

Resilience of logistics supply chains and the development of innovative entrepreneurship in Morocco

Résilience des supply chaînes logistiques et développement de l'entrepreneuriat innovant au Maroc

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Disclosure Statement :	Authors are not aware of any findings that might be perceived as affecting the objectivity of this study and they are responsible for any plagiarism in this paper.
Conflict of Interest :	The authors report no conflicts of interest.
Cite this article :	ES-SADAT, Y., & BELBACHIR, M. (2025). Resilience of logistics supply chains and the development of innovative entrepreneurship in Morocco. <i>International Journal of Accounting, Finance, Auditing, Management and Economics</i> , 6(3), 61-83. https://doi.org/10.5281/zenodo.14984900
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Received: January 06, 2025

Accepted: March 02, 2025

International Journal of Accounting, Finance, Auditing, Management and Economics - IJAFAME

ISSN: 2658-8455

Volume 6, Issue 03 (2025)

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Abstract:

This study examines the impact of supply chain resilience on innovative entrepreneurship in Morocco, considering digital transformation and logistics risk management in an increasingly uncertain environment. Using a hypothetico-deductive approach, we conducted a quantitative study on 134 companies in the Tanger-Tetouan region. We employed Structural Equation Modeling (PLS-SEM) using SPSS and SMART PLS software to analyze direct and mediating relationships among four key variables: digital transformation (advanced technologies, process digitization, data management), logistics risk management (identification, assessment, response), supply chain resilience (flexibility, redundancy, recovery speed, sustainability), and innovative entrepreneurship. The findings reveal that logistics risk management plays a crucial mediating role between digital transformation and resilience, emphasizing the importance of strategic adoption of digital technologies and proactive risk management practices to enhance supply chain robustness and competitiveness. Consequently, this contributes to a significant increase in innovative entrepreneurship in Morocco.

Keywords: Digital transformation, risk management, supply chain resilience, supply chain, innovative entrepreneurship, Morocco.

Classification JEL: L26, J20

Paper Type: Empirical Research

Résumé :

Cet article explore l'effet de la résilience de la chaîne d'approvisionnement sur l'entrepreneuriat innovant au Maroc, en prenant en compte la transformation numérique et la gestion des risques logistiques dans un contexte d'incertitude croissante. Une méthodologie hypothético-déductive combinée à une analyse quantitative sur un échantillon de 134 entreprises de la zone Tanger-Tétouane a été adoptée. La méthode des équations structurelles (PLS-MES), réalisée à l'aide des logiciels SPSS et SMART PLS, a été utilisée pour analyser les relations directes et médiatrices entre quatre variables principales, à savoir la transformation numérique (technologies avancées, digitalisation des processus, gestion des données), le risque logistique, gestion (identification, évaluation, réponse), résilience de la chaîne d'approvisionnement (flexibilité, redondance, rapidité de reprise, durabilité) et entrepreneuriat innovant.

Les résultats confirment que la gestion des risques agit comme un médiateur clé entre la transformation numérique et la résilience, soulignant l'importance de l'adoption stratégique des technologies numériques et des pratiques proactives de gestion des risques pour améliorer la compétitivité et la robustesse des chaînes d'approvisionnement. Cela conduit à une croissance marquée de l'entrepreneuriat innovant au Maroc.

Mots clés : Transformation numérique, gestion des risques, résilience de la supply chain, supply chain, entrepreneuriat innovant, Maroc.

JEL Classification : L26, J20

Type du papier : Recherche empirique

1 Introduction

The COVID-19 pandemic, rising inflation, and emerging political crises have increased economic uncertainty. In this context, a strong focus on business innovation is crucial to revitalizing the Moroccan economy. In light of these economic challenges, innovative entrepreneurship is a key driver of economic and societal growth (Surlemont et al., 2014). Viewing it this way, improving cost efficiency boosts the competitiveness of businesses in unpredictable situations (Ferreira & Fernandes, 2017).

