

Sustainability in the Age of Digital Transformation: Myths, Realities, and Future Pathways

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ABSTRACT

Innovations in the area of digital technology have changed drastically the current perception of sustainability. The theory of digital technology revolution based on the achievements in AI, big data analytics, cloud computing, and IOT, is believed to be a driving force of sustainability due to efficiency and optimization of resources used. However, more consideration needs to be given to this perspective. The current paper presents an analysis of the relationship between digital transformation and sustainability using a comparison of supposed and actual impacts of the digital revolution supported by secondary sources of data, which include scholarly articles, official documents, and industry surveys. Thematic and comparative method of analysis will be used in this paper, and it will focus on the impact of digital technologies on the environment, economy, and society separately. The findings indicate that although digital technology leads to innovations, increase in productivity, and promotes financial inclusion, it leads to a variety of problems, for example, increased electricity consumption, greenhouse gas emissions, and electronic waste. Moreover, the digital revolution intensifies the problem of inequality in accessing opportunities caused by the digital divide. **Keywords:** Digital Transformation, Sustainability, Sustainable Development, Green Technology, Digital Economy, Artificial Intelligence, E-waste, Energy Consumption, Digital Divide

INTRODUCTION

However, the beginning of the 21st century has been characterized by the rapid pace of digital transformation, which has radically changed the economic, business, and societal spheres. Technologies such as AI, big data analytics, cloud computing, and IoT have made it possible for companies to increase efficiency and make better decisions. On the other hand, the notion

of sustainability has become increasingly important in the face of the UN SDGs that require a careful balancing of economic, environmental, and societal considerations. In this environment, digital transformation has often been associated with sustainable development, with the premise being that technologies will inevitably lead to more effective use of resources.

However, nowadays the mentioned sustainable development model is facing growing criticism as well. On the one hand, even though digitalization leads to dematerialization and improvements in terms of efficiency, at the same time, it also causes particular environmental and social issues. First of all, the growing use of data centers, infrastructure, and electronics results in a higher consumption of natural resources and pollution rates. Second, due to the problem of obsolescence, there appears an additional issue related to electronic waste and possible risks associated with it. Finally, socially, digital inequality creates a problem related to digital divide and makes sustainable development impossible in various countries.

Considering both positive and negative aspects characteristic of the phenomenon of digitalization as well as of the notion of sustainability, the necessity emerges to investigate the problem of their correlation. Thus, the main aim of the current research paper is to explore the problem of interaction between these phenomena.

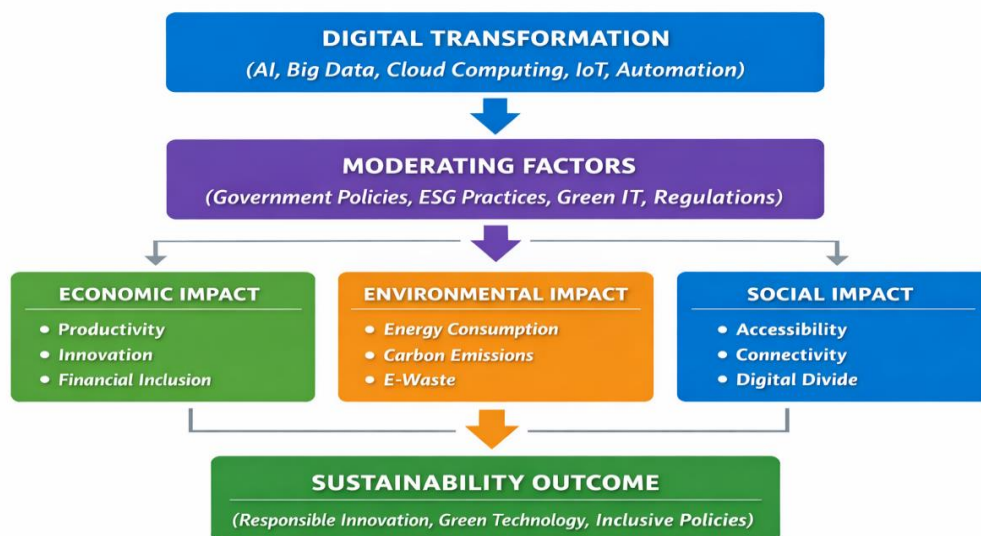
OBJECTIVES OF STUDY:

1. To investigate the relationship between digital transformation and sustainable development.
2. To understand the myths about digital transformation and sustainability.
3. To examine the impact of digital transformation on environment, economy, and society, using secondary sources of data.
4. To highlight the issues of increased energy usage, e-waste, and digital divide.
5. To propose recommendations for sustainable digital development in the future.

RESEARCH METHODOLOGY

For this current study, the secondary data collection method has been selected, and the research design methodology employed to study the relationship between digital transformation and sustainability will be descriptive and analytical in nature. Data has been gathered from credible sources such as academic journals and articles, research papers, and reports from international bodies around the world that include UN agencies, World Bank, OECD, International Energy Agency, and industry reports from McKinsey, Deloitte, and PwC. Information obtained was then analyzed using thematic and comparative approaches in order to identify existing trends and perspectives regarding digitalization and sustainability. In this research, the impact of digital transformation on the environment, economy, and society will be evaluated while distinguishing between misconceptions and realities. Since secondary data is being used exclusively in this research, there is no scope for primary data collection and statistical analysis.

CONCEPTUAL FRAMEWORK



In the above mentioned conceptual model, the interaction between digital transformation and sustainability is reflected through the direction of the mutual influence between the different dimensions. Being a process of enabling technology, which is related to the use of advanced technologies, such as artificial intelligence, big data, cloud computing, IoT, digital transformation might be regarded as the input. At this point, it is necessary to say that digital transformation cannot be regarded as a separate phenomenon, because its impact depends on various conditions including governmental policy, ESG initiatives, green IT, and so forth.

Thus, as shown in the above-mentioned conceptual model, digital transformation affects three important dimensions economy, environment, and society. At first, digital transformation contributes to the economic sphere by providing innovations and enhancing the productivity rate. The second one is environment; at this point, although the positive impact exists, the negative impact is also noticeable due to the increase in resource utilization, greenhouse gas emission, and the production of waste. Finally, society is positively affected by the provision of information and services but negatively affected by the expansion of the digital divide.

It is imperative to mention that, in the final stage of the model, the impact of digital transformation on sustainability cannot take place spontaneously, but rather depends on the existence of a connection between technology development and responsible innovation, greening technology, and inclusive policies. To sum up, the model provides a full understanding that the impact of digital transformation on sustainability happens under specific circumstances and depends on how these critical factors are managed.

MYTHS AND REALITIES OF DIGITAL TRANSFORMATION AND SUSTAINABILITY

1. Digitalization Is Environmentally Sustainable

Digitalization is perceived as environmentally friendly because it guarantees that fewer materials and papers will be needed. At the same time, recent studies prove that this assumption ignores the impact of environmental concerns associated with digitalization. Specifically, Bieser & Hilty (2018) note that information and communication technologies produce some environmental impacts that are not directly related to them. At that, the mentioned environmental impacts occur due to the use of energy. In more detail, the growth of data centers increases electricity usage. This fact is confirmed by Hilty & Aebischer (2015). Data centers

are among those sectors that contribute greatly to energy consumption and carbon dioxide emissions, according to the International Energy Agency (2023). Additionally, Forti et al. (2020) state that digitalization increases electronic waste generation.

2. Artificial Intelligence Is Always Sustainable

Artificial intelligence has been seen as a technology that can be used to optimize the use of resources and make operations more efficient. George et al. (2021) posit that digital technologies, including artificial intelligence, can contribute to sustainability through improved efficiency and intelligent decision-making. Nevertheless, Brynjolfsson and McAfee (2017) indicate that the processing involved in running an AI model consumes energy, which implies higher energy use. In addition, Acemoglu and Restrepo (2020) suggest that there are various impacts on the economy and society associated with the adoption of automation, and such effects may conflict with the objectives of sustainability. Similarly, OECD (2021) indicates that advancements in technologies lead to increased energy demands.

3. E-commerce Is More Environmentally Sustainable than Traditional Retail

While e-commerce is seen as an environmentally sustainable choice because of lower physical infrastructural demands, research provides a more nuanced picture. As pointed out by UNCTAD (2021), the growing popularity of e-commerce increases waste generated by packages and increases emissions during deliveries. Also, last-mile delivery, which is a crucial factor influencing urban CO₂ emissions, is underlined by the World Economic Forum (2022). Moreover, Deloitte (2023) shows that increasing pressure for faster delivery adds to the negative environmental impact caused by e-commerce. Finally, according to Loiseau et al. (2016), consumption behavior induced by digital platforms may lead to higher resource consumption levels.

