

Resource Orchestration in the Digital Era: How IT Development Drives Resilience and Sustainable Performance

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ABSTRACT

This study examines the relationship between IT Development Level, Corporate Resilience, and Sustainable Performance in manufacturing firms. Drawing on Resource Orchestration Theory, the research analyzes how technological capabilities contribute to organizational resilience and long-term performance outcomes. Data were collected from 304 manufacturing companies through a structured survey. The hypotheses were tested using Partial Least Squares Structural Equation Modeling. The results indicate that IT Development Level has a significant positive effect on Corporate Resilience and Sustainable Performance. Furthermore, Corporate Resilience strongly influences Sustainable Performance and acts as a key mechanism linking digital capabilities to sustainability outcomes. The findings highlight the importance of effectively managing and integrating digital resources to strengthen organizational adaptability and maintain multidimensional performance in turbulent environments.

Keywords: IT Development Level; Corporate Resilience; Sustainable Performance; Resource Orchestration Theory; Manufacturing Firms.

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Introduction

Contemporary organizations operate in increasingly volatile environments characterized by rapid technological change, economic uncertainty, and growing sustainability pressures. In such contexts, firms must continuously adapt their internal resources and capabilities to maintain competitiveness and long-term viability. The resource-based view suggests that organizations achieve sustained competitive advantage through valuable, rare, and difficult-to-

imitate resources (Barney, 1991; Wernerfelt, 1984). However, possessing strategic resources alone does not necessarily guarantee superior performance. Firms must actively manage, integrate, and deploy these resources to generate value and respond effectively to environmental turbulence (Sirmon *et al.*, 2011; Ketchen *et al.*, 2014). This perspective has gained particular relevance in the digital era, where technological resources have become central to organizational functioning and strategic transformation.

Digital technologies allow organizations to process large volumes of information, coordinate complex operations, and support strategic decision-making processes (Wei *et al.*, 2022). At the same time, firms are increasingly required to balance economic performance with environmental and social responsibilities. Sustainable performance has therefore emerged as a multidimensional objective that encompasses economic, environmental, and social outcomes within a long-term development perspective (Gadenne *et al.*, 2012; Johnson & Schaltegger, 2016). As organizations attempt to navigate these simultaneous demands, the role of digital capabilities and organizational adaptability becomes increasingly important. Understanding how firms manage technological resources to sustain performance under uncertain conditions represents a central challenge in contemporary management research.

Within this evolving context, the development of information technology capabilities has become a critical factor shaping organizational performance and strategic flexibility. Information technology capabilities refer to the ability of firms to mobilize and deploy IT-based resources in combination with other organizational resources and capabilities to achieve strategic objectives (Bharadwaj, 2000; Cassia *et al.*, 2020; Nwankpa & Roumani, 2016). These capabilities facilitate knowledge integration, improve communication flows, and strengthen coordination across organizational functions. Through digital infrastructure and data analytics, firms can detect emerging opportunities and threats, enabling more informed and timely decision-making processes (Chakravarty *et al.*, 2013; Trieu *et al.*, 2023).

In manufacturing industries, where production systems and supply chains involve high levels of operational complexity, digital technologies also support real-time monitoring and coordination of activities across organizational boundaries (Dubey *et al.*, 2023; Wang *et al.*, 2023). The increasing adoption of digital platforms, enterprise systems, and analytics tools has therefore transformed the way firms manage resources and respond to environmental disruptions. These technological capabilities also influence how organizations pursue sustainability objectives by improving transparency, operational efficiency, and resource utilization (George *et al.*, 2021; Pan *et al.*, 2022; Sott *et al.*, 2020). Consequently, the level of IT development within an organization may shape its ability to respond to crises while simultaneously maintaining sustainable performance outcomes.

In parallel, the concept of corporate resilience has gained increasing attention as organizations confront more frequent disruptions and systemic uncertainties. Resilient organizations are able to recover from disruptions, reconfigure resources, and maintain strategic continuity under conditions of instability (Somers, 2009; Ortiz-de-Mandojana & Bansal, 2016). In manufacturing environments exposed to supply chain disruptions, economic volatility, and environmental challenges, resilience plays a critical role in sustaining operational stability and long-term performance (Williams *et al.*, 2017). At the same time, organizations must continue pursuing sustainable development objectives that balance economic growth with environmental protection and social well-being (Yao & Wang, 2024).

These considerations suggest that technological development and resilience capabilities may jointly influence the ability of firms to achieve sustainable performance in uncertain environments. However, the mechanisms linking digital capabilities, organizational resilience, and sustainability outcomes remain insufficiently explored in empirical research. Therefore, this study seeks to address the following research question: How does IT Development Level influence Sustainable Performance through the development of Corporate Resilience in manufacturing firms? By examining these relationships, the study aims to contribute to a better understanding of how digital resources and organizational capabilities interact to shape sustainable performance outcomes in contemporary organizations.

