УДК 005.591.6:004.738.5
DOI: 10.60022/3(6)-2S

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DIGITAL BUSINESS SYSTEMS AS STRATEGIC INFRASTRUCTURE FOR ORGANIZATIONAL SUSTAINABLE DEVELOPMENT

***Abstract**. The integration of digital business systems into organizational strategy has become essential for achieving sustainable development. Companies face simultaneous pressures to improve operational efficiency, meet environmental, social, and governance goals, and strengthen stakeholder relationships. This paper examines how digital business systems function as strategic infrastructure enabling enterprises to operationalize sustainability practices through systematic measurement, process automation, and real-time optimization.*

The study synthesizes recent research on digital transformation, sustainable development, and enterprise systems, analyzing the specific contributions of modern ERP and CRM platforms to sustainability management. It proves digital transformation and sustainable development are mutually reinforcing processes creating a "twin transformation" cycle. Modern ERP systems provide four critical capabilities: integrated data architecture eliminating information silos, real-time IoT-based monitoring, automated compliance management, and predictive analytics. CRM platforms complement these by managing external stakeholder relations. A six-step roadmap for implementation is presented. Organizations that integrate digital business systems with sustainability objectives achieve measurable progress across operational efficiency, environmental performance, stakeholder engagement, and governance transparency, establishing durable competitive advantage where technology and sustainability become inseparable elements of coherent enterprise strategy.

***Keywords:** digital transformation, sustainable development, ERP system, CRM system, ESG performance, twin transformation, competitive advantage.*

ЦИФРОВІ БІЗНЕС-СИСТЕМИ ЯК СТРАТЕГІЧНА ІНФРАСТРУКТУРА ДЛЯ СТІЙКОГО РОЗВИТКУ ОРГАНІЗАЦІЇ

***Анотація**. Інтеграція цифрових бізнес-систем у корпоративну стратегію стала необхідною*

умовою досягнення сталого розвитку. Сучасні компанії стикаються з безпрецедентним тиском: необхідно одночасно підвищувати операційну ефективність, виконувати екологічні, соціальні та управлінські (ESG) цілі, а також зміцнювати відносини зі стейкхолдерами. При цьому ініціативи зі сталого розвитку часто залишаються відокремленими від основної діяльності підприємства, а іноді навіть перешкоджають досягненню цілей сталого розвитку, що обмежує їхню ефективність.

Мета статті – дослідити, як цифрові бізнес-системи виконують функцію стратегічної інфраструктури, що дозволяє підприємствам впроваджувати практики сталого розвитку через системний вимір, автоматизацію процесів та оптимізацію в реальному часі. Дослідження ґрунтується на синтезі сучасних наукових публікацій з питань цифрової трансформації, сталого розвитку та корпоративних інформаційних систем. Проаналізовано конкретний внесок сучасних ERP- та CRM-платформ в управління сталістю, а також представлено покрокову дорожню карту впровадження.

Цифрова трансформація та сталий розвиток є взаємопідсилюючими процесами, що утворюють цикл «подвійної трансформації». Сучасні ERP-системи забезпечують чотири критичні можливості: інтегровану архітектуру даних (усунення інформаційних «силосів»), моніторинг у реальному часі на основі IoT, автоматизоване управління відповідністю вимогам (комплаєнс) та прогностичну аналітику. CRM-платформи доповнюють ці функції шляхом систематичного управління відносинами із зовнішніми стейкхолдерами. Порівняльний аналіз демонструє суттєві переваги сучасних систем над застарілими Legacy-рішеннями. На основі моделі Bain & Company запропоновано шестиетапний план впровадження, що включає: діагностику готовності, стратегічне планування з двома часовими горизонтами, перерозподіл ресурсів, модульне впровадження через пілотні проєкти, соціотехнічну інтеграцію та системне узгодження всіх організаційних підсистем.

