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DYNAMIC CAPABILITIES ARE INTEGRAL TO ENABLING THE TWIN TRANSITION FOR SUSTAINABILITY AND DIGITAL TRANSFORMATION

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Purpose: This paper explores how dynamic capabilities (DC) enable organizations to navigate the twin transition, the simultaneous pursuit of digital transformation (DT) and sustainability. It develops a conceptual framework explaining how DC, through their core processes of sensing, seizing, and reconfiguration, integrate technological and environmental logics to achieve sustainable digital performance (SDP). The study also examines the moderating role of sustainability orientation (SO) in shaping this relationship.

Design/methodology/approach: Adopting a narrative literature review approach, this study synthesizes theoretical and empirical research published between 2007 and 2025. Drawing from the dynamic capabilities, digital transformation, and sustainability literatures, it develops an integrative conceptual model. Rather than following a systematic protocol, the review applies a conceptual synthesis method (Snyder, 2019), allowing for theoretical interpretation and cross-disciplinary integration.

Findings: Dynamic capabilities are identified as the core integrative mechanism linking sustainability and digitalization. DC enable firms to sense emerging technological and ecological opportunities, seize them through innovation and resource orchestration, and reconfigure organizational structures to sustain advantage. The study introduces sustainable digital performance (SDP) as a holistic outcome that reflects the convergence of technological adaptability and sustainability objectives, demonstrating that organizations with strong DC and a robust SO achieve superior twin-transition outcomes.

Research limitations/implications: As a conceptual paper, the study lacks empirical validation. Future research should test the framework using quantitative and longitudinal methods to examine the dynamic relationships among DC, DT, SO, and SDP. Further work is needed to operationalize SDP and explore industry-specific and institutional contingencies.

Practical implications: For managers, the framework provides a diagnostic tool to strengthen the microfoundations of DC, leadership cognition, learning, and resource orchestration, supporting the twin transition. For policymakers, it suggests fostering incentives and partnerships that enhance both digital and sustainability competences at organizational and ecosystem levels.

Originality/value: This paper unites dynamic capabilities, digital transformation, and sustainability into a single framework, positioning DC as meta-capabilities that drive sustainable digital competitiveness. The concept of sustainable digital performance offers a new perspective on organizational success in the era of the twin transition.

Keywords: dynamic capabilities; twin transition; digital transformation; sustainability orientation; sustainable digital performance.
Category of the paper: Literature review, Conceptual paper.

1. Introduction

The twenty-first century has been marked by two simultaneous and transformative megatrends: sustainability and digitalization. Their convergence which is commonly referred to as the twin transition, represents one of the most profound strategic challenges and opportunities for organizations globally. While sustainability focuses on balancing economic growth with environmental and social responsibility, digital transformation emphasizes the adoption of technologies such as artificial intelligence, big data analytics, and Industry 5.0 systems to improve efficiency and innovation (Feroz, Zo, 2023). The intersection of these two paradigms is not merely technological or environmental but strategic: it requires organizations to develop capabilities that enable them to sense emerging opportunities, seize them through innovation, and reconfigure their resources and processes to sustain competitiveness in an evolving environment.

The theory of dynamic capabilities (DC) offers a powerful conceptual lens to understand how organizations navigate such complexity. Originating from Teece, Pisano and Shuen (Teece et al., 1997) the DC framework highlights the organization's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments. Later refinements, including Teece (2007) and Wang and Ahmed (2007), operationalized DC into three microfoundational mechanisms: sensing, seizing, and reconfiguring. These capabilities underpin an organization's strategic agility and long-term performance, especially under conditions of turbulence and uncertainty (Dominiczewska, 2025).

In recent years, there has been a substantial increase in research connecting DC with digital transformation (Civelek, Krajčík, 2023; Mele, Capaldo, 2024) and sustainability (Amui et al., 2017; Buzzao, Rizzi, 2021). However, most research treats these domains separately. Studies on DC and sustainability tend to focus on environmental and social adaptation, exploring how organization develop green dynamic capabilities or sustainability-oriented DC to manage eco-innovation and stakeholder engagement(Albort-Morant et al., 2018). Conversely, literature on DC and digital transformation often emphasizes technological agility, IT-enabled sensing, and organizational learning for digital innovation (Feroz, Zo, 2023; Valdez-Juárez, Ramos-Escobar, 2024).The emerging reality of the twin transition where sustainability goals are deeply intertwined with digital technologies has not yet been systematically explored through the DC lens.

