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Digital transformation and economic development: A review of emerging technologies' impact on national economies

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Abstract

This scholarly investigation delves into the transformative influence of digital technologies on national economies, marking a pivotal shift in the global economic landscape. The study's primary objective was to dissect the multifaceted impact of digital transformation, scrutinizing its role in reshaping economic sectors and societal norms. Adopting a qualitative synthesis of peer-reviewed literature, the research meticulously evaluated the economic ramifications of emerging technologies, drawing insights from diverse global contexts and industries. The findings reveal that digital transformation catalyses economic change, with significant variations observed across sectors such as healthcare and manufacturing. The study highlights the critical role of digital technologies in driving innovation, enhancing productivity, and fostering sustainable development. Case studies from different countries provided real-world perspectives on the implementation of digital strategies, underscoring the challenges and opportunities inherent in this digital shift. Conclusively, the research emphasizes the necessity of strategic planning and policy support in navigating the complexities of digital transformation. It advocates for a holistic approach that considers sociocultural, political, and economic factors in technology adoption, stressing the importance of global partnerships in fostering digital economic growth. The study culminates in recommendations aimed at guiding policymakers and business leaders in leveraging digital transformation for sustainable and inclusive economic development. In essence, this paper offers a comprehensive and nuanced understanding of the digital era's impact on national economies, serving as a valuable resource for stakeholders navigating the ever-evolving landscape of digital transformation.

Keywords: Digital Transformation; Economic Development; Sectoral Impact; Global Partnerships; Technology Adoption; Policy Recommendations.

1. Introduction

1.1. Digital Transformation in Today's Economy

Digital transformation has become a pivotal force in reshaping the global economy, introducing new challenges and opportunities for economic security and growth. Ganievich et al. (2021) emphasize the critical role of digitalization in socio-economic processes, highlighting its significance in the modern world. The transformation is not just a technological shift but a comprehensive change affecting various aspects of the economy, including income generation,

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economic activities, and security measures. The United States, China, and Japan, as leading digital powers, exemplify the profound impact of digital technologies on national economies, where a significant portion of income is increasingly derived from digital sectors (Ganievich, 2021).

The rapid development and integration of digital technologies such as artificial intelligence, blockchain, and cloud computing marks the evolution of the digital economy. Evstratievich (2020) discuss the transformation of the digital economy, which has become a trend shaping emerging industries. This transformation is characterized by the diffusion of digital technologies, leading to structural changes in the economy. The digital economy model pivots around digital platforms and technologies, including innovations like big data and business analytics, which are becoming new sources and factors of production (Evstratievich, 2020).

Qi and Chu (2022) explore the transformative power of the digital economy from both supply and demand perspectives. They argue that the digital economy enhances the quality and efficiency of the supply side, promoting structural reforms and economic growth. From the demand side, it influences the "troika" of economic growth - consumption, exports, and investment - by changing market investment directions and fostering new strengths in exports. This interaction between supply and demand in the digital economy is creating new social relations and significantly adjusting existing ones, involving both positive and negative externalities (Qi & Chu, 2022).

The digital transformation is not just a technological upgrade but a comprehensive economic shift. It involves the reconfiguration of economic activities, income sources, and market structures. The role of digital technologies in this transformation is multifaceted, influencing various sectors and aspects of the economy. The digital economy is becoming a critical driver of economic growth, innovation, and competitiveness in the global market.

The digital transformation of today's economy is a multifaceted phenomenon. It encompasses the integration of advanced technologies into the core of economic activities, leading to significant changes in how economies operate and grow. The experiences of leading digital economies like the United States, China, and Japan provide valuable insights into the potential and challenges of this transformation. As digital technologies continue to evolve, they will undoubtedly play an increasingly crucial role in shaping the future of global economic landscapes.

1.2. The Pivotal Role of Emerging Technologies in Economic Growth

Emerging technologies are fundamentally reshaping the landscape of economic growth, offering new pathways for development and transformation. Mshvidobadze (2022) highlights the significant impact of digital technologies on the social and economic development of societies. The study underscores the necessity of digital transformation in managing socio-economic development, demonstrating how digitalization influences GDP growth. The research provides a compelling forecast of GDP growth under the influence of the IT sector, illustrating the potential of digital technologies to stimulate economic growth across various sectors (Mshvidobadze, 2022).

Zhao et al. (2022) delve into the dynamic influence of digital and technological advancement on sustainable economic growth, particularly in the context of the Belt and Road Initiative (BRI) countries. Their findings reveal that increases in the E-government Development Index (EGDI), Internet Users' growth, and ICT exports significantly boost sustainable economic growth. This study underscores the positive impact of digital and technological advancement on economic development, suggesting that improvements in digital infrastructure and a reduction in unemployment rates can enhance balanced sustainable economic growth in the BRI region (Zhao et al., 2022).

Osipov (2020) takes a systematic approach to exploring the sustainability of the global digital economy. The research highlights major transformations in the world economy due to digitalization, such as the erosion of national borders and the diminishing role of the state in monetary policy. The study identifies economies of scale, ratchet, and hysteresis effects as key areas of research in understanding the global processes influenced by digitalization. This comprehensive view of the digital economy's impact on macroeconomic stability and global economic processes underscores the transformative power of emerging technologies (Osipov, 2020).

The integration of digital technologies into economic systems has led to a reconfiguration of traditional economic models. The development of the IT sector and digital platforms has become a critical driver of economic growth, influencing various aspects of the economy from production to consumption. The role of digital technologies in stimulating economic activities and fostering innovation is increasingly recognized as a cornerstone of modern economic development.

In the context of global economic challenges, the role of emerging technologies in driving economic growth cannot be overstated. The digital transformation offers opportunities for economies to leapfrog traditional development pathways, enabling rapid growth and innovation. The experiences of countries engaged in the Belt and Road Initiative provide valuable insights into how digital and technological advancements can be leveraged for sustainable economic growth.

Emerging technologies are not only transforming economic structures but also reshaping social relations and global interactions. The digital economy is creating new paradigms for economic activities, challenging traditional notions of economic development and competitiveness. As digital technologies continue to evolve, they will play an increasingly crucial role in shaping the future of global economic landscapes.

