

Received: 28 Dec. 2025; Revised: 21 Feb. 2026; Accepted: 26 June 2026
<https://doi.org/10.22306/al.v13i3.796>

An exploratory study of supply chain performance in the digital era: evidence from Morocco

Salim Ghoubach

Mohammed First University, Multidisciplinary Faculty of Nador, Mohammed V avenue, P.O.Box 524, Oujda 60000, Morocco, salim.ghoubach@ump.ac.ma (corresponding author)

Bouzid El Amine

Mohamed Premier University, Multidisciplinary Faculty of Nador, B.P 300, Selouane, 62700 Nador, Morocco, aminebzd821@mail.com

Asmae El Jaouhari

Hassan First University, National School of Applied Sciences of Berrechid, Avenue de l'université, B.P: 218, Berrechid 26100, Morocco, asmae.eljaouhari@uhp.ac.ma

Keywords: supply chain performance, digital transformation, exploratory study, emerging country, Morocco.

Abstract: This study aims to explore the determinants of supply chain performance in the digital era, with a particular focus on identifying both the benefits and challenges of digital transformation within the Moroccan context. The research seeks to contribute to the understanding of how digital technologies reshape supply chain practices in emerging economies. A qualitative approach was adopted, involving semi-structured interviews with 30 experts and specialists in supply chain management and digital transformation. The collected data were analyzed using a textometric approach, which enabled the identification of recurrent themes, patterns, and relationships among the determinants influencing supply chain performance. The results reveal that digitalization enhances supply chain performance through improved transparency, agility, and cost efficiency, while also fostering stronger collaboration across stakeholders. However, significant challenges persist, including digital infrastructure limitations, high implementation costs, resistance to change, and gaps in digital skills. These findings underscore the dual nature of digital transformation as both an opportunity and a constraint in the Moroccan supply chain landscape. The study provides insights for policymakers and managers to design strategies that leverage digital tools for supply chain optimization while addressing the contextual challenges faced by Moroccan firms. By focusing on Morocco as an emerging economy, this research offers fresh evidence on the role of digital transformation in supply chain performance, contributing to both academic debates and managerial practices in developing contexts.

1 Introduction

At the international level, supply chain performance has emerged as a central concern for firms and policymakers, as it directly affects competitiveness, cost efficiency, and customer satisfaction [1,2]. Global markets are increasingly characterized by heightened competition, complex trade networks, and greater interdependence among firms operating across borders. In this context, the ability of a supply chain to ensure reliability, flexibility, and resilience has become a strategic advantage [3]. Several studies highlight that efficient supply chains contribute not only to operational excellence but also to sustainable growth by optimizing resources, reducing lead times, and enhancing value creation for stakeholders [4]. The international literature emphasizes that supply chain performance is a multidimensional concept, encompassing financial outcomes, service quality, collaboration, and risk management, making it a critical area of research and practice worldwide [5].

With the advent of digital transformation, supply chain performance has gained new dimensions, reshaping the way organizations operate and compete [6,7]. Digital technologies such as big data analytics, artificial intelligence, blockchain, and the Internet of Things have significantly enhanced transparency, visibility, and coordination across supply chain networks. These innovations enable firms to improve forecasting accuracy, reduce lead times, optimize inventory management, and strengthen collaboration among stakeholders [8]. Moreover, digital transformation contributes to cost efficiency and agility, allowing supply chains to respond more effectively to disruptions and volatile market conditions. From a strategic perspective, digitalization not only improves operational outcomes but also creates opportunities for innovation, sustainability, and customer satisfaction, making supply chain performance a central pillar of competitiveness in the digital era [9].

In emerging economies, the digitalization of supply chains presents both opportunities and persistent challenges. While digital tools promise greater efficiency, transparency, and integration, many firms in these contexts face structural barriers that hinder full adoption [10]. Limited digital infrastructure, unreliable internet connectivity, and high investment

costs often restrict the scalability of digital solutions. Moreover, small and medium-sized enterprises (SMEs), which dominate the economic fabric of many developing countries, struggle with financial constraints, insufficient digital literacy, and resistance to organizational change [11]. Institutional weaknesses, such as inadequate regulatory frameworks and fragmented logistics systems, further exacerbate these difficulties. The literature also emphasizes issues of data security, trust among supply chain partners, and the shortage of skilled professionals capable of managing advanced technologies [12]. As a result, while digital transformation is recognized as a driver of competitiveness, its implementation in emerging economies requires tailored strategies that address contextual limitations and resource disparities.

In the Moroccan context, supply chain performance has attracted growing academic interest, evolving alongside the country's strategic orientation toward Digital Morocco 2030. Early contributions, such as [13], focused on identifying the most commonly used performance indicators in Moroccan supply chains, highlighting both existing practices and missing dimensions through Frazelle's model. Building on this foundation, [14] explored reverse supply chain practices, demonstrating that company attitudes and both internal and external barriers critically determine the success of such initiatives, particularly in an environment where research on RSC in developing countries remains scarce. [15] further contributed by analyzing supply chain management practices in the automotive sector, underlining their impact on the financial performance of suppliers, though within a sector-specific scope. More recently, Moroccan research has shifted toward digitalization and sustainability, [16] showed that digital transformation, mediated by supply chain integration, positively affects sustainable performance, while [17] emphasized the importance of proactive risk management to mitigate disruptions and enhance logistic efficiency. Complementing these insights, [18] provided nuanced evidence by disaggregating digital supply chain dimensions, revealing that while information technology and logistics strongly enhance agility and innovation, digital manufacturing may negatively affect performance. Taken together, these works illustrate an evolution from descriptive studies of performance indicators toward more complex analyses linking digital transformation, sustainability, and resilience, while also showing that the impact of digitalization is not uniformly positive but highly context-dependent in Morocco.

Despite these valuable contributions, the literature on supply chain performance in Morocco remains fragmented and reveals several important gaps. First, from a theoretical perspective, there is still a lack of comprehensive models that clearly define the determinants of supply chain performance in the digital era, particularly within the Moroccan context. Second, on the practical level, few studies have examined the concrete implications of digital transformation, especially the dual nature of its benefits and challenges for enhancing supply chain performance. Methodologically, most existing research relies on sector-specific or case-based analyses, while exploratory studies remain rare, even though the Moroccan context is still emerging and rapidly evolving. As noted by [14], few studies have been conducted in developing countries, which further emphasizes the need for context-specific evidence that captures the dynamics of supply chain performance in Morocco under digital transformation.

This study aims to address the limited understanding of supply chain performance in the context of Morocco, particularly under the influence of ongoing digital transformation. While international literature highlights the role of digital technologies in reshaping supply chains, empirical evidence from emerging economies, and Morocco in particular, remains scarce. Thus, this research seeks to explore the determinants of supply chain performance in the digital era, with a particular focus on identifying both the benefits and challenges that digital transformation brings to Moroccan companies. To address these objectives, this study is guided by the following research questions:

Q1. What are the key determinants of supply chain performance in the digital era within the Moroccan context?

Q2. How does digital transformation impact the supply chain performance of Moroccan companies?

Q3. What are the main benefits and challenges of digital transformation in shaping supply chain performance in Morocco?

