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Research Article

A Systematic Literature Review of Digital Transformation

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ABSTRACT

The introduction of information, technology, and innovation in goods and services is the cornerstone of success in the modern global economy. These significant digital revolution shifts have established new digitally related practices that enhance and add value to the way businesses, organizations, and countries operate. In light of this, the research aims to examine how digital transformation is applied in business and economy. This study presents 20 reviewed literatures precisely their basis of the sources of data, geographical settings, statistical treatment employed, distribution of geographical settings of selected studies, the variable usage for digital transformation, its parameters, and the concepts or other variables it is being related with. The results revealed that the innovations made by the enhancement of the management system and expansion of management capacity via the use of digital technologies demonstrate the significance of digital transformation. With this, digital transformation has increased economic growth rates, enhanced the caliber of services offered, and created new opportunities for consumers and business owners in many countries. However, to get the most out of digitalization, stricter laws that guarantee business competition and worker skills that meet the needs of the contemporary workforce are required.

Keywords: *Business growth, Digital transformation, Economic growth, Information, Technology*

Introduction

The employment of new digital technologies, accelerating the growth and spread of innovation, has brought society and the economy closer to the peak of the industrial revolution. The introduction of information, technology, and innovation in goods and services is the cornerstone of success in the modern global economy, which is often characterized by dynamism, individualization, and intense competition. These significant shifts made by the digital

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revolution have established new digitally related practices that enhance and add value to how businesses and countries operate.

Globally, digital transformation is becoming a significant issue in all fields. It has many effects on society. For example, in the production sector of the economy, digital transformation makes it possible to automate business processes, which results in operational benefits like lower transaction costs and increased productivity. Similarly, it affects employment and entrepreneurship by opening new business opportunities. In terms of public service delivery, digital transformation improves the way health and education are provided and how individuals engage with the governments. It also influences interpersonal interactions and personal conduct, facilitating communication and social inclusion. In addition, Paul et al. (2024) elucidated that the recent adversities presented by the COVID-19 pandemic have further catalyzed the imperative for digital transformation. This transformation has not only affected businesses and economies but has also had a profound influence on consumer behavior. Overall, digital transformation innovates the traditional social structure by applying information and communication technology, such as the Internet of Things, Big Data, Cloud, and Artificial Intelligence across society.

However, digital transformation could also result in unfavorable outcomes, including disruptions to the workforce, business collapse, cybercrime, and social discontent. Therefore, studying digital transformation from a strategic point of view will contribute to completing the literature with valuable ideas and how it can help businesses and economies, explicitly understanding the digital transformation processes and the underlying building blocks of this transformation. In light of this, the research aims to examine how digital transformation is being applied in businesses and countries' economies. The critical global challenge to society is digital transformation in almost all specters of modern life. This study contributes to the continuous research on digital transformation by pondering the articles about its disposition, as results have yet to bring consensus on the real impact of digital transformation on businesses and the economy.

According to Karimov (2021), digital transformation is one of the main factors in the development of the worldwide economy since it not only increases labor productivity but also saves time and creates new demand for new goods and services, new quality and value, etc. Like Yoo & Goo Yi (2022), digital transformation refers to the use of technology by economic agents to improve values and propose new directions for the industry through integrating ICT and physical elements. Fundamentally, digital transformation utilizes technology to streamline operations, reduce expenses, and foster the creation of novel products and services, ultimately enhancing organizational performance.

On the other hand, digital transformation is considered the most complex phase of digital changes in an organization. There are no multidisciplinary discussions, including using technologies, changing the business organization, and delivering business value (Verhoef et al., 2021). In connection with Skog, Wimelius, and Sandberg (2018), digital transformation is dramatic and disruptive as it can generate chaos in the business world. They explained it to be a result of small but continuous digital innovations undertaken at a firm level, which leads to being permanent at the industry level. This shows how digital transformation is a complex process that requires thoughtful planning and execution. It can lead to significant and often unpredictable outcomes for businesses and industries, making it challenging.

Meanwhile, Morakanyane, Grace, and Reilly (2017) stated that one of the most balanced definitions of digital transformation is an evolutionary process using digital capabilities and technology to enable business models, operational processes, and consumer experiences to generate value. This supports Drechsler (2020) stating that digital transformation can also be viewed from the perspective of the relations among changes in structure, strategy, and technology to help respond to the needs imposed by a digital environment, stressing the need to balance between the old and new elements of the organization. Digital transformation is a dynamic process that helps organizations navigate the digital age. It involves adopting innovative approaches and maintaining a careful

equilibrium between established methods and emerging technologies.

Overall, Ko, Feher, and Szabo (2019) considered digital transformation to be an increasingly important process for organizations today and critical for the survival of companies as the spreading of digital technologies throughout societies brings various changes in organizational culture, people, business processes, and business models. This emphasizes how digital transformation is essential for organizations to adapt to the evolving digital landscape and maintain their competitive edge.