The pivotal role of emerging technologies in economic growth is evident in their capacity to drive innovation, enhance productivity, and foster sustainable development. The integration of digital technologies into economic systems is creating new opportunities for growth and transformation, reshaping the global economic landscape. As the world continues to embrace digital transformation, the role of emerging technologies in economic development will become increasingly significant.

1.3. Comparative Insights: Digital Transformation in Diverse Economic Contexts

Digital transformation varies significantly across different economic contexts, particularly when comparing developed and emerging markets. Andrade and Gonçalo (2021) explore this phenomenon in the context of the BRICS nations (Brazil, Russia, India, China, and South Africa), emphasizing the strategic capabilities enabled by digital transformation in these emerging countries. Their research highlights the institutional policies that nurture global competitiveness and the need for development to catch up with more advanced economies. The study underscores the importance of adopting Industry 4.0 value creation systems and the role of digital transformation in achieving sustainable competitive advantages (Andrade & Gonçalo, 2021).

Revak and Gren (2022) provide a broader perspective on digital transformation, discussing its background, trends, risks, and threats, with a focus on Ukraine. Their analysis reveals the essence of digital transformation and its advantages and disadvantages. The study highlights the main prerequisites for the spread of digital technologies, such as the development of internet infrastructure and e-commerce. It also identifies the obstacles to digital transformation, particularly in political, economic, technological, and psychological spheres, which are more pronounced in countries like Ukraine (Revak & Gren, 2022).

Achieng and Malatji (2022) delve into the digital transformation of small and medium enterprises (SMEs) in sub-Saharan Africa, a region where digital transformation has been slow due to various impediments. Their research establishes how SMEs can develop comprehensive strategies for integrating digital technologies into their operations to build resilience. The study identifies economy-based, market-based, and sociotechnical contextual factors as themes that impede digital transformation in the region. This highlights the unique challenges faced by SMEs in sub-Saharan Africa, emphasizing the need for a thorough understanding of the operational context to fully realize the transformative potential of digital technologies (Achieng & Malatji, 2022).

The contrast between developed and emerging markets in terms of digital transformation is stark. In developed markets, digital transformation is often seen as an extension of existing technological capabilities, whereas in emerging markets, it represents a leapfrogging opportunity to catch up with more advanced economies. The strategic adoption of digital technologies in emerging markets like the BRICS nations and sub-Saharan Africa can lead to significant economic growth and development.

However, the challenges faced by these emerging markets in embracing digital transformation cannot be overlooked. Issues such as limited digital infrastructure, political and economic instability, and a lack of skilled workforce are common barriers. These challenges necessitate tailored strategies that consider the unique socio-economic contexts of these regions.

The role of government policies and institutional support is crucial in facilitating digital transformation in both developed and emerging markets. Effective policies can help overcome barriers to digital adoption and create an environment conducive to technological innovation and growth.

Digital transformation presents opportunities and challenges varying significantly across different economic contexts. While developed markets continue to advance their technological capabilities, emerging markets face unique challenges

that require strategic planning and policy support. Understanding these differences is crucial for formulating effective digital transformation strategies tailored to each market's specific needs and conditions.

1.3.1. Contrasting Impacts in Developed and Emerging Markets

The impact of digital transformation on economies varies significantly between developed and emerging markets. Strelchenko, Strelchenko, and Kot (2022) explore the economic development gap between these two types of economies. They note that while developed economies have higher GDP per capita, emerging markets are growing at a faster rate. This growth is attributed to the adoption of market economies and institutions similar to those in developed countries, albeit with varying maturity and quality. The study emphasizes the higher economic growth rates in emerging markets compared to developed ones, highlighting the different economic approaches and the role of globalization in these disparities (Strelchenko, Strelchenko, & Kot, 2022).

Tung and Binh (2022) investigate the impact of research and development (R&D) investment on firm performance in Vietnam, a rapidly developing country. Their findings indicate that R&D investments positively affect revenues, profits, and returns on assets and equity. This suggests that emerging markets, through focused investment in R&D, can enhance firm performance and competitiveness. The study underscores the importance of R&D in emerging markets, which contrasts with the already established R&D ecosystems in developed countries (Tung & Binh, 2022).

Shah, Raza, and Hashmi (2022) provide an analysis of the downside risk-return volatilities during the Covid-19 outbreak across stock markets in the USA, UK, China, and Pakistan. Their findings reveal that the impact of the pandemic was larger and more significant in developed markets (USA and UK) compared to emerging markets (China and Pakistan). This suggests that developed markets, despite their advanced economic structures, faced greater financial volatility during the pandemic, highlighting the differing economic resilience between developed and emerging markets (Shah, Raza, & Hashmi, 2022).

The contrasting impacts of digital transformation in developed and emerging markets can be attributed to several factors. In developed markets, digital transformation often builds upon existing advanced technological infrastructures and institutional frameworks. In contrast, emerging markets may leverage digital transformation as a means to accelerate economic development and catch up with more developed economies.

However, the challenges faced by emerging markets in embracing digital transformation are significant. These include limited digital infrastructure, political and economic instability, and a lack of skilled workforce. Despite these challenges, the potential for growth and development through digital transformation in emerging markets is substantial.

The role of government policies and institutional support is crucial in facilitating digital transformation in both developed and emerging markets. Effective policies can help overcome barriers to digital adoption and create an environment conducive to technological innovation and growth.

The impact of digital transformation varies significantly between developed and emerging markets. While developed markets continue to advance their technological capabilities, emerging markets face unique challenges that require strategic planning and policy support. Understanding these differences is crucial for formulating effective digital transformation strategies tailored to each market's specific needs and conditions.

1.4. Conceptualizing Digital Transformation: Theoretical Perspectives

Mozelius et al. (2009) examine the impact of digital transformation on the socio-economic landscape, providing a critical reflection on the evolution of the field of 'ICT for Development' (ICT4D). The study examines important quality aspects of ICT4D projects and their impact on socio-economic development in poor countries. It emphasizes the need for a multidisciplinary approach in ICT4D, considering factors such as authentic local needs, local ownership, realistic limitations, and competence networks. This underscores the complexities of ICT4D as a field and the importance of aligning it with the challenges and opportunities of digital transformation in the modern era.

