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Linking ERP Systems and business sustainability: A conceptual review

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Abstract
Enterprise Resource Planning (ERP) systems enable business sustainability by integrating platforms that enhance efficiency and decision-making across economic, environmental, social, and governance dimensions. This review synthesizes how ERP systems contribute to sustainability performance. ERP systems support economic sustainability through improved efficiency and cost reduction, while enabling environmental sustainability by monitoring resources and emissions. They promote social and governance sustainability through transparency and compliance with regulations. Data consolidation and resource management link ERP capabilities to sustainable outcomes. However, challenges like high costs and data quality issues can limit ERP systems' sustainability impact. Success requires managerial commitment and alignment between ERP functionality and sustainability goals. Future research should validate these links and explore ERP integration with digital tools.

Keywords: ERP systems, sustainability, digital transformation, ESG

Introduction

As businesses strive for agility and cost-effectiveness, the adoption of Enterprise Resource Planning (ERP) systems is proving to be transformative. Recent industry findings reveal that nearly 95% of organizations experience clear operational improvements after implementing an ERP system [1]. These improvements often include reductions in IT costs, faster process cycle times, and inventory decreases of nearly 38%, demonstrating how integrated systems can significantly enhance efficiency across core business activities. Enhancing coordination, reducing redundancies, and supporting more efficient use of organizational resources are central functions of ERP systems, and the operational gains achieved through their implementation reflect these capabilities [2–4]. Since operational efficiency is closely linked to reduced waste, optimized material flows, and more controlled use of energy and inputs, the benefits of ERP adoption may extend beyond financial performance alone [5, 6]. Meanwhile, companies are increasingly expected by stakeholders and regulators to pursue sustainability goals alongside maintaining strong financial outcomes [7–9]. These conditions raise an important question for both practitioners and researchers: Can the efficiency gains associated with ERP systems also form the basis for broader progress in business sustainability?

The importance of this question has grown considerably in recent years as organizations face increasing expectations regarding environmental responsibility, social impact, and ethical governance [7, 8]. Business sustainability, often framed through the economic, environmental, and social dimensions of the triple bottom line [10, 11] has transitioned from a voluntary initiative to a central element of long-term organizational strategy [12, 13]. As a result, companies are now expected to operate efficiently, reduce environmental impacts, comply with regulations, and demonstrate accountability to a broad range of stakeholders.

Simultaneously, digital transformation has revolutionized how organizations handle data and coordinate activities, which to support strategic decision-making [14]. Among the most widely adopted digital tools are ERP systems, which integrate information across finance, operations, supply chains, and human resources [15, 16]. Their capacity to centralize data and standardize processes positions them as potentially valuable infrastructures for supporting sustainability practices [17]. Whether through improved resource planning, enhanced transparency, or stronger control mechanisms, ERP systems can influence how effectively firms measure and advance sustainability performance [18].

Despite these advancements, existing research has largely overlooked the broader sustainability implications of ERP adoption. Much of the literature concentrates on technical implementation challenges, operational benefits, or financial outcomes, leaving the strategic role of ERP systems in supporting environmental, social, and governance (ESG) objectives underexplored. Furthermore, conceptual work linking ERP functionalities to sustainability outcomes remains relatively scarce. This paper seeks to address this gap by offering a conceptual review of the relationship between ERP systems and business sustainability. It synthesizes insights from existing literature to elucidate how ERP systems can contribute to sustainability across economic, environmental, and social dimensions.

Literature Review

ERP Systems: Concepts and Characteristics

ERP systems are integrated information systems designed to support and coordinate core business functions within an organization [19]. Early ERP systems evolved from material requirements planning (MRP) tools used in manufacturing, eventually expanding into comprehensive enterprise-wide platforms covering finance, human resources, supply chain operations, procurement, and customer service [20, 21]. Modern ERP systems integrate data from multiple departments into a unified database, enabling standardized processes, real-time information sharing, and improved decision-making.

The literature underscores the significant advantages of ERP systems, particularly in enhancing decision-making by equipping organizations with real-time, accurate, and

actionable data through integrated analytics and reporting tools [22, 23]. By merging transactional data with machine learning and business intelligence capabilities, these systems transition analysis from retrospective to predictive, facilitating more precise forecasting and trend identification [24, 25]. Centralized financial and operational data bolster transparency and aid in profitability analysis, budget control, and resource optimization [26, 27]. AI-driven dashboards and decision support algorithms streamline data interpretation, enabling swift responses to operational or market shifts [23, 28].

Effective decision-making also hinges on robust data quality management and user competency, which are bolstered through training and data governance [29]. Furthermore, automated data processing minimizes manual errors, accelerates decision cycles, and enhances operational efficiency. Collectively, these capabilities empower organizations to transform extensive enterprise data into timely, informed, and strategic decisions [22, 26].