Дослідження підтверджує, що цифрові бізнес-системи є фундаментальною інфраструктурою для операціоналізації сталого розвитку в організаціях. Інтеграція ERP та CRM із ESG-цілями дозволяє досягати вимірного прогресу одночасно за чотирма напрямами: операційна ефективність, екологічна результативність, залучення стейкхолдерів та прозорість управління. Для практиків ключовим висновком є те, що сталість не можна ефективно управляти як окремою функцією – її необхідно вбудовувати безпосередньо в основні бізнес-процеси та інформаційні системи. Подальші дослідження мають зосередитися на кількісному вимірюванні зв'язку між конфігурацією цифрових систем та конкретними ESG-результатами, а також на вивченні бар'єрів впровадження в малих та середніх підприємствах.

Ключові слова: *цифрова трансформація, сталий розвиток, ERP-система, CRM-система, ESG-результативність, подвійна трансформація, конкурентна перевага.*

Formulation of the problem. Sustainable development has become a crucial element of modern business strategy because it helps companies achieve long-term growth while addressing environmental, social, and economic challenges. The United Nations Sustainable Development Goals (SDGs) emphasize that businesses play a central role in creating a more sustainable future through innovation, responsible production, and investment. Companies that integrate sustainability into their operations often improve their reputation, strengthen stakeholder trust, and enhance their competitiveness in increasingly environmentally conscious markets [1].

Sustainable development is also important because it creates economic opportunities. Achieving the SDGs could generate trillions of dollars in new market opportunities across sectors such as food and agriculture, energy, cities, and healthcare. Sustainable practices can reduce costs through greater resource efficiency, lower waste generation, and improved risk management. As a result, sustainability is no longer viewed solely as a social responsibility but also as a source of innovation and business value [2].

The principles of sustainable development are applied across multiple sectors. In the energy sector, companies invest in renewable energy and smart-grid technologies to reduce carbon emissions. In healthcare, organizations use sustainable and digital solutions to improve access to medical services. The manufacturing industry adopts circular economy models and sustainable supply chains to minimize environmental impact, while the financial sector promotes sustainable investments and ESG-focused products. Research also shows that sustainable business models are increasingly used in industries including agriculture, transportation, construction, fashion, hospitality, technology, education [3; 4].

However, companies face unprecedented pressure to simultaneously enhance operational efficiency, follow environmental, social and governance (ESG) goals, and strengthen stakeholder relationships. While sustainability initiatives often remain segregated from core business operations, emerging evidence demonstrates that integrating digital business systems with sustainability objectives creates synergistic benefits strengthening both organizational performance and environmental-social outcomes. This interconnection

between technological capability and sustainability achievement represents a fundamental shift in organizational transformation strategy.

Analysis of recent research and publications. Recent research strongly indicates that digital transformation has become a common trend, covering 9 out of 10 organizations all over the world [5]. Moreover, digital business systems have evolved from operational tools into strategic infrastructures that are fundamentally reshaping how organizations pursue sustainability. Ghosal I., Prasad B., Ray N. and Joshi L. K. state convergence of business, innovation, and sustainability reaches a "tipping point" [6]. This idea is echoed in a study on digital business strategy, which concludes that firms must move beyond seeking "alignment" between IT and business goals. Instead, they need a fusion view where digital infrastructure is the foundation of strategy itself, responding to the capabilities and limitations of existing socio-technical systems [7].

Digital technologies are among core drivers for sustainability, forming a new strategic infrastructure for environmental, social, and governance performance and green innovation. Digital transformation positively enhances enterprise innovation, with ESG performance acting as a significant mediating factor [8]. This suggests digital systems are not just for efficiency but for building the trust and governance structures that enable innovation. To be more specific, digitalization transformation directly fosters enterprise green innovation, boosting both the quantity and quality of green innovation by enhancing resource flexibility and activating "organizational slack" (excess resources) to be re-deployed for sustainable purposes [9]. Artificial Intelligence/Machine Learning (AI/ML), Internet of Things (IoT) integration, and Digital Twins serve as strategic resources that directly enhance Sustainable Manufacturing Practices (SMP), which then fully mediate the impact on overall sustainability performance. This demonstrates a clear causal pathway from digital infrastructure to operational sustainability [10].

