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The Impact of Digital Transformation on Business Models and Organizational Performance: A Review of Empirical Evidence and Future Directions

Moses Adondua Abah*[1,2], Agada Priscillia Ojotule[3], Micheal Abimbola Oladosu[2,4] and Ochuele Dominic Agida[1,2]

[1]*Department of Biochemistry, Faculty of Biosciences, Federal University Wukari, Taraba State, Nigeria*
[2]*ResearchHub Nexus Institute, Nigeria*
[3]*Department of Theatre and Media Arts, Faculty of Theatre Arts, Federal university of Lafia, P.M.B 950101, Lafia, Nasarawa State, Nigeria*
[4]*Department of Biochemistry, Faculty of Basic Medical Sciences, University of Lagos, Lagos State, Nigeria*

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Corresponding Author: **Moses Adondua Abah** | E-Mail: **(m.abah@fuwukari.edu.ng)**

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ABSTRACT

The accelerating wave of digital transformation (DT) has fundamentally reshaped how organizations create value, compete and sustain performance in the modern economy. Emerging digital technologies such as artificial intelligence, big data analytics, cloud computing and the Internet of Things are not merely operational tools, ; they are strategic enablers that redefine business models and organizational trajectories. This review synthesizes a broad spectrum of empirical evidence to examine how DT influences business model innovation and organizational performance across industries and contexts. Findings from recent studies reveal that DT fosters new value creation logics, enhances operational efficiency, and stimulates organizational agility, yet its benefits are unevenly distributed and often contingent on leadership capabilities, digital culture, and strategic alignment. The review highlights that while many firms achieve measurable gains in productivity and innovation through DT initiatives, others struggle with legacy systems, resistance to change, and capability gaps that hinder transformation outcomes. Beyond summarizing existing evidence, this paper identifies emerging trends such as data-driven ecosystems, sustainability-oriented digitalization, and human–machine collaboration as critical frontiers for future research. By bridging insights from management, information systems, and innovation literature, this review offers a comprehensive understanding of DT's transformative power and provides strategic directions for organizations striving to thrive in an increasingly digital and competitive landscape.

Keywords: *Digital transformation, Business models, Organizational performance, Innovation, Industry 4.0, and Digital strategy.*

Introduction

Digital transformation (DT) has become a strategic imperative for organizations seeking to remain competitive in an increasingly digital and dynamic global economy. It refers to the integration of digital technologies such as artificial intelligence (AI), cloud computing, big data analytics, the Internet of Things (IoT), and blockchain into core business processes, models, and strategies [1]. The rise of DT has been accelerated by global disruptions, shifting consumer expectations, and technological convergence, fundamentally changing how firms create, deliver, and capture value [2]. Rather than representing a purely technological evolution, DT reflects an organizational transformation that requires reconfiguring capabilities, culture, and leadership. Consequently, understanding how DT influences business model innovation (BMI) and organizational performance has become an essential topic of empirical inquiry within management, information systems, and strategic innovation research [3].

A central pathway through which DT influences firm success is business model innovation. The adoption of digital technologies allows organizations to redefine value propositions, revenue streams, and delivery mechanisms. Empirical research indicates that DT acts as a catalyst for BMI by enabling firms to leverage digital platforms, data analytics, and connectivity to introduce new forms of customer interaction and service delivery [4]. For instance, firms in manufacturing and service industries increasingly adopt platform-based and data-driven business models that emphasize co-creation and ecosystem partnerships [5]. However, the process of business model adaptation is highly context-dependent. Traditional industries face barriers such as legacy systems, rigid hierarchies, and cultural resistance that slow digital adoption [6]. Consequently, DT's impact on BMI varies across sectors and is often mediated by organizational agility, knowledge transfer, and digital leadership capabilities [7].