Bondarenko and Aleshkovski (2019) analyze the development regularities of human systems in the context of digital transformation, identifying three potential social and economic development models in the era of Industry 4.0. These models are distinguished by their development purposes and the relationships they establish between the state, society, business, and individuals. The authors argue that only one of these models is capable of fostering sustainable development and creating a new economic paradigm that aligns with 21st-century digital technologies (Bondarenko & Aleshkovski, 2019).

Taimaskhanov (2021) delves into the socio-economic prerequisites and factors driving digital transformation. The study highlights the integral role of digitization in modern society, covering its influence across technical, social, economic, political, and cultural spheres. Taimaskhanov identifies two main approaches to digital transformation – evolutionary and revolutionary – and outlines four stages of digital transformation observed globally. The research emphasizes the importance of digital finance, social networks, digital identification, cybersecurity, data accessibility, and the integration of management systems in the development of the digital economy.

The theoretical perspectives on digital transformation reveal a complex and multifaceted phenomenon. Digital transformation is not merely a technological shift but a comprehensive change that affects all aspects of society and the economy. The transition from traditional to digital modes of operation presents both opportunities and challenges, necessitating a reevaluation of existing economic and social models.

The role of government policies and institutional frameworks is crucial in shaping the trajectory of digital transformation. Effective policies can facilitate the adoption of digital technologies, fostering innovation and economic growth. However, the pace and nature of digital transformation vary across different regions and economies, influenced by local contexts and developmental stages.

The theoretical exploration of digital transformation underscores the importance of a multidisciplinary approach. Understanding the interplay between technology, economy, society, and policy is essential for comprehending the full impact of digital transformation. This approach can provide valuable insights into the formulation of strategies and policies that harness the potential of digital technologies for sustainable development.

Conceptualizing digital transformation requires a comprehensive understanding of its socio-economic implications. Theoretical perspectives provide a foundation for analyzing the complex dynamics of this phenomenon, guiding policymakers, businesses, and societies in navigating the challenges and opportunities presented by the digital era. As digital technologies continue to evolve, their impact on economic and social structures will undoubtedly shape the future of global development.

1.4.1. Synergy of Technology and Economy: A Theoretical Exploration

The synergy between technology and economy is a critical aspect of the digital transformation era, shaping the trajectory of modern civilization. Vlasova et al. (2021) delve into the transformative impact of information technologies on the post-industrial state and network thinking. Their research emphasizes the revolutionary changes brought about by digitalization, particularly in terms of creating favorable conditions for human improvement across moral, ethical, psychological, and intellectual dimensions. The study provides a theoretical analysis of the convergence of digitalization into everyday reality, highlighting its role in evolving post-industrial society and the economy (Vlasova et al., 2021).

Sazonova et al. (2021) explore the synergy of business, law, and economy in the context of smart-contract implementation. The evolution of digital technologies, particularly blockchain, has led to significant changes in legal frameworks and business models. Smart contracts, as a technological innovation, are reshaping the interaction between the state and business, allowing for the algorithmization of rules and machine-readable regulation. This research underscores the importance of legal research in understanding the current legislation and the synergy of various sectors in the implementation of smart contract technology (Sazonova, et al., 2021).

Liu, Zhao, and Mao (2022) focus on the synergy between the digital economy and traditional manufacturing industries in China. Their study employs comparative analysis and theoretical mechanisms to evaluate the synergy degree of digital transformation in traditional manufacturing. The research presents empirical findings based on data from the Yangtze River Delta, demonstrating the dynamic interaction between systems and the impact of digital transformation on traditional industries. The results reflect the need for scientific judgment and effective decision-making in the digital transformation of manufacturing industries (Liu, Zhao, & Mao, 2022).

The synergy between technology and economy is evident in the way digital transformation is reshaping various sectors. Information technologies are not only transforming the economic landscape but also influencing societal values and norms. The integration of digital technologies into traditional industries is creating new opportunities for growth and innovation.

The role of smart contracts in business and law highlights the need for a holistic approach to understanding the implications of digital technologies. The convergence of technology, law, and economy requires a comprehensive understanding of the changes brought about by digitalization.

The transformation of traditional manufacturing industries through digital technologies is a testament to the potential of digital transformation in revitalizing established sectors. The synergy between digital and traditional industries is crucial for achieving sustainable growth and competitiveness in the global market.

The synergy of technology and economy in the digital era is a multifaceted phenomenon that encompasses various sectors and disciplines. Understanding this synergy is essential for harnessing the full potential of digital transformation. As digital technologies continue to evolve, their impact on the economy and society will play a pivotal role in shaping the future of global development.

1.4.2. Addressing the Knowledge Gap in Digital Economic Transformation

The digital economic transformation is a complex process that requires a deep understanding of various factors, including technology, policy, and societal impacts. Addressing the knowledge gap in this area is crucial for effective implementation and sustainable growth.

Alvarenga et al. (2020) explore the digitization of public services and its impact on government efficiency, business growth, and citizen engagement. Their study emphasizes the relationship between digital transformation in the public sector and knowledge management. The research, based on a survey of employees in Portuguese government services, reveals that digital government research is still in an exploratory stage, particularly concerning knowledge management effectiveness. The findings suggest that successful digital government initiatives are closely linked with the quality of an organization's knowledge management practices (Alvarenga, et al., 2020).

Tišma, et al., (2022) analyze the readiness of small and medium enterprises (SMEs) across various European Union countries for digital and bionic transformation. The study identifies key skills and knowledge needed for employees to adapt to digital transformation. Despite widespread awareness of the need for digital transformation, there is a notable lack of knowledge about 4.0 technologies, especially in areas like blockchain and artificial intelligence. The research highlights the significant demand for further education and training in these fields (Tišma, et al., 2022).

