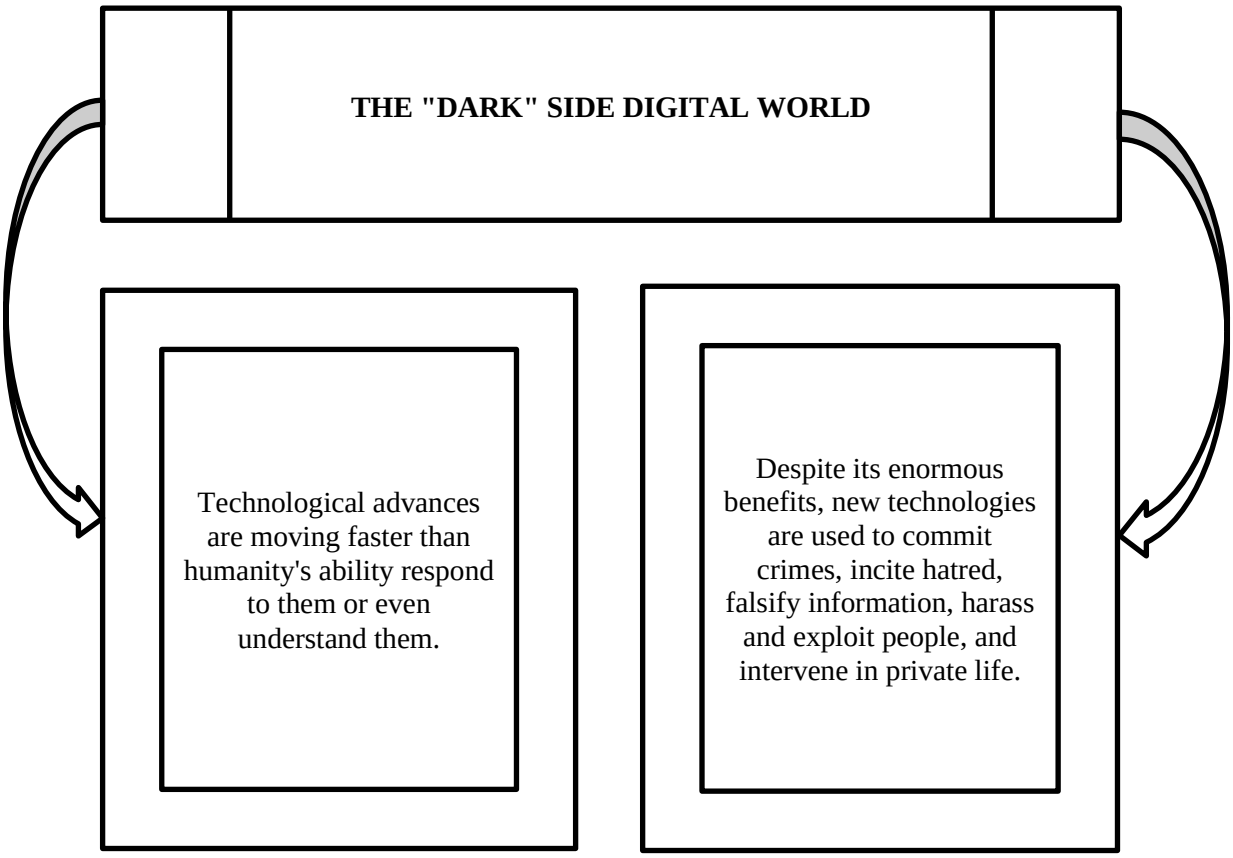

Figure 4. The major threats from digitalization

Source: The Clean Network US Department of State, 2021

Macroeconomic threats of digitalization. Slow productivity growth will threaten progress in raising global living standards, viability of social protection systems and economic viability politicians respond to future shocks.

The world is experiencing a trend of declining global productivity, increasing global inequality and a global crisis management. Among the main causes of the decline are:

- inconsistency and lack of skills;
- reducing spending on science and innovation, especially in the business sector;
- restraint (reduction) of investments in intangible assets;
- demographic factors such as population aging;
- strict conditions and limited access to corporate credit, including innovative;
- reduction of the number of registered new patents (including process patents, in the OECD study).

Increasing tensions between states over technological dominance. One striking example is the trade war between the United States and China, which began in 2018. and which hides the escalation of rivalry between the two superpowers for world

technological dominance when China became active compete in global markets with US IT corporations.

The winner of the technology race will receive decisive advantage in the commercial, geopolitical and military spheres.

The trade war showed on the basis of which superpower technologies plan to secure world dominance – it's artificial intelligence, communication and surveillance systems, autonomous transport.

The United States intends to completely clean up the information and digital space from any Chinese influence. The initiative of the State Department is formalized as the state program "Clean Network" (Clean Network) (*The Clean Network US Department of State, 2021).*

The program contains six areas:

1. "Clean Path". This is a data security plan transmitted over 5G networks to U.S. diplomatic missions abroad and within the country. The State Department insists that the participation of the Chinese corporation Huawei in the 5G project (fifth generation of mobile communications) is unacceptable.

2. "Clean Carrier". Chinese cellular operator's communications pose a threat to U.S. national security, should not have connect to US telecommunications networks and be present in the US communications services market.

3. "Clean Store". Unreliable applications cannot be sold in mobile application stores64 in the United States. To particularly unreliable and dangerous applications from China.

4. "Clean Apps". Unreliable smartphone manufacturers from China may not pre-install or otherwise make critical applications available for download through their stores. US and foreign companies should remove their applications from the Huawei store.

5. "Clean Clouds". Storage and processing of personal information of US citizens and intellectual property of enterprises, including COVID-19 vaccine research should not be in "cloud" systems available to US foreign adversaries through companies such as Alibaba, Baidu and Tencent.

6. "Clean Cable". All submarine cables connecting the United States with the World Wide Web, should not be used to gather intelligence from China. The United States is ready to cooperate with other states to ensure that China's access to submarine cables is blocked worldwide.

Artificial intelligence is not profitable. According to a forecast study in 2019. Forrester, artificial intelligence has been overestimated and in a year there will be disappointment (Ransbotham, Khodabandeh, Fehling, Lafountain, & Kiron, 2019). In particular, a return was predicted 10% of companies are in favor of automated processes that will be carried out with the help of the human factor, and this trend is

largely due to the limitations of AI. Automation definitely speeds up most processes and often eliminates common human errors when it comes to analyzing large data sets or comparing objects. However, automation is only good for business if it helps bring the business closer to the customer.

Replacing man with artificial intelligence on stage of help desk or round-the-clock chat, businessmen risk losing customers. The fact is that most people prefer human contact. So in most cases, people don't have to completely be excluded from the AI cycle. Automation can be used for market analysis and accelerating customer support processes, but direct contact should be made by people. In a balanced relationship between AI and humans, automation should only be used as a first line of response. If the company leaves customers the opportunity to any time to contact an experienced representative, it will save effective balance between the necessary automation and maintaining contact with people.

Cyber-attacks as the main danger. According to a report by the World Economic Forum, cyberattacks are among the five main threats threaten humanity, along with natural disasters and climate change (The Global Risks Report, 2019). In recent years, cybercrime has increased tenfold. Today the main one's risks are typical for the financial and credit industry (in 2018, the loss from cyber-attacks increased to $1.5 trillion, continuing the upward trend, the duration of DDoS attacks has doubled, according to rough estimates, the annual loss global business from cyber-attacks is up to $600 billion), but already a threat can become relevant for almost all industries. Cyber threats are characterized by the fact that they are constantly changing and appear almost daily.

New trends are cryptocurrency fraud and attacks on virtual values in the block chain. The amount of investment in cybersecurity in 2018, for by some estimates, amounted to $96 billion.

Digital divide, Digital inequality and polarization. Inequalities in access to social, economic, educational, cultural and other opportunities are exacerbated by unequal access to information technology.

The problem of "digital inequality" has received an unexpectedly significant response in the world. Polar views were expressed: from the recognition of this problem as one of the global threats to states and societies in the information age before labeling it as contrived, which further enriches computer and telecommunications corporations. Subsequently, the discussions moved to the plane development of practical recommendations for overcoming "digital inequality" as in internationally and on the scale of individual states.

Digital inequality reduces the quality of life: fewer opportunities, poorer health care and education. Digital Inequality is a consequence of other inequalities and at the same time deepens others, historically earlier inequalities. As a result, states that do not

pay attention to stimulating the integration of information technology in all spheres of society will be uncompetitive in the world economy.

The digital revolution has so far had little effect on the lives of the greater parts of the world's population. Only about 15% of the world's population can afford to pay for broadband internet access. The main means of Internet access in developing countries is a mobile phone, which provide about 80% of the world's population. However, almost 2 billion people do not have mobile phones, and about 60% of the world's population do not have access to the Internet.

The problem of professional development. Partly because of new technology complement more skilled work and at the same time replace standard labor operations, forcing many workers to compete alone with one for low-paid jobs.

The shortage of professionals who have the necessary digital skills comes first place among the threats to growth according to company executives, and they agree so that retraining (advanced training) is the best way elimination of this deficit.

Increasing price competition in the labor market. On the one hand, workers from the periphery with approximately the same level of qualification with employees from the center, favorable price competition because they are ready work for lower wages, but on the other hand - Internet technology allow workers from even poorer areas (such as other countries) to enter the market, effectively waging a price war.

In addition, on the labor market with price competition, their services are offered primarily by relatively low-skilled workers, whose work is easily automated. Therefore, winning wages first, low-skilled information workers in the future may be replaced by technology, the creation of which is stimulated by the desire to reduce costs.

A striking example is the market for standard website design services, where standard work is done web programmers have gradually supplanted ready-made solutions (CMS-systems, Content Management System (content management system, etc.). Using such systems, the average experienced user can quickly make a fairly complex website without the help of a programmer (creating the same CMS-systems require highly skilled creative work, so demand for such professionals will only grow).

Increasing gender inequality in the workplace and in society as a whole is recognized as one of the most likely social risks associated with the development of the digital economy. This threat is primarily related to modern gender asymmetric reduction of employment due to the introduction of new technologies, including robotics and AI.

At the same time, in the digital economy, employment in the field of STEM (science, technology, engineering and mathematics) will develop rapidly, i.e. science, technology, engineering and mathematics. Asymmetry of employment in this area in favor of men is typical not only for countries like Ukraine, but and for all OECD

countries. This can be seen in the example of employment in the field of ICT, which traditionally belongs to the "male" activities and where women make up no more than 30%.

Critique of the consumer economy in the "digital world" and the innovative doctrine of "goods as a service". Adherents of digital sharing through Smartphone apps try to prove that owning things is inconvenient.

Critics of this approach insist that a person buys a house, transport, clothing, household appliances and other things when they are economically prosperous and viable. If a person is economically disadvantaged (beggar), then she does not buy things, but tries to share material goods among them beggars themselves, otherwise there will not be enough money for basic needs. "Economy Schering is poverty. A communist collective farm burdened with bourgeois rent".

"Digital Dictatorship". Opportunities are also a matter of serious concern introduction of universal control over citizens through digital technologies, when it is possible to track every step, the word of man, and later - and his thoughts. A few years ago, the news space was blown up by the news: "China is introducing a digital dictatorship." With such headlines, one could see articles on the revolutionary initiatives of the Chinese leadership, when a tough decision to fight corruption throughout society, as well as restoring trust in society.

Digital culture, new technologies and the "power of data" are changing the means through which citizens use public services and exist in civilian space. Digitization increases people's opportunities interact with the state and business and defend their position. At the same Over time, society's expectations, which are gradually becoming accustomed to the benefits of digital tools in everyday life, are rising, and emerging cyber threats change perceptions of security. At the same time, new threats to digital security increase the vulnerability of both governments and individuals.

Digitalization provides a number of benefits for economic development. In particular, the potential of digitalization is confirmed in the OECD report: "Technology, smart applications and other innovations in the digital economy can improve the quality of services provided and help solve problems within the various areas, including health, agriculture, public administration, taxes, transport, education, the environment, etc.".

The high speed of digitization of all aspects of life is due, first of all, its possible positive manifestations and consequences at all levels.

Benefits at the level of the whole society:

- economic and social effects of digital technologies for business and society;
- improving the quality of life, primarily by improving the satisfaction of specific already known and new needs of people;

- increasing the productivity of all social labor by increasing it at the level of individual industries and enterprises;

- the emergence of new models and forms of business that can improve profitability and competitiveness of activity;

- increasing the transparency of economic transactions and ensuring the possibility of their monitoring;

- ensuring the availability and promotion of goods and services as public, and commercial, up to the world scale;

- the emergence of human-replaceable control systems, for example, for enterprises certain classes.

Advantages at the level of individual companies and industries:

- getting rid of intermediaries. Digitization allows manufacturers themselves arrange on their sites the sale of their products or services and reach out to potential customers. Consumers get the same possibility to independently choose the offered goods and services on the servers of airlines, hotels, e-shops, etc.;

- cost optimization, which involves, above all, reducing costs information retrieval, identification and measurement of transaction costs; costs to promote goods and services; costs of concluding and conducting negotiations, etc.;

- acceleration of all business processes, including by reducing time communications;

- reduction of reaction time to market changes, reduction of terms of development products and services and bringing them to market;

- better understanding of their customers and improving product quality and services;

- creation of new products and services, increase of flexibility of the offered products and their high adaptability to new expectations or needs consumer.

Technological advantages due to digitalization:

- information sharing and lack of competition in consumption knowledge and information, as the use of a database or knowledge base one consumer does not interfere with their simultaneous use by others consumers;

- accumulation of large amounts of data, their automatic processing and analysis;

- synchronization of information flows, the possibility of point distribution of data throughout the business and, as a result, the ability to track a large number of chains between suppliers and consumers, as well as conducting intellectual and point analysis;

- not just mastering new technologies at the applied level, but the transition to awareness of the potential of new innovations, to create new one's innovative products focused on the development of technological intelligence (for example, data management technologies);

- transition from paper to electronic documents.

Consumer and employee benefits:

- reduction in the cost of payments and the emergence of new sources of income;

- the cost of Internet services is much lower than in the traditional economy (mainly due to reduced marketing costs), which makes services more accessible (both commercial and public). Goods and services become available anywhere in the world to any buyer;

- goods and services take into account consumer preferences and needs as much as possible customers;

- the range of informational, educational and entertaining is significantly expanded services, the level of provision and speed of which are also increasing.

Conclusions. Digital culture, new technologies and the "power of data" are changing the means through which citizens use public services and exist in civilian space. Digitization increases people's opportunities interact with the state and business and defend their position. At the same Over time, society's expectations, which are gradually becoming accustomed to the benefits of digital tools in everyday life, are rising, and emerging cyber threats change perceptions of security. At the same time, new threats to digital security increase the vulnerability of both governments and individuals.

So, to bring the benefits of digital technology to real organizations sectors of the economy were able to fully manifest themselves, they need balanced development. The best case scenario for the future is if new technologies are used not for selected countries and small elites, but for the well-being of most people in the world.

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DIGITAL ECONOMY AS A SOURCE OF EMERGENT GROWTH

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Abstract. *The scientific issue "Digital economy as a source of emergent growth" is important because it adds to the development of the general theory of the digital economy. After all, solving this issue necessitates answering important general questions about the scale, structure of the digital economy and its multiplier effect on other sectors. At the same time, this scientific issue is important for the Ukrainian economy, which has to find sources of rapid stabilization and post-war recovery. The purpose of this study is to more precisely identify the concept of "Emergent Growth" and apply the ideas (contents) of this concept in the context of transforming the digital economy into a source of "Emergent Growth" of the Ukrainian economy. Part of the overall goal of this study is to identify the main circumstances that hampered emergent growth before the start of the active phase of the Moscow-Ukrainian war and may hinder growth in the post-war recovery. Accordingly, we are discussing the circumstances that hinder the digital economy and its IT sector from becoming a source of emergent growth. The research uses the tools of the theory of endogenous/exogenous economic growth, structural analysis, analysis based on rating evaluation, analysis of the digital economy and ICT sector economic indicators dynamics. The results of the research were embodied in: determining the content of the emergent growth category based on its connections with the endogenous/exogenous growth, developed/developing economies, sustainable growth categories; judgements about the general conditions for transforming the digital economy into a source of emergent growth; substantiating the potential of the Ukrainian ICT sector as a source of "Emergent Growth" of the Ukrainian economy; the use of the scheme of the digital economy economic cycle to explain the content of "Emergent Growth"; substantiating the potential of the Ukrainian ICT sector as a source of "Emergent Growth" of the Ukrainian economy and outlining some features of the Ukrainian economy and society, which objectively inhibit the real performance of the role of the source (factor) of "Emergent Growth" by the ICT sector.*

Keywords: *digital economy, emergent growth, emerging countries, propensity to use the advantages of the digital economy.*

The scientific issue of this study is related to the identification of sources of economic growth created by the digital economy, in general, and economic growth of the Ukrainian economy, in particular. The importance of solving this issue for Ukraine is increasing, given the need to stabilize the economy during the war and to restore the economic potential after the war. The positive experience of individual countries testifies to the possibility of rapid growth due to the use of special favorable circumstances and sources. According to the authors, the IT industry, which is the core of the digital economy, has the potential to be a source of growth and recovery for the Ukrainian economy. Therefore, the **research hypothesis** is an assumption about the IT sector of the national economy as a source of distinctive "Emergent Growth".

The term "emergent Growth", other concepts related to it, as well as the context in which they are used, denotes the ongoing existence of economic subjects in particular states. These can be, first and foremost, innovative companies at the initial stages of their life cycle, known as "emerging Growth Companies" [1]. Secondly, the term "emergent" is used for investment funds ("Emergent Growth Funds") which support companies dealing with unique products, technologies and having the potential for rapid growth [2]. Thirdly, the concept of "Emerging technologies" is used in those cases when it comes to the adaptation of new technologies in innovative and traditional activities [3]. Fourthly, the term "emerging" refers to countries which are mastering special advantages and opportunities while achieving high growth rates. In particular, the term "emerging" is used for countries - Advanced Emerging and Secondary Emerging - in the Global Equity Index methodology [4]. The investment markets of the countries around the world are evaluated according to the Global Equity Index method. And the term "emerging" is used as a counterpoint to "advanced", precisely to emphasize that high growth rates are achieved by countries with a lower level of development. The McKinsey Global Institute uses the phrase "emerging economies" to distinguish those "developing economies" that have demonstrated high rates of economic growth for a long time. Moreover, the latter are achieved through the use of advantages and opportunities, including technological ones [5].

Taking everything into account, we can conclude that "Emergent Growth" is a phenomenon generated by the successful use of favorable conditions, innovative opportunities and advantages, and successful adaption to new technologies. This kind of growth can be both quick and long-term. At the same time, we are discussing advantageous conditions, opportunities, and advantages that are realized by developing countries rather than the most developed. Such developing countries in the early stages of "Emergent Growth" may be in challenging socioeconomic circumstances that must be overcome through rapid growth.

According to the authors of this section, the concept of "emergent growth" should be described in conjunction with the concepts of "endogenous growth" and "exogenous

growth." Such analysis is especially significant in light of the hypothesis regarding the use of the Ukrainian economy's IT industry as a source of emergent growth.

Ideas for our research are formulated within the framework of the "Endogenous Economic Growth" theory. They include the following:

- Endogenous growth, as opposed to exogenous growth, is dependent on internal factors, the most important of which are human capital and the research and development (R&D) sector;

- Investing in human capital and developing the research and development (R&D) sector creates a distinct type of economy known as a "knowledge-based economy".

Based on the arguments presented in the "Endogenous Economic Growth" idea, we assume that economic growth does not acquire endogenous features until the research and development sector develops. Furthermore, the latter is dependent on human capital, which is developed through education, research, culture, medicine, and the like.

A series of model constructions have been developed within the context of the "Endogenous Economic Growth" theory to explain the impact of human capital on economic growth [6] and the influence of research and development sector on the economic growth [7].

The Endogenous Economic Growth theory reaches the pinnacle in the 1990s. However, in 2022, enthusiasm in the concept of economic growth based on research and development surged once more. This occurred as a result of the approval of "The CHIPS and Science Act" normative act in the United States. The act calls for the greatest investment in the research and development (R&D) sector in the history of the United States, totaling $280 billion [8]. The expediency of such investments is supported by the need to lessen dependence on microcircuits developed in other countries and to boost the development of the own research and development sector.

Thus, Endogenous Economic Growth assumes the existence of a "knowledge-based economy", which relies on significant investments in the research and development (R&D) sector. Such investments are clearly available for advanced economies. It is advanced economies that set the goal of the so-called "sustainable growth" - growth that does not deplete resources, does not harm the environment, and does not exacerbate social problems.

Individual countries with developing economies can, as evidenced by the facts of their economic history, ensure sufficiently high rates of economic growth for an extended period of time, relying on *externa*l factors. Therefore, such Emergent Growth takes on the characteristics of exogenous economic growth.

Fig. 1 depicts the relationships of the examined ideas.

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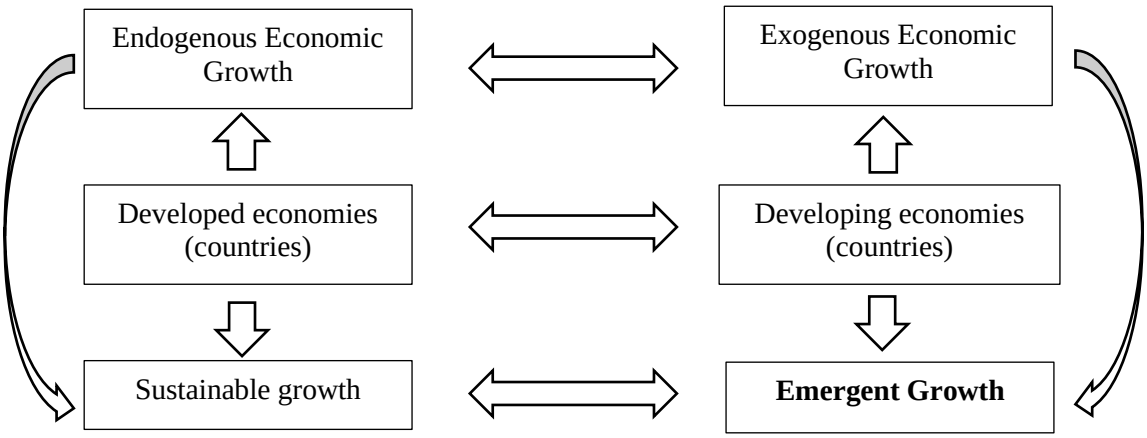

Figure 1. Emergent Growth in the system of categories that explain growth

Sources: developed by the authors

The idea illustrated in Fig. 1 can be formulated as follows: "Emergent Growth is economic growth demonstrated by some developing economies (countries). Furthermore, given the use of external sources without the establishment of an integral "knowledge-based economy" system, this growth is exogenous. With such growth, the goal of sustainable economic growth may not be achieved, but the general standard of living of citizens improves.

We are aware of a specific convention of categorizing countries into developed and developing while discussing the connection of emergent growth and developing countries. This conditionality is particularly evident in the case of Turkey. Turkey is classified as a developing country under the World Bank classification system. Turkey, on the other hand, is classified as a developed country according to the Human Development Index (HDI) criteria. Therefore, when we use the phrase "developing countries" in Fig. 1, we mean those countries that do not formally belong to developed countries based on all criteria and international classifications.

The definition of the digital economy as a source of emergent growth is linked to its boundaries and structural elements. The boundaries, elements of the digital economy, and ways of estimating its scale are still being debated. According to one of the digital economy studies, "the bad news is that there are no specific measures of the digital economy... The foundational minimum is set by measures of the digital (IT/ICT) sector..." [9].

The issue of evaluating the digital economy is being studied by authoritative economic analysis institutions such as the Bureau of Economic Analysis (BEA) USA [10], statistical analysis bodies of the OECD [11], the Statistics Canada [12], and the Chinese Academy of Information and Communication Technologies (CAICT) [13]. One of the most challenging issues is the separation of so-called "digital" and "non-digital" components in the structure of modern economies' final products.

This study requires an examination of the structure of the digital economy for the following reasons. We assume that a sufficiently full (exhaustive) set of digital economy components renders economic growth *endogenous*. Instead, an *insufficient (partial)* set of these elements serves as the foundation for *exogenous* growth, which, given favorable conditions, transforms into emergent economic growth in developing countries.

Regardless of the discussion over the boundaries, structural elements, and ways of assessing the scale of the digital economy, there are several indisputable propositions on which this analysis will be based.

First, it is the recognition of the existence of a special technological core (scope) of the digital economy, which is the ICT sector. The components of this core are defined as: 1) hardware manufacture, 2) software and IT-consultation, 3) information services, 4) telecommunication [14]. According to the approach implemented by the OECD, such components are defined somewhat differently, namely: 1) telecommunications and mobile communications, 2) broadband access and connectivity, 3) internet communication technologies themselves [15].

Secondly, it is a demarcation of the spheres of direct and indirect application of the ICT core and a more or less clear identification of the components of the mentioned spheres. Using research on the areas of the digital economy, which are presented in the sources [14, 16-21], we make a generalization about the structure of the mentioned spheres, which is visualized in Fig. 2.