Business Sustainability

Sustainability has gained prominence as firms respond to stakeholder expectations, regulatory demands, and environmental challenges. The triple bottom line, which includes economic, environmental, and social performance, remains central, supported by research on environmental responsibility, green innovation, sustainable business models, and ethical decision-making [30, 31]. ESG metrics and sustainability reporting assess how firms balance financial outcomes with ecological and social impacts, with evidence showing ESG performance and green innovation can enhance firm value, although mediation effects vary [32, 33]. High-quality data on resource use, emissions, labor practices, governance, and community engagement is essential for credible reporting, aligning with studies emphasizing accountability and ethical integrity to prevent greenwashing [34]. These developments underscore the importance of information systems in supporting accurate measurement and communication of sustainability performance, as organizations adopt cleaner production technologies and eco-efficient practices documented across sectors [35].

Recent literature emphasizes eco-efficient technologies, waste reduction, and green entrepreneurship as strategies strengthening sustainability while preserving competitiveness. Green entrepreneurship aligns with frameworks like the Triple Bottom Line and Circular Economy by linking innovation with environmental stewardship and social justice [30, 31, 36]. Tools like the Green Business Model Canvas help integrate ecological priorities into business models [36]. Topic-modeling studies reveal dominant themes, sustainable innovation, green technologies, eco-friendly agriculture, and managerial sustainability, while noting social impacts remain underexamined [35]. Ethical concerns, including greenwashing risks, highlight the need for accountability in sustainability practices [34]. Evidence from manufacturing and beauty industries shows how cleaner production and green innovation enhance competitiveness [37], reinforcing that sustainability emerges from ESG performance, innovation, ethics, and strategic management [32].

Methods

This study adopts a descriptive and conceptual approach, relying solely on secondary data from academic and professional publications. The relevant academic literature was systematically reviewed using databases such as Google Scholar, Scopus, EBSCO, ProQuest, and Web of Science. The search strategy included terms like ERP systems, sustainability, digital transformation, ESG reporting, and resource efficiency, with an emphasis on full-text materials. The selected literature underwent a straightforward descriptive analysis, where concepts were compared, categorized, and interpreted through logical reasoning, induction, and deduction, similar to methodologies used in other conceptual studies. The aim was to elucidate the potential contributions of ERP systems to business sustainability.

Results and Discussion

A review of the existing literature consistently highlights a link between ERP implementation and enhancements in business sustainability performance. ERP systems are increasingly vital in supporting business sustainability across economic, environmental, social, and governance dimensions. As integrated information platforms, ERP systems offer organizations unified data, standardized processes, and real-time insights that bolster decision-making and improve operational efficiency. These capabilities directly contribute to various aspects of sustainable business performance.

ERP Contribution to Economic Sustainability

ERP systems enhance economic sustainability by improving efficiency, accuracy, and resource utilization. Integrated workflows reduce duplication, minimize errors, and streamline procurement, production, and inventory activities, enabling organizations to reduce costs and improve financial performance [38]. Empirical evidence indicates that ERP implementation can lower costs and increase revenues in sectors such as architecture, engineering, and construction by enhancing process coordination and productivity [39]. Effective ERP use facilitates control over product life cycle costs, allowing firms to manage expenditures across development, production, and distribution stages, which drives financial stability and sustainable economic outcomes [40]. These improvements bolster the economic dimension of sustainability by promoting stability, productivity and responsible cost management.

Beyond their core operational advantages, ERP systems contribute to economic sustainability by facilitating digital transformation, financial integration, and alignment with sustainable technologies. ERP-driven digital transformation enhances coordination across business functions, boosts adaptability to market shifts, and automates production processes, leading to increased competitiveness and reduced operational costs [41]. When combined with green IT solutions or Building Information Modeling, ERP systems further promote efficient resource utilization and waste reduction, thereby indirectly reinforcing economic sustainability through operational efficiency [42, 43]. Moreover, ERP applications that integrate with financial systems and cybersecurity frameworks bolster financial stability, transparency, and regulatory compliance, supporting sustainable business performance [44]. Collectively, these contributions illustrate that ERP systems enhance economic resilience and profitability, positioning firms for sustained economic growth [39, 40].

ERP Contribution to Environmental Sustainability

ERP systems play a crucial role in promoting environmental sustainability by enabling organizations to effectively monitor and manage energy consumption, raw materials, waste, and emissions. With real-time data and analytics, these systems enhance visibility across supply chains, allowing firms to pinpoint inefficiencies, redesign production schedules, and minimize unnecessary resource use [45]. The tracking capabilities supported by ERP systems improve waste and emissions management through precise data collection, regulatory compliance, and transparent stakeholder reporting [46]. These features assist organizations in implementing greener logistics, optimizing transportation routes, and adopting circular economy practices, such as recycling and reuse, ultimately reducing their environmental footprints [42, 47].