To address the above research questions, a qualitative approach was adopted, as it provides deeper insights into complex and evolving phenomena such as supply chain performance in the digital era. Data were collected through semi-structured interviews with 30 experts and specialists in supply chain management and digital transformation across various Moroccan industries. This method allowed the capture of diverse perspectives and practical experiences. The collected data were subsequently analyzed using a textometric approach, which facilitated the identification of recurrent themes, patterns, and relationships among the determinants influencing supply chain performance. This methodological choice was particularly suitable for exploring an emerging and under-researched context, enabling both theoretical enrichment and practical insights.

2 Methodology

2.1 Methodological approach

Given that this study addresses a relatively new topic within a context that has rarely been investigated, an exploratory design is considered appropriate. Exploratory studies are particularly suited to contexts where the theoretical foundations are still emerging, and where little prior empirical work exists to guide the research [19,20]. In such cases, a qualitative approach is recommended, as it allows researchers to capture rich, in-depth insights into complex phenomena and to

An exploratory study of supply chain performance in the digital era: evidence from Morocco

Salim Ghoubach, Bouzid El Amine, Asmae El Jaouhari

generate new theoretical perspectives that can later be tested quantitatively [21]. Accordingly, this study adopts a qualitative exploratory approach to investigate the determinants of supply chain performance in the digital era in Morocco, as well as the benefits and challenges associated with digital transformation [22]. This methodological choice ensures flexibility in data collection and analysis, while enabling a deeper understanding of the perceptions and experiences of experts and practitioners.

2.2 Data collection

Data were collected through semi-structured interviews conducted with 30 experts and specialists in supply chain management and digital transformation operating in different Moroccan industries (Table 1). Semi-structured interviews were chosen because they allow flexibility in exploring the perspectives of participants, while still ensuring consistency in addressing the core research questions.

Table 1 Characteristics of interviewees

Characteristics	Frequency (n)	Percentage (%)
Gender		
Female	12	40%
Male	18	60%
Age		
25–35 years	7	23%
36–45 years	15	50%
46–55 years	8	27%
Educational Qualification		
Master's degree	20	67%
PhD	10	33%
Professional Experience		
5–9 years	8	27%
10–15 years	12	40%
More than 15 years	10	33%
Current Position		
Logistics Director	5	17%
Logistics Manager	12	40%
Logistics Assistant/Agent	13	43%
Sector		
Service sector	15	
Trade sector	8	
Other sectors (Primary sector, Industry, etc.)	7	

Source: Created by the authors

An interview guide structured around three main thematic axes was developed to steer the discussion and ensure comprehensive coverage of the study objectives (Table 2). The selection of participants was based on their expertise, professional background, and active involvement in supply chain activities, ensuring the relevance and richness of the collected data.

Table 2 Main axes of semi-structured interview

Main Axes	Description
Axe 1	Determinants of supply chain performance in the digital era within the Moroccan context.
Axe 2	Impact of digital transformation on the supply chain performance of Moroccan companies.
Axe 3	Main benefits and challenges of digital transformation in shaping supply chain performance in Morocco.

Source: Created by the authors

2.3 Data analysis procedure

After completing the data collection phase, the interview transcripts were analyzed using a textometric approach, which is particularly suitable for exploring large volumes of qualitative data. Textometry enables a systematic examination of textual material by combining both quantitative and qualitative techniques to identify patterns, recurrent themes, and conceptual structures within participants' discourse [23]. This method provides valuable insights into the frequency and co-occurrence of words, thereby uncovering the underlying organization of narratives related to supply chain performance.

For this purpose, the analysis was conducted using IRaMuTeQ (Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires), an open-source software specifically designed for textual data analysis [24,25]. IRaMuTeQ allows several forms of analysis, including word frequency analysis, descending hierarchical classification,

and correspondence analysis, which facilitate the identification and visualization of emerging themes [26,27]. In this study, the identified themes were grouped into semantic clusters, providing a clearer picture of the determinants, benefits, and challenges of digital transformation in shaping supply chain performance in Morocco. This approach not only ensured analytical rigor but also enabled the extraction of nuanced insights directly grounded in expert perspectives.

3 Results and discussion

3.1 Descriptives statistics

Before proceeding to thematic and interpretative analyses, it is important to present the general descriptive statistics of the corpus (Table 3). These indicators provide an overview of the textual data collected from the semi-structured interviews and offer a first understanding of its richness, diversity, and suitability for textometric analysis.

Table 3 General statistical analysis of the corpus

Indicators	Values
Number of texts	3
Number of text segments	208
Number of occurrences (tokens)	7,507
Number of forms (types)	1,175
Number of lemmas	1,153
Number of hapax	439 (5.85% of occurrences – 38.07% of forms)
Number of active forms	1,140
Number of supplementary forms	13
Active forms with frequency ≥ 3	536
Average occurrences per text	2,502.33
Average forms per segment	36.09
Number of classes (clusters)	5
Classified segments	142 / 208 (68.27%)

Source: Created by the authors

The corpus is composed of three texts segmented into 208 text segments, yielding a total of 7,507 occurrences and 1,175 different forms. This indicates a sufficiently large and diverse dataset to support robust textual analysis. The number of lemmas (1,153) is close to the number of forms, suggesting a limited level of lexical variation, as expected in interviews focusing on a specific professional domain such as supply chain management.

The presence of 439 hapax (words occurring only once) represents 5.85% of total occurrences and 38.07% of forms, reflecting both the richness and the specificity of the vocabulary used by interviewees. This highlights the emergence of key technical terms linked to supply chain performance and digital transformation. Regarding active forms, 1,140 words were effectively mobilized in the analysis, while 536 had a frequency equal to or higher than three, confirming the presence of recurrent themes. The average of 2,502.33 occurrences per text and 36.09 forms per segment demonstrates the density of discourse and the consistency of contributions across participants.

The classification procedure identified five main semantic classes from the data, with 142 segments out of 208 successfully classified (68.27%). This rate of classification is considered satisfactory in textometric research, as it indicates that more than two-thirds of the discourse could be structured into coherent thematic clusters. This provides a solid foundation for the subsequent interpretation of determinants, benefits, and challenges of digital transformation in shaping supply chain performance in Morocco.

To further explore the discourse of experts and specialists, a lexical analysis was conducted on the corpus. Table 4 presents the 50 most frequently used active words, which provide a first indication of the dominant themes and concepts associated with supply chain performance in the digital era within the Moroccan context.

Table 4 The 50 most frequently used active words

Order	Active forms	Freq.	Order	Active forms	Freq.
1	Supply chain	71	26	optimization	19
2	stock	60	27	flexibility	19
3	logistics	58	28	coordination	19
4	companies	54	29	reliability	18
5	time	52	30	IA tools	17
6	costs	46	31	IOT	16
7	Customer satisfaction	40	32	ERP	16
8	market	38	33	Digital transformation	14
9	Inventory management	33	34	profitability	13
10	delivery time	33	35	Procurement management	13

An exploratory study of supply chain performance in the digital era: evidence from Morocco

Salim Ghoubach, Bouzid El Amine, Asmae El Jaouhari

11	risks	31	36	resilience	12
12	efficiency	31	37	Logistics flows	12
13	disruptions	30	38	transportation	11
14	systems	29	39	Logistics operations	11
15	Logistics performance	29	40	Artificial intelligence	11
16	planning	26	41	agility	11
17	responsiveness	25	42	ability	11
18	Moroccan companies	25	43	warehouse	10
19	challenge	25	44	Service quality	10
20	cost	24	45	competitiveness	10
21	Flow management	23	46	agility	10
22	optimizing	22	47	Operational efficiency	9
23	automation	21	48	logistics costs	9
24	suppliers	19	49	Competitive advantage	9
25	strategic	19	50	stakeholders	8

Source: Created by the authors

The most frequently occurring terms, such as supply chain (71), stock (60), logistics (58), and companies (54), underline the centrality of operational management and firm-level practices in shaping supply chain performance. High-frequency words like time (52), costs (46), and customer satisfaction (40) confirm that efficiency, cost control, and service quality remain key performance indicators for Moroccan firms.