This systematic review of selected empirical articles about digital transformation will formulate concepts and extend knowledge that may be used for further studies. Furthermore, this may enlighten business stakeholders and policymakers on the substance of digital transformation in the business and economy. The following parts of the paper are organized. The second section describes the materials and methods used in the paper. This includes the review process in identifying and selecting articles from reputable journals. The third section presents the digested articles. The fourth section laid down the findings of the literature review. The final section provides the conclusion of the paper.

Methods

The paper's digital transformation assessment was done through a systematic review of the related literature and studies. Dewer and Drahota (2016) defined *systematic literature review* as identifying, selecting, and critically appraising research to answer a formulated question. It is a comprehensive, transparent search conducted over multiple databases and grey literature that other researchers can replicate and reproduce. It involves planning a well-thought-out search strategy with a specific focus or answering a defined question. With this, the systematic review should follow a clearly defined protocol or plan where the criteria are clearly stated before the review is conducted. Since the goal of the paper is to provide an inclusive review of the use and measure of digital transformation, the paper is limited to the following:

1. only articles published in foremost peer-reviewed academic journals with a good impact factor were reviewed,
2. only empirical studies were included. Thus, books and conceptual papers were excluded from the review,
3. only topics regarding business and economy about digital transformation were selected, and
4. only studies from the last ten (10) years were included.

The study presents the basis of the sources of data, geographical settings, statistical treatment employed, distribution of geographical settings of selected studies, the variable usage for digital transformation, its parameters, and the concepts or other variables it is being related to. By doing so, the research could categorize and evaluate the development employed from early years to recent digital transformation.

Results

Table 1. Journal Impact Factor of Source Journals

Journal Title	Impact Factor
International Review of Economics and Finance	3.399
Technological and Economic Development of Economy	5.656
Journal of Asian Finance, Economics, and Business	2.74
Brazilian Journal of Political Economy	0.47
Aquaculture	5.135
Journal of International Studies	2.53
Polish Journal of Management Studies	0.338
Economics and Business Review	1.8
International Journal of System Assurance Engineering and Management	2.44
Humanities and Social Sciences Communication	3.81

Journal Title	Impact Factor
Sustainability	3.889
Engineering, Technology, & Applied Science Research	1.5
Ecological Economics	6.536

Table 1 exhibits the impact factors of the journals used in the study. The selected articles were published in reputable journals in business and allied subjects viz: *International Review of Economics and Finance, Technological and Economic Development of Economy, Journal of Asian Finance, Economics, and Business, Brazilian Journal of Political Economy, Aquaculture, Journal of International Studies, Polish Journal of Management Studies, Economics and Business Review, International Journal of System Assurance Engineering and Management, Humanities and Social Science Communication, Sustainability, Engineering, Technology, & Applied Science Research, and Ecological Economics.* Digital transformation is considered new, as most studies conducted concerning it ranged from 2017 onwards. This review used twelve (12) journals for six (6) years. The paper only consists of twenty (20) related literature and studies due to the limitation of finished studies and the fact that other studies published in journals need a score for impact factor. The keywords that were used to look for studies were: "digital transformation," "digital transformation in business," and "digital transformation in the economy." The latter keywords were used to look for more studies since the topic is not conventional; therefore, only a few were available.

Table 2. Sampled Articles

Journal Title	2019	2020	2021	2022	2023	2024	Total
International Review of Economics and Finance					2	1	3
Technological and Economic Development of Economy				1	1		2
Journal of Asian Finance, Economics, and Business		1	1		1		3
Brazilian Journal of Political Economy				1			1
Aquaculture				1			1
Journal of International Studies			1				1
Polish Journal of Management Studies	1						1
Economics and Business Review	1						1
International Journal of System Assurance Engineering and Management					1		1
Humanities and Social Sciences Communication					1		1
Sustainability			1		2		3
Engineering, Technology, & Applied Science Research	1						1
Ecological Economics		1					1

Table 2 presents the reviewed articles categorized in the following years: 2019, 2020, 2021, 2022, 2023, and 2024. The study identified research related to digital transformation from 2015 to 2023. However, other studies were not published in reputable journals and had no impact factor score. Parviainen et al.'s (2017) study explained digital transformation as disruptive changes that can make current businesses obsolete. According to Bondar et al. (2017), new opportunities and work may become resilient against risks by responding to

changes. This implementation of digital transformation emphasizes its importance and contribution to productivity for improvements and innovations. Thus, digital transformation is a part of published studies every year. This table also serves as the basis for the year of the publication of each reviewed literature or study.