Beyond transforming business models, digital transformation also has significant implications for organizational performance. Numerous empirical studies report that DT enhances financial outcomes, innovation capacity, and operational efficiency [8, 9]. In a longitudinal analysis of Chinese A-share companies from 2012 to 2022, [10] found that digital transformation improves enterprise performance, with dual innovation, exploratory and exploitative, acting as a mediating mechanism. Similarly, [11] showed that DT enhances innovation quality by promoting strategic risk-taking and improving the coordination of resources. [12] further demonstrated that in small- and medium-sized enterprises (SMEs), the interplay between digital adoption, digital culture,

and organizational learning significantly boosts innovation performance. These findings collectively underscore that DT's impact on performance extends beyond financial metrics to include intangible dimensions such as organizational learning, digital maturity, and resilience.

However, the benefits of DT are neither automatic nor universal. Organizational enablers such as leadership, digital culture, strategic alignment, and workforce capability play pivotal roles in determining transformation success [13]. Firms that cultivate digital leadership and encourage experimentation are more likely to achieve positive performance outcomes than those focusing solely on technology implementation [14]. Conversely, resistance to change, fragmented IT infrastructure, and skill shortages remain major obstacles to realizing DT's full potential [15]. Empirical evidence increasingly supports the notion that effective digital transformation requires alignment between technological investments and human, structural, and cultural capital [16]. Thus, leadership commitment and organizational readiness act as crucial moderators in the DT-performance relationship.

Despite the growing empirical attention, several research gaps persist. Most studies have concentrated on large firms in developed economies, leaving limited insight into how DT affects SMEs, public institutions, and organizations in emerging markets [17]. Additionally, the diversity of DT measurement approaches, ranging from IT investment ratios to digital maturity indices, complicates cross-study comparisons and generalization. Moreover, longitudinal studies capturing the long-term evolution of DT impacts are scarce [18]. Emerging themes such as sustainability-driven digitalization, artificial intelligence–enabled ecosystems, and human-machine collaboration remain underexplored empirically. Addressing these gaps is essential for advancing both theory and practice. Therefore, this review aims to consolidate empirical evidence on the impact of digital transformation on business models and organizational performance, analyze the mechanisms and contingencies involved, and outline future research directions that can deepen scholarly understanding and guide effective digital strategies for organizations worldwide.

Conceptualizing Digital Transformation

Digital transformation (DT) is widely conceptualized as more than technology adoption. It refers to the reconfiguration of organizational resources, capabilities, processes, and strategies to harness digital technology for creating, delivering, and capturing value [19]. DT requires firms to develop dynamic capabilities, including sensing new digital opportunities, seizing them through strategic initiatives, and transforming by aligning structure, culture, and business model to sustain competitive advantage [20].

Recent empirical studies in various contexts illustrate core dimensions and drivers of DT. For instance, [21] in their study of SMEs in China find that digital adoption, digital drive (i.e., the internal momentum to invest and push digital efforts), and digital culture are critical and interlinked in affecting innovation performance. In their model, digital drive mediates the relationship between adoption and innovation, while culture moderates those relationships [22]. Another study [23] shows in construction enterprises that DT positively impacts service innovation performance, with dual innovation (both exploratory and exploitative innovation) acting as a mediator of this relationship [24].

A useful theoretical framing comes from [25] process model of DT in incumbent firms. They propose that business model renewal, changes in collaborative approaches, and culture renewal are stages through which incumbents build dynamic capabilities for DT, mediated by agility and several microfoundations (e.g., sensing, prototyping, ecosystem interaction) [26]. This helps explain how internal drivers (leadership, culture, innovation mindset), external pressures (competitive environment, customer expectations), and organizational structure interact.

These conceptualizations also link DT with both business model innovation and organizational performance. Dual innovation is frequently used in recent studies to capture how DT enables both incremental improvement (exploitative) and radical/new innovation (exploratory), which jointly contribute to enhanced performance [27, 28]. Importantly, these relationships are not uniform: moderating factors such as firm size, culture, management power, and industry type shape how strongly DT leads to performance outcomes or innovation results.