Fig. 2 shows the idea of distinguishing two interrelated spheres, namely direct and indirect application of the results of the digital economy ICT core development.

The *economy of platforms* and the *economy of digital services* comprise the sphere of ICT direct application. Each of these elements has a substantial impact on the character of economic relations. For example, the term "platform economy" has a different name that captures the nature of these changes: "trust economy." The latter is explained by the fact that technologically advanced IT platforms alter the relationship between product and service manufacturers and consumers.

Relationships become clearer and more sensitive to interests and values. In particular, the *creator economy*, a component of the platform economy, more intimately connects consumers and manufacturers in science, culture, art, journalism, entertainment, and recreation. *Gig-economy* is related to changing relationships in the field of employment, as it creates opportunities for independent, temporary, part-time forms of employment. *Sharing economy* forms more transparent and direct relations of economic subjects in the sphere of use of non-financial and financial assets.

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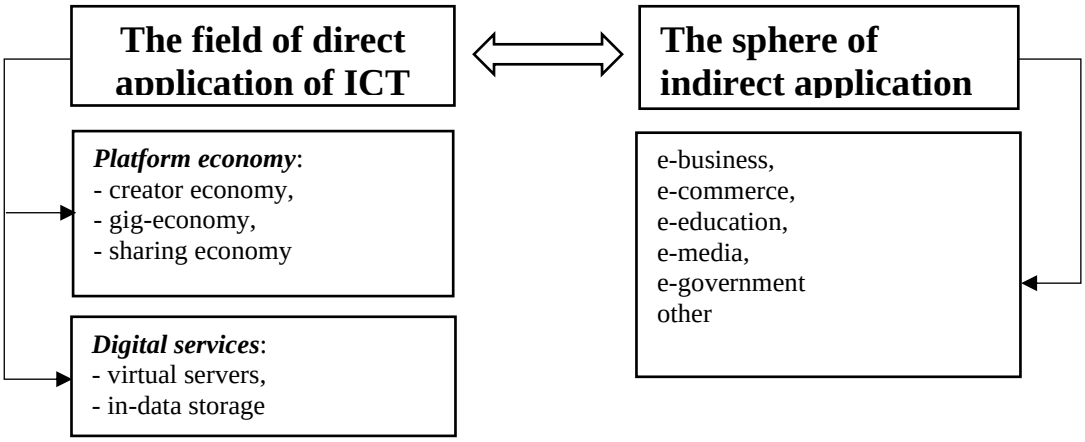

Figure 2. The structure of the spheres of direct and indirect use of the digital economy ICT core potential

Sources: developed by the authors

Digital services, which include virtual servers and in-data storage, such as Google, One Drive, Adobe Creative Cloud, etc., create special opportunities for the formation, storage and transfer of information. This changes the algorithms for making and the quality of economic decisions of all participants in economic relationships.

The *indirect use of ICT* encompasses a wide range of activities that make use of core products as well as *ICT direct application* sphere products. It is about e-business, e-commerce, e-education, e-media, e-governance, etc. the products of which are manufactured with the help of the Internet, telecommunications and mobile communications, IT platform services, and digital services. The issue of identifying "digital" and "non-digital" components of products made in manufacturing, trade, education, journalism, public administration, and so on is related to the sphere of indirect ICT use. And how the "digital component" is evaluated and separated from the "non-digital" has a considerable impact on establishing the extent and boundaries of the digital economy.

Our assumption about the complete set of elements of the digital economy as a factor influencing the nature of economic growth, in particular, what makes it emergent, can be specified. It is about specification based on the analysis of the structure of the digital economy, as well as the experience of successful developing countries. We specify our assumption as follows:

- emergent growth can be ensured due to the anticipatory development of the *sphere of indirect* application of ICT, namely: e-business, e-trade, etc.

- the platform economy and software production can also become the basis of the emergent growth of individual developing countries.

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Despite the fact that emergent growth is caused by certain elements of the digital economy, it remains external, since high technologies of Internet communications, hardware manufacture, digital services are created in *other countries.*

It is obvious that the assumption about the relationship of emergent growth with only certain elements in the set of elements of the digital economy should be validated by the analysis of the product structure of countries with emerging economies. First and foremost, it is a comparison of the shares of the overall digital economy, its ICT core, the platform economy, the sphere of indirect ICT application, and other components in the GDP of both developed and developing countries. Unfortunately, the current statistical data limits the capabilities of such a study, which takes into consideration all of the specified components of the digital economy.

Figure 3 shows a comparison of countries based on the percentage of the Internet economy in GDP created using one of the most comprehensive data sources [14]. The numbers next to the country names mean the country's place in the ranking, based on the share of the Internet economy in GDP.

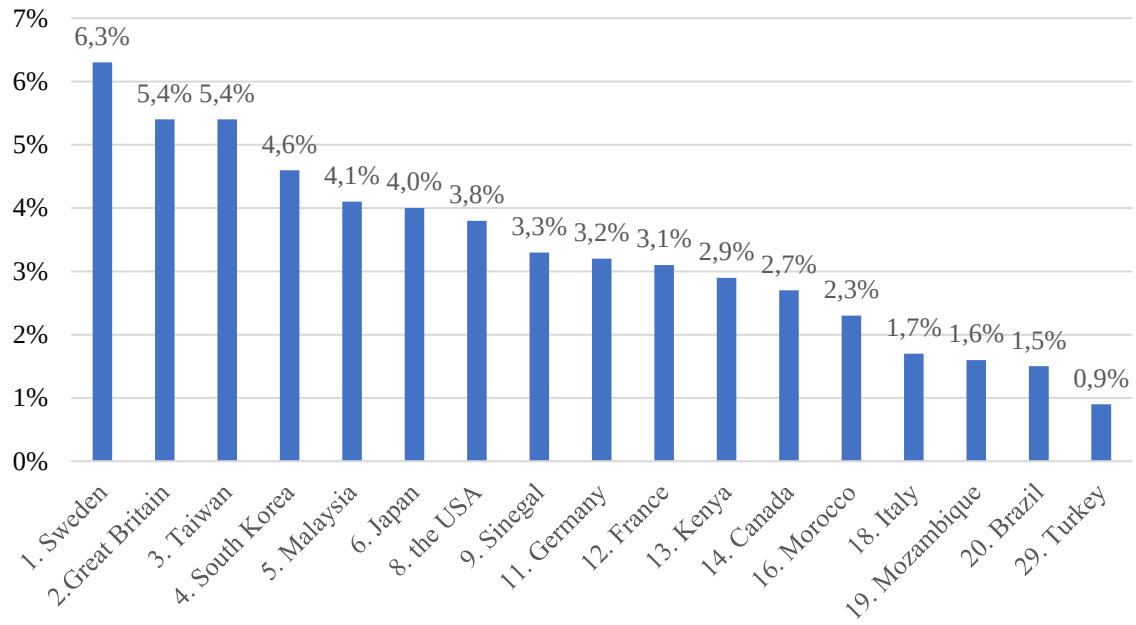

Figure 3. The share of internet economy in % of GDP of some countries of the world in 2012

Sources: developed by the authors on the basis of [14], p. 17]

Data on the share of the Internet economy are significant for our research since, first and foremost, the Internet economy is a component of the digital economy. Therefore, the dynamics of these two economies are interconnected. Secondly, information on the share of the Internet economy became available for analysis in sufficient amounts earlier than information about the share of the digital economy. The internet economy, according to the definition provided in the source

[20], consists of four components: 1) activities like e-comers that use web as support, 2) telecommunication that uses IP and ISP, 3) ICT consulting and software development, 4) computers, smart phones, hardware and servers. It follows from this list that the Internet economy does not cover, at least, such elements of the digital economy as "Platform economy" and part of "Digital services".

The information presented in Fig. 3 testifies to such facts that are directly related to the emergent growth issue:

- only two developed OECD member countries belong to the five countries, which in the early 2010s were characterized by the world's largest share of the Internet economy in GDP. These are Sweden and Great Britain. The other three countries - Taiwan, South Korea, Malaysia - belonged to another group of countries. These are *emergent economy* countries that demonstrated a tendency to make the most complete use of the opportunities created by ICT technologies;

- in addition to Asian countries, the leading positions in terms of the share of the Internet economy were also occupied by some African countries, namely: Senegal (ahead of Germany and France in terms of share), Kenya (ahead of Canada), Morocco (ahead of Italy), Mozambique (ahead of Brazil);

- only the 29th place of Turkey, which belongs to the OECD countries, is indicative. In terms of the share of the Internet economy in GDP, Turkey lagged behind agrarian countries with much lower per capita GDP indicators, namely the Republic of South Africa (21st position), Cote d'Ivoire (22nd), Tanzania (23rd), Cameroon (24th), Ghana (25th), Vietnam (26th), Egypt (27th).

The aforementioned facts provide reasons for some broad generalizations regarding emergent growth based on use of Internet economy advantages:

- the share of the Internet economy in the country's GDP is determined **not only** by the previously achieved level of socio-economic and technological development of the country, but also by the ability to adapt new technologies,

- the possibilities of new technologies, which, due to globalization processes, become available to all developing countries, are expediently used only by a part of developing countries.

Further research should address the issue of how countries previous levels of development affect the scale of the digital economy, as well as how developing countries may best take advantage of the digital economy's opportunities.

It is evident that for our research, the analysis of the share of the total digital economy in GDP is more significant than the analysis of the share of the Internet economy in GDP. Figure 4 depicts data from the Asian Development Bank on the share of the total digital economy in GDP of countries accessible for analysis.

The numbers next to the names of the countries shown in Fig. 4 represent the country's position in the 15-country ranking. The first number represents the ranking

position in one of the first (2000-2012) period's years, and the second - in one of the second (2014-2019) period's years. For example, "8/10 AUS" indicates that Australia is ranked eighth in the first period by the share of digital economy in GDP (with an indicator of 5.1% digital economy in GDP) and tenth in the second period (with an indicator of 4.9% digital economy in GDP).

The presented country ranking is not global in the sense that it only includes countries for which relevant data is available in open sources. In particular, the information is comparable in Asian Development Bank sources.

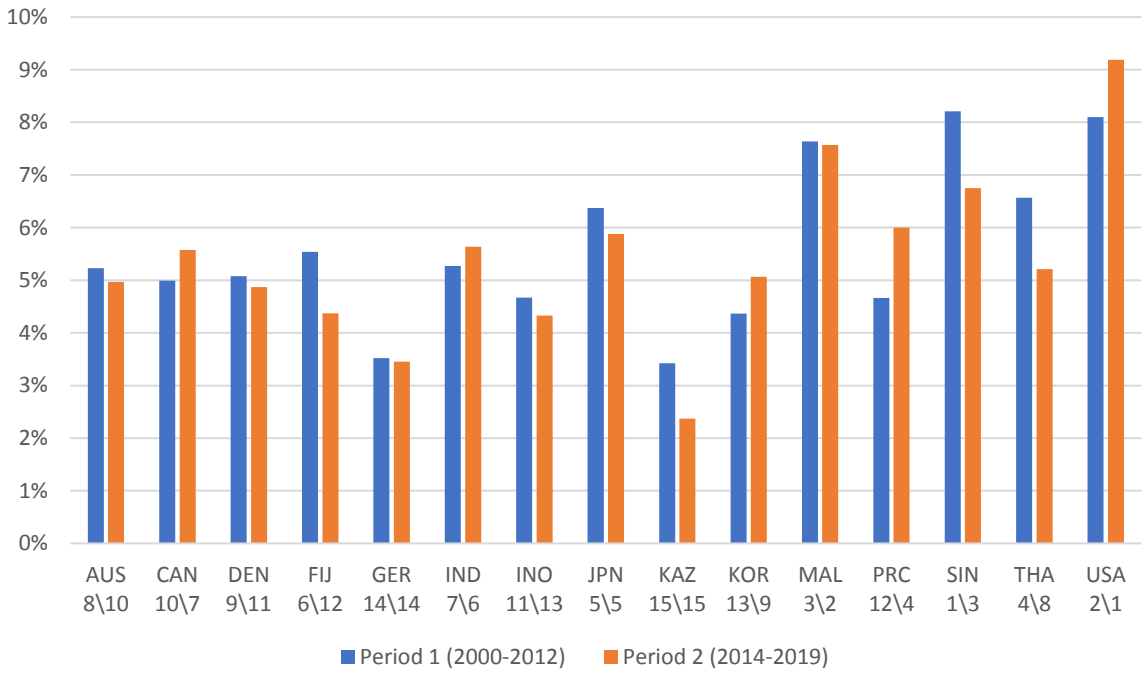

Figure 4. The share of the digital economy in % of the GDP of some countries of the world (data for individual years within period 1 - 2000-2012 and within period 2 - 2014-2019)

Sources: developed by the authors on the basis of [22], [23]

AUS = Australia; CAN = Canada; DEN = Denmark; FIJ = Fiji; GER = Germany; IND = India; INO = Indonesia; JPN = Japan; KAZ = Kazakhstan; KOR = Republic of Korea; MAL = Malaysia; PRC = People's Republic of China; SIN = Singapore; THA = Thailand; USA = United States. **Notes:**

Period 1 = 2000 to 2012. Period 1 for AUS, 2010; CAN, 2012; DEN, 2010; FIJ, 2011; GER, 2010; IND, 2010; INO, 2010; JPN, 2011; KAZ, 2001, 2010; KOR, 2010; MAL, 2010; PRC, 2012; SIN, 2000, THA, 2010; and USA, 2010.

Period 2 = 2014 to 2019. Period 2 for AUS, 2018; CAN, 2016; DEN, 2016; FIJ, 2015; GER, 2016; IND, 2014; INO, 2014; JPN, 2018; KAZ, 2018; KOR, 2018; MAL, 2015; SIN, 2015; THA, 2015; and USA, 2019.

The information presented in Fig. 4 gives grounds for the following generalizations:

- In the first analyzed period (2000-2012), two developed countries - the United States and Japan - and three developing countries - Singapore, Malaysia, and Thailand - made the top five in the list.

- In the second period (2014-2019), China surged to the top five of the rankings. As a consequence, the number of developing countries in the top ranking has increased to four.

In terms of content, the indicator of the share of the digital economy in GDP appears contradictory, at least when it (the indicator) is roughly the same in a highly developed country as in a developing one that did not show signs of rapid growth. This is true for both Germany and Kazakhstan. In both periods, the quantitative values of the share of the digital economy in GDP in Germany and Kazakhstan were roughly the same and the lowest in the ranking for both countries. In attempts to "expand the boundaries" of the digital economy, the inconsistency of the indicator of the digital economy's share of GDP is also highlighted. We're talking about China, for example. The data source we used, the Asian Development Bank, fails to provide information on China's digital economy's share of GDP in the second period (2014-2019). Instead, the Chinese Academy of Information and Communication Technologies (CAICT) provides a disproportionately large value for this share. In 2018, the digital economy accounted for 34.8% of GDP [24, p. 3].

At the same time, CAICT uses the so-called "broad interpretation" of the digital economy. In view of this, the authors of this chapter were forced to use another source of information about China in the second period. Figure 4 illustrates data for China in the second period based on the so-called "narrow definition" (based on the OECD framework) [23].

We began with the fact that China had only achieved a 6% digital economy in GDP for the second period:

- the places of countries in the ranking of 15 countries changed in a special way. Only in two countries - Malaysia (7.6% in both periods) and Germany (3.5% in both periods) - the share of digital economy in GDP did not change. However, with this share unchanged, Malaysia improved its position in the ranking by one point. More than half of the countries - eight out of fifteen - *worsened* their positions in the ranking in the second period due to a decrease in the share of the digital economy in the country's GDP. Among such countries there are both developed and developing countries, namely: Singapore, Thailand, Japan, Australia, Fiji, Denmark, Indonesia, Kazakhstan. It is clear that such a decrease in the share could occur due to the outpacing growth rates of the product of the entire economy in comparison with the growth rates of the digital economy. The latter can be interpreted as a certain inhibition in the

development of the digital economy. However, this can also be interpreted as the result of an increase in the multiplier effect of the influence of the digital economy on the entire national economy;

- it is indicative that only in five countries - the USA, India, Canada, China, Korea - the share of digital economy in GDP increased. Such changes in the share can be interpreted either as a result of higher growth rates of the digital economy product compared to the GDP growth rate of the entire economy, or as a result of a decrease in the multiplier effect of the influence of the digital economy on the entire economy.

Based on the analysis of the data presented in Figure 4, we make the following generalizations about the digital economy as a source of emergent growth.

First, the actual indicator of the share of the digital economy in the country's GDP ($d_{dig} = \frac{Y_{dig}}{Y}$) is not a convincing characteristic of emergent growth. It is not even when this share is considered in dynamics. As an argument, we will use the fact that developing countries can demonstrate both rapid growth of this share and its rapid reduction. For example, in 6 years (from 2012 to 2018), China had an increase in the share of the digital economy in GDP by 1.3 percentage points (from 4.7% to 6.0%). On the other hand, in Thailand, this share decreased by 0.8 percentage points (from 6.6% to 5.8) over 5 years (from 2010 to 2015). A reduction in the share of the digital economy in GDP also took place in Singapore - by 1.4 percentage points (from 8.2% to 6.8) over 15 years (from 2000 to 2015), and in Indonesia - by 0.4 percentage points (from 4.7% to 4.3%) for 4 years (from 2010 to 2014), etc.

Secondly, since the dynamics of the share of the digital economy in the country's GDP is affected by the growth rate of the GDP itself, the sensitivity of changes in the country's national product to changes in the digital economy product can be considered as a more relevant indicator for explaining emergent growth. This sensitivity is reflected in the values of the multiplier of the impact on changes in the country's GDP of digital economy changes ($m_{dig} = \frac{\Delta Y}{\Delta Y_{dig}}$). It is likely that the value of the multiplier m_{dig} is determined by a special propensity to use the technological opportunities generated by the digital economy (c_{dig}).

According to the logic used in the Keynesian macroeconomic theory, it is possible to assume the existence of the following dependence: $Y = Y^* + c_{dig}\, Y$. From this we can derive the so-called multiplier of the digital economy: $m_{dig} = \frac{\Delta Y}{\Delta Y_{dig}} = \frac{1}{1 - c_{dig}}$ (where Y is actual GDP, Y^* is autonomous (independent) of the propensity to use digital economy GDP).

In the economic history of developing countries, which belong to the group of emerging countries, there are facts that, in addition to the intensive use of digital technologies, they carried out reforms in the social and public spheres. We are talking,

first of all, about reforms in education, medicine, social security, public administration, etc. Therefore, it is likely that the behavioral factor - "propensity to use the advantages of the digital economy" - is derived from the level and quality of education, culture, public administration, and the development of the entire social sphere. Therefore,

$c_{dig} = f(educ, public\ admin, \ldots)$. It is possible that under the conditions of unstable democracies, when reforms in the social and public spheres are inhibited, such a propensity may fade over time. Therefore, the potential of emergent growth will also be lost.

The multiplicative effect of the digital economy on the overall economy in relation to a special behavioral factor - the "propensity to use the advantages of the digital economy" - and the conditions for implementing this propensity in developing countries should be the subject of further research.

The idea of emergent growth based on certain components of the digital economy can be interpreted in terms of "economic circuits". The toolkit of "economic circuits" is a technique recognized in economic science for interpreting and visualizing economic relations. Moreover, the latter are presented in the form of interrelated movement of *products* (and corresponding production resources), *expenditures* (and corresponding incomes) of the subjects of these relationships.

Figure 5 depicts the scheme of economic circulation between subjects of the digital economy, which allows us to evaluate emergent growth while taking into consideration the components of the digital economy.

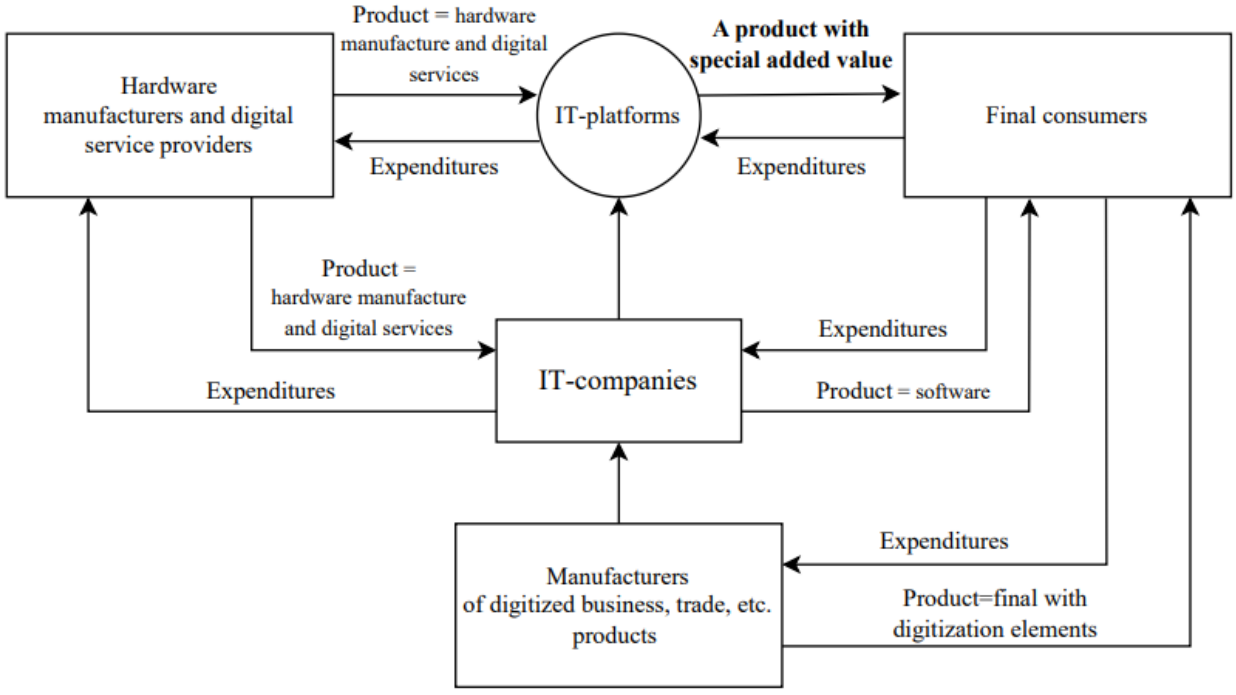

Figure 5. Scheme of the economic circulation of the "digital economy".

Sources: developed by the authors

Fig. 5 illustrates a fragment of the national economy that is specifically related to the functioning of the digital economy sector. This fragment clearly does not cover all economic relationships, but it does illustrate economic flows between the key subjects of relationships.

Figure 5 depicts the interrelated movement of products and expenditures amongst five subjects within the digital economy. We are talking about producers of hardware manufacture and digital services, IT companies, owners of IT platforms, manufacturers of digitized final products containing elements of digitalization, on the one hand, and consumers of these products, on the other. Moreover, each of the subjects creates a product based on special resources at its disposal. It is obvious that these products exist in special forms, namely: hardware manufacture and digital services, software, IT platform products with special added value, final consumption products with digitalization elements. Consumers of the mentioned products incur expenses that form the income of digital economy producers.

Using the scheme depicted in Fig. 5, we generalize that developing nations' exogenous emergent growth can occur without their own hardware manufacture and digital services, but rather through national digitized business, trade, education, and so on. All national manufacturers can use software from external and internal IT companies, as well as services from external and internal IT platforms. Endogenous growth, on the other hand, presumes the presence in the national economy of all elements of the IT core of the digital economy, which may be lacking in a country with emergent growth.

The suggested scheme of economic circuit within the boundaries of the digital economy, like any other scheme, is a simplification of actually existing relationships. It is particularly lacking in financial system subjects that are relevant to the activities of all actors in the digital economy. The scheme also lacks the state as an economic entity, with the participation of which the digital economy's manufacturing infrastructure, etc., is being developed. However, the authors believe that such a scheme and simplification has some theoretical significance since it allows them to explain the meaning of emergent growth.

Another limitation of the given scheme of economic circulation is that it does not reflect the internal (in-house) product of the digital economy. This is software created not by IT companies, but by IT divisions of enterprises of traditional or innovative business. The existence of such products objectively complicates the accounting and assessment of the digital economy scale.

As previously said, the purpose of this research, among other things, is to find an answer to the question of what is preventing the digital economy from serving as an emergent growth factor for the Ukrainian economy.

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Are there reasons to believe that the components of the Ukrainian digital economy have the potential to become a source of emergent growth and, accordingly, a source of economic stabilization during the war and accelerated growth during post-war recovery? According to the authors, there are such grounds. The following arguments can be used in favor of this.

First, the IT sphere of the Ukrainian economy exhibits exceptional adaptability particularly during the active phase of the Moscow-Ukraine war. Figure 6 shows data to support this assertion.