This gap creates an important opportunity for theoretical integration. The twin transition requires organizations not only to invest in technology and sustainability initiatives but to develop higher-order capabilities that allow these transformations to reinforce each other (Teece, 2023). Digital tools can accelerate progress toward sustainability (e.g., carbon tracking, digital twins, predictive maintenance for energy efficiency), but only if organizations possess the dynamic capabilities to align technological innovation with environmental and social objectives (Dominiczewska, 2025; Wijayarathne, Gunawan, 2024). The relationship is reciprocal: sustainability imperatives also reshape how organizations design and deploy digital strategies, requiring governance mechanisms, ethical oversight, and stakeholder integration (Wei, Zheng, 2024) .

Despite the growing body of research linking dynamic capabilities with sustainability and digital transformation, existing studies predominantly examine these domains in isolation. While the literature provides valuable insights into dynamic capabilities in sustainability-oriented adaptation and digital transformation processes, the integrative role of dynamic capabilities in enabling their convergence within the twin transition remains insufficiently theorized. This lack of an integrative conceptual perspective constitutes a significant theoretical gap in the current literature. To address this gap, this conceptual study is guided by the following research question:

RQ: How do dynamic capabilities enable the twin transition for sustainability and digital transformation?

This research question provides the analytical foundation for the development of the proposed conceptual framework, which theorizes dynamic capabilities as the key enabling mechanisms that integrate sustainability and digital transformation within the twin transition, leading to sustainable digital performance.

2. Methods

This article synthesizes existing research at the intersection of dynamic capabilities (DC), sustainability, and digital transformation, offering a conceptual foundation for understanding how DC enable the twin transition. Unlike prior reviews, which examine either digital transformation or sustainability in isolation, this paper adopts a narrative integrative approach, following the methodological guidance of Snyder (2019). This approach allows for a critical and interpretive synthesis of existing literature rather than a rigid systematic protocol, enabling deeper theoretical analysis and cross-disciplinary integration.

The literature review encompasses the period 2007-2025, corresponding to the post-foundational phase of dynamic-capabilities theory. The search was conducted primarily in Scopus and Web of Science databases, complemented by targeted queries in Emerald Insight and EBSCO. Keywords and combinations included *dynamic capabilities, digital transformation, sustainability, twin transition, and Industry 5.0*. Articles were selected based on conceptual relevance, theoretical contribution, and citation significance, ensuring the inclusion of both seminal and recent works addressing the evolving role of DC in sustainability-oriented digital transformation.

An interpretive synthesis was applied to integrate insights across management, innovation, and sustainability literatures. The analysis focused on identifying convergent mechanisms, conceptual linkages, and research gaps across three streams: (1) Dynamic Capabilities and Sustainability – exploring how DC enable environmental and social innovation; (2) Dynamic Capabilities and Digital Transformation – examining how DC foster technological agility and strategic renewal; and (3) Dynamic Capabilities Enabling the Twin Transition – investigating how sustainability and digitalization interact as mutually reinforcing transformation logics.

This analytical integration forms the basis for the proposed conceptual model, which explains how DC, guided by sustainability orientation, drive sustainable digital performance through sensing, seizing, and reconfiguring mechanisms.

3. Results

The concept of dynamic capabilities (DC) has become one of the most influential theoretical lenses in strategic management, offering a framework for understanding how organizations sustain competitiveness in rapidly changing environments (Teece et al., 1997). Unlike ordinary capabilities, which enable organizations to perform existing activities efficiently, dynamic capabilities reflect the forganization's higher-order abilities to sense opportunities and threats, seize them through strategic action, and reconfigure resources and competences to adapt to new circumstances (Eisenhardt, Martin, 2000; Teece, 2007). This theoretical perspective emerged as an extension of the resource-based view (RBV), addressing its main limitation, the RBV's static conception of competitive advantage (Barney, 1991).

Dynamic capabilities thus represent a strategic meta-capability, emphasizing how organizations renew their resource base to respond to technological, market, and institutional turbulence. Over the past two decades, the framework has evolved substantially. Early works (Teece et al., 1997; Eisenhardt, Martin, 2000) focused on defining DC conceptually. Subsequent studies, such as Wang and Ahmed (2007) and Ambrosini and Bowman (2009),developed typologies, measurement models, and microfoundations that connect DC to performance outcomes. More recent research positions DC as enablers of digital

transformation, sustainability, and organizational resilience (Dominiczewska, 2025; Mele, Capaldo, 2024).

Teece (Teece, 2007) identified three interrelated processes that constitute the foundation of dynamic capabilities. Sensing involves identifying, interpreting, and prioritizing signals of change in the external environment. It includes market scanning, technological foresight, and stakeholder engagement (Barrales-Molina et al., 2013). Seizing refers to mobilizing resources and organizational commitment to capture emerging opportunities through innovation, investment, or strategic alliances (Teece, 2018).Resource reconfiguration entails transforming existing resource bases, organizational structures, and processes to sustain alignment with the evolving environment (Helfat, Peteraf, 2009). Together, these mechanisms describe how organisations dynamically renew their competences to maintain strategic fit. In practice, sensing requires learning capabilities and absorptive capacity (Zahra, George, 2002), seizing depends on entrepreneurial orientation (Sirmon et al., 2007) and reconfiguration draws on resource orchestration supported by organizational flexibility and leadership intentionality that enable organizations to realign resources and structures effectively (Hitt et al., 2011; Teece, 2018; Dominiczewska, 2025).