Table 3. Sources of Data

Title	Year	Author	Type of Data	Source of Data	Sample Sizes	Observation
The effect of digital transformation on total economy enterprises' total factor productivity	2023	Yiran Cheng, Xiaorui Zhou, & Yongjian Li	Secondary	A-share listed companies in Shanghai and Shenzhen, Wind Database, and CSMAR database	8,337	2007 - 2020
Digital transformation and Economic Growth – Desi Improvement and Implementation	2022	Magdalena, Olczyk & Marta, Kuc-Czarnecka	Secondary	Eurostat, European Commission, Penn World Table, UNCTAD Stat, and World Bank	Not stated in the paper	2015 - 2020
Digital Transformation Enablers and Barriers in the Economy of Kazakhstan	2020	Gulnaz Alibekova, Tunc Medeni, Aksana Panzabekova, & Dinara Mussayeva	Secondary	ICT Development Index and Global Innovation Index	Not stated in the paper	2010 - 2018
Digitalization and its impact on economic growth	2022	Ariadna Aleksandrova, Yuri Truntsevsky, & Marina Polutova	Secondary	World Economic Forum, Global Competitiveness Index, Telefonica's Index on Digital Life, Digital Adoption Index, and FM Global Resilience Index	Not stated in the paper	2009 - 2019
Impact of the digital economy on the development of economic systems	2022	Angela Mottaeva, Zhibek Khussainova, & Yelena Gordeyeva	Secondary	World Economic Forum	Not stated in the paper	2016 - 2021
The impact of digital transformation on macroeconomic stability: Evidence from EU Countries	2021	Tiutiunyk, I., Drabek, J., Antoniuk, N., Navickas, V., & Rubanov, P.	Secondary	Digital Evolution Index	Not stated in the paper	2001 - 2020
Digitalization in Economy and Innovation: The effect on Social and Economic Processes	2019	Afonasova M.A., Panfilova E.E., Galichkina M.A,. & Ślusarczyk B.	Secondary	The Organisation for Economic Cooperation and Development	Not stated in the paper	2011 - 2018

Title	Year	Author	Type of Data	Source of Data	Sample Sizes	Observation
Digital Transformation – A Hungarian Overview	2019	Andrea Ko, Peter Feher, & Zoltan Szabo	Primary	Survey Questionnaire	167	-
Digitalization and its impact on regional economy transformation mechanisms	2023	Sergey Demin, Anna Mikhaylova, & Svetlana Pyankova	Primary	Survey Questionnaire	2290 (8 organizations)	-
EU Countries' Digital transformation, economic performance, and sustainability analysis	2023	Claudiu George Bocean & Anca Antoaneta Vărzaru	Secondary	Eurostat	28 European Countries	2022
The impact of digital transformation on enterprise green innovation	2024	Chao Xu, Guanglin Sun, & Tao Kong	Secondary	A-share listed corporation	29,111	2010 - 2020
Technology management has a significant impact on digital transformation in the banking sector	2023	Luís Filipe Rodrigues, Abílio Oliveira, & Helena Rodrigues	Primary	Interview Guide and Survey Questionnaire	604	-
China's Digital Economy Development: Incentives and Challenges	2023	Yang Chen , Shaorui Xu , Oleksii Lyulyov, & Tetyana Pimonenko	Secondary	China Statistical Yearbook	310	2010 - 2019
A journey of digital transformation of small and medium-sized enterprises in vietnam: insight from multiple cases	2021	Minh Le Bui	Primary	Interview Guide	6 companies	-
How can digital economy development empower high-quality economic development?	2023	Wen Chen, Xiaoyu Du, Wei Lan, Weili Wu, & Murong Zhao	Secondary	China Statistical Yearbook	210	2012 - 2018
The effect of enterprise digital transformation on green technology innovation: a quantitative study on chinese listed companies	2023	Liang Tang, Haifeng Jiang, Shanshan Hou, Jun Zheng & Lianqi Miao	Secondary	A-share listed companies in Shanghai and Shenzhen	18,655	2011 - 2021

Title	Year	Author	Type of Data	Source of Data	Sample Sizes	Observation
The impact of digital transformation on business performance	2019	Muhammad Faraz Mubarak, Fazal Ali Shaikh, Mobashar Mubarik, Kamran Ahmed Samo, & Sanya Mastoi	Primary	Survey Questionnaire	390	-
Role of government to enhance digital transformation in small service business	2021	Chun-Liang Chen, Yao-Chin Lin, Wei-Hung Chen, Cheng-Fu Chao, & Henry Pandia	Primary	Interview Guide	10	-
Digital transformation and localizing the sustainable development goals	2020	Suzanna ElMassaha, & Mahmoud Mohieldinb	Secondary	World Bank	7 countries	2016 - 2018
Impact of digital transformation toward sustainable development	2023	Mohammed Alojail & Surbhi Bhatia Khan	Primary Data	Survey Questionnaire	760	-

Type of Data. The type of data to use, whether primary or secondary, is essential when doing research. Its primary benefit is that it becomes specific to the scope of the study. Most of the data in the reviewed literature came from secondary sources, with thirteen (13) or 65%, while primary data comprised seven (7) or 35%. Since digital transformation relates to technology, its data will be primarily secondary as it is used in data to create development or test innovations. According to Hillier (2022), secondary data allows researchers and data analysts to build large, high-quality databases that help solve business problems. By expanding secondary data, analysts can enhance the quality and accuracy of their insights. Meanwhile, the use of primary data is specially designed to understand and solve research problems. According to the Institute for Work & Health (2015), primary data is helpful as the questions are tailored to fit the study's objective. Since digital transformation can also affect business owners and employees, for instance, topics like organizational shift, using primary data to gather insights is useful.

Source of Data. The foremost sources of secondary data are well-known sources of data. The study of Cheng, Zhou, and Li (2023), Xu, Sun, and Kong (2024), and Tang et al. (2023) employed data from A-share listed companies in Shanghai and Shenzen, as the setting of the study focused on China and the scope of the study are the incorporated companies that are based in mainland China. The study of Olcyzk and Kuc-Czarnecka (2022) and Bocean and Varzaru (2023) utilized data from Eurostat as the study setting focused on European countries. Eurostat offers Europe-wide statistics and indicators in digital transformation that enable a researcher to compare and analyze data between regions and countries of Europe. The study of Olcyzk and Kuc-Czarnecka (2022) and El Massaha and Mohieldnib (2020) used data from the World Bank as both studies focused on economic improvement and sustainable development. World Bank is considered a treasure trove of information as it is an international development-proving dataset for each country. The study by Aleksandrova, Truntsevsky, and Polutova (2022) and Mottaeva, Khussainova, and Yelena (2022) gathered data

from the World Economic Forum (WEF). WEF published a comprehensive series of reports to help address a broad range of global issues. The said study used data from WEF to focus on digitalization's impact on economic growth. At the same time, the study of Chen et al. (2023) and Chen et al. (2023) considered getting data from China Statistical Yearbook. The China Statistical Yearbook annually provides comprehensive data on China's social and economic development since the objective of both studies was digital economic development and incentives.

Meanwhile, several databases such as Wind Database, China Stock Market & Accounting Research Database, European Commission, Penn World, United Nations Conference on Trade and Development, ICT Development Index, Global Innovation Index, Global Competitiveness Index, Telefonica's Index on Digital Life, Digital Adoption Index, FM Global Resilience Index, Digital Evolution Index, and Organization for Economic Cooperation and Development, were also used as sources to analyze digital transformation.

As for the primary data gathered through a survey questionnaire, the study of Andrea et al. (2019) gathered data about the perception of digital transformation's importance among the management of companies. Demin, Mikhaylova, and Pyankova (2023) gathered employees' skills in programming, translation, copywriting, SEO and SMM, design, and engineering services. The study by Mubarak et al. (2019) identified the role of industry 4.0 technologies, including big data, cyber-physical systems, the Internet of Things, and interoperability. As for the study of Alojail and Khan (2023), they gathered the adoption of innovative digital technologies, stakeholder engagement, resource allocation, risk mitigation, and availability of resources. Meanwhile, the study by Rodrigues, Oliveria and Rodrigues (2023) used both survey questionnaires and interview questions. The survey questionnaire gathered data about the employees' perception of the IT and non-IT measures in improving digital transformation and an interview guide for the textual analysis of the factors that impact digital transformation. Finally, as for the interview, the study of Minh (2021) collected the challenges and benefits of digital transformation, and the study of Chen et al. (2021) collected the roles of government in digital transformation in small service businesses.

Years of Observation. The number of years of observation in research is essential as it allows researchers to analyze and understand the movement or pattern of data over the years. Based on the reviewed literature, the years of observation if the study utilizes secondary data depends on the available data. The majority are 6-10 years with seven (7) studies from Gulnaz et al. (2020), Aleksandrova, Truntsevsky, and Polutova (2022), Afonasova et al. (2019), Xu, Sun, and Kong (2024), Chen et al. (2023), Chen et al. (2023), Tang et al. (2023), 1-5 years of observation with four (4) studies from Olcyzk and Kuc-Czarnecka (2022), Mottaeva, Khussainova, and Yelena (2022), Bocean and Varzaru (2023), El Massaha and Mohieldnib (2020), and 11-15 years and 16-20 years with one (1) study each from Cheng, Zhou, and Li (2023) and Tiutiunyk et al. (2021). On the other hand, the studies that employed primary data collected their data the same year the study was conducted. Economic and demographic data are data types that change slowly and may remain relevant for a decade or more. Digital transformation is considered a fast-paced field. Southern New Hampshire University (2022) states that one-year-old data may need to be updated. As a result, using a more extended year of observations to collect data on digital transformation is applicable and valid.