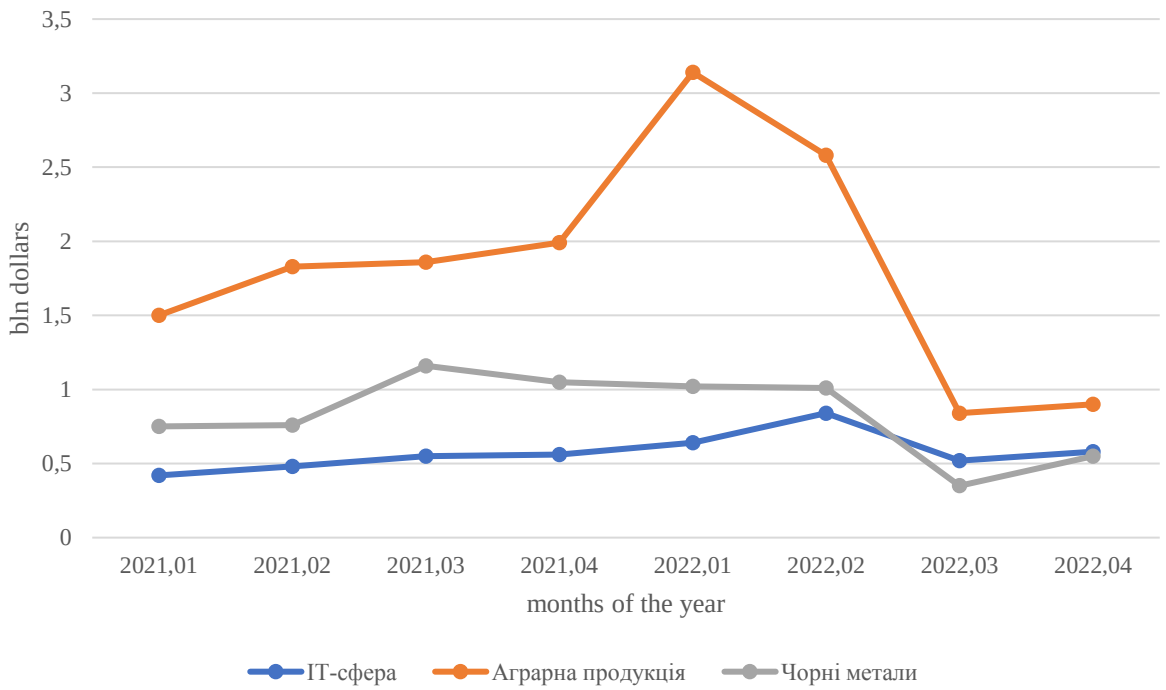

Figure 6. Dynamics of foreign currency receipts from the three main branches of Ukrainian exports

Sources: developed by the authors on the basis of [25] based on the data itself refers to the NBU, State Customs, State Statistics Service, Ministry of Agrarian Policy

Figure 6 demonstrates that during the start of the active phase of the Moscow-Ukraine war in February 2022, the three primary exporters of Ukrainian goods - agriculture, ferrous metallurgy, and information technology - saw a reduction in foreign exchange earnings. Only the IT industry, however, restored its export levels to the beginning of 2021 three months later.

Secondly, the Ukrainian IT sector showed significantly higher growth rates than the average in the economy as a whole, according to key economic indicators, in the period before the start of the active phase of the war. This is evidenced by the data in fig. 7 and fig. 8.

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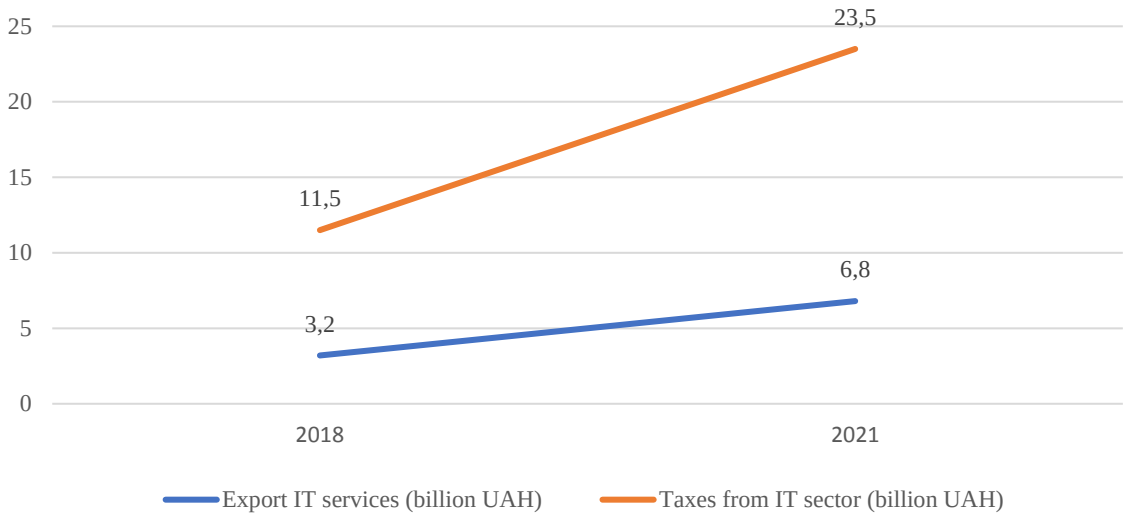

Figure 7. Export revenues and tax revenues from the Ukrainian IT sector

Sources: developed by the authors on the basis of [26]

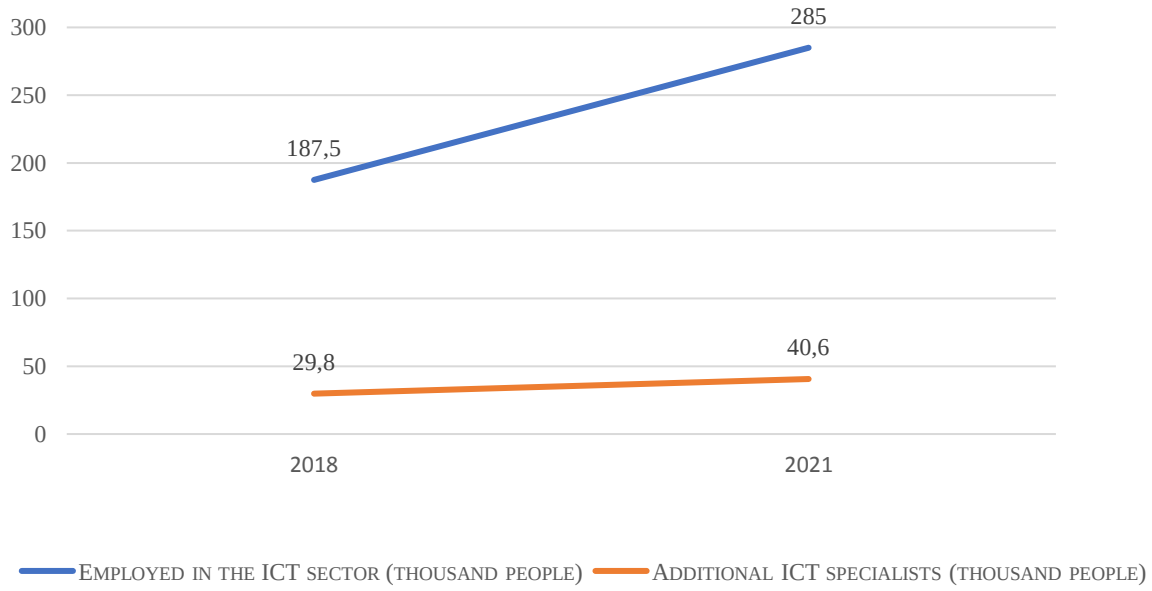

Figure 8. Employment in the Ukrainian ICT sector and the growth of specialists in the ICT sector

Sources: developed by the authors on the basis of [26]

Fig. 7 illustrates a very rapid - more than two-fold - increase in the volume of exports and tax revenues to the budget from the IT sector in the three years before the active phase of the Moscow-Ukraine war.

The data presented in Fig. 8 indicate a 1.5-fold increase in employment in the Ukrainian ICT sector in just three years and a 1.36-fold increase in the employment of specialists in the sector over the same three-year period.

The "gap" between the average wage in the entire economy of Ukraine and the average wage of specialists in the IT sector is impressive, in favor of the latter. In pre-

war 2021, the average monthly wage in the Ukrainian economy (17,453 hryvnias) was approximately 2 times lower than the median wage of the lowest-paid IT workers (QA Manual) and 6 times lower than the median salary the highest paid employees of the IT sphere (Project Manager) [27, p 15].

The high incomes of employees and companies in the IT sphere have quite obviously influenced, first of all, the development of the residential and commercial real estate market in large cities of Ukraine. Particularly in those where so-called "IT clusters" have emerged and the greatest number of IT specialists and companies are located. And this is only the connection that "lies on the surface". Further research is anticipated to find additional channels of real influence of the digital economy IT sector on the whole Ukrainian economy. This effect is clearly exercised through individual markets and other sectors of the Ukrainian economy.

Given the very high development rates of economic indicators - export products, tax revenues, population employment, and rising demand for professionals, a much higher level of wages - the Ukrainian IT sector has the potential to become a source of emergent growth. Furthermore, this expansion has been ongoing since the mid-2000s.

Unfortunately, the IT sector of the Ukrainian economy has not become a source of emergent growth. After all, the entire Ukrainian economy has traditionally demonstrated much lower rates of economic growth than the ICT sector. So, we are talking about the unused potential of the Ukrainian IT sector, the entire digital economy as a source of emergent growth.

In the analysis of the Ukrainian situation, according to the authors, it is appropriate to rely on the assumption that the transformation of the digital economy into a source of emergent growth occurs due to the "propensity to use the advantages of the digital economy." If this assumption of ours has grounds, then it is necessary to analyze the circumstances that give rise to this propensity in Ukraine. We concentrate primarily on the two most essential factors: education level and public administration quality.

According to the World Education Rankings [28], in 2021, Ukraine ranked 40th in the world in terms of education level and was ahead of 8 EU countries - Lithuania, Croatia, Slovakia, Romania, Bulgaria, Latvia, and Slovenia. Therefore, education cannot be considered as the main factor limiting the "propensity to use the advantages of the digital economy". Accordingly, education is not the main factor inhibiting the process of transforming the digital economy into a source of emergent growth.

According to the World Competitiveness Index, Ukraine ranks substantially lower than in education in terms of indicators of the quality of public administration used in country rankings. Ukraine ranks 53rd and 59th in the parameters of Governance efficiency and Institutional framework, respectively [29]. Other global rankings, such as the Economic Freedom Index (EFI), Worldwide Governance Indicators (WGI), and Fragile States Index (FGI), identify Ukraine's low quality governmental institutions,

high level of corruption, and judicial system shortcomings. If the quality of public administration is a factor influencing the "propensity to use the advantages of the digital economy", then low indicators of this quality, with a high probability, limit the transformation of the digital economy into a source of emergent growth in Ukraine.

Identification of the reasons for the unused potential of the ICT sector to ensure the emergent growth of the Ukrainian economy should be the subject of many theoretical and applied studies. In our opinion, the most common cause of unused potential is the economic model formed in Ukraine, which is defined as "oligarchic economy". A more detailed answer to the question of the causes involves the analysis of the inhibiting effects of the components of this "oligarchic economy"

Conclusions. We draw the following concluding generalizations based on our findings.

- Emergent growth, which is a growth enabled by external factors, in particular, digital technologies created in other countries, is an undeniable fact of the development of dozens of developing countries. Evaluating the contribution of the digital economy to the emergent growth of developing countries has theoretical and applied value. After all, comparing these contributions across countries makes it possible to identify the conditions under which the contribution becomes larger or, conversely, smaller, as well as to make management decisions.

- A relevant definition of the digital economy's boundaries (scales) is a fundamental requirement for an adequate assessment of the digital economy's contribution to emergent growth. Determining the boundaries of the digital economy only on the share of the IT/ICT sector in the country's GDP does not fully correspond to the real content of the digital economy and the concept of emergent growth. After all, developing countries which lack the technological core of the digital economy (the IT/ICT industry) might attain faster growth rates through the development of other elements of the digital economy.

- The scheme of economic circulation can be used to theoretically identify the digital economy as a component of the national economy. The following circumstances explain the expediency of using the scheme of economic circulation of the digital economy to describe emergent growth. First, the scheme makes it possible to focus attention on the subjects of economic ties, related to the digital economy technological core, on the one hand, and to the spheres of its (core) direct and indirect influence, on the other. Secondly, a circuit diagram can be used to depict the movement of the product of the digital economy, which ensures the emergent growth of developing countries.

- The Ukrainian economy has the capacity to develop the digital economy into a source of emergent growth that is currently untapped. The presence of this potential may be seen in the continually high growth rates of the ICT sector's output,

employment in it, and tax revenues from it, among other things. The absence of correlation between the growth of the overall national economy and the growth of the Ukrainian ICT sector confirms that the potential is not being used.

- The poor quality of public administration is likely one of the most powerful limiting factors in the transformation of the digital economy into a source of emergent growth for the Ukrainian economy. As you are aware, the quality of state institutions, the extent of corruption, and other factors are required components for measuring the quality of public administration in all countries throughout the world. There are reasons to believe that the quality of public administration influences emergent growth because of a unique "propensity to use the benefits of the digital economy." It is this propensity that determines the multiplicative effect of the influence of the digital economy on the entire national economy. Therefore, the increase of this propensity in the Ukrainian economy and society can play the role of a contributing factor in the transformation of the IT-sector of digital economy into a source of emergent growth.

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CHAPTER 3
ADAPTIVE BUSINESS MODELS FOR THE DIGITAL ECONOMY

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DIGITAL ENTREPRENEURSHIP BUSINESS ENVIRONMENT MODELING AND ANALYZING

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Absract. *Based on the results of a strategic analysis of the development of the services market in the conditions of digital transformation of the economy, the prerequisites, factors and trends of the development of the services market in the national economy were determined, the environment of the services market in the conditions of the digital transformation of the economy was investigated, and the modeling of economic processes in the services market was carried out as a necessary condition for the effective management of its development. The analysis of the environment of the services market in the conditions of the digital economy through the PEST analysis made it possible to conclude that the factors of the political environment exert the greatest negative influence on the development of the market, which is caused by crisis phenomena in politics and the significant dependence of certain sectors of the intermediary services market on state regulation. The economic environment exerts the greatest positive influence on market development. Social and technical factors influence market development almost equally. The positive value of the integrated assessment indicates the predominance of trends of the positive overall impact of macro-environmental factors and indicates the possibility of market growth. The scientific principles of the cognitive approach to the analysis of the development of the service market were further developed, vector maps of alternative SWOT strategies were constructed for individual branch service markets; the conceptual and categorical apparatus of management theory by defining the concept of managing the development of economic systems; scientific-methodical approach to cognitive analysis, within which the structural-logical scheme of cognitive analysis of the market is applied.*

Keywords*: digital economy, digital entrepreneurship, business environment, PEST analysis, SWOT analysis, cognitive modelling.*

Digital entrepreneurship business environment concept. In the modern world, a digital society has actually formed - a modern person cannot imagine his existence without digital devices, information and computer technologies. The economy of this society has already acquired a digital character.

The date of the appearance of the term "digital economy" is considered to be 1994 - the publication of a well-known book by a Canadian economist and business consultant D. Tapscott "Digital Economy" (Tapscott, 1994).

In 1995, this term spread and went beyond the limits of scientific use thanks to the American computer scientist of the University of Massachusetts N. Negroponte (1995), who defined the ideology of the digital economy as "the transition from the processing of atoms, the constituent matter of physical substances, to the processing of bits, the constituent matter of program codes".

N. Negroponte (1995) argued that material substances, which are considered in the form of raw materials and products, have their own disadvantages, such as: the physical weight of products, the need for resources for their production, the use of areas for their storage, logistical costs and problems related to with transportation of goods. The advantages of the digital economy as a "new" type of economy, according to informatics, could be: the absence of physical weight of products, which is replaced by information volume, lower resource costs for the production of electronic goods, several times smaller area occupied by products (electronic media), as well as instant global movement of goods via the Internet.

The digital economy is also sometimes called the internet economy, the new economy, or the web economy. Increasingly, the "digital economy" is intertwined with the traditional economy, making a clear distinction more difficult (Negroponte, 1995). The digital economy began to develop in the late 1950s, and since the 1960s, digital innovations have been actively spreading around the world. The second phase of digitalization began around the mid-1990s, with the global spread of the Internet and mobile communications.

Today, we can talk about the third stage of digitalization, which is connected with the spread of digital currencies and distributed ledger technology in the world economy. Bitcoins and other digital currencies have already gained a place in the world financial market, their number (as well as the scale of operations with them) is increasing, as a result of which a new currency component of the world financial architecture is formed, which meets the requirements of the time. They have been in use since 2009, and to date have proven their demand and value.

Contemporary market in the conditions of digital transformation of the economy is characterized by rapid variability and uncertainty of the environment. In order to form reliable knowledge about the state and trends of the development of the market,

it is proposed to apply a structural and logical model of the research of the market by its sectors and as a whole, had been developed before (Kostynets, 2014).

To analyse the macro- and microenvironment, the PEST-analysis method was used, which was used to study four main groups of factors of the external environment: economic, legal, technological, and socio-cultural (Nandonde, 2019). The PEST-analysis method involves the assessment of four components, that is, four groups of factors influencing the development of the market: the political and legal environment, the economic environment, the socio-cultural environment, and the technological environment (Islam&Mamun, 2017).

According to the existing approaches, each component is evaluated by the method of expert evaluations according to the appropriate scale. However, taking into account the fact that each of the factors of each group affects the others. Therefore, there are relationships between them due to mutual influence. And this means that actually all the factors that are involved in the PEST analysis can be combined into a fuzzy cognitive map (FCM) and analysed by cognitive analysis(Glory&Kasper, 2021; Leyva Vázquez et al., 2018; Monshizadeh et al., 2023).

In macro-level management, the cognitive approach to modelling and managing the development of the economy is aimed at the development of formal models and methods that can be used during the intellectual process of solving problems thanks to the consideration of cognitive capabilities (perception, representation, cognition, understanding, explanation) in these models and methods. management subjects when solving management tasks.

The cognitive map is built on the basis of subjective perceptions of experts about the situation. The system of concepts of the development digital entrepreneurship business environment in Ukraine is given in the table 1.

From the table 1 we can draw a conclusion about the predominantly negative influence of factors of the political and legal environment on the processes of digital market development. Political risk has the greatest negative impact. Tax regulation has a significant negative impact. In fact, all factors of the political environment exert a negative influence on the development of the market, which is mainly due to the shortcomings of the state regulation of the development of this market.

Evaluating the impact of the economic environment allows us to draw conclusions that the factors of the "E" group exert both a negative and a positive influence on the development of this market. The greatest influence on the development of the digital market in Ukraine at the current stage is exerted by the factor of the exchange rate and its fluctuations, as well as the factor of the state of employment in the market in a whole, since the end consumers of many services are individuals who, in case of unemployment, have limited opportunities to use paid services. The structure and trends of GDP is an important indicator for the economic situation of the country as a

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whole. Personnel as the main asset in the market is a factor of significant influence on the market. The inflation factor, which strongly affects the cost of resources, the cost of goods, works, and services, has the same impact assessment.

Table 1. A system of concepts of the digital entrepreneurship business environment in Ukraine

Group of concepts	Conventional designation of the concept	Name of concept	Influence on the development of the market
P - political and legal factors	E1	antimonopoly regulation	has a negative impact on the activities of market subjects with various prohibitions
	E2	tax regulation	A significant negative impact on the activities of market entities
	E3	legislation on environmental protection	Affects the regulation of the activities of enterprises in all markets
	E4	Legal regulation of export-import activities	legal regulation affects external national and foreign entities
	E5	The level of bureaucracy and corruption	complicates the development of the market, prevents quick decision-making
	E6	the presence of pressure groups lobbying the interests of individual market subjects in power structures	It negatively affects the development of the market as a whole
E –economic factors	E7	structure and dynamics of GDP	An indicator of the country's economic development
	E8	cost of capital	Capital is one of the resources in the market
	E9	price index	strongly affects the cost of resources, the cost of goods, works, and services
	E10	the state of employment in the market	strong impact, digitalization has the risk of increasing unemployment, correspondingly decreasing the level of employment and income, searching for alternative types of employment
	E11	availability/unavailability of credit resources	great impact on activity
	E12	the cost of labour in the labour market	personnel are the main asset in the market, the factor has a significant impact
	E13	investment activity	the activity of enterprises improves due to the inflow of investments and vice versa
S- soc ioc ult ur	E14	changing standards of living and education	affects the economic development in direct proportion to the increase

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Group of concepts	Conventional designation of the concept	Name of concept	Influence on the development of the market
			in the standard of living and the number of educated citizens
	E15	public attitude to business	Some groups of service consumers believe that the service provider does not make any effort, so there is nothing to pay for
	E16	employment structure	The presence of a tendency to increase the number of people employed in the service sector
	E17	age structure of the population	Different age groups use the services of different entities in different ways, depending on consumer preferences
	E18	family structure	Married / single, with or without children, have different values and needs, which affects the structure of demand for services
	E19	value system in society	For people, there is a different set of concrete, material things. Each person spends different amounts of money on clothes, food, etc.
	E20	stratification of society based on income	A significant stratification of population strata depending on the level of income determines consumer preferences and expectations
	E21	consumerism	Clients evaluate the quality of the service and can refuse services in case of dissatisfaction
	E22	Using the digital environment for both communication and work	blurring the boundaries between work and private life; however, increasing opportunities for digital neuromarketing
T – technological environment factors	E23	State and non-state expenditures on science and technology	significantly affects, because in modern conditions any enterprise uses IT
	E24	Services on cyber markets	Significant influence on the development of the services market and the level of digitalization
	E25	Patent and license protection of technologies	Insignificant influence due to existing influence in certain sectors of the market
	E26	Mass use of the Internet	Significant influence on the development of the services market
	E27	Mass use of social networks	Digitization of personal space
	E28	State of business digitalization	digitalization means increased individual capacity for successful work and opportunities for self-realization and achieving economic

Group of concepts	Conventional designation of the concept	Name of concept	Influence on the development of the market
			growth and development of the country's society in general
	E29	The level of digital competence of the population	Affects the possibility of introducing innovations for consumers

Source: developed by author based on experts' evaluation

Therefore, in the process of assessment, appropriate assessments of factors influencing the socio-cultural environment on the development of the market were obtained. In particular, it was established that the greatest influence on this process is exerted by such factors as the value system in society, since for people there is a different set of concrete, material things, and each person spends different money on clothes, food, and the factor of consumerism, since customers evaluate the quality service and in case of dissatisfaction can refuse services. Factors of the structure of employment and the age structure of the population exert a significant influence.

From the table 1 the conclusion follows that in the group of factors of the technological environment, the factor of mass use of the Internet has the greatest influence on the development of the market, which became possible due to the popularization of network technologies, wireless technologies of Internet communication and the reduction of tariffs for the services of Internet providers. The following factor is connected with this factor - the provision of services on cyber markets in the network, which is an innovative form of the market, and therefore has a significant impact on the development of the market. Patent and license protection of technologies as a factor of the technological environment exerts a minor influence due to the existing influence only in certain sectors of the digital market in Ukraine.

From Table 1, it can also be concluded that the most negative influence on the development of the market is exerted by the factors of the political environment, which is caused by periodic crisis phenomena in politics and the significant dependence of certain sectors of the market on state regulation. The economic environment exerts the greatest positive influence. Social and technical factors influence market development almost equally. The positive value of the integrated assessment indicates the predominance of trends of the positive overall impact of macro-environmental factors and indicates the possibility of market growth.

In order to analyse the system characteristics of the proposed cognitive model, it is necessary to determine the main system connections. The results of identifying cause-and-effect relationships between concepts characterizing the macro-environment of the market in the conditions of digital transformations should be

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summarized in the integral system characteristics of the cognitive model (Monshizadeh, 2023).

Based on the binary matrix of the incidence of the digital market environment, on the basis of which the cognitive map of the macro-environment of the market in the conditions of the digital transformation of the economy will actually be a hypergraph, where the both individual concepts of this environment and subsets of these concepts. Such a hypergraph in this case is demonstrated on figure 1.