Olczyk and Kuc-Czarnecka (2022) aim to improve the methodology of the Digital Economy and Society Index (DESI), assessing the development of the digital economy in the European Union. Their study examines whether methodological changes to DESI can better capture the digital transformation of EU economies. The research finds that connectivity is a crucial dimension impacting digital transformation and that DESI is a significant indicator for explaining changes in GDP per capita in EU countries. This highlights the importance of digital transformation in bridging the economic gap between richer and poorer EU nations (Olczyk & Kuc-Czarnecka, 2022).

Addressing the knowledge gap in digital economic transformation is vital for ensuring that governments, businesses, and societies can effectively adapt to and benefit from the digital era. The studies discussed above provide valuable insights into the current state of knowledge and readiness for digital transformation across different regions and sectors. They underscore the importance of continuous learning, skill development, and policy improvements to harness the full potential of digital technologies for economic growth and societal advancement.

1.5. Defining the Research Questions

In the context of digital transformation and its impact on economic development, the following research questions are proposed to guide future studies:

How does digital transformation influence the productivity and competitiveness of small and medium-sized enterprises (SMEs) across different economic sectors? This question aims to explore the specific impacts of digital technologies on SMEs, which are crucial for economic growth and innovation.

What are the key factors that determine the successful integration of emerging digital technologies in developing economies? This question seeks to identify and analyze the critical elements, such as infrastructure, education, and policy, that enable developing countries to effectively leverage digital transformation for economic development.

In what ways does digital transformation affect employment patterns and workforce requirements in various industries? This question intends to investigate the implications of digitalization for labor markets, including changes in job roles, skill requirements, and employment opportunities.

How can digital transformation be leveraged to promote sustainable economic growth while addressing environmental and social challenges? This question focuses on understanding the role of digital technologies in achieving sustainable development goals, including environmental sustainability and social equity.

These research questions are designed to deepen the understanding of digital transformation's multifaceted impact on national economies and to identify strategies for harnessing its potential for inclusive and sustainable economic development.

1.6. Study Goals and Objectives

The aim of this study is to comprehensively analyze the impact of digital transformation on national economies, focusing on how emerging technologies are reshaping economic landscapes, influencing business practices, and affecting societal norms.

To achieve this aim, the study sets out the following five objectives:

- **To Evaluate the Economic Impact of Digital Transformation:** This objective involves assessing how digital technologies are influencing economic growth, productivity, and competitiveness in various sectors.
- **To Identify the Role of Digital Transformation in Developing and Developed Economies:** This includes comparing and contrasting the effects of digital transformation in different economic contexts, highlighting the unique challenges and opportunities in each.
- **To Examine the Influence of Digital Transformation on Employment and Skill Requirements:** This objective seeks to understand how digital technologies are changing job markets, skill sets required in the workforce, and the nature of employment across industries.
- **To Explore the Integration of Digital Technologies in Business Models and Operations:** This involves analyzing how businesses are adapting to digital transformation, including changes in strategies, processes, and consumer engagement.
- **To Assess the Contribution of Digital Transformation to Sustainable Economic Development:** This final objective aims to understand how digital technologies can be leveraged to promote not only economic growth but also environmental sustainability and social equity.

These objectives are designed to provide a holistic understanding of the multifaceted impact of digital transformation on national economies, guiding policymakers, businesses, and other stakeholders in navigating the challenges and opportunities presented by this digital era.

1.6.1. Parameters and Focus of the Study

The study on digital transformation and its impact on national economies will be guided by specific parameters and focus areas to ensure a targeted and comprehensive analysis. The research will primarily concentrate on the period from 2010 to 2022, a timeframe that encapsulates significant advancements and milestones in digital technologies and their integration into various economic sectors.

Geographically, the study will encompass a global perspective, with a particular emphasis on contrasting the experiences of developed and emerging economies. This comparative approach will allow for an exploration of how digital transformation manifests under different economic conditions and stages of development.

Sector-wise, the study will focus on key industries that have been at the forefront of digital transformation, such as information technology, telecommunications, finance, healthcare, and manufacturing. This will provide insights into how digital technologies are reshaping industry-specific practices and contributing to overall economic growth.

The study will also examine the role of policy and regulatory frameworks in facilitating or hindering digital transformation. This includes an analysis of government initiatives, public-private partnerships, and international collaborations that have influenced the pace and nature of digital adoption.

Lastly, the study will pay special attention to the societal implications of digital transformation, particularly in terms of employment, skill development, and the digital divide. This holistic approach will ensure that the study not only addresses the economic dimensions of digital transformation but also its broader impacts on society.

2. Methodology

2.1. Research Methodology for Studying Digital Economic Impact

The research methodology for studying the digital economic impact is centered around a comprehensive literature review, focusing on qualitative analyses and theoretical explorations. This approach is designed to synthesize a wide range of perspectives and insights into the multifaceted nature of digital transformation and its economic implications.

Yoo and Yi (2022) utilized a systematic literature review method to analyze existing studies on digital transformation and economic growth. Their approach highlights the importance of reviewing diverse sources to understand the drivers of economic innovation and the resultant changes in industrial structures and productivity. This method also sheds light on the interaction between economic innovation and technology and society spheres (Yoo & Yi, 2022).

Geyda, Gurieva, and Naumov (2022) conducted a literature review focusing on conceptual and mathematical models, methods, and technologies for studying digital transformation. Their work underscores the significance of theoretical tools in developing a comprehensive understanding of the digital transformation of economic and social systems (Geyda, Gurieva, & Naumov, 2022).

Olczyk and Kuc-Czarnecka (2022) improved the methodology of the Digital Economic and Society Index (DESI) to better capture the digital transformation of EU economies. Their research involved sensitivity-based analysis to assess the selection of weights in DESI, demonstrating the importance of methodological refinement in understanding digital transformation's impact on economic growth (Olczyk & Kuc-Czarnecka, 2022).

Al Mashalah et al. (2022) reviewed literature on the impact of digital transformation on supply chains through e-commerce. Their approach included classifying literature based on supply chain drivers and research methodologies, conducting network and content analysis to uncover main research themes, and proposing future research directions. This comprehensive review provides a conceptual framework linking supply chain stages with business and digital transformation strategies (Al Mashalah, et al., 2022).