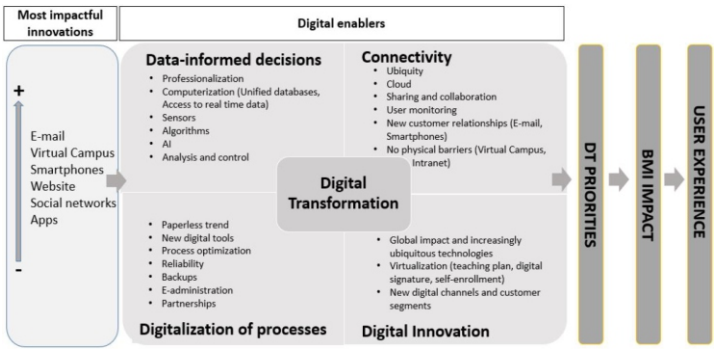

Figure 1. Digital Transformation Concept. This diagram illustrates the integration of digital technologies into various aspects of an organization's operations, culture, and strategy. It highlights how digital tools, data analytics, automation, and innovation drive improved efficiency, enhanced customer experiences, and new business models in the modern digital era. ***Source:*** [29]

In sum, the conceptual landscape shows that DT is multidimensional, driven by internal capability building, cultural readiness, and strategic alignment. However, gaps remain: most work is cross-sectional rather than longitudinal; measurement of digital transformation and its dimensions is inconsistent; and there is less theoretical clarity about how DT interacts with external environment factors, and how business model innovation specifically mediates performance in different sectors.

Table 1. Key enablers of digital transformation and their organizational impacts

Enabler	Primary Effect	Sources
Artificial Intelligence (AI)	Enhances decision-making and innovation capability	[30]
Big Data Analytics (BDA)	Supports data-driven business models	[31]
Cloud Computing	Improves agility and scalability	[32]
Digital Leadership	Drives cultural readiness for transformation	[33]
Internet of Things (IoT)	Enables real-time data integration	[12]

Empirical Evidence on Digital Transformation and Business Model Innovation

Over the past several years, empirical studies have progressively clarified how digital transformation (DT) acts as a powerful driver of business model innovation (BMI) in various industry and firm settings. One line of research has demonstrated that DT reduces transaction costs, enhances operational efficiency, and enables novel value creation

mechanisms, which in turn spur changes in business model architecture. For example, a study of manufacturing enterprises found that DT significantly reduces transaction costs, which mediates how digital capabilities lead to BMI and ultimately competitive advantage [14]. The researchers used econometric models to show that firms with stronger DT investments tend to undertake more radical shifts in value-delivery and value-capture mechanisms.

Another set of empirical work examines how SMEs (small and medium enterprises) utilize digital technologies as a core enabler of business model innovation in response to internationalization pressures. [15], in a study on internationalizing SMEs, found that BMI mediates the relationship between digital technologies and successful entry into foreign markets. Their framework emphasises that components such as value proposition, delivery channels, and revenue logic need digital reconfiguration for firms to adapt successfully across borders.

Empirical evidence has also surfaced in traditional industries, which are often thought to lag in digital adoption. In the study "The Influence of Digital Transformation on Business Model Innovation in Traditional Industries," [17] show that traditional firms using technologies like IoT, big data, and AI are able tocan transform their business models by improving customer experience, redesigning value delivery, and creating new revenue streams. However, the study also notes that these industries encounter higher friction from legacy systems and regulatory constraints, which moderate the pace and extent of business model innovation.

A further insight comes from structured literature reviews and bibliometric analyses, which have mapped the landscape of how DT fosters BMI, revealing patterns in which technologies are used, which business model components are most frequently changed, and what facilitators or obstacles are recurrent. For example, [18] in The Digital Transformation of Business Model Innovation: A Structured Literature Review, examined 57 publications and found that DT has affected all key components of business models—value creation, value delivery, and value capture. They observed that enabling technologies, stakeholder involvement, ecosystem orientation, and sustainability considerations are increasingly prominent in BMI studies.

However, the empirical evidence also highlights heterogeneity: not all DT leads to disruptive BMI, and the nature of the innovation depends strongly on firm size, industry, regulatory environment, digital maturity, and managerial capabilities. For example, in manufacturing, BMI often takes the form of improving efficiency and optimising value chains, whereas in service or high-tech firms, it may involve platform models, ecosystem partnerships, or entirely new revenue logics [19, 20]. Moreover, some studies have found that while DT enables innovation, the changes may be incremental rather than radical, especially in traditional firms constrained by legacy assets and organizational inertia [21].