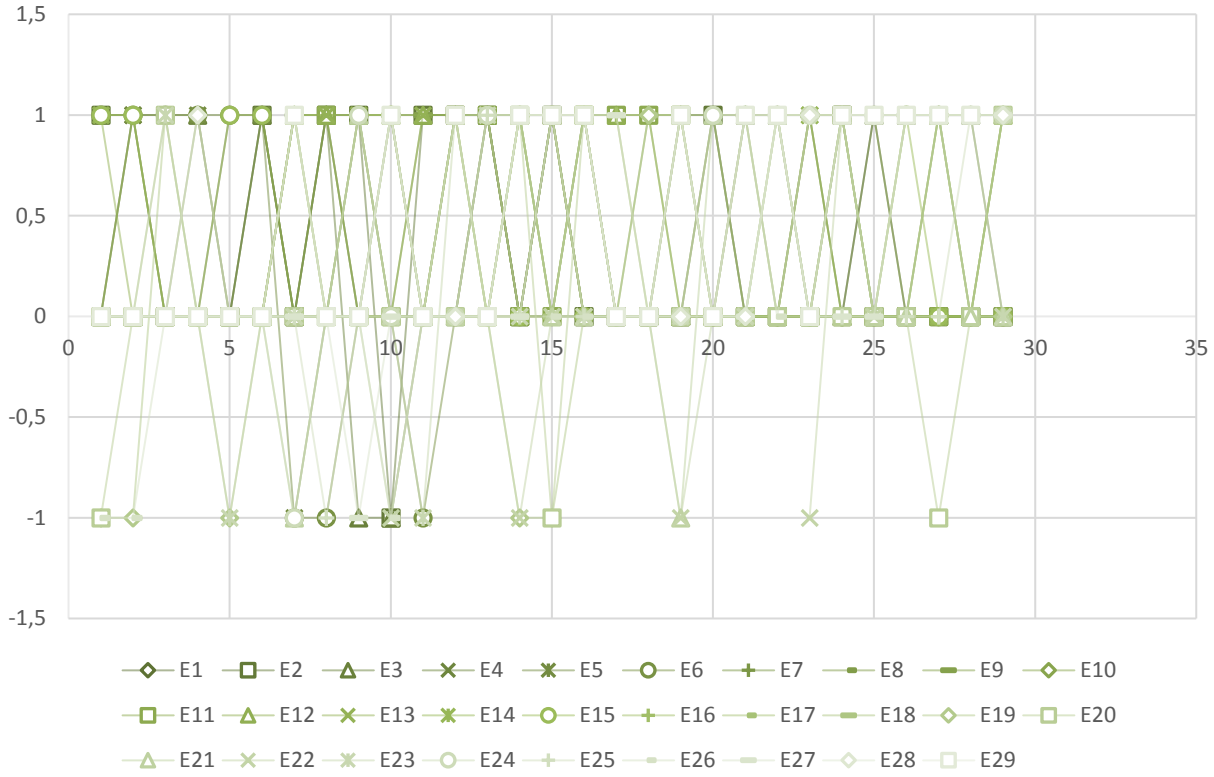

Figure 1. Visual representation of a subset of concept for digital entrepreneurship business environment modelling

Source: by author

In general, a fuzzy cognitive map is a causal network that will reflect a certain phenomenon and allows the following formal presentation (1):

$$G = (E, W), \quad (1)$$

where $E = E = \{e_1, e_2, ..., en\}$ is a set of concepts, W is a binary relation on the set E that specifies the connections between them. The concepts e_i and e_j are considered to be related by the relation W (denoted by (e_i, $e_j \in W$ або e_iWe_j), if a change in the value of the concept e_i (cause) leads to a change in the value of the concept e_j (consequence). According to the terminology of cognitive analysis, in this case it is said, that the concept e_i affects e_j. At the same time, if an increase in the value of the concept-cause

leads to an increase in the value of the concept-effect, then the influence is considered positive ("strengthening"), while if the value decreases, it is negative ("inhibition").

Thus, the ratio W can be represented as a union of two disjoint subsets W = W + ∪ W, where "W +" is a set of positive and "W-" is a set of negative connections. The concepts themselves can be defined as relative (qualitative) indicators, as well as absolute, measurable (quantitative) indicators – population, cost, etc.

After carrying out a classification assessment of the main concepts, we will determine the result of the analysis of the macro environment. Based on the results of figure 1, we can see that the economic factors of the external environment have the greatest impact on the development of the services market, directly due to the increase in the unemployment rate (negative impact), GDP growth (positive impact) and changes in the NBU discount rate (its growth has a negative impact, because increases the value of credit resources), which in turn requires market entities to take appropriate actions, such as: increasing the range of services in the activities of intermediaries, increasing the cost of services, attracting investments, etc. Other factors, such as: legal, technological and socio-cultural, have a smaller impact, but require marketing management entities to respond to changes in the state of factors, develop and implement new programs, and look for ways to expand the scope of services.

Based on the analysis, it can be concluded that the economic environment is the biggest threat to the development of the services market, because the factors of this environment have the strongest influence on the development of the market. A significant influence is exerted by social, political, legal and technological factors of the macro environment (Dong & Jia, 2022).

An empirical SWOT analysis of the environment of the digital economy and identify its main opportunities and threats for Ukraine are represented in the table 2.

It is believed that digital development in general has a positive impact on the economy, business, society and life of the country as a whole. In particular, the digital economy is the basis of the Industry4.0 approach and the third wave of globalization. A characteristic feature of the digital economy is its connection with the on-demand economy, which involves not selling goods and services, but gaining access to them exactly at the moment when it is needed. Orders are received online and fulfilled offline.

However, in addition to opportunities for economic development, the digital economy has a certain number of threats to both socio-economic and socio-political spheres.

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Table 2. Generalized SWOT analysis of implementation and development of the digital economy in Ukraine

Strength	Weaknesses
- increasing the accessibility of ordinary users to certain markets (goods or services), not only large companies; - reduction of transaction costs; - targeting a specific consumer and comprehensive use of information as a driving resource, taking into account the specific characteristics of a specific consumer in a specific place; - development of digital entrepreneurship, creation of appropriate (including analogy) infrastructures for the support and development of innovative activities, implementation of funding, stimulation and support mechanisms	- Ukraine's significant lag in the development of digital technologies compared to EU countries; - low level of security of computer networks; - insufficient financial security of the population for full access to modern technologies; - an effective plan for the development of broadband access (broadband access) in Ukraine has not been created, under which primary attention would be paid to the elimination of areas of digital inequality; - modern Internet services are not implemented in all social life; - there is almost no state support for the modernization of the main means of production to modern digital and energy-efficient ones; - minimal control over improving the quality of training of engineering specialists in higher education; - control over the observance of rights to intellectual property objects is not fully ensured in order to stimulate the creation of high-quality domestic media content; - the demand for digital services and talented developers abroad is thousands of times higher than the demand for such services in Ukraine
Opportunities	**Threats**
- digital transformation of all spheres of life; - new specialists with modern knowledge, digital skills, capable of self-learning, solving complex tasks in a constantly changing environment are needed; - the consumer chooses the product relying on advice, personal experience and advertising, the seller does not have the opportunity to personally contact the buyer; - formation of consumers' motivations and needs in "digital technologies"	- production and society will become more dependent on cyber-attacks; - redistribution of labour; - short-term decrease in labour productivity from the introduction of new technologies; - reducing the number of employees, in particular highly paid and low-skilled workers - the growth of technological unemployment; - temporary increase in inequality in income distribution; - significant changes in the regional structure of placement of productive forces, necessary education and qualifications of personnel, infrastructure; - a shift in social values and a change in society's priorities.

Source: by author

Thus, favourable conditions have not been created for the transition of all business entities to electronic systems of interaction (electronic document flow, customer relationship management systems, enterprise management systems), and IT outsourcing of Ukrainian IT companies and private specialists is the digitization of other economies. Accordingly, favourable and comfortable conditions for the creative self-realization of talented youth (highly qualified specialists, scientists, engineers) have not been created in Ukraine today in order to prevent mass migration abroad.

There is insufficient implementation of modern IT technologies and services in such areas of social life as: education, health care, security, environmental protection, housing and communal services, transport, etc.

The introduction of digital technologies is accompanied by certain challenges that society and the state must overcome in order to successfully implement the digital economy: short-term reduction in labour productivity from the introduction of new technologies; reduction in the number of employees, in particular highly paid and low-skilled workers, and the growth of technological unemployment; a temporary increase in the uneven distribution of income during the period of upgrading the qualifications of working people to the required level of qualification; significant changes in the regional structure of placement of productive forces, necessary education and qualifications of personnel, infrastructure; transformation of norms and rules (strengthening the protection of intellectual property rights, improvement of antimonopoly legislation, etc.), lifestyle (Lipsey, 2007).

In the conditions of the digital transformation of the national economy, in order to carry out successful business in the service sector and form a positive image (brand), enterprises operating in this area must fulfil all their promises made to the consumer, because under their influence, consumers' expectations of those benefits are formed services that may not materialize. In this aspect, it is necessary to professionally help consumers to positively evaluate the services provided to them. Considerable attention should also be paid to minimizing consumer risks in the services market, which are associated with the variability of services, the lack of guarantees and the complexity of individual operations, which deter or, on the contrary, stimulate the consumer to make a choice in favour of the services of the main competitor.

Conclusions. The analysis of the environment of the services market in the conditions of the digital economy through the PEST analysis made it possible to conclude that the factors of the political environment exert the greatest negative influence on the development of the market, which is caused by crisis phenomena in politics and the significant dependence of certain sectors of the intermediary services market on state regulation. The economic environment exerts the greatest positive influence on market development. Social and technical factors influence market development almost equally. The positive value of the integrated assessment indicates

the predominance of trends of the positive overall impact of macro-environmental factors and indicates the possibility of market growth.

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DIGITAL REPUTATION ANALYTICS FOR BUSINESS MODELS

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Abstract. *In the rapidly evolving digital landscape, the assessment of business models' reputations has become a pivotal aspect of strategic decision-making. Information for the research of the business reputation of legal entities and individuals can be obtained by analyzing the provided reports on the results of financial and economic activities of enterprises, declarations of individual entrepreneurs, in the course of processing printed publications (newspapers, magazines, bulletins, catalogs), by communicating with persons aware of the peculiarities of the work of the objects of study, etc. However, this research is devoted to the study (analysis) of exclusively electronic media, Internet resources and digital technologies, thanks to which the study and confirmation of the business reputation of business entities is carried out. The purpose of the research is to analyze open sources of information, which contain the data necessary to study the business reputation of legal entities and individuals, identify their shortcomings and problems of functioning, in particular under martial law and other crisis situations. This research delves into the realm of digital reputation analytics, exploring methodologies and frameworks for evaluating and managing the reputational standing of diverse business models. The study proved the importance of studying and evaluating the business reputation of legal entities and individuals as an important element of the functioning of economic entities, public associations and formations. It has been established that the set of documented information about the business entity makes it possible to draw a conclusion about the compliance of its business and professional activities with the requirements of the law, and about the natural person - also about the appropriate level of professional abilities and management experience. The study analyzed digital resources at the international and national level of Ukraine, including non-state resources. These sites contain a notice that the information posted on them is obtained exclusively from open official data sources. Their study and analysis give reason to believe that this is indeed the case. The difference between them mainly consists only in the appearance of the User Interface, the form of the report and the cost of providing individual services. An analysis of the open sites of foreign registrars and global aggregator sites shows that much less information is published on them than on Ukrainian ones.*

Keywords: *business reputation; decision-making; stakeholder; digital reputation analytics; business entities.*

Evolution of views on business reputation. The strategy for managing the development of an economic entity should be based on the synergy of the functioning of the company's structural divisions, the effective interaction of which is possible only on a systematic basis.

Building an effective management system that prevents and minimizes possible negative phenomena of internal and external nature, enables the company to move in the wake of development and profitability, is the basis for creating a system of economic security of the enterprise.

Assessment of prospective counterparties (business partners, etc.), in front of their business reputation, also has the status of "permanent relevance", as well as the business reputation itself, in the context of the main vectors of processing of the enterprise economic security system.

Business reputation, according to the author is a subjective rational judgment (consideration) of the state and relations of an economic entity for making communicative (managerial) decisions about it [1].

It is appropriate to pay attention to whom and when the process of studying and assessing the business reputation of a business entity - a bearer of business reputation is initiated.

According to the author, this process is initiated by another subject – **the consumer of business reputation.** The basis is the movement of vectors of vital activity (development, state, freedom, goals of economic activity, etc.) of subjects. Possible intersection, or parallel movement of vectors, causes the need for communication (**communicative interest**). In the absence of communication needs, the consumer of business reputation is characterized by a neutral status in relation to other subjects around him, due to the fact that the need has a cost - a financial burden on the company's budget.

The concept of "communicative interest" should be understood as an emotionally rational argumentation of possible actions in relation to the bearer of business reputation.

Communicative interest is the basis, the basis, the beginning of the process of studying and confirming business reputation

The process includes identification of the bearer of business reputation (owners, managers), collection of reliable information, its analysis (study), verification, adoption of a communicative (managerial) decision, actions to implement the decision, control of implementation, evaluation of the result. The process has a cyclical structure, due to the fact that the life of an economic entity is characterized by movement (change of state and relations).

It is proposed to understand the "communicative decision" as the concept of possible actions in relation to the bearer of business reputation. Communicative

solutions can be implemented both in the form of direct interaction (direct influence) and in the form of indirect interaction (influence through available opportunities). Influence is direct (indirect) interaction in the interests of obtaining benefits. It should be noted that influence can be exercised in the following ways: coercion; contract; manipulation; crime, etc. [1].

To make a communicative (managerial) decision regarding a potential business partner (bearer of business reputation), it is not enough to use its publicity. "publicity" – "publicity", "publicity") is a wide positive popularity and recognition of the company, its personnel and activities [2]. It is formed with the use of the media and represents the external popularity of the enterprise. Sometimes "publicity" contradicts the results of the process of studying and confirming the business reputation of a potential business partner.

Confirmation of business reputation should be carried out with the help of information resources, the tools of which make it possible to comprehensively study the necessary aspects of business reputation of both legal entities and individuals (beneficiaries, managers, VIP management, etc.).

Solving these problems requires a careful and careful selection of sources of information, on the basis of which conclusions about the business reputation of this category of persons will be based.

The study of the principles of search, assessment of reliability, completeness and directions of use of information sources in the study and confirmation of business reputation is an important scientific and applied task.

According to the author, these criteria are best met by open sources of information, the administrators of which are state organizations, institutions and enterprises.

This study is devoted to the study and evaluation of these sources of information, as well as sites that use open data.

It also reviews open sources of information from foreign countries and their approaches to studying and assessing the business reputation of counterparties.

There are no studies devoted to the problems of using specific open sources of information to study and confirm the business reputation of legal entities and individuals.

Most of the publications deal with the problems of conducting Competitive Intelligence [3], which in the English-language literature is commonly called Open Sources Intelligence (OSINT) [4]. At the same time, it should be borne in mind that OSINT is mainly used in the state, military and law enforcement spheres.

Databases of state bodies and enterprises, which are defined as administrators in the List of data sets to be published in the form of open data, contained in the Annex

to the Resolution of the Cabinet of Ministers of Ukraine dated 21.10.2015 No. 835 [5], can be reliable and legitimate sources of information, on the basis of which it is possible to draw conclusions about the business reputation of individuals.

To improve the quality of the use of open data and introduce uniform approaches to the publication of sets, the Ministry of Digital Transformation of Ukraine, with the support of the project "Transparency and Accountability in Public Administration and Services", has developed "Recommendations for the publication of open data sets" [6], which consist of publishing 14 sets of open data from the section "All administrators" and 64 sets from the section "Local Self-Government Bodies" mentioned above The list approved by the Resolution of the Cabinet of Ministers of Ukraine No. 835 [5].

The recommendations are based on the principles of the International Open Data Charter [7] and take into account a number of limitations:

- features of the national regulatory framework;
- a large number of administrators, a variety of software, different levels of development of data culture;
- insufficient level of implementation of information systems;
- unsuitability of a significant part of the software for exporting data in open machine-readable formats (CSV, XML, JSON), lack of an open API (application programming interface).

Basic digital resources for studying business reputation. According to Doctor of Political Sciences, Honored Worker of Science and Technology of Ukraine, Professor of the Institute of State and Law. According to V. M. Koretsky of the National Academy of Sciences of Ukraine Oleksandr Sosnin, "the unresolved in Ukraine of many political and legal issues related to the rapid development of the information and communication sphere with the advent of digital technologies have acquired signs of danger, since the increase in the complexity of communication processes — interconnections, has increased the quality of risks and threats, which have turned out to be so complex and comprehensive that their level is growing in a logarithmic progression compared to the ability to resist (a) To the extent permitted by the provisions of this Convention, the Secretary-General shall ensure that the Secretary-General Against this background, the emergence of a new type of crime — organized cybercrime — is progressing, which forces the state to single out even the main tasks to prevent threats in the information and communication sphere in the following areas:

- protection of personal data of a person;
- security of information and communication systems, government agencies;
- protection of the working environment and technology.

The expansion of digital services, the individualization of many types of services have increased the threat of fraud from a wide range of users or providers to a critical

level, and the risks of information leakage require constant attention of the state to increase the level of protection of electronic systems."

The essence of the above, in the context of this study, is that the assessment of the business reputation of legal entities and individuals can be influenced by data obtained from unverified or dubious sources of information, created at the request of certain political forces, representatives of competing business circles both in Ukraine and abroad.

Fabricated information can also be posted on the Internet by unscrupulous competitors in the interests of the struggle for political influence or markets.

In order to obtain reliable information about legal entities and individuals, it is most expedient to use the data published on the Unified State Web Portal of Open Data, where they are uploaded to free access by Data Controllers and on the Data Controllers' own websites.

National government web portals. National state web portals include the Unified State Web Portal of Open Data and Websites of Information Administrators.

The Unified State Open Data Web Portal (https://data.gov.ua) is a Ukrainian government website created to store public information in the form of open data and provide access to it to a wide range of people according to the principles defined in the International Open Data Charter [7], which Ukraine joined in October 2016. The site belongs to the Ministry of Digital Transformation of Ukraine.

The list of sets of information that are subject to disclosure in the form of open data is determined by the Resolution of the Cabinet of Ministers of Ukraine dated 21.10.2015 No. 835 [5]. The Resolution also defines the requirements for the format and structure of data sets, the frequency of their updating and the procedure for publication. In the case of automatic updating of the data set, information administrators are responsible for the accuracy and relevance of the published sets on the Portal in accordance with the law.

The most sought-after datasets for this are:

1. Unified State Register of Legal Entities, Individual Entrepreneurs and Public Organizations (administrator - Ministry of Justice of Ukraine).

The first set contains: full and abbreviated name of the legal entity, EDRPOU code, registration address, full name/name of the founders, amount of their contributions to the authorized capital and addresses of their registration, amount of authorized capital, full name of the ultimate beneficiaries and their percentage participation in ownership, addresses of their registration, type of activity of the legal entity, dates of registration and termination, full name of the head, contact information, data on enforcement proceedings, data on initiated proceedings in the bankruptcy case, data on the registration of a person by the tax authorities and removal from it.

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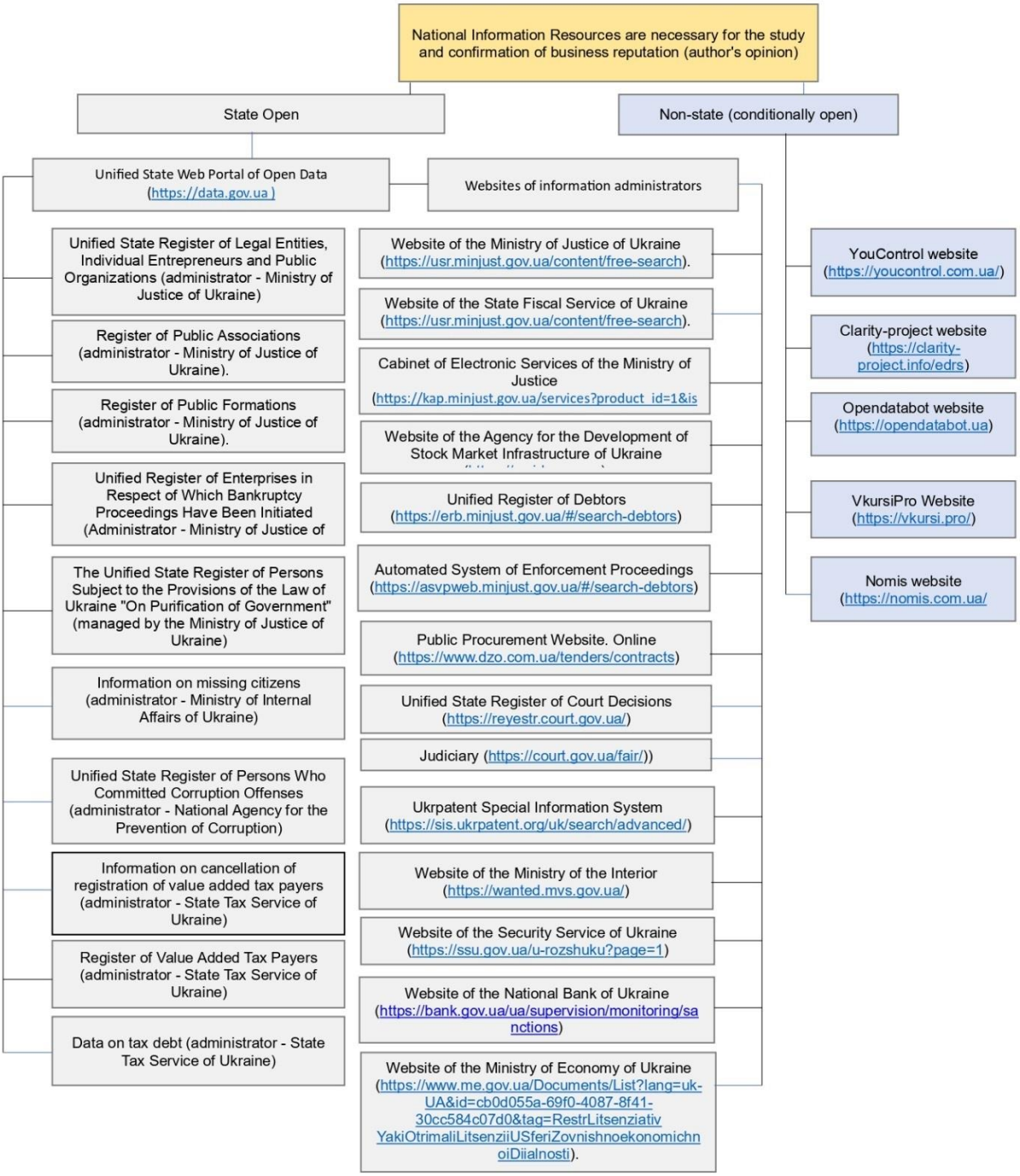

Figure 1. National Information Resources are necessary for the study and confirmation of business reputation

Sources: developed by the authors

The second set contains: full name of an individual entrepreneur, place of registration, contact information, data on types of activities, dates of registration and termination of activities, grounds for termination, data on registration with tax authorities and deregistration from it.

From 24.02.2022, the sets will not be made public.

2. Register of Public Associations (administrator - Ministry of Justice of Ukraine). The set contains the registration number of the record, the name of the public association, the Unified State Register of Enterprises and Organizations of Ukraine, the full name/name of the founders.

3. Register of Public Formations (administrator - Ministry of Justice of Ukraine). The set contains data on public formations and their types: "Political Parties", "Charitable Organizations", "Creative Unions", "Chambers of Commerce and Industry", "Permanent Arbitration Courts", "Charters", "Associations of Local Self-Government".

4. Unified Register of Enterprises in Respect of Which Bankruptcy Proceedings Have Been Initiated (Administrator - Ministry of Justice of Ukraine). The set contains data on companies in respect of which bankruptcy proceedings have been initiated, registration record, date of registration, case number, date of ruling, name/full name of the debtor, status of proceedings, etc.

5. The Unified State Register of Persons Subject to the Provisions of the Law of Ukraine "On Purification of Government" (managed by the Ministry of Justice of Ukraine). The set contains data on persons to whom the provisions of the Law "On Government Cleansing" are applied, in particular, full name, place of work, position at the time of application of the provisions of the Law, the time during which the person is prohibited from holding public office.

6. Information on missing citizens (administrator - Ministry of Internal Affairs of Ukraine). The set contains data for the identification of persons considered missing.

7. Unified State Register of Persons Who Committed Corruption Offenses (administrator - National Agency for the Prevention of Corruption). The set contains data on persons to whom the provisions of the Law of Ukraine "On Prevention of Corruption" are applied, in particular, full name, place of work, position at the time of application of the provisions of the Law. From 24.02.2022, the sets will not be made public.

8. Information on cancellation of registration of value added tax payers (administrator - State Tax Service of Ukraine). The set contains data on persons whose registration as VAT payers has been canceled, name or surname, first name and patronymic, individual tax number of the VAT payer (RNOKPP), date of registration as a VAT payer, date of registration as a subject of special taxation regime, date of

cancellation of registration, reason for cancellation of registration, grounds for cancellation of registration, list of activities of an agricultural enterprise as a subject of a special tax regime, date of exclusion from the register subjects of the special taxation regime, the date from which the agricultural enterprise is considered to be a VAT payer on a general basis.

Information posted only on 28.08.2019.

9. Register of value added taxpayers (administrator - State Tax Service of Ukraine). The set contains data from the register of VAT payers: name or surname, name and patronymic of the taxpayer, individual tax number of the VAT payer (RNOKPP), date of registration as a VAT payer, validity period of registration of the VAT payer. Information posted only on 23.08.2019.

10. Data on tax debt (administrator - State Tax Service of Ukraine). The set contains data on the name of the legal entity or RNOKPP of an individual, the total amount of debt, the amount and number of installments up to a year or more than a year. The information was posted only on 01.08.2019.

Despite the fact that these kits contain the most up-to-date and verified information, their use is fraught with certain difficulties:

1. The data is presented on the Portal in CSV, JSON, XML, RDF formats, which do not allow an ordinary user to freely process information.