Sample Sizes. In the paper of Olcyzk and Kuc-Czarnecka (2022), with 5 years of observation, Gulnaz et al. (2020) with 8 years observation, Aleksandrova, Truntsevsky, and Polutova (2022) with 10 years observation, Mottaeva, Khussainova, and Yelena (2022) with 5 years observation, Tiutiunyk et al. (2021) with 19 years observation, and Afonasova et al. (2019) with 7 years observation, the sample sizes used in the study are not stated yet data was presented in years based on the number of observations per variables and parameters. According to the Institute for Work & Health (2008), sample size refers to the number of participants usually represented by n or by the number of observations included in a study. On another note, those studies with sample sizes (Cheng, Zhou, & Li, 2023; Aleksandrova,

Truntsevsky, and Polutova, 2022; Demin, Mikhaylova, and Pyankova, 2023; Bocean and Varzaru, 2023; Xu, Sun, and Kong, 2024; Rodrigues, Oliveria and Rodrigues, 2023; Chen et al., 2023; Minh, 2021; Chen et al., 2023; Tang et al., 2023; Mubarak et al., 2019; Chen et al., 2023; El Massaha and Mohieldnib, 2020; Alojail and Khan, 2023), have an average mean of sample size of 5,070. Concerning Charlesworth (2022), larger sample sizes allow researchers to control the risk of reporting false-negative or false-positive findings. The more significant the number of samples, the greater the precision of the results will be.

Table 4. Distribution of Geographical Settings of Selected Studies

Settings	Number of Studies	Percentage
Asia	10	50
Europe	6	30
North America	1	5
Several Countries	4	20
Total	20	100

Table 4 presents the distribution of the geographical settings of the reviewed literature and studies about digital transformation. The study categorized each setting of the used literature and studies based on their setting to explore the digital transformation trend in each country. By doing so, the literature review will be beneficial in targeting the countries or locations with little to no digital transformation study. Most of the sampled studies are from Asia, representing 50% of the total. The most common source of data for the studies located in Asia were A-share Listed Companies, ICT Development Index, Global Innovation Index, China Statistical Yearbook, and World Bank (Cheng, Zhou, & Li, 2023; Xu, Sun, and Kong, 2024; Tang et al., 2023; Gulnaz et al., 2020; Chen et al., 2023; Chen et al., 2023; & El Massaha and Mohieldnib, 2020.) For the studies located in Europe and North America, the primary source of data came from Eurostat, the World Economic Forum, and The Organisation for Economic Cooperation and Development (Olcyzk and Kuc-Czarnecka, 2022; Claudui et al., 2023; Aleksandrova, Truntsevsky, and Polutova, 2022; Mottaeva, Khussainova, and Yelena, 2022; & Afonasova et al., 2019). Other studies from several countries gathered data from the Digital Evolution Index (Drabek et al., 2021), and the remaining comes from primary data through interviews and surveys.

Table 5. Statistical Treatment of Sampled Articles

Statistical Treatment	No. of Studies	Percentage
Regression Analysis	7	35
Correlation Analysis	5	25
Descriptive Analysis	5	25
Thematic and Case Analysis	2	10
ANOVA and Chi-Square Test	1	5
Total	20	100

The statistical treatment applied from the reviewed literature and studies on digital transformation are well assessed and analyzed in the study. The number of articles and percentage distribution of the applied statistical treatments and data analysis are presented in Table 5. Since most of the study is in quantitative design, the objective mainly focused on finding the relationship or effect between variables, as digital transformation is used chiefly as the independent variable. With this, regression analysis and correlation analysis are utilized with 30% and 20% respectively (Cheng, Zhou, & Li, 2023; Xu, Sun, and Kong,

2024; Chen et al., 2023; Chen et al., 2023; Tang et al., 2023; Muhammed et al., 2019; Olcyzk and Kuc-Czarnecka, 2022; Bocean and Varzaru, 2023; Tiutiunyk et al., 2021; Andrea et al., 2019). At the same time, descriptive analysis was employed since studies presented data using years of observation, the use of graphs, charts, and figures to present the data regarding digital transformation (Gulnaz et al., 2020; Aleksandrova, Truntsevsky, and Polutova, 2022; Mottaeva, Khussainova, and Yelena, 2022; Afonasova et al., 2019). As for the studies with a qualitative design, thematic and case analysis were used in presenting the results regarding the challenges and benefits of digital transformation and the roles of government in digital transformation in small service businesses (Minh, 2021 & Chen et al., 2021). Lastly, the study of Alojail and Khan (2023) used ANOVA and Chi-square test to study the impact of digital transformation toward sustainable development.