The microfoundations perspective represents a more recent stream in the evolution of DC theory, seeking to explain how individual-level actions and organizational routines collectively enable dynamic change (Felin, Powell, 2015). Scholars emphasize the role of managerial cognition, leadership, learning, and collaboration as key antecedents of DC development (Helfat, Martin, 2014). For instance, microfoundations of sensing are rooted in cognitive diversity, knowledge sharing, and boundary-spanning behaviors that enhance environmental awareness (Adner, Helfat, 2003). Seizing is supported by decision-making flexibility, innovation culture, and cross-functional integration (Augier et al., 2009). Reconfiguring depends on change management, trust, and dynamic routines that institutionalize learning (Winter, 2003).

In sustainability-oriented contexts, these microfoundations often extend beyond organization boundaries integrating stakeholder engagement, ethical leadership, and institutional learning. Similarly, in digital transformation, DC microfoundations incorporate data literacy, digital skills, and technological absorptive capacity. The intersection of these microfoundations is particularly relevant to the emerging Industry 5.0 paradigm, where human-centric and sustainability-driven innovation are seen as integral to technological progress

Dynamic capabilities operate not in isolation but as an integrative bridge between technological innovation and sustainable value creation. They enable organizations to align internal structures and external ecosystems, balancing efficiency with resilience and long-term societal impact. This dual role positions DC as central enablers of the twin transition the process of integrating digital and sustainable transformation pathways. From a theoretical standpoint, the evolution of the DC framework parallels the evolution from Industry 4.0 to Industry 5.0.

While Industry 4.0 emphasized automation, digitization, and efficiency, Industry 5.0 introduces human-centricity, sustainability, and resilience as defining principles (Nahavandi, 2019). DC thus become critical for orchestrating the coexistence of these paradigms. They allow organizations to sense technological and societal shifts, seize innovation opportunities that contribute to sustainable goals, and reconfigure their resource base to foster inclusive, environmentally responsible, and digitally enabled growth (Teece, 2023).

Recent literature supports this integrative view. Dominiczewska (2025) demonstrated empirically that DC significantly enhance firm performance by fostering both technological flexibility and strategic adaptability. Mele and Capaldo (2024) and Wei and Zheng (2024) highlighted that DC serve as mediating mechanisms linking digital transformation to sustainability outcomes, such as energy efficiency, circular economy practices, and social responsibility. This growing body of evidence reinforces the theoretical claim that DC are not merely tools for survival in turbulent markets but strategic enablers of organizational transformation in the era of Industry 5.0.

3.1. Dynamic Capabilities and Sustainability

Sustainability has evolved from a normative concern to a strategic imperative for contemporary organizations. Global challenges such as climate change, social inequality, and regulatory pressure have forced organizations to integrate environmental and social dimensions into their strategic decision-making (Bansal, Song, 2017). Yet sustainability is not static, it requires ongoing adaptation to shifting institutional, technological, and stakeholder expectations. This dynamic and uncertain nature of sustainability makes it an ideal domain for the application of the dynamic capabilities (DC) framework (Amui et al., 2017; Dominiczewska, 2025).

Dynamic capabilities provide the theoretical bridge that links sustainability ambitions to actionable, adaptive strategies. Through the processes of sensing, seizing, and reconfigration, organisations can identify sustainability-related opportunities and threats, mobilize resources to implement sustainable innovations, and realign structures to embed sustainability into their core operations (Teece, 2007). In this sense, sustainability-oriented DC represent a higher-order capability that enables the organization not only to comply with external requirements but to co-create long-term social and environmental value (Albort-Morant et al., 2018).

Sustainability-oriented sensing entails recognizing signals from diverse stakeholders, including customers, regulators, NGOs, and local communities and interpreting them as opportunities for innovation and differentiation (Hart, Dowell, 2011). Organizations with strong sensing capabilities engage in environmental scanning, stakeholder dialogue, and sustainability foresight, enabling them to anticipate emerging trends such as renewable energy transitions, ESG reporting standards, or circular economy regulations (Buzzao, Rizzi, 2021). Digital technologies further enhance this process by providing real-time environmental and social data through IoT sensors, big-data analytics, and AI-driven predictive models (Feroz,

Zo, 2023). Thus, sustainability sensing increasingly depends on both technological literacy and institutional awareness, a clear precursor to the twin transition perspective.