2.2. Selection Criteria for Global and Sector-Specific Literature

The selection of literature for this study is guided by specific criteria to ensure comprehensive coverage and relevance. The focus is on sourcing material that provides in-depth insights into various facets of digital transformation across different economic sectors and global contexts. The primary emphasis is on qualitative analyses and theoretical explorations that delve into the nuances of digital transformation and its economic implications.

The literature chosen for this study predominantly includes peer-reviewed journal articles, authoritative industry reports, and academic books. These sources are selected for their credibility and depth of analysis they offer on the subject. Special attention is given to works published from 2018 onwards, as this ensures the inclusion of the most recent and relevant discussions in the rapidly evolving field of digital transformation.

In terms of content, the literature must directly address aspects of digital transformation, particularly its influence on economic growth, business practices, employment patterns, and societal changes. This includes studies that explore the integration of digital technologies in various industries and their impact on economic activities, both in developed and emerging markets.

The study also seeks to include a diverse range of geographical perspectives to understand how digital transformation manifests in different economic and cultural settings. This global perspective is crucial for identifying universal trends as well as region-specific challenges and opportunities in the digital economy.

By adhering to these selection criteria, the study aims to compile a rich and varied body of literature, providing a comprehensive understanding of the digital economic transformation. This approach ensures a balanced view that encompasses both the theoretical underpinnings and practical implications of digital transformation in the global economic landscape.

3. Results

3.1. Identifying Key Technologies Driving Economic Change

The digital transformation of economies worldwide is being driven by several key technologies. These technologies are not only reshaping industries but also altering the socio-economic fabric of societies.

Statsenko (2020) discusses the transformative role of digital technologies in various aspects of economic and social life. The study emphasizes that digitalization, seen as a key trend in global development, is becoming a driving force for efficiency in areas such as the economy, society, and improving life standards. The widespread introduction of digital technologies into business production, science, the social sphere, and the daily life of citizens is crucial. The research also highlights the emergence of digital ecosystems as innovative platforms that provide users with a favorable environment to solve groups of problems (Statsenko, 2020).

Konnikov et al. (2020) analyze the development of digital technologies in the context of the information revolution and globalization processes. The study focuses on how information, transformed into knowledge, is migrating into network space, leading to the development of a digital culture. This culture is identified as a key factor in digital transformation. The comprehensive introduction of state-of-the-art digital technologies is seen as a growth area for the economy, changing business processes, communications, and the social sphere. The paper also explores how various governments are adapting to changes resulting from the digital economy (Konnikov, et al., 2020).

Sidenko (2018) addresses the development of electronic (digital) commerce (EDC) as a key trend in the transformation of the world economy. The study emphasizes the multidimensional manifestations of EDC and its diversification under conditions of intensive technological transformations. The spread of EDC is associated with the growing role of key new technologies of the Fourth Industrial Revolution, such as analytics based on large databases, blockchain technologies, the Internet of things, and artificial intelligence. These technologies are creating the foundation for systemic changes in the nature of economic and non-economic relations (Sidenko, 2018).

The key technologies driving economic change are diverse and multifaceted. Digitalization, the development of digital culture, and the rise of electronic commerce are among the primary forces shaping the current and future economic landscape. These technologies are not only enhancing productivity and efficiency but are also creating new opportunities and challenges for businesses, governments, and individuals. As these technologies continue to evolve, they will play a pivotal role in shaping the trajectory of global economic development.

3.2. Sectoral Impact Analysis: From Healthcare to Manufacturing

The impact of digital transformation varies significantly across different sectors, with each experiencing unique challenges and opportunities. This section explores how digital transformation is influencing two key sectors: manufacturing and healthcare.

Manufacturing Sector: Zhang et al. (2022) conducted an empirical analysis of the digital economy's impact on the green and low-carbon transformation of the manufacturing industry in China. Their study reveals that digital economic development significantly enhances the green transformation of manufacturing, with a notable effect on technological innovation. This transformation is crucial for achieving carbon neutrality goals and promoting high-quality economic development. The research underscores the role of digital technologies in driving sustainable practices in manufacturing, leading to improvements in energy efficiency and reduction in carbon emissions (Zhang, Zhou, Chen, & Fan, 2022).

Zhang (2022) examines the impact of digital transformation on the innovation performance of manufacturing enterprises, particularly in the context of cloud manufacturing. The study finds that digital transformation significantly improves the innovation performance of enterprises, especially at higher levels of innovation. This effect is moderated by factors such as government subsidies and the scale of enterprises' assets, profits, R&D investments, and R&D personnel ratio. The research highlights the transformative power of digital technologies in enhancing the innovative capabilities of manufacturing enterprises (Zhang, 2022).

Healthcare Sector: Kitsios and Kapetaneas (2022) focus on the digital transformation in healthcare, particularly the critical factors for successful Business Intelligence (BI) system development. The study develops a framework considering organizational determinants that impact the acceptance, implementation, and evaluation of BI systems in healthcare. This framework classifies determinants under organizational, process, and strategic aspects, providing a

roadmap for healthcare practitioners to ensure successful BI system development. The research emphasizes the importance of digital transformation in making informed decisions in the healthcare sector (Kitsios & Kapetaneas, 2022).

The sectoral impact of digital transformation is profound and multifaceted. In manufacturing, digital technologies are driving innovation and sustainable practices, while in healthcare, they are enhancing decision-making and adapting to new challenges posed by the pandemic. These sectors exemplify the transformative potential of digital technologies in reshaping economic activities and societal functions. As digital transformation continues to evolve, its impact across various sectors will likely deepen, bringing both challenges and opportunities for growth and development.

3.3. Case Studies: Pioneers of Digital Economic Transformation

The digital economic transformation is a global phenomenon, with various countries and industries adopting digital technologies in unique ways. This section explores case studies that highlight pioneering efforts in digital transformation across different contexts.