Literature Review

Resource Orchestration Theory

Resources Orchestration Theory (ROT) extends the Resource-Based View (RBV) by arguing that the accumulation of resources and capabilities alone is insufficient to achieve the competitive advantage prescribed by RBV unless these resources and capabilities are effectively managed (Sirmon *et al.*, 2011; Ketchen *et al.*, 2014). While RBV emphasizes valuable, rare, and inimitable resources (Wernerfelt, 1984), ROT focuses on how firms select, construct, bundle, and configure resources and capabilities to create synergies (Hitt *et al.*, 2016; Sirmon *et al.*, 2007) and leverage these resource configurations to gain a competitive advantage (Barney *et al.*, 2011; Sirmon *et al.*, 2011). Accordingly, holding valuable resources does not certainly create value for firms (Sirmon *et al.*, 2011); rather, firms must acquire, manage, and use them effectively when it needs the most to create an

edge in the market (Andersén *et al.*, 2020; Asiaei *et al.*, 2022; Wang *et al.*, 2020). In turbulent environments characterized as “brittle,” “anxious,” “nonlinear,” and “incomprehensible,” enterprises must reassess how allocate their resources (Williams *et al.*, 2017; Queiroz *et al.*, 2022). Within this logic, corporate resilience is conceptualized as both an inherent capability and a dynamic process, involving the deployment of resources and capabilities by enterprises to seize opportunities (Duchek *et al.*, 2020). Thus, resilience is not a mere stock of assets but the outcome of orchestrated resource structuring and bundling under conditions of crisis and discontinuity.

Applying ROT to IT development level, corporate resilience, and sustainable performance, the literature underscores that IT capabilities are the ability to mobilize and deploy IT-based resources in combination with other resources and capabilities (Bharadwaj, 2000) and to organize and utilize IT resources, in combination with additional resources and capabilities, to achieve organizational goals (Cassia *et al.*, 2020; Nwankpa & Roumani, 2016). IT capabilities allow businesses to detect and analyze market opportunities and threats, representing an active form of organizational resilience (Chakravarty *et al.*, 2013; Trieu *et al.*, 2023), while digital resources, through accessibility, experimental nature, scalability, and reconfigurability, enable operational transformation in response to shocks (Bag *et al.*, 2023). In parallel, sustainability performance is defined as a dynamic process that requires achieving short-term performance (meeting current needs) without compromising long-term performance (future needs) (Gadenne *et al.*, 2012), and reflects the firm’s performance in all aspects and for all corporate sustainability drivers (Johnson & Schaltegger, 2016). From a ROT standpoint, enhancing sustainable performance requires orchestrating traditional and digital resources, since digital resources and capabilities have become pivotal in enhancing corporate resilience, yet resource-centric activities are more critical than the resources themselves (Sirmon *et al.*, 2011). Therefore, IT development level contributes to resilience through the orchestration of IT-based and complementary resources, and resilience, in turn, supports sustainable performance as firms integrate, coordinate, and reconfigure resource portfolios to respond to volatility while advancing long-term sustainability objectives.

IT Development Level and Corporate Resilience

The relationship between IT development level and corporate resilience can be theoretically grounded in ROT, by emphasizing that the mere possession of

valuable resources is insufficient unless firms effectively manage, bundle, and leverage them (Sirmon *et al.*, 2011; Ketchen *et al.*, 2014). While RBV underscores the strategic importance of valuable and rare resources (Barney, 1991; Wernerfelt, 1984), ROT argues that competitive advantage emerges from managerial actions that structure, integrate, and deploy resources in a coordinated manner (Hitt *et al.*, 2016; Sirmon *et al.*, 2007). In manufacturing firms operating in turbulent and crisis-prone environments, such as those shaped by economic volatility and global disruptions, resilience depends not only on technological assets but on how these assets are orchestrated to respond to environmental shocks (Queiroz *et al.*, 2022; El Baz *et al.*, 2023). Therefore, IT development level should be understood as a strategic resource configuration whose value materializes through orchestration processes that enable firms to adapt, reconfigure operations, and sustain functioning under adversity.

IT capabilities are conceptualized as the ability to mobilize and deploy IT-based resources in combination with other organizational resources and capabilities (Bharadwaj, 2000; Cassia *et al.*, 2020; Nwankpa & Roumani, 2016). These capabilities typically encompass technical IT skills, managerial competencies, and IT-enabled practices that facilitate coordination, knowledge integration, and strategic alignment (Chakravarty *et al.*, 2013; Vial, 2019). In manufacturing contexts, where operational continuity and supply chain coordination are critical, IT infrastructure enables firms to absorb, process, and utilize knowledge efficiently, strengthening decision-making and responsiveness (Wei *et al.*, 2022). Digital platforms facilitate cross-departmental integration of people, materials, and information, fostering continuous interaction and timely feedback loops that are essential during crises (Wang *et al.*, 2023; Dubey *et al.*, 2023). From a ROT perspective, such integration reflects bundling and leveraging activities that transform dispersed technological resources into coherent organizational capabilities capable of supporting resilience.

Corporate resilience has been conceptualized as both an inherent capability and a dynamic process involving anticipation, coping, and adaptability (Duchek, 2020; Kahn *et al.*, 2018). It enables firms to recover from adverse events, maintain operational continuity, and adjust proactively to environmental changes (Somers, 2009; Ortiz-de-Mandojana & Bansal, 2016). In manufacturing enterprises, resilience manifests through efficient resource allocation, rapid supply chain adjustments, and strategic reconfiguration in

response to environmental and market disruptions (Williams *et al.*, 2017; Duchek, 2020). IT development enhances these processes by enabling firms to detect and analyze market opportunities and threats, thereby representing an active form of organizational resilience (Chakravarty *et al.*, 2013; Trieu *et al.*, 2023). Digital resources characterized by accessibility, scalability, and reconfigurability allow firms to transform operational methods and respond flexibly to uncertainty (Bag *et al.*, 2023; Tian *et al.*, 2022). Thus, IT development level strengthens the dynamic capabilities underpinning resilience.