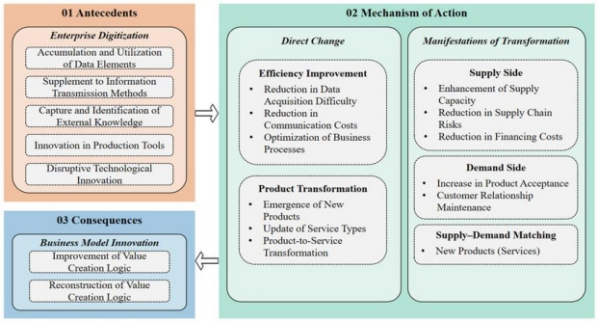

Figure 2. Logic of digitalization and business model innovation in manufacturing enterprises. This diagram demonstrates the interrelationship between digital transformation initiatives and business model innovation within manufacturing enterprises. It highlights how emerging digital technologies drive operational efficiency, value co-creation, and strategic renewal, ultimately leading to sustainable competitive advantage.
Source: [22]

Digital Transformation and Organizational Performance

Research treating digital transformation (DT) as a multi-dimensional phenomenon shows that DT affects organizational performance through several pathways, such as operational efficiency, innovation capability, financial metrics, and customer value creation. However, effects are conditional on complementary capabilities (leadership, culture, knowledge processes) and on industry/contextual factors [23, 24]

Operational and Financial Performance Outcomes

Empirical studies report that DT improves operational performance by streamlining processes, increasing responsiveness, and enabling smarter supply-chain coordination.[25] show how smart technologies in digital supply chains support collaboration and operational gains. At the firm-level, DT is associated with productivity and financial improvements when technology investments are paired with managerial reform and capability upgrades [26]. These findings indicate that technology alone rarely produces sustained financial returns without organizational change.

Innovation and Knowledge Performance

DT functions as a "knowledge amplifier," enabling both exploitative and exploratory innovation. [27] find that, in Made-in-Italy SMEs, digital tools (combined with sensing and learning capabilities) support customer-value innovations and business-model renewal. Similarly, [28] synthesize evidence that DT facilitates new value propositions via data, platforms, and ecosystem interactions, thereby boosting firms' innovation performance when supported by dynamic capabilities.

Mediators and Moderators: Culture, Leadership, Capabilities: Scholars repeatedly identify organizational culture, leadership, and dynamic capabilities as key mediators/moderators of the DT–DT-DT-performance link. [28] develop a dynamic-capabilities perspective that emphasizes sensing, seizing, and transforming microfoundations as necessary for DT to translate into performance gains. [29] find that digital capability improves organizational outcomes primarily through digital innovation i.e., innovation mediates the effect of digital capability on performance. Thus, investments in people, processes, and managerial practices are central to realizing DT benefits.

Mixed Evidence and Contextual Differences

Despite the generally positive picture, evidence is heterogeneous. Some firms experience limited returns because of fragmented IT landscapes, weak change management, or missing complementary investments [30]. Industry differences matter: service and platform-oriented firms often capture gains faster than traditional manufacturing firms, which must overcome legacy systems and regulation [31, 32]. Overall, the literature indicates that DT raises performance potential, but realization depends on organizational readiness and contextual fit.

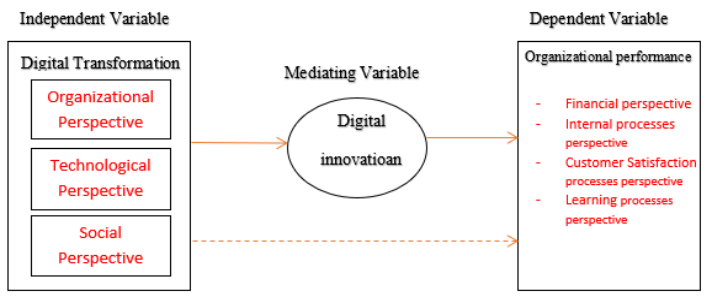

Figure 3. Digital Transformation and Organizational Performance. This diagram illustrates how digital transformation influences key dimensions of organizational performance, including efficiency, innovation, customer satisfaction, and strategic agility. It emphasizes the role of technology adoption, digital culture, and process reengineering in achieving improved business outcomes and long-term competitiveness.
Source: [33]