2. Some data sets are about 6 GB in size, which does not allow them to be opened in the Microsoft Office office suite (Excel spreadsheet processor, Word word processor), text editors "Notepad", "Notepad++", etc. At the same time, even these programs allow you to work with large amounts of data quite slowly and with certain limitations.

That is, only an employee who has sufficient skills in creating and working with SQL Database Management Systems, Access, CronosPro or a software engineer who can adapt them for ordinary users will be able to analyze the information received from the Portal.

The availability of databases downloaded from the Portal in permanent use allows you to use them even in case of their temporary shutdown or restrictions on downloading.

The aggregator of most of the operators' open websites is ***the State Enterprise "National Information Systems" (SE "NAIS"),*** founded by the Ministry of Justice of Ukraine in May 2015 (https://nais.gov.ua/about). An aggregator (from the Latin aggregatio "accumulation") — the one who collects and groups objects — aggregates into a higher-level category. A content aggregator (content aggregator) is a program or service that collects information from various news channels, sites, forums, and blogs into one source [11].

SE "NAIS" has a parent company and 22 regional branches in regional centers of Ukraine. The company operates on a self-supporting basis. The main purpose of its activity is technical and technological support for the creation and maintenance of software, maintenance of automated systems of unified and state registers created in accordance with the orders of the Ministry of Justice of Ukraine, as well as other electronic databases created in accordance with the legislation of Ukraine, providing access to individuals and legal entities to automated systems of the Unified and State Registers, ensuring the safety and protection of data, contained in them.

Most of the sites united on the website of SE "NAIS" have been temporarily unoperational since 24.02.2022.

Table 1. Advantages and disadvantages when using National State Web Portals

	Advantages	Disadvantages
Open Data Portal	-Authenticity; -Relevance; -Security; - the ability to download for own use and for commercial purposes	- significant size of individual databases; - the need for the user to have skills in working with DBMS or creating a separate position of a programmer; - lack of datasets on the portal of a significant number of information administrators who have their own websites; - blocking or restricting access to most databases under martial law and other crisis situations
Websites of information administrators	-Authenticity; -Security; -Relevance; -Fullness	- time spent on transitions from one website to another; - heterogeneous user interfaces; - the need for an electronic signature to use separate databases; - inability to use most of the bases under martial law and other crisis situations; - Inability to download data for personal use

Sources: developed by the authors

National non-governmental websites. To date, there are about 10 non-governmental websites on the Internet, which provide users with access to open information from the sites of state organizations - administrators, acting as aggregators of the content received from them. The most famous of them are the following.

1. YouControl website (https://youcontrol.com.ua/). The Website is a content aggregator that combines open data downloaded or pulled from the operators' sites, which are displayed in a single User Interface. The site is positioned as an analytical system for comprehensive, market analysis, business intelligence and investigations. It has been operating for 9 years.

According to the data of the Unified State Register of Legal Entities, Individual Entrepreneurs and Public Organizations as of 24.02.2022, the head and sole founder of U-Control LLC, EDRPOU 39407134, which owns the Internet resource, is a citizen of

Ukraine Milman Sergey Arkadyevich. The IP address of the server is registered, according to the https://who.is/ service, in San Francisco, USA, by the Internet provider CloudFlare Inc.

According to the data posted on the website, the system forms a complete dossier for each company in Ukraine and individual entrepreneur based on more than 100 official data sources, tracks changes in state registers and visualizes connections between affiliates. The monitoring function reports on changes on a daily basis, based on data from official sources. According to the PR-CY website [12] As of September 2022, about 52 thousand users visited the site daily and 108 thousand views were made.

Access to the data obtained by the site from the Unified State Register of Legal Entities, Individual Entrepreneurs and Public Organizations is free, to the extended and complete set is paid. The website has been operating for the entire period, starting from 24.02.2022, using the downloaded sets of information from the Open Data Portal that were available on the specified date. Only the exact registration addresses of founders, beneficial owners and individual entrepreneurs were closed.

2. Clarity-project website (https://clarity-project.info/edrs). The Website is a content aggregator that combines open data downloaded or pulled from the operators' sites, which are displayed in a single User Interface. It is positioned as an Open Data Analytics System. According to the data posted on the site, all information to which access is provided is obtained from open state sources in accordance with the Law of Ukraine "On Access to Public Information" dated 13.01.2011 No. 2939-VI [8]. The site has been operating for 5 years. According to Article 10-1 of this Law, public information in the form of open data is public information in a format that allows its automated processing by electronic means, free and free access to it, as well as its further use.

The owners of the website are not disclosed. The IP address of the server is registered, according to the https://who.is/ service, in San Francisco, USA, by the Internet provider CloudFlare Inc.

According to the data presented on the website, the main goal of ClarityProject is to search according to various procurement criteria using the ProZorro electronic system, where state and municipal customers announce tenders for the purchase of goods, works and services, and business representatives compete in tenders for the opportunity to become a supplier to the state. At the same time, the site provides access to information from all open data sites and state registers, described above. According to the PR-CY website [12], as of September 2022, about 27 thousand users visited the site daily and about 63 thousand views were made.

Access to the data is free. The website has been operating for the entire period, starting from 24.02.2022, using downloaded sets of information from the Open Data

Portal. Only the exact registration addresses of founders, beneficial owners and individual entrepreneurs were closed.

3. Opendatabot website (https://opendatabot.ua). The Website is a content aggregator that combines data downloaded or pulled from open sites of administrators, which are displayed in a single User Interface. According to the data posted on the site, all materials on it are posted under the terms of a Creative Commons license with authorship 4.0 International [13].The site is positioned as a service for monitoring the registration data of Ukrainian companies and the court register to protect against raider seizures and counterparty control. The service has chatbots in Telegram and Viber messengers.

The Opendatabot website is owned by IT Company 908, owned by Oleksii Ivankin, a citizen of Ukraine, from Dnipro. In September 2015, the company's office moved to Poland. The IP address of the server is registered, according to the https://who.is/ service , in Ukraine. According to the PR-CY website [12], as of September 2022, about 71 thousand users visited the site daily and about 183 thousand views were made.

Access to most of the data is free. The website has been operating for the entire period, starting from 24.02.2022, using the downloaded sets of information from the Open Data Portal available on the specified date. Only the exact registration addresses of founders, beneficial owners and individual entrepreneurs were closed.

4. VkursiPro website (https://vkursi.pro/). The Website is a content aggregator that combines data downloaded or pulled from open sites of administrators, which are displayed in a single User Interface. It is positioned as a software product in the form of an information and analytical online service that contains functionality and algorithms for machine analysis of business data, monitoring and visualization of information from State Registers and other public information.

The site has been operating for 4 years and belongs to Web Dream Technology LLC, EDRPOU 41462280, Kyiv. The ultimate beneficiaries of the company are citizens of Ukraine Zapeka Vadym Vitaliyovych, Chemer village, Kozeletsky district, Chernihiv region, and Hryshchuk Andriy Yakovlevich, Khmelnytskyi. The server is located in Amsterdam, the Netherlands, by the Internet provider Microsoft Corporation. According to the PR-CY website [12], as of September 2022, about 16 thousand users visited the site daily and 26 thousand views were made.

Access to information from the Unified Register of Pre-Trial Investigations is free, but registration is required to obtain extended data. The M, Data BI and Data BI XL packages are paid. Individual data is provided within a few days after ordering.

The website has been operating for the entire period, starting from 24.02.2022, using the downloaded sets of information from the Open Data Portal available on the specified date.

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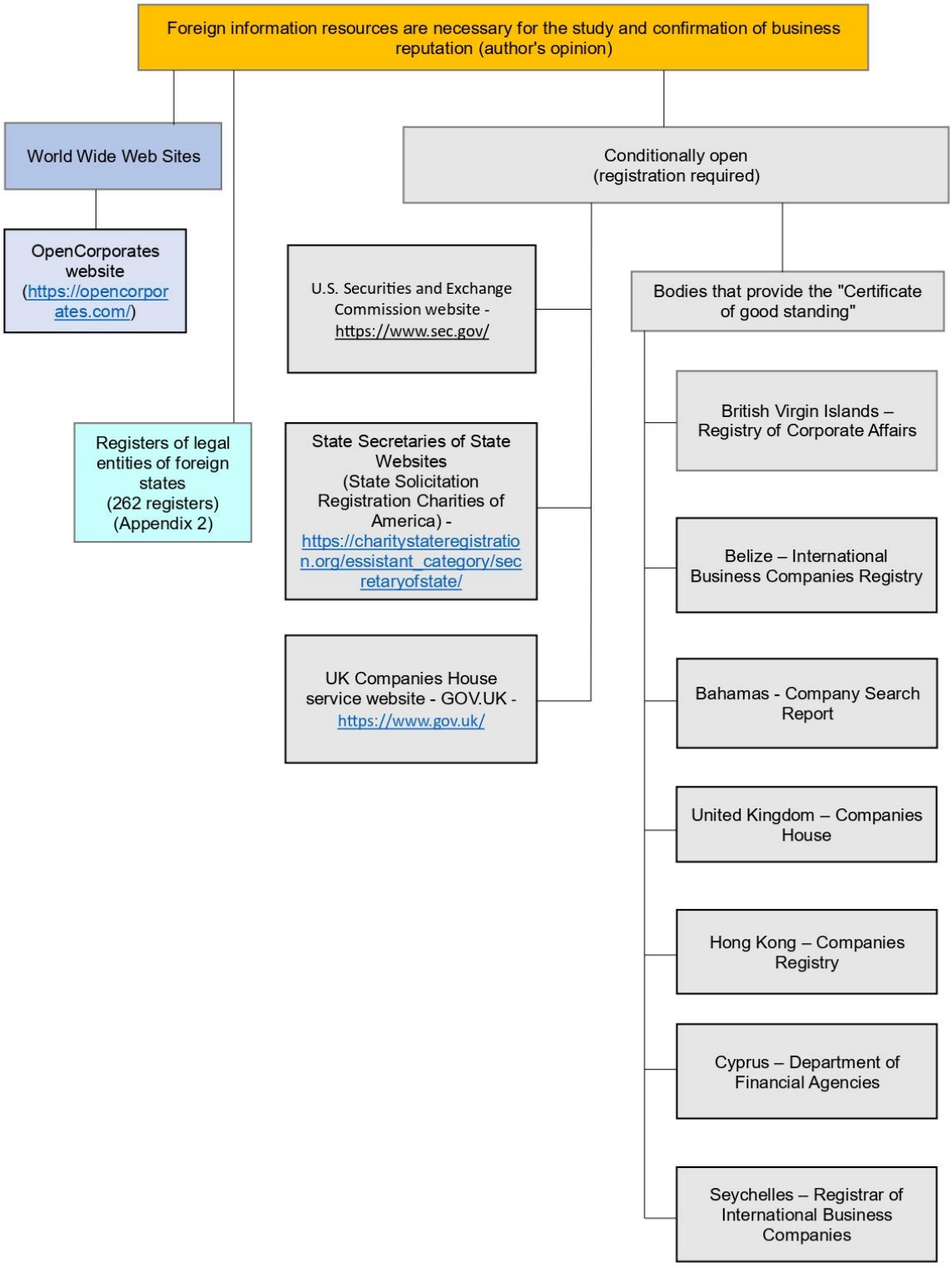

Figure 2. Foreign information resources are necessary for the study and confirmation of business reputation

Sources: developed by the authors

4. Nomis Website (https://nomis.com.ua/). The Website is a content aggregator that combines data downloaded or pulled from open sites of administrators, which are displayed in a single User Interface. The site is positioned as an analytical business platform, which presents all legal entities of Ukraine registered on a certain date.

Information about companies is constantly updated from the Unified State Register of Legal Entities of Ukraine, as well as from other open sources, and is displayed on the relevant "Company Card". The information used to create reports on the inspection of legal entities is open and publicly available. Access to information and the procedure for using it are provided for by the current legislation of Ukraine.

The site has been operating for 5 years and belongs to the Ukrainian Business Intelligence Agency LLC, EDRPOU 40979910, Kherson. Its founders are citizens of Ukraine Burakovsky Oleksandr Yuriyovych, Kherson and Kovalenko Iryna Volodymyrivna (Kherson). The server is located in Munich, Germany, by the Internet provider Giga-Hosting GmbH. According to the PR-CY website [12], as of September 2022, about 5 thousand users visited the site daily and 9 thousand views were made.

Access to most of the data is free. Access to the sections "Finance" and "Legal Analysis, Conclusions and Recommendations" is paid.

The website has been operating for the entire period, starting from 24.02.2022, using the downloaded sets of information from the Open Data Portal available on the specified date.

Open websites of foreign countries. There are a significant number of legal entities in the Ukrainian market, the founders of which are foreign companies or foreigners. According to the Law of Ukraine "On Foreign Investments" dated 13.03.1992 No. 2198-XII [14], foreign investments can be made in the following forms:

- partial participation in enterprises established jointly with Ukrainian legal entities and individuals, or acquisition of a share in existing enterprises;
- establishment of enterprises wholly owned by foreign investors, branches and other structural units of foreign legal entities or acquisition of existing enterprises;
- acquisition of immovable or movable property not expressly prohibited by the laws of Ukraine, including houses, apartments, premises, equipment, vehicles and other property objects, through direct receipt of property and property complexes or in the form of shares, bonds and other securities;
- acquisition, independently or with the participation of Ukrainian legal entities or individuals, of land use rights and concessions for the use of natural resources on the territory of Ukraine;
- acquisition of other property rights;

- in other forms of investment, in particular on the basis of agreements with business entities of Ukraine, which are not directly and exclusively prohibited by the current laws of Ukraine.

According to the National Bank of Ukraine, foreign direct investment in the Ukrainian economy through the equity instrument, excluding reinvestment of income, amounted to USD 922,600,000 at the end of 2021.

The largest foreign investor in the Ukraine is the Republic of Cyprus, the Netherlands is in second place, Luxembourg is in third place, and the United Kingdom is in fourth place.

According to the analysts of YouControl LLC [15], in 2019, more than 6,000 legal entities in Ukraine had Cypriot companies among the founders, and Cypriot citizens among the beneficial owners.

They are present in about 30% of legal entities with foreign founders and in almost 1% of limited liability companies. Among the private joint-stock companies, Cypriot participants are present in every fifteenth enterprise.

From the above, it can be seen that the study of the business reputation of foreign investors is essential for ensuring the economic security of Ukrainian enterprises. Information on non-residents can be obtained from national and world registers.

According to the author's estimates, access to open registries is provided by about 200 countries of the world (there are 256 countries in the world).

Some of them, in particular the United States, China, Canada, Brazil, and the United Arab Emirates, have both national and regional registers. In the United States, there are 48 registers of legal entities, one of which is national and 47 are state registers, in China there are 34 registers, one of which is national and 33 are provincial registers, in Canada there are 12 regional registers, and in the UAE - 4.

All registers are divided into:

- registers of legal entities, which contain data on managers, founders and their ultimate beneficial owners;
- statistical business registers containing data on the results of financial and economic activities of legal entities;
- business registers (procurement or tender repositories);
- state aid registers;
- land and mortgage registers;
- registers of vehicles;
- registers of pledged property;
- intellectual property registers;
- tax registers (registers of taxpayers and debtors);
- registers of enterprises operating in the stock market;

- registers of enterprises in respect of which bankruptcy proceedings have been initiated;
- registers of licensee enterprises.

In some countries of the world, the so-called Certificates of Good Standing (Certificates of Good Standing) are in circulation [16]. The form and content of the certificate may vary from country to country.

The Certificate reflects: - the name and registration number of the company, its legal address, as well as the conclusion that the company is in the status of good standing.

Such a conclusion indicates that the company is indeed registered in the specified jurisdiction, is not in the process of liquidation, is not excluded from the register, is not in a state of bankruptcy and meets all the requirements of the country of registration, that is, it operates in accordance with the norms of local legislation, pays the annual state fee on time and in full, and in the case of some jurisdictions, submits financial statements. In most cases, the document is issued on thick paper or official letterhead, contains the seal of the issuing authority, and in some cases – elements of state symbols. The validity period of the certificate is not specified, but by default it is valid until the date of the next continuation of the company's activities or the entry into force of other circumstances as a result of which the company loses its good standing status (for example, the beginning of the liquidation process).

A certificate of good standing can be obtained from the state authorities of the country of registration of the company. Most often, such a body is the trade register, whose duties include the registration of companies and control over their activities. In particular, in the main jurisdictions, such bodies are:

- British Virgin Islands – Registry of Corporate Affairs, the cost of the certificate is 280 USD, the terms of issue with an apostille are 6-7 days, without an apostille 1-2 days;
- Belize – International Business Companies Registry, the cost of the certificate is 270 USD, the terms of issue with an apostille are 14 days, without an apostille 7 days;
- Bahamas - the cost of the certificate is 475 USD, the terms of issue with an apostille are 14 days, without an apostille 7-10 days;
- United Kingdom – Companies House (cost data is given below);
- Hong Kong – Companies Registry, the cost of the certificate is 340 USD, the terms of issue with an apostille are 5-6 days, without an apostille 1-2 days;
- Cyprus - Department of Financial Agencies and official receiver, the cost of the certificate is 351 US dollars, the terms of issue with an apostille are 5-6 days, without an apostille 2-3 days;

- Seychelles - Registrar of International Business Companies, the cost of the certificate is 215 USD, the terms of issue with an apostille are 5-6 days, without an apostille 1-2 days.

Issuance of a Certificate of good standing about the company under study is possible if the reserve has paid the state duty in a timely manner and in full and is not in the process of liquidation. In some jurisdictions, the certificate can only be ordered after the company has fulfilled the requirement to provide financial statements.

A certificate of good standing cannot be obtained for liquidated companies, those that are in the process of liquidation, as well as those companies that have been removed from the register of registration in an administrative manner for non-payment of state duty. These companies are considered to have ceased operations and thereby lost their status in good standing.

Certificate of good standing, as a rule, is ordered:

1. At the request of the bank in which the company has opened an account or in which it is planned to open an account.

2. At the request of partners or counterparties who want to make sure that the company is active.

3. Due to changes in the corporate structure (director/shareholder/beneficiary of the company). At the same time, the certificate does not provide a corporate structure, but only states the fact of the company's good condition.

4. During the sale of the company.

5. To be submitted to state authorities, for example, at the request of the court in the case of the company's participation in court cases, etc.

The list of information contained in the above open registers is generally similar to each other. A number of Internet resources of foreign countries should be considered conditionally open, because they provide access to information only after registration, which can only be carried out by a citizen of their country and when paying a certain amount of money for the provision of information. The following websites are available for use from the territory of Ukraine as examples.

U.S. Securities and Exchange Commission website - https://www.sec.gov/. The Internet resource belongs to the American Securities and Exchange Commission (SEC), which is an independent agency of the federal government of the United States of America, created after the collapse of stocks on Wall Street in 1929 [17].The main purpose of the SEC is to enforce the law against market manipulation. To achieve this goal, the SEC requires public and other companies to file quarterly and annual reports. In addition, CEOs must provide an extensive corporate governance (MD&A) report that also outlines the results of operations carried out in the previous year. The SEC maintains an online database called ***EDGAR*** (Electronic Collection, Analysis, and Retrieval System) from which investors can access information submitted to the

agency. This online system also accepts advice and complaints from investors to help the SEC track down violators of securities laws. The SEC has a strict policy of never commenting on the existence or status of an ongoing investigation into the company. The site provides access to information about: the name of the legal entity, its registration code, data on the form of ownership, address, data on the service agent, contact phone numbers, quarterly reports on the results of financial and economic activities of legal entities. The U.S. Securities and Exchange Commission website is free, but it is quite cumbersome and difficult to understand.

Websites of the Secretaries of State (State Solicitation Registration Charities of America) **-** https://charitystateregistration.org/essistant_category/secretaryofstate/. The site is owned by the registration authorities of the states that register companies. The email addresses of each state registry can be found on the site at the URL above. The site is only accessed through proxy servers or a proxy browser. Website addresses are arranged in alphabetical order.

The Internet resource contains data on the full name of legal entities registered in the territory of a particular state, their organizational and legal form, tax number, address of registration of activities, name of the registration agent. If the place of registration of the company in the United States is unknown, the search for information about it should begin with the register of the state of Delaware, in which more than half of the country's legal entities are registered. After Delaware, the most popular states for doing business are Wyoming (specializing in startups) and Nevada (gambling). A significant number of companies are also registered in offshore jurisdictions in the United States: Puerto Rico, the island of Guam, American Samoa, and the U.S. Virgin Islands.

UK Companies House service website **-** GOV.UK - https://www.gov.uk/. Internet resource GOV.UK is a public sector information website of the United Kingdom, created by the Government Digital Service to provide a single point of access to the country's public services [18]. Companies House service deals with the registration of companies in the United Kingdom and is part of the Department for Enterprise, Energy and Industrial Strategy (BEIS). In 2020, about 4.3 million businesses were registered in the register of the Companies House.

The site was launched on 31.01.2012 and by 2014 had replaced the individual websites of hundreds of government departments and public bodies. As of March 2022, the GOV.UK brings together the pages of 23 ministerial departments, 20 non-ministerial departments, and more than 410 agencies, state corporations, and other government bodies.

Some of the information on the site can be obtained free of charge, namely: the full name of the legal entity and its previous names, address and date of registration, constituent data on current and former managers, data on the availability of mortgage

loans, information on solvency, certain financial indicators. In this case, the information is provided in the form of a document with a barcode. The user can also set up free e-mail notifications about changes and updates of data (change of directors, addresses). To do this, the user needs to register on the site.

More complete certified information and a certified Certificate of Good Standing can be ordered within 5 minutes.

The cost of a certificate and a standard certificate for a subscriber in the UK or a foreign user will cost £15. The certificate will be sent within 10 business days. The cost of a similar certificate in the express production mode will cost £50. Express production may also include sending a copy to the customer's e-mail.

World Wide Sites. In addition to national sites, the Internet contains a certain number of world sites that are aggregators of open national registrars' sites. One of the most popular and information-rich is OpenCorporates.

OpenCorporates (https://opencorporates.com/) website. OpenCorporates is an Internet resource that provides access to more than 300 national and regional sites of foreign registrars. Through it, as of the end of 2022, it is possible to obtain information on 21,149,854 legal entities. The data is similarly structured and easy to use. Some of the information (company name, registration code, status, country, date and address of registration, data on directors, secretaries, history of changes, sometimes data on beneficial owners) is provided without registration. More detailed information about events, directors and secretaries of companies, their participation in other legal entities is provided only after registration. The search is carried out by the name of the company or by the data of its managers. To get direct real-time access to structured data in JSON or XML formats, you should subscribe to a paid version of access at a price of £792 per year, for which you can make 1000 queries per month and 200 requests per day, at a price of £6,600 per year, for which you can make 2,500 requests per month and 500 per day, at a price of £12,000 per year, for which to make 5000 requests per month and 1000 per day, at a price of £16,200 - 7500 requests and 1500 per day.

The site operates under the open database license Copyleft [20] since 20.12.2010. It was created by British nationals Chris Taggart and Rob MacKinnon. In July 2015, the OpenCorporates website was announced as the winner of the Open Data Award for its work in promoting data transparency in the corporate sector. The service is also used to study data on public procurement, online recruitment, visualization and analysis of company data, analysis of tax havens, illegal activities of companies.

Conclusions. The study and assessment of the business reputation of legal entities and individuals is an important element of the functioning of business entities, public associations and formations.

Only the totality of documented information about a business entity makes it possible to conclude that its economic and professional activities comply with the requirements of the law, and for an individual - also about the appropriate level of professional abilities and managerial experience.

In the interests of compliance with these criteria when assessing business reputation, the sources of information used to obtain data on legal entities and individuals are of primary importance. It is clear that it is the open sets of state data controllers that are the most reliable, relevant and protected. Open databases of state organizations and enterprises are created on the basis of the legislation of Ukraine and are based on the principles of the International Open Data Charter.

Information administrators in Ukraine have created the Unified State Web Portal of Open Data, as well as 138 sites and registers that contain the information necessary for studying business reputation.

In accordance with the Law of Ukraine "On Access to Public Information" of 13.01.2011 No. 2939-VI, public information in the form of open data is published for free and free access to it. Open data is allowed for further free use and distribution. Any person is free to copy, publish, distribute, use this data, including for commercial purposes. They can be combined with other information by including them in their own product with mandatory reference to the source of their receipt.

In the study, in addition to the main Internet resources of administrators, 5 non-governmental websites were analyzed.

These sites contain messages that the information posted on them is obtained exclusively from open official data sources. Their study and analysis give reason to believe that this is true.

The difference between the two mainly lies only in the appearance of the User Interface, the form of the report, and the cost for the provision of individual services.

At the same time, it should be borne in mind that most of the information used by non-state sites was downloaded from the Unified State Web Portal of Open Data and is located on servers outside Ukraine, which may cast doubt on the degree of its reliability.