The same way, ROT further clarifies that resilience does not emerge automatically from the existence of digital assets but from managerial orchestration activities that coordinate traditional and digital resources (Sirmon *et al.*, 2011; Andersén *et al.*, 2020). In manufacturing firms, traditional resources such as relational and technological portfolio resources provide the material foundation for innovation and competitive advantage (Cao, 2022; Tang *et al.*, 2025). However, crises characterized by unpredictability and continuity require firms to reassess how resources are allocated and reconfigured (Queiroz *et al.*, 2022). IT capabilities enhance the efficiency of information exchange, collaboration, and coordination across supply chain participants, thereby minimizing risks associated with volatile environments (El Baz *et al.*, 2023; Lin & Fan, 2024). Through structured integration and leveraging of IT with existing operational resources, firms can create synergistic configurations that support stability and adaptive recovery.

In the context of Mexican manufacturing firms, which operate within complex economic and environmental systems prone to uncertainty and external shocks (Gorzen-Mitka, 2016; Marconatto *et al.*, 2022), IT development level becomes a critical antecedent of corporate resilience. Manufacturing organizations must process large volumes of data to comprehend market changes and coordinate production, logistics, and stakeholder relationships (Chakravarty *et al.*, 2013; Gui *et al.*, 2021). IT-enabled analytics, enterprise systems, and collaborative platforms enhance real-time monitoring, scenario simulation, and coordinated responses, thereby strengthening adaptive capacity (Panda & Rath, 2018; Setia *et al.*, 2013). From a resource orchestration standpoint, these technologies enable firms to structure, bundle, and leverage heterogeneous resources into coherent capabilities that preserve core competencies under stress. Consequently, higher IT development levels provide manufacturing firms with the orchestrated resource configurations necessary to

sustain operations, absorb shocks, and achieve resilient performance in dynamic environments. This reasoning provides the foundation for proposing:

H1: IT Development Level has a significant positive effect in Corporate Resilience.

IT Development Level and Sustainable Performance

The relationship between IT development level and sustainable Performance can be explained through the strategic structuring, bundling, and leveraging of technological resources to generate multidimensional value (Sirmon *et al.*, 2007; Sirmon *et al.*, 2011; Hitt *et al.*, 2016). Whereas prior arguments position IT as a driver of adaptive capacity, in the sustainability domain IT must be understood as a strategic infrastructure that supports the simultaneous achievement of environmental, social, and economic objectives (Yao & Wang, 2024). Sustainable performance is defined as the firm's performance across all corporate sustainability drivers (Johnson & Schaltegger, 2016) and as a dynamic process that satisfies present needs without compromising future performance (Gadenne *et al.*, 2012). For manufacturing firms, whose operations directly affect energy consumption, emissions, and resource utilization, IT development constitutes a foundational resource base that can be orchestrated to align operational efficiency with long-term sustainability goals.

IT development level enhances sustainable Performance by enabling advanced information processing, data integration, and transparency across production systems. IT infrastructure provides the backbone for reliable and efficient operations and facilitates the absorption and utilization of new knowledge (Wei *et al.*, 2022). Through big data analytics and digital monitoring systems, firms can analyze energy consumption patterns, waste generation, and supply chain performance to identify inefficiencies and implement corrective actions (George *et al.*, 2021; Pan *et al.*, 2022; Sott *et al.*, 2020). IT practices further reduce energy usage and paper consumption through virtualization, remote collaboration, and digital communication technologies (Dana *et al.*, 2022). Within ROT, these mechanisms reflect bundling processes that integrate IT assets with production routines, thereby transforming isolated technological investments into coordinated systems that support environmental and economic performance simultaneously.

In addition, sustainable Performance also requires strategic alignment between IT investments and

organizational objectives. A robust IT strategy aligned with sustainability goals integrates environmental considerations into decision-making processes and prioritizes investments in green technologies (Al Halbusi *et al.*, 2024). Effective IT structures ensure optimal allocation and management of technological resources, including the establishment of dedicated teams focused on sustainability initiatives (Pan *et al.*, 2022). ROT emphasizes that value creation depends on managerial orchestration actions that synchronize resources with strategic intent (Andersén *et al.*, 2020; Asiaei *et al.*, 2022). In manufacturing firms, where operational complexity and regulatory demands are high, orchestrating IT with environmental management systems and production planning tools enables firms to reduce waste, improve compliance, and enhance long-term competitiveness (Hahn & Figge, 2011). Thus, IT development level contributes to sustainable performance when it is strategically configured to support integrated performance outcomes.

Moreover, digital transformation reshapes the context in which sustainability practices are implemented. Digitization links organizations to broader digital ecosystems through internet-based platforms, sensor networks, and mobile technologies that enhance coordination and traceability (Seele & Lock, 2017). However, IT expansion may also increase energy consumption and carbon emissions if not carefully managed (Bieser & Hilty, 2018; Lin & Niu, 2018). This duality reinforces the ROT proposition that resources must be actively managed to generate positive outcomes. By integrating environmental protection and energy conservation measures into IT-enabled business processes, firms can reduce their carbon footprint and comply with international environmental regulations (Fernando & Wah, 2017). In manufacturing contexts, this integration requires deliberate orchestration to balance productivity improvements with ecological responsibility.

