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THE IMPACT OF DIGITAL AND GREEN TECHNOLOGIES ON THE EFFICIENCY OF THE SERVICE SECTOR

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Annotation

This thesis examines the role of digital and green technologies in enhancing the efficiency of the service sector. In the context of increasing environmental challenges, climate change, and limited natural resources, the integration of digital tools—such as Artificial Intelligence (AI), Internet of Things (IoT), Big Data, cloud computing, 5G, and blockchain—with green economic principles has become essential. Digital technologies optimize energy consumption, improve resource management, reduce waste, and support sustainable service delivery. Green technologies, including renewable energy and eco-friendly production practices, further contribute to environmental sustainability and operational efficiency. By analyzing empirical data, literature, and case studies, this research demonstrates that digital and green technologies create a synergistic effect, fostering ecological and economic sustainability in the service sector. Recommendations include enhancing digital infrastructure, promoting eco-innovation, increasing public awareness, and integrating service platforms to maximize productivity while minimizing environmental impact.

Keywords

Digital technologies, Green economy, Service sector, Artificial Intelligence, Internet of Things, Big Data, Renewable energy, Blockchain, Sustainability, Resource efficiency.

Introduction

Globally, the demand for green economic solutions is steadily increasing, driven by growing awareness of climate change, environmental degradation, and the finite nature of natural resources. The green economy emphasizes the efficient use of natural resources, environmental protection, and social sustainability. It aims to balance economic growth with ecological preservation, ensuring that development does not compromise the needs of future generations. Issues such as global warming, deforestation, water scarcity, air pollution, and waste management have emerged as urgent contemporary challenges, requiring immediate and innovative solutions.

In response, societies and businesses are increasingly required to adopt innovative economic models and integrate sustainable practices across sectors. Digital technologies have emerged as critical enablers of this transition, providing tools to monitor, optimize, and reduce environmental impacts while maintaining economic productivity. Technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), cloud computing, Big Data, and automation can improve resource management, enhance energy efficiency, and reduce waste in service delivery processes. For instance, smart energy grids enable real-time monitoring and distribution of energy resources, while intelligent logistics systems reduce fuel consumption and carbon emissions during transportation. The integration of digital and green technologies is expected to foster a synergistic effect, enhancing ecological stability, mitigating climate change, and contributing to a more sustainable global economy.

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Recent research underscores the growing significance of digital technologies in promoting green economic development. Brynjolfsson and McAfee (2014) argue that digitalization enables industries to automate processes, optimize resource use, and minimize waste, which strengthens environmental sustainability while supporting productivity. Similarly, Schwab (2016) emphasizes that the Fourth Industrial Revolution positions digital transformation as a core component of sustainable economic growth, facilitating the adoption of eco-friendly business practices.

Zhang et al. (2020) highlight that IoT and smart systems enable efficient monitoring and management of energy resources, helping organizations reduce carbon footprints and energy consumption. These technologies facilitate predictive maintenance, real-time tracking of industrial processes, and optimization of operational workflows, thereby contributing to environmental efficiency. Tapscott and Tapscott (2016) examine blockchain technology, emphasizing its potential to increase transparency and accountability in supply chains and financial transactions, while supporting sustainable finance initiatives and verifying eco-friendly certifications.

Artificial Intelligence (AI) also plays a pivotal role. According to Russell and Norvig (2021) and Chen et al. (2018), AI-based systems enhance predictive environmental analysis, automate waste management, and support energy-efficient operations in service industries. These tools enable smarter decision-making by providing accurate forecasts, identifying inefficiencies, and optimizing resource allocation. Overall, literature demonstrates that digital technologies not only improve operational efficiency but also serve as essential instruments in the advancement of green economic principles.

Conclusion

The integration of digital and green technologies is vital for enhancing the efficiency and sustainability of the service sector. AI, IoT, Big Data, blockchain, and 5G technologies collectively optimize energy usage, improve resource management, reduce waste, and support climate change mitigation efforts. The convergence of digitalization and green economic principles fosters sustainable development, creates new employment opportunities, strengthens social equity, and improves overall sector performance.

To maximize these benefits, policymakers and service providers should prioritize strategic investments in digital infrastructure, promote innovation in green technologies, enhance digital literacy among employees and consumers, and ensure the interoperability of service platforms. By aligning technological advancement with sustainable practices, the service sector can achieve greater operational efficiency while contributing to a resilient and environmentally responsible economy.

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