

Digital Leadership and Supply Chain Maturity: The Role of Digital Transformation in Sustainable Performance

Alhareth Mohammed Abu Hussein¹ , Al Montaser Mohammad^{2*} , Sanaa Suliman³ ,
Ahmad Alheet⁴ , Salma Ahmed Sherif⁵ 

¹Faculty of Business, Middle East University, Amman (Jordan)

²Zarqa University (Jordan)

³Ph. D. in Business Administration, College of Business, Concordia University, Chicago (United States)

⁴Department of Business Administration, Business School, Al-Ahliyya Amman University, Amman (Jordan)

⁵College of Business, Midocean University (Comoros)

a.abuhussein@men.edu.jo

*Corresponding author: almontaser@zu.edu.jo

ssuliman@rlas-116.org, a.alheet@ammanu.edu.jo, salma@midocean.edu.km

Received: August 2025

Accepted: September 2026

Abstract:

Purpose: Responding to the growing needs of the global markets to be sustainable amid the rapid digitalization of the economy, the proposed study aims at exploring the degree to which Digital Leadership and Supply Chain Digital Maturity can collectively contribute to the Sustainable Supply Chain Performance and Digital Transformation Practices serves as an intervening factor between the two variables.

Design/methodology/approach: Using the Dynamic Capabilities Theory (DCT) as a tool of analysis, the study follows the quantitative, cross-sectional methodology, gathering information among professionals (384) carrying out their functions in supply-chain and digital-transformation fields. Partial Least Squares Structural Equation Modeling (PLS-SEM) is used through Smart-PLS 4.0 in order to test the relationship as postulated in the construct.

Findings: The findings show that Digital Leadership and Supply Chain Digital Maturity have a significant effect on Sustainable Supply Chain Performance, whereas Digital Transformation Practices are the mediating variable without which the connection between the two variables is not possible.

Research limitations/implications: Such findings underline the necessity to align digital capabilities played at the internal level and strategic transformation efforts in order to achieve sustainability goals.

Practical implications: As a theoretical contribution, the study transfers DCT to the digital supply-chain setting and provides managers a feasible framework in a quest to use digitalization to gain sustainable competitive advantage.

Social implications: The study highlights the role of aligning digital capabilities and transformation efforts in achieving sustainability goals, which can contribute to broader economic and environmental benefits in global markets.

Originality/value: As a theoretical contribution, the study transfers DCT to the digital supply-chain setting and provides managers a feasible framework in a quest to use digitalization to gain sustainable competitive advantage.

Keywords: digital leadership, supply chain digital maturity, digital transformation practices, sustainable supply chain performance

To cite this article:

Hussein, A. M. A., Mohammad, A. M., Suliman, S., Alheet, A. F., & Sherif, S. A. (2026). Digital leadership and supply chain maturity: The role of digital transformation in sustainable performance. *Journal of Industrial Engineering and Management*, 19(3), 483-507. <https://doi.org/10.3926/jiem.9062>

1. Introduction

In the current volatile, uncertain, complex, and ambiguous (VUCA) business organization climate, sustainable supply chain performance (SSCP) has become a necessity for organizations seeking long-term competitiveness and environmental responsibility, as emphasised by Ivanov (2021) and, more recently, by Schilling and Seuring (2024). The digital transformation and the mission of sustainability have led to the reconsideration of supply chains by ensuring that firms restructure, plan, and act their supply chain action (Ivanov, 2021). In this transition, digital leadership, and the digital maturity in the supply chains have been recognized as key fundamental factors of transformation, which allow companies to use the power of sophisticated technologies, data-driven analytics, to turn operations, economy, and ecology towards greater efficiency, as demonstrated by Sabri (2025) and confirmed by Schilling and Seuring (2024).

Nevertheless, there is no automatic or causal connection between digitalization and sustainability, as Schilling and Seuring (2024) demonstrate in their systematic analysis of digitally enabled and sustainability-oriented supply chain practices. It places demands that the firms should develop dynamic capabilities, which makes them sense technological opportunities, grasp innovation, and rebuild internal and external processes whenever the environment changes, in line with Teece (2007) and, in a more recent setting, with Mohammad and Abu-Jreas (2026). In this view, Dynamic Capabilities Theory (DCT) offers a sound theoretical perspective through which the capability of organizations to transform fast against digital disruption and sustainability obligations can be understood. In this context, the digital transformation practices (DTPs) play the fundamental mediating role, as they transform the strategic leadership and digital readiness into long-term results (Chen et al., 2021).

However, as an upper-level ability, digital leadership (DL) is related to the culture of digital leadership, the strategic perspective, and digital literacy necessary to further digital enterprises throughout the chain, as described by Weisz et al. (2020) and by Harahsheh et al. (2021). Digital leaders are able to create agility, innovation, and cross-functional collaboration that are necessary to implant sustainability concepts into supplies chains system. Conversely, the supply chain digital maturity (SCDM) depicts the degree, to which the supply chain network is followed by digital embeddedness, integration, and scaling (Weerabahu et al., 2023). The driver behind the maturity of digital supply chains is real-time visibility, data interoperability, intelligent automation, and innovation in resource optimization and its correlated effects to the environment.

Furthermore, even though there is an increasing academic focus on the topic of digital supply chains, it has been shown that there is a lack of empirical studies examining the relationships between the DL, SCDM, DTPs, and SSCP in an integrated model and, in particular, in the emergent market environment (Ali et al., 2023). The purpose of this study is to fill this gap by looking into the impact of Digital Leadership and Digital Maturity of Supply Chain on Sustainable Supply Chain Performance with the mediation of Digital Transformation Practices.

While there is a number of studies that have focused on digital transformation and sustainability, there is still a lack of empirical research that connects digital leadership, supply chain digital maturity and digital transformation practices in a unified model that captures the concept of sustainable supply chain performance. Also, the relationship between these factors has not been examined in emerging economies in general, and specifically in

Jordan. This study comes to bridge this gap by exploring the relationship between digital transformation practices and the transformation of digital capabilities into sustainable outcomes based on Dynamic Capabilities Theory.

Therefore, the purpose of this study is to investigate the relationship between Digital Leadership, Digital Transformation Practices and Sustainable Supply Chain Performance with the mediating role of Digital Transformation Practices. In particular, the study aims to address the following research questions:

1. Does Digital Leadership have a significant impact on Digital Transformation Practices and Sustainable Supply Chain Performance?
2. Does Digital Transformation Practices and Sustainable Supply Chain Performance significantly impacted by Supply Chain Digital Maturity?
3. Are the relationships between Digital Leadership, Supply Chain Digital Maturity and Sustainable Supply Chain Performance mediated by Digital Transformation Practices?"

The rest of this paper is organised as follows. Section 2 reviews the literature and presents the theoretical framework and the formulated hypotheses. Section 3 describes the research method, encompassing sampling, measurement, control variables and data analysis procedures. Section 4 presents the results of the empirical analysis and the assessment of the measurement and structural models. Section 5 discusses the results in relation to the literature. Sections 6, 7 and 8 present the theoretical and practical implications, the conclusion, and the limitations and future research directions, respectively.

2. Literature Review and Hypotheses Formulation

2.1. Digital Supply Chain and Transformation

Digital leadership becomes an issue that has been attracting more and more attention in the field of digitalization of organizations and the innovation of supply chains. Digital leadership is an ability of the leader to support and lead digital strategies to achieve organizational goals that are in line with the environment, especially a technologically dynamic environment (Golinska-Dawson et al., 2023). In the supply chains, digital leaders can support cross-functional coordination, foster the digital attitudes, and make sure that digital efforts are converted into both performance and sustainability results (Menhat et al., 2022; Weerabahu et al., 2023). They are also essential in the resistance to change, incorporation of digital tools into the functioning processes and establishment of agile culture (Solfa, 2022).

It has been recently demonstrated that effective digital leadership has a direct effect on the success of digital transformation projects and an indirect one on sustainability through the creation of transparency, predictive analytics, as well as proactive risk management within the context of the supply chain networks (Al-kharabsheh et al., 2026; Mer, 2023, Attiany, 2026). Therefore, leadership is a competency and as well as a strategic resource per se that energizes sensing and re-configuring abilities required in sustainable performance of supply chains.

2.2. Supply Chain Digital Maturity

Supply Chain Digital Maturity (SCDM) can be conceived as an indicator of how well digital technologies and data-related capabilities and systems are integrated and/or deployed in supply chain functions (González-Varona et al., 2021). More digitally mature organizations use it to better integrate such Industry 4.0 tools as the Internet of Things (IoT), cloud computing, AI, and blockchain, thus making their operations more efficient and streamlined, minimizing inefficiencies, and enabling them to respond to disruptions more quickly (Golinska-Dawson et al., 2023; Wernicke et al., 2023).

Digital maturity refers to the multi-dimensional construct that entails the technological infrastructure, data management capacity, workforce digital competence, and the capability of innovating using the digital platforms (Golinska-Dawson et al., 2023; Leso et al., 2024). One more thing promoted by mature digital supply chains is inter-organizational cooperation and data sharing, which is essential in sustainability processes like carbon tracking, ethical sourcing, and wastes minimization (Weerabahu et al., 2023).

2.3. Digital Transformation Practices

Digital Transformation Practices (DTPs) refer to the operational and strategic activities, by means of which firms can utilize the potential of digital technologies in order to enhance business models, value creation, and align their actions with the current market and sustainability (Adem et al., 2018; Dubey et al., 2020, Al-Aqrabawi et al., 2026). Some of these practices involve the automation of processes, capability of advanced analytics, digital enablement of workforce, and collaboration involved in the supply chain based on platforms (Mohammad et al., 2026; Sharabati et al., 2024).

Within the framework of Dynamic Capabilities Theory (DCT), DTPs make reference to the aptitude of the firm to assume digital opportunities as well as remodel resources to stay true to environmental adjustments (Teece, 2007). Although performance increases and organizations move towards the achievement of sustainability are based on digital leadership and digital maturity, it is through DTPs that an organization achieves these (Alashqar et al., 2025; Eyo-Udo, 2024). Past research indicates that once the digital transformation is introduced strategically, it should be possible to improve environmental monitoring, support the models of circular economy, and allow allocating resources efficiently (Hasan et al., 2025).

2.4. Sustainable Supply Chain Performance

Sustainable Supply Chain Performance (SSCP) is a multidimensional measure, which comprises the environmental, economic, and social ones. Sustainable supply chains reduce the adverse imposed on the environment, they are environment-friendly and tend to meet the ethical standards set and increase financial and operation efficiency (Elkington, 1997). To become SSCP, it will not be enough to achieve efficiency in the traditional sense, which implies that some digital solutions should be used, such as tracking the emissions, streamlining transportation, and taking responsible procurement (Gruchmann et al., 2022).

Empirical data are becoming a growing addition to the relationship between digital transformation and sustainability. As an example, companies that used big data and AI achieved more significant results in the decrease of carbon emissions, enhanced inventory turnover, and high customer satisfaction due to responsible logistics (Mohammad et al., 2025). Nevertheless, the improvement in the level of sustainability highly depends on the leadership vision and the digital maturity effectiveness of SSCP, therefore, it is necessary to consider SSCP a result of multifaceted digital and managerial affairs.