For Mexican manufacturing firms operating in environments characterized by economic uncertainty and sustainability pressures (Gorzen-Mitka, 2016; Marconatto *et al.*, 2022), IT development level represents a strategic lever for advancing sustainable performance. Manufacturing activities demand efficient resource utilization, cost control, and innovation in production methods (Taheri & Stevenson, 2017). IT-enabled analytics and enterprise systems support continuous improvement initiatives, facilitate recycling processes, and optimize supply chain operations, generating cost savings and environmental benefits (MMSD, 2016; Ahmed *et al.*, 2022). Through structured orchestration

of IT resources with operational capabilities, firms can enhance economic productivity while strengthening environmental and social performance. Consequently, from a resource orchestration perspective, higher IT development levels enable manufacturing firms to configure technological and organizational resources into synergistic systems that sustain long-term, multidimensional development. This reasoning provides the foundation for proposing:

H2: IT Development Level has a significant positive effect in the Sustainable Performance

Corporate Resilience and Sustainable Performance

Corporate resilience contributes to sustainable performance when it is conceptualized as a dynamic capability that enables firms to preserve functioning, reallocate resources, and sustain identity under adverse conditions (Duchek, 2020; Kotsios, 2023). Sustainable performance encompasses environmental, social, and economic performance dimensions that must be simultaneously achieved to ensure long-term prosperity (Yao & Wang, 2024; Johnson & Schaltegger, 2016). In manufacturing firms exposed to economic volatility and environmental pressures, resilience provides the organizational capacity to maintain strategic continuity while adjusting to disruptions (Gorzen-Mitka, 2016; Marconatto *et al.*, 2022). Within the Resource-Based View, unique and difficult-to-imitate capabilities constitute the foundation of sustained advantage (Barney, 1991). Organizational resilience has been characterized as such a resource, harboring potential value and contributing to long-term viability (Duchek & Growth, 2014). Consequently, resilience functions as an internal strategic asset that supports the consistent pursuit of sustainable performance objectives.

Therefore, resilience enables organizations to anticipate, cope with, and adapt to environmental changes beyond predefined adaptive mechanisms (Woods, 2006; Kahn *et al.*, 2018). It involves reallocating internal resources, optimizing processes, reshaping relationships, and leveraging crises for countercyclical growth (Ortiz-de-Mandojana & Bansal, 2016). Sustainable performance requires precisely these capabilities, as firms must adjust production systems, stakeholder engagement practices, and strategic priorities in response to environmental regulations and social expectations (Hahn & Figge, 2011; Sasaki *et al.*, 2023). In manufacturing contexts, resilience facilitates efficient supply chain management, faster market response, and more precise strategic planning under uncertainty (Williams *et al.*, 2017; Duchek, 2020). Through these

mechanisms, resilient firms are better positioned to maintain environmental standards, protect social welfare, and sustain economic performance despite external shocks.

Corporate resilience also fosters a risk-aware culture that strengthens the firm's capacity to manage uncertainty and identify opportunities within crises (Gorzen-Mitka, 2016). Such cultural and structural preparedness supports the long-term prosperity defined as flourishing and sustained successful status (Szabo *et al.*, 2013). Sustainable performance demands that firms balance short-term operational pressures with long-term environmental and social commitments (Gadenne *et al.*, 2012). Resilient organizations endure crises and persist over time by enhancing collective learning and strengthening organizational capacity to deal with internally and externally changing environments (Kantabutra & Ketprapakorn, 2021). This capacity for persistence and adaptation under stress enables manufacturing firms to avoid performance decline during disruptions, thereby preserving investments in sustainability initiatives rather than abandoning them under pressure.

Furthermore, resilience has been associated with improved market performance and competitive advantage, both of which are essential for sustaining investments in environmental and social practices (Chowdhury & Quaddus, 2017; Çankaya & Sezen, 2019; Yang & Hsu, 2018). When firms can maintain operational continuity and recover rapidly from adverse events, they protect financial stability and stakeholder trust, reinforcing their ability to pursue sustainable performance strategies (Ortiz-de-Mandojana & Bansal, 2016). In manufacturing enterprises, this translates into maintaining production standards, safeguarding employee well-being, and complying with environmental requirements even during economic downturns. By enabling more efficient resource allocation and usage under stress, resilience contributes to improved environmental, social, and economic outcomes (Williams *et al.*, 2017; Ducheck, 2020). Thus, resilience underpins the structural stability necessary for sustainable performance.

In addition, the context of Mexican manufacturing firms, which operate within complex socio-economic systems subject to crises and regulatory pressures (Gorzen-Mitka, 2016; Marconatto *et al.*, 2022), corporate resilience serves as a foundational mechanism linking internal capabilities to sustainable performance outcomes. Manufacturing activities inherently involve environmental impacts and social

responsibilities, making continuity and adaptive capacity critical for maintaining compliance and competitiveness (Taheri & Stevenson, 2017). Resilient firms can sense maladaptive tendencies, correct strategic misalignments, and respond proactively to environmental and social challenges (Ortiz-de-Mandojana & Bansal, 2016). By preserving core capabilities while adapting operational models, these firms sustain multidimensional performance across economic, environmental, and social domains (Yao & Wang, 2024). Accordingly, corporate resilience constitutes a strategic dynamic capability that enables manufacturing organizations to achieve and maintain sustainable performance in uncertain and evolving environments. This reasoning provides the foundation for proposing:

H3: Corporate Resilience has a significant positive effect in the Sustainable Performance

Taking into account the literature review and previous hypotheses we can establish, the IT Development Level represents a set of strategic technological resources that the firm not only possesses but must also structure, combine, and deploy effectively. The ROT maintains that value does not come from the mere accumulation of resources but from the managerial capacity to orchestrate them through processes of structuring, leveraging, and synchronization. In this model, a higher level of IT development reflects more sophisticated digital capabilities, flexible infrastructure, and advanced analytical skills. These capabilities allow the organization to improve its Corporate Resilience, understood as the ability to anticipate, absorb, and adapt to disruptions. Hypothesis H1 is explained by the fact that IT maturity facilitates operational visibility, real-time decision-making, and systemic redundancies. Likewise, H2 can be justified because the effective orchestration of digital resources optimizes processes, reduces inefficiencies, and improves sustainable performance. Therefore, the IT Development Level acts as a strategic resource that, when properly managed, generates dynamic intermediate capabilities.