In this context, supply chains are adapting to a world filled with uncertainty, marked by economic, environmental, geopolitical, and technological upheavals. These obstacles necessitate resilience, which is crucial for maintaining competitiveness and ensuring operational stability (Christopher & Peck, 2022). The capacity of supply chains to withstand shocks, quickly adjust, and recover effectively serves as a significant strategic benefit in this intricate landscape. The advancement of digital technology offers innovative methods to bolster resilience and improve logistics risk management (Nasir et al., 2024; Khan et al., 2023). Additionally, supply chains face a variety of disruptions (Ambulkar et al., 2015; Gligor et al., 2019), which can adversely affect business performance. In this light, as noted by Narasimhan and Talluri (2009), firms are concentrating on boosting their resilience to mitigate these unexpected incidents. Hence, a robust supply chain resilience is a vital asset in tackling these challenges (Sheffi and Rice, 2005).

In addition, fostering innovation enhances both resilience and competitiveness for companies (Kamalahmadi and Parast, 2016; Khan et al.). However, despite the widely recognized benefits of digital technologies, the precise mechanisms by which they influence supply chain resilience remain underexplored. In particular, the mediating roles played by logistics risk management in this dynamic raise theoretical and practical questions (Schlegel & Trent, 2024; Hess et al., 2024). These knowledge gaps limit companies' ability to formulate integrated strategies that fully leverage the potential of digital tools. In other words, Coskun & Altunisk, 2002a) and Demick & O'Reilly, 2000 have clearly highlighted the importance of all environmental elements for small and medium-sized businesses.

According to Albury (2011), previous research has highlighted the impact of appropriate investment conditions, financing subsidies, simplification of administrative procedures, encouragement of innovative initiatives and governance on the competitiveness of small and medium-sized enterprises. According to Banham (2005), SMEs are affected by environmental changes.

In other words, thanks to its major infrastructure, notably the port of Tangier Med and the new TG railway line linking various cities and the Tangier-Tetouan-Al Hoceima area¹, the region is recognised as a logistics hub. This has helped to attract foreign investment and ensure a suitable environment for promoting entrepreneurship.

Thus, by focusing on the Tangier-Tetouane region with a particular interest in digital transformation and logistics risk management, the aim of this paper is to answer our question: **To what extent does supply chain resilience interact to strengthen innovative entrepreneurship in Morocco?** This problem encompasses crucial issues, such as identifying the technological dimensions favoring proactive risk management, assessing the direct impact of risk management practices on resilience, examining the mediating role of these practices in the relationship between digital transformation and resilience, and its impact on innovative entrepreneurship.

To answer this question, this article proposes an integrative conceptual model and mobilizes a hypothetico-deductive approach based on structural equation analysis (PLS) applied to a sample

¹ - <https://investangier.com/>

of 134 companies in the Tangier-Tetouan-Al Hoceima region. The contributions of this research are as follows:

- Theoretical: Enrich the literature by providing an in-depth understanding of the interactions between digital transformation, risk management and resilience;
- Empirical: Validate the hypotheses formulated through rigorous analysis;
- Practical: Propose strategic recommendations for optimized adoption of digital technologies and proactive risk management practices.

As such, the paper aims to fill the theoretical and practical gaps concerning the role of digital transformation in logistics risk management and supply chain resilience in relation to innovative entrepreneurship in Morocco. It aims to provide innovative companies with concrete solutions to the challenges posed by an uncertain and constantly changing global environment.

2 Theoretical research framework

2.1 Digital transformation in supply chains

Digital transformation has become a central element in modernizing supply chains. The integration of advanced technologies, such as artificial intelligence (AI), the Internet of Things (IoT), blockchain, and advanced ERP systems, is transforming supply chains into interconnected, resilient, and flexible networks (McKinsey, 2023; Deloitte, 2024). However, this transformation goes beyond the simple adoption of technological solutions.

It involves a comprehensive restructuring of organizational processes, business models, and governance principles. Unlike traditional digitization or digitalization approaches, digital transformation integrates a strategic perspective that aligns technological innovation with performance objectives. The figure below highlights the different alignments involved in a digital transformation strategy.

Figure 1: Positioning the digital transformation strategy



Source: Adapted by the authors from Didier Bonnet and Andrew McAfee (2009)

2.1.1. Definition and key concepts

To explain how digital transformation affects supply chains strategically, it's crucial to clarify important concepts such as digitization, digitalization, and digital transformation. By differentiating these terms and pinpointing applicable technologies and approaches, we can gain a deeper insight into the advantages and challenges these transformations bring. It is vital to comprehend the differences among these terms to appreciate their effects on supply chains.