Several words reflect the emphasis on operational processes, such as inventory management (33), delivery time (33), planning (26), flow management (23), and procurement management (13), showing that performance measurement is strongly linked to resource allocation, responsiveness, and timely deliveries.

The presence of terms such as risks (31), disruptions (30), resilience (12), and reliability (18) highlights the increasing awareness of vulnerabilities in supply chains and the need for proactive risk management, especially in an uncertain business environment.

Digitalization is also reflected in the lexical field with words like IA tools (17), IoT (16), ERP (16), digital transformation (14), and artificial intelligence (11). Although their frequencies are lower compared to traditional logistics terms, their presence indicates a growing integration of digital technologies into Moroccan supply chains.

Finally, strategic dimensions appear through terms such as competitiveness (10), competitive advantage (9), strategic (19), and stakeholders (8), pointing to the importance of aligning supply chain performance with long-term business objectives and external collaborations. Taken together, these findings suggest that Moroccan supply chains are still heavily focused on classical performance drivers (cost, stock, delivery, efficiency), while progressively incorporating digital tools and resilience strategies to address emerging challenges.

To gain deeper insights into the structure of the discourse, a descending hierarchical classification (DHC) was conducted using the Reinert method. This analysis groups text segments according to the co-occurrence of words, thereby revealing distinct lexical worlds related to supply chain performance in the digital era. The dendrogram in Figure 1 illustrates the five main classes that emerged from the corpus (Table 5), each representing a specific thematic dimension of the experts' discourse.

Table 5 Summary of lexical classes (Reinert Method)

Class	Percentage of segments	Thematic title	Main utilized concepts
Class 1	14.3%	Cost reduction and sustainability	Reduction, development, logistics costs, compliance, service quality, environmental, CSR, optimization
Class 2	21.1%	Risks, shortages, and service failures	Poor, delays, shortages, insufficient, failures, customer satisfaction, logistics performance, additional costs
Class 3	20.4%	Challenges of digital transformation of supply chains	Challenge, adopt, digital transformation, supply chains, agility, collaboration, competitiveness, strategies
Class 4	17.6%	Forecasting and adaptive capabilities	Adjust, role, algorithms, anticipate, demand, artificial intelligence, forecasting, procurement, production, efficiency
Class 5	26.1%	Real-Time technologies and traceability	Real time, ERP, IoT, BI, cloud, tracking, monitoring, smart, logistics operations, traceability

Source: Created by the authors

An exploratory study of supply chain performance in the digital era: evidence from Morocco

Salim Ghoubach, Bouzid El Amine, Asmae El Jaouhari

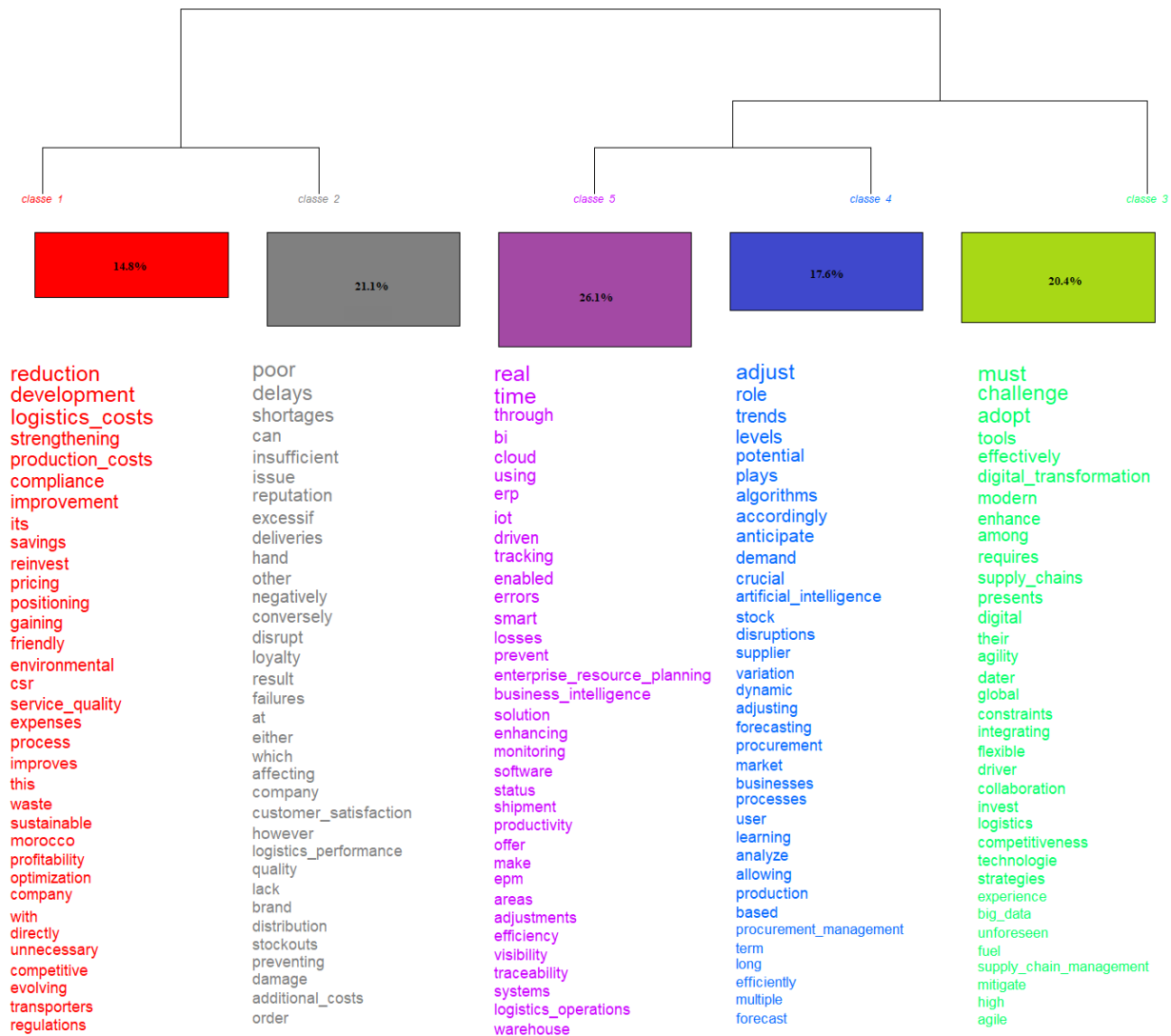


Figure 1 Results of the classification method Reinert

Class 1: Cost Reduction and Sustainability (14.3%)

This class highlights the centrality of cost reduction and sustainable practices in Moroccan supply chains. The frequent appearance of terms such as logistics costs, production costs, compliance, service quality, and CSR shows that firms are highly concerned with balancing efficiency and responsibility. The discourse suggests that reducing costs is not only a financial imperative but also linked to competitiveness and long-term resilience. Furthermore, the references to environmental responsibility and corporate social responsibility (CSR) reflect an increasing awareness among Moroccan companies of the need to integrate sustainable development into their supply chain strategies. This indicates a shift from traditional cost-cutting approaches toward more holistic models that consider both economic and environmental performance.

Class 2: Risks, Shortages, and Service Failures (21.1%)

The second class is dominated by words such as delays, shortages, failures, insufficient, customer satisfaction, and additional costs. It represents the risks and vulnerabilities that disrupt supply chain performance. Experts emphasize the negative consequences of poor coordination, insufficient resources, and distribution failures, which directly impact customer satisfaction and company reputation. The lexical field highlights both external risks (e.g., shortages, transportation disruptions) and internal inefficiencies (e.g., stockouts, excess costs). This class underscores the need for Moroccan companies to develop risk management frameworks and to adopt proactive strategies for mitigating disruptions, particularly in a volatile and uncertain business environment.

Class 3: Challenges of Digital Transformation (20.4%)

This class centers on the opportunities and constraints of digital transformation in Moroccan supply chains. Words such as digital transformation, agility, collaboration, competitiveness, strategies, and adopt indicate that firms recognize the potential of digital tools but also face significant obstacles in implementation. The discourse shows that the adoption

An exploratory study of supply chain performance in the digital era: evidence from Morocco

Salim Ghoubach, Bouzid El Amine, Asmae El Jaouhari

of new technologies requires substantial investments, cross-company collaboration, and organizational change, which can be particularly challenging for small and medium-sized enterprises. Furthermore, the class reflects the duality of digitalization: while it offers pathways for enhancing competitiveness and agility, it also brings unforeseen challenges such as infrastructure gaps, skills shortages, and cultural resistance.

Class 4: Forecasting and Adaptive Capabilities (17.6%)

This class is associated with predictive and adaptive capacities that are crucial for managing supply chains in the digital era. Terms such as forecasting, anticipate, demand, artificial intelligence, algorithms, procurement, and production suggest a focus on using advanced tools to better predict market variations and adjust operations. The discourse indicates that Moroccan firms are increasingly aware of the role of artificial intelligence and algorithm-based solutions in supporting forecasting and decision-making. Adaptability and learning capacity emerge as key factors in strengthening supply chain resilience. This reflects a strategic shift from reactive problem-solving to proactive anticipation and planning.

Class 5: Real-Time Technologies and Traceability (26.1%)

As the largest class, this cluster emphasizes the importance of real-time technologies in modern supply chains. The frequent use of terms like real time, ERP, IoT, BI, cloud, tracking, monitoring, and traceability highlights the critical role of digital infrastructure in enhancing visibility and responsiveness. These technologies enable firms to monitor logistics flows, improve shipment tracking, and ensure greater operational transparency. The class also points to the emergence of smart systems that integrate data-driven solutions, offering Moroccan companies the ability to reduce errors, increase productivity, and enhance customer trust. However, while these technologies provide significant benefits, their implementation may require overcoming barriers related to costs, digital literacy, and technological readiness.

3.2 Detailed results

To complement the DHC and provide a spatial representation of the relationships between lexical units, a factorial correspondence analysis (FCA) was performed. This method allows the visualization of associations between words and classes by projecting them onto factorial axes. Figure 2 presents the results of the FCA, which highlights the semantic proximity of terms and the underlying structure of discourses around supply chain performance in the digital era. The first two axes explain a significant proportion of the total variance, illustrating how experts' narratives are organized around distinct but interconnected dimensions. This analysis facilitates a more nuanced interpretation of the corpus, by linking thematic classes to their most representative concepts and showing how cost reduction, risk management, digital adoption, adaptability, and real-time technologies coexist and interact in the Moroccan context.

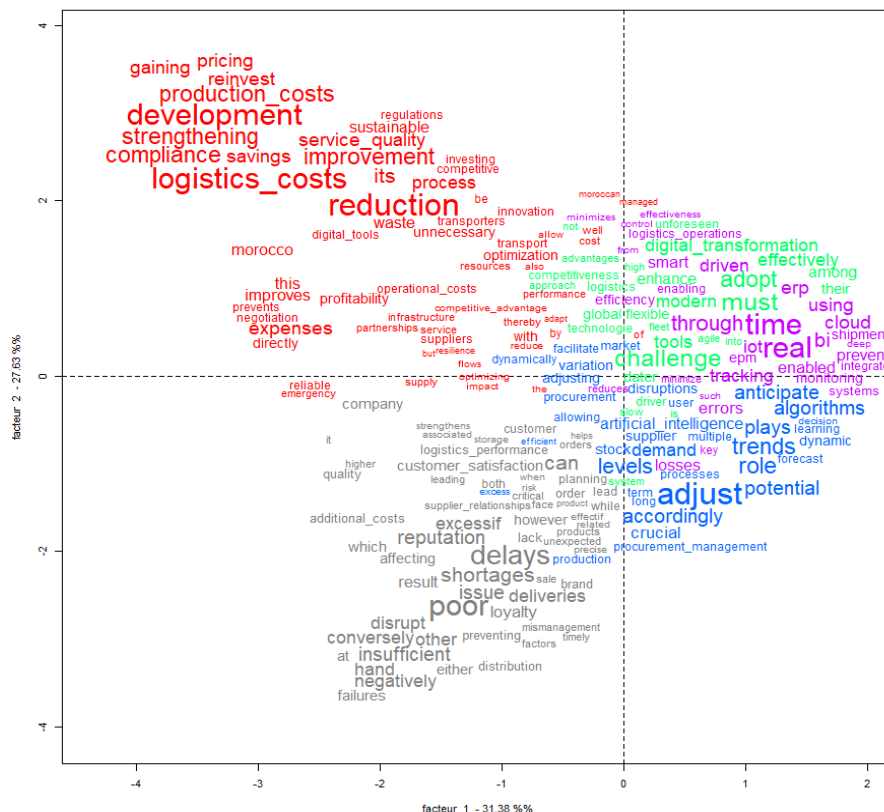


Figure 2 Factorial correspondence analyses (FCA)

An exploratory study of supply chain performance in the digital era: evidence from Morocco

Salim Ghoubach, Bouzid El Amine, Asmae El Jaouhari

The factorial correspondence analysis (FCA) provides a visual representation of the relationships between the most frequently used terms and the thematic classes previously identified. The first two axes together explain a substantial part of the variance (Factor 1 = 31.38%; Factor 2 = 27.63%), offering a meaningful interpretation of the underlying structure of the corpus.

Upper-left quadrant (Class 1 – Cost Reduction and Sustainability):

This area is dominated by terms such as logistics costs, production costs, reduction, compliance, service quality, and environmental. It illustrates a discourse focused on cost optimization and sustainability, where reducing expenses is strongly linked to improving profitability and integrating socially responsible practices (CSR). This quadrant confirms the importance Moroccan companies attribute to financial efficiency while progressively adopting sustainability principles.

Lower-left quadrant (Class 2 – Risks, Shortages, and Service Failures):

Here, words such as delays, shortages, insufficient, failures, reputation, and customer satisfaction prevail. This reflects the vulnerability of supply chains to disruptions and inefficiencies, highlighting operational risks that negatively impact customer trust and brand reputation. The FCA thus reinforces the idea that risk management remains a structural challenge for Moroccan firms, particularly in contexts of resource shortages or weak coordination.

Upper-right quadrant (Class 3 – Challenges of Digital Transformation):

This quadrant clusters terms such as digital transformation, challenge, adopt, agility, competitiveness, and strategies. It reflects a narrative on the need for Moroccan companies to embrace digital technologies while acknowledging the barriers that hinder successful adoption (costs, skills, and cultural resistance). This positioning suggests that digital transformation is perceived as both an opportunity for competitiveness and a source of significant challenges.