While innovation is abundant, significant barriers remain, including the high cost of new technologies, lack of skilled workforce, and difficulty integrating digital systems with legacy processes. This is confirmed by studies showing that legacy systems can inhibit a firm's ability to formulate an effective digital business strategy [7]. A critical gap identified is the tendency to focus on the volume of green innovations (like patent counts) rather than their impact. Researches emphasize the need to avoid a "quantity-over-quality bias" by measuring outcomes like carbon reduction and resource efficiency [9; 10].

However, there are multiple concerns regarding the increasing use of digital technologies. One of the major problem is the increasing energy consumption of digital infrastructure, particularly data centers. As organizations rely more heavily on cloud services, AI applications, and large-scale data processing, the demand for electricity continues to rise, contributing to greenhouse gas emissions, potentially undermining climate action efforts [11].

Another challenge is the rapid growth of electronic waste as digital transformation requires more of equipment and devices that are to eventually be scrapped and recycled. Improper disposal of these products can release hazardous substances into the environment and increase pressure on natural resources, negatively affecting responsible consumption and production (SDG 12) and causing ecosystem degradation, thereby impacting SDG 15 (life on land) [12].

Digital transformation can also contribute to increased social inequalities through the phenomenon known as the digital divide. Access to digital technologies, high-speed internet, and digital skills remains uneven across countries, regions, and social groups. So digital transformation can deepen existing social and economic disparities, challenging the Reduced Inequalities SDG [13].

The purposes of the article is to examine how digital business systems function as foundational infrastructure enabling enterprises to operationalize sustainable practices through systematic measurement, process automation, and real-time optimization.

The main material presentation. A digital transformation is the process of developing organizational and technology-based capabilities that allow a company to continuously improve its customer experience and lower its unit costs; and over time sustain a competitive advantage [5]. It encompasses the systematic adoption and integration of digital technologies into organizational operations to enhance efficiency, transparency, and innovation capacity. Understanding its role as a sustainability enabler requires examining how organizations leverage technological advancement to operationalize sustainable business practices.

Scholarly perspectives on digital transformation reveal multiple dimensions contributing to organizational change. Technology-driven approaches emphasize how organizations harness advanced digital capabilities − including big data analytics, artificial intelligence, IoT networks, and cloud computing − to fundamentally reorient their operations. Strategic renewal perspectives characterize digital transformation as ongoing processes through which organizations rebuild their business models, collaborative structures, and organizational cultures, viewing technology as the enabling foundation. Operational frameworks focus on how digital tools reshape daily workflows and service delivery, translating manual processes into integrated automated systems. Systemic perspectives recognize that digital transformation catalyzes ecosystem-wide

changes affecting industry structures, stakeholder relationships, and institutional paradigms [14; 15; 16; 17; 18].

These multidimensional perspectives demonstrate that digital transformation functions simultaneously as a technological foundation, strategic process, operational redesign mechanism, and systemic reshaping initiative. This comprehensive character proves particularly valuable for sustainability purposes, providing both the technological capacity to address measurement challenges and the organizational restructuring necessary to embed sustainability imperatives into core business operations [16; 19].

The synergistic relationship between digital transformation and sustainable development becomes evident through cyclical feedback mechanisms. Digital capabilities and sustainability imperatives mutually reinforce each other, creating "twin transformation" cycle. The visual representation of such cycle is given below on fig. 1.