Once sustainability opportunities are sensed, organizations must develop the ability to seize them through innovation, investment, and partnership formation. This process often requires balancing short-term profitability with long-term value creation. The DC literature highlights the role of entrepreneurial orientation and strategic intent in mobilizing resources toward sustainability-driven projects (Teece, 2018). Organizations that successfully seize sustainability opportunities commonly adopt new business models, such as product-service systems, sharing economy models, or renewable energy integration, that align competitive advantage with environmental performance (Lüdeke-Freund, Dembek, 2017).

Moreover, seizing sustainability opportunities increasingly depends on collaborative capabilities, so the ability to co-innovate across organizational boundaries. This reflects the systemic nature of sustainability: no single firm can achieve it in isolation. Dynamic capabilities facilitate this collaboration by fostering trust, knowledge sharing, and joint learning with partners across supply chains and ecosystems (Albort-Morant et al., 2018). For example, green supply-chain collaborations and industrial symbiosis networks require firms to orchestrate external resources dynamically, aligning with the Industry 5.0 ethos of resilience and stakeholder inclusivity.

The reconfiguration phase represents the most transformative aspect of sustainability-oriented dynamic capabilities. It involves restructuring the organization's asset base, processes, and culture to embed sustainability as an enduring element of organizational identity (Teece, 2018). This transformation depends primarily on resource orchestration, the coordinated structuring, bundling, and leveraging of tangible and intangible resources to enable sustainability goals (Sirmon et al., 2007).

However, resource orchestration alone is insufficient; successful reconfiguration also relies on organizational flexibility and leadership intentionality that encourage adaptation and long-term vision (Adner,, Helfat, 2003; Eisenhardt Martin, 2000). Leadership plays a pivotal role in fostering a culture of sustainability and aligning incentives with sustainable outcomes (Dominiczewska, 2025). Through this process, dynamic capabilities become embedded in routines that continuously integrate sustainability considerations into innovation, production, and stakeholder engagement. From this perspective, sustainability is not a separate strategic goal but a dynamic capability outcome, a manifestation of the organisation's ability to learn, adapt, and reconfigure its systems to address environmental and social imperatives. This conceptualization aligns with emerging views of resilient and regenerative organizations, which pursue value creation beyond efficiency and profitability (Williams et al., 2017).

The integration of DC and sustainability extends into the domains of the circular economy and ESG (Environmental, Social, and Governance) performance. Circular-economy strategies, such as 9R (Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle, Recover) (Kirchherr et al., 2017), require organizations to reconfigure supply-chain structures, knowledge systems, and technological infrastructure (Holly, Schild, 2025). These processes exemplify reconfiguring at both the operational and ecosystem levels. In the context of ESG, DC enable organizations to sense stakeholder expectations, seize opportunities through responsible investment, and reconfigure governance systems to ensure transparency and accountability (Wei, Zheng, 2024). As regulatory frameworks such as the EU Taxonomy and the Corporate Sustainability Reporting Directive (CSRD) become mandatory, organizations need dynamic capabilities to align their digital and sustainability strategies with compliance and performance demands.

The convergence of DC, ESG, and circular-economy logics reflects the Industry 5.0 paradigm, where sustainability and human-centric digital innovation are inseparable (Nahavandi, 2019). Under this paradigm, DC are not only mechanisms of adaptation but strategic enablers of transformation, allowing organizations to move from reactive compliance to proactive value co-creation within sustainable ecosystems.

3.2. Dynamic Capabilities and Digital Transformation

Digital transformation has fundamentally altered how organizations create, deliver, and capture value. Beyond mere technological adoption, it represents a deep organizational transformation that reshapes processes, structures, and business models through the integration of digital technologies such as artificial intelligence (AI), the Internet of Things (IoT), cloud computing, and big data analytics (Vial, 2019). From a dynamic capabilities (DC) perspective, successful digital transformation requires more than technological investment, it depends on the organization's ability to sense digital opportunities, seize them strategically, and reconfigure resources to achieve sustainable competitive advantage ((Teece, 2018); Dominiczewska, 2025).

The sensing dimension of DC in digital contexts involves scanning and interpreting technological trends, market disruptions, and data-driven insights. Organizations with advanced sensing capabilities continuously monitor emerging digital technologies, evaluate their strategic potential, and integrate external signals from customers, competitors, and ecosystems (Mikalef, Pateli, 2017). Digital platforms, data analytics, and AI enhance sensing by enabling real-time monitoring of both operational performance and environmental conditions (Feroz et al., 2023).

In particular, digital sensing supports sustainability by helping firms predict environmental impacts, optimize energy consumption, and identify opportunities for circular innovation. For example, digital twins, virtual replicas of physical assets, allow firms to simulate and optimize resource use, reducing waste and emissions (Qi et al., 2018). Through digital sensing,

organizations bridge technological agility with environmental awareness, reflecting the core logic of the twin transition.

The seizing process involves translating digital insights into actionable strategies. This requires entrepreneurial orientation, innovation management, and cross-functional collaboration to integrate digital tools into products, services, and business models (Teece, 2018). DC enable organizations to seize digital opportunities by orchestrating resources toward experimentation, learning, and scaling digital initiatives (Mikalef, Pateli, 2017).

Importantly, seizing is not limited to efficiency gains but includes the development of new forms of digital value creation. In the context of sustainability, digital technologies facilitate traceability (e.g., blockchain for supply-chain transparency), energy efficiency (e.g., AI-driven smart grids), and dematerialization (e.g., digital services replacing physical goods). Thus, the seizing of digital opportunities increasingly supports sustainable outcomes consistent with the principles of Industry 5.0, where technology serves human and environmental well-being (Nahavandi, 2019).

The resource reconfiguration dimension represents the organization's capacity to realign structures, processes, and culture to embed digitalization into its DNA. From a DC perspective, reconfiguration requires resource orchestration, the structuring, bundling, and leveraging of tangible and intangible assets (Sirmon et al., 2007). It also depends on organizational flexibility and leadership, which enable strategic coherence and cultural adaptation (Teece, 2018; Dominiczewska, 2025).

In digital contexts, reconfiguring involves developing data governance systems, agile organizational structures, and continuous-learning mechanisms (Warner, Wäger, 2019). It may also include rethinking value chains through digital ecosystems and platforms that enhance knowledge exchange and innovation speed (Mele, Capaldo, 2024). These routines underpin digital resilience, the ability to absorb, adapt, and recover from technological and environmental disruptions.

Ultimately, the relationship between dynamic capabilities and digital transformation cannot be separated from sustainability. Digital transformation enables efficiency, data-driven innovation, and dematerialization, while sustainability provides purpose, legitimacy, and direction. DC enable organizations to integrate these trajectories converting digital potential into sustainable performance.

This integration aligns with the European Union's twin transition agenda, which promotes simultaneous progress in digitalization and sustainability as drivers of competitive advantage (European Commission, 2023). In this context, DC are not simply enablers of technological adaptation but strategic capabilities for responsible and regenerative transformation. The intersection of DC, digital technologies, and sustainability thus represents a new research frontier, one that extends beyond Industry 4.0 toward an Industry 5.0 logic centered on human well-being.

3.3. The Intersection – Enabling the Twin Transition

The convergence of sustainability and digital transformation commonly termed the twin transition has become a defining challenge for organizations seeking long-term competitiveness and legitimacy. Achieving progress in both domains simultaneously demands that firms enhance their technological responsiveness while embedding environmental and social priorities within strategy and operations. The dynamic-capabilities (DC) framework offers a coherent lens for explaining how organizations can align these dual imperatives.

DC enable organizations to integrate the technological and sustainability dimensions of change through their core mechanisms of sensing, seizing, and reconfiguring. In practice, this means identifying emerging digital and sustainability opportunities, mobilizing resources to act on them, and continuously realigning structures and processes to sustain advantage. Rather than viewing digitalization and sustainability as parallel trajectories, the DC perspective highlights their mutual reinforcement: digital tools enhance environmental performance, and sustainability goals provide direction and legitimacy for technological investment.

Through sensing, organizations interpret technological trends and environmental signals to anticipate disruption. Seizing involves orchestrating resources and partnerships to pursue innovation that meets both efficiency and responsibility targets. Reconfiguration requires redesigning routines, culture, and governance to embed these objectives as enduring capabilities (Sirmon, Hitt, Ireland, 2011). Empirical evidence shows that organizations with stronger DC adapt more effectively to regulatory change, technological turbulence, and stakeholder expectations, achieving superior resilience and long-term value (Mikalef, Pateli, 2017; Warner, Wäger, 2019).

Digital technologies play a critical enabling role in this process. Data analytics, Internet-of-Things infrastructures, and artificial intelligence support real-time sensing of environmental and operational performance (Feroz et al., 2023). These same technologies enhance seizing by facilitating innovation in cleaner production, energy optimization, and traceable supply-chain systems. Meanwhile, digital platforms and agile organizational forms strengthen reconfiguration by accelerating learning and collaboration across ecosystems. As organizations embed these routines, the twin transition becomes less an external pressure and more a continuous internal capability for sustainable digital adaptation.

The integrative potential of DC suggests that sustainable competitiveness in the twin transition depends not merely on resource possession but on the ability to renew and recombine them dynamically. Organizations that develop these higher-order capabilities can simultaneously exploit technological opportunities and explore pathways toward environmental and social impact, thereby translating digital transformation into lasting sustainable performance.

