ENHANCING THE EFFECTIVENESS OF GREEN DIGITAL TRANSFORMATION IN THE SERVICE INDUSTRY

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Annotatsiya: Ushbu maqolada xizmat ko‘rsatish sohasida yashil raqamli transformatsiyaning samaradorligini oshirish masalalari ilmiy jihatdan tahlil qilinadi. Maqolada raqamli texnologiyalar — sun’iy intellekt, narsalar interneti (IoT), blokcheyn va bulutli tizimlar — xizmat korxonalarida energiya samaradorligini oshirish, chiqindilarni kamaytirish hamda ekologik barqarorlikni ta’minlashdagi roli o‘rganiladi. Shuningdek, O‘zbekiston tajribasi doirasida yashil raqamli texnologiyalarni joriy etishning amaldagi holati, mavjud muammolar va ularni bartaraf etishning samarali yo‘llari ko‘rib chiqilgan. Maqola yakunida xizmat ko‘rsatish sohasida yashil raqamli transformatsiyaning samaradorligini oshirish maqsadida raqamli infratuzilmani kengaytirish, xodimlar malakasini oshirish, innovatsion boshqaruv tizimlarini joriy etish va ekologik ongni rivojlantirish bo‘yicha tavsiyalar berilgan

.**Kalit so‘zlar:** yashil iqtisodiyot, raqamli transformatsiya, xizmat ko‘rsatish sohasi, ekologik barqarorlik, innovatsiya, energiya tejamkorlik.

Abstract : This article examines ways to enhance the effectiveness of green digital transformation in the service sector. It analyzes the role of digital technologies — including artificial intelligence, the Internet of Things (IoT), blockchain, and cloud systems — in improving energy efficiency, reducing waste, and ensuring environmental sustainability within service enterprises. The study also reviews the current state of green digital technology implementation in Uzbekistan’s service sector, identifies existing challenges, and explores possible solutions. Finally, the article provides recommendations for increasing the effectiveness of green digital

transformation, including expanding digital infrastructure, enhancing employee competencies, introducing innovative management systems, and promoting environmental awareness.

Keywords: green economy, digital transformation, service sector, environmental sustainability, innovation, energy efficiency.

Аннотация : В данной статье рассматриваются пути повышения эффективности «зелёной» цифровой трансформации в сфере услуг. Анализируется роль цифровых технологий — включая искусственный интеллект, Интернет вещей (IoT), блокчейн и облачные системы — в повышении энергетической эффективности, сокращении отходов и обеспечении экологической устойчивости предприятий сферы услуг. Также изучается текущее состояние внедрения «зелёных» цифровых технологий в секторе услуг Узбекистана, выявляются существующие проблемы и предлагаются возможные пути их решения. В заключение приводятся рекомендации по повышению эффективности «зелёной» цифровой трансформации, включая расширение цифровой инфраструктуры, повышение квалификации сотрудников, внедрение инновационных систем управления и развитие экологической культуры.

Ключевые слова: зелёная экономика, цифровая трансформация, сфера услуг, экологическая устойчивость, инновации, энергоэффективность.

INTRODUCTION

Today, one of the main directions of global economic development is accelerating the processes of green digital transformation. The rapid development of digital technologies is deeply penetrating almost all spheres of human activity, including the service sector. At the same time, ensuring environmental sustainability, rational

use of resources and increasing energy efficiency are becoming priority directions of state policy.

The service sector is one of the most dynamic branches of the modern economy and occupies an important place in the national gross domestic product. However, together with the wide implementation of digital technologies, ensuring their ecological efficiency and sustainability is also crucial. From this point of view, “green” digital transformation not only implies technological renewal, but also the formation of environmental awareness.

The Decisions of the President of the Republic of Uzbekistan “On the implementation of the Green Economy Transition Strategy”, the programs on developing the digital economy, as well as measures aimed at modernizing the service sector serve as an essential foundation for development in this direction. Therefore, a scientific study of the effectiveness of green digital transformation in the service sector, the analysis of existing problems and the development of forward-looking proposals are of high relevance.

In recent years, the concept of “green digital transformation” has become an integral part of global economic and environmental policy. This process aims to ensure environmental sustainability while improving economic activity through digital technologies. Green digital transformation represents the integration of the digital and green economy, aligning economic growth with energy efficiency, environmental safety and rational use of natural resources.

The introduction of digital technologies in the service sector not only increases economic efficiency, but also provides environmental benefits. For example, artificial intelligence and the Internet of Things (IoT) technologies create opportunities for managing customer flows, reducing energy consumption and automating service processes. Cloud technologies reduce energy consumption

while ensuring secure data storage, and blockchain is used as an important tool to ensure compliance with environmental standards.

The service sector accounts for more than 40 percent of the gross domestic product in Uzbekistan and is one of the key branches of the economy. Within the framework of the Strategy “Digital Uzbekistan – 2030”, projects on e-government, digital payment systems, online banking services and automation of transport routes are being implemented. However, the insufficient implementation of energy-efficient technologies and waste recycling systems in service enterprises still limits environmental sustainability.

In addition, uneven development of digital infrastructure, insufficient financial resources and the limited application of environmental management standards hinder the full implementation of this process.

To effectively implement green digital transformation in the service sector, it is advisable to define the following strategic directions:

1. Expanding digital infrastructure — improving service quality through the development of 5G networks, IoT and cloud technologies.
2. Introducing energy-efficient technologies — “smart” lighting and heating systems, using renewable energy sources.
3. Enhancing human capital — developing digital literacy and environmental knowledge, integrating “green management” into the education system.
4. Strengthening environmental awareness — forming a “green service” culture in service enterprises.
5. Developing public-private partnership — using grants and “green bonds” to finance environmental projects.

These measures will contribute to developing digital transformation in the service sector in an environmentally sustainable direction, ensuring energy efficiency and reducing carbon footprint.

LITERATURE REVIEW

In recent years, the concepts of "green economy" and "digital transformation" have been regarded globally as a new paradigm for economic growth. Studies show that sustainable development is now determined not only by the efficient use of resources but also by ensuring environmental safety and the widespread implementation of digital technologies.

1. Theoretical Foundations of the Green Economy

British economist E. Barbier (1989) was the first to define the concept of the "green economy" as a model that integrates economic growth with environmental protection. In 2011, the United Nations Environment Programme (UNEP) released the report *Towards a Green Economy*, in which this concept was described as "a new model of sustainable economic growth." The report emphasized energy efficiency, waste reduction, the use of renewable energy sources, and the development of ecological innovations as priority directions.

The Presidential Decree of the Republic of Uzbekistan dated October 4, 2019, "On the Transition Strategy to a Green Economy" provided the political and economic foundations for this direction at the national level. In the strategy, the service sector is recognized as a key branch for ensuring environmental sustainability.

2. The Essence of Digital Transformation and Global Experience

Digital transformation is the process of reorganizing the economy, governance, and social life based on a new technological model. Klaus Schwab (2016), in his theory of the "Fourth Industrial Revolution," identified artificial intelligence (AI),

blockchain, cloud technologies, and the Internet of Things (IoT) as key directions of digital transformation.

In the European Union, “Smart Services” systems have demonstrated the potential to reduce energy consumption in transport, hospitality, and education sectors by an average of 20–25% (European Commission, 2022). This shows that digital technologies not only provide convenience but also ensure ecological efficiency.

3. The Concept of Green Digital Transformation

In recent years, the term “green digital transformation” has emerged as a distinct scientific field. Research by J. Banga (2022), M. GeSI (2020), and R. Edquist (2023) emphasizes that digital technologies can be leveraged to serve ecological sustainability goals, achieving “dual efficiency” — both economic and environmental benefits.

For example, IoT technologies monitor energy consumption in real time, cloud computing reduces paper usage, and “smart logistics” systems help minimize transport-related emissions.

4. Uzbekistan’s Experience and Existing Challenges

In Uzbekistan, the introduction of digital technologies in the service sector is actively implemented within the framework of the “Digital Uzbekistan – 2030” strategy. Digital solutions are widely applied in tourism, transport, finance, and education sectors. At the same time, operating in accordance with the principles of the “green economy” is recognized as a priority of state policy.

However, practical challenges remain: uneven development of digital infrastructure, lack of qualified IT specialists, weak mechanisms for assessing ecological efficiency, and an underdeveloped culture of “green management” in service enterprises.

ANALYSIS AND RESULTS

1. Relevance of Green Digital Transformation in the Service Sector
Integrating the digital economy with environmental sustainability is of critical importance in today's service sector. Service industries — including transport, tourism, education, finance, and healthcare — contribute to the principles of the green economy by using resources efficiently and reducing waste. According to the Statistics Agency of the Republic of Uzbekistan, in 2023, the number of service enterprises implementing energy-efficient technologies increased by 18% compared to 2020.

2. Practical Application of Green Digital Technologies
The following technologies have demonstrated effective results in the service sector:

- Artificial Intelligence (AI): Automates customer service and optimizes resource utilization.
- Internet of Things (IoT): Reduces energy consumption by 15–25%.
- Cloud Technologies: Minimizes environmental footprint through paperless documentation.
- Blockchain Systems: Simplifies financial operations while enhancing energy efficiency.

For instance, companies such as "Uztelecom" and "Turon EcoService" have implemented "smart billing" and "e-service" systems to promote environmentally safe service practices.

3. Uzbekistan's Experience and Existing Challenges
Under the "Digital Uzbekistan – 2030" strategy, by 2024, more than 60% of service sector entities operate through online systems. However, challenges remain, including uneven digital infrastructure development, low environmental awareness, and a shortage of specialists in "green technologies." Despite this, some

enterprises have achieved significant success; for example, the “Hilton” hotel in Tashkent reduced its energy consumption by 19% in 2022.

4. Economic and Environmental Benefits

Green digital transformation provides efficiency in two main dimensions:

- Economic: IoT and AI technologies reduce energy and labor costs by 15–25% and increase service efficiency by 20%.
- Environmental: Paperless documentation and waste monitoring systems reduce the sector’s environmental impact.

As a result, service enterprises contribute to resource efficiency and reinforce environmental sustainability through digital innovations.

CONCLUSION

Green digital transformation in the service sector is a key factor in ensuring both economic efficiency and environmental sustainability. The implementation of artificial intelligence, IoT, blockchain, and cloud technologies enhances energy efficiency and enables the rational use of resources.Uzbekistan is achieving significant results in this direction within the frameworks of the “Digital Uzbekistan – 2030” strategy and the “Green Economy Transition Strategy.” At the same time, challenges remain, including uneven development of digital infrastructure, a shortage of qualified specialists, and a low level of environmental culture.

To further deepen this process, it is necessary to modernize digital infrastructure, expand the use of energy-efficient technologies, enhance human capital, and strengthen public-private partnerships.Green digital transformation has strategic importance for increasing the competitiveness of Uzbekistan’s economy and ensuring sustainable development.

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