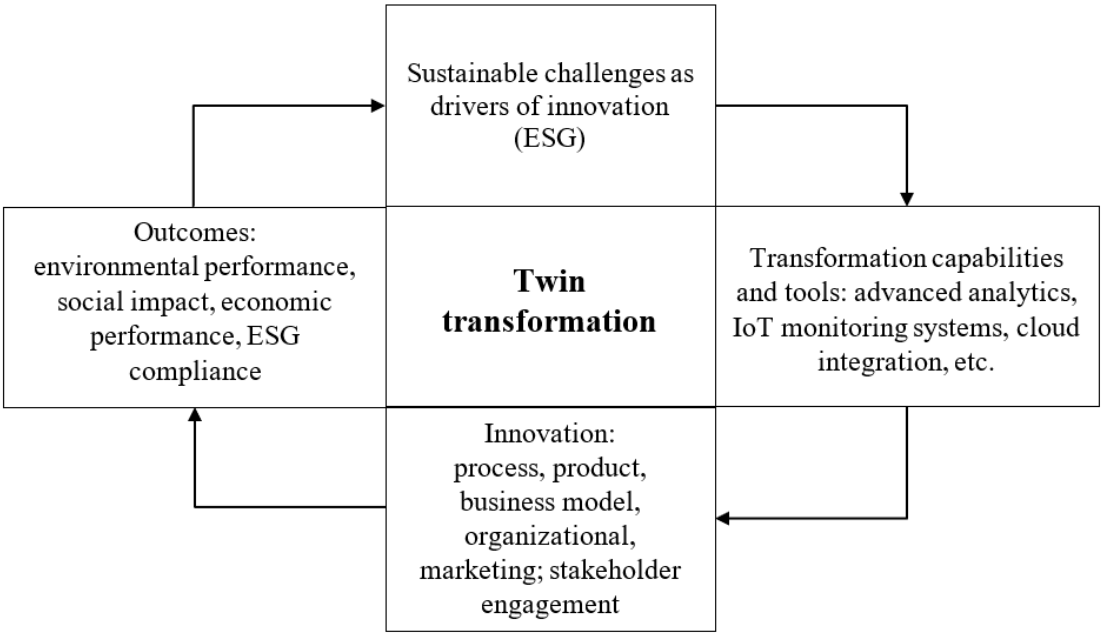

Fig. 1. Digital & Sustainable transformation framework
Source: compiled by authors based on [16; 19]

Digital transformation capabilities − including advanced analytics, IoT monitoring systems, cloud integration, and process automation − provide the technological foundation necessary to address complex sustainability challenges such as resource scarcity, environmental degradation, and regulatory compliance pressures. These capabilities enable enterprises to deploy innovation mechanisms across process optimization, product development, business model reconfiguration, and stakeholder engagement. The resulting sustainability outcomes − enhanced environmental performance, social impact measurement, economic efficiency gains, and ESG compliance − in turn create new demands and opportunities for further digital capability development, establishing self-reinforcing cycles of organizational transformation [17].

Empirical research confirms this cyclical relationship. Analysis reveals that digitalization significantly enhances green innovation performance [8; 9].

Corporate sustainability efforts address four distinct contribution categories, each requiring specialized digital tools and implementation strategies. Organizations improving business performance and reputation leverage Enterprise Resource Planning (ERP) integration and business intelligence platforms to consolidate financial, operational, and sustainability data for real-time strategic insights. Enterprises connecting with and partnering with stakeholders deploy Customer Relationship Management (CRM) systems integration and digital stakeholder engagement platforms to systematically track partner satisfaction and manage collaborative relationships. Organizations improving environmental management implement environmental management information systems, IoT networks for real-time data, and carbon accounting software enabling data-driven optimization of resource consumption. Enterprises investing in human resources development utilize employee engagement analytics platforms ensuring that workforce initiatives align with broader corporate sustainability targets [20].

Table 1 below shows the main contributions of corporate sustainability with relative digital solutions.