In the same way, regarding the link between Corporate Resilience and Sustainable Performance (H3), the ROT suggests that resilience is an organizational capability derived from the appropriate configuration and deployment of resources. It is not an isolated resource, but rather the result of an organizational architecture that integrates technological assets, human capital, and organizational routines. When a company manages to orchestrate these elements

coherently, it develops greater strategic flexibility and the capacity to reconfigure itself in the face of external shocks. This capability reduces performance volatility and protects value streams in the long term, resulting in economic, social, and environmental sustainability. From this perspective, resilience functions as a mediating mechanism between technological resources and sustainable performance. The theory

emphasizes that managers are key actors in this process, as they determine how resources are allocated and synchronized. Consequently, the proposed model aligns with the ROT by establishing a causal sequence: technological resources → organizational capabilities (resilience) → sustainable results. This reinforces the theoretical coherence and explanatory validity of the proposed framework.

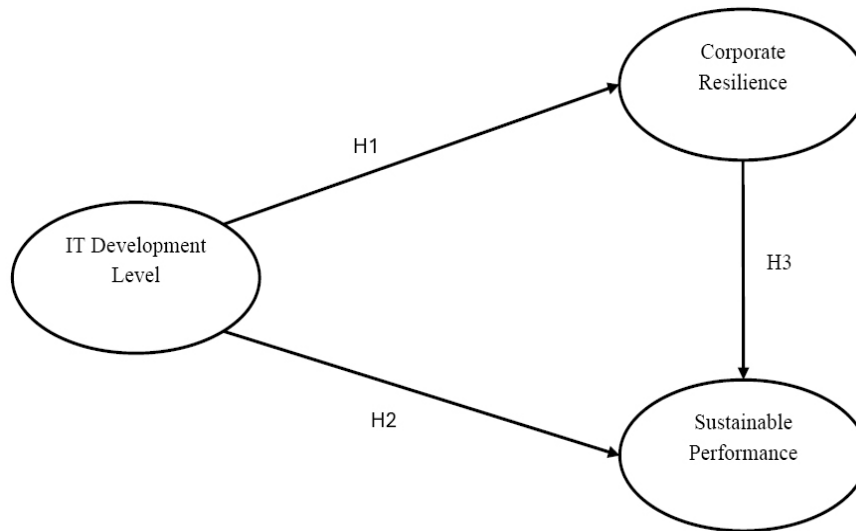


Figure 1. *Research Model*

Methodology

Sample

This study employed the National Statistical Directory of Economic Units (DENUE) as its sampling framework. Official data indicate that, in 2022, the directory listed 38,583 manufacturing companies with more than ten employees across the various industrial subsectors (INEGI, 2021). The empirical analysis focused on five priority subsectors: automotive, aerospace, metal-mechanic, chemical, and textile industries. Primary information was collected using a structured survey instrument specifically designed for this project. The questionnaire was administered to senior executives and key decision-makers within the selected firms through in-person interviews conducted between April and December 2022. A total of 580 companies were initially contacted to participate in the study. The achieved response rate was 52.41%,

resulting in a final dataset of 304 valid cases. A simple random sampling technique was applied, ensuring a maximum margin of error of $\pm 5\%$ at a 95% confidence level. The fieldwork and survey implementation were conducted by a specialized firm with expertise in industrial data collection.

Variables

The measurement instrument was constructed through the adaptation of previously validated scales to ensure methodological rigor and suitability for subsequent statistical analysis. To operationalize IT Development Level, the framework proposed by Zeng et al. (2010) was adopted. The Corporate Resilience was assessed using the scale developed by Rapaccini et al., (2020), which measures resilience by its 4 main attributes. Finally, SP was measured based on the instrument proposed by D'Amato et al., (2019). Table 1 shows the items used to measure each research construct

Table 1. *Research Items*

IT Implementation	
IT1	It has information technology similar to that used in the industry
IT2	It has better information technology than its competitors.
IT3	It has better information technology than its customers use.
IT4	He commonly uses the information to negotiate with his suppliers.
IT5	The company commonly uses some software in its departments
IT6	The company has trained personnel for the management of Information Technology