Challenges, Barriers, and Limitations of Digital Transformation

Although digital transformation (DT) promises considerable gains in value creation and organizational performance, empirical research consistently shows that many firms struggle to realize these benefits because DT is as much an organizational and strategic challenge as it is a technological one. One core issue is strategic misalignment: firms often pursue ad-hoc technology projects without integrating them into a coherent digital strategy or rethinking their value proposition and business model architecture. [24] emphasize that DT requires a multidisciplinary alignment strategy, ; marketing, IT, operations, and governance must be coordinated, otherwise investments become fragmented and fail to produce systemic performance improvements. In short, technology adoption alone is insufficient; DT must be embedded within organizational strategy and business model renewal.

Organizational culture and people issues form a second major barrier. Resistance to change, siloed structures, and a lack of experimentation mentality impede the organizational shifts DT demands. [25] argue that building the dynamic capabilities necessary for DT—sensing, seizing, and transforming depends heavily on cultural and managerial microfoundations such as experimentation, cross-functional teams, and leadership that rewards learning. Similarly, [26] highlight that people (leadership, workforce skills, change management) are the decisive factor in successful DT: organizations that neglect human and managerial dimensions commonly see digital initiatives stall or produce only piecemeal improvements.

Third, technological and legacy-system constraints often limit DT's effectiveness. Firms with a patchwork of legacy IT systems face integration bottlenecks, data silos, and higher cybersecurity exposure, which complicates attempts to scale digital pilots into enterprise-wide capabilities. [27] document how digital supply-chain technologies produce benefits only when there is a coherent architecture and governance that avoids fragmentation; otherwise, smart technologies create isolated pockets of improved efficiency without overall supply-chain transformation. Small and medium enterprises (SMEs) and organizations in emerging economies are particularly exposed, often lacking the capital, infrastructure, or technical talent to modernize legacy estates comprehensively [28].

A fourth constraint is the uneven distribution of organizational capabilities required to convert digital investments into performance. Empirical studies show that digital capability or orientation improves outcomes primarily via digital innovation and complementary managerial processes [29]. Where firms lack these complementary capabilities, data analytics competence, cross-functional coordination, and managerial routines for experimentation, technology investments may yield marginal returns. This explains why the same digital intervention can deliver dramatic performance improvements in digitally mature firms but produce negligible effects in less prepared organizations.

Finally, external and contextual factors—regulation, industry dynamics, and ecosystem readiness, - can further limit DT. Highly regulated sectors (e.g., healthcare, finance) face compliance constraints that slow experimentation and adoption, while ecosystem dependencies (partners, suppliers, platforms) can bottleneck transformation trajectories. [29] and [30] both stress that DT is path dependent and contingent: successful transformation is rarely a one-off project but a long-term process requiring continual reconfiguration of resources, relationships, and capabilities.

In sum, the literature indicates that overcoming DT barriers requires a holistic approach: integrate digital strategy with business model innovation, invest in leadership and human capital, modernize and govern technology architecture, and develop dynamic capabilities that enable continuous sensing and reconfiguration. Addressing these strategic, organizational, technological, and contextual constraints is essential if DT is to translate into sustained performance and meaningful business-model renewal.

Figure 4. Challenges of Digital Transformation. This diagram outlines the major obstacles organizations encounter during the digital transformation journey. It highlights issues such as technological integration difficulties, cybersecurity risks, skill gaps, cultural resistance to change, and financial constraints that can hinder successful digital adoption and implementation.
Source: [33]

Emerging Trends and Theoretical Perspectives

Contemporary research shows that digital transformation (DT) is reshaping business models and firm performance through several converging trends and theoretical lenses. This section summarizes the most influential emerging trends — platformization and ecosystems, AI and analytics, socio-technical alignment, digital sustainability, and theoretical integrations (dynamic capabilities, ambidexterity, institutional perspectives) and cites the key, peer-reviewed sources that support these ideas.