Table 1

Digital solutions for corporate sustainability across key aspects

Key aspects of corporate sustainability	Digitalization tools
Business performance and reputation	ERP; Business Intelligence platforms; ESG reporting systems; Digital Risk Management tools
Employees	HR Information Systems; Business Process Modeling tools; Digital Learning platforms; Employee Engagement analytics
Governance and stakeholder relations	CRM integration; Stakeholder Engagement platforms; Supply Chain Management systems; Digital communication tools; Integrated Management Systems
Environmental management	Environmental management Information Systems; IoT Sensor networks; ERP; ESG reporting systems; Carbon Accounting software

Source: compiled by authors based on [20]

This categorization clarifies that effective organizational sustainability requires integrated platform solutions addressing multiple sustainability dimensions simultaneously rather than deploying isolated specialist tools. Among available digital business systems, ERP and CRM platforms have emerged as the most strategically positioned solutions, combining proven technical capabilities with organizational scope encompassing all functional areas through which sustainability imperatives must be implemented.

Modern ERP systems represent fundamental evolution from legacy enterprise software. Contemporary ERP implementations provide web-based interface accessibility, mobile application integration, automated business process execution, and modular architecture supporting continuous system evolution [21]. The comparative analysis presented in (table 2) illustrates the substantial advantages of modern ERP systems over legacy platforms across ten critical operational dimensions.

From sustainability perspectives, modern ERP systems deliver four critical capabilities addressing ESG measurement and management challenges. First, integrated data architecture eliminates information silos by consolidating financial, operational, environmental, and social data into unified databases supporting comprehensive sustainability reporting [21]. Second, real-time monitoring capabilities through IoT integration provide continuous tracking of resource consumption, emissions levels, and operational efficiency metrics essential for environmental performance optimization. Third, automated compliance management ensures adherence to environmental regulations and sustainability standards through built-in tracking and reporting functions reducing administrative burden while improving accuracy. Fourth, predictive analytics capabilities support proactive sustainability management by identifying optimization opportunities and enabling scenario analysis for strategic sustainability planning.

Table 2

Comparative analysis of the functions and capabilities of software complexes of Legacy and modern ERP and CRM systems

Aspect	Legacy Enterprise Systems	ERP and CRM Platforms
Functional scope	Limited features with insufficient web-based and thin-client support.	Advanced functionality with full web browser and thin-client capabilities.
	Outdated technology platform lacking web and cloud integration.	Modern framework prioritizing web, mobile, and cloud technologies for enhanced efficiency.
	Static architecture with minimal evolution capacity.	Modular design enabling continuous expansion and adaptation to emerging business needs.
Vendor support	Discontinued or soon-to-end technical support and updates.	Active vendor support with regular updates and bug fixes.
User interface	Obsolete and non-intuitive design.	Contemporary, user-friendly, and intuitive interface.

Continued from Table 2

Information security	Vulnerabilities and inadequate protection, especially in file-based modes.	Enhanced security with multi-tier architecture, web authentication, and modern encryption, while risk of increased cybersecurity threats during the implementation process.
System compatibility	Limited or absent support for current operating systems and hardware standards.	Full compatibility with latest OS versions and optimized for modern devices.
Performance	Slow processing and extended loading times.	Fast task execution and responsive performance.
Accessibility	Outdated access protocols with restricted functionality.	Web-based client with cloud technology enabling flexible access.
Total cost of ownership	High support and maintenance costs due to resource-intensive updates.	Competitive service pricing, but high initial acquisition costs.
Development outlook	Minimal prospects for future enhancement.	Clear development roadmap with scalability potential.
Integration capabilities	Lacks native integration, requiring specialized IT development.	Seamless interoperability through built-in standardized data exchange.
Employee engagement	Usually high due to familiar interface and procedures	Implementation can be challenged by staff resistance and skill gaps in teams.

Source: compiled by authors based on [21; 22]

CRM platforms complement ERP capabilities by delivering specialized functionality for managing external stakeholder relationships. Research demonstrates that CRM digitalization significantly enhances sustainable competitive performance by systematically tracking stakeholder satisfaction, managing community engagement initiatives, and ensuring transparent communication across diverse stakeholder groups. The integration of CRM and ERP systems creates synergistic sustainability management capabilities addressing all corporate sustainability contribution categories simultaneously, enabling comprehensive ESG reporting linking internal operational data with external stakeholder engagement metrics while supporting circular economy business models and sustainability innovation [20].