Digitization is the process of converting physical data into a digital format, which serves as the groundwork for digitalization (Saarikko et al., 2020). Digitalization is not simply about transforming analog processes into digital formats; it also entails the adoption of digital tools aimed at enhancing operational efficiency and effectiveness (Tilson et al., 2010). On the other hand, digital transformation represents a synthesis of both digitization and digitalization, placing a stronger emphasis on fundamentally restructuring organizations and their cultures to foster adaptability and robustness within supply chains (Matt et al., 2014; Singh and Hess, 2017).

In the modern age of technology, innovative advancements are pivotal in transforming various sectors. A notable instance is the combination of artificial intelligence (AI) with predictive analytics, which significantly improves the precision of forecasts while encouraging proactive decision making crucial for effective problem resolution.

Likewise, the Internet of Things (IoT) integrates multiple facets of the supply chain, providing immediate insights and enhanced management of both information and tangible assets (Nasir et al., 2023). Additionally, blockchain technology guarantees a level of transparency and security in transactions, fostering trust among logistics collaborators (Paksoy et al., 2021).

Moreover, digital twin technology facilitates the virtual modeling of different logistics scenarios, thereby boosting readiness and identifying potential risks (Schlegel & Trent, 2015).

2.1.2. Strategic implications of digital transformation

Building on the foundational concepts of digital transformation, we can explore its strategic implications through structured models and practical applications in supply chains. The framework known as the '3 horizons' model, introduced by Westerman and colleagues in 2011, offers a structured method for managing digital transformation efforts. The first horizon emphasizes the improvement of existing processes to boost operational efficiency. Horizon 2 involves exploring new technological opportunities, while Horizon 3 focuses on anticipating future disruptions through proactive preparation.

In an environment marked by constant unforeseen events, logistics resilience has become an essential strategic pillar. Digital transformation, by leveraging advanced technologies, enhances organizations' ability to anticipate disruptions using real-time simulation and predictive analysis tools, react with agility to crises by leveraging reliable, up-to-date data, and optimize resources to maintain operations in unstable environments. According to a recent study, companies that have digitized their supply chains reduce their recovery time after a crisis by 40%, compared to non-digitized supply chains, illustrating the added value of digital technologies in managing the unexpected (Schlegel & Trent, 2024).

Digital technologies are also transforming how logistics risks are tackled. AI and predictive analytics detect anomalies that could disrupt operations. Blockchain and IoT enhance the transparency and traceability of flows, limiting the risks of fraud or supply disruptions. Additionally, collaborative planning (CPFR) through digital platforms facilitates efficient coordination between partners, reducing logistical imbalances.

Beyond resilience and risk management, digital transformation is reshaping performance standards. Advanced ERP tools and collaborative planning enhance logistics efficiency, while environmental commitment is supported by technological solutions that monitor and reduce carbon emissions, aligning logistics performance with ESG criteria (Christopher & Peck, 2004). By integrating technological innovation with social responsibility, digital transformation enhances companies' competitiveness while meeting societal expectations. More than just a technological lever, it redefines business models by promoting resilient, agile processes. To fully capitalize on this transformation, it must be embedded in a clear strategy, supported by visionary leadership and an organizational culture focused on adaptability and sustainability.

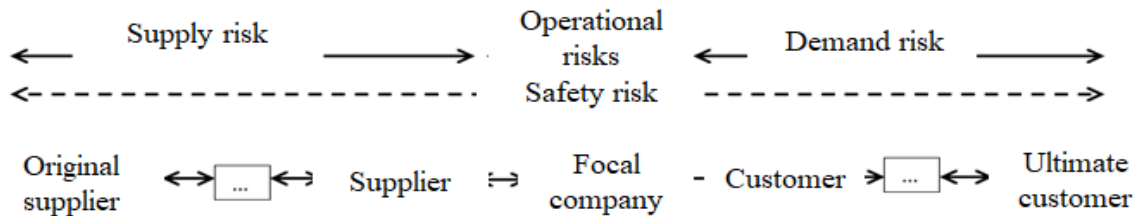
2.2 Logistics risk management: typology and impact on supply chain performance

Risk management is generally linked to natural disasters, which were widespread at the time of the great Hanshin-Awaji earthquake in 1995 (Okada 2004). Risk management is a crucial tool that aims to increase the competencies of companies in order to face their global organizational problems (Hanafi, 2009). However, (Darmawi, 2011) considered it as an effective and efficient way to make the right process decisions (Ferry, 2008).

In an increasingly unstable global economic context, companies must cope with a variety of logistics risks that may affect physical, informational, or financial flows. These risks, identified

as events or situations likely to interrupt operations, threaten business continuity, customer satisfaction and, ultimately, overall supply chain performance (Ivanov, 2022). To remedy this, organizations are adopting integrated strategies supported by digital tools aimed at anticipating, assessing and mitigating these risks. Digital transformation, in particular, plays a central role in providing technological solutions capable of increasing supply chain resilience and better managing growing uncertainties.

Figure 2: Risk in the extended supply chain



Source: Adapted from Ila Manuj and John T. Mentzer (2008)

2.2.1. Logistics risk typology

Logistics risks can be classified into various categories based on their impact on supply chains, distinguishing between internal and external threats. An essential distinction is made between internal risks, linked to malfunctions within the organization, and external risks, which result from independent factors. These categories are also accompanied by sector-specific characteristics.

Internal risks, which are under the direct control of the organization, often stem from operational or organizational problems. Inadequate resource management or poor inventory oversight can cause budget excesses and delays in deliveries (Ivanov & Dolgui, 2021). Malfunctions in automated logistics systems can lead to disruptions in processes and increased expenses (Norrman & Jansson, 2004). Mistakes made by personnel, such as erroneous decisions or order mishaps, frequently contribute to chain disruptions.

External risks arise from conditions that the organization cannot control, including environmental, economic, or socio-political events. Climate change has increased the occurrence of natural disasters like floods and hurricanes (Sodhi & Tang, 2023). Shifts in laws, such as new international standards, environmental regulations, or tariffs, necessitate quick and costly adaptations. The rise in cyber threats, intensified by growing digitalization, puts businesses at risk of data breaches or ransomware incidents (Khan et al., 2023). Geopolitical conflicts disrupt supply routes and increase logistics costs (Christopher, 2020).

In a similar vein, various sectors experience specific weaknesses that stem from their particular traits. Industries with a global footprint are notably vulnerable to economic troubles that arise from shifts in currency values or disruptions in their supply chains (Lavastre et al., 2021). The farming and resource extraction sectors are especially at risk from environmental challenges, as their reliance on basic materials can be affected by climate-related incidents (Ivanov, 2022). Furthermore, in fields where technological advancement plays a crucial role, the threat of rapid obsolescence of machinery or software can cause major disruptions to operations (Ceryno et al., 2023).

2.2.2. Impact on supply chain performance

Logistics risk management plays a decisive role, with direct and indirect consequences that depend on the level of preparation and tools deployed by organizations.

In this respect, the consequences of ineffective risk management can lead to a number of major dysfunctions, namely supply disruptions, which are interruptions to the flow of goods that disrupt business continuity and cause major delays, increased costs that aim to compensate for

uncertainties, companies may increase their stocks or implement emergency solutions, thereby increasing their financial costs, as well as the loss of reputation, in particular frequent delays or failure to meet contractual commitments damage the loyalty of customers and partners (Christopher & Peck, 2022).

As for the benefits of proactive, digital risk management, digital transformation offers innovative solutions for optimising logistics risk management, such as real-time visibility that enables goods to be tracked continuously, improving traceability and responsiveness (Khan et al, 2023), predictive planning which are analytical tools that allow disruptions to be predicted and corrective measures to be put in place (Nasir et al., 2024) and cost reduction through the integration of blockchain to validate transactions reduces inefficiencies while strengthening trust between partners (Paksoy et al., 2023).

In this context digital technologies boost supply chain resilience and competitiveness. Supply chain digitization has cut crisis recovery time by 40% compared to old methods (Schlegel & Trent, 2024). Blockchain makes things clearer and helps logistics players work together better building more trust (Paksoy et al. 2023). Good logistics risk management with new digital tech can reduce problems and turn risks into chances to get ahead. This forward-thinking tough approach gives businesses an edge in today's uncertain world. Also smart digital risk management brings new ways to handle logistics risks better. These include: 1. Real-time tracking with Internet of Things (IoT) tech, which lets you follow goods all the time making things easier to trace and react to (Khan et al. 2023). 2. Planning ahead using data analysis to spot problems before they happen and fix them (Nasir et al. 2024). 3. Saving money by using blockchain to check transactions cutting out waste and making partners trust each other more (Paksoy et al. 2023).

2.3 Supply chain resilience: definition and strategic importance

Supply chain resilience refers to a production system's ability to adapt to changes (Fiksel, (2003;2006), Pettit et al. 2010). It also has an impact on how well a system can handle various market uncertainties (Barroso et al. 2011) and unforeseen events (Ponomarov & Holcomb; 2009). With frequent disruptions like geopolitical crises natural disasters, or economic shocks, supply chain resilience has turned into a key strategic tool. This resilience embodies a robustness and flexibility that enable crises to be transformed into competitive opportunities (Ivanov, 2022). From this perspective, digital transformation stands out as a major catalyst for resilience. By integrating advanced technologies, companies can better anticipate disruptions and maintain the fluidity of critical operations, thus limiting the impact on their global supply chains (Khan et al., 2023).

2.3.1. Definition and measurement indicators

Logistics resilience is based on three key dimensions. Resource redundancy, defined as a company's ability to rely on alternative suppliers, strategic stockpiles, or secondary transport routes, acts as a crucial safeguard against unexpected disruptions. For example, after the 2011 tsunami, Toyota adopted a multi-sourcing strategy to limit its reliance on single suppliers (Christopher & Peck, 2022), the process flexibility is the ability to adjust operations quickly, for example by adopting alternative modes of transport or modifying production flows, is paramount. Digital platforms, such as those operated by DHL, offer real-time visibility, enabling immediate adjustments in the face of operational constraints (Nasir et al., 2024) and the speed of recovery who is the time required to restore normal operations after a disruption is a central indicator of resilience. For example, Maersk has used blockchain to enhance security and accelerate recovery from cyberattacks, reducing financial and operational losses (Schlegel & Trent, 2024). These dimensions, supported by digital technologies, provide a more rigorous assessment of resilience and guide strategies toward continuous optimization.

2.3.2. Importance in an uncertain environment

In an environment dominated by uncertainty and disruption, supply chain resilience has become a major strategic advantage. Recent crises, such as the pandemic or trade tensions, illustrate the importance of proactive, resilient management of logistics flows.

A resilient supply chain provides significant competitive advantages, including operational continuity, cost efficiency, and increased trust among stakeholders. Indeed, the operational continuity: A resilient supply chain guarantees product availability even in the event of major disruptions. For example, Procter & Gamble was able to maintain supplies of essential products thanks to its digitalized network during the global health crisis (Sodhi & Tang, 2023), the cost reduction: by limiting delays and inefficiencies, resilient supply chains reduce financial losses and contractual penalties. Walmart, for example, optimized its flows in times of crisis thanks to collaborative tools such as ERP and CPFR (Paksoy et al., 2023) and the increased confidence: Companies able to maintain operational continuity boost their credibility with partners and investors. Unilever, for example, has used blockchain to increase transparency and trust in its supply chains (Khan et al., 2023). And the contribution of digital technologies that the digital innovations who play a key role in building resilience.

Proactive anticipation through AI and digital twins enables risk prediction and preventive planning (Christopher & Peck, 2022). Then, the advanced simulation: Testing different scenarios with digital twins optimizes crisis response (Schlegel & Trent, 2024) and the enhanced collaboration that the collaborative platforms facilitate the harmonization of objectives between logistics partners, increasing chain efficiency.

Resilience and sustainability are strengthened by integrating practices such as optimizing logistics routes or using renewable energy sources, allowing companies to reconcile business continuity with ESG compliance. FedEx, thanks to the adoption of digital technologies, has been able to reduce its carbon footprint while strengthening the resilience of its operations (Hess et al., 2024). This observation shows that resilience is more than just a response to crises. It is also a strategic lever for coping with an increasingly uncertain environment. However, to make the most of it, the integration of technologies must be coherent, there must be good collaboration between the various players, and the organization must be able to adapt effectively.

In this theoretical framework, the main concepts of digital transformation, logistics risk management and supply chain resilience were defined, while showing their strategic links. Digital transformation emerged as a key lever that goes beyond the simple implementation of technologies. It helps to improve risk management and strengthen resilience in the face of disruption. But despite a clear conceptualization, these ideas have yet to be transformed into concrete tools, which is no easy task. The following section will analyze the results of empirical and conceptual studies to formulate sound hypotheses, and develop a conceptual model capable of assessing these complex relationships. The ultimate aim is to provide a practical, empirical framework for exploring the real-life implications of these concepts in modern supply chains.

2.4 Innovative entrepreneurship: a theoretical overview

When we talk about the concept of innovative entrepreneurship, we are referring to the innovative company. This company can introduce new, more innovative and evolved methods in order to produce more sophisticated goods and services while optimizing costs (Baumol et al., 2007). It encompasses all creative change actions (Hayek, 1994), which contribute to economic growth (Wennekers et al., 2005).

In 2015, at the European Risk Forum (ERF), innovation was defined as “the most important factor in societal prosperity, indispensable for sustainable development and economic growth”. Thus, entrepreneurial innovation is seen as a process of identifying and exploiting opportunities by reorganizing the combination of resources and capabilities (Helfat & Peteraf, 2003).

Innovation plays an essential role in productivity, as well as in economic and social dynamics (Elkihal & Hattab, 2019).

Moreover, innovative entrepreneurship, according to Albert and Mougenot (1988), is characterized by great uncertainty. It relies on introducing new technologies to the market, thus offering a competitive advantage. This type of entrepreneurship is also influenced by socio-economic factors, such as level of academic and technical training (Shane, 2000; Koellinger, 2008). Furthermore, the aim of innovative entrepreneurship is to create new products and/or services, thereby contributing to business growth and economic development.

Furthermore, innovative entrepreneurship stems from the interaction between individuals and opportunities (Shane, 2000), and can thus be seen as two aspects of the same phenomenon (Soriano & Huarng, 2013c). Examination of this concept led us to explore the relationship between entrepreneurship and innovation. According to Brazeal and Herbert (1999) and Zhao (2005), the integration of new information to create opportunities has revealed some uncertainty about the nature of the relationship between these two concepts. Moreover, digital transformation is a key tool for enhancing innovative entrepreneurship. This point has been developed in the work of Belbachir and Zammar (2022), particularly in the rural context.

3 Formalizing an analysis framework

A review of existing studies highlights the interactions between the main variables of this research. The key dimensions identified in the literature provide a relevant analytical structure to guide the formalization of the hypotheses.

3.1 Digital transformation and logistics risk management

Empirical studies, including those by Nasir et al (2024) and Khan et al (2023), demonstrate that the integration of digital technologies is a strategic lever for strengthening proactive and effective logistics risk management. Several fundamental dimensions emerge from this analysis: (1) the adoption of advanced technologies such as artificial intelligence (AI), the Internet of Things (IoT), and blockchain, which enhance the ability to identify and manage disruptions in real time; (2) process digitization, where automation improves synchronization and traceability of logistics flows; and (3) predictive analysis and data management, where Big Data facilitates early detection of anomalies and enhances the preparation of response scenarios. These dimensions have an impact on the three main parts of logistics risk management: (1) Risk identification where new tech enables complete data collection in real time; (2) Risk assessment where prediction tools help rank threats based on their potential effects; and (3) Risk response where blockchain improves clarity and helps to implement emergency plans. We can explain this connection between digitalization and managing logistics risks using the Dynamic Capabilities Theory (Teece, 2007). This theory suggests companies develop dynamic abilities to adapt to changes in their environment and technology. By adopting tech like AI, IoT, and blockchain, digitalization allows companies to build dynamic abilities to spot, evaluate, and handle risks before they occur. For instance, AI and IoT make it easier to collect and analyze data in real time, which helps companies anticipate disruptions and put effective backup plans in place. So, digitalization acts as a catalyst to enhance dynamic abilities in risk management (Teece 2007; Nasir et al. 2024).

However, there are several challenges in the way of widely adopting these techniques, including resistance to organizational obstacles such as changes or lack of digital skills. In addition, the effects of digital technologies in specific contexts, such as the supply chain in emerging areas, are still rarely discovered. These gaps underline the importance of intensive empirical analysis to identify conditions in favor of effective adoption of digital devices. Such discovery will be

able to propose a variety of organizational and regional environment -friendly solutions, thus fill the existing theoretical and practical intervals.

Studies confirm that digital changes are a strategic driver for logistics risk management. However, the organizational and regional challenges associated with their integration calls for further research to better understand its effects on various dimensions of risk management. The targeted empirical investigation will be able to more accurately assess these relationships, taking care of organizational and cultural specialties.

3.2 Logistics risk management and supply chain resilience

Studies by Christopher & Peck (2022) and Ivanov & Dolgui (2021) show that careful risk management plays a key role to build stronger more resilient supply chains. Risk management has three main parts: (1) Risk identification, which means spotting possible threats, whether they're environmental, operational, or tech-related; (2) Risk assessment, which figures out how much these threats could hurt business operations; and (3) Risk response, which puts strategies in place, like extra resources or backup plans, to keep business running when things go wrong. These parts have a direct effect on the four aspects of resilience: flexibility having extra resources how fast a business can bounce back, and how well it can keep going. We can understand the link between managing logistics risks and making supply chains more resilient through Contingency Theory (Lawrence & Lorsch 1967). This theory suggests that how well a company does depend on how well it can adapt to what's going on around it. Planning ahead for risks, like having different suppliers or making backup plans, helps companies react to outside problems like political issues or natural disasters. This better ability to adapt improves flexibility having extra resources, and how fast a company can recover - all crucial for resilience. Thus, logistics risk management serves as an adaptive mechanism that allows supply chains to maintain performance in uncertain environments (Christopher & Peck, 2022; Ivanov & Dolgui, 2021).

Despite the extensive documentation of these strategies, the literature lacks longitudinal studies measuring the evolution of supply chain resilience capabilities after a crisis. Furthermore, the trade-offs between flexibility and economic sustainability remain poorly studied, limiting understanding of the trade-offs required in real-life contexts. These theoretical and practical gaps pave the way for in-depth empirical investigations. They enable us to assess the effectiveness of integrated approaches, particularly in complex, global supply chains. While logistics risk management is indeed a prerequisite for resilience, current research does not sufficiently explore the tensions between redundancy costs, economic viability and post-crisis evolution dynamics.

So, to fill these gaps, it is necessary to formulate specific hypotheses and empirically test the complex relationships between these dimensions in a variety of environments. These investigations will contribute to enriching our understanding of the mechanisms that underpin the resilience of Supply Chains in the face of an uncertain and constantly changing world.

3.3 Digital transformation and supply chain resilience

The work of Schlegel & Trent (2024) and Hess et al. (2024) reveals that digital transformation strengthens resilience capabilities through the following dimensions like a flexibility and a rapid adaptation to disruptions via technologies, a resource redundancy, a speed of recovery and a sustainability. Empirical studies based on these dimensions demonstrate a direct relationship, where digital technologies enhance flexibility and adaptability, and an indirect relationship, mediated by risk management, where these technologies reinforce resilience by optimizing crisis identification and response.

Although the benefits are well established, the initial investment and specialist skills required pose challenges. In addition, current studies do not fully capture the complex interactions between technological, organizational and cultural dimensions. These observations reinforce

the relevance of formalizing a conceptual model integrating these dimensions, with a view to testing their impact in various organizational contexts. These results justify the formalization of solid hypotheses and the development of an innovative conceptual model that will be empirically tested in the remainder of the research.

Although digital transformation has demonstrated its potential to enhance supply chain resilience, the interplay between its technological and organizational dimensions requires further exploration. This study aims to formalize hypotheses integrating these relationships, focusing on multi-dimensional dynamics and organizational specificities.

The relationship between digital transformation and supply chain resilience can be illuminated by the Resource-Based View (RBV) theory (Barney, 1991). According to RBV, digital resources (such as AI, IoT, and blockchain) are valuable, rare, inimitable, and non-substitutable (VRIN) assets that provide a competitive advantage. These resources enable firms to develop resilience capabilities, such as flexibility and recovery speed, by improving supply chain visibility and optimizing decision-making. For example, digital twins allow firms to simulate crisis scenarios and test response strategies, thereby enhancing their ability to adapt to disruptions. Thus, digital transformation, as a strategic resource, strengthens supply chain resilience (Barney, 1991; Schlegel & Trent, 2024).

3.4 Supply chain resilience and entrepreneurship

According to (Veeraraghavan, 2009a), innovation and entrepreneurship are inseparable. Moreover, innovative entrepreneurship plays a key role in economic growth (Fagerberg & Sappasert, 2011). However, these concepts are often approached separately in the literature (Wennekers & Thurik, 1999b).

The relationship between supply chain resilience and innovative entrepreneurship can be explained by Schumpeