Digital Technology in the Context of Sustainable Development

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Abstract: This article explores the concept of Digital technology and its role in advancing Sustainable development goals (SDGs) within the educational context. It delves into the potential of Digital technology as a means to bridge the gap between traditional pedagogical practices and the dynamic demands of the 21st century. By examining the transformative power of technology in education, this exploration seeks to shed light on how educational institutions can leverage digital advancements to foster sustainable development and achieve the SDGs. Throughout this discourse, we will delve into various aspects of Digital technology , including the significance of SDGs in education, the need for pedagogical transformation, and how technology can act as an enabler for educational reform. Furthermore, it underscores the importance of aligning educational practices with the SDGs to foster sustainability and empower students as active contributors to society. The challenges and opportunities associated with integrating technology in education to achieve the SDGs are discussed. By embracing Digital technology, educational institutions can create inclusive, equitable, and sustainable learning environments. This article offers valuable insights for further research and implementation of digital technology approaches worldwide to support sustainable development initiatives in education.

Keywords: Digital technology, Sustainable development, Economy, Innovation, Human capital

Introduction

In today's rapidly evolving digital landscape, technology has emerged as a powerful catalyst for transformation across various sectors, including education . With the growing recognition of the significance of sustainable development, educational institutions are actively seeking innovative approaches to align their objectives with the global agenda of accomplishing Sustainable Development Goals (SDGs). Sustainable development is focused on improving the quality of life at the global level, ensuring equal access to education and public goods, and caring for the environment and biodiversity, as well as responsible consumption and production. Digital technologies are among the main drivers of sustainable development. It is very important to develop government strategy and choose correct measures aimed at ensuring sustainable development of the countries in terms of the digitalization processes.

The purpose of this study is to clarify the role and specifics of human capital development in the new digital reality, grouping factors that stimulate or constrain employment, trends in the use of human capital, and emerging risks in the field of inclusiveness, innovation, and security. Specifically, in the present study, the conditions for the development of human capital in the digital economy were analysed. Sustainable development involves not only the competent, rational use of natural resources by current generations but also measures to preserve the environment for the sake of the life of future generations. Therefore, an important point of education for sustainable development is the practical implementation of the laid foundations of

sustainability, the provision of early action to address environmental problems, as well as the problems of sustainable economic and social development.

The globalization of the world economy, politics, and culture became the main issue of the development of world civilization at the beginning of the new millennium. Modern education is also involved in the process of globalization with its positive and negative impacts. The current stage of development of the education system reflects the needs of the world community, generated by the process of globalization of the world economy. The world educational space, which until recently was a collection of separate national education systems, is gradually turning into an integral system of world education.

Literature Review

According to a number of authors (Corejova, & Al Kassiri, 2016; Johnson, 2023), one of the main tasks of modernizing the education system and the educational environment is to create conditions for quality education. It is the implementation of measures to introduce a digital educational environment that will create conditions for the formation of digital competence of a specialist, which today plays a key role in ensuring its competitive position. A similar opinion is shared by another group of scientists (Rieckmann , 2017; Thompson, 2023), according to which the issue of reforming the educational system in the direction of ensuring the sustainable development of not only the region but also the country involves the development and implementation of innovative educational systems and technologies.

Analyzing specialized scientific sources, we can conclude that today the issue of introducing innovative digital technologies for the development of the educational environment is a fairly relevant and well-studied topic. A large number of scientists have already proved the importance of this process both in terms of ensuring the development of the educational system and in terms of forming a competitive specialist. The issue of using modern digital technologies for the development of the educational environment in the system for ensuring the sustainable development of the region has been studied to a small extent.

This paper employed a systematic literature review approach to gather 33 relevant journal articles, proceedings, and government reports on the area of research to elicit information and insights on the topic by searching through Scopus, ResearchGate, and Google Scholar. The study extensively references various studies and research articles and grouped them based on the area discussed like digital technology. The evidence was present on the transformative potential of technology in achieving the SDGs in education. By incorporating these sources, the paper strengthens its claims about the benefits, challenges, and strategies associated with integrating technology in education and aligning educational practices with the SDGs. This thorough literature review demonstrates the paper's reliance on existing research to establish a solid foundation of knowledge and offer valuable insights into smart learning environments and its contribution in contributions to SDGs in the education context.

At the first stage of this study, a literature review was carried out considering the problems associated with human capital development in the digital economy. At the second stage, an analysis of the preparedness of different countries for this development of human capital was carried out. A cross-country analysis was carried out using global indices provided by leading institutions to obtain a summary indicator and rank the nations in terms of preparedness. At the third stage, the obtained results were analysed, and trends in the development of human capital in the digital economy—together with the associated risks—were identified. The analysis was carried out on the basis of data from the scientific publications, expert opinions, and data from international institutions as well as statistical indicators.

Method

The swift progress of the technological landscape has made digital transformation an essential driver for organizational growth and success (Adams, 2023). The majör aim to remain competitive and adapt to evolving customer needs, the sustainable adoption of innovative digital technologies has emerged as a critical aspect of their digital transformation path. The concept of continuous digital transformation involves responsibly and durably integrating digital technologies into business processes while considering their environmental, social, and economic impacts. Achieving the sustainable adoption of these innovative digital technologies requires organizations to carefully evaluate their environmental footprint, optimize energy consumption, and minimize e-waste . It also involves addressing the social implications of technology adoption, such as privacy concerns, ensuring inclusivity, and promoting digital

literacy among employees and customers. By embracing sustainable practices in the adoption of innovative digital technologies, organizations can not only attain operational efficiencies and cost savings but also contribute to the greater good by reducing their carbon footprint, supporting social development, and driving economic growth (Chinoracký, 2019). In the context of globalization transformations, the modern paradigm of innovative development of human capital is a key lever of increasing the competitiveness of the country, a major factor in the development of an innovative and investment model of state development . With the development of scientific and technological progress, information and communication technologies, human capital occupies a central place as a carrier of intelligence, knowledge, skills, experience, and professionalism.

Human development is a continuous process of qualitative and quantitative changes that lead to an increase in the level of education, culture of man, his mental and spiritual maturity. Innovative development of human capital is characterized by fundamentally new approaches that are embodied in the introduction of a new model of "life-long learning" and the formation of a new model of working life, where the main focus is innovative work; the application of social technologies, innovative forms of employment, the use of new models of working time, etc. Increasing investment in human development (from the state, business, personality) leads to an increase in its level of intellectualization, which is the basis for sustainable economic development (Tohãnean, 2020).

In recent years, there have been notable efforts to integrate the SDGs into educational systems worldwide. Many countries are incorporating sustainable development themes and concepts into curricula, encouraging project-based learning, and promoting environmental stewardship and social responsibility. Educational institutions are also adopting innovative teaching methodologies and technologies to enhance student engagement and empower learners as active agents of change. Understanding the SDGs in education goes beyond awareness; it requires action and implementation. It involves fostering a culture of sustainability within educational institutions and communities, promoting participatory decision-making processes, and encouraging problem-solving and critical thinking skills. By embracing the principles of the SDGs, education becomes a powerful tool for nurturing responsible global citizens who can contribute to a more sustainable and equitable world. This cannot be achieved without adequate technology integration.

Results and Discussion

This study is based on an analysis of conceptual approaches to measuring the impact of the digital transformation on the development of human capital. In accordance with the systematic method of studying trends in the field of education, health care, and employment, the processes that change the requirements for human capital with both a destructive and positive impact on its development are specifically analysed (Table 1).

This proves the feasibility and necessity of modern educational technology–based approach to successfully and sustainably develop new technology-based schools and is the destination of the transformative model hereinafter. The fourth industrial revolution has brought about significant changes to the process of human capital development. Nowadays, information technologies overcome territorial and temporal barriers, creating opportunities for flexible and non-standard forms of employment. Thanks to digitalisation tools, young people, women with children, and people with disabilities— previously considered the most vulnerable groups—now enjoy an increased competitiveness and new opportunities in the labour market. The availability of smartphones and mobile Internet as well as the development of electronic payment systems have created new income-generating mechanisms for young and enterprising African women (Bailur & Masiero, 2018). Overall, there is a steadily increasing demand in the labour market for pro-fessionals in the digital environment field as well as specialists with the competencies necessary to work with digital tools . There is also a demand for specialists with the skills to build effective communication in management, education, and marketing .

The impact of Digital technology in advancing SDGs can be assessed through various indicators that measure its effectiveness in promoting sustainable development and addressing the targets outlined by the SDGs. By evaluating key factors such as educational outcomes, student engagement, access to quality education, and the integration of SDGs into the curriculum, we can gauge the extent to which Digital technology contributes to SDG advancement. One important aspect to assess is the educational outcomes achieved through Digital technology initiatives. This includes measuring improvements in student performance, critical thinking skills, problem-solving abilities, and knowledge acquisition. By examining academic accomplishments and learning outcomes, we can determine the effectiveness of Digital technology in delivering quality education and ensuring that students are equipped with the necessary skills and knowledge to contribute to sustainable development (Smith, 2023).