Digital business systems for organizational sustainability can be implemented or updated in such a way (fig. 2).

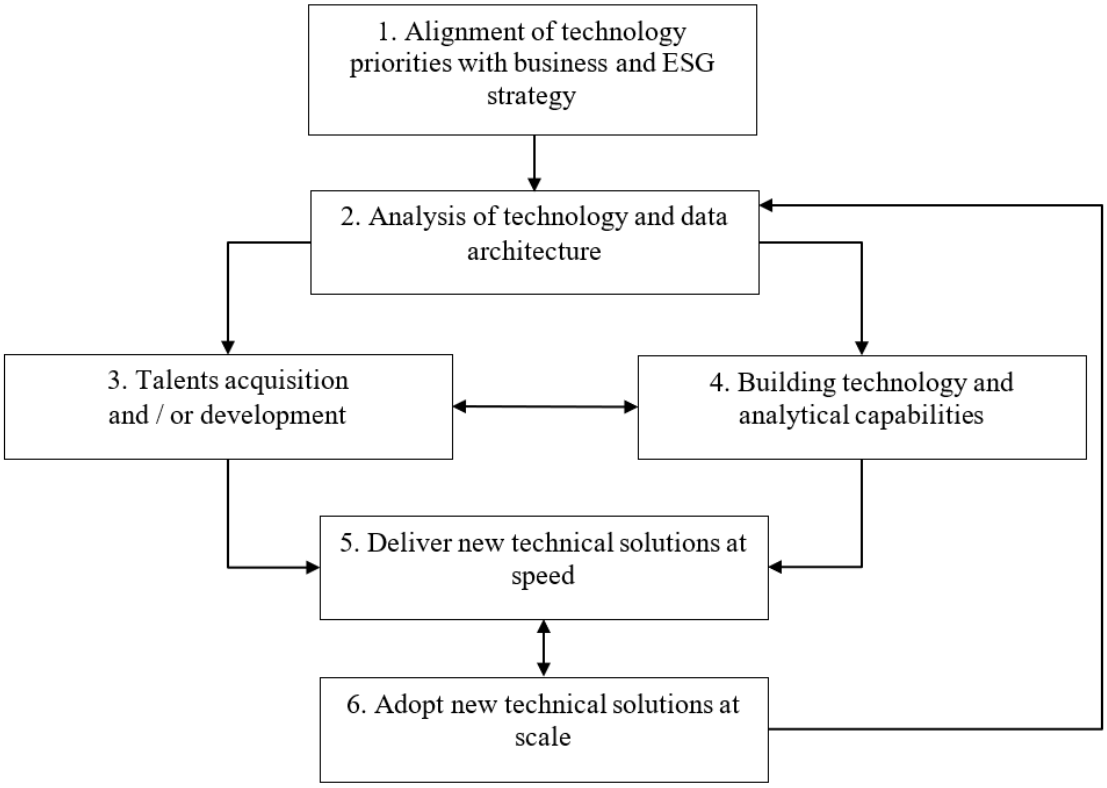

Fig. 2. Digital & Sustainable transformation roadmap
Source: compiled by authors based on [23]

Digital transformation is a complex organizational process that extends beyond the implementation of individual technologies. It requires strategic alignment, organizational readiness, technological modernization, and continuous capability development. Based on contemporary digital transformation practices, the process can be viewed as a sequence of six interconnected stages that collectively enable organizations to create sustainable business value.

The first stage is the alignment of technology priorities with business and ESG strategy. At this stage, organizations define how digital technologies support corporate objectives and sustainability goals. Rather than functioning as a purely operational support unit, the technology function becomes a strategic partner responsible for identifying opportunities for innovation, improving organizational performance, and contributing to environmental, social, and governance outcomes. Effective alignment ensures that investments in digital solutions directly support long-term business priorities and ESG objectives, without hindering sustainable development.