ERP systems extend their utility beyond mere operational oversight by embedding sustainability criteria into areas like procurement, production, and logistics, thereby bolstering green supply chain management and eco-design efforts [48]. By adopting cloud-based or green-IT-aligned ERP solutions, organizations can further decrease the carbon emissions linked to IT infrastructure, as these solutions enhance energy efficiency and reduce e-waste through improved life cycle management. The comprehensive perspective of organizational processes offered by ERP systems aids in making strategic decisions aimed at reducing pollution, optimizing resources, and adopting sustainable production models [45]. New sustainable ERP (S-ERP) frameworks incorporate environmental, social, and economic principles directly into their system architecture, thereby enhancing overall sustainability performance when coupled with strategic planning and managerial dedication [18, 47].

ERP Contribution to Social and Governance Sustainability

ERP systems play a vital role in promoting social and governance sustainability by improving transparency, accountability, and stakeholder involvement. They enhance compliance with regulatory standards and facilitate accurate ESG reporting through standardized data collection and reporting [49]. Moreover, ERP-driven communication and collaboration strengthen connections with both internal and external stakeholders, which is essential for social sustainability. Research from the nonprofit sector shows that adopting ERP can foster stakeholder trust by optimizing financial and operational processes and improving communication [50]. Additionally, ERP systems incorporate social performance metrics into organizational operations, enabling companies to better track labor practices, training, and social impacts.

From a governance perspective, ERP systems bolster sustainable governance frameworks by enhancing financial management, regulatory compliance, and data transparency. ERP-enabled reporting is closely aligned with governance requirements under ESG frameworks and emerging regulations, such as those of the European Union, thereby reinforcing organizational accountability [51]. Integrated management information systems within ERP deliver accurate and timely data, which improves governance quality and supports informed decision-making [52]. Research further indicates that ERP systems can positively moderate the impact of social and governance disclosures on a firm's sustainable business performance, underscoring their role in strengthening governance [53].

Integrative Mechanisms Linking ERP to Sustainability

Integrative mechanisms that connect ERP systems to sustainability emphasize how these platforms consolidate business operations to boost efficiency and support sustainable practices through data analysis, resource management, and adherence to regulations. ERP systems consolidate multiple functions onto a single platform, enabling businesses to monitor resource consumption, waste management, and carbon emissions, facilitating sustainable operations and reducing environmental impacts. Data integration allows enterprises to analyze and report sustainability metrics, enhancing transparency and stakeholder trust. ERP systems align organizational activities with environmental regulations by embedding environmental policies into core business processes. Cloud-based ERP solutions support sustainability through reduced energy consumption and optimized IT infrastructure, contributing to lower costs and waste reduction. These systems promote green supply chain management by managing environmental impacts and eco-design initiatives. Strategic planning, managerial commitment, and interdisciplinary expertise are essential for successful ERP-sustainability integration. Integration with other systems can enhance sustainable outcomes through improved supply chain visibility and resource optimization.

Managerial Implications and Challenges

Managers should harness ERP capabilities to facilitate sustainability-focused decision-making by configuring relevant modules, indicators, and reporting tools to align with sustainability goals. Implementing training programs can enhance user proficiency and promote the use of ERP data for monitoring environmental and social performance. Organizations can also integrate ERP with complementary tools, such as sustainability dashboards or carbon-tracking solutions, to improve reporting accuracy and responsiveness [18, 54]. Strategic alignment between ERP implementation and sustainability frameworks, like ESG reporting standards, is crucial for maximizing value.

However, several challenges hinder ERP systems' ability to fully support sustainability. High implementation and maintenance costs may limit adoption, particularly among small and medium-sized enterprises [55, 56]. Successful ERP usage demands skilled employees, effective change management, and robust data governance, which many organizations find difficult to maintain. Issues with data quality, fragmented legacy systems, and misalignment between ERP features and sustainability reporting needs can further diminish the system's effectiveness [57]. In some instances, organizations may underutilize sustainability-related functionalities or lack the expertise to meaningfully analyze the available data.

Conclusion and Suggestion

This conceptual review explores the role of ERP systems in bolstering business sustainability across economic, environmental, social, and governance dimensions. The discussion highlights how ERP systems add substantial value by integrating organizational data, enhancing process efficiency, and improving transparency. These capabilities

empower firms to reduce operational costs, optimize resource usage, strengthen internal controls, and support reliable sustainability and ESG reporting. Through both operational and strategic mechanisms, ERP systems serve as comprehensive enablers of sustainable business performance.

Despite these strengths, organizations may encounter challenges such as high implementation costs, limited user capabilities, data quality issues, and a misalignment between system features and the system's sustainability requirements. Overcoming these barriers necessitates strong managerial commitment, targeted training, and the strategic alignment of ERP functionality with sustainability goals. Firms should ensure that ERP modules, performance indicators, and reporting tools are designed to effectively capture sustainability-related information.

Future research can substantiate the conceptual connections proposed in this review by conducting empirical studies across various industries, organizational sizes, and geographical contexts. Further exploration may focus on integrating ERP with emerging digital tools such as sustainability analytics, carbon accounting systems, and artificial intelligence. As sustainability becomes increasingly central to corporate strategy, ERP systems will continue to play a crucial role in enabling organizations to manage performance, comply with reporting standards, and pursue long-term sustainable growth.

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