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Implementation of Sustainable Operations Management in the Digital Age: Toward a Greener and More Efficient Business

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ABSTRACT

This study discusses the importance of sustainable operational management in the digital era. The purpose of this study is to explore how digital transformation has changed the industrial sector, as well as green business practices, technology, and innovation for sustainability, innovative products and services, and sustainable operational management. The research method used is a literature review of various relevant sources, including scientific journals, reports, and current articles. The analysis technique used is descriptive analysis to identify trends, challenges, and opportunities in implementing sustainable operational management in the digital era. The research results show that digital transformation has brought significant changes to various industrial sectors. Companies that adopt green business practices, technology, and innovation for sustainability and innovative products and services can improve their triple bottom line performance and gain a competitive edge in the market. The case study of Unilever shows that by embracing green digitalization tools and integrating sustainability into all activities, organizations can achieve their sustainability goals. However, there are challenges and opportunities that need to be faced in implementing sustainable operational management in the digital era.

Keywords: *sustainable operations management, digital age, greener, efficient business*

1. INTRODUCTION

In the current digital era, sustainable operational management has become increasingly important for companies that want to remain competitive and relevant. Digital transformation has changed the way companies plan, organize, manage, and oversee the production of goods and services, making it possible to adopt digital technologies such as the Internet of Things (IoT), artificial intelligence (AI), cognitive computing, advanced robotics, cloud technology, blockchain, and big data to improve efficiency, productivity, and competitiveness.

Sustainable operational management is an approach that focuses on the effective management of resources (Bromiley & Rau, 2016; Raut et al., 2019) and sustainable operational management is an approach that focuses on the effective and efficient management of resources to achieve sustainable operational goals (Jaehn, 2016). In the context of business, operational management involves integrated planning, organization, and control of operational activities to improve efficiency, productivity, and product/service quality, while reducing costs and increasing customer satisfaction. The main goal of sustainable operational management is to achieve business sustainability through the optimal utilization of resources, improved product/service quality, and reduced operational expenditures (Tseng et al., 2018; Wang et al., 2020). The efficient implementation of digital business strategies does not only aim to build a competitive edge in the international market but also to support the achievement of Sustainable Development Goals (SDGs). In this context, green digital innovation

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plays a crucial role in helping organizations achieve sustainability by adopting sustainable development practices.

The importance of sustainable operational management in contemporary business is due to the fact that effective and efficient operational management strategies and functions enable organizations to increase operational efficiency, productivity, and competitive advantage. Sustainable operational management ensures smooth and efficient business operations and facilitates adaptation to developing technology and fast-paced market dynamics (Wibowo, 2023).

In today's business landscape, sustainable business management is a necessity, as it enables companies to improve operational efficiency, reduce costs, and increase productivity, thereby increasing their competitive advantage. The preservation of operational management plays a crucial role in allowing businesses to adapt to technological advancements, ensuring a seamless integration of modern management technologies.

Other digital technologies, such as digital twins, have shown significant benefits in asset management, process optimization, and training, leading to increased efficiency, cost reduction, and mitigation of greenhouse gas emissions (GHGs). Moreover, the integration of risk management into digital business operations is increasingly important in the post-pandemic landscape, marked by increasing digital fraud threats (Ghosh & Sil, 2025).

In the supply chain management domain, the implementation of digital transformation alongside innovative technologies such as blockchain, big data analytics, and IoT can facilitate sustainable strategy development, cost minimization, and environmental-friendly practices. Digitalization also introduces new prospects and challenges in the sustainability domain, where digital maturity models function as valuable tools for evaluating and directing supply chains towards increased digitalization.

2. RESEARCH METHODS

This study employs a qualitative approach using the literature review method to explore the implementation of sustainable operations management in the digital age. The literature review method is conducted by collecting and analyzing information from a variety of credible sources, including peer-reviewed journal articles, research reports, case studies, books, and official documents published between 2015 and 2025. These sources are carefully selected to ensure their relevance to themes such as digital transformation, green business practices, innovation for sustainability, and sustainable operations management.

The data collection process focuses on identifying key concepts, best practices, and case examples—such as Unilever’s digital sustainability initiatives that illustrate how organizations integrate sustainability into their operations through technological innovation. A descriptive analysis technique is used to synthesize the findings, highlight current trends, evaluate challenges, and map strategic opportunities for achieving operational efficiency and environmental responsibility. This method allows for a comprehensive understanding of how digital technologies contribute to sustainability efforts in modern business environments.

3. RESULTS AND DISCUSSION

3.1 Digital Transformation in Operational Management

Digital transformation has had a significant impact on various industries, changing the way businesses are run and creating new opportunities. Here is an overview of how digital transformation has affected several main industries:

a. Manufacturing Sector: In the manufacturing sector, digital transformation has enabled the adoption of more widespread automation, digital supply chain integration, and the use of data analytics to improve operational efficiency. Digital technology enables manufacturing companies to automate production processes, track material flow in real-time, and make more informed decisions based on data (Lăzăroiu et al., 2022).
b. Financial Services Sector: In the financial services sector, digital transformation has brought significant changes. Fintech (financial technology) enables faster, safer, and easier financial transactions through digital applications and platforms. Services such as digital payments, online lending, digital investments, and blockchain technology have changed the way people interact with financial services (Gomber et al., 2018).