In accordance with the Resolution of the Cabinet of Ministers of Ukraine dated 12.03.2022 No. 263 on "Some Issues of Ensuring the Functioning of Information and Communication Systems, Electronic Communication Systems, Public Electronic Registers under Martial Law" [21], from 12.03.2022, data administrators have suspended the operation of information, information and communication and electronic communication systems and public electronic registers.

In order to preserve the integrity and confidentiality of information, prevent unauthorized interference and distortion of data, and prevent cases of raiding, the

Ministry of Justice of Ukraine and the State Enterprise "National Information Systems" terminated the functioning of state registers and databases administered by the state.

At the same time, at the time of preparation of this study, non-governmental aggregator sites continued and continue to provide services for access to information, free access to which was terminated or restricted by data administrators.

These circumstances have increased the popularity of non-state sites to the detriment of state ones, but the information displayed on them is no longer relevant, based on the fact that data sets have not been updated by data managers for 9 months.

These circumstances may adversely affect the quality of the study of the business reputation of legal entities and individuals.

An analysis of the open websites of foreign registrars and global aggregator sites indicates that much less information is published on them than on Ukrainian ones.

They did not have any advantages over domestic open websites. As a rule, foreign websites do not contain complete data on the founders and ultimate beneficial owners of legal entities, their places of registration and contact details.

The websites also lack information about individual entrepreneurs, their places of registration and contact information.

At the same time, in some countries of the world, in particular in the UK, there are such official documents as the Certificate of Good Standing, which actually certify the capacity of legal entities and their positive business reputation.

These certificates, in case of their implementation in Ukraine, can significantly facilitate the procedure for assessing prospective counterparties (business partners, etc.), in front of their business reputation, in the context of the main vectors of processing of the enterprise economic security system.

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ARTIFICIAL INTELLIGENCE AS AN ELEMENT OF DIGITIZATION IN TOURISM AND HOSPITALITY

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Abstract. *The direction of the research is based on the problem of using an artificial element in the field of tourism and hospitality. In the section, the author emphasizes the relevance of the implementation of artificial intelligence tools in the activities of hospitality enterprises, which is connected with the active growth of the market after the previous years of recession. Accordingly, the research hypothesis consists in the assumption that the effective use of artificial intelligence tools in the operational activities of hospitality enterprises contributes to the formation of customer-oriented business. The main goal of the study is the analysis of artificial intelligence tools in the activities of enterprises in the field of tourism and hospitality. The chapter emphasizes the idea that in the new digital era, technology collaborates with human senses and intelligence to offer a convenient customer experience across both online and offline channels. This approach leads to increased efficiency, productivity, and a deeper understanding of customer services. Digital technologies also contribute to the progress of such a component as marketing in order to optimize the entire travel process, focusing on the wishes of customers, and not on the actions of competitors. In conclusion, the author offers a technology stack of the optimal chatbot of the HoReCa segment, which will allow to fully automate the processes from the creation of an order by the customer to feedback from the client in the form of feedback upon completion of the order. The application of the latest modern information technologies can give impetus to the development of the restaurant and hotel business, therefore, choosing the optimal combination of progressive digital solutions and a scientific approach to the HoReCa segment is an urgent task.*

Keywords: *artificial intelligence, hospitality, tourism, chatbot, digitalization.*

The widespread use of artificial intelligence (AI) in the field of tourism and hospitality is associated with the need to generate profit through the development and improvement of the visitor service system through the use of the latest information technologies.

The analysis of many scientific sources showed a significant variety of existing information solutions and methodical approaches in this field. One that deserves attention, in particular, is the concept of a digital interactive table created by students of Lund University and Eindhoven University of Technology for "Ikea's Concept Kitchen 2025" (Vermes, 2015). Also of note is the research on a futuristic concept for the restaurant sector. The tablet computer "Fujitsu Iris" was created with the concept of a transparent tablet and using an OLED display (Vermes, 2015). In his how-to video, he is placed in futuristic situations where augmented reality takes place. The concept of a transparent screen works as an additional barrier between the interaction of the real and the augmented world.

AI is transforming the travel planning process, making it more intuitive and convenient. AI in travel planning acts as a personal assistant, using sophisticated algorithms to suggest itineraries and destinations that match each traveler's unique preferences (Tapscott & Tapscott, 2016). These systems can analyze past trips, reviews, and even current weather conditions to suggest the most suitable options. Thanks to machine learning, AI is able to recognize and adapt to users' changing interests and habits, making recommendations increasingly accurate and personalized over time. AI also helps make booking easier by providing real-time information on ticket availability, hotel room availability, and available excursions. This allows travelers more flexibility in planning their trips, minimizing stress and increasing planning pleasure. Thus, AI acts as an innovative tool that makes travel planning more intuitive, efficient and personal (Table 1 - Examples of using).

Table 1. Examples of using AI

App	*Description*
Google Trips	This app uses AI to analyze your email inbox to automatically gather information about your upcoming trips and offer personalized recommendations for places to visit.
Hopper	This app predicts prices for airline tickets and hotel rooms using AI to analyze massive amounts of data. It helps you find the best time to book to save money.
Kayak	Uses AI to improve search and filter travel options, suggesting options that best match a user's individual preferences.

AI in the travel industry takes into account not only travel preferences, but also the personal characteristics of each client. From restaurant recommendations to the choice of excursions - everything is selected individually. By analyzing user behavior

and feedback, AI can suggest options that you didn't even think about, but that will hit the mark.

The use of big data and AI makes it possible to collect and analyze information about previous travels, interests, even behavior on social networks of tourists. This allows us to offer travel products and services that are ideal for each customer, from choosing a destination to recommending hotels and excursions. This approach increases customer satisfaction and makes their journey more comfortable and memorable (Table 2 - Examples of using).

Table 2. Examples of using

App	*Description*
Booking.com	Uses AI to analyze users' preferences based on their past bookings and searches to suggest the most suitable hotels and holiday destinations.
TripAdvisor	Uses machine learning algorithms to create personalized tour and restaurant recommendations based on reviews and ratings from other users with similar interests.
Expedia	Uses data about customers' preferences and travel habits to offer customized travel packages, including airfare, hotels and excursions.

These examples demonstrate how AI technologies and big data analytics can be used to provide a more personalized and targeted approach to travel planning, increasing customer satisfaction and loyalty.

AI in hotel services helps improve guest comfort through automation and personalization of services. AI-powered systems can manage bookings and provide guests with personalized offers, including room preferences, services, and even in-room settings. AI also helps in optimizing staff work and hotel management, providing more efficient and faster service. With the help of AI, hotels can provide more intuitive and comfortable experiences for their guests, increasing customer satisfaction and loyalty (Table 3 - Examples of using).

Table 3. Examples of using

App	*Description*
Hilton's Connie	Hilton has introduced "Connie", an IBM Watson-powered robot that assists guests with information about the hotel and local attractions.
Marriott's Chatbots	Marriott uses chatbots to provide quick answers to guest questions and help book services.
The Cosmopolitan of Las Vegas's Chatbot Rose	This chatbot assists guests with restaurant reservations, event information and personalized recommendations.

These examples demonstrate how hotels are using AI to improve customer service and create unique hotel experiences.

Artificial intelligence is penetrating more and more into various areas of life. The hospitality industry, which traditionally follows new products, is no exception. There are many applications for AI-powered algorithms in the hotel industry. The pandemic has increased the demand for contactless services and, although COVID-19 is a thing of the past (Priyadarshini, 2020), they have caught on and are still in high demand. For example, online programs have replaced plastic key cards, which tourists so often lose. Through the application, a guest can independently choose a unit from anywhere in the world, pay for accommodation, check-in and check-out, book a parking space, which means saving his time. In addition, the guest, bypassing the reception, goes straight to the room and literally feels at home. This solution is ideal for apart-hotels designed for long-term stays.

Discerning travelers expect technology to become part of their everyday lives at work and at home. That's why hotel apps now also allow guests to set settings for comfort elements, such as turning on heating and air conditioning, adjusting lighting and TV speaker volume. In the future, they promise to teach AI to save this data. Every time a guest decides to book a stay at a specific hotel or brand, they will be greeted with a room perfectly customized to their preferences.

Chatbots have learned to answer guests' most basic questions. They can tell you about the services of the spa center, the opening hours of the pool or the breakfast menu. Some large hotels already use an advanced version of the bot - an online concierge. An example of a concierge already well-known in the professional environment is the voice assistant Rose at the Cosmopolitan Hotel in Las Vegas. It's similar to Apple's Siri, but specifically designed for hotel guests. You can ask your assistant to deliver towels, tell you about attractions, help you choose a cocktail, or order a taxi (more detailed information about chatbots in the hospitality industry is given below).

AI can improve the work of staff who are responsible for making reservations, handling complaints and other requests from guests. To do this, the hotel can use a speech analytics system powered by AI. These systems have long been used in banks, insurance companies, retail, air transport companies, as well as in the operation of hotlines. That is, wherever it is necessary to analyze 100% of the records of communication between employees and clients, and prepare a report on what problems the guests had, how they were helped, what affected sales, how best to convince a potential client and respond to his requests, and who of the employees did it better than others. This identifies best sales and service practices and then trains staff. It is important to understand that without using a speech analytics system, no more than 3% of the array of accumulated voice information can be analyzed. The advantage is

obvious. The system performs such analysis thousands of times faster than people, working 24/7. Moreover, the operator communicating with the client can receive the information necessary for the conversation directly in real time.

In general, the process of managing a hospitality enterprise is a set of relationships and actions aimed at ensuring the optimal ratio of labor, material and financial resources (Tapscott et al., 2000). Restaurant business processes can be divided into 3 main processes:

- the main business processes related to the direct production of restaurant services;

- auxiliary business processes that ensure the implementation of the production process;

- business management processes (Kostynets, 2020 *(1)*).

Automation of groups of the main business processes of a hospitality enterprise is one of the key tasks. Modern informational computer technologies, created directly for enterprises in the field of hospitality, allow to significantly optimize, simplify and accelerate many monotonous, repetitive operations specific to this business. Let's consider this issue in more detail using the example of restaurants.

Currently, there is a fairly large number of services that help optimize restaurant operations, from full accounting and analytics to table reservations. Such services can be classified according to three types of system functionality.

The first type is an information system designed for one institution or a network of institutions, which involves managing all business processes in one program. These systems are quite difficult to use and expensive. This calls into question the expediency of their use, especially for a recently opened restaurant. Their disadvantage is also the lack of interaction with the client (Van Krevelen & Poelman, 2010). Examples of such systems can be:

- "Quick Resto" is a combination of a CRM system for attracting guests, accounting and analytics tools to increase profits, and a universal POS system for visitor service;

- "Poster" is a program for accounting in cafes, shops and restaurants. Poster accelerates the reception of sales, keeps warehouse and financial records, builds detailed statistics on the institution's activities (Poster);

- "R-Keeper" - automates sales, customer service, kitchen and bar operations and analyzes sales and service data in different time periods at restaurant enterprises and entertainment centers. The collected data are used in warehouse and accounting systems (Kostynets, 2020 *(2)*).

Information systems belonging to the second type implement only table reservations. These are, for example, such systems as:

- "RestoPlace" - creates a scheme of the establishment in a convenient online designer, which can be easily inserted into the site and accept applications. A potential client chooses the table in the establishment that he liked. Reservations and deposits are made with the help of "Restoplace". The fact of booking a table is recorded in "R-Keeper";

- "emptyStudio" - a system that allows users to set up and according to their needs manage working time and free places online, also process requests and customer data, add employees to manage orders.

The third group includes systems that work with several institutions at once. Most often, they only provide the opportunity to choose a table in one of the offered restaurants, book a table for a certain time for a certain number of people, view the menu and leave your wishes. An example of such systems can be the "LeClick" system - it is a convenient and understandable service for searching, selecting and online booking of restaurants; the service ensures the selection and reservation of the appropriate restaurant according to an extended set of criteria.

Existing systems optimize restaurant operations in various ways. Some affect all business processes of the restaurant, but do not work with customers in any way, others, on the contrary, work exclusively with customers, that is, they transmit information only about the reservation of tables in the restaurant for a certain date and time. Thus, restaurants need such an information system that would be convenient and easy to use on the part of customers, meet their requirements and requests, namely: book a table for the right date and time, order the desired dishes and drinks, have a guarantee of timely fulfillment of the order. The requirement put forward by the staff is to ensure receipt of orders from customers and transfer them to other departments - kitchen, bar, hall, automatic collection of data on orders. A requirement for the program, which is usually put forward by the administration and management, is the automation of personnel management. To some extent, such an information system that will satisfy all these requirements can be a chatbot (software that simulates a real interview with a client).

Chatbots are the story about the interaction experience. When a restaurant launches its bot, the guest has a new way of communicating with the brand in a familiar environment: he can order meals or book a table with minimal movements. At the same time, an audience is formed that chooses only this way of interaction (Kostynets, 2020 *(2)*).

Potential restaurant guests have many requests that can be solved with the help of standardized algorithms - for example, to find out the exact address of a restaurant or order food delivery without going to a separate site or platform. A chatbot can perfectly cope with these tasks. If the guest has a non-standard question at the time of interaction with the chatbot, and there is no pre-programmed answer, the operator connects to the

guest. Today, this is the optimal scheme for using bots in the restaurant industry, both from the point of view of economy and convenience for the guest. On the other hand, a chatbot does not replace communication with a person.

A classic example of using chatbots in the restaurant business is delivery. However, the potential set of functions of chatbots is not limited to delivery - it is much wider: from table reservations and food orders to recruiting line staff. And yet, in most cases, the chatbot is responsible for the initial contact with the guest. The bot is able to answer simple, standard questions, as well as perform some functions: for example, provide a menu at the user's request, orient the guest to the location of network establishments, etc. This allows to offload the SMM specialist (chat operator), who joins the conversation only when non-standard questions arise. With the help of the bot, you can also conduct voting, surveys on the site and much more. The benefit of chat bots also lies in the digitization of the customer base, because when a guest starts communicating with a bot in a social network or messenger chat, the owner of the establishment receives contact information: as a rule, a phone number and name. This data can then be used for marketing activity, such as sending messages with promotions or offers.

If the chatbot is integrated with the establishment's accounting system, the restaurateur receives additional valuable analytics: which customers come to him, how much they spend, how much they buy using the chatbot. Another promising direction for the use of a chatbot is promotions, during which the chatbot is used to manage the engagement funnel. Chatbots are also used to work with personnel - training employees about menus and standards, identifying weak points in knowledge, scheduling interviews. In addition to messengers, restaurants can also use voice chatbots. Following banks, financial and insurance companies, restaurants are implementing language technologies to communicate with customers. In this case, the main advantage of using a chatbot is to relieve the call center. The bot answers questions and answers in the application or over the phone: where is the order, until what time is the establishment open, etc.

The conducted empirical studies indicate that the optimal chatbot, from the author's point of view, should be implemented using a technology stack (a set of software tools) (Fig. 1).

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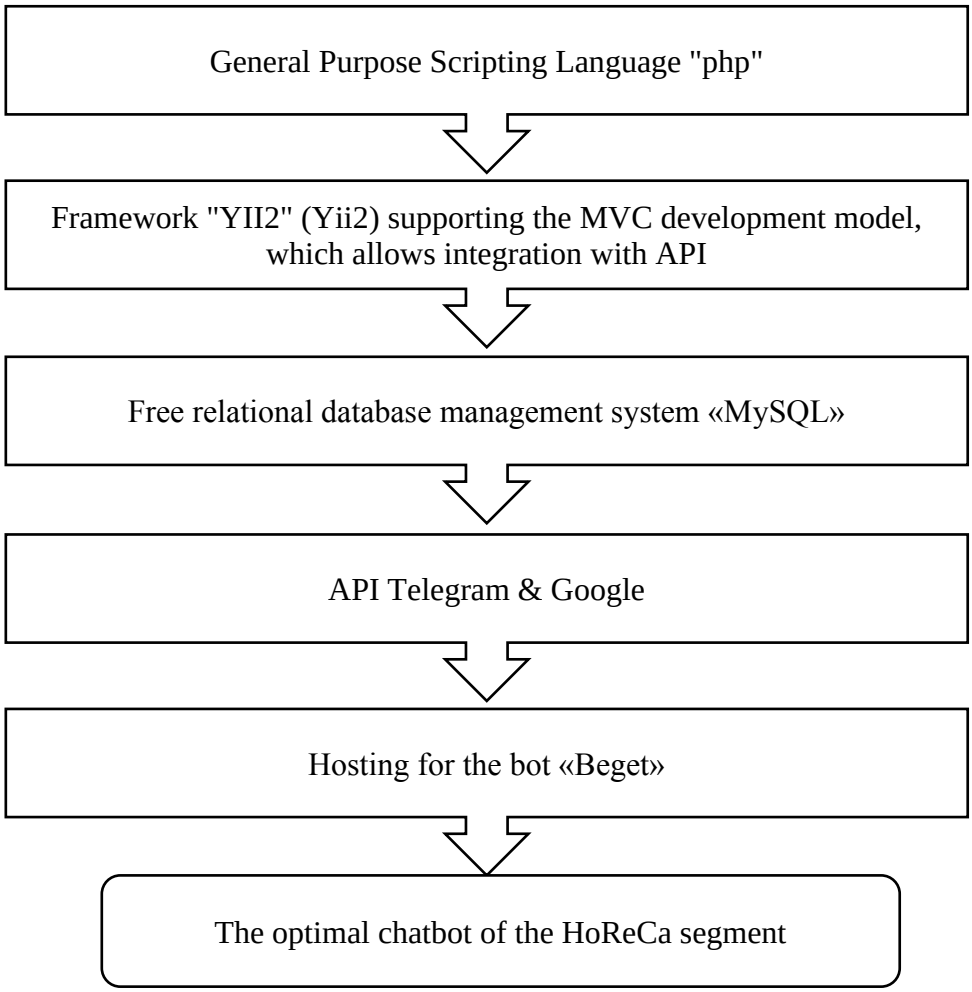

Figure 1. The optimal chatbot technology stack for the HoReCa segment

This bot will allow users to fully automate the processes from the creation of an order by the client to feedback from the client in the form of feedback upon completion of the order. The chatbot will integrate with the restaurant's database, receive up-to-date information about the composition of the menu, availability of ingredients, free seats in the hall and offer possible options to the client. When the customer creates an order, the system will receive all the necessary data and transfer them to the hall and kitchen administrator (Wagler & Hanus, 2018). After their confirmation, the order will be automatically sent to the waiters and cooks, who will begin to process it. The client, for his part, will be able to track the status of the order and have a guarantee that the table will be ready at the time of his visit and the ordered dishes will be served in a timely manner, the waiting time for service will be reduced to a minimum. After closing the order, i.e. paying and receiving the check from the waiter, the client will be able to leave his feedback with the help of the chatbot. Collecting feedback from customers will allow us to adjust and improve the activity of the restaurant in general and this information system in particular.

The application of the latest modern information technologies can give impetus to the development of the restaurant and hotel business, therefore, choosing the optimal combination of progressive digital solutions and a scientific approach to the HoReCa segment is an urgent task. The results of our research show the prospects of this direction and substantiate the expediency of their implementation in the activities of restaurant enterprises, because those establishments that implement all information conveniences for their customers will be in a more attractive position for a potential customer compared to those establishments where this service not practiced. Thus, the presence of a chatbot as an element of digitization will allow coordination of all departments and services both inside the restaurant and will be an indisputable advantage for interaction between the restaurant's services and the potential customer of services - the visitor. All this is possible due to the presence of a well-thought-out chain of interaction from the client to the waiter using modern technologies. The proposed idea of an optimal chatbot has a wide functionality for organizing the interaction process of the restaurant visitor with all departments responsible for customer service. Yes, in such a system, it is possible to reserve tables, order specific dishes and drinks from the restaurant menu. Accordingly, this program relieves one of the bottlenecks of the restaurant business, namely the process of high-quality order processing and customer service. In turn, the integration of a chatbot will allow you to place orders online, which will provide a new customer base for the restaurant and increase the competitiveness of the enterprise.

Conclusions. To summarize, we note that artificial intelligence is an effective business tool. Already today, a neural network is capable of processing huge amounts of information in real time, offering the optimal price for a hotel. This means that the company will not lose out on potential guests due to inflated prices and at the same time avoid the problem of selling rooms too cheap.

In the near future, algorithms may learn to collect and analyze other specific data - guest reviews, employee performance, resource allocation. This will allow you to make informed decisions on hotel management and ultimately lead to improved business results and a new level of guest comfort. Hoteliers who implement AI today stand a good chance of outperforming their peers and competitors in the coming years.

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DIGITAL SOLUTIONS FOR HOTEL BUSINESS ACCOUNTING

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Abstract. *The study examines the main aspects of management accounting in hotel business enterprises. The use of information systems and information support of the hotel's activities is analyzed. The chains of information flows on the example of Hotel "A", the features of management decision-making, and the use of this information are studied. The main disadvantages of the ORAK Hotel R5 system used in Hotel "A" and their impact on the management process have been identified. The purpose of the research is to reveal the main aspects of organizing the effectiveness of the management accounting system as a source of information support for making management decisions, to highlight the problems that arise in the process of forming and functioning of this system, and the advantages it provides to the hotel business enterprise. The object of this research is the process of development, implementation, and improvement of management accounting at a hotel enterprise. The subject of the research is the theoretical and methodological principles and practical aspects of the organization of effective management accounting in the management system at hospitality industry enterprises. The theoretical and methodological basis of the research are the fundamental provisions of economic theory and scientific works of domestic and foreign scientists who were engaged in management accounting at enterprises in the hotel business. Some specific principles that are inherent in management accounting and distinguish it from financial accounting are studied. The place of the information center in the hotel's information support system has been determined, and the reasons for changes in the hotel's information support structure have been established. The consequences of informatization and computerization of business processes, as a necessary aspect of the effective operation of hotel enterprises, are presented, and ways of improving management accounting in the hotel are proposed.*

Keywords: *management accounting, hotel business, management, information support, management accounting system, management decision- making, information support system*

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Information requirements in the management accounting system. Management accounting has indeed become a very widespread and important tool in enterprise management. It helps managers make effective decisions based on the analysis of expenses, revenues, results, and other indicators. Management accounting also allows planning, budgeting, controlling, and organization's resources optimization. Management accounting has long ceased to be something new for both scientists and practitioners. Its main tools are used daily in their activities by heads of enterprises and individual structural units' managers.

The need for management accounting at domestic enterprises is determined by the following facts:

1) the presence of different forms of ownership, which leads to the emergence of different groups and levels of management information users;

2) intensifying competition in the domestic and foreign sales markets of domestic products, which requires timely information about their market conditions;

3) the integration of the Ukrainian economy into the world economy, which inevitably leads to a reorientation of both practice and theory of accounting knowledge.

Management accounting is an important tool for effective management of enterprises. It allows for receiving, analyzing, and using information about costs, revenues, results, and other indicators of the enterprise's activity. Management accounting also contributes to planning, budgeting, control, and optimization of the organization's resources.

However, management accounting at domestic enterprises has some problems and peculiarities. In particular, the following can be highlighted:

- Lack of clear rules, methodology, and components of management accounting. Unlike accounting, regulated by legislation, management accounting must be developed by the enterprise itself, taking into account its specifics, goals, and needs. This requires high qualifications and creativity of specialists conducting management accounting [1].
- The problem of obtaining and processing data on strategically important processes of the external and internal environment. Management accounting requires not only factual information about the state of passive and active balance sheet items but also predictive information about the market situation, competitive analysis, and risks and opportunities of the enterprise. Such information should be systematized in special accounting registers that often do not exist in domestic enterprises.
- The problem of choosing and applying costing methods products (works, services). Management account should provide managers with information about the profitability of certain species products, centers responsibilities, market segments, etc. To do this, it is necessary to apply modern methods of cost calculation, which allow for to accurate distribution of indirect costs between accounting objects. However,

many domestic enterprises use outdated methods that do not take into account the complexity and diversity of production processes [2: 3].

The management accounting system is based on an information system that uses input information and relevant processes to obtain results that meet precisely defined management goals.

Information base is used by all management functions, including planning, control, and evaluation functions to make management decisions.

Special attention should be paid to the fact that the management accounting system goes beyond accounting and includes elements of planning, control, analysis, and evaluation. It is this fact that caused some disagreements in determining its essence and meaning, principles, and functions among leading domestic and foreign scientists.

The management accounting system is a set of methods, procedures, rules, and tools that are used to collect, process, analyze, and present information about the company's activities, necessary for making effective management decisions. The management accounting system must be adapted to the specifics, goals, and needs of each enterprise. The management accounting system can have a different structure and components but it is generally accepted to distinguish the following main elements:

- The chart of accounts of management accounting is a systematized list of accounts that are used to record information about the sources and use of the company's resources, costs, revenues, results, and other indicators. The chart of accounts of management accounting can be built according to different principles, for example, according to functional characteristics, according to cost centers, or according to profit centers [4; 5].
- Budgeting is the process of planning and controlling the financial flows of an enterprise based on forecasting its activities for a certain period. Budgeting allows setting goals and standards for individual indicators, comparing the actual dynamics with the planned, identifying deviations and their causes, and taking corrective measures. Budgeting can be static or flexible, strategic or operational [6; 7].
- Costing is the process of determining the cost of products (works, services) produced or provided by the enterprise. Calculation helps to substantiate pricing, assess the profitability of certain types of products or market segments, control the use of resource factors. The calculation can be carried out by different methods, for example, by the method of full costs, direct costs, and standard costing [8].
- Analysis is the process of evaluating and interpreting information about the company's activities provided by management accounting. The analysis makes it possible to identify the strengths and weaknesses of the enterprise, its competitiveness, and development prospects, to determine the factors affecting the results of the activity, and to develop recommendations for improving management efficiency. The analysis

can be carried out in different directions, for example, by cost analysis, income analysis, profitability analysis, liquidity analysis, etc. [9].

As can be seen, the management accounting system contains many components that help the managers of the enterprise to make reasonable and timely decisions, methods, and systems. Management accounting, like any accounting that is part of a complex accounting system of a business entity, is intended to provide certain information. Management accounting information created and prepared for use by management within the enterprise is subject to other requirements that differ from information intended for external users. The requirements that such information must satisfy are illustrated in Fig. 1.

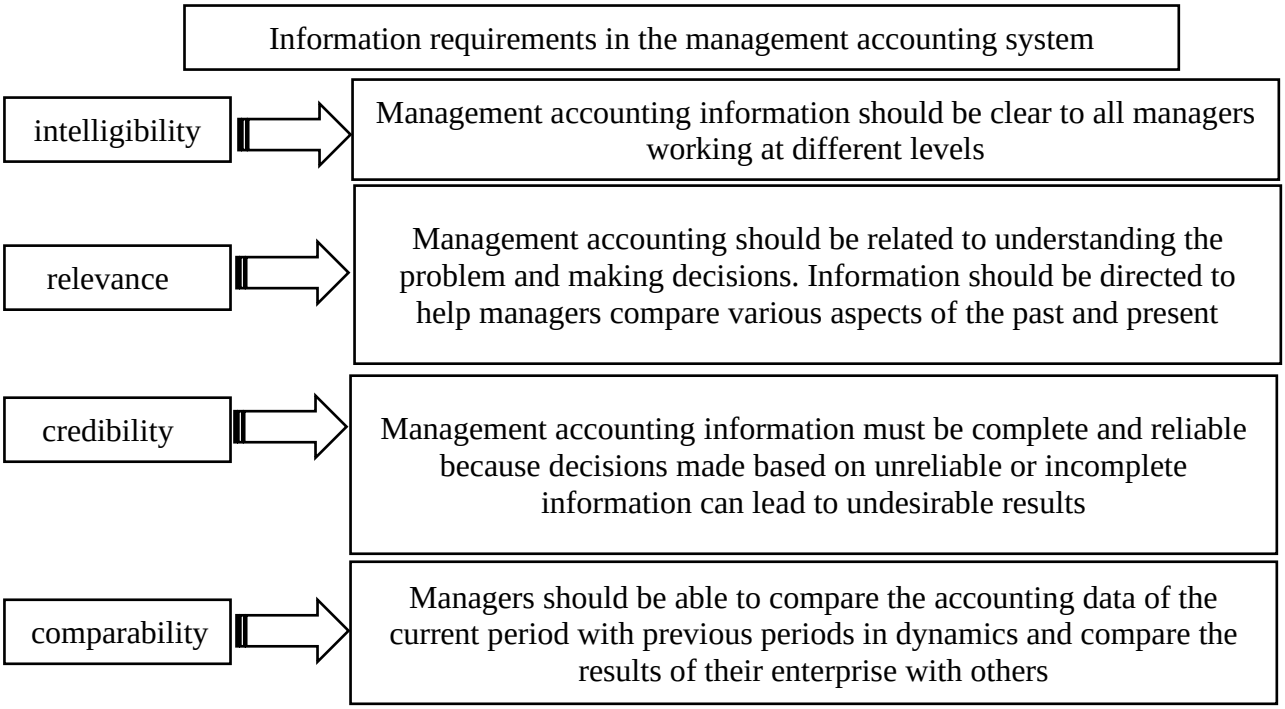

Figure 1. Information requirements in the management accounting system

Sources: developed by the authors

The list of such requirements affects the definition of the concept of "management accounting". Some definitions of management accounting are given in Table 1.

The Law of Ukraine "On Accounting and Financial Reporting in Ukraine" provides the following definition of management accounting: "Internal economic (management) accounting – a system of processing and preparing information about the enterprise's activities for internal users in the process of enterprise management" [22].

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Table 1. Definitions of management accounting given in the works of domestic and foreign scientists

No.	Definition	Author, source of information¨
1	Management accounting is understood as the process of identifying, measuring, accumulating, analyzing, preparing, interpreting, and transmitting information that is used by the management unit for planning, evaluation, and control within the enterprise.	Butynets F.F. [1, p. 229]
2.	Management accounting is the process of identifying, measuring, accumulating, analyzing, preparing, interpreting, and communicating information used by management to plan, evaluate, and control within an organization and to ensure appropriate, accountable use of resources.	Holov S.F., Yefimenko V.I. [2, p. 246]
3	Management accounting is an urgent service for businesses of any scale and direction: enterprises of all forms of ownership, organizations, and private entrepreneurs. Management accounting is aimed, in particular, at providing the necessary information about the functioning of the business, first of all, to the business owner and managers.	AGTL site materials [12]
4	Management accounting is a system of accounting for financial operations –that responds to specific requests of owners, financial analysts, and heads of a group of companies, namely: obtaining analytics on sales, expenses, planning, budgeting, periods of capital turnover, other analytical information; transformation of reporting according to other rules and standards (accounting policy of the owner company, IFRS, reporting requirements of other jurisdictions, etc.); data consolidation of several companies; consolidated reporting of several companies	AGTL site materials [13]
5	An economic system related to the preparation and provision of an information management system during implementation investment, operational and financial activities, which allows to develop and comprehensively adopt the most effective operational, tactical, and strategic decisions at various levels of enterprise management is called management accounting.	Napadovska L.V. [14, p. 95]
6	Management accounting is a subsystem of control, built on the principles of accounting, but taking into account the specifics of a particular enterprise, the main task of which is to provide the management apparatus of the enterprise with relevant, timely, and complete information that serves to make management decisions, is used during planning, control, and analysis of the financial and economic processes of the enterprise.	Pankov V.A., Yeletskih S.Ya., Mykhailychenko N.M. [15, p. 112]
7	Management accounting, like any accounting that is part of a complex accounting system of a business entity; it is designed to provide certain information.	Pisarenko. T.M., Bukalo N.A. [16, p. 137]
8	Management accounting is an independent subsystem of accounting with its subject, method, and tasks, which is closely related to the management system and is aimed at reducing production costs and increasing company profits.	Pushkar M.S. [17, p. 124]
9	Internal economic accounting (the so-called managerial accounting, production controlling) is not independent accounting. This is a continuation, or more precisely, a further deepening, detailing of the data of accounting and financial accounting in terms of expenses and income of activities, when all the effectiveness of the acquisition of resources, their processing, technological and organizational solutions, motivation, etc. is revealed.	V. V. Sopko [18, c. 483]
10	Management accounting is a subsystem that, within the boundaries of one organization, provides its management apparatus with information used for planning, proper management, and control of the organization's activities.	Turylo A.M., Svyatenko S.V. [19, c. 75]
11	Management accounting is a process of data collection, accumulation and analysis, interpretation, and presentation of financial and production information, which will be the basis for management to make operational and strategic decisions.	Administrative and financial accounting : what's the difference [20]
12	Management accounting at the current stage of society development is no longer an end in itself, but a means of achieving successful positions in business, which is accompanied by the process of developing strategic plans for making long-term decisions	Shevtsiv, T. I. Spodaryk [3]
13	*Management accounting is* the process of identifying, measuring, accumulating, analyzing, preparing, interpreting, and communicating information that is used by management to plan, evaluate, and control within an organization and to ensure efficient use of resources.	Shevtsiv L.Yu. [21, p.4]

Sources: developed by the authors

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Common to these statements is that the main task of management accounting is to provide unbiased information necessary for making management decisions by the relevant management units of the enterprise. The content of management accounting is revealed in Fig. 2.

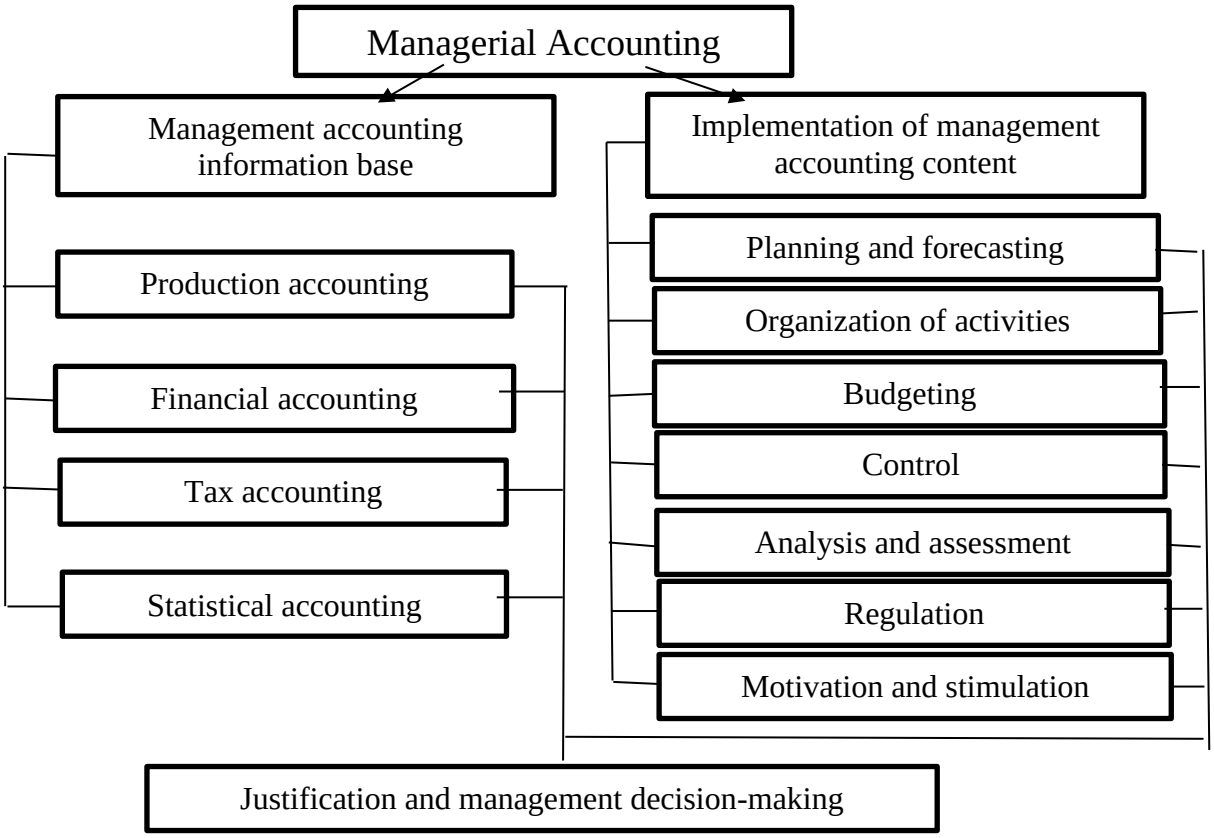

Figure 2. Implementation scheme of management accounting content

Sources: developed by the authors

Sometimes the concepts of management accounting and controlling are equated. There are lots of common features between them however there are also differences. *Controlling* is a functionally embodied direction of economic work at the enterprise, associated with the implementation of the financial and economic commenting function in management during the adoption of operational and strategic management decisions.

Controlling may consist of the following sections: planning; analysis of plans, results, and deviations; control; monitoring; information flows; management accounting; goal management; development of a recommendation for making management decisions, etc. From the above, we conclude that management accounting is a component of controlling.

Considering the fact that management accounting is an integrated system of various economic disciplines, the method of management accounting includes:

1) elements of the accounting method (in particular, accounts and double-entry; estimation and calculation; inventory and documentation);

2) elements of statistics (index method);

3) methods of economic analysis (factor analysis);

4) mathematical methods (linear programming, method of least squares).

The management accounting method is a set of techniques and methods by which management accounting objects are displayed in the enterprise information system. The main elements of the management accounting method are:

- documentation – is the recording of the facts of economic activity in written sources;
- inventory – is a check of the availability and assessment of property, liabilities, and capital of the enterprise;
- grouping and generalization – is the systematization and aggregation of data according to certain characteristics;
- normalization – is the establishment of standard indicators for comparison with actual results;
- budgeting – is the preparation of planned calculations of income and expenses, as well as cash flows;
- analysis and control – is an assessment of the efficiency and rationality of economic activity, the identification of the causes of deviations, and the development of measures to eliminate them.

The subject of management accounting is a set of objects in the process of managing the economic activity of the enterprise, namely:

1) production resources – fixed assets, intangible assets, material resources, and labor resources;

2) economic processes and their results – supply and procurement activities, production activities, financial and sales activities, investment, and other types of activities of the business entity.

Considering that management accounting in the narrow sense is a component of the entire accounting system and is related to financial accounting, it must comply with uniform accounting principles, in particular: continuity of enterprise activity; a single monetary unit; completeness and analyticity of information; periodicity, etc.

Consequently, management accounting has some specific principles that distinguish it from financial accounting. Here are some of them [23; 24; 25] :

- The principle of relevance means that the information provided by management accounting should be useful for decision-making by the company's management.
- The principle of flexibility means that management accounting must adapt to changes in the external and internal environment of the enterprise.
- The principle of individualization means that management accounting must take into account the peculiarities of each enterprise and its structural divisions.

- The principle of communication means that management accounting should ensure the effective exchange of information between different levels of management and stakeholders.
- The principle of methodological independence means that each firm (enterprise) establishes its rules of organization and methodology management accounting.
- The principle of orientation towards the achievement of strategic goals of the enterprise means that when making decisions at any level and choosing the most optimal of them, the interests of the enterprise as a whole should be prioritized.
- The principle of evaluating the results of the activity of the structural subdivisions of the enterprise, which involves determining the tendency and prospects of each subdivision in the formation of the enterprise's profit from production to the sale of products.
- The principle of effectiveness means that when carrying out any type of activity, one should constantly compare the costs incurred as a result of the activity with the result obtained; at the same time, the result must exceed the costs.
- The principle of responsibility means that a specific person controlling them is responsible for the amount of costs and results.
- The multivariate principle means that when preparing information, all options should be taken into account, but the most optimal one should be chosen for making management decisions.
- The principle of complexity, which provides for one-time recording of data in primary documents or production calculations and repeated use in all types of management activities.
- The principle of the budgetary method of management, which is a tool of planning, control, and regulation and provides for budgeting of production, implementation, and financing of divisions, as well as the enterprise in general.
- The principle of dependence, which consists in the fact that only those costs that will depend on the future choice are included in the various alternative solutions.
- The principle of causality, which consists in the fact that only those costs that arose as a result of the production of this product should be attributed to the cost price of the product.
- The principle of interconnection is based on the fact that management accounting includes not only cost accounting but also planning, control, analysis, and regulation; all these functions are implemented simultaneously, in a complex and interconnected manner.
- The principle “different costs for different purposes” means that depending on the goal, i.e. for making specific management decisions, different information is used to form the costs, which is why the cost will be different.

The main goals of management accounting are to provide information for calculating the cost of products (works, services), planning, control, evaluation, and continuous improvement of the enterprise's activities, and making management decisions. That is, management accounting information should enable managers to determine the future development prospects of the enterprise, solve problems, and evaluate the success of activities. Management accounting is also used to determine the strategy and planning of the organization's future activities, control its current activities, optimize the use of resources, evaluate the effectiveness of activities, and reduce the level of subjectivity in the decision-making process.

Means of communication at the current stage of society development play a significant role in ensuring effective management in the field of hotel business. Information delay can cause negative financial consequences and lead to the loss of the hotel's image on the market. In the hotel business, various means of communication are used to interact with guests and promote their services. Some of them are:

- Online booking and web platforms**.** This allows guests to book a room via the Internet, which ensures convenience and accessibility [26; 27].
- SEO and contextual advertising**.** This contributes to increasing the visibility of the hotel website in search engines and attracting the target audience [28; 29].
- Social networks and e-mail**.** It helps to publish up-to-date information, special offers, and photos, as well as send personalized emails with booking information [28-30].
- Messengers and online chats**.** This allows guests to quickly ask questions and receive answers in real time [29-30].

Some key aspects to consider are:

- Technological preparation for production**.** This is the process of developing and optimizing technological processes, equipment, tools, devices, quality control, and other elements of the production system. Technological preparation for production is aimed at ensuring efficient use of resources, cost reduction, improvement of productivity, and quality of products [31].
- Information systems and technologies**.** This is a set of means, methods, and procedures for collecting, processing, saving, transferring, and using information to support management decisions, coordinate actions, and control the state of the production system [31]. Information systems and technologies make it possible to improve communication, integration, automation, and innovation of the production process [32].
- Design and optimization of the production system. This is the process of analysis, modeling, evaluation, and selection of the best options for the structure, parameters, modes of operation, and placement of elements of the production system [32]. The design and optimization of the production system aims to achieve the desired

goals in terms of capacity, productivity, quality, reliability, safety, environmental friendliness, and economy of the production process [33]. With the correct organization of the production process at the enterprise, the use of information systems and technology for the transmission of information ultimately significantly increases the economic efficiency of the hotel enterprises's operation.

If earlier the hotel industry was focused mainly on tourists, who "dictated" working conditions for hotels, today the bet is often placed on representatives of businesses – both large and small. Their requirements for comfortable accommodation are an order of magnitude higher than those of tourists because a hotel for a business person is not only a place of residence but also a place of work. Modern hotels are increasingly offering guests the organization of business congresses, press conference rooms, and assistance in organizing negotiations with clients and partners. For these purposes, not only conference halls are created but also lobby bars and lobbies where coffee breaks can be organized. At the same time, "business" hotels also choose a special location that is convenient from the point of view of transport junctions [34].

The research utilized materials from Hotel "A" which uses a whole range of information equipment. The hotel has 14 personal computers connected to one network. Moreover, the following is used for information support of the activities of Hotel "A" (Table 2).

Table 2. Information equipment of Hotel "A"

Name	List of means
Equipment	- 206 Fanvil H3 telephones; - 8 Canon PIXMA i6520 printers; - 2 Panasonic faxes kx-ft 982; - mini PBX; - the hotel has 6 telephone lines; - a video surveillance system operates on the territory and in the middle of the hotel to ensure the safety of hotel guests; - a Siemens fire alarm system was installed; - the hotel is connected to satellite television channels; - the hotel is connected to the Internet, and free Wi-Fi is available on the territory of the hotel
Software products	- Windows 7 and its applications; - Microsoft Office 2003 (Word, Excel, Access, Outlook); - Avast Antivirus; - Adobe graphics editor Photoshop; - electronic translators; - Outlook Express mail program; - Google browser chrome;

Sources: developed by the authors

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This level of information technology use is acceptable for a hotel of this class. The maintenance of the equipment and software is handled by the system administrator, who is in the hotel's staff. Telephone communication and Internet access are provided by the Kyivstar company.

The hotel's automated management system (AMS), complexes of security, life support, and computerization systems are integrated into the hotel's single information field. Consider the chain of flows of basic information in hotel "A". (Fig. 3).

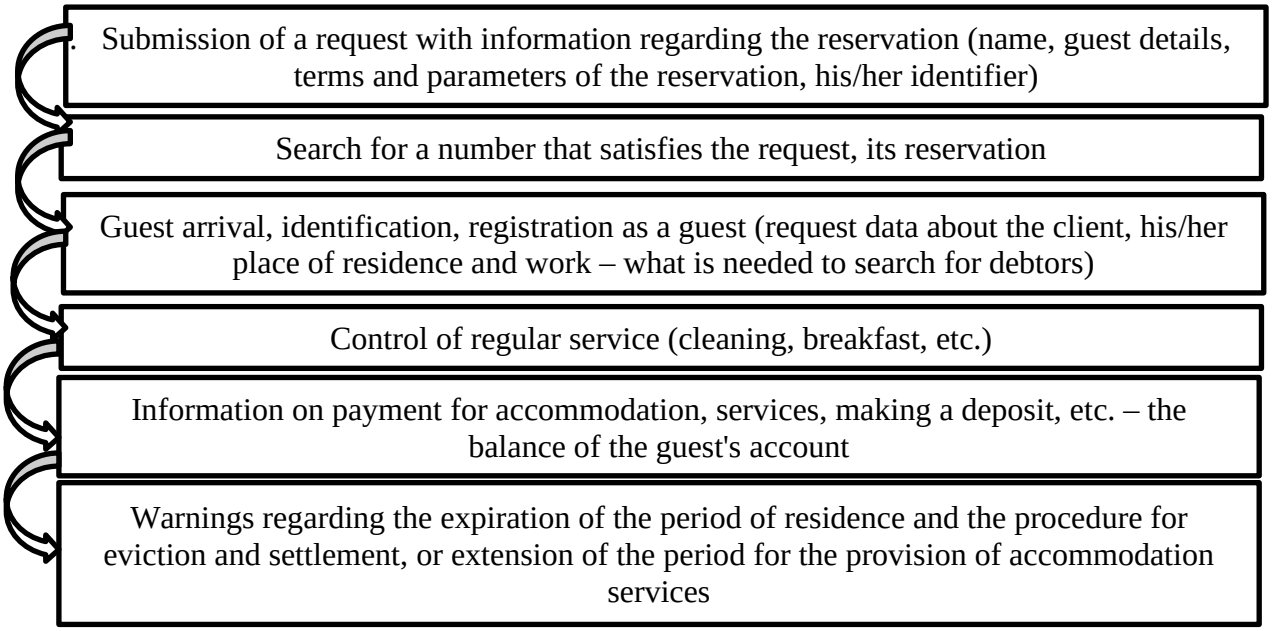

Figure 3. Chain of information flows in Hotel "A"

Sources: developed by the authors

This is not a complete list, but it gives an idea of the main functions of the system. The ORAK Hotel R5 system is used for the automation of management in the hotel. The main capabilities of this system include:

- accounting of hotel room stock. Visual display of all information about the current state of the hotel's room stock in the main working window of the program: the status of each room, the number of occupied rooms, the number of reserved rooms, rooms that will be vacated, and free rooms, the number of guests currently staying in the hotel, revenue received per shift. Architectural plan of the hotel rooms and construction of the hotel's room structure. Besides an unlimited number of room types, categories, and statuses are available;

- reservation. Creating a reservation due to the universal booking tool for individual and collective orders allows one to book different rooms with different accommodation conditions (check-in and check-out dates, tariff, meal plan) within each reservation. All information about the guest's stay is stored in the database. At

any time, you can get information about the guest's previous visit to the hotel. The card of a guest who has previously visited the hotel is filled in automatically upon new check-in. All information about the date of arrival and departure, category of rooms, additional services, tariff, meals, and invoices is stored. All this is shown on the display. Reservations for private individuals, corporate clients, and travel operators are made through a single form but with considerations features of each client;

- flexible pricing policy. In addition to the general price list, it is possible to set special prices for different types of customers (travel agencies, regular customers, corporate customers). Setting special prices can be based on a discount or specially developed price lists. It is possible to set a discount individually for each client or each type of service. Guests staying under special conditions can be separated into special categories, which makes it possible to evaluate the effectiveness of the pricing policy;

- housekeeping – assigning responsible maids to rooms. Viewing and printing the schedule for changing linen and towels, cleaning rooms after the departure of guests, and scheduled cleaning of vacant hotel rooms. The module for planning services by time allows you to perform hourly accounting for billable services. Minibar filling is also accounting;

- security service – the interface for night security is contrasting. Control of guest and staff access to hotel rooms and office premises. Controlling the debts of departing guests.

However, the ORAK Hotel R5 system has several disadvantages (Fig. 4).