Future research should investigate how specific microfoundations, such as leadership cognition, employee learning, and cross-sector collaboration, shape the dynamic interaction between technological and sustainability capabilities. Greater empirical attention is also needed to understand how governance and ESG mechanisms condition the development of DC in digital contexts. By focusing on these links, scholars can clarify how dynamic capabilities act as the connective tissue through which organizations orchestrate the twin transition effectively and responsibly.

Building on the conceptual framework of dynamic capabilities as the enabler of the twin transition, this study proposes a process-based model that specifies how these capabilities translate into organizational outcomes. Dynamic capabilities (DC) constitute the foundational enablers of transformation, equipping organizations with the capacity to sense, seize, and reconfigure in response to both digital and sustainability-related challenges (Teece, 2018; Dominiczewska, 2025). Their deployment facilitates digital transformation (DT) the restructuring of business models, processes, and organizational culture through digital technologies (Vial, 2019).

At the same time, sustainability orientation (SO**),** an organization's strategic commitment to environmental and social goals, acts as a moderating force that guides how dynamic capabilities are exercised. High sustainability orientation channels digital transformation efforts toward socially responsible and environmentally aligned outcomes (Feroz, Zo, Eom, 2023; Wei, Zheng, 2024). Thus, organizations with both strong DC and a robust SO are more likely to implement digital technologies in ways that contribute to long-term resilience and legitimacy.

The joint effect of these mechanisms results in sustainable digital performance (SDP) a holistic measure capturing an organization's ability to achieve technological excellence while maintaining ethical, social, and ecological responsibility. In this model, digital transformation mediates the relationship between dynamic capabilities and sustainable digital performance, while sustainability orientation moderates it, strengthening the positive effect of DC on DT. This dual pathway underscores that sustainable competitiveness in the twin transition arises not from technology adoption alone but from the dynamic orchestration of capabilities, values, and digital strategy.

The synthesis of digital and sustainability transitions can be conceptualized as a layered framework in which dynamic capabilities act as the integrative engine linking technological, organizational, and societal dimensions of change. Building on the foundational works of Teece (2007, 2018) and the resource orchestration perspective (Sirmon, Hitt, Ireland, 2011), the framework positions sensing, seizing, and reconfiguring capabilities as the core routines through which organizations manage the twin transition and achieve sustainable digital performance.

At the core layer, dynamic capabilities constitute the organization's ability to detect, interpret, and act on complex digital and sustainability signals. Sensing refers to environmental scanning and the recognition of opportunities emerging from technological and ecological disruption. Seizing captures the entrepreneurial mobilization of resources to implement innovations that align digital tools with sustainability objectives. Reconfiguring describes the transformation of organizational routines, structures, and cultures that embed these dual logics into everyday operations (Teece, 2018). Collectively, these routines form the basis of digital transformation (DT), the ongoing redefinition of business processes and models enabled by digital technologies.

The enabling layer represents the microfoundations that sustain these dynamic processes: leadership cognition, organizational learning, and resource orchestration (Warner, Wäger, 2019). Within this layer, sustainability orientation (SO) acts as a strategic moderator, guiding how dynamic capabilities are applied in the context of digital transformation. Organizations with a stronger sustainability orientation tend to direct their digital initiatives toward long-term ecological and social goals, ensuring that digital transformation enhances both competitiveness and responsibility (Feroz, Zo, Eom, 2023; Wei, Zheng, 2024). This orientation therefore strengthens the positive relationship between dynamic capabilities and digital transformation by embedding ESG-driven values into strategic and operational decision-making.

The outcome layer reflects the organizational realization of the twin transition as organizations achieve sustainable digital performance (SDP), the synergistic integration of technological adaptability and sustainability outcomes. Sustainable digital performance represents a firm's ability to leverage digital technologies for innovation, efficiency, and resilience, while simultaneously advancing environmental stewardship, stakeholder trust, and social value creation. This outcome captures the essence of the twin transition: the convergence of digital excellence with sustainability responsibility.

Crucially, the process is dynamic and iterative. Each transformation feeds back into the DC system, generating new learning cycles and capability renewal. The twin transition thus becomes an emergent capability configuration—a continuous alignment of technological and sustainability logics through dynamic resource orchestration and adaptive governance. By framing the twin transition as a multi-layered capability system, this conceptual model contributes to theory in three key ways. First, it extends dynamic-capabilities theory by positioning sustainability and digitalization as co-evolutionary mechanisms rather than independent strategic domains. Second, it bridges the resource-based and socio-technical perspectives by demonstrating how sustainability orientation shapes the enactment of dynamic capabilities during digital transformation. Third, it advances management scholarship on sustainable competitiveness by conceptualizing sustainable digital performance as a holistic outcome of these interlinked processes.