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c. Trading and E-commerce Sector: Digital transformation has changed the landscape of trading and e-commerce, enabling companies to sell products online and reach a wider market. E-commerce platforms, social media, and digital marketing have allowed businesses to connect with customers more effectively (Khrais & Gabbori, 2023.
d. Healthcare Sector: In the healthcare sector, digital transformation has brought significant changes. With the adoption of electronic medical records, telemedicine, and wearable health technology, patients can access healthcare services online, monitor their health conditions, and receive medical diagnoses and health analytics (Ding et al., 2020).
e. Education Sector: Digital transformation has also occurred in the education sector, where digital technology has enabled online learning, distance learning courses, and easy access to educational resources (Bygstad et al., 2022). This has changed the way people learn and access information.
f. Transportation and Logistics Sector: In the transportation and logistics sector, digital transformation has brought significant innovations. Ride-sharing applications, food delivery services, and technology-based logistics have accelerated delivery processes and optimized delivery routes (Zhou & Wan, 2022).

3.2 Green Business Practices

Green business practices encompass various methodologies that aim to promote environmental sustainability while maintaining high operational efficiency. These methodologies require the use of renewable energy sources such as solar power to reduce carbon footprint, implementing waste reduction schemes to minimize the negative impact on the environment, and adopting resource-efficient tactics such as green procurement and environmentally friendly design. By integrating these methodologies into their daily activities, organizations can increase their competitiveness by expanding their market share, fostering customer loyalty, and driving innovation (Azeem et al., 2021). Furthermore, businesses involved in sustainable practices not only contribute to sustainable economic growth but also advocate for environmental management in their operations. Embracing green business practices not only generates environmental benefits but also fosters long-term profitability and community well-being by aligning financial success with social and environmental goals.

3.3 Technology and Innovation for Sustainability

Technology and innovation are crucial factors in promoting more environmentally friendly and efficient operations towards sustainability. By integrating sustainable practices into production processes, technology can support sustainability while considering economic, environmental, and social aspects. Organizations that align their strategic choices with the Sustainable Development Goals (SDGs) invest in innovation for sustainability to improve their operational performance, demonstrate their dedication to sustainable practices.

The emergence of digital transformation and Industry 4.0 has brought prospects for renewable energy technology and sustainable production and consumption, crucial for achieving SDGs and reducing global disparities (Bai et al., 2023). Small businesses exploring green technology are motivated by their commitment to sustainability, striving to generate economic, social, and environmental benefits using environmentally friendly technology. Green innovation is a fundamental strategy for maintaining the environment, increasing a company's competitiveness, and ensuring sustainable performance, particularly in small businesses located in developing countries.

3.4 Innovative Sustainable Products and Services

Innovative sustainable products and services are a concept that supports efforts to preserve the environment and ensures that current needs are met without compromising the ability of future generations to meet their own needs. To achieve this goal, it is necessary to design environmentally friendly products. Environmentally friendly product design focuses on reducing the negative impact on the environment throughout the product's life cycle, from raw materials to production, use, and end-of-life (Ahmad et al., 2018).

Implementing environmentally friendly product design involves selecting raw materials that can be recycled or made from natural materials that can quickly degrade in the environment, reducing energy and waste consumption in production, using safe chemicals for the environment and humans, and considering how products can be easily recycled or dismantled after use. Innovative sustainable products and services also involve developing solutions and services that support sustainability (Nasiri et al., 2018). For example, developing information technology and communication technologies that enable online services can reduce

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paper usage and make it easier for people to access services. Using online systems in the service sector not only saves time, but also reduces negative environmental impacts such as paper usage and emissions.

3.5 Case Study

In the field of sustainable operational management in the digital era, companies like Unilever, particularly with its Dove brand, stand out as a real example of successful implementation with positive impact. Unilever's strategic use of digital marketing techniques has not only positioned Dove as a socially responsible and sustainable brand but also contributed to its profitability. By leveraging digital tools and the internet, Unilever has effectively communicated its sustainability efforts to consumers, shaped behavior, and promoted sustainable consumption patterns (Gündüzyeli, 2024). Integrating sustainability into marketing strategies shows how businesses can achieve competitive advantages and long-term success by aligning operational practices with environmental and social goals.

3.6 Challenges and Opportunities for Sustainable Operational Management

Sustainable operational management in the digital era presents challenges and opportunities for businesses. Challenges include obstacles such as increased electronic waste, high energy consumption, and data protection issues, as well as potential risks in applying new ISO standards for sustainable digitalization in facility management (Asif, et al., 2024). However, there are numerous opportunities to leverage digital technology for renewable energy, smart cities, and sustainable products, and positive impacts from practicing technology management on sustainability in oil companies (Madkhali & Sithol, 2023). By embracing green digitalization tools and integrating sustainability into all activities, organizations can increase their triple bottom line performance and gain a competitive edge in the market.

4. CONCLUSIONS AND SUGGESTION

Sustainable operations management has emerged as a strategic imperative in the digital era, as digital transformation reshapes industrial processes and enhances operational efficiency. This study emphasizes that companies adopting green business practices, leveraging digital technologies, and promoting innovation for sustainability are better positioned to improve their triple bottom line—economic, environmental, and social performance. The case of Unilever illustrates how integrating sustainability into digital operations can drive both competitive advantage and long-term value creation.

Despite the challenges posed by digitalization, such as increased e-waste and energy consumption, there are vast opportunities for companies to use technology responsibly to support sustainable development. Organizations are encouraged to utilize green digital tools and embed sustainability into every aspect of their operations. Doing so not only helps address environmental concerns but also enables businesses to remain agile and relevant in a rapidly evolving global market landscape.

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