4. Digital Transformation Always Results in Sustainable Development

Digital transformation has been taken for granted as an effective measure toward sustainable development due to increased efficiency and better management. Nevertheless, such an understanding is too simplified. According to Melville (2010), even though information systems can promote environmental sustainability, it is important to remember how such

information systems are managed. In addition, the UN (2023) notes that any sustainability should include efforts aimed at aligning technologies to meet the requirements of both environment and society. The World Bank (2022) underlines the same idea by arguing that if there are no mechanisms of governance, digital development may harm the environment and society.

FINDINGS OF THE STUDY:

Based on the results of the analysis of secondary data about digital transformation and sustainability, the following conclusions can be drawn:

1. Digital Transformation Does Not Guarantee Sustainability

The results of the study indicate that digital transformation does not imply sustainability. On the one hand, it is efficient and uses fewer physical resources; however, on the other hand, digital technologies require higher energy expenses. Therefore, it can be assumed that sustainability needs to be purposefully achieved through the use of digital solutions.

2. Environmental Consequences are Underestimated

It can be concluded that there are many hidden environmental costs of digitalization. In particular, carbon dioxide emissions and e-waste become the significant environmental challenges caused by digital technologies.

3. Economic Benefits of Digital Transformation

Another conclusion made based on the analyzed secondary sources is that digital technologies have a positive impact on economic development since they foster innovation and increase productivity.

4. Persistence of the Digital Divide

Despite the progress that has been made, digital technology access is not equal across geographical locations and socioeconomic status, causing a disparity that is a major hindrance to inclusive growth and exacerbating inequality, especially in emerging economies.

5. Double-Edged Nature of Digital Transformation

In light of the findings, digital transformation is found to be beneficial as well as detrimental for the future due to both positive effects and potential negative consequences.

DISCUSSIONS:

It can be seen from the above-discussed findings that there are many complexities involved in digital transformation and sustainability and one needs to understand the relationship between both concepts in relative terms. Although digital technology has been a great facilitator of economic progress and efficiency, it also has serious environmental and social concerns that should not be overlooked. The analysis of these results suggests that there is a clear disconnect between the apparent advantages of digitalization and its real influence, thus underpinning the concept of the sustainability paradox.

Economic sustainability refers to the process of economic development that contributes to improving overall living conditions without deteriorating natural resources for future generations. From an economic point of view, digital transformation has been found to be a powerful instrument for driving productivity, innovation, and financial inclusion. The spread of digitalization in business has led to scaling up operations and expanding the target markets of enterprises. This notion corroborates the current literature that states that digital technologies are key enablers of economic sustainability.

The environmental side of digital transformation is more important. While digitalization leads to reduced dependency on natural resources, it increases the dependence on energy-demanding facilities like data centers and cloud servers. With the rapid increase in digital services, there has been an increase in power usage and carbon footprint. Another environmental challenge in the age of digital transformation is the rapid obsolescence of technological devices leading to generation of electronic waste (e-waste). Thus, the discussed findings demonstrate the double-edged nature of digitalization in relation to sustainability.

Socially, digital transformation has provided access to digital services in various spheres such as education, health care, and finance. In particular, people can now use computers and the internet to receive education, conduct online medical consultations, and carry out financial transactions. Nevertheless, because of digital divides, digital services are not available to all

members of society. As a result, it is imperative to ensure access to digital technologies for everybody. In general, as seen from the above-discussion, digital transformation is a phenomenon with potential advantages and disadvantages. Digitalization cannot be sustainable unless there will be proper management and regulation of technologies.

CONCLUSION:

This research study analyzed the link between digital transformation and sustainability based on the secondary analysis method. The results of the work reveal that although digitalization made a great contribution to the growth of economies, innovations, and accessibility, its effect on sustainability is a much more complicated issue than previously thought. The myth that digitalization is sustainable can be debunked based on the facts about the increased energy use and carbon emissions, not to mention the increasing problem of e-waste. On the other hand, the role of digitalization in increasing financial inclusion and access to services shows its potential contribution to sustainable development.

Nevertheless, this research shows that digital transformation is a two-sided concept that poses both threats and benefits for sustainability. Although it increases efficiency and connectivity, digital transformation also creates more environmental challenges and social inequalities due to the emergence of the digital divide. Thus, sustainability in the age of digital transformation cannot occur automatically; rather, it should be carefully planned and achieved by integrating green technology and innovation with a holistic approach to policy development.

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