3.3.1. Russian Digital Transformation

Zolochevskaya et al. (2019) examine the factors influencing Russia's digital transformation during its transition from the formation of a digital economy to its development. The study highlights that Russia's digital transformation is not a simple evolution but a strategic initiative implemented through public policy measures. The analysis of the state innovation policy of the USA, EU countries, Sweden, and Norway, which occupy leading positions in the Digital Economy and Society Index (I-DESI) rating, provides insights into the main directions of economic growth that are important for Russia's digitalization policy. The study identifies successes and constraints in Russia's digital transformation, emphasizing the importance of strategic planning and policy support in digitalization (Zolochevskaya, et al., 2019).

3.3.2. Digital Transformation in Algeria's Drilling Industry

Arnaout, Bakhti, and Thonhauser (2019) present a case study on managing digital transformation challenges in a national drilling contractor in Algeria. The study discusses the implementation of a real-time digitalization tool based on automated rig activities detection technology. It highlights the importance of data aggregation, standardizing, and quality control in digital transformation. The research also underscores the significance of company culture in fostering the successful execution of a digital strategy, particularly in the context of the oil and gas industry (Arnaout, Bakhti, & Thonhauser, 2019).

3.3.3. Digital Readiness in Russian Regional Economies

Kozhevina et al. (2018) focus on the digital readiness of regional economies in Russia. Their empirical research includes cross-country comparisons of readiness for the digital economy based on statistical analysis. The study identifies significant factors influencing digital transformation and proposes an aggregated digital economy index. It also investigates the innovative component of the transition to a digital economy in Russian regions, providing insights into the relationship between sustainable development and digital transformation (Kozhevina, et al., 2018).

3.3.4. Meorient: Digital Exhibition Industry Pioneer

Bai, Yang, Hunter, & Wang, (2022) explore the case of Meorient, a pioneer in the digital exhibition industry. The study identifies external and internal factors crucial for formulating a digital platform strategy. It emphasizes the importance of dynamic capability theory in achieving sustainable competitive advantages through digital platform strategies. The research also discusses the advantages and disadvantages of different digital platform strategies, such as independent digital platforms and online-offline integration platforms, highlighting the need for companies to adapt their business structures, product structures, and technology architectures to their digital platform strategies (Bai, Yang, Hunter, & Wang, 2022).

These case studies provide valuable insights into the diverse ways in which digital transformation is being implemented across different countries and industries. From national strategies to industry-specific initiatives, these examples illustrate the multifaceted nature of digital economic transformation and the critical role of strategic planning, policy support, and dynamic capabilities in navigating the digital era.

Cross-National Analysis of Digital Strategies

The adoption and implementation of digital strategies vary significantly across nations, influenced by unique contextual factors and national development policies. This section provides a cross-national analysis of digital strategies, highlighting the diverse approaches and outcomes in different countries.

In the manufacturing industry, the digital transformation strategies of Italy and Denmark offer insightful contrasts. Colli et al. (2020) investigated four large manufacturers, two each from Italy and Denmark, to understand how they address digital transformation agendas. The study reveals that contextual factors and national development policies significantly influence the adoption of digital strategies, leading to varied effects on companies' operations. This cross-country evaluation underscores the importance of understanding the unique challenges and opportunities in different national contexts when implementing digital transformation in the manufacturing sector.

The evolution of digital transformation strategies in the Philippines, as reviewed by Treceña (2021), provides a comprehensive view of the country's approach over three decades. The study analyzed six strategic plans focusing on Information and Communications Technology (ICT) infrastructure development, government operations, digital engagement, ICT policies, and bridging digital gaps. The research highlights the evolution of the Philippines' digital strategies, emphasizing the need for policies that recognize the interconnection between digital literacy, affordable connectivity, and ICT infrastructures.

In the context of eGovernment strategies, the qualitative comparative analysis conducted by Patergiannaki and Pollalis (2021) on the strategic objectives set by the European Commission and the Greek government offers a unique perspective. The study divides the strategic objectives into themes and quantifies the data to provide an understanding of the strategies implemented in Greece. The research identifies recurring themes such as Inclusive Citizen-centric Digital Services, Digital Enablers, and Administrative Efficiency & Transparency. The findings suggest differences between the strategies proposed by the European Commission and those implemented by the Greek Government, impacting Greece's digitalization process.

These case studies demonstrate the diverse approaches to digital transformation across different national contexts. From the manufacturing industry in Italy and Denmark to the evolving digital strategies in the Philippines and the implementation of eGovernment strategies in Greece, each case provides unique insights into the challenges and successes of digital transformation. Understanding these cross-national differences is crucial for developing effective digital strategies that are tailored to specific national contexts and development goals.

Policy Insights and Strategic Implications

The journey of digital transformation across various countries and industries offers critical insights into policy formulation and strategic implications, reshaping traditional paradigms and influencing strategic renewal, social implications, and geopolitical contexts.

Kowalska and Kowalik (2021) examine the impact of digital transformation on the strategic renewal of companies, highlighting the challenges in the diffusion of technological innovations due to the lack of coordinated national policies, especially in the context of Industry 4.0. The study emphasizes the influence of digital technologies on production systems, supply chain sustainability, and business process automation. It suggests that realizing the potential of digital transformation requires changes in innovation ecosystems, management structures, business strategies, and technological cycles, highlighting the need for a strategic approach that encompasses both organizational and technological aspects.

Misuraca, Pasi, and Viscusi (2018) explore the social implications of digital transformation through case studies, focusing on how social innovation can foster resilience in a digital governance context. The research underscores the importance of ICTs in driving social policy innovation and counterbalancing the negative consequences of digital transformation on labor markets and social protection systems. This study offers valuable insights into the design and implementation processes of innovative initiatives, identifying drivers and processes that facilitate change and foster societal resilience.

Ciuriak (2021) discusses the strategic implications of digital transformation in the context of shifting economic geography and technology. The study comments on how global trade is being reshaped by digital transformation, affecting traditional trade routes and emphasizing the Indo-Pacific region over the North Atlantic trade system. It suggests that countries like Canada must re-visualize their place in the world, move towards the emerging economic

center of gravity, and invest in their digital future. This highlights the importance of understanding the geopolitical implications of digital transformation and the need for countries to adapt their strategies accordingly.