The second stage involves the analysis of technology and data architecture. Organizations evaluate the current state of their technological infrastructure, data management systems, and integration capabilities. A modern and flexible architecture provides the foundation for digital transformation by enabling efficient data flows, improved customer experiences, enhanced operational performance, and reduced business risks. The objective of this stage is to establish an architecture capable of supporting future business growth and technological innovation.

The third stage is talent acquisition and development. Successful digital transformation depends not only on technology but also on the availability of qualified personnel capable of implementing and managing digital initiatives. Organizations must attract specialists with relevant technical expertise while simultaneously developing the digital competencies of existing employees. Particular attention should be given to leadership development, diversity and inclusion, continuous learning, and the cultivation of a collaborative organizational culture that supports innovation and change.

The fourth stage is the development of technology and analytical capabilities. During this stage, organizations identify gaps in their existing technological and analytical competencies and implement measures to address them. These capabilities may include data analytics, business intelligence, artificial intelligence, process automation, cybersecurity, and digital process management. Strengthening such capabilities allows organizations to transform data into actionable insights, improve decision-making processes, and increase organizational agility.

The fifth stage focuses on the rapid delivery of new technical solutions. Modern digital organizations adopt agile approaches that enable the fast development, testing, and deployment of digital products and services. Cross-functional collaboration between business and technology teams becomes essential for ensuring that solutions are aligned with business needs and deliver measurable value. The use of product management practices further helps organizations prioritize initiatives based on strategic objectives and expected outcomes.

The final stage is the adoption of new technical solutions at scale. The successful implementation of digital technologies requires widespread organizational acceptance and effective change management. Employees must be trained to use new systems and processes, while management should actively support the transformation process. At this stage, organizations seek to maximize the value generated by digital investments through enterprise-wide adoption, process standardization, and continuous performance improvement. Scaling successful solutions allows organizations to fully realize the benefits of digital transformation and achieve sustainable competitive advantages [23].

This model aligns with recent transformation literature [14; 15] that emphasizes sequencing, resource commitment, and organizational alignment as critical success factors, moving beyond a purely technological view of digital change.

Conclusion. The “twin transformation” framework demonstrates that digital capability development and sustainability performance are mutually reinforcing rather than parallel or competing processes. Digital systems enable sustainability measurement and management, while sustainability pressures drive further digital innovation, creating a positive feedback cycle that generates cumulative value across environmental, social, and governance dimensions.

Empirical evidence confirms that organizations achieve superior sustainability outcomes when digital transformation is purposefully aligned with ESG objectives rather than treated as a separate technical initiative. The comparative analysis shows that legacy systems actively inhibit this alignment, whereas modern ERP and CRM platforms deliver four critical enablers: integrated data architecture (eliminating reporting silos), IoT-based real-time monitoring (enabling operational optimization), automated compliance management (reducing administrative burden), and predictive analytics (supporting strategic planning).

Successful implementation follows a structured, six-step roadmap that emphasizes diagnostic assessment, dual-horizon planning, committed resourcing, pilot-based scaling, socio-technical integration,

and systemic alignment. This model moves beyond purely technological views of digital change, recognizing that transformation fails not from lack of ideas but from under-resourcing and misaligned incentives.

Thus, the convergence of digital capabilities and sustainability imperatives represents a fundamental reshaping of organizational transformation. Technology and sustainability are no longer separate considerations but inseparable elements of coherent enterprise strategy. Organizations that recognize and act on this integration position themselves to achieve measurable progress across operational efficiency, environmental performance, stakeholder engagement, and governance transparency simultaneously, establishing durable competitive advantage in an increasingly sustainability-driven economy.

This paper synthesizes existing literature and provides a conceptual framework. Empirical validation of the six-step roadmap across different industries and organizational sizes remains necessary. Future research should investigate quantitative relationships between specific digital system configurations and measurable ESG outcomes; barriers to twin transformation in small and medium enterprises; and the role of emerging technologies (AI agents, digital twins, blockchain) in next-generation sustainability infrastructure.

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Отримано: 14.04.2026
Прийнято до публікації: 15.05.2026
Опубліковано: 16.05.2026