Table 6. Parameters used in measuring Digital Transformation

Title	Author	Variable Usage	Parameters	Dependent Variables
The effect of digital transformation on total economy enterprises' total factor productivity	Yiran Cheng, Xiaorui Zhou, & Yongjian Li	Independent Variable	Investment in ICT hardware and software	Total factor productivity
Digital transformation and Economic Growth – Desi Improvement and Implementation	Magdalena, Olczyk & Marta, Kuc-Czarnecka	Independent Variable	ICT Capital	DESI dimensions
Digital Transformation Enablers and Barriers in the Economy of Kazakhstan	Gulnaz Alibekova, Tunc Medeni, Aksana Panzabekova, & Dinara Mussayeva	Independent Variable	ICT and Innovation	Economic Growth
Digitalization and its impact on economic growth	Ariadna Aleksandrova, Yuri Truntsevsky, & Marina Polutova	Independent Variable	Digital Adoption Index	Economic Growth
Impact of the digital economy on the development of economic systems	Angela Mottaeva, Zhibek Khussainova, & Yelena Gordeyeva	Independent Variable	Information Industry (big data and artificial intelligence)	Economic Development
The impact of digital transformation on macroeconomic stability: Evidence from EU Countries	Tiutiunyk, I., Drabek, J., Antoniuk, N., Navickas, V., & Rubanov, P.	Independent Variable	Digital Readiness Score and ICT Development Index	Macroeconomic Stability
Digitalization in Economy and Innovation: The effect on Social and Economic Processes	Afonasova M.A., Panfilova E.E., Galichkina M.A,. & Ślusarczyk B.	Independent Variable	ICT Development Index, Global Innovation Index, and Network Readiness Index	Economic Development
Digital Transformation – A Hungarian Overview	Andrea Ko, Peter Feher, & Zoltan Szabo	Independent Variable	Dimensions of Strategy, Technol-	Need for digital transformation

Title	Author	Variable Usage	Parameters	Dependent Variables
			ogy, and Digital Innovation Capabilities (Primary Data - Survey)	
Digitalization and its impact on regional economy transformation mechanisms	Sergey Demin, Anna Mikhaylova, & Svetlana Pyankova	Independent Variable	Presence and absence of high-tech industries and digital skills of residents (Primary Data – Survey)	Economy Transformation
EU Countries' Digital transformation, economic performance, and sustainability analysis	Claudiu George Bocean & Anca Antoaneta Vărzaru	Independent Variable	Digital Technologies (use of computers and internet, big data, Internet of Things)	Economic Growth
The impact of digital transformation on enterprise green innovation	Chao Xu, Guanglin Sun, & Tao Kong	Independent Variable	ICT development and innovations of companies	Green Innovation
Technology management has a significant impact on digital transformation in the banking sector	Luís Filipe Rodrigues, Abílio Oliveira, & Helena Rodrigues	Independent Variable	Perceptions of IT and non-IT measures (Primary Data - Survey	Employee's Collaboration
China's Digital Economy Development: Incentives and Challenges	Yang Chen , Shaorui Xu , Oleksii Lyulyov, & Tetyana Pimonenko	Independent Variable	Quality Development Index of Digital Economy	Sustainable Development
A journey of digital transformation of small and medium-sized enterprises in vietnam: insight from multiple cases	Minh Le Bui	Qualitative	Perspective of managers and executives in digital transformation (Interview)	-
How can digital economy development empower high-quality economic development?	Wen Chen, Xiaoyu Du, Wei Lan, Weili Wu, & Murong Zhao	Independent Variable	Digital Economy Growth Level	Regional Total Productivity
The effect of enterprise digital transformation on green technology innovation: a quantitative study on chinese listed companies	Liang Tang, Haifeng Jiang, Shanshan Hou, Jun Zheng & Lianqi Miao	Independent Variable	Quality Development Index of Digital Economy	Green technology innovation

Title	Author	Variable Usage	Parameters	Dependent Variables
The impact of digital transformation on business performance	Muhammad Faraz Mubarak, Fazal Ali Shaikh, Mobashar Mubarik, Kamran Ahmed Samo, & Sanya Mastoi	Independent Variable	Big Data, Cyber-Physical Systems, and Internet of Things (Primary Data – Survey)	Performance of SMEs
Role of government to enhance digital transformation in small service business	Chun-Liang Chen, Yao-Chin Lin, Wei-Hung Chen, Cheng-Fu Chao, & Henry Pandia	Qualitative	Role of government in digital transformation of Small Service Business (Interview)	-
Digital transformation and localizing the sustainable development goals	Suzanna ElMassaha, & Mahmoud Mohieldinb	Independent Variable	Internet Penetration	Sustainable Development
Impact of digital transformation toward sustainable development	Mohammed Alojail & Surbhi Bhatia Khan	Independent Variable	Technology efficiency (Primary Data – Survey)	Sustainable Development

Variable Usage. Since this paper's objective is to identify the use of digital transformation in different literature and studies, analyzing how digital transformation was used as a variable is included in this review. As presented in Table 6, the studies that utilized quantitative research design used digital transformation as the independent variable. *Digital transformation* is a change made by technology that can affect different levels of the economy or organization. It can bring overall improvement or fall in a specific performance or process. For this reason, digital transformation is being used to measure its impact, effect, or influence in different sectors where it can be related, where it is being used, or where it can benefit. As for the studies with a qualitative design, digital transformation was still used as the central concept of their study, wherein perceptions regarding it (Minh, 2021) and the government's role were studied (Chen et al., 2021).