IT7	He commonly uses information technology for decision-making.
Corporate Resilience	
PRE1	The organization is aware of the risks that may arise in the face of global emergencies (health, environmental, social and economic).
PRE2	The impacts on companies of products and services are assessed promptly and correctly using the information and methods available.
PRE3	The experience gained in dealing with disruptions has generated (new) organizational and technical knowledge that can help to deal with future crises.
AGI1	Your organization reacts quickly to restrictions imposed by the authorities.
AGI2	Your organization can implement quick and seamless solutions to ensure customer service during a potential shutdown.
AGI3	I'm satisfied with the way his IT applications and infrastructure have helped staff to work and provide customer support remotely.
ELA1	The organization was able to implement appropriate solutions to restart the business after the shutdown due to disruptions.
ELA2	Additional resources were effectively implemented to meet the demand for delayed products and services.
ELA3	Can the implemented resources be quickly and safely deactivated in the event of another disruptive event?
RED1	The organization plans to increase critical resources, such as spare parts stocks and trained technicians, which can be deployed close to its customers.
RED2	The organization plans to increase the adoption of digital technologies and ensure infrastructure redundancy for the provision of advanced services.
RED3	The organization plans to develop new offerings that could be more attractive to customers and industries heavily impacted by the coronavirus pandemic.
Sustainable Development	
DES1	The company's activities enable the transition to a low-carbon economy.
DES2	The company's activities protect and/or restore the environment by focusing on environmental quality aspects and improving resource efficiency.
DES3	The company's activities help to maintain, protect, transform and/or strengthen the economy
DES4	The company's activities help to protect, transform, strengthen and/or develop society, human well-being and/or employment
DEF5	Over the past 3 years, the company has invested in integrating environmentally friendly technology to improve business activities
DEF6	The integration of sustainable policies into the company's activities has resulted in a reduction of operating and/or production costs.
DEF7	The integration of sustainable policies into the company's activities has had a positive effect on recorded profits.

To assess common method bias, the Harman one-way test was performed. The results showed that the first unrotated factor accounted for 42.71% of the total variance, which does not exceed the recommended threshold of 50%, suggesting that common method bias is not present.

Results

Structural Equation Modeling Analysis

Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to test the proposed hypotheses, given its suitability for analyzing complex predictive models and theory development in emerging research domains (Hair *et al.*, 2019; Hair *et al.*, 2022; Rigdon, 2012). This variance-based approach is particularly appropriate for models emphasizing prediction and mediation effects, as in the relationships

among IT capability, Organizational Resilience and Sustainable Performance. PLS-SEM allows for the simultaneous estimation of measurement and structural components while accommodating measurement error and complex interdependencies among constructs.

Measurement Model Assessment

The reliability and validity of the measurement model were evaluated following established PLS-SEM guidelines (Hair *et al.*, 2019; Hair *et al.*, 2022). As reported in Table 2 (Panel A), all constructs exhibited satisfactory internal consistency. Cronbach's alpha values ranged from 0.929 to 0.943, exceeding the recommended threshold of 0.70. Similarly, Dijkstra-Henseler's rho (ρ_A), considered a consistent reliability estimator in PLS-SEM (Dijkstra & Henseler, 2015), ranged from 0.913 to 0.937. Composite Reliability Index (CRI) values varied between 0.913 and 0.937,

further confirming strong internal consistency across constructs. Convergent validity was assessed using the Average Variance Extracted (AVE) criterion (Fornell & Larcker, 1981). AVE values for IT Development Level (0.602), Corporate Resilience (0.556), and Sustainable Performance (0.600) exceeded the recommended threshold of 0.50, indicating adequate convergent validity (Hair *et al.*, 2022).

Discriminant validity was examined using both the Fornell–Larcker criterion and the Heterotrait–Monotrait ratio (HTMT), as recommended in recent PLS-SEM literature (Henseler *et al.*, 2015; Hair *et*

al., 2021). Under the Fornell–Larcker criterion, the square roots of the AVE values (diagonal elements in Table 2, Panel B) exceeded the inter-construct correlations, supporting discriminant validity. For instance, the square root of AVE for IT Development Level (0.776), Corporate Resilience (0.746), and Sustainable Performance (0.774) were all greater than their corresponding inter-construct correlations. The HTMT ratios ranged from 0.655 to 0.806, all below the conservative threshold of 0.85 (Henseler *et al.*, 2015). These results provide strong evidence that the constructs are empirically distinct.

Table 2. Measurement Model. Reliability, Validity and Discriminant Validity

PANEL A. Reliability and Validity							
Variables	Cronbach’s Alpha	Dijkstra-Henseler rho			CRI	AVE	
IT Development Level	0.929	0.914			0.914	0.602	
Corporate Resilience	0.943	0.937			0.937	0.556	
Sustainable Performance	0.929	0.913			0.913	0.600	
PANEL B. Fornell & Larcker Criterion					Heterotrait–Monotrait ratio (HTMT)		
Variables	1	2	3		1	2	3
1. IT Development Level	0.776						
2. Corporate Resilience	0.632	0.746			0.677		
3. Sustainable Performance	0.608	0.737	0.774		0.655	0.806	

Note: PANEL B: Fornell & Larcker Criterion: Diagonal elements (bold) are the square root of the variance shared between the constructs and their measures (AVE). For discriminant validity, diagonal elements should be larger than off-diagonal elements.

The structural model was evaluated in terms of path coefficients, effect sizes (f^2), explanatory power (R^2), and model fit as reported in Table 3. All hypothesized direct relationships were statistically significant at conventional levels, with bootstrapped 95% confidence intervals not including zero. The strongest effect was observed between IT Development Level and Corporate Resilience ($\beta = 0.632$, $p < 0.001$), indicating a substantial influence of digital development capabilities on the resilience capacity of organizations. Furthermore, Corporate Resilience significantly influenced Sustainable Performance ($\beta = 0.646$, $p < 0.001$), highlighting the central role of resilience mechanisms in enhancing long-term organizational sustainability outcomes. The direct effect of IT Development Level on Sustainable Performance, while significant ($\beta = 0.176$, $p = 0.001$), was comparatively smaller, suggesting that a large portion of the impact of IT development on sustainability is transmitted through resilience capabilities.