Lower-right quadrant (Classes 4 & 5 – Forecasting, Adaptability, and Real-Time Technologies):

The terms real time, ERP, IoT, tracking, algorithms, forecasting, and anticipate dominate this space. It highlights the role of advanced technologies and predictive capabilities in improving supply chain agility, traceability, and responsiveness. The discourse here emphasizes the strategic use of artificial intelligence, big data, and business intelligence tools to anticipate demand, prevent errors, and enhance real-time decision-making.

The FCA confirms the complementarity of the five classes by showing their spatial organization: Traditional concerns (cost and risk management) dominate the left side, reflecting enduring priorities in Moroccan supply chains. Digital transformation and advanced technologies dominate the right side, representing emerging drivers of competitiveness and resilience. This duality illustrates a transition phase: Moroccan companies remain anchored in cost efficiency and risk minimization while progressively moving toward digital adoption and data-driven supply chain performance.

To complement the classification and FCA, a similarity analysis was carried out to map the co-occurrence relationships among the most frequent terms in the corpus. Figure 3 presents the graphical representation of these associations, where clusters illustrate groups of words that frequently appear together in the experts' discourse. This network structure provides insights into how concepts are interlinked, offering a clearer view of the role digital transformation plays in shaping supply chain performance.

Cluster 1 (Green) – Performance and Competitive Advantage

This cluster groups terms such as performance, supply chain management, logistics operations, business intelligence, and competitive advantage. It highlights the strategic dimension of supply chain performance, showing how companies perceive digital tools as enablers of operational excellence and sources of competitive advantage. The strong association with business intelligence suggests that data-driven decision-making is becoming central for Moroccan companies aiming to strengthen their position in competitive markets.

Cluster 2 (Red) – Flow Management and Digitalization

The second cluster centers on words like supply chain, flow management, digitalization, logistics flows, logistics costs, management systems, and digital platforms. This indicates that digital transformation is closely tied to the optimization of flows and systems, aiming to reduce costs and improve process efficiency. The co-occurrence of digital transformation and Moroccan companies also shows that experts explicitly link modernization efforts to the national context. This cluster reflects the operational backbone of supply chains, where digital platforms play a key role in ensuring smoother flows and greater integration across stakeholders.

Cluster 3 (Blue) – Customer Satisfaction and Operational Efficiency

The third cluster is dominated by terms such as customer satisfaction, inventory management, logistics performance, delivery times, service quality, procurement management, operational efficiency, and artificial intelligence. This cluster clearly connects digital technologies (e.g., AI, automation) with improvements in customer service, delivery performance, and procurement processes. It demonstrates that digitalization is not only about internal efficiency but also about enhancing the external dimension of supply chain performance through better customer experience and reliability.

An exploratory study of supply chain performance in the digital era: evidence from Morocco

Salim Ghoubach, Bouzid El Amine, Asmae El Jaouhari

The similarity analysis reveals that digital transformation impacts supply chain performance through three interconnected dimensions:

- Strategic impact (Cluster 1) – by fostering competitiveness and strengthening supply chain management with advanced decision-making tools.
- Operational impact (Cluster 2) – by optimizing flows, reducing costs, and leveraging digital platforms for integration and efficiency.
- Customer-oriented impact (Cluster 3) – by improving service quality, delivery times, and overall customer satisfaction through technology adoption.

Overall, the analysis shows that Moroccan companies view digital transformation as both a driver of internal optimization and a pathway toward external value creation. While efficiency and cost reduction remain central, the discourse emphasizes that the ultimate goal of digital adoption is to enhance agility, reliability, and competitiveness in increasingly dynamic markets.



Figure 3 Similarity analysis representation

3.3 Results discussions

3.3.1 Determinants of supply chain performance in the digital era

The findings of this study indicate that supply chain performance in the digital era is shaped by a combination of operational, technological, and strategic determinants. The experts interviewed emphasized both traditional drivers, such as inventory management, cost efficiency, and delivery performance, as well as emerging factors linked to digitalization, such as the integration of advanced technologies, real-time information sharing, and predictive capabilities. These determinants interact to reinforce competitiveness, enhance resilience, and improve customer satisfaction. Table 6 summarizes the main determinants of supply chain performance in the digital era as identified in the Moroccan context.

An exploratory study of supply chain performance in the digital era: evidence from Morocco

Salim Ghoubach, Bouzid El Amine, Asmae El Jaouhari

Table 6 Determinants of supply chain performance in the digital era

Determinants	Description
Cost Efficiency	Ability to reduce logistics and operational costs through optimization and resource management.
Inventory Management	Effective monitoring and control of stock levels to minimize shortages, delays, and excess costs.
Delivery Performance	Meeting customer expectations in terms of delivery times, reliability, and service quality.
Digital Integration	Adoption of ERP, IoT, and digital platforms to streamline logistics flows and enhance visibility.
Real-Time Information	Use of real-time tracking, monitoring, and data analytics for better decision-making and responsiveness.
Forecasting and Predictive Capabilities	Application of AI, algorithms, and business intelligence to anticipate demand and manage risks.
Collaboration and Coordination	Strengthening inter-organizational relationships with suppliers, customers, and partners through digital connectivity.
Resilience and Risk Management	Ability to anticipate, absorb, and recover from disruptions to ensure supply chain continuity.
Sustainability Orientation	Integration of environmental and CSR practices into supply chain strategies to align with global sustainability standards.
Competitiveness and Innovation	Leveraging digital transformation as a driver for strategic differentiation and long-term competitive advantage.

Source: Created by the authors

3.3.2 Impacts of digital transformation on supply chain performance

The results of this study show that digital transformation has a multidimensional impact on supply chain performance. Beyond traditional efficiency gains, digital technologies contribute to enhancing visibility, agility, and collaboration across the supply chain. At the same time, they enable Moroccan companies to anticipate risks, improve customer satisfaction, and strengthen competitiveness. However, the impact is not uniformly positive, as challenges related to implementation costs, digital readiness, and organizational resistance persist. Table 7 summarizes the main impacts of digital transformation on supply chain performance, as identified in this research.

Table 7 The impacts of digital transformation on supply chain performance

Impacts	Description
Efficiency Improvement	Streamlines processes, reduces operational costs, and minimizes waste through automation and digital platforms.
Enhanced Visibility	Real-time monitoring and tracking enable better control over logistics flows and decision-making accuracy.
Agility and Responsiveness	Digital tools allow supply chains to quickly adapt to demand variations and external disruptions.
Integration and Collaboration	Facilitates coordination between suppliers, customers, and stakeholders through shared digital platforms.
Risk Mitigation	Predictive analytics and AI help anticipate disruptions, shortages, and delays, thereby reducing vulnerabilities.
Customer Satisfaction	Improves service quality, delivery reliability, and personalization, enhancing the overall customer experience.
Competitiveness	Provides firms with new capabilities to innovate, differentiate, and strengthen their market positioning.
Sustainability Support	Digitalization helps reduce carbon footprint, optimize resource use, and align with CSR commitments.