These studies provide a comprehensive view of the policy insights and strategic implications of digital transformation. They underscore the need for strategic renewal in companies, address the social implications of digital governance, and highlight the geopolitical shifts in global trade. Policymakers and business leaders must consider these insights to formulate effective strategies that leverage the opportunities and address the challenges presented by the digital era.

3.4. Overcoming Challenges in Digital Transformation

Digital transformation, while offering immense potential for business growth and innovation, also presents a range of challenges. Understanding and addressing these challenges is crucial for organizations to progress in their digital maturity and leverage the opportunities of a post-COVID-19 world.

Research by Järfvert, Parnefjord and Gustafsson, (2019) provides insights into the challenges faced by managers in digitally mature organizations. The study highlights that the main challenges are internal, focusing on leading digital change within the organization and transforming established legacy systems. It suggests that for organizations to progress in digital transformation, they need to focus not only on external development but also on digitally transforming their internal processes. This involves a comprehensive approach that encompasses organizational culture, employee training, and updating technological infrastructures (Järfvert, Parnefjord and Gustafsson, 2019).

Bhat, and Kaswan (2022) examines the challenges and opportunities of digitalization in the context of the COVID-19 pandemic. The study identifies key areas impacted by digital transformation, including labor and social relations, marketing and sales, and technology. The findings suggest that digitalization can lead to the introduction of new digital products and services, new working modes, and increased demand for new talent. However, it also highlights the importance of cybersecurity and privacy in the digital era (Bhat, and Kaswan, 2022).

Thanikachalam (2020) focuses on the challenges encountered by Human Resource Management (HRM) in the context of industrial metamorphosis due to digital innovation. The study points out the necessity of intelligent training and development models to enhance employee competencies in the face of rapid technological advancements. It emphasizes that traditional training approaches are inadequate in sectors where digital innovation is prominent. The research advocates for adopting new working environments and training methods that align with the demands of Industry 4.0, highlighting the critical role of HRM in facilitating successful business transformation.

Overcoming challenges in digital transformation requires a multifaceted approach that addresses both internal and external factors. Organizations must focus on transforming their internal processes, updating their technological infrastructure, and ensuring that their workforce is adequately trained and prepared for the digital era. Additionally, understanding and adapting to the changing landscape in the post-COVID-19 world, with an emphasis on cybersecurity and privacy, is crucial for sustainable digital transformation.

4. Discussion

4.1. Evaluating Digital Transformation Strategies Across Economies

The evaluation of digital transformation strategies across various economies reveals significant insights into their socio-economic impacts and the role of technology in driving economic growth, especially in the context of the post-COVID-19 era.

Mohamed (2023) explores the role of digital transformation in socio-economic recovery post-COVID-19, employing cross-sectional regression analysis on 99 countries in 2020. The study analyzes the impact of digital transformation on economic growth, healthcare, and income inequality. The results indicate a positive and significant impact of digital transformation on GDP per capita and income equality, and a negative impact on infant mortality rate, reflecting its positive influence on healthcare. This research underscores the importance of digital transformation in enhancing economic growth and addressing socio-economic disparities (Mohamed, 2023).

Zhang et al. (2022) examine the impact of the digital economy on the economic growth of countries along the “Belt and Road” before and during the COVID-19 pandemic. The study employs a comprehensive evaluation index system and a panel data regression model, followed by a Global Trade Analysis Project (GTAP) model. The findings reveal that the digital economy significantly contributes to economic growth by promoting industrial structure upgrading, total

employment, and restructuring of employment. The research also highlights the regional imbalance in digital economy development and suggests development strategies to bridge the digital divide and strengthen the driving effect of the digital economy on industrial upgrading, employment, and trade in the post-COVID-19 era (Zhang et al., 2022).

These studies provide a comprehensive view of the impact of digital transformation strategies across different economies. They highlight the significant role of digital transformation in enhancing economic growth, improving healthcare, and addressing income inequality. The research also underscores the importance of technology brands and the digital economy in driving economic growth and innovation, particularly in the context of the post-COVID-19 era. These insights are crucial for policymakers and business leaders to formulate effective strategies that leverage digital transformation for sustainable economic development.

4.2. Sociocultural, Political, and Economic Factors in Technology Adoption

The adoption of technology is influenced by a complex interplay of economic, behavioral, and social factors, each playing a crucial role in how technology is embraced and utilized across different sectors and regions.

Chersoni, et al, (2019) model the choice of adopting technology as a combination of economic, behavioral, and social factors. Their research shows that traditional adoption curves emerge predominantly when the decision to adopt technology is driven by imitation. The study also finds that the rate and level of diffusion depend on the structure of interaction, such as network topology. In environments with preferential attachment, adoption is higher than in small world topologies. This suggests that the adoption decision cannot be explained by any single factor in isolation, highlighting the importance of a multifaceted approach (Chersoni, et al, 2019).

Smidt and Jokonya (2022) focus on the factors affecting digital technology adoption by small-scale farmers in agriculture value chains in South Africa. Their study presents the economic, political, and social factors influencing digital adoption and highlights the implications for governance and institutional challenges. The findings show the critical role of state governance and institutional support in facilitating collaboration and participation among different actors. The study emphasizes the need to develop a comprehensive localized developmental implementation framework to support the adoption of digital solutions for small-scale farmers (Smidt & Jokonya, 2022).

Zemlyak, Gusarova, and Sivakova (2022) investigate the factors influencing the adoption of collaborative robots in the manufacturing sector in Russia. Their study, driven by the increasing technological innovation in manufacturing, particularly in robotics, reveals that organizational and economic factors influence the adoption of collaborative robots. The research suggests that collaborative robot adoption and sociotechnical systems significantly influence perceived performance improvement. The study recommends that stakeholders in Russia's manufacturing sector should improve their training, management support, perceived innovativeness, and prior experience to enhance the adoption of collaborative robots and flexibility in design (Zemlyak, Gusarova, & Sivakova, 2022).