Effect size analysis revealed a large effect of IT Development Level on Corporate Resilience ($f^2 = 0.664$), indicating that digital development capabilities represent a major driver of organizational resilience. In addition, Corporate Resilience exerted a large effect on Sustainable Performance ($f^2 = 0.420$), reinforcing its central role as a key mechanism linking organizational capabilities with sustainability outcomes. In contrast, the direct effect of IT Development Level on Sustainable Performance showed a small effect size ($f^2 = 0.031$), consistent with Cohen's (1988) benchmarks.

The model demonstrated moderate to substantial explanatory power. The adjusted R^2 value for Corporate Resilience was 0.397, indicating that IT Development Level explains approximately 39.7% of the variance in resilience capability. For Sustainable Performance, the adjusted R^2 value reached 0.611, suggesting that the combined influence of IT Development Level and Corporate Resilience explains over 61% of the

variance in sustainable performance outcomes. These results indicate satisfactory predictive accuracy in organizational research contexts (Hair *et al.*, 2022). Overall, the findings suggest that Corporate Resilience

plays a central mediating role in translating IT development capabilities into improved sustainable performance.

Table 3. *Structural Equation Model*

Paths	Path (<i>t-value</i> ; <i>p-value</i>)	95% Confidence Interval	f ²	Support
IT → CR (H1)	0.632 (15.87 - 0.001)	[0.557 - 0.703]	0.664	Yes
IT → SP (H2)	0.176 (3.21 - 0.001)	[0.068 - 0.284]	0.031	Yes
CR → SP (H3)	0.646 (11.94 - 0.001)	[0.542 - 0.741]	0.42	Yes
Endogenous Variable	Adjusted R ²	Model Fit	Value	HI99
		SRMR	0.661	0.074
Corporate Resilience	0.397	dULS	0.873	1.021
Sustainable Performance	0.611	dG	0.512	0.638

Note: IT: IT Development Level; CR: Corporate Resilience; SP: Sustainable Performance. One-tailed *t*-values and *p*-values in parentheses; bootstrapping 95% confidence intervals (based on *n* = 10,000 subsamples) SRMR: standardized root mean squared residual; dULS: unweighted least squares discrepancy; dG: geodesic discrepancy; HI99: bootstrap-based 99% percentiles.

Predictive Validity

The predictive assessment indicates that the model demonstrates satisfactory out-of-sample predictive power. The Q^2_{predict} values show moderate predictive relevance for Corporate Resilience ($Q^2 = 0.286$) and strong predictive relevance for Sustainable

Performance ($Q^2 = 0.421$). Furthermore, the Cramér-von Mises test results are non-significant ($p > 0.05$), suggesting that the predicted distributions do not significantly differ from the observed data, confirming the model's predictive adequacy.

Table 4. *PLS-SEM Q^2_{predict} and prediction error (descriptives)*

Variables	Q^2_{predict}	Mean	Cramér-von Mises Test Statistics	Cramér-von Mises <i>p</i> -value
Corporate Resilience	0.286	3.98	0.162	0.214
Sustainable Performance	0.421	3.96	0.147	0.263

Discussion

The empirical results provide evidence supporting the proposed relationship between IT Development Level and Corporate Resilience, indicating that firms with more advanced digital capabilities exhibit stronger resilience capacities. This finding is consistent with the view that technological capabilities enable firms to mobilize and deploy IT-based resources in combination with other organizational assets to strengthen decision-making and responsiveness (Bharadwaj, 2000; Cassia *et al.*, 2020; Nwankpa & Roumani, 2016). In manufacturing environments characterized by volatility and supply chain complexity, the integration of digital infrastructure facilitates efficient knowledge processing and coordination across operational units (Wei *et al.*, 2022). Such integration enhances the organization's capacity to detect threats and opportunities, which has been associated with proactive forms of resilience (Chakravarty *et al.*, 2013; Trieu *et al.*, 2023).

Furthermore, digital platforms improve communication and information exchange among stakeholders,

enabling faster organizational responses during crises (Wang *et al.*, 2023; Dubey *et al.*, 2023). The magnitude of the observed effect also reflects the importance of managerial orchestration activities in transforming technological resources into coherent capabilities (Sirmon *et al.*, 2007; Sirmon *et al.*, 2011). In this sense, resilience emerges not simply from the existence of IT infrastructure but from the coordinated integration of digital resources with organizational processes (Andersén *et al.*, 2020). These findings align with previous research suggesting that digital technologies facilitate operational transformation and adaptive responses under uncertain conditions (Bag *et al.*, 2023; Tian *et al.*, 2022). Overall, the results reinforce the argument that higher levels of IT development strengthen the mechanisms through which firms absorb shocks and sustain operations in turbulent environments.

The analysis also confirms the positive association between IT Development Level and Sustainable Performance, although the magnitude of this

relationship appears smaller compared with other structural paths in the model. This pattern suggests that while technological development contributes directly to sustainability outcomes, its influence may operate through multiple organizational mechanisms. Digital technologies enhance information processing capabilities and enable firms to monitor operational indicators related to energy consumption, waste generation, and production efficiency (George *et al.*, 2021; Pan *et al.*, 2022; Sott *et al.*, 2020). In manufacturing contexts, the integration of IT infrastructure within production systems improves transparency and supports more efficient resource utilization (Wei *et al.*, 2022). Additionally, digital communication technologies reduce material consumption and energy use through practices such as virtualization and remote collaboration (Dana *et al.*, 2022).

These technological improvements contribute to sustainability outcomes by facilitating the alignment of operational efficiency with environmental and economic objectives (Johnson & Schaltegger, 2016). Previous studies have also emphasized that digitalization strengthens coordination and traceability across supply chains, improving the monitoring of sustainability practices (Seele & Lock, 2017). However, the expansion of digital technologies can simultaneously increase energy consumption if not managed carefully (Bieser & Hilty, 2018a; Lin & Niu, 2018). This dual effect highlights the importance of managing digital resources strategically to ensure that technological investments translate into positive sustainability outcomes (Fernando & Wah, 2017). Consequently, the empirical results support the view that IT development contributes to sustainable performance when it enhances organizational information capabilities and operational efficiency.

Finally, the results demonstrate a strong and significant relationship between Corporate Resilience and Sustainable Performance, indicating that resilient organizations are better positioned to maintain multidimensional performance over time. The magnitude of the path coefficient suggests that resilience mechanisms play a central role in sustaining economic, environmental, and social outcomes. Organizations capable of anticipating and responding effectively to disruptions are more likely to maintain operational continuity and preserve investments in sustainability initiatives during periods of instability (Duchek, 2020; Kahn *et al.*, 2018). Resilience enables firms to reallocate resources, optimize processes, and reshape organizational relationships in response

to environmental changes (Ortiz-de-Mandojana & Bansal, 2016).

These adaptive processes contribute to improved operational stability and strategic planning in manufacturing contexts characterized by uncertainty (Williams *et al.*, 2017). Moreover, resilient firms tend to maintain stronger stakeholder relationships and organizational legitimacy, which supports long-term performance outcomes (Çankaya & Sezen, 2019; Yang & Hsu, 2018). Organizational resilience has also been associated with enhanced market performance and competitive positioning, factors that facilitate the continuation of sustainability initiatives (Chowdhury & Quaddus, 2017). By maintaining functional stability and enabling adaptive responses to crises, resilience strengthens the capacity of firms to pursue sustainability objectives consistently. In this way, resilient organizations are able to balance operational demands with long-term performance priorities even in uncertain environments. Collectively, the results highlight resilience as a critical organizational capability associated with sustained performance outcomes across multiple dimensions.

Theoretical Contributions

The study contributes to the existing literature by advancing the understanding of how digital capabilities interact with organizational mechanisms to influence sustainability outcomes within manufacturing contexts. Specifically, the findings enrich the literature on Resource Orchestration Theory by empirically demonstrating how IT development level functions as a strategic technological resource that supports the configuration of higher-order organizational capabilities. While prior research has emphasized the strategic value of digital technologies, the results clarify that the contribution of IT resources to organizational outcomes is not merely direct but also operates through intermediate capabilities such as corporate resilience.

In doing so, the study integrates perspectives from digital capability research and sustainability management, providing empirical evidence that technological resources contribute to multidimensional performance when they are effectively combined with organizational processes and adaptive capacities. Furthermore, by examining these relationships within the manufacturing sector, the research extends the application of resource orchestration arguments to environments characterized by operational complexity and external volatility. The study therefore contributes to the theoretical discussion by reinforcing the view that technological development, organizational resilience,

and sustainable performance should be understood as interconnected elements within broader resource configuration processes that shape organizational outcomes.

Practical Contributions

From a managerial perspective, the findings highlight the importance of strategically developing and managing digital capabilities to strengthen organizational resilience and improve sustainability outcomes. Managers in manufacturing firms should prioritize investments in IT infrastructure, data analytics, and digital platforms that enhance information processing, coordination, and operational visibility across organizational functions. Strengthening these technological capabilities can improve the firm's ability to anticipate disruptions, support rapid decision-making, and maintain operational continuity during periods of uncertainty.

Additionally, executives should promote the integration of digital systems with sustainability initiatives, enabling more efficient monitoring of energy consumption, waste generation, and supply chain performance. This integration can help organizations identify inefficiencies, optimize resource utilization, and align operational practices with broader sustainability objectives. Managers should also encourage the development of internal capabilities that facilitate the effective use of digital tools, including training programs and cross-functional collaboration mechanisms that support knowledge sharing and adaptive problem solving. By coordinating technological resources with organizational processes and sustainability strategies, firms can enhance both their adaptive capacity and their long-term performance.

Conclusions

The findings of this study provide empirical evidence that IT Development Level plays a significant role in strengthening Corporate Resilience and enhancing Sustainable Performance in manufacturing firms. The results indicate that organizations with higher levels of digital development possess stronger capabilities to anticipate disruptions, maintain operational continuity, and adapt to environmental uncertainty. In addition, the analysis shows that Corporate Resilience represents a key mechanism associated with sustainable performance outcomes, as resilient firms demonstrate greater capacity to maintain economic, environmental, and social performance over time. These results reinforce the importance of technological development and organizational adaptability in contemporary

manufacturing environments characterized by volatility and increasing sustainability demands. By examining the relationships among IT development, resilience, and sustainability within a unified analytical framework, the study contributes to a deeper understanding of how organizational capabilities interact to influence long-term performance outcomes in complex and dynamic contexts.

Despite these contributions, several limitations should be acknowledged. First, the cross-sectional nature of the data limits the ability to capture the dynamic evolution of digital capabilities and resilience over time. Future research could address this limitation by employing longitudinal research designs that examine how technological development and resilience capabilities evolve and influence sustainability outcomes across different stages of organizational development. Second, the study focuses on manufacturing firms within a specific national context, which may limit the generalizability of the findings to other industries or geographic regions. Subsequent studies could extend the analysis to different sectors or conduct comparative international research to examine whether similar relationships emerge in diverse institutional environments. Additionally, future research may explore other organizational factors—such as leadership capabilities, organizational culture, or innovation orientation—that may interact with digital development and resilience to shape sustainable performance outcomes.

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