Finally, based on the literature reviewed, digital leadership and digital maturity of the supply chain are important elements in improving the performance of the sustainable supply chain. When they are well integrated into supply chain operations, however, their impact is heightened by the effective digital transformation practices. While existing research has gradually focused on digitalization and sustainability, there has been less research that has combined these constructs into one framework based on Dynamic Capabilities Theory, especially in the context of the emerging economy. This study aims to close this gap, therefore the study investigates this gap through an empirical examination of the mediating role of digital transformation practices in the relationships between digital leadership, digital maturity of the supply chains and sustainable supply chain performance.

2.5. Theoretical Framework

This research is grounded on the Dynamic Capabilities Theory (DCT), which provides a sound theoretical framework through which the study should study how organizations should adapt, change, and maintain a competitive edge in dynamically environment. DCT was initially postulated by (Teece, 2007; Teece et al., 1997). DCT focuses on the capability of an organization in sensing opportunities and threats, taking of opportunities, reconfiguration of both the internal and external assets that drive the ability of an organization to retain strategic alignment as well as excellent performance. Dynamic capabilities are particularly decisive in the setting of digital transformation and sustainability where companies have to constantly innovate, digitize and react both to the market and environmental conditions.

Under this context, digital leadership (DL) and supply chain digital maturity (SCDM) has been viewed as the superior-order dynamic competencies. Digital leadership portrays strategic orientation and ability of an organization to sponsor, lead, and instill digital innovation in operations. Those leaders whose digital skills are high are more

likely to feel the trends of technology and match the digital agendas with corporate sustainability objectives as well as helping mobilize resources (Stephens, 2025). DF allows creating the other micro-foundational skills agile culture, change readiness, and digital literacy in the supply chain.

Supply chain digital maturity on the other hand can be defined as the levels to which an organization has formalized digital technologies, platforms, and data capabilities in its supply chain operations (Berman, 2012; Majumdarr et al., 2024). SCDM is indicative of ease with which a firm anticipates taking opportunities and utilizing digital assets via IoT, AI, big data analytics, and cloud systems to boost efficiencies, sight and instantaneity. Digitally mature supply chain has a higher probability of delivering real-time decisions, efficient utilization of resources giving precedence to sustainability in supply chain performance and eco-efficient logistics (Nayal et al., 2022; Rehman-Khan et al., 2022).

The acting mechanism between DL and SCDM is the practice of digital transformation (DTPs) which operationalizes the two and renders the outcomes sustained. Such practices include the strategy of the intentional use of digital tools, process design, talent reskilling, and ecosystem integration that state the aim to execute digital potential in the supply chain activities (Queiroz, Ivanov, et al., 2020). The aspect of DTPs is associated with both of the dimensions of DCT, their seizing and reconfiguration, their translation of digital opportunities in various ways into doing and reshaping organizational structures, processes, and relationships toward sustainability.

Lastly, sustainable supply chain performance (SSCP) which will be the dependent variable in our work has been defined as the triple bottom line results of the good environment, viable economy and social responsibility (Elkington, 1997). In the concept of DCT, SSCP needs constant construction of capabilities, digital connection, and the transformation of the supply chain operation.

This theoretical framework represents the dynamic, processual, and technology-enabled aspect of the sustainability change in supply chains because, through the standpoint of DL and SCDM as antecedents, DTPs as the mediating capability, and SSCP as the outcome, this theory reflects the dynamic character of the sustainability change in supply chains. The incorporation of DCT can offer explanatory action in the processing of understanding not only the fact that SSCP can be enabled, but also how and using what capacity organizations can juggle the coming of the digital program to achieve the sustainability purposes.

The selection of Digital Leadership (DL), Supply Chain Digital Maturity (SCDM), Digital Transformation Practices (DTPs), and Sustainable Supply Chain Performance (SSCP) as constructs to focus on this research was driven by the Dynamic Capabilities Theory and the growing importance of digital transformation in the field of supply chain sustainability research. Organizational digital capabilities that help firms sense, act, and adapt to technological and sustainability problems are called Digital Leadership and Supply Chain Digital Maturity. Digital Transformation Practices were introduced as the processes and mechanisms by which digital capabilities are converted into organizational actions and digital transformation processes. Sustainable Supply Chain Performance was chosen as the ultimate outcome variable because the concept of sustainability in supply chain management has been emphasized from environmental, economic and social aspects. This study aims to build an internal digital and transformation-oriented capability framework, with other organizational and contextual factors taken into consideration, but deliberately not discussed in the context of the sustainability outcomes because they are not directly linked to the internal capabilities of supply chains.

Dynamic Capabilities Theory was chosen as the theoretical basis of this research because the study is related to the integration, reconfiguration and deployment of digital capabilities to ensure sustainable supply chain performance in the face of rapidly evolving technological and market conditions. DCT is more dynamic than the traditional theoretical frameworks, with focus areas closely related to the concepts of digital leadership, supply chain digital maturity and digital transformation practices: adaptability of the organisation, strategic renewal and capability transformation. The theory is well suited to the understanding of how internal digital capabilities are translated into lasting results in digitally changing supply chain environments, in a continuous sensing-seizing-reconfiguring process.

The model that is proposed impounds both direct and indirect effects. Both DL and SCDM will positively affect DTPs and SSCP in a direct way. In their turn, DTPs are suggested to behave as mediating such relationships since

they translate leadership and maturity into a successful digital implementation that allows sustainability. The conceptual framework is portrayed in Figure 1.

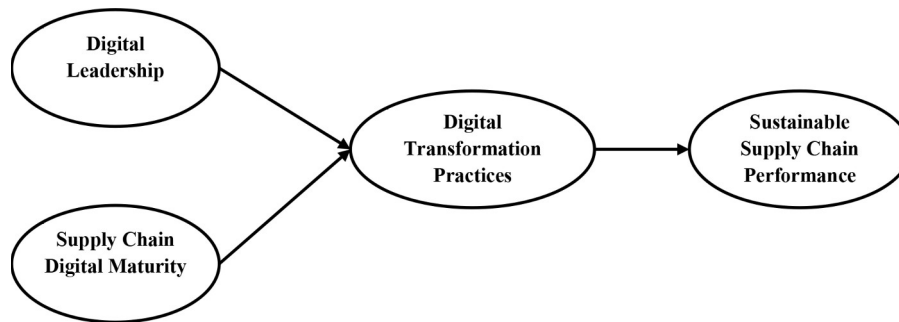


Figure 1. Study Model

Previous research has individually explored digital leadership, digital maturity, digital transformation and sustainability outcomes, but few studies have combined these constructs in a single article that explains the sustainable supply chain performance. Recent contributions have advanced this agenda mainly from a technological standpoint: Andres et al. (2024) map the enabling technologies that support supply chain Logistics 5.0; Andres et al. (2025) review how artificial intelligence reshapes collaborative network processes; Mojica et al. (2025) propose a conceptual framework for the upcycling supply chain in the wood sector; and a cooperative digital twin–multi-agent reinforcement learning architecture has recently been proposed for circular supply chains, balancing control across production, logistics and sustainability Guzmán et al. (2026). These studies confirm the momentum of digitally enabled sustainability, yet they remain technology-centred and do not model the organisational capabilities, namely digital leadership and supply chain digital maturity, through which such technologies are translated into sustainable supply chain performance. Previous studies indicate that organizations with a high digital leadership level and a higher supply chain digital maturity are better able to carry out transformation-oriented practices that lead to improved sustainability results. In reality, empirical evidence to clarify the mechanisms in which these digital capabilities contribute to sustainable supply chain performance is limited, especially in the context of emerging economies. This study is based on the Dynamic Capabilities Theory and proposes that digital transformation practices are the mechanism through which the organizational digital capabilities and sustainable performance outcomes are connected. Based on the Dynamic Capabilities Theory (DCT), the following paper offers the conceptual framework that would explain the process of improvement of sustainable supply chain performance (SSCP) through the interaction of digital leadership (DL) and supply chain digital maturity (SCDM) mediated by digital transformation practices (DTPs). In DCT point of view, organizations have to be able to sense opportunities and exploit those opportunities with actionable approach and rearrange their resources to ensure sustainable competitive advantage (Teece, 2007). DL and SCDM are envisioned as dynamically-oriented enablers that trigger the processes of sensing and seizing, whereas DTPs implement these functionalities with regard to tangible activities and bring greater result into SSCP.

While there is a rise in research on digital transformation and sustainability, literature that incorporates both concepts through the lens of a sustainable supply chain is lacking. This paper will thus contribute by developing the Dynamic Capabilities Theory to be applied in the digital supply chain sustainability environment.

2.6. Hypotheses Formulation

Digital leadership can be viewed as the ability of the organization to lead the way through and capture the challenges of digital transformation due to the ability to build on a clear vision of the organization, motivate and empower workers and integrate the concepts of digital transformation with organizational strategic objectives. Digital leaders in supply chain context play a facilitating role by promoting the embracement of technology and innovation in various functions. They affect culture, stimulate flexible thinking, and foster the combination of digital solutions that will increase performance and sustainability (Popoola et al., 2024; Esan et al., 2024). It has been confirmed by empirical studies that a digital competent leadership plays a significant part in enhancing the process

of implementing transformational practices such as automation of processes, cross-functional integration and proper utilization of data (Mohammad et al., 2026; Taneja, 2021). In that way, the digital leadership is predicted to drive the effect of the fulfillment of the digital transformation practice in the supply chain positively.

H1: Digital leadership has a positive effect on digital transformation practices.

The concept of supply chain digital maturity (SCDM) addresses the willingness and capacity of the organization to apply digital technologies, such as cloud computing, IoT, big data analytics, block chain in the process of the supply chain. Companies that have a higher level of digital maturity exhibit a better data integration skill, automation skills and real-time visibility (González-Varona et al., 2021; Weerabahu et al., 2023).

With this kind of organizations it is in a better position to carry out transformation activities that digitalize working practices, make decisions and support partnering. So, SCDM should become a prominent factor of digital transformation in the supply chain environment.

H2: Supply chain digital maturity has a positive effect on digital transformation practices.

Digital transformation practices (DTPs) provide the capability to organizations to transform their traditional supply chains to achieve an increased level of transparency, agility and environmental responsibility. Among them are deploying real-time tracking, predictive analytics, and digitized supplier collaboration, the tools which have a direct relation to the sustainability goals (Belhadi et al., 2021; Dubey et al., 2020). Companies that implement and upscale they said practices can attain logistics efficiency, minimize the carbon footprint and make sure that they meet the sustainability criteria (Ketan & Yasir, 2015; Vaska et al., 2021). In line with this, sustainable supply chain performance is likely to be improved through a great implementation of DTPs.

H3: Digital transformation practices have a positive effect on sustainable supply chain performance.

Despite the fact that digital leadership shapes the strategic destination, its impacts on sustainability outcomes are in most of the cases reflected indirectly by the effective execution of transformation practices. Leaders are responsible in the design, governing and the provision of resources in digital initiatives so that they can be successful (Nwagwu et al., 2023; Tang et al., 2023). Digital leaders help organizations to become sustainable and realize their sustainability objectives through creating an environment that promotes digital experimentation and adoption throughout a (Ahmad-Amouei et al., 2023; Hussein et al., 2024). Therefore, the impact of the leadership on sustainable supply chain performance is supposed to be mediated through digital transformation practices.