Table 1. Impact of educational technology on the transformative model

	Modern educational technology-based approach	
Characteristics	Description, evidence	Impact
Integrity and synchronization	Reflected in the correlation among major components of Educational Technology (4M: Method-Materials-Media-Man Power)	The solution should be comprehensive, synchronous, and consistent with the overall development goals of the school.
Mutuality and the key factors to education effectiveness	Reflected in the synchronous development and mutual support between hardware and software, in which software (instructional design) is the key factor to education effectiveness	The solution should focus on the development of teachers' competence in instructional technology; Ensure synchronous development between technological infrastructure and the capacity to use it efficiently.
Openness, constant updates and flexibility	Reflected in the constant updates of the technological component, requiring practical changes in education.	The solution requires a vision for the development of new technology-based schools (e.g. in the orientation to an education ecosystem)
Diversity, creativity and differences without losing effectiveness	Reflected in the appearance of many forms of teaching due to the diversity of technology.	The solution should ensure diversity, allowing schools to select the forms of teaching consistent with the reality and teachers' competence.
Feasibility	Reflected in the strategic implementation of instructional technology, including the following stages: analyze, design, implement, evaluate and adjust.	The solution should follow the instructional technology process to ensure success and optimal quality.

Furthermore, assessing student engagement is crucial in understanding the impact of Digital technology on SDGs. Student engagement indicators can include participation rates, levels of motivation, active involvement in learning activities, and collaborative interactions. Digital technology platforms that encourage interactive and personalized learning experiences, virtual simulations, and peer collaboration contribute to increased student engagement, fostering a sense of ownership and empowerment in accomplishing the SDGs. The integration of SDGs into the curriculum is another significant factor to assess. Evaluating the extent to which SDGs are incorporated into the educational content, teaching materials, and assessment methods can provide insights into how effectively Digital technology promotes awareness, understanding, and action towards the SDGs. Digital technology should ensure that the curriculum reflects the interconnected nature of the SDGs, fostering a holistic understanding of sustainable development and empowering students to address complex global challenges (Brown, 2023).

Additionally, evaluating access to quality education through Digital technology initiatives is essential. This includes assessing the availability of technology infrastructure, digital resources, and equitable access to educational opportunities. Digital technology should strive to bridge the digital divide and provide equal access to quality education for all learners, irrespective of their socio-economic backgrounds or geographic locations. To accurately assess the impact of Digital technology on SDGs, it is important to utilize a combination of qualitative and quantitative methods. Surveys, interviews, observations, and academic assessments can provide valuable insights into the effectiveness and outcomes of Digital technology initiatives in advancing SDGs. Longitudinal studies and monitoring mechanisms can track progress over time and identify areas for improvement, ensuring continuous evaluation and refinement of Digital technology strategies in alignment with the SDGs.

Conclusion

Thus, the innovative development of human capital is a major factor in building a model of sustainable economic development in the context of globalization transformations, as it is formed through investment in human beings. The effectiveness of investment is determined by the level of development of productive abilities

of the individual, capable of innovative work, creativity, creativity. The growth of the role of human capital in the conditions of sustainable development of the innovative economy necessitates the use of new approaches to its assessment, formation, anddevelopment. An important role in the reproduction of human capital is played by the state, which pursues regulatory policy using regulatory acts. The formation ofan effective organizational and economic mechanism of state regulation of human capital development is a priority task that will create appropriate conditions for increasing the quality of human capital, its innovative potential, which will enhance the competitiveness of the national economy.

Digital technology will play a critical role in the achievement of the SDGs, although innovation will most likely affect progress in both positive and negative ways. The deployment of new technologies could be essential for achieving the SDGs, considering the need for accelerated progress to fulfil the goals by 2030. At the same time, as new technologies are usually unavailable to marginalized populations, it will be a key challenge to ensure that no one is left behind in the fourth industrial revolution, as new innovations often exacerbate existing divides in society between those who can benefit, and those who are left behind. In addition, with the current speed of innovation, there are many opportunities and risks that are still unknown, but could rapidly crystallize, without regulators being able to respond in a timely manner. Further research will be to develop strategic directions and mechanisms for the development of innovative human capital, using the foreign experience of developed countries.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPESS Journal belongs to the authors.

Acknowledgements or Notes

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