Parameters used in measuring Digital Transformation. Measuring digital transformation can be drawn from various areas such as trade, development, growth, innovation, internet use, or digital policies. By doing this, digital transformation's expected or unknown effect can be assessed and used to solve problems or implement policies that will benefit all. Based on Table 6 above, the parameters used in measuring digital transformation were: investment in Information and Communication Technologies and Digital Technologies Development (Cheng, Zhou, & Li 2023; Olcyzk & Kuc-Czarnecka, 2022; Gulnaz et al., 2020; Tiutiunyk et al., 2019; Afonasova et al., 2019; Xu, Sun, & Kong, 2024; Chen et al., 2023; Tang et al., 2023; Andrea et al., 2019; Mottaeva, Khussainova, & Yelena, 2022; Bocean & Varzaru, 2023; Mubarak et al., 2019; El Massaha & Mohieldnib, 2020), Digital Adoption Index (Aleksandrova, Truntsevsky, & Polutova, 2022), and Technology Efficiency (Alojail & Khan 2023).

Information and Communication Technologies (ICT) refers to the investment and acquisition of equipment and computer software, such as tools, technologies, and systems, to improve the creation, processing, and sharing of information and data that leads to development or innovation in different fields (Organization for Economic Cooperation and Development, 2017). ICT is being used in measuring digital transformation as it holds the core of the technology cycle and information regarding the use of technologies in economic activities. On the

other hand, the digital technologies development and adoption index measures how digitally developed an organization, or a country is (Skare & Soriano, 2021). It primarily holds data about the increase in the use of technology in a country and self-assessments on the progress of using digital transformation. Moreover, technology efficiency measures how businesses or the economy embed technologies in driving fundamental changes (Zuo et al., 2022). Technology efficiency is a parameter for digital transformation as it holds data such as changes and innovation processes and the reorganization of processes and strategies in the use of technology.

Dependent Variables. In addition, how digital transformation is being employed as a variable and how it is being measured, as shown also in Table 6, are the other factors or variables that the reviewed literature and studies used to relate to digital transformation. Half of the studies connected digital transformation with economic growth and development (Cheng, Zhou, & Li ,2023; Gulnaz et al., 2020; Aleksandrova, Truntsevsky, & Polutova, 2022; Mottaeva, Khussainova, & Yelena, 2022; Tiutiunyk et al., 2019; Afonasova et al., 2019; Demin, Mikhaylova, & Pyankova, 2023; Bocean & Varzaru, 2023; Chen et al., 2023; El Massaha & Mohieldnib, 2020; Alojail & Khan, 2023). According to Qureshi (2022), today's generation mainly lives in technological innovations, and digital technologies are one of the driving factors in this transformative change, in which economic paradigms are shifting. With this, the advances will affect the growth and development of economies, and it is necessary to measure, implement, and use its advantages properly—the reason why digital transformation is related to economic growth and development.

Other studies also relate digital transformation to the performance of businesses. According to Schwertner (2021), digital transformation impacts businesses similarly to people's everyday lives. Specifically, it transforms how businesses produce, promote, and operate. Therefore, digital transformation relates to it as it can make businesses grow or fall. Lastly, green innovation is a low-carbon, resource-efficient, and socially inclusive economy that pursues knowledge and practices leading to environmentally friendly lifestyles and businesses (The World Bank, 2023). It is related to digital transformation as digital technologies also shape the responses to climate change, particularly in reducing emissions in the energy, transportation, and other material sectors. In this way, studying the two can lead to a greener and more resilient innovation.

Discussion

Numerous studies have examined how the nation's macroeconomic stability is affected by the digital transformation of the economy and how it affects business performance. Nonetheless, there needs to be more consensus about the relationship between the digital economy, how it impacts enterprises, and how it might benefit various economic sectors.

In the study of Olcyzk and Kuc-Czarnecka (2022), digital transformation can be used to analyze economic growth indicators from where the available sources are. Like Mottaeva et al. (2022), digitalization affects most of the production processes and activities in the economy. This demonstrates how the availability of sources varies per country, enabling each to self-evaluate and generate resources effectively. In this way, the country may profit from the digital transformation in local and national contexts. In the rapid development of the digital economy, its importance can be demonstrated by its deep integration with economic and social sectors, promotion of digital transformation, and constant introduction of novel technologies, models, and industrial procedures. This results in the modernization and transformation of businesses, industry, and society, supporting innovation-based, sustainable economic growth.