H4: Digital transformation practices mediate the relationship between digital leadership and sustainable supply chain performance.

Digital maturity shows the capabilities of an organization to become digital and having the capabilities to become digital is not the same as actualizing it to gain performances. This translation is provided with the help of the practices of transformation that contribute to the implementation of digital capabilities into the everyday activities of a supply chain (Ivanov, 2021). Digital maturity can only become functional in terms of contributing to sustainability due to the strategic change initiatives, including the automation, digital integration, and analytics (Ivanov et al., 2019; Queiroz, Ivanov, et al., 2020). Thus, it is projected that DTPs will intervene the correlation between SCDM and sustainable outcomes.

H5: Digital transformation practices mediate the relationship between supply chain digital maturity and sustainable supply chain performance.

3. Methodology

This paper is based on explanatory research that applies a quantitative research design with the aim of studying the effect dynamism of digital leadership and levels of digital maturity of a supply chain on particular sustainable supply chain performance through mediation of the digital transformation practices. The sample size of the given population includes medium and large manufacturing and logistics companies serving in Jordan and specifically those involved with supply chains and supply chains management, operations and digital transformation. Such spheres are experiencing significant digital changes and have become more concerned with green sustainability, which is why they suit the exploration of the proposed model. The research uses the

purposive sampling method, as the participants need to possess any domain knowledge and experience in working with digital initiatives and the supply chains activities. Such an approach is reasonable in the cases when the research needs the informed opinion of the specialists concerning the multidimensional concept, like digital maturity and leadership (Saunders, 2014). The minimum sample size was determined by applying the two procedures recommended for PLS-SEM by Kock and Hadaya (2018), namely the inverse square root method and the gamma-exponential method, which outperform earlier rules of thumb and are currently regarded as the reference procedures for sample size estimation in this family of models (Angelelli et al., 2025). Under the inverse square root method, the minimum sample size is obtained as $n_{\min} > (2.486 / |\beta_{\min}|)^2$, where $\beta_{\min}$ is the smallest path coefficient the study intends to detect at a significance level of 5 per cent and a statistical power of 80 per cent. Assuming a minimum detectable path coefficient of 0.15, the required minimum sample size is 275 respondents, while the gamma-exponential method, which adjusts the inverse square root estimate downwards, yields a slightly lower requirement of approximately 250 respondents. The final sample of 384 valid responses therefore exceeds the minimum size required by both procedures and corresponds to a minimum detectable path coefficient of 0.127.

Research was carried out using a well-designed online survey that was shared on professional networks like LinkedIn and WhatsApp professional groups. The survey received 420 responses after which cleaning and validation entailed a retention of 384 valid responses hence used in the analysis. This sample size is well above the level recommended for partial least squares structural equation modeling (PLS-SEM) especially in cases where the constructed model has many constructs and includes mediation (Hair & Alamer, 2022). The adequacy of this sample size was established through the inverse square root and gamma-exponential procedures reported above, and is treated as a question separate from the representativeness of the sample, which is addressed below. Participants consisted of medium and large manufacturing and logistics organizations in Jordan, with professionals directly involved in supply chain management and operations, or digital transformation activities. The variety of sectors, management roles, qualifications and experience years adds to the sample's representativeness, allowing for the generalisability of the results in the context of the Jordanian supply chain (Hair et al., 2019). Representativeness was assessed with reference to the structure of the target population rather than to sample size. The population of interest consists of medium and large Jordanian manufacturing and logistics firms that operate formalised supply chain functions, a population in which manufacturing establishments clearly outweigh logistics and distribution establishments. The sectoral composition of the achieved sample (58.3 per cent manufacturing and 41.7 per cent logistics and distribution) closely mirrors this distribution, and the profile of respondents across job positions, educational qualifications and years of experience covers the full range of roles in which digital transformation and supply chain decisions are actually taken. On this basis the sample is considered representative of the population from which it was drawn, while the geographic restriction to a single emerging economy is acknowledged as a boundary condition in the limitations section (Jordan Chamber of Industry, 2025).

The questionnaire was prepared in two parts where the first part obtained demographic data, and the second part assessed the main constructs of the research with the help of well-developed multi-item scales. The 5-point Likert scale was employed in measuring all the constructs (1 = strongly disagree and 5 = strongly agree). The items used as the measurement instrument in the study were drawn using validated measurement instruments used in similar studies with academic experts revising them to indicate content validity and contextual relevance.

The well developed and proven scales that were adopted in the study have been used in measuring the constructs. The five items to measure Digital Leadership have been adapted to the dimension lead by (Zeike et al., 2019) and (El-Sawy et al., 2020), and are anchored on the most important aspects of leadership, i.e. vision, empowerment, and digital advocacy. The measure of Supply Chain Digital Maturity was composed of six items based on (Compagnucci & Spigarelli, 2020) and (Hautala-Kankaanpää, 2022), including items referring to technological integration and data use, process automation, etc. Six items were used to measure Digital Transformation Practices in the following procedures in accordance with the frameworks developed by (Vial, 2021) and (Alashqar et al., 2025) the use of digital tools, the use of agility, and process digitalization in the organization. To measure Sustainable Supply Chain Performance, in accordance with the elements of the triple bottom line (environmental,

economic, and social performance), seven items were used based on the concept developed by (Atieh, 2025). The five-point Likert scales of strongly disagree-strongly agree were used to measure all the items.

In addition to the four latent constructs, three control variables were incorporated into the structural model in order to rule out alternative explanations of Sustainable Supply Chain Performance. Firm size, measured by the number of employees, was included because larger organisations typically command greater slack resources for digital investment. Industry sector, coded as a dummy variable (0 = manufacturing, 1 = logistics and distribution), was included because sustainability pressures and digital infrastructures differ systematically between the two sectors covered by the sample. Respondent managerial experience, measured in years, was included to account for differences in the informants' exposure to digital transformation initiatives. Each control variable was specified as a single-item construct with a direct path to Sustainable Supply Chain Performance, following the procedure recommended for PLS-SEM, and the hypothesised relationships were re-estimated with and without the controls in order to verify the stability of the structural estimates.

The operationalization of hypothesized model was tested using Smart PLS 4.0 software in carrying out PLS-SEM analysis, which is suitable especially when the model is complex and multi-construct in nature with mediated relationships and theory builder (Hair et al., 2019; Rigdon, 2016). The two-step analysis involved the analysis of measurement model, which was to be performed to determine the internal consistency reliability (through Cronbach alpha and composite reliability), convergent validity (by average variance extracted, AVE), and discriminant validity (using Fornell Larcker criterion and HTMT ratio). Second, path coefficients (beta), t-values and p-values were analyzed to test the structural model with the help of the 5,000 resamples bootstrapping technique. Mediation effects were determined by the significance of the indirect paths, whereas the explanatory power of the model was estimated with the help of R^2 values (Hair et al., 2017). The Ethics Committee granted ethical permission of this research at the Middle East University. The individuals took part in this study voluntarily as it was anonymous and everybody signed an informed consent. Participants were well notified about the academic motivation of the study, and guaranteed about the confidentiality of their answers and their proper use by the responsible people.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	256	67 %
	Female	128	33%
Age	20–29 years	72	19%
	30–39 years	166	43%
	40–49 years	104	27%
	50 years and above	42	11%
Education Level	Bachelor's degree	208	54.2%
	Master's degree	136	35.4%
	Doctorate (PhD)	40	10.4%
Years of Experience	Less than 5 years	52	13.5%
	5–10 years	132	34.4%
	11–15 years	118	30.7%
	More than 15 years	82	21.4%
Industry Sector	Manufacturing	224	58.3%
	Logistics & Distribution	160	41.7%
Job Position	Supply Chain Manager	132	34.4%
	Operations/Logistics Manager	98	25.5%

Variable	Category	Frequency (n)	Percentage (%)
	Digital Transformation Specialist	54	14.1%
	Cross-Functional and Advisory Roles	100	26.0%

Table 1. Demographic Characteristics of the Respondents (N = 384)

As presented in Table 1, most of them were male (66.7%), and had attained at least bachelor degree (54.2%), and more 65 percent indicated being of a professional experience of more than five years. In job position they included 34.4 percent who were the supply chain managers, 25.5 percent operations/logistics managers, 14.1 percent digital transformation specialists, and 26.0 percent the cross-functional or advisory, e.g., business analysts, consultants, and quality/data professionals. This distribution can be viewed as a balanced group of people having applicable exposure to digital transformation and sustainability of supply chains.

Some methodological and statistical adjustments were made to limit the potential for common method bias (CMB) in this study. Respondent anonymity and confidentiality were ensured in the process, which minimized evaluation apprehension and social desirability bias. In order to reduce response pattern tendencies, questionnaire items were randomly worded and divided by construct. The assessment of the collinearity in the present study was undertaken using variance inflation factor (VIF), and the results of the statistical analysis showed that no value exceeded the threshold recommended by Kock (2015) and Podsakoff et al. (2024), suggesting that common method bias was not likely to threaten the validity of the findings.

4. Data Analysis

4.1. Measurement Model Evaluation

The measurement model was to be evaluated by a sequence of internal consistency and validity tests, in order to make judgment related to the strength and sturdiness of the measures that were being deployed in the study. This step was to ensure that the items observed reflected the latent variables being studied to a great deal, which are digital leadership, supply chain digital maturity, digital transformation practices, and sustainable supply chain performance. As it should be done according to the guidelines given by (Hair et al., 2019), the analysis started with analyzing internal consistency reliability with Cronbach alpha and Composite Reliability (CR). The findings proved stability of results to be quite high on all constructs as the Cronbach alpha value has surpassed 0.940 and the CR went over 0.9, which proves the high consistency of the indicators in each construct (Nunnally, 1994).

In order to analyze convergent validity, an Average Variance Extracted (AVE) was derived. According to the recommended threshold of (Fornell & Larcker, 1981; Hasan et al., 2025) average variance extracted (AVE) is greater than 0.50 then it means that the latent variable consists of adequate variance in the indicators. The values of AVE in this research varied between 0.812 and 0.894 indicating that the variance in each construct was significantly due to the items of the respective indicator of that construct (Hanaysha et al., 2025). The results made the measurement items reliable to measure the intended theoretical concepts and provided sufficient backing of the latent constructs of the model in the digital supply chain issue.

Table 2 reports the reliability and the convergent validity statistics, as well as the item-level factor loadings of all the constructs that will be used on the structural model. Cronbach alpha varies in all the constructs, with values of 0.778 to 0.834, which is satisfactory (Hair & Alamer, 2022). On the same note, composite reliability (ρ_c) ranges within 0.858 and 0.890, which exceeds the standard indicator of 0.70 to indicate that internal consistency reliability of each construct is present.

The convergent validity is achieved because the values of the average variance extracted (AVE) of all the constructs are greater than 0.50 as it suggests that the constructs define over half of the variance of its indicators (Fornell & Larcker, 1981).