Source: Created by the authors

3.3.3 Benefits and challenges of digital transformation within the Moroccan context

The empirical findings indicate that while digital transformation is widely perceived as a catalyst for improving supply chain performance in Morocco, its adoption is accompanied by significant challenges. On the one hand, digital tools create opportunities for efficiency, agility, and customer orientation, reinforcing firms' competitiveness. On the other hand, structural barriers, resource constraints, and organizational resistance limit the full realization of these benefits, particularly among small and medium-sized enterprises. Table 8 summarizes the key benefits and challenges of digital transformation as identified in the Moroccan context.

An exploratory study of supply chain performance in the digital era: evidence from Morocco

Salim Ghoubach, Bouzid El Amine, Asmae El Jaouhari

Table 8 The benefits and challenges of digital transformation within the Moroccan context

Benefits	Challenges
Cost Reduction and Efficiency: Automation, ERP, and IoT reduce logistics and operational costs while minimizing errors.	High Implementation Costs: Investments in technology, infrastructure, and training remain prohibitive for many firms.
Enhanced Visibility and Traceability: Real-time monitoring and data analytics improve control over flows and inventories.	Limited Digital Infrastructure: Weak internet connectivity and technological gaps constrain digital adoption, especially outside urban areas.
Agility and Responsiveness: Digital tools allow firms to adapt quickly to demand fluctuations and disruptions.	Skills Shortages: Lack of trained personnel and digital literacy slows down adoption and integration of new technologies.
Improved Customer Satisfaction: Better service quality, delivery reliability, and personalization enhance customer trust.	Resistance to Change: Cultural and organizational inertia make it difficult to embrace digital innovation.
Collaboration and Integration: Shared digital platforms strengthen coordination among supply chain partners.	Cybersecurity Risks: Increased dependence on digital systems exposes firms to data breaches and security threats.
Sustainability Orientation: Digital tools support eco-efficient practices and alignment with CSR objectives.	Regulatory and Institutional Gaps: Lack of clear frameworks and incentives hinders large-scale digital transformation.

Source: Created by the authors

Digital transformation is fundamentally reshaping supply chain performance (SCP) in Morocco through a dual and context-dependent dynamic. First, the findings confirm that traditional operational determinants—such as cost efficiency, inventory management, delivery reliability, and customer satisfaction—remain central in shaping SCP. This aligns with prior research emphasizing that supply chain performance is inherently multidimensional and strongly rooted in operational excellence and cost optimization [1,3]. Even in the digital era, Moroccan firms continue to evaluate performance primarily through logistics costs, stock levels, and delivery times, which confirms earlier Moroccan evidence highlighting the predominance of operational indicators in SCP measurement [13].

However, the study demonstrates that these traditional determinants are increasingly being reconfigured through digital technologies. The strong presence of terms related to ERP, IoT, cloud systems, real-time tracking, and business intelligence indicates that visibility and traceability are emerging as structural pillars of performance. This supports empirical findings suggesting that digital transformation enhances supply chain capabilities by improving transparency, coordination, and data-driven decision-making [6,7]. In line with the triple-A supply chain perspective, digital tools strengthen agility, adaptability, and alignment, which in turn positively influence sustainable and competitive performance [9]. In the Moroccan context, digitalization appears first as an information infrastructure that enhances monitoring and flow optimization before evolving into a broader innovation driver.

Moreover, the results highlight the growing role of predictive and analytical capabilities in strengthening supply chain resilience. The discourse around forecasting, algorithms, artificial intelligence, and demand anticipation reflects a shift from reactive management to proactive and anticipatory supply chain strategies. This finding is consistent with recent studies showing that machine learning and AI-based systems improve agility, risk mitigation, and inventory optimization [3,5]. In emerging economies, such digital capabilities are particularly valuable in addressing volatility and uncertainty, thereby reinforcing supply chain viability and resilience [8]. Nevertheless, the adoption of advanced analytics remains conditional upon data quality, digital maturity, and human competencies.

Importantly, the study reveals the dual nature of digital transformation. On one hand, digitalization enhances efficiency, visibility, collaboration, customer satisfaction, and competitiveness, corroborating prior empirical evidence that links digital transformation to improved supply chain performance and integration [7,9,16]. On the other hand, significant structural barriers persist. High implementation costs limited digital infrastructure, skills shortages, organizational resistance, and cybersecurity risks constrain the full realization of digital benefits. These constraints are consistent with research on supply chain management in emerging economies, which emphasizes financial limitations, institutional weaknesses, and technological gaps as major adoption barriers [10,11,12]. Thus, digital transformation does not produce automatic performance gains; rather, its impact is contingent upon contextual readiness and organizational capabilities.

Compared to previous Moroccan studies, this research extends the literature in several ways. Earlier works focused on performance measurement frameworks [13], reverse supply chain practices [14], or sector-specific impacts of SCM on financial performance [15]. More recent studies examined digital transformation and sustainable supply chain performance [16], risk management and resilience [17], and the differentiated impact of digital supply chain dimensions [18]. Building on these contributions, the present study offers a more integrative and exploratory perspective by identifying a comprehensive set of determinants that combine operational, technological, relational, and sustainability dimensions. It also empirically confirms that digitalization in Morocco operates as a transitional and uneven process, where traditional performance logics coexist with emerging digital imperatives.

In sum, the study contributes scientifically by providing contextualized empirical evidence from an underexplored emerging economy [10], by adopting a rigorous qualitative and textometric methodology grounded in systematic discourse analysis [23–26], and by proposing an integrated framework of SCP determinants adapted to the digital era. The findings demonstrate that supply chain performance in Morocco is at a strategic inflection point: while cost control and operational efficiency remain dominant priorities, digital transformation introduces new capabilities, real-time visibility, predictive analytics, and collaborative platforms that can significantly enhance resilience and competitiveness, provided that infrastructural, human, and institutional barriers are effectively addressed.

4 Conclusions

This study aimed to explore the dynamics of supply chain performance in the digital era, with a particular focus on the Moroccan context. The results provide insights into the determinants, impacts, and dual nature both benefits and challenges of digital transformation. The findings show that supply chain performance is shaped by a set of interconnected determinants. Traditional drivers such as cost efficiency, inventory management, and delivery performance remain crucial. At the same time, new determinants linked to digitalization, such as real-time information sharing, forecasting capabilities, collaboration through digital platforms, and sustainability orientation have emerged as equally important in strengthening competitiveness and resilience.

Digital transformation has a multidimensional impact on Moroccan supply chains. It enhances efficiency by streamlining processes, improves visibility and traceability, and increases agility in responding to market fluctuations and disruptions. Furthermore, it strengthens integration and collaboration across stakeholders, fosters customer satisfaction, and contributes to competitiveness. However, the analysis also reveals that these impacts are not uniform, and their effectiveness depends on firms' readiness and resource availability.

The benefits of digital transformation include cost reduction, enhanced visibility, improved customer service, and alignment with sustainability goals. Yet, these are counterbalanced by significant challenges such as high implementation costs, limited digital infrastructure, skills shortages, resistance to change, and cybersecurity risks. These findings highlight the dual nature of digitalization, offering both opportunities for innovation and barriers that need to be addressed for Moroccan companies to fully realize its potential. In sum, this research demonstrates that supply chain performance in Morocco is at a transition point, where traditional performance levers coexist with new digital imperatives. The future of Moroccan supply chains will depend on the ability of firms and policymakers to overcome structural barriers and leverage digital tools strategically to build more resilient, agile, and competitive supply chains.