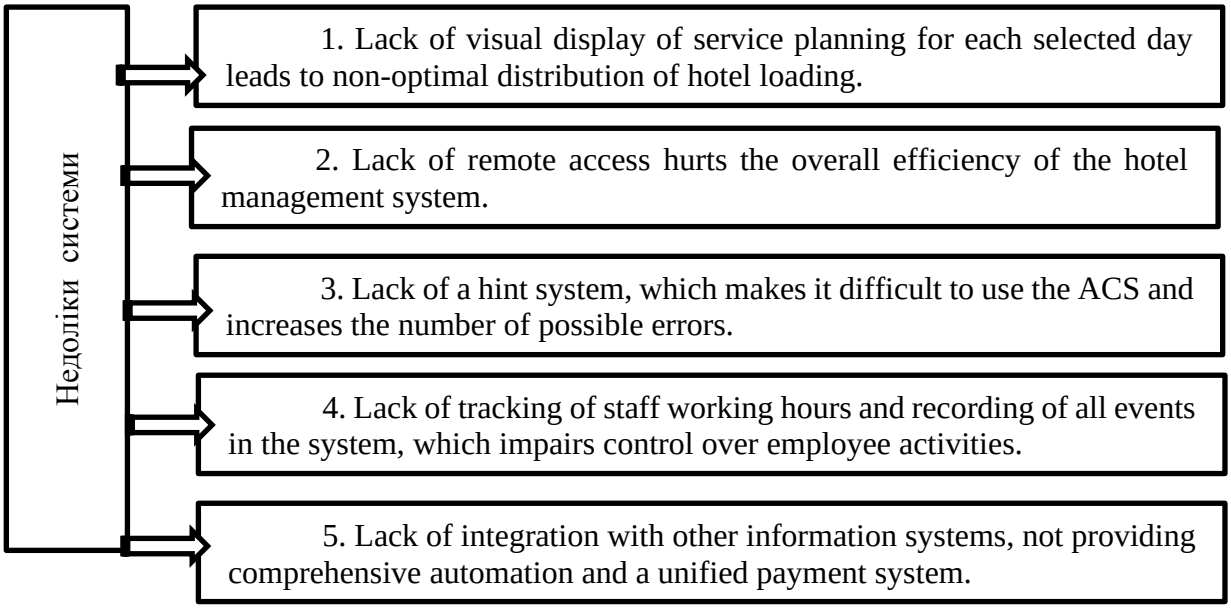

Figure 4. Disadvantages of the ORAK Hotel R5 system used in Hotel "A"
Disadvantages of the system

Sources: developed by the authors

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Thus, it is necessary to improve the automated management system in Hotel A.

Hotel "A" has its website, which contains all information about the hotel's room stock, additional services, and special offers, there is a guest book where hotel clients can leave reviews about their stay at the hotel, and it is also possible to book rooms at the hotel.

Requests for accommodation of guests in Hotel "A" are received from travel companies, private clients, and corporate clients through the use of Internet resources (booking through the website, e-mail), phone calls, and faxes. Managers of Hotel "A" surveyed hotel customers to identify the specifics of their use of Internet technology when searching for and booking hotel rooms. 50 people who used the services of Hotel "A" were interviewed. The distribution of survey participants regarding hotel reservation methods is shown in Fig. 5.

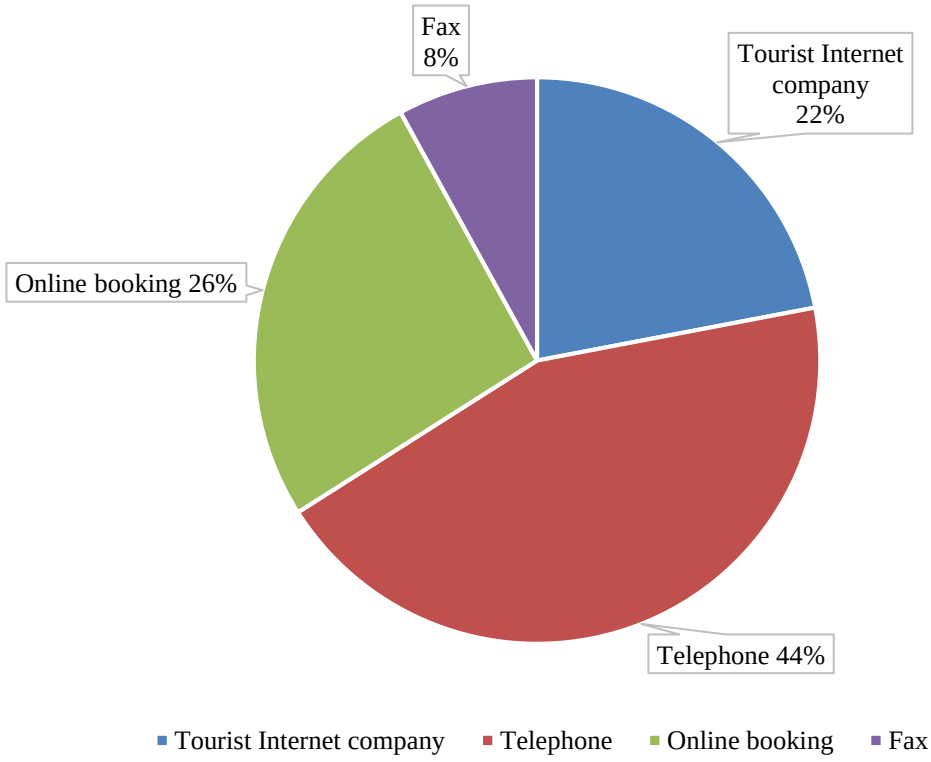

Figure 5. Distribution of responses from survey participants regarding the methods of booking rooms in hotels, %

Sources: developed by the authors

Therefore, 44% of respondents made reservations by phone, 26% through online booking, 22% through travel agencies, and 8% via fax.

Fig. 6. presents the distribution of survey participants who made reservations via the Internet by place of reservation.

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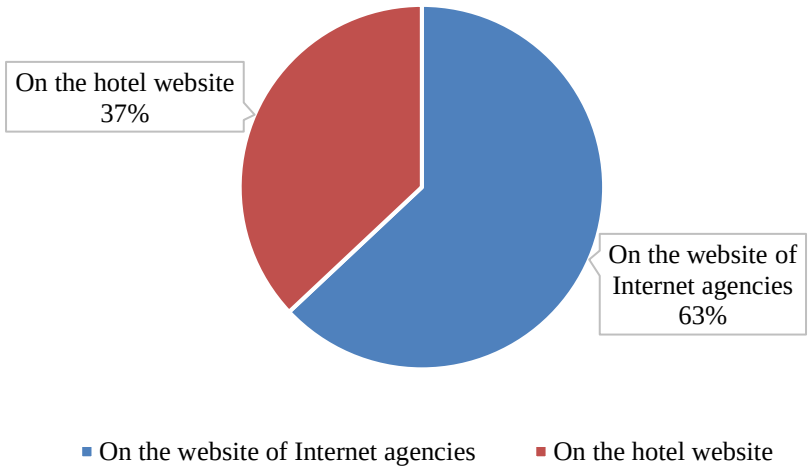

Figure 6. Distribution of survey participants who made reservations via the Internet by place of reservation, %

Sources: developed by the authors

As can be seen from Fig. 6, only 37% booked rooms on the hotel's website, while the other 63% booked hotel rooms on the websites of Internet agencies. This suggests that the website of Hotel "A" is not actively promoted on the Internet, and most of the bookings are made by Internet agencies that offer online booking services.

Among those who did not use Internet booking on the hotel website, the reasons for such behavior were determined (Fig. 7).

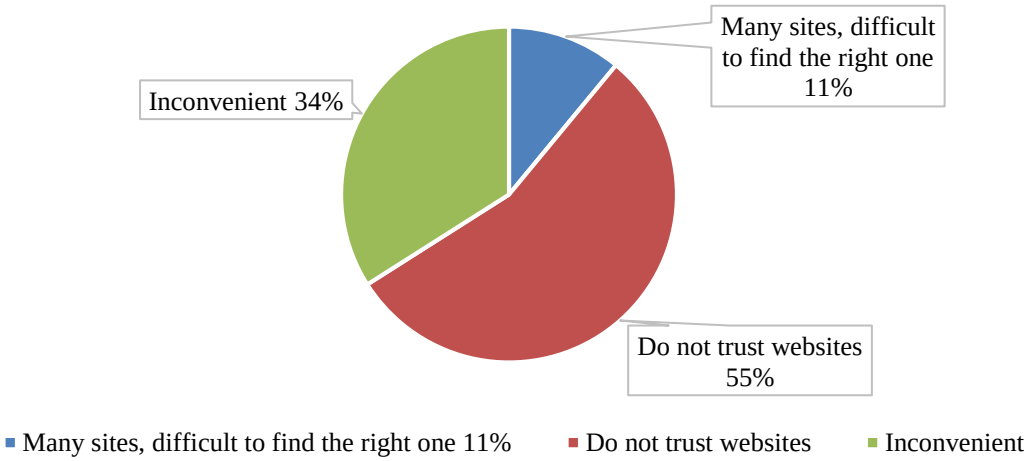

Figure 7. Distribution of survey participants' answers about the reasons for refusing online bookings on the hotel website, %

Sources: developed by the authors

Consequently, 55% do not trust the sites, 34% consider it inconvenient, and 11% answered that it is difficult for them to navigate since there are quite a lot of sites.

Based on the conducted survey, it was concluded that it is necessary to increase the trust of hotel customers in booking rooms on the website of hotel "A", as well as so that the hotel does not lose profits due to the participation in the sales process of intermediaries (Internet booking agencies).

Note that with indirect sales, Hotel "A" loses profit, because if the reservation is made on the hotel's website, the hotel receives the full price for the room in the hotel, taking into account minor costs for maintaining the website. However, if the client applies to book a room on the intermediary's website, then the hotel receives less money since the intermediary's percentage usually ranges from 10 to 15% of the room price. Consequently, with this type of online booking, Hotel "A" loses up to 15% of the price, since indirect sales channels were chosen. Thus, we consider it necessary to increase the efficiency of booking on the website of Hotel "A" through active promotion of the site on the Internet.

The specifics of the operation of hotel industry enterprises, as well as all intangible enterprises, require a special form of managerial interaction through the formation of a system of information and communication support. The hotel business is a highly saturated information sphere. The peculiarities of business processes in hotel enterprises provide for the structuring of operations both by technical and technological process and by the time factor, and this requires the availability of systematic and dynamic information support.

Managerial interaction is characterized by focus and intensity, which reflects the sphere of the information and communication field of hotel business enterprises. The basic criterion for the formation of a rational-parity information field is information support. In hotel business enterprises, it is determined by the number of information flows and their content saturation, which depends on information processes in the production and provision of basic and additional services (Table 3).

Table 3. Information support for the production and sale of hotel services

Features of hotel services	Impact on Information Process Management
1. Customer service is provided on the premises of the enterprise	Organization of the production process (basic and additional services)
2. Uneven and seasonal consumption	The occupancy level of the room stock, the use of material and labor resources are uneven
3. Round-the-clock operation of the enterprise	Shift work of hotel staff throughout the day
4. Increased requirements for the qualifications of service personnel	Application of a flexible remuneration system (availability of support staff)

Features of hotel services	Impact on Information Process Management
5. Form of consumption of services	The consumer is part of the distribution system, which in some cases takes the form of self-service (additional services).
6. The service process is limited in time	Under-occupancy of the hotel cannot be compensated in the future. Estimation of overhead costs.
7. High level of contact with the client	Difficulty in organizing control and rationalization of the production process. The duration of service, the structure of the service, and its actual and expected quality have a significant dependence on the client.
8. Consumption (one customer's use of a specific location) is a lengthy process	The total cost of the services provided is determined upon departure of the client with adjustments to the preliminary calculation data. Difficulties in recognizing and measuring income.
9. Large share of preliminary material costs at the stage of establishing a hotel	The need to attract financial investment in the initial stages of establishing a hotel
10. Hotel room occupancy is less than 100%	Optimizing the use of room stock

Sources: developed by the authors

Information flows are formed from a set of modules and a core, which ensures their integration and separation of powers of employees of the hotel enterprise. The activities of accommodation establishments are accompanied by the preparation of various types of documents (Table 4), that form various information flows.

Information support for enterprise management involves the organization of targeted arrays of information and information flows, which includes the collection, storage, processing, and transmission of information to analyze the obtained results for the preparation, justification, and adoption of management decisions [27; 32; 35]. The basis of information support is the system of interrelations between the divisions of a hotel enterprise and the communications that arise between them, as well as the relationship with the external environment. The formation of effective information support for management interaction is impossible without the presence of information technologies, and therefore, certain costs associated with their use.

Considering that the information and communication field is formed not only through interaction in the internal environment, but it can be argued that this process is accompanied by interaction with all participants in the business process, and for hotel industry enterprises this is: travel agents, tour operators, airline representatives, etc. Interaction with these participants in business processes is carried out through the use of automated hotel management systems. Further development of the hotel and restaurant industry is impossible without modern equipment and the latest technologies. This concerns, first of all, information technologies, and effective and

reliable protection systems, without which it is impossible to achieve a high level of service quality [36; 37, p. 227].

Table 4. The structure of information flows of various means of accommodation

Information base	Accompanying information base
organizational documents	structural and staff numbers, staffing schedules, job instructions, etc.
administrative documents	decisions, instructions, and orders on the main activity
personnel documents	collective agreement, personnel orders, work books, personal files, and personal accounts
financial and accounting documents	annual report, general ledger, profit and loss accounts, acts, audits, etc.
information and reference documents	letters, references, and reports
regulatory documents from higher authorities	
commercial documents	contracts and agreements
settlements with external services	purchase invoices, and external deliveries
income from basic and additional services	accounts for the provision of services, settlements with clients, cash receipts, and payment transactions
formation of the expendable part	distribution of periodic costs, distribution of overhead costs, depreciation deductions, and cost of hotel services
room service by staff	sending rooms into operation, entry of rooms into the register, active room stock, and resettlement
Providing additional services	registers of additional services, network schedule for the provision of additional services, and rental needs

Sources: developed by the authors

Hotel systems allow one to automate all stages of guest service, starting from ticket booking, check-in, and ending with the final payment, as well as the main business processes – from the work of maids to the organization of reporting at the enterprise. In addition, they provide management of all hotel services and systems available in the room.

The ratio between the number of hotel projects implemented in Ukraine on HMS systems of different brands is presented in Fig. 8.

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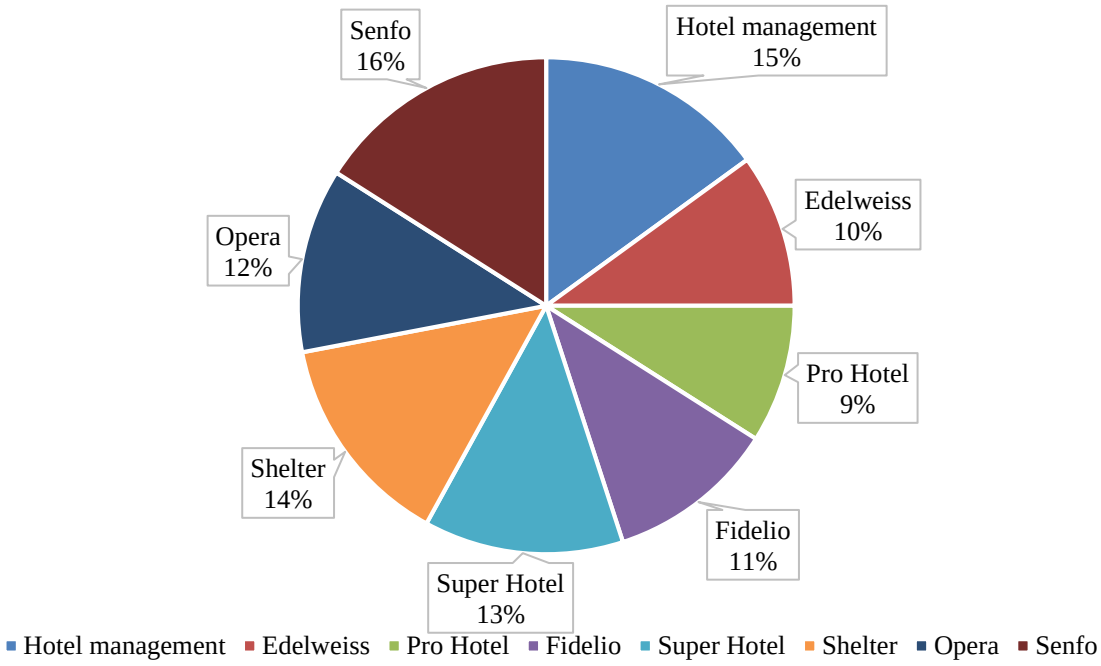

Figure 8. Structure of ACS installations of hotels in Ukraine

Sources: developed by the authors

The given data show that hotel management has a wide spectrum in the field of information technology implementation and automation. At the same time, there are great prospects for further development in this direction, because there are more than ten high-quality modern hotel management automation systems on the Ukrainian market, and some of them are not adaptations of foreign systems, but original developments of Ukrainian companies and are therefore most adapted to the conditions of Ukraine.

For the formation of proper internal information flows in the enterprises of the hotel industry, it is necessary to implement automated systems that allow rational and balanced use of resource potential with the lowest costs for business processes.

At present, the most common automated hotel systems used in global practice are [36]:

- Hotel management system (*PMS – Property Management System)*;
- Restaurant management system (*Point of Sales)*;
- Telephone service system (*Telephone Management System*);
- Electronic key system (*Key System*);
- System of electronic mini bars (*Mini bar System*);
- Interactive television system (*Video Services System*);
- Energy saving system (*Energy Management System*);
- Credit card processing system (*Credit Card Authorization System*);
- Warehouse accounting and costing system (*Food & Beverage*);
- The financial and accounting system (*Accounting System*);

- Central reservation system (*Central Reservation System*);
- Internet booking system (*Web Reservation System*);
- Personnel accounting system (*Human Resource System*);
- Security system (*Security System*).

An important place in the information provision of hotels is occupied by the information center. The activity of the information center is aimed at increasing the efficiency of hotel management and has the following directions:

- management assistance:
- warehouse management:
- commodity and material resources:
- personnel;
- organization and implementation of information systems in various services and departments;
- work of the marketing department by collecting and processing important information to develop operational and strategic decisions, assisting the accounting department in monitoring and controlling the movement of customer folio accounts;
- processing of data and information;
- generation of necessary report forms and data transfer.

The work of the information center is aimed at comprehensive management of material and information flows in the field of information support for reception and accommodation services, restaurants, room service, security, fire protection services, maids, etc.

The hotel and restaurant business has achieved special success over the past 30 years due to the introduction of effective management systems using innovations [37, p.332; 38]. Diagnostics of the effectiveness of experience, planning, and implementation of information systems, and technologies made it possible to outline the reasons for their implementation (Fig. 9). The questionnaires of 20 hotel business enterprises in the city of “B” were taken as a basis. In most cases of changes in the formation of the information field (60%), forced and voluntary factors are considered the main motivating impulse.

Among the factors predicting changes in the information space, it is possible to single out: deterioration of financial and economic indicators (54%), incomplete satisfaction of consumers (15%), and dissatisfaction of employees with existing information flows (10%).

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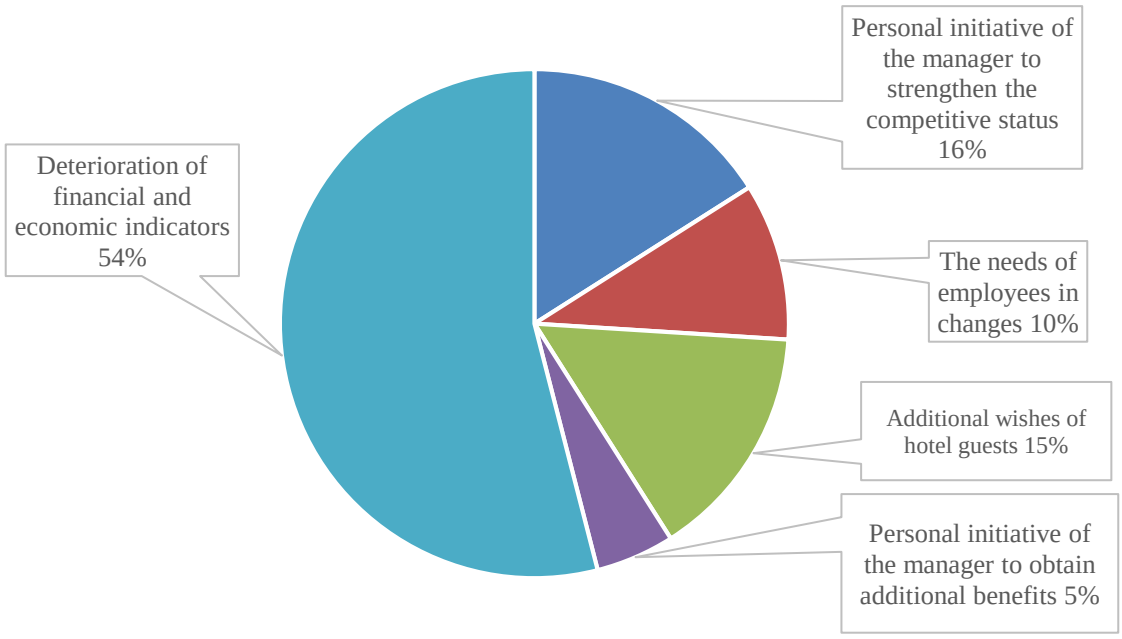

Figure 9. Reasons for making changes in the hotel's information support structure

Sources: developed by the authors

Functional and line managers of the hotel business evaluate the perception and recognition of the need for constant monitoring of the existing information interaction and the formation of the information field of the hotel enterprise based on it, defining the main barriers that can be ranked as follows:

- lack of competent specialists in modern information technologies;
- lack of awareness of the need to introduce modern information systems;
- lack of financial resources for information changes.

The hotel and restaurant business is an industry with a high level of information saturation, and its success directly depends on the speed of transmission and exchange of information, relevance, and timeliness of receipt. The development of the hotel and restaurant business involves the wide use of the latest information technologies both in the field of introducing new hotel services and in their promotion to the market [37, p. 271]. Managerial interaction involves the constant use and provision of information units at different levels of management. For hotel business enterprises, it is sometimes difficult and impossible to determine the information flows of strategic and tactical levels of management [38-39]. To eliminate this problem, information support must be viewed through the prism of information flows generated during the implementation of business processes in the main departments of the hotel. The level of their content, completeness, and intensity ensure rational management interaction and make it possible to determine the index of consumer satisfaction with the information of the hotel divisions. For selected enterprises of the hotel business in the city of "B", the data of this indicator are given in Table 5.

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Table 5. Efficiency indicators of hotel business information services

The main components of the hotel's information service	Importance to consumers of components		Quality assessment					total	The average value of the quality assessment	Consumer satisfaction index, %
	Bi	%	5	4	3	2	1			
1. Reception and accommodation service (reception service)	5.0	11.26	12	6	2	0	0	20	4.5	87.5
2. Service desk, room management	4.3	9.68	10	5	3	2	0	20	4.15	78.75
3. Reception service and settlement part	4.1	9.23	8	7	5	0	0	20	4.15	78.75
4. Telecommunication services	4.0	9.01	15	5	0	0	0	20	4.75	93.75
5. Room maintenance service	4.7	10.59	6	6	6	2	0	20	3.8	70.00
6. Security service	4.8	10.81	15	4	1	0	0	20	4.7	92.5
7. Catering service	4.9	11.04	5	9	4	2	0	20	3.85	71.25
8. Engineering and technical service	4.5	10,14	15	4	1	0	0	20	4.7	92.5
9. Administrative service	4.6	10.36	10	6	4	0	0	20	4.3	82.5
10. Additional services (hairdresser, swimming pool, solarium)	3.5	7.88	6	10	4	0	0	20	4.1	77.5
Total (absolute value of the sum of the numbers in the column)	44.4	100.00	102	62	30	6	0	200	43.0	825.0

Sources: developed by the authors

As can be seen from the table, the service providing telecommunication services, the security service, and the engineering and technical service correspond to the highest consumer satisfaction with information provision. Indexing the degree of consumer satisfaction with the information base allows for formalizing the organizational work of the hotel based on the needs and expectations of the consumer,

which makes it possible to choose strategic alternatives for improving the quality of the hotel enterprise.

Conclusions. Informatization and computerization of business processes are necessary aspect of the effective operation of hotel enterprises. They affect its efficiency, competitiveness, and innovativeness, in particular, here are some possible consequences:

- increasing productivity and quality of customer service using automated reservation, registration, payment, and personnel management systems;
- decrease costs and increase profitability due to optimization resources, reduction of errors, improving quality control and safety;
- extension markets and attraction new segments of clients using online marketing, social networks, mobile applications, loyalty programs, etc.;
- creation of new products and services using intellectual analysis cloud data technologies, artificial intelligence, Internet of things, etc.

In the course of the research, we analyzed the effectiveness of information support for management interaction of hotel business enterprises, developed measures to improve management accounting in Hotel "A", and also calculated the economic efficiency of the proposed measures, as follows: proposed measures to intensify the management activity of the hotel "A" based on the use of information systems and technology are effective and can be implemented in the activities of hotel "A".

Therefore, management accounting in the hotel is an important tool for planning, controlling, and evaluating the effectiveness of business processes. Ways to improve management accounting in the hotel can be as follows:

- the use of modern information technologies to automate the collection, processing, and analysis of data on expenses, income, occupancy, profitability, etc. This helps reduce errors, increase the speed and accuracy of information, and improve decision making;
- the application of strategic management accounting aimed at determining the goals, strategies, and performance indicators of the hotel in the long term. This helps to take into account the external environment, competitive situation, customer needs, and other factors affecting the success of the hotel;
- implementation of a budgeting system, which involves drawing up a plan for the hotel's income and expenses for a certain period, as well as monitoring its implementation. This allows one to rationally allocate resources, predict financial results, identify deviations, and correct actions;
- involving staff in the management accounting process, which includes stimulating, motivating, and training hotel employees. This helps to improve the quality of work, increase interaction, and coordination between departments, and create a corporate culture.

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