In the study of Tiutiunyk et al. (2021), the result shows the bidirectional causality (significant link) between the economy's digital transformation and macroeconomic stability indicators. Also, in the study of Bocean and Varzaru (2023), it was confirmed that digital transformation has a positive impact on both sustainability and economic performance. This implies that sustainable development and digital trans-

formation are related. Competitiveness, creativity, and entrepreneurship all rise to greater degrees with the intensity of the digital transition, which in turn drives economic progress. Authorities may use these insights to generate sustainable development and economic competitive advantages.

On the other hand, Chen et al. (2021) explained that the four main barriers to digital transformation in small service businesses are lack of funding, digital capability, human resources, and technical barriers. In the study of Gulnaz et al. (2020), the findings show that despite the outstanding efforts of Kazakhstan in digitalization, the ICT industry contribution remains the same, even if it falls. The country's lack of innovation, venture capital, and innovation linkages is the cause, as evidenced by the global indexes. This results in low knowledge, technological, and creative outputs. The drivers of the digital economy and the progress of innovation in general are recognized. As a result, recommendations fall on creating a digital platform for small service businesses, encouraging digital and mobile payments, offering digital training, and creating an environment for a digital collaboration ecosystem.

Meanwhile, Demin, Mikhaylova, and Pyankova (2023) carried out an investigation that revealed that the benefits of digitalization are more visible in innovative regions. In line with this, regions with innovative industries tend to have more highly skilled digital workforces. Politicians and professionals in the IT sector who wish to encourage the use of contemporary technology might utilize the acquired results as a foundation for their management decisions. In the study of Cheng, Zhou, and Li (2023), the results reveal a positive nonlinear relationship, demonstrating that real economy enterprises' TFP is reduced at the initial stage of digital transformation and then improves after exceeding a critical threshold value. The digital transformation of real economy businesses affects TFP through financing restrictions, working capital turnover rate, and human capital structure. Similar to the study of Aleksandrova, Truntsevsky, and Polutova (2022), the macroenvironment and the readiness of the population for digital transformation do not allow digital technologies to affect economic growth seriously. The research's findings suggest that digitalization's potential to boost economic development depends on how prepared the economy is to embrace this change. Businesses and the public's willingness to adopt cutting-edge digital technology have a significant effect.

The digital transformation of the economy and businesses is crucial for economic modernization and transformation. It involves continuously producing high-quality innovations and enhancing overall development and competitiveness. In line with Veldhoven and Vanthienen (2023) research, digital transformation is a complex process. However, overviews can provide valuable guidance for both researchers and practitioners.

Businesses must dynamically allocate resources to understand digital demands and encourage digital reengineering of management processes. Integrating digital technologies into all business facets will significantly change how businesses function and satisfy customers, boosting industrial sector competitiveness and impacting both the public and private sectors. Many countries are implementing extensive supporting activities in digital technologies as they continue to drastically alter society and the economy. The conclusions of the evaluated research suggested that countries should invest in all educational initiatives meant to produce a new generation that can adjust to and use ICTs, in addition to developing 4G and fast broadband technologies. This corroborates Costa et al. (2022) research, which suggests that emerging economies must prioritize technological development to attain the Sustainable Development Goals to enhance sustainability outcomes.

As a result of the increased software skills resulting from digital transformation, there is a more significant potential for partnerships between the public and commercial sectors to promote public awareness of ICTs. In addition to economic development, digital transformation also impacts the drivers of sustainable development, such as social and environmental drivers. For instance, using digital technology may benefit commercial businesses, public

government, and more effective communication. Additionally, it can aid in resource conservation, promoting sustainable development, and reducing carbon emissions.

Conclusion

Nearly every state globally has already been impacted by digital transformation, and technologies are far more common than ever. As of 2020, the number of people with mobile phone connectivity exceeds those with electricity connections in their homes. The output of data worldwide is growing exponentially because of this reality. Countries with advanced stages of digitalization, exemplified by the widespread integration of digital technology and applications by enterprises, governments, and consumers, have seen noteworthy advantages for their public sectors, businesses, and economies.

The innovations made by the enhancement of the management system and expansion of management capacity via the use of digital technologies demonstrate the significance of digital transformation. With this, digital transformation has increased economic growth rates, enhanced the caliber of services offered, and created new opportunities for consumers and business owners in many countries. However, to get the most out of digitalization, stricter laws that guarantee business competition and worker skills that meet the needs of the contemporary workforce are required.

Today, countries and businesses are actively investigating the growth of the digital economy to lead global economic development and benefit from this new economic revolution. The competitive landscape between countries is shifting due to the digital economy, which is also emerging as a new engine for economic growth. Therefore, evaluating the state of the development of digital transformation aids in a thorough analysis of the benefits and drawbacks of digitalization and presents practical and focused recommendations for businesses' and countries' quick and sustainable growth in the future.

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