At the same time, the context-specific focus on Morocco represents both a strength and a limitation of this research. On the one hand, concentrating on an emerging economy provides rich, grounded insights into how digital transformation unfolds in environments characterized by infrastructural constraints, SME dominance, and evolving institutional frameworks. This contextual depth enhances the relevance of the findings for policymakers and practitioners operating in similar developing settings. On the other hand, the specificity of the Moroccan economic, regulatory, and industrial landscape may limit the direct generalizability of the results to other regions or highly industrialized economies. Differences in technological maturity, supply chain sophistication, digital infrastructure, and institutional support mechanisms could lead to distinct patterns of digital adoption and performance outcomes. Therefore, while the identified determinants and dual impacts of digital transformation may offer conceptual relevance beyond Morocco, their empirical validation in other industrial sectors and regional contexts remains necessary. Future comparative studies across emerging and developed economies would help assess the transferability and robustness of the proposed insights and framework.

4.1 Implications of the study

4.1.1 Theoretical implications

This study makes several important theoretical contributions to the literature on supply chain management in emerging economies. First, it proposes a new framework of determinants of supply chain performance (SCP) within the Moroccan context. While previous studies in Morocco have primarily focused on operational indicators such as logistics costs, inventory levels, and delivery times, the present research expands this perspective by integrating digital-era factors. These include real-time information sharing, forecasting and predictive capabilities, digital integration, and sustainability orientation. By doing so, the study bridges traditional efficiency-based approaches with the emerging digital and sustainability imperatives that increasingly shape supply chain performance.

Second, the study contributes to theory by analyzing the multidimensional impacts of digital transformation on SCP. It highlights that digitalization not only improves efficiency and visibility but also fosters agility, integration, and customer satisfaction. At the same time, the research reveals the dual nature of digital transformation: while it provides opportunities for competitiveness and resilience, it also introduces challenges such as high costs, digital infrastructure gaps, and organizational resistance. This nuanced view advances the theoretical debate by showing that digital transformation in emerging economies is not a linear process of improvement but rather a context-dependent phenomenon with both enabling and constraining effects.

An exploratory study of supply chain performance in the digital era: evidence from Morocco
Salim Ghoubach, Bouzid El Amine, Asmae El Jaouhari

Finally, by situating these findings within the Moroccan context, where empirical evidence remains limited, this study contributes to filling the theoretical gap on supply chain performance in developing countries. It enriches the global literature by offering evidence from an underexplored setting, thereby expanding the applicability of supply chain theories to diverse economic environments.

4.1.2 Implications for policy makers

The findings of this study also provide important implications for policymakers, particularly in developing countries where structural constraints often limit the effectiveness of supply chain transformation initiatives. First, the results underscore the need for investment in digital infrastructure—including reliable internet connectivity, cloud systems, and data platforms—since these are prerequisites for the successful adoption of digital supply chain solutions. Without adequate infrastructure, companies may remain unable to benefit from the efficiency, agility, and resilience that digital transformation offers.

Second, policymakers should prioritize capacity-building programs aimed at improving digital literacy and technical skills among supply chain professionals. The study shows that skills shortages and lack of training are major barriers to leveraging digital tools. National strategies that promote continuous training, certification programs, and partnerships with universities and business schools can help bridge this gap.

Third, the study highlights the importance of regulatory and institutional frameworks to support digital adoption. Policymakers in developing countries should design clear guidelines on data protection, cybersecurity, and interoperability standards, ensuring that firms can engage in digitalization with confidence. In addition, providing fiscal incentives, subsidies, or public–private partnerships could ease the burden of high implementation costs, especially for SMEs.

Finally, beyond efficiency and competitiveness, the findings stress the opportunity for policymakers to promote sustainable supply chain practices by encouraging firms to align digital initiatives with environmental and social responsibility goals. This dual focus on digitalization and sustainability can help developing countries not only modernize their supply chains but also integrate into global value chains in a more resilient and responsible manner.

4.1.3 Implications for companies

For companies, the results of this study offer several practical implications for strengthening supply chain performance in the digital era. First, firms should recognize that digital transformation is not only a technological investment but also a strategic process that requires organizational alignment, cultural change, and capacity building. Embracing digital tools such as ERP systems, IoT devices, and AI-based forecasting solutions can significantly improve visibility, responsiveness, and decision-making, but their successful adoption depends on leadership commitment and employee engagement.

Second, the study highlights the importance of integrating digital initiatives with core supply chain practices. Companies should not treat digital transformation as an isolated project but as a means of optimizing stock management, delivery performance, procurement, and customer service. Aligning digital tools with operational objectives ensures that investments generate tangible performance gains.

Third, the findings show that resilience and risk management must be central considerations for companies in Morocco. Firms should use digital platforms to anticipate disruptions, manage uncertainties, and enhance agility, especially given the volatility of global supply chains. This requires developing partnerships with suppliers and customers that are supported by transparent information sharing and collaborative platforms. Finally, companies should view digital transformation as an opportunity to differentiate through sustainability and innovation. Integrating eco-efficient practices, improving traceability, and aligning with corporate social responsibility (CSR) expectations can enhance competitiveness in both local and international markets. In doing so, Moroccan firms can move beyond cost reduction and efficiency toward building more adaptive, innovative, and future-ready supply chains.

4.1.4 Limitations and future research directions

Like any research, this study is subject to certain limitations that need to be acknowledged. First, the study is purely qualitative in nature, which, while appropriate for exploring an emerging topic and context, does not allow for the generalization of findings to the wider population of Moroccan companies. Nevertheless, this limitation also constitutes one of the study's strengths, as it offers original insights into a relatively unexplored field and provides a foundation for future empirical work.

Second, the number of interviews was limited to 30 experts and specialists, reflecting the scarcity of expertise in supply chain performance and digital transformation within the Moroccan context. Although the sample provided rich and diverse perspectives, a larger pool of participants might have yielded additional insights and broader validation of the findings.

For future research, it would be valuable to build on these exploratory results by developing a conceptual framework of the determinants and impacts of supply chain performance in the digital era. Such a model could then be tested empirically using quantitative methods, with data collected directly from companies across different sectors. This would

allow for statistical validation of the relationships identified in this study and a deeper understanding of how digital transformation shapes supply chain performance in Morocco and other developing countries.