These studies provide a comprehensive view of the sociocultural, political, and economic factors influencing technology adoption. They highlight the need for a multifaceted approach that considers the complex interplay of various factors in different contexts. Understanding these dynamics is crucial for policymakers, businesses, and other stakeholders to effectively facilitate and leverage technology adoption for economic growth and development.

4.2.1. Implications for National and International Economic Policy

The digital transformation of economies globally has profound implications for national and international economic policies. This section explores these implications through the lens of various studies.

Abayomi (2018) focuses on the digital transformation of state foreign trade policy. The study examines the impact of digital transformations on financial, investment, and trade flows, emphasizing the need for appropriate incentives and the reduction of restrictive practices. The lack of coordination between national governments and international organizations in establishing mechanisms and instruments is identified as a risk factor for instability. The research underscores the dual nature of modern regulatory instruments applied by countries due to the nature of digital technologies. The article proposes theoretical, methodological, and practical approaches to regulate the digital transformation process in foreign trade policy

Topçu and Oran (2021) construct a monthly news-based economic policy uncertainty index for Turkey. The study, based on data from the digital archives of five Turkish newspapers, shows that the Turkish Economic Policy Uncertainty (EPU) index is affected by both domestic and foreign events. The research reveals that national elections, national political uncertainties, uncertainties related to US and Turkish central banks, the failed coup attempt in Turkey, the September

11 terror attacks, and the US presidential elections significantly influence the EPU index. The findings suggest that governments in emerging economies should strengthen constitutions and institutions and implement economic policies that decrease country risk (Topçu & Oran, 2021).

Genberg (2020) reviewed how digital transformation is likely to impact financial stability, payment systems, and macroeconomic stability. The paper discusses the need for changes in regulatory and macroeconomic policies to mitigate the associated risks. It reflects on the possible consequences of the current Coronavirus pandemic for the analysis and conclusions, highlighting the challenges posed by unregulated FinTech and BigTech firms to traditional commercial banking models and the globalization of production processes leading to greater economic fluctuations across borders (Genberg, 2020).

The above studies provide valuable insights into the implications of digital transformation for national and international economic policies. They highlight the need for rethinking state regulation of digital processes, coordinating international efforts in digital trade policy, and understanding the impact of digital transformation on economic policy uncertainty. These insights are crucial for policymakers to navigate the challenges and opportunities presented by the digital era and to formulate effective strategies for sustainable economic development.

4.2.2. The Role of Global Partnerships in Digital Economic Growth

Global partnerships play a crucial role in fostering digital economic growth, especially in the context of evolving international trade dynamics and the pursuit of sustainable development goals (SDGs).

The research by Kumar, Chakradhar, and Balchin (2020) delves into the potential elements of a future digital trade agreement and its impact on digitalization and economic growth. The study uses panel data analysis to examine the effect of digitalization on economic growth in developed and developing countries. The findings suggest that increased internet usage, broadband usage, and mobile cellular subscriptions significantly boost GDP. The paper proposes policy recommendations for trade negotiators on elements of a multilateral agreement on digitalization, considering exceptional circumstances such as pandemics. This highlights the importance of international cooperation in formulating policies that harness digitalization for economic growth (Kumar, Chakradhar, & Balchin, 2020).

Shulla et al. (2021) assess the impact of the COVID-19 pandemic on economic growth and sustainable development, emphasizing the need to reenergize partnerships for achieving SDGs in the post-COVID-19 digital world. The article reviews the toll of the pandemic on SDG implementation and examines the interconnected effects on various SDGs. The study concludes by outlining priorities for strengthening international cooperation on sustainable development, including incorporating key components of digitalization into the SDGs as concrete targets and indicators. This underscores the significance of global partnerships in leveraging digital transformation for sustainable development.

Ganievich (2021) discuss the development of the digital economy in Uzbekistan and its implications for ensuring economic growth. The study addresses issues and challenges in terms of economic growth through digital economy development, highlighting the strategic importance of digitalization for the country's socio-economic development. The gradual transition to a digital economy in Uzbekistan is seen as a solution to many economic problems and a driver of economic growth. This case study exemplifies the role of national strategies and international cooperation in digital economic development (Ganievich, 2021).

These studies highlight the need for international cooperation in formulating digital trade policies, the importance of aligning digital transformation with sustainable development goals, and the impact of national digital strategies on economic growth. These findings are crucial for policymakers and stakeholders in leveraging global partnerships to maximize the benefits of digital transformation for economic development.

5. Conclusion

This study embarked on a comprehensive exploration of the digital transformation landscape, dissecting its multifaceted impact on national economies. The journey began with a clear aim to understand how emerging technologies are reshaping economic paradigms and the objectives set forth were meticulously pursued through an extensive literature review and synthesis approach. The methodology, rooted in qualitative analysis, was pivotal in unearthing a wealth of insights from diverse global and sector-specific sources, ensuring a robust and nuanced understanding of the digital era's complexities.

The findings of this study painted a vivid picture of the digital transformation era. Key technologies like digitalization, electronic commerce, and digital culture emerged as significant drivers of economic change, each playing a unique role in different sectors. The sectoral analysis revealed how healthcare and manufacturing are adapting and evolving in response to digital innovations. Intriguing case studies from various countries provided real-world examples of digital strategies in action, highlighting both successes and challenges. The study also navigated through the hurdles organizations face in digital maturity, emphasizing the need for internal transformation alongside technological advancements.

The discussion section brought to light the critical role of sociocultural, political, and economic factors in technology adoption, underscoring the importance of a holistic approach to digital transformation. It also delved into the implications of digital transformation for national and international economic policies, revealing the necessity for adaptive and forward-thinking strategies in the digital age.

In conclusion, this study not only achieved its aims and objectives but also offered a kaleidoscopic view of the digital transformation landscape. It underscored the need for strategic planning, policy support, and a deep understanding of the dynamics of digital transformation across various sectors and global contexts. The recommendations put forth are intended to guide policymakers, business leaders, and stakeholders in leveraging the opportunities presented by digital transformation while navigating its challenges. As the digital era continues to evolve, this study serves as a beacon, illuminating the path towards sustainable and inclusive economic development in a digitally transformed world.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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