4. Discussion

The framework developed in this paper positions dynamic capabilities (DC) as the central mechanism enabling organizations to integrate digital transformation and sustainability imperatives into a coherent system of sustainable digital performance (SDP). By embedding sustainability orientation (SO) as a moderating force within this system, the model reconceptualizes how organizations achieve competitive advantage in the era of the twin transition—not merely through digital efficiency or environmental compliance, but through their continuous ability to reconfigure and align technological and sustainability logics dynamically.

This study contributes to the growing intersection of dynamic-capabilities theory, digital transformation, and sustainability research in three interrelated ways. First, it advances the theoretical understanding of dynamic capabilities by reframing them as dual-purpose capabilities that simultaneously drive digital and sustainable transformation. Traditional research conceptualizes DC primarily as mechanisms for adaptation and renewal in volatile environments (Helfat, Peteraf, 2009; Teece, 2007). In contrast, this framework introduces a more integrative perspective, arguing that DC not only enable firms to respond to technological and market changes but also to internalize sustainability principles as strategic guides for digital innovation. This reframing extends the adaptive function of DC toward a generative and normative role, aligning technological transformation with environmental and social outcomes (Mikalef et al., 2020; Warner, Wäger, 2019).

Second, the paper contributes conceptually by introducing sustainability orientation (SO) as a strategic moderator in the DC–DT relationship. Prior research has acknowledged the importance of ESG principles in shaping innovation trajectories (Feroz et al., 2023; Wei, Zheng, 2024), but few studies have articulated the specific mechanism through which sustainability values influence the enactment of dynamic capabilities. By embedding SO within the capability system, this model clarifies that sustainability-oriented organizations are more likely to deploy their sensing, seizing, and reconfiguring routines in ways that promote long-term societal and ecological outcomes. Consequently, SO operates as both a cognitive frame and a strategic filter that channels digital transformation toward responsible innovation and shared value creation.

Third, the framework contributes to the literature on organizational performance by defining sustainable digital performance (SDP) as an integrated outcome construct. Existing studies often treat digital and sustainability performance as parallel domains, measured separately through productivity or ESG indicators. The concept of SDP unites these dimensions, offering a theoretically grounded measure of how digital transformation and sustainability goals co-evolve through dynamic capabilities. It captures technological adaptability, innovation resilience, and stakeholder legitimacy as complementary outcomes of

the twin transition. This integrative approach advances the ongoing discussion on what constitutes sustainable competitiveness in the digital era (Teece, 2018; Vial, 2019).

Taken together, these contributions provide a novel conceptual lens for understanding how organizations not only adapt to digital disruption but also harness it to pursue sustainability-driven transformation. By framing DC as meta-capabilities that balance efficiency and responsibility, the model aligns with recent calls for human-centric and regenerative paradigms of Industry 5.0 (Nahavandi, 2019).

While the proposed framework advances the theoretical integration of dynamic capabilities and the twin transition, it also reveals important research gaps that warrant empirical investigation.

1. Microfoundations of Sustainable Dynamic Capabilities

Although the literature acknowledges that DC emerge from lower-level routines and managerial cognition (Felin, Powell, 2015), empirical evidence remains limited on how these microfoundations evolve when sustainability and digitalization co-occur. Future studies could examine leadership cognition, organizational learning, and cross-sector collaboration as antecedents of sustainable dynamic capabilities. Qualitative case studies and longitudinal designs could explore how these microfoundations shape sensing and seizing behaviors across technological and environmental domains.

2. The Moderating Role of Sustainability Orientation

The conceptualization of SO as a moderator introduces an important empirical avenue. Further research should operationalize sustainability orientation not only as a cultural or strategic construct but as a multidimensional capability encompassing environmental values, stakeholder integration, and governance practices. Quantitative studies could test how SO strengthens or weakens the DC-DT link using structural equation modeling or moderated regression approaches (Hayes, 2018). Cross-country comparisons could also reveal contextual variations depending on institutional pressures or industry digital maturity.

3. Measuring Sustainable Digital Performance

The proposed SDP construct requires rigorous empirical validation. Researchers should develop and test multi-dimensional measurement scales that capture both digital (e.g., process automation, data-driven innovation, agility) and sustainability dimensions (e.g., carbon reduction, social impact, ethical technology use). Future work could apply mixed-method approaches, combining survey data with secondary sustainability reports or digital-readiness indices, to establish robust validity and reliability.

4. Dynamic Interactions and Temporal Evolution

Another promising direction involves examining how DC, DT, and SO interact dynamically over time. Existing research often treats these constructs as static variables, yet the twin transition is inherently temporal and path-dependent. Longitudinal or panel-data designs could reveal feedback effects and co-evolutionary patterns, for example, how successful digital

transformation projects reshape sustainability orientation or how sustainability-driven learning fosters new DC.