Table 2. Emerging Trends in Digital Transformation Research

Trends	Implication	Sources
Platformization	Encourages network-based business models	[12]
AI-Driven Processes	Automates analytics and decision-making	[13]
Digital Sustainability	Integrates green and digital innovation	[14]
Human–Machine Collaboration	Reshapes roles and learning processes	[15]
Data Ethics & Governance	Requires responsible data management	[16]

Platformization and Ecosystems

Digital platforms and ecosystems reconfigure firm boundaries and shift competition to network-level orchestration. Ecosystem theory and platform research explain how interdependent actors co-create and appropriate value within platform-based business models [17].

AI, Analytics, and the Knowledge View

AI, machine learning, and big-data analytics are central to modern business- model innovation because they enable prediction, personalization, and process optimization. These capabilities interact with firms' knowledge resources and dynamic capabilities to influence performance [18].

Socio-Technical Alignment and Dynamic Capabilities

Successful DT depends on aligning technology with human and organizational systems. The socio-technical and dynamic-capabilities perspectives emphasize sensing, seizing, and transforming routines, and the need for leadership, culture, and learning as microfoundations of transformation [19, 20].

Digital sustainability Sustainability and Responsible Innovation

An emerging strand integrates sustainability with digital strategy — "digital sustainability" — arguing that digital initiatives should advance environmental and social goals alongside economic performance [21]. This trend calls for responsible data governance and sustainability-oriented capabilities.

Theoretical Integration: Ambidexterity and Institutions

Finally, ambidexterity (balancing exploration/exploitation) and institutional theory provide lenses to explain how firms manage competing pressures during DT and how regulatory and normative contexts shape adoption pathways [22].

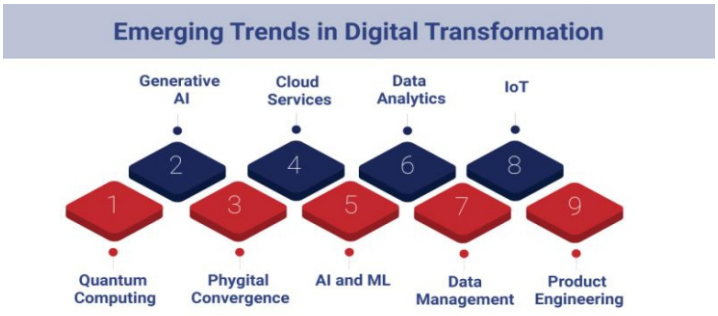

Figure 5. Emerging trends in Digital transformation. This diagram showcases the latest developments shaping the future of digital transformation. It highlights trends such as artificial intelligence integration, cloud computing, Internet of Things (IoT), edge computing, automation, and data-driven decision-making that are redefining business operations and enhancing digital competitiveness.
Source: [22]

Table 3. Major theoretical perspectives on digital transformation

Theory	Core Focus	Sources
Dynamic Capabilities	Firms adapt through sensing and seizing opportunities	[23]
Knowledge-Based View	Knowledge integration enhances innovation	24]
Ambidexterity Theory	Balances exploration and exploitation	[25]
Socio-Technical Systems	Aligns technology with human systems	[26]
Institutional Theory	Explains external pressures in digital adoption	[27]

Future Research Directions and Managerial Implications

As digital transformation (DT) continues to redefine competitive dynamics across industries, research has advanced our understanding of how digital technologies reshape business models and organizational performance. Yet, empirical and theoretical gaps remain. Many existing studies are cross-sectional, context-specific, or focused on large enterprises, leaving questions about causal mechanisms, boundary conditions, and long-term outcomes unanswered [28]. Likewise, managerial practices are evolving faster than academic frameworks can capture. Therefore, future research should adopt a longitudinal, multi-level, and interdisciplinary lens to explain how DT drives sustainable performance and organizational resilience, while managers must build adaptive strategies that align digital initiatives with human and strategic capabilities.

Future Research Directions

First, longitudinal and cross-industry investigations are essential to capture the temporal evolution of DT and its effects on performance. Most empirical studies remain snapshot analyses that fail to reveal how digital initiatives mature over time or interact with changing market conditions [29]. Future research should employ longitudinal case studies and panel data to examine how firms sustain digital advantages, adapt business models, and institutionalize new routines. Comparative work across manufacturing, services, and public sectors could also illuminate sector-specific enablers and inhibitors of digital maturity.

Second, scholars should further explore the microfoundations of dynamic capabilities that mediate the DT–DT-performance relationship. While the dynamic capabilities framework has been widely adopted [30,31], few studies empirically disentangle how sensing, seizing, and transforming capabilities operate at the individual and team levels. Future research should investigate how leadership cognition, learning routines, and digital mindsets translate into organizational agility and innovation. Mixed-methods designs integrating behavioral, managerial, and technological data could help uncover these mechanisms more precisely.

Third, the role of digital ecosystems and inter-organizational collaboration deserves deeper exploration. As firms increasingly depend on platforms and data partnerships, the locus of innovation and value creation extends beyond firm boundaries [32]. Future studies should analyze how ecosystem participation, data sharing, and co-innovation influence both firm performance and collective outcomes such as sustainability and resilience. Integrating ecosystem theory with business model innovation research could clarify how firms co-create and appropriate value within digital networks.

Fourth, the ethical, social, and sustainability dimensions of DT remain underexamined. As organizations adopt artificial intelligence, automation, and data-driven decision-making, questions about digital ethics, employee well-being, and

environmental impact become increasingly salient. Research should investigate how responsible digital transformation—balancing efficiency with ethics affects stakeholder trust, long-term legitimacy, and sustainable performance [33]. This agenda aligns with the emerging discourse on "digital sustainability," which integrates ESG (environmental, social, and governance) principles into digital strategies.

Managerial Implications

For managers, the implications are both strategic and operational. First, digital transformation must be treated as a strategic renewal process rather than a technology adoption exercise. Leaders should articulate a clear digital vision aligned with corporate strategy, ensuring that investments in technology support new value propositions and business models [13]. Second, organizations must foster digital leadership and a learning culture that encourages experimentation and cross-functional collaboration. Managers should prioritize skill development, psychological safety, and empowerment to overcome resistance and accelerate adoption [12]

Third, firms need to develop ambidextrous capabilities, balancing exploration of new digital opportunities with exploitation of existing competencies. As [14] demonstrate, digital capabilities enhance performance mainly through digital innovation; thus, managers should cultivate innovation routines, agile structures, and partnerships that sustain digital momentum. Finally, success requires ecosystem thinking: participating in digital networks, sharing data responsibly, and co-creating value with partners and customers. This mindset transforms DT from a firm-centric initiative into a collaborative, ecosystem-driven process that strengthens long-term competitiveness and resilience.

Conclusion

Digital transformation has emerged as a defining force reshaping how firms operate, compete, and create value in the digital economy. The evidence reviewed highlights that DT extends beyond technology adoption to encompass strategic, structural, and cultural renewal that drives business model innovation and organizational performance. Emerging trends such as platformization, data-driven decision-making, socio-technical alignment, and digital sustainability underscore that transformation success depends on dynamic capabilities, knowledge integration, and leadership agility.

Empirical research further reveals that while digital initiatives enhance innovation, efficiency, and customer engagement, their benefits are often contingent upon organizational readiness and strategic coherence. Theoretical frameworks, particularly the dynamic capabilities, knowledge-based, and ambidexterity perspectives, offer valuable explanations for these variations. As firms navigate increasingly volatile digital environments, aligning digital strategy with long-term sustainability and ethical considerations will be essential for maintaining competitive advantage.

Future research should move beyond firm-level analyses to explore ecosystem-level transformations, digital inclusion, and human–machine collaboration. By integrating insights across management, information systems, and sustainability disciplines, scholars can better explain how digital transformation simultaneously disrupts and advances the foundations of organizational performance in the 21st century.

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Conflict of Interest

The authors declared that there are no conflicts of interest.

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