References

- [1] VERMA, A.: Green thinking: impact of smart technologies on supply chain management, *Journal of Science and Technology Policy Management*, Vol. 16, No. 9, pp. 1527-1559, 2024. <https://doi.org/10.1108/JSTPM-01-2024-0020>
- [2] FAN, D., BRESLIN, D., CALLAHAN, J.L., ISZATT-WHITE, M.: Advancing literature review methodology through rigour, generativity, scope and transparency, *International journal of management reviews*, Vol. 24, No. 2, pp. 171-180, 2022. <https://doi.org/10.1111/ijmr.12291>
- [3] PASUPULETI, V., THURAKA, B., KODETE, C.S., MALISETTY, S.: Enhancing supply chain agility and sustainability through machine learning: Optimization techniques for logistics and inventory management, *Logistics*, Vol. 8, No. 3, 73, pp. 1-16, 2024. <https://doi.org/10.3390/logistics8030073>
- [4] NAZARIAN, H., KHAN, S.A.: The impact of industry 5.0 on supply chain performance, *International Journal of Engineering Business Management*, Vol. 16, pp. 1-19, 2024. <https://doi.org/10.1177/18479790241297022>
- [5] ŠTREIMIKIENĖ, D., BATHAEI, A., STREIMIKIS, J.: Enhancing Sustainable Global Supply Chain Performance: A Multi-Criteria Decision-Making-Based Approach to Industry 4.0 and AI Integration, *Sustainability*, Vol. 17, No. 10, 4453, pp. 1-19, 2025. <https://doi.org/10.3390/su17104453>
- [6] BELHADI, A., KAMBLE, S., GUNASEKARAN, A., MANI, V.: Analyzing the mediating role of organizational ambidexterity and digital business transformation on industry 4.0 capabilities and sustainable supply chain performance, *Supply Chain Management: An International Journal*, Vol. 27, No. 6, pp. 696-711, 2022. <https://doi.org/10.1108/SCM-04-2021-0152>
- [7] NING, L., YAO, D.: The impact of digital transformation on supply chain capabilities and supply chain competitive performance, *Sustainability*, Vol. 15, No. 13, 10107, pp. 1-22, 2023. <https://doi.org/10.3390/su151310107>
- [8] OBIRI-YEBOAH, H., TETTEH, F.K., AMOAKO, D.K., KYEREMEH, A.: Navigating digital transformation: a practice-based view of supply chain resilience and viability in small and medium enterprises, *Journal of Enterprising Communities: People and Places in the Global Economy*, Vol. ahead-of-print, No. ahead-of-print, 2025. <https://doi.org/10.1108/JEC-12-2024-0249>
- [9] MOHAGHEGH, M., BLASI, S., RUSSO, I., BALDI, B.: Digital transformation and sustainable performance: the mediating role of triple-A supply chain capabilities, *Journal of Business & Industrial Marketing*, Vol. 40, No. 4, pp. 896-910, 2025. <https://doi.org/10.1108/JBIM-02-2023-0098>
- [10] AVITTATHUR B., JAYARAM, J.: Supply chain management in emerging economies, *Decision*, Vol. 43, pp. 117-124, 2016. <https://doi.org/10.1007/s40622-016-0130-8>
- [11] FARIDI, M.R., MALIK, A.: Digital transformation in supply chain, challenges and opportunities in SMEs: a case study of Al-Rumman Pharma, *Emerald Emerging Markets Case Studies*, Vol. ahead-of-print, No. ahead-of-print, pp. 1-16, 2020. <https://doi.org/10.1108/EEMCS-05-2019-0122>
- [12] ALSHAHRANI, S.T.: Industry 4.0 in 'major emerging markets': A systematic literature review of benefits, use, challenges, and mitigation strategies in supply chain management, *Sustainability*, Vol. 15, No. 20, 14811, pp. 1-30, 2023. <https://doi.org/10.3390/su152014811>
- [13] LEMTAOUI, M., ROCHDI, M.H., ELOUELDRHIRI, S.: *Measuring the supply chain performance in Morocco: Application of the Edward Frazelle's model*, 2017 International Colloquium on Logistics and Supply Chain Management (LOGISTIQUA), Rabat, Morocco, 2017, pp. 188-192, 2017. <https://doi.org/10.1109/LOGISTIQUA.2017.7962896>
- [14] EL BAZ, J., FREI, R., LAGUIR, I.: Reverse supply chain practices in developing countries: the case of Morocco, *Journal of Manufacturing Technology Management*, Vol. 29, No. 1, pp. 198-216, 2018. <https://doi.org/10.1108/JMTM-04-2017-0068>
- [15] VELDA, A.M.E.: *Impact of Supply Chain Management Practices on Financial Performance: Case Study of Automotive Suppliers in Morocco*, 2019 International Colloquium on Logistics and Supply Chain Management (LOGISTIQUA), Montreuil - Paris, France, 2019, pp. 1-5, 2019. <https://doi.org/10.1109/LOGISTIQUA.2019.8907241>
- [16] OUBRAHIM, I., SEFIANI, N., HAPPONEN, A.: The influence of digital transformation and supply chain integration on overall sustainable supply chain performance: An empirical analysis from manufacturing companies in Morocco, *Energies*, Vol. 16, No. 2, 1004, pp. 1-24, 2023. <https://doi.org/10.3390/en16021004>
- [17] ABABOU, M.: Managing supply chain risks for enhanced logistic performance: insights from the automotive industry in Morocco, *International Journal of Business Continuity and Risk Management*, Vol. 15, No. 1, pp. 18-31, 2025. <https://doi.org/10.1504/IJBCRM.2025.144942>
- [18] ELMOUHIB, S., IDRISSE, Z.Y.: Agility in the Digital Era: Bridging Transformation and Innovation in Supply Chains, *Sustainability*, Vol. 17, No. 8, 3462, pp. 1-18, 2025. <https://doi.org/10.3390/su17083462>

- [19] CRESWELL, J.W., POTH, C.N.: *Qualitative inquiry and research design: Choosing among five approaches*, 5th ed., Sage publications, 2016.
- [20] BELAHOUAOUI, R., ATTAK, E.H.: Analysis of tax compliance behavior of family businesses: combining social and psychology norms and legitimacy determinants, *International Journal of Sociology and Social Policy*, Vol. 44, No. 7-8, pp. 672-688, 2024. <https://doi.org/10.1108/IJSSP-12-2023-0314>
- [21] YIN, R.K.: Case Study Research Design and Methods (5th ed.), *Canadian Journal of Program Evaluation*, Vol. 30, No. 1, pp. 108-110, 2014. <https://doi.org/10.3138/cjpe.30.1.108>
- [22] GHOUACH, S., EL AMINE, B.: Enhancing supply chain performance through digitalization: insights from a qualitative study in an emerging market., *Acta Logistica*, Vol. 12, No. 3, pp. 529-539, 2025. <https://doi.org/10.22306/al.v12i3.684>
- [23] DELYSER, D., HERBERT, S., AITKEN, S., CRANG, M., MCDOWELL, L., DITTMER, J.: *Textual and discourse analysis*, In *Textual and discourse analysis*, 1st ed., SAGE Publications, Inc., pp. 274-286, 2010. <https://doi.org/10.4135/9780857021090.n17>
- [24] LOUBERE, L., RATINAUD, P.: *Documentation IRaMuTeQ 0.6 alpha 3 version 0.1*, [Online], Available: https://metars.web.uniroma1.it/sites/default/files/download/documentation_19_02_2014.pdf [20 Dec 2025], 2014. (Original in French)
- [25] RATINAUD, P.: *IRaMuTeQ: Interface de R pour les analyses multidimensionnelles de textes et de questionnaires*, Computer software, 2009, [Online], Available: <https://pratinaud.gitpages.huma-num.fr/iramuteq-website/> [20 Dec 2025], 2009. (Original in French)
- [26] CHAVES, M.M.N., DOS SANTOS, A.P.R., DOS SANTOSA, N.P., LAROCCA, L.M.: *Use of the software IRAMUTEQ in qualitative research: an experience report*, In: Costa, A., Reis, L., Neri de Sousa, F., Moreira, A., Lamas, D. (eds) *Computer Supported Qualitative Research. Studies in Systems, Decision and Control*, Vol. 71, Springer, Cham., pp. 39-48, 2017. https://doi.org/10.1007/978-3-319-43271-7_4
- [27] SOUZA, M.A.R., WALL, M.L., THULER, A.C.M.C., LOWEN, I.M.V., PERES, A.M.: The use of IRAMUTEQ software for data analysis in qualitative research, *Revista da Escola de Enfermagem da USP*, Vol. 52, pp. 1-7, 2018. <https://doi.org/10.1590/s1980-220x2017015003353>

Review process

Single-blind peer review process.