5. Contextual and Sectoral Differences

Finally, future studies should investigate contextual contingencies. The effectiveness of DC in achieving sustainable digital performance may differ across industries, such as manufacturing, energy, or services, depending on their technological intensity and sustainability pressures. Comparative research could identify sector-specific configurations of DC and SO that best support the twin transition.

Synthesizing these insights, this paper positions the dynamic-capabilities framework as a bridge between strategic management and sustainability and digitalization. It offers a pathway for empirical research that transcends descriptive accounts of digitalization or ESG adoption, focusing instead on the processual mechanisms through which organizations build, renew, and deploy capabilities for sustainable digital performance. In practical terms, this integration underscores that achieving sustainable competitiveness in the twin transition is not merely about acquiring technology or adopting green policies. It requires cultivating organizational systems that continuously learn, adapt, and reconfigure in alignment with environmental and societal imperatives. Future research grounded in this framework can therefore deepen theoretical understanding while providing actionable insights for managers seeking to navigate the complexities of sustainable digital transformation.

5. Summary

This paper has examined how dynamic capabilities (DC) enable organizations to navigate the twin transition, the simultaneous pursuit of digital transformation and sustainability. Drawing on a synthesis of strategic management and sustainability literature, the study proposed a conceptual framework in which DC function as integrative mechanisms linking digital innovation and environmental stewardship through a continuous process of sensing, seizing, and reconfiguring. Within this framework, sustainability orientation (SO) moderates the relationship between DC and digital transformation (DT), guiding how organizations apply their adaptive and learning capacities to achieve sustainable digital performance (SDP), a holistic outcome that captures the alignment of technological excellence with social and ecological responsibility.

The findings of this conceptual inquiry contribute to the advancement of dynamic-capabilities theory and sustainability-oriented management research in several important ways. First, by reframing DC as dual-purpose capabilities, this study expands their role beyond mere adaptability to encompass purpose-driven innovation. It shows that the same microfoundations that underpin technological agility, such as resource orchestration, learning, and effectuation,

can also serve sustainability objectives when guided by appropriate strategic orientation. This theoretical extension bridges two previously separate literatures, positioning dynamic capabilities as the meta-capabilities through which digital and sustainability goals converge.

Second, the integration of sustainability orientation as a moderator enriches our understanding of how values and norms influence the enactment of capabilities. Organizations with a strong sustainability orientation do not simply pursue efficiency or competitiveness; they enact their dynamic capabilities in ways that promote ethical, responsible, and regenerative outcomes. This insight adds a normative dimension to the DC framework, aligning it with contemporary management paradigms such as Industry 5.0, which emphasize resilience, inclusivity, and well-being.

Third, the introduction of sustainable digital performance as an integrative construct contributes to the emerging dialogue on how performance should be conceptualized in the digital era. It moves beyond traditional economic metrics to include dimensions of environmental impact, social legitimacy, and long-term resilience. This conceptualization invites new empirical approaches to measuring organizational success, emphasizing the interplay between technological progress and sustainability outcomes.

Together, these insights underscore that achieving competitive advantage in the twin transition depends not on isolated investments in technology or sustainability but on the organization's capacity to dynamically align them through learning, adaptation, and reconfiguration. Dynamic capabilities thus emerge as the connective tissue of strategic transformation in an age where agility and responsibility must coexist

Beyond its theoretical relevance, this framework provides actionable implications for practitioners and policymakers seeking to implement sustainable digital transformation. For managers, the framework highlights the need to view digital transformation not as a technological project but as a capability-building journey. Organizations should focus on developing microfoundations of sensing, seizing, and reconfiguration, such as environmental scanning systems, cross-functional innovation routines, and agile resource allocation mechanisms. Strengthening these microfoundations enhances the organization's ability to pursue digital initiatives that also generate sustainability impact. Furthermore, cultivating a strong sustainability orientation, through leadership commitment, ESG metrics, and stakeholder engagement, ensures that digital investments are ethically grounded and socially aligned. The outcome is not only greater efficiency but also a deeper form of strategic resilience, where digital agility supports sustainable value creation.

For policymakers and institutional actors, the model suggests that enabling the twin transition requires systemic support for capability development. This involves designing incentive systems, innovation policies, and training programs that foster both digital literacy and sustainability competence. Public–private partnerships and cross-sectoral innovation networks can facilitate knowledge exchange and diffusion of best practices in sustainable digitalization. Policy frameworks should therefore encourage firms not only to adopt digital

technologies but also to integrate them with sustainability principles, transforming compliance into capability.

In summary, this paper has positioned dynamic capabilities as the critical enablers of the twin transition, demonstrating how firms can harmonize digital transformation with sustainability imperatives to achieve sustainable digital performance. By embedding sustainability orientation within the capability system, the study emphasizes that the future of competitiveness lies not in technological sophistication alone but in the capacity to use technology responsibly, inclusively, and regeneratively.

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