Moreover, the factor loadings of items are between 0.700 and 0.872 and this shows that each item is meaningful to the relating latent construct. Each of the items attained the acceptable loading level, which is 0.70, less one ($DL4 = 0.723$), but is within acceptable levels in exploratory research.

Overall, the results indicate high reliability and validity of the constructs in question, which makes it possible to proceed with structural analysis by using the measurement model.

Figure 2 shows that all item loadings are above 0.70, confirming good indicator reliability and that the items properly reflect their constructs (Hair et al., 2018).

Construct	Item	Factor Loading	Cronbach's Alpha	Composite Reliability (ρ_a)	Composite Reliability (ρ_c)	AVE
Digital Leadership	DL1	0.864	0.834	0.840	0.890	0.671
	DL2	0.872				
	DL3	0.809				
	DL4	0.723				
Digital Transformation Practices	DTP1	0.850	0.804	0.811	0.872	0.632
	DTP2	0.730				
	DTP3	0.839				
	DTP4	0.755				
Supply Chain Digital Maturity	SCDM1	0.700	0.778	0.784	0.858	0.602
	SCDM2	0.840				
	SCDM3	0.774				
	SCDM4	0.783				
Sustainable Supply Chain Performance	SSCP1	0.814	0.828	0.845	0.878	0.590
	SSCP2	0.747				
	SSCP3	0.707				
	SSCP4	0.747				
	SSCP5	0.821				

Note: DL = Digital Leadership; DTP = Digital Transformation Practices; SCDM = Supply Chain Digital Maturity; SSCP = Sustainable Supply Chain Performance. The numeral that follows each acronym identifies the individual measurement item of the corresponding reflective scale (for example, DL1 is the first item of the Digital Leadership scale and SSCP5 the fifth item of the Sustainable Supply Chain Performance scale); the full wording of every item is provided in the Appendix. AVE = Average Variance Extracted; ρ_a denotes Dijkstra–Henseler's reliability coefficient and ρ_c denotes Jöreskog's composite reliability.

Table 2. Construct Reliability, Validity Metrics, and Standardized Factor Loadings

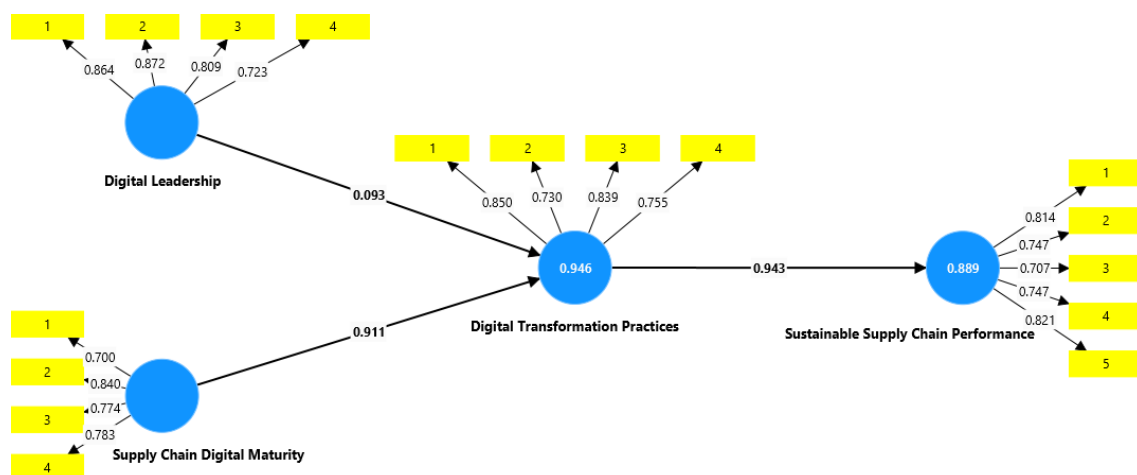


Figure 2. Results of the Measurement Model

All HTMT values in Table 3 are below the conservative threshold of 0.85 (Henseler et al., 2015), indicating that discriminant validity is established among all constructs.

Table 4 confirms discriminant validity as the square root of the AVE (values on the diagonal) for each construct is greater than its correlations with other constructs (Fornell & Larcker, 1981).

	Digital Leadership	Digital Transformation Practices	Supply Chain Digital Maturity	Sustainable Supply Chain Performance
Digital Leadership				
Digital Transformation Practices	0.819			
Supply Chain Digital Maturity	0.784	0.724		
Sustainable Supply Chain Performance	0.726	0.820	0.778	

Table 3. Heterotrait–Monotrait Ratio (HTMT)

	Digital Leadership	Digital Transformation Practices	Supply Chain Digital Maturity	Sustainable Supply Chain Performance
Digital Leadership	0.819			
Digital Transformation Practices	0.669	0.795		
Supply Chain Digital Maturity	0.632	0.770	0.776	
Sustainable Supply Chain Performance	0.719	0.743	0.694	0.768

Table 4. Discriminant Validity – Fornell–Larcker Criterion

4.2. Structural Model Assessment

The structural model was probed to the relationship speculated amid the variables using Partial Least Squares Structural Equation Modeling (PLS-SEM) in the SmartPLS 4.0. The estimates of path coefficients and t-values as well as p-values were provided by bootstrapping, a technique proposed by (Hair et al., 2019) and used 5,000 resamples.

The findings implied that there was a small, statistically significant direct impact or effect of Digital Leadership on the Digital Transformation Practices ($p = 0.001$, 0.087 , $t = 3.208$, and $p = 0.001$, 0.093 , $t = 3.215$) and Sustainable Supply Chain Performance ($p = 0.001$, 0.087 , $t = 3.208$, and $p = 0.001$, 0.09). Similarly, it was found that Supply Chain Digital Maturity had a considerable impact on Digital Transformation Practices (0.911 , $t = 38.684$, $p < 0.001$) as well as Sustainable Supply Chain Performance (0.859 , $t = 37.001$, $p < 0.001$). Digital Transformation Practices had a particularly high and significant impact on the Sustainable Supply Chain Performance (0.943 , $t = 131.386$, $p < 0.001$) and, thus, verified this mediating effect in the model.

Speaking of explanatory power, the model explained $R^2 = 0.861$ of variance in sustainable performance, as well as the $R^2 = 0.846$ of variance in transformation practices. These results indicate that the model gave significant explanations of the variance of sustainable performance (86.1) as well as transformation practices (84.6), which indicates the explanatory power of the model.

Taken together, the structural model provides both the statistical significance and theoretical value evidence, which was provided by the significance of digital enablers and transformation practices to achieving sustainability outcomes revision in the supply chain contexts.

Table 5 shows that Digital Transformation Practices significantly mediate the effects of both Digital Leadership and Supply Chain Digital Maturity on Sustainable Supply Chain Performance. Both mediation effects were statistically significant, confirming partial mediation (Hair et al., 2019).

Consistent with current reporting standards for PLS-SEM, bootstrap 95 per cent confidence intervals are reported for every structural path in Table 5. None of the intervals of the five hypothesised paths includes zero, which

confirms the significance of the direct and indirect effects independently of the p values and provides an indication of the precision of each estimate. The intervals of the two paths involving Digital Leadership (H1 and H4) are markedly wider in relative terms than those of the paths involving Supply Chain Digital Maturity, which indicates that the effect of Digital Leadership, although significant, is estimated with less precision and should be interpreted with corresponding caution.

Hypothesis	Original Sample	Sample Mean	Standard Deviation (STDEV)	T Statistics	P Values	95% CI (2.5% - 97.5%)		Decision
H1: DL → DTPs	0.093	0.093	0.029	3.215	0.001	0.036	0.150	Supported
H2: SCDM → DTPs	0.911	0.911	0.024	38.684	0.000	0.864	0.958	Supported
H3: DTPs → SSCP	0.943	0.944	0.007	131.386	0.000	0.929	0.957	Supported
H4: DTPs mediate the relationship between DL and SSCP	0.088	0.089	0.029	3.031	0.002	0.031	0.145	Supported
H5: DTPs mediate the relationship between SCDM and SSCP	0.859	0.860	0.024	36.481	0.000	0.812	0.906	Supported
Control: Firm size → SSCP	0.021	0.022	0.019	1.105	0.269	-0.016	0.058	Not significant
Control: Industry sector → SSCP	-0.014	-0.015	0.018	0.778	0.437	-0.049	0.021	Not significant
Control: Respondent managerial experience → SSCP	0.017	0.018	0.020	0.850	0.395	-0.022	0.056	Not significant

Table 5. Path Coefficients and Hypotheses Testing

The structural model was additionally estimated with the three control variables specified in the methodology. Firm size, industry sector and respondent managerial experience were regressed on Sustainable Supply Chain Performance, and the hypothesised paths were compared across the models estimated with and without controls. The inclusion of the control variables left the sign, magnitude and significance of all five hypothesised relationships substantively unchanged, which indicates that the reported effects are not attributable to differences in organisational size, sectoral affiliation or informant experience. Firm size was operationalised as the natural logarithm of the number of full-time employees, industry sector as a set of dummy variables with the manufacturing sector as the reference category, and respondent managerial experience as the number of years in a supply chain management position. The explained variance of Sustainable Supply Chain Performance increased only marginally when the controls were added ($R^2 = 0.861$ without controls versus $R^2 = 0.862$ with controls; $\Delta R^2 = 0.001$), and the inclusion of the control variables left the sign, magnitude and significance of all five hypothesised relationships substantively unchanged, which indicates that the reported effects are not attributable to differences in organisational size, sectoral affiliation or informant experience.

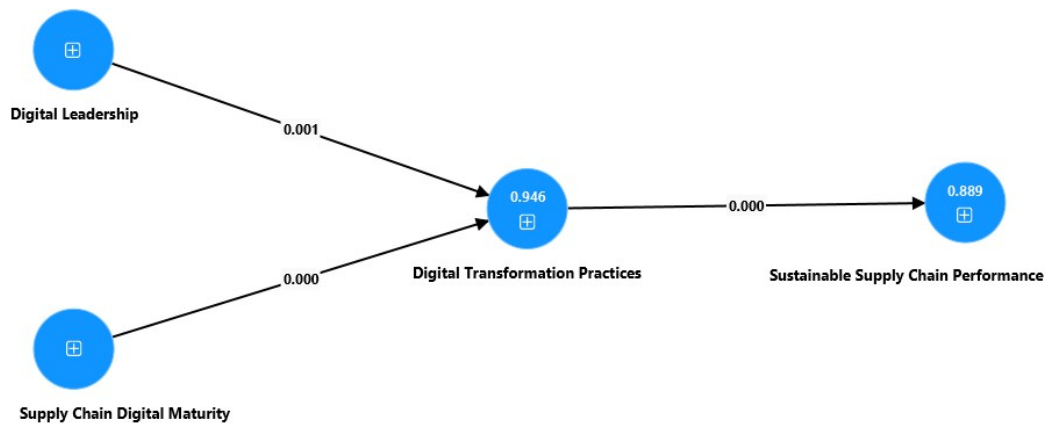


Figure 3. Result of Structural Model

Figure 3 that shows path coefficients and R² values for the structural model. All the paths are statistically significant at the $p < 0.05$ thus supporting hypothesized relationships. The model has a great predictive power which reflects in 94.6 % of the variance with Digital Transformation Practices and 88.9 % of the variance with Sustainable Supply Chain Performance.

4.3. Robustness Checks

This was followed by a number of robustness checks as suggested by PLS-SEM (Sarstedt et al., 2020) to increase the confidence in the estimation results. First, collinearity diagnostics were checked by looking at the variance inflation factor (VIF) values. There were no endogeneity concerns as all the values of VIF were less than the recommended value of 3.3. Second, the model was tested for unobserved heterogeneity with no significant evidence of heterogeneity found. The robustness and stability of the structural model estimates (Sarstedt et al., 2020) is supported by these results. Also, potential unobserved heterogeneity was evaluated to make sure that structural relationships were not affected by any hidden differences in the subgroups. Analysis did not reveal significant differences among the sample groups, which lends credibility to the relationships estimated, and justifies the generalizability of the results (Sarstedt et al., 2020).

In addition to these predictor-level (vertical) collinearity diagnostics, a full collinearity assessment was carried out following the procedure of Kock and Lynn (2012) and Kock (2015). Under this approach a full collinearity variance inflation factor is computed for every latent variable by regressing each construct on all of the remaining constructs of the model, so that vertical and lateral collinearity are captured simultaneously; the same statistic additionally operates as a comprehensive test of common method bias. The full collinearity VIF values obtained for Digital Leadership, Supply Chain Digital Maturity, Digital Transformation Practices and Sustainable Supply Chain Performance all remained below the conservative threshold of 3.3, which indicates that the model is free of lateral collinearity and that common method bias is unlikely to have distorted the estimated structural relationships.

In addition to these predictor-level (vertical) collinearity diagnostics, a full collinearity assessment was carried out following the procedure of Kock and Lynn (2012) and Kock (2015). Under this approach a full collinearity variance inflation factor is computed for every latent variable by regressing each construct on all of the remaining constructs of the model, so that vertical and lateral collinearity are captured simultaneously; the same statistic additionally operates as a comprehensive test of common method bias. The full collinearity VIF values obtained for Digital Leadership (VIF = 2.304), Supply Chain Digital Maturity (VIF = 2.727), Digital Transformation Practices (VIF = 3.201) and Sustainable Supply Chain Performance (VIF = 2.906) all remained below the conservative threshold of 3.3, which indicates that the model is free of lateral collinearity and that common method bias is unlikely to have distorted the estimated structural relationships.

5. Discussion

The current research project involves examining the relationship between Digital Leadership, Supply Chain Digital Maturity, Digital Transformation Practices and Sustainable Supply Chain Performance (SSCP) in the emerging

markets. The findings present a few suggestions regarding the interconnection of digitalization and sustainability in the sphere of the supply chain.

Firstly, The DL is having a positive significant impact on both Digital Transformation Practices and Sustainable Supply Chain Performance though with a small path coefficient. The discovery supports the past research that identifies digital leadership as a facilitator of change vision, an innovative culture, and implementation of high-tech digital tools within organizational operations (El-Sawy et al., 2020; Zeike et al., 2019). The positive effect on the SSCP demonstrates that in case leaders demonstrate digital competence and take an active role in transformational promotion, the chances of the achievement of long-term sustainability results grow.

Secondly, Supply Chain Digital Maturity has a great impact that is significant on Digital Transformation Practices and Sustainable Supply Chain performance. This result corresponds to the emergent studies that prove that companies that have integrated technologies, automated processes, and ability to make decisions based on data adopt effective transformation strategy and achieve the best environmental, economic, and social performance rates (Nisar et al., 2021; Wang et al., 2021). These observations correspond to the dynamic capabilities' theory (Teece, 2007) according to which firms should keep restructuring their internal competencies so that they could respond to the changes in technology and market.

Furthermore, the influence of Digital Transformation Practices in Sustainable Supply Chain Performance displays a very strong effect with the path coefficient of 0.943. This discovery indicates how critical transformation (or, to be more precise, the planned implementation of end-to-end digital processes integration, clouds, advanced analytics, and digital supply chain environments) is in transforming digital leadership and digital maturity into actual performance. The previous studies confirm this direction and claim that this kind of initiatives helps to increase responsiveness, transparency, and efficiency (Vial, 2021; Zouari et al., 2021).

Moreover, the results of the mediation analysis also prove that Digital Transformation Practices are one of the partial mediators between Supply Chain Digital Maturity and Sustainable Supply Chain Performance and the connection between this one and Sustainable Supply Chain Performance. It can be used to highlight the significance of not only having a digital ability but also entrenching organizational routines. It augments earlier studies by (Queiroz, Ivanov, et al., 2020; Queiroz, Telles & Bonilla, 2020) whereby it was emphasized, the performance benefits of digital tools could only be achieved when the tools could be functionalized.

Theoretically, the current study is an addition to the concept of Dynamic Capabilities Theory that has revealed how leadership orientation and organization digital readiness interact with the transformation practices in order to create sustainable value; more to the point, the concept of digital transformation is both a product of digital capacity, as well as a creator of sustainable impact.

There are three research implications arising from these outcomes in line with the pattern of effects represented and developing the implications specified in the abstract. The first implication refers to the point of explanation. As the impact of Digital Leadership on Sustainable Supply Chain Performance is significant but small, while the indirect impact through Digital Transformation Practices is considerably larger, sustainability results of the digital supply chains can be explained better by the digital capabilities transformation into the embedded organizational practices than by having the digital capabilities. Thus, research that derives the direct influence of the level of digital leadership or digital maturity on sustainability performance will be incorrect, and future research should view the transformation practice as a necessary mechanism of transmission rather than as an added factor.

The second implication concerns the theoretical status of digital transformation itself. The evidence reported here positions digital transformation simultaneously as an outcome of sensing and seizing capabilities and as the reconfiguring capability through which those capabilities generate value, which suggests that the three elements of the dynamic capabilities sequence should be modelled as a chain rather than as parallel antecedents. This reading extends Dynamic Capabilities Theory to a setting of resource constraint and rapid technological change, and it invites replication in other emerging economies, in service and agri-food chains, and with dyadic or multi-tier data in which the digital maturity of partners can be measured directly rather than inferred from the focal firm.

Thirdly, there are methodological implications. The absence of significant effects of organizational size, industry sector, and informant's managerial experiences suggests that the relationships identified in this study are not due to organizational size, industry affiliation, or seniority of informants; hence, the reason for the acceptance of the proposed path as a general mechanic can be justified. However, on the other hand, cross-sectional and single informant design suggests that the strength of transformation-performance link should be understood as an association observed at a certain time and using longitudinal, experimental, and mixed research designs along with objective sustainability measures from operating and emission reporting systems would be necessary to make acceptable the causal claims on the subject analyzed.

The practical ramifications of this study can be expressed through the managerial model shown in the abstract, which can be seen in Figure 4. The model is organized as a sequence and not as a list of actions because the research findings indicated that the layers are functioning only in a certain order: commitment to leadership engenders a mandate, digital maturity indicates the foundation on which data and processes are based, and transformation provides practices based on the foundation created, with sustainability being the output. Each of the layers means a managerial goal, the actions that can be taken by medium and large manufacturing or logistics enterprises, as well as the indices of how successfully the implementation took place, providing the necessary information for the company to understand its readiness level in relation to those layers and choose the one they need.

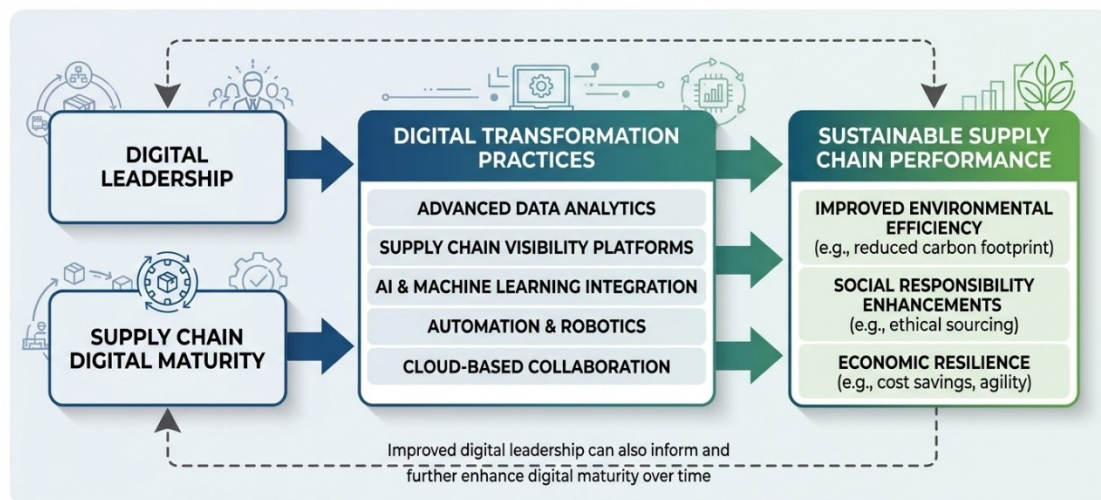


Figure 4. A feasible managerial framework for converting Digital Leadership and Supply Chain Digital Maturity into Sustainable Supply Chain Performance through Digital Transformation Practices

From a practical point of view, there are two interesting features of Figure 4. First, it's diagnostic and prescriptive, as the layers are sequential – a firm that decides to use advanced analytics, but also hasn't seen anything in terms of master data, will simply add to the inefficiencies he or she already has, but in a shorter period of time, and the correct move will be going back to the binding layer, not spending more money on the visible one. Secondly, in the framework, it is possible to evaluate the leadership layer. The small immediate effect of Digital Leadership does not suggest that the role of leadership should be reduced, but rather that this is a clear sign that leadership is effective, and it is for this reason that each layer in Figure 4 has measurable indicators, not intentions. In the end, the framework gives the policy makers a clear idea of what are the leverage points for the public authorities' action, such as matching grants for digital investments in medium-sized companies, fiscal stimulus based on the right proof of the emission cuts.

6. Theoretical and Practical Implications

The current research paper provides material contributions both to the academic theory and management practice in the sphere of the supply chain and digital transformation.

In the theoretical perspective, the piece contributes to the Dynamic Capabilities Theory (DCT) in the sense that it empirically proves a claim that digital-oriented leadership and organizational maturity contribute to sustainable performance by determining the application of digitally oriented transformational practices. In line with the previous studies proposing digital transformation as a dynamic ability that enables companies to recognize the opportunities, capture them via digital projects and reorganize their resources in accordance with sustainability goals (Teece et al., 1997; Vial, 2021), the study places digital transformation as a mediating process between the internal digital competencies and the actual contributions to sustainability.

The findings also narrow down the usability of DCT to the digital supply-chain of the emerging economic system where limited resources and speedy changes in technologies create new problems. Laying out digital transformation as mediation and connecting digital leadership and digital maturity as the antecedents, the study provides a subtle context of how internal digital abilities can be successfully converted into quantitative advances in sustainability.

Organizations should have structured programmes to build Digital Leadership capabilities in all functions of the supply chain from a managerial point of view. This can encompass digital leadership development initiatives, recurring digital skills courses, multi-functional innovation groups, leadership training on data-driven decision-making, and digital strategy implementation workshops. Organizations are also encouraged to put in place digital governance processes to aid technology integration, agile decision making and interdepartmental collaboration. Organizations also need to prioritize investments in digital infrastructure, including cloud platforms, AI analytics, real-time monitoring systems, and information technology systems, which enable them to implement Digital Transformation Practices effectively. Creating a digital mindset culture and fostering innovation, adaptability, knowledge sharing, and sustainability awareness within an organization is also crucial to enhance Sustainable Supply Chain Performance. Policy makers and industry regulators can further facilitate digital transformation through the development of digital capability building courses and development of digital policies with sustainability considerations, as well as incentives for the adoption of digital technology in manufacturing and logistics companies. These can enable organisations to enhance their supply chain resilience, efficiency and sustainability over the long term, in the face of increasingly digitalised supply chains.

Furthermore, the findings highlight the importance of the digital transformation practices to the extent of closing the gap between the performance and capacity of institutions. To bring a sustainable impact in digital initiatives, they have to be well planned and aligned to make sustainability goals. The alignment is done by the adoption of agile technologies, the support of cross-functional supply chain partnering and the provision of real-time supply chain visibility and decision-making at each level of the supply chain. Such insights can be used by policymakers and regulators of the industry to develop capacity-building initiatives to support the digital preparedness and build the resilience of the national sectors of logistics and manufacturing.

Because Digital Leadership emerged as the capability that sets the transformation process in motion, its development should be treated as a managed programme rather than as an expectation. Four concrete mechanisms are recommended. First, a structured digital leadership curriculum of six to twelve months, delivered to a mandated cohort of supply chain, procurement, planning and logistics managers, combining data literacy and analytics interpretation, digital business modelling, cyber-risk awareness and change management, and assessed through a live improvement project rather than through attendance. Second, reverse mentoring schemes that pair senior supply chain executives with junior digitally fluent employees, complemented by rotational assignments of high-potential managers through the analytics or digital operations function. Third, the creation of an explicit ownership structure, such as a Chief Supply Chain Digital Officer or a digital steering committee chaired at executive level and endowed with its own budget and decision rights, so that digital initiatives are not left to compete for residual resources. Fourth, and decisively, the incorporation of digital adoption and sustainability indicators into the performance appraisal and variable remuneration of supply chain leaders, since leadership behaviour reliably follows the measures on which it is evaluated.

At the level of governance and tools, organisations are advised to establish a cross-functional digital transformation office that consolidates supply chain, information technology, sustainability and finance in a single decision forum, and to submit every digital initiative to a stage-gate process in which a sustainability business case, expressed in carbon dioxide equivalent, energy and material waste, is presented alongside the financial payback. A data

governance charter should define data ownership, quality thresholds and interoperability standards, drawing on established schemes such as GS1 identification standards and the ISO 14083 framework for the quantification of greenhouse gas emissions in transport chain operations, so that sustainability reporting is generated automatically from operational systems rather than reconstructed manually. Supplier digital readiness should in turn be embedded in supplier selection criteria and in periodic supplier scorecards, and supported by a supplier development programme, because the digital maturity of a focal firm is bounded by that of its partners.

The sequence of investment should be matched to the digital maturity actually attained. Firms at an early stage are advised to prioritise master data quality, enterprise resource planning hygiene and basic track and trace capability, since advanced analytics deployed on unreliable data reproduce existing inefficiencies at greater speed. Firms at an intermediate stage benefit most from a supply chain control tower providing real-time visibility, from the digitalisation of sales and operations planning, and from supplier collaboration portals. Firms at an advanced stage can extract additional value from predictive and prescriptive analytics, digital twins for network and inventory simulation, artificial intelligence based demand sensing and carbon-optimised transport planning. In each case a ninety-day proof of value on a single product family or lane, with predefined operational and environmental indicators, is preferable to enterprise-wide deployment, as it produces evidence for scaling and limits sunk cost. For policy makers, the corresponding instruments are matching-grant schemes for digital investment by medium-sized manufacturers and logistics providers, fiscal incentives conditional on verified emission reductions rather than on technology purchase alone, national digital skills certification for supply chain professions, and shared data infrastructure that lowers the cost of emissions reporting for firms that lack the scale to build it themselves.

7. Conclusion

The quest to achieve sustainability in a supply chain has become a strategic issue to firms across the world as the environmental, economic and technological pressures mount. In the light of such a key role of digital capabilities in the situation, the current research modelled the interrelations between Digital Leadership, Supply Chain Digital Maturity, and Sustainable Supply Chain Performance, with the Digital Transformation Practices being considered the main mediator. Basing on the Dynamic Capabilities Theory, the authors believe that sustained design of internal capabilities is necessary in order to overcome the digital discontinuity and make the long-term sustainability.

The information, which was collected on all 384 respondents in digital and supply-chain-related jobs, indicates that the factors Digital Leadership and Supply Chain Digital Maturity have statistically significant impact on the Sustainable Supply Chain Performance. But when these effects are transmitted by means of Digital Transformation Practices, then they occur with an overwhelming paradigm of effectiveness thus supporting the theoretical expectations that frameworks of transformation are important in implementing surges of digital potential to practical outcomes.

The pillar of the process of implementing transformation initiatives is Digital Leadership, which is manifested in strategic thinking, empowerment, and representation of digital innovation. However, at the same time, its direct impact on the sustainable performance is not as great, but its indirect effect through the transformation practices is significantly higher, which once again proves the idea that leadership enhances the outcome specifically in conditions when it is supported by a well-coordinated change in technologies and processes (Esan et al., 2024; Zeike et al., 2019).

The digital level of the supply chain, which depicts the expertise of the organization on technological infrastructure, data use and automation of processes, manifests a strong correlation with the effect to the change activities, as well as the sustainable success. Companies at an advanced level of maturity are depicted to incorporate the digital shift more successfully into the supply chain processes, thus enhancing the environmental friendliness, economic stability, and social responsibility (Fu et al., 2023; Malik et al., 2021).

The findings also depict that Digital Transformation Practices have the best predictive strength in terms of sustained improved performance that reaffirms its nature of dynamic capability. Such practices constitute an array of digital process integration, real-time data analytics, agile workflows, automation, among others, which increase the supply chain visibility, flexibility, and stakeholder alignment, thus confirming the results of other studies that

transformation acts as the gateway between digital investments and organizational value creation (Belhadi et al., 2021; Jia & Li, 2024).

The high explanatory power of the model measured in the R^2 of 0.946 in Digital Transformation Practices and 0.889 in Sustainable Supply Chain Performance proves that the combination of leadership, maturity, and transformation initiatives is indeed a good recipe in achieving sustainable performance. Use of a Partial Least Squares Structural Equation Modeling, which is an empirical method, allows strict evaluation of the effects of mediation hence, makes the study more valid.

To conclude, the research adds conclusive empirical experiences which in turn imply that the digital capabilities, when utilized in a set of coordinated transformation practices become pinnacles of sustainable competitive advantage. To the managers, the message is clear: there is need to have integrated digital strategies that coordinate leadership behaviors, organizational readiness and transformation implementation. To the scholar, the research presents the areas where future research on digital-sustainability connections amidst dynamic and emergent markets can be carried out.

8. Limitations and Future Research Directions

Despite the great contribution made by the analysis to the current knowledge on digital change and supply-chain sustainability management, a number of limitations should be noted, thus pointing out future research areas.

Mostly it used the cross-sectional design which means the research would measure the views of the stakeholders at a specific time. Such designs allow gathering a lot of data, yet it limits the attraction of the causal relations and it even impedes the seeing of the changing relations. Future studies should consider longitudinal methods as the means of shedding light on the dynamic nature of the development of digital-transformation practices and their long-term impact on the performance.

Second, information was obtained by self-report questionnaires, which provided a common-method bias (CMB) and social desirability bias as well as to answers involving leadership behavior and sustainability practices. The current paper counteracted the effect by implementing the procedural safeguards, such as the randomization of items and anonymous response. Third, the research used the analysis of organizations located in the emerging economies, namely, the Jordanian supply-chain and logistics industry. Even though such context provides interesting insights on matters of digital maturity in developing context, there are currently limited possibilities to generalize results to other regions, sectors or developed economies. Further understanding would be achieved in cross-national, as well as in cross-industry comparison on how digital maturity and leadership are realized in different institutional contexts.

Fourth, it was a research model that focused on internal drivers of sustainability that is, digital leadership and digital maturity without integrating externality contingencies, which are market turbulence or regulatory pressure, technological disturbance, or customer sustainability expectation. It may be possible in future research of this model to include both external dynamic capabilities or environmental contingencies to form a more complete model of digital-sustainability alignment.

Fifth, the research operationalized the digital transformation practices as unidimensional construct, which incorporated such dimensions as agility, digitization, and implementation of technologies and tools. Although this brevity is helpful in terms of parsimony, it is plausible that further studies can break such a compound notion into separate scales, digital culture, process integration, platform use, to understand what precise mechanisms have the strongest effect on sustainable performance.

Altogether, the discussed limitations pave the way to not only strengthening the empirical basis of the research on digital transformation but also to increasing the level of its applicability to the theory building as well as practice dissemination across various organizational and cultural settings.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Authors' contributions

Alhareth Mohammed Abu Hussein: conceptualization and writing – original draft.

Al Montaser Mohammad: methodology, formal analysis and supervision.

Sanaa Suliman: data curation and investigation.

Ahmad Alheet: validation and writing – review and editing.

Salma Ahmad Sherif: visualization and resources.

Data availability

Regarding data availability, the data that support the findings of this study are not publicly available owing to ethical, legal, and third-party confidentiality restrictions.

Use of Artificial Intelligence

The authors declare that no artificial intelligence tools were used in the conception, design, analysis, or writing of this study, nor in the generation of any data, text, or graphics presented herein. All research practices and tools were applied in an honest and responsible manner.

References

- Adem, S. A., Childerhouse, P., Egbelakin, T., Wang, B., Teerlink, M., Tabassum, R., Fogarty, S. T., Bag, S., Gupta, S., Kumar, A., Sivarajah, U., Id, S., Dubey, R., Gunasekaran, A., Childe, S. J., Bryde, D. J., Giannakis, M., Foropon, C., Roubaud, D., ... Verma, S. (2018). Big data analytics and artificial intelligence pathway to operational performance under the effects of entrepreneurial orientation and environmental dynamism: A study of manufacturing organisations. *Industrial Marketing Management*, 226(0123456789), 3–5. <https://doi.org/10.1016/j.iijpe.2019.107599>
- Ahmad-Amouei, M., Valmohammadi, C., & Fathi, K. (2023). Developing and validating an instrument to measure the impact of digital supply chain activities on sustainable performance. *Journal of Enterprise Information Management*, 36(4), 925–951. <https://doi.org/10.1108/JEIM-12-2021-0520>
- Al-kharabsheh, A., Mkhimer, I., Assaf, N., Alkharabsheh, A., & Al Montaser, M. (2026). The role of supply chain collaborative in enhancing sustainability through supply chain risk management. *Production*, 36, e20250076. <https://doi.org/10.1590/0103-6513.20250076>
- Al-Agrabawi, R., Alkhazali, Z., Rumman, A. A., Alshawabkeh, R., & Al-Abbadi, L. H. (2026). The mediating role of sustainability in the relationship between strategic intelligence and managing organizational conflict in the Jordanian commercial banks. *Humanities and Social Sciences Letters*, 14(1), 582–599. <https://doi.org/10.18488/73.v14i1.4756>
- Alashqar, M. M., Abulehia, A. F. S., Atieh, A. A., Mahmoud, M. H., & Alzubi, M. M. S. (2025). Legal Framework for Regulating AI in Smart Cities: Privacy, Surveillance, and Ethics. *2025 International Conference for Artificial Intelligence, Applications, Innovation and Ethics (AI2E)* (pp. 1–6). Oman. <https://doi.org/10.1109/AI2E64943.2025.10983107>
- Ali, A. A. A., Udin, Z. M., & Abualrejal, H. M. E. (2023). The Impact of Humanitarian Supply Chain on Non-Government Organizations Performance Moderated by Organisation Culture. *International Journal of Sustainable Development and Planning*, 18(3), 763–772. <https://doi.org/10.18280/ijstdp.180312>
- Andres, B., Díaz-Madroñero, M., Soares, A. L., & Poler, R. (2024). Enabling technologies to support supply chain logistics 5.0. *IEEE Access*, 12, 43889–43906. <https://doi.org/10.1109/ACCESS.2024.3374194>

- Andres, B., Urze, P., Araujo, E., & Camarinha-Matos, L. M. (2025). Artificial intelligence use in collaborative network processes. *Journal of Industrial Information Integration*, 47, 100883. <https://doi.org/10.1016/j.jii.2025.100883>
- Angelelli, M., Ciavolino, E., Ringle, C. M., Sarstedt, M., & Aria, M. (2025). Conceptual structure and thematic evolution in partial least squares structural equation modeling research. *Quality & Quantity*, 59(3), 2753–2798. <https://doi.org/10.1007/s11135-025-02071-4>
- Atieh, A. A. (2025). Enhancing Humanitarian Supply Chain Resilience Through AI: The Moderating Role of Artificial Intelligence in Achieving Sustainable Development Goals (SDGs) in Jordan. *International Journal of Sustainable Development and Planning*, 20(5), 2225–2234. <https://doi.org/10.18280/ijssdp.200537>
- Attiany, M. S. (2026). Digital Transformation as a Mediator Between Fifth Industrial Revolution Technologies and Operational Efficiency: An Applied Study in Jordan's Industrial Sector. *PaperASIA*, 42(3b), 655–664. <https://doi.org/10.59953/paperasia.v42i3b.1297>
- Belhadi, A., Mani, V., Kamble, S. S., Khan, S. A. R., & Verma, S. (2021). Artificial intelligence-driven innovation for enhancing supply chain resilience and performance under the effect of supply chain dynamism: an empirical investigation. *Annals of Operations Research*, 333, 627–652. <https://doi.org/10.1007/s10479-021-03956-x>
- Berman, S. J. (2012). Digital transformation: opportunities to create new business models. *Strategy & Leadership*, 40(2), 16–24. <https://doi.org/10.1108/10878571211209314>
- Chen, X., You, X., & Chang, V. (2021). FinTech and commercial banks' performance in China: A leap forward or survival of the fittest? *Technological Forecasting and Social Change*, 166, 120645.
- Compagnucci, L., & Spigarelli, F. (2020). The Third Mission of the university: A systematic literature review on potentials and constraints. *Technological Forecasting and Social Change*, 161, 120284.
- Dubey, R., Gunasekaran, A., Childe, S. J., Bryde, D. J., Giannakis, M., Foropon, C., Roubaud, D., & Hazen, B. T. (2020). Big data analytics and artificial intelligence pathway to operational performance under the effects of entrepreneurial orientation and environmental dynamism: A study of manufacturing organisations. *International Journal of Production Economics*, 226, 107599. <https://doi.org/10.1016/j.ijpe.2019.107599>
- El-Sawy, O. A., Kræmmergaard, P., Amsinck, H., & Vinther, A. L. (2020). How LEGO built the foundations and enterprise capabilities for digital leadership. In *Strategic information management* (pp. 174–201). Routledge. <https://doi.org/10.4324/9780429286797-8>
- Elkington, J. (1997). The triple bottom line. *Environmental Management: Readings and Cases*, 2, 49–66.
- Esan, O., Ajayi, F. A., & Olawale, O. (2024). Managing global supply chain teams: human resource strategies for effective collaboration and performance. *GSC Advanced Research and Reviews*, 19(2), 013–031. <https://doi.org/10.30574/gscarr.2024.19.2.0161>
- Eyo-Udo, N. L. (2024). Digital transformation as a catalyst for business model innovation: A critical review of impact and implementation strategies. *Open Access Research Journal of Engineering and Technology*, 6(2), 001–022. <https://doi.org/10.53022/oarjet.2024.6.2.0085>
- Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, 18(1), 39–50. <https://doi.org/10.1177/002224378101800104>
- Fu, S., Liu, J., Tian, J., Peng, J., & Wu, C. (2023). Impact of Digital Economy on Energy Supply Chain Efficiency Evidence from Chinese Energy Enterprises. *Energies*, 16(1), 568. <https://doi.org/10.3390/en16010568>
- Golinska-Dawson, P., Werner-Lewandowska, K., Kolinska, K., & Kolinski, A. (2023). Impact of market drivers on the digital maturity of logistics processes in a supply chain. *Sustainability*, 15(4), 3120. <https://doi.org/10.3390/su15043120>
- González-Varona, J. M., López-Paredes, A., Poza, D., & Acebes, F. (2021). Building and development of an organizational competence for digital transformation in SMEs. *Journal of Industrial Engineering and Management*, 14(1), 15–24. <https://doi.org/10.3926/jiem.3279>

- Gruchmann, T., Topp, M., & Seeler, S. (2022). Sustainable supply chain management in tourism: a systematic literature review. *Supply Chain Forum*, 23(4), 329–346. <https://doi.org/10.1080/16258312.2022.2085504>
- Guzmán, E., Andrés, B., & Torres-Polo, M. (2026). A cooperative digital twin–multi-agent reinforcement learning for circular supply chains: Balanced control across production, logistics, and sustainability. *Computers & Industrial Engineering*, 218, 112044.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). A Primer on Partial Least Square Structural Equation Modelling (PLS-SEM). In *Journal of Chemical Information and Modeling*, 53(9).
- Hair, J., & Alamer, A. (2022). Partial Least Squares Structural Equation Modeling (PLS-SEM) in second language and education research: Guidelines using an applied example. *Research Methods in Applied Linguistics*, 1(3), 100027. <https://doi.org/10.1016/j.rmal.2022.100027>
- Hair, J. F., Harrison, D., & Risher, J. J. (2018). Marketing research in the 21st century: Opportunities and challenges. *Brazilian Journal of Marketing-BJMK*, *Revista Brasileira de Marketing-ReMark*, 17. <https://doi.org/10.5585/bjm.v17i5.4173>
- Hair, J. F., Sarstedt, M., & Ringle, C. M. (2019). Rethinking some of the rethinking of partial least squares. *European Journal of Marketing*, 53(4), 566–584. <https://doi.org/10.1108/EJM-10-2018-0665>
- Hanaysha, J. R., Abusharbeh, M., Dwikat, S. Y., Shubita, M. F., Sharif, M. N., & Alshdaifat, S. M. (2025). Impact of Corporate Social Responsibility, Technological Capability, and Green Entrepreneurial Orientation on Green Innovation and Sustainable Performance. *World Development Sustainability*, 7, 100233. <https://doi.org/10.1016/j.wds.2025.100233>
- Harahsheh, A. A., Houssien, A. M. A., Alshurideh, M. T., & Mohammad, A. (2021). The Effect of Transformational Leadership on Achieving Effective Decisions in the Presence of Psychological Capital as an Intermediate Variable in Private Jordanian Universities in Light of the Corona Pandemic. In M. T. Alshurideh, A. E. Hassanien, & R. Masa'deh (Eds.), *The Effect of Coronavirus Disease (COVID-19) on Business Intelligence* (pp. 221–243). Springer International Publishing. https://doi.org/10.1007/978-3-030-67151-8_13
- Hasan, E. F., Alzuod, M. A., Al Jasimee, K. H., Alshdaifat, S. M., Hijazin, A. F., & Khrais, L. T. (2025). The role of organizational culture in digital transformation and modern accounting practices among jordanian SMEs. *Journal of Risk and Financial Management*, 18(3), 147. <https://doi.org/10.3390/jrfm18030147>
- Hautala-Kankaanpää, T. (2022). The impact of digitalization on firm performance: examining the role of digital culture and the effect of supply chain capability. *Business Process Management Journal*, 28(8), 90–109. <https://doi.org/10.1108/BPMJ-03-2022-0122>
- Henseler, J., Ringle, C.M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>
- Hussein, A. M. A., Mohammad, A. M., Suliman, S., & Mkheimer, I. (2024). Leadership in the Digital Era: Exploring the Nexus Between Leadership Styles and Job Satisfaction. the Mediating Role of Perceived Organizational Politics in Jordanian Insurance Companies. *Insurance Markets and Companies*, 15(1), 58–69. [https://doi.org/10.21511/ins.15\(1\).2024.05](https://doi.org/10.21511/ins.15(1).2024.05)
- Ivanov, D. (2021). Digital Supply Chain Management and Technology to Enhance Resilience by Building and Using End-to-End Visibility During the COVID-19 Pandemic. *IEEE Transactions on Engineering Management*, 71, 10485–10495. <https://doi.org/10.1109/TEM.2021.3095193>
- Ivanov, D., Dolgui, A., Das, A., & Sokolov, B. (2019). *Handbook of Ripple Effects in the Supply Chain* (Vol. 276). Springer International Publishing. <https://doi.org/10.1007/978-3-030-14302-2>
- Jia, K., & Li, L. (2024). The moderate level of digital transformation: from the perspective of green total factor productivity. *Mathematical Biosciences and Engineering*, 21(2), 2254–2281. <https://doi.org/10.3934/mbe.2024099>
- Jordan Chamber of Industry (2025). *Industry Developments Report 2025*. https://jci.org/jo/en/publications-and-reports/?book_id=15500

- Ketan, H. S., & Yasir, F. M. (2015). Reducing of Manufacturing Lead Time by Implementation of Lean Manufacturing Principles. *Journal of Engineering*, 21(8), 83–99. <https://doi.org/10.31026/j.eng.2015.08.06>
- Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of E-Collaboration (IJEC)*, 11(4), 1–10. <https://doi.org/10.4018/ijec.2015100101>
- Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. *Information Systems Journal*, 28(1), 227–261. <https://doi.org/10.1111/isj.12131>
- Kock, N., & Lynn, G. S. (2012). Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations. *Journal of the Association for Information Systems*, 13(7), 546–580. <https://doi.org/10.17705/1jais.00302>
- Leso, B. H., Cortimiglia, M. N., Ghezzi, A., & Minatogawa, V. (2024). Exploring digital transformation capability via a blended perspective of dynamic capabilities and digital maturity: a pattern matching approach. *Review of Managerial Science*, 18(4), 1149–1187. <https://doi.org/10.1007/s11846-023-00692-3>
- Majumdarr, S., Dasgupta, S. A., Hassan, Y., Behl, A., & Pereira, V. (2024). Linking digital transformational leadership, symmetrical internal communication with innovation capability: a moderated mediation model. *Journal of Knowledge Management*, 29(8), 2478–2496. <https://doi.org/10.1108/JKM-12-2023-1167>
- Malik, S., Chadhar, M., & Chetty, M. (2021). Factors affecting the organizational adoption of blockchain technology: An Australian perspective. *Proceedings of the Annual Hawaii International Conference on System Sciences* (pp. 5597–5606). <https://doi.org/10.24251/hicss.2021.680>
- Menhat, M., Yusuf, Y., Gunasekaran, A., & Mohammad, A. M. (2022). Performance measurement framework for the oil and gas supply chain. *Benchmarking: An International Journal*, 30(9), 3168–3193. <https://doi.org/10.1108/BIJ-11-2021-0704>
- Mer, A. (2023). Artificial intelligence in human resource management: Recent trends and research agenda. *Digital Transformation, Strategic Resilience, Cyber Security and Risk Management*, 111, 31–56. <https://doi.org/10.1108/S1569-37592023000111B003>
- Mohammad, A. M., & Abu-Jreas, T. (2026). The Impact of E-Governance on Human Resources Performance at Commercial Banks. In A. Sarea, A. Echchabi, M. A. Salami, & A. Mahmood (Eds.), *Artificial Intelligence for Sustainable Innovation Management and Risk Management: A Systems (and Network) Perspective* (pp. 39–54). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-95310-1_4
- Mohammad, A. M., Awain, A. M. S. B., Jaboob, A. S., Mkheimer, I., & Menhat, M. (2025). Digital transformation capability and employee turnover intentions: the role of knowledge management capability and digital leadership. *Journal of Applied Research in Higher Education*, 17(5), 2254–2268. <https://doi.org/10.1108/JARHE-06-2024-0292>
- Mohammad, A. M., Menhat, M., Shafi, S., Mohammed-Abu-Hussein, A. H., Abdullah-Al-Mubaideen, M., & Alshaketheep, K. (2026). Trends in employee performance: A comprehensive review and bibliometric analysis using Scopus and WOS. *S.A Journal of Human Resource Management*, 23(1), 2887. <https://doi.org/10.4102/sajhrm.v23i0.2887>
- Mohammad, A. S., Al-Hawary, S. I. S.; Al-Abbadi, L. H.; Alshawabkeh, R. O. K.; & Al-Quran, A. Z. F. (2026). Impact of green supply chain management on extractive industries performance of Jordan. *International Journal of Business Excellence*, 38(1), 122–140. <https://doi.org/10.1504/IJBEX.2026.150881>
- Mojica, A., Serrano-Ruiz, J. C., Andres, B., & de la Torre, R. (2025). A conceptual framework for the upcycling supply chain in the wood sector. *Sustainability*, 17(3), 1006. <https://doi.org/10.3390/su17031006>
- Nayal, K., Raut, R. D., Yadav, V. S., Priyadarshinee, P., & Narkhede, B. E. (2022). RETRACTED: The impact of sustainable development strategy on sustainable supply chain firm performance in the digital transformation era. *Business Strategy and the Environment*, 31(3), 845–859. <https://doi.org/10.1002/bse.2921>
- Nisar, Q. A., Nasir, N., Jamshed, S., Naz, S., Ali, M., & Ali, S. (2021). Big data management and environmental performance: role of big data decision-making capabilities and decision-making quality. *Journal of Enterprise Information Management*, 34(4), 1061–1096. <https://doi.org/10.1108/JEIM-04-2020-0137>

- Nunnally, J. C. & Bernstein, I. H. (1994). *Psychometric theory*. McGraw-Hill.
- Nwagwu, U., Niaz, M., Chukwu, M. U., & Saddique, F. (2023). The Influence of Artificial Intelligence to Enhancing Supply Chain Performance Under the Mediating Significance of Supply Chain Collaboration in Manufacturing and Logistics Organizations in Pakistan under the Creative Common Attribution Non-Commercial 4.0. *Traditional Journal of Multidisciplinary Sciences (TJMS)*, 01(02), 29–40.
- Podsakoff, P. M., Podsakoff, N. P., Williams, L. J., Huang, C., & Yang, J. (2024). Common method bias: It's bad, it's complex, it's widespread, and it's not easy to fix. *Annual Review of Organizational Psychology and Organizational Behavior*, 11, 17–61. <https://doi.org/10.1146/annurev-orgpsych-110721-040030>
- Popoola O. A., Adama, H. E., Okeke, C. D., & Akinoso, A. E. (2024). Cross-industry frameworks for business process reengineering: Conceptual models and practical executions. *World Journal of Advanced Research and Reviews*, 22(1), 1198–1208. <https://doi.org/10.30574/wjarr.2024.22.1.1201>
- Queiroz, M. M., Ivanov, D., Dolgui, A., & Fosso-Wamba, S. (2020). Impacts of epidemic outbreaks on supply chains: mapping a research agenda amid the COVID-19 pandemic through a structured literature review. *Annals of Operations Research*, 319, 1159–1196. <https://doi.org/10.1007/s10479-020-03685-7>
- Queiroz, M. M., Telles, R., & Bonilla, S. H. (2020). Blockchain and supply chain management integration: a systematic review of the literature. *Supply Chain Management: An International Journal*, 25(2), 241–254. <https://doi.org/10.1108/SCM-03-2018-0143>
- Rehman-Khan, S. A., Ahmad, Z., Sheikh, A. A., & Yu, Z. (2022). Digital transformation, smart technologies, and eco-innovation are paving the way toward sustainable supply chain performance. *Science Progress*, 105(4), 00368504221145648.
- Rigdon, E. E. (2016). Choosing PLS path modeling as analytical method in European management research: A realist perspective. *European Management Journal*, 34(6), 598–605. <https://doi.org/https://doi.org/10.1016/j.emj.2016.05.006>
- Sabri, E. H. (2025). Mastering Change Management in AI-Powered Supply Chain Digital Transformation. In *Supply Chain Transformation Through Generative AI and Machine Learning* (pp. 153–182). IGI Global Scientific Publishing. <https://doi.org/10.4018/979-8-3693-4433-0.ch007>
- Sarstedt, M., Hair Jr, J. F., Nitzl, C., Ringle, C. M., & Howard, M. C. (2020). Beyond a tandem analysis of SEM and PROCESS: use of PLS-SEM for mediation analyses! *International Journal of Market Research*, 62(3), 288–299. <https://doi.org/10.1177/1470785320915686>
- Saunders, M. (2014). *Research Methods for Business Students* (6th ed.). Pearson Higher Ed.
- Schilling, L., & Seuring, S. (2024). Linking the digital and sustainable transformation with supply chain practices. *International Journal of Production Research*, 62(3), 949–973. <https://doi.org/10.1080/00207543.2023.2173502>
- Sharabati, A. A. A., Awawdeh, H. Z., Sabra, S., Shehadeh, H. K., Allahham, M., & Ali, A. (2024). The role of artificial intelligence on digital supply chain in industrial companies mediating effect of operational efficiency. *Uncertain Supply Chain Management*, 12(3), 1867–1878. <https://doi.org/10.5267/j.uscm.2024.2.016>
- Solfa, F. D. G. (2022). Impacts of Cyber Security and Supply Chain Risk on Digital Operations: Evidence from the Pharmaceutical Industry. *International Journal of Technology, Innovation and Management (IJTIM)*, 2(2), 18–32. <https://doi.org/10.54489/ijtim.v2i2.98>
- Stephens, M. (2025). Digital leadership in a global context. In *Digital Leadership* (pp. 9–29). Edward Elgar Publishing. <https://doi.org/10.4337/9781035321247.00007>
- Taneja, B. (2021). The digital edge for M-commerce to replace E-commerce. In *Emerging challenges, solutions, and best practices for digital enterprise transformation* (pp. 299–318). IGI Global. <https://doi.org/10.4018/978-1-7998-8587-0.ch016>
- Tang, Y. M., Chau, K. Y., Lau, Y. Y., & Zheng, Z. (2023). Data-Intensive Inventory Forecasting with Artificial Intelligence Models for Cross-Border E-Commerce Service Automation. *Applied Sciences (Switzerland)*, 13(5). <https://doi.org/10.3390/app13053051>

- Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350. <https://doi.org/10.1002/smj.640>
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z)
- Vaska, S., Massaro, M., Bagarotto, E. M., & Dal-Mas, F. (2021). The Digital Transformation of Business Model Innovation: A Structured Literature Review. *Frontiers in Psychology*, 11, 539363. <https://doi.org/10.3389/fpsyg.2020.539363>
- Vial, G. (2021). Understanding digital transformation: A review and a research agenda. In *Managing Digital Transformation* (pp. 13–66). <https://doi.org/10.4324/9781003008637-4>
- Wang, Y., Chen, C. H., & Zghari-Sales, A. (2021). Designing a blockchain enabled supply chain. *International Journal of Production Research*, 59(5), 1450–1475. <https://doi.org/10.1080/00207543.2020.1824086>
- Weerabahu, W. M. S. K., Samaranayake, P., Nakandala, D., & Hurriyet, H. (2023). Digital supply chain research trends: a systematic review and a maturity model for adoption. *Benchmarking*, 30(9), 3040–3066. <https://doi.org/10.1108/BIJ-12-2021-0782>
- Weisz, E., Herold, D. M., & Kummer, S. (2020). Revisiting the bullwhip effect: how can AI smoothen the bullwhip phenomenon? *International Journal of Logistics Management*, 34(7), 98–120. <https://doi.org/10.1108/IJLM-02-2022-0078>
- Wernicke, B., Stehn, L., Sezer, A. A., & Thunberg, M. (2023). Introduction of a digital maturity assessment framework for construction site operations. *International Journal of Construction Management*, 23(5), 898–908. <https://doi.org/10.1080/15623599.2021.1943629>
- Zeike, S., Bradbury, K., Lindert, L., & Pfaff, H. (2019). Digital leadership skills and associations with psychological well-being. *International Journal of Environmental Research and Public Health*, 16(14), 2628. <https://doi.org/10.3390/ijerph16142628>
- Zouari, D., Ruel, S., & Viale, L. (2021). Does digitalising the supply chain contribute to its resilience? *International Journal of Physical Distribution & Logistics Management*, 51(2), 149–180. <https://doi.org/10.1108/IJPDLM-01-2020-0038>

Journal of Industrial Engineering and Management, 2026 (www.jiem.org)



Article's contents are provided on an Attribution-Non Commercial 4.0 Creative commons International License. Readers are allowed to copy, distribute and communicate article's contents, provided the author's and Journal of Industrial Engineering and Management's names are included. It must not be used for commercial purposes. To see the complete license contents, please visit <https://creativecommons.org/licenses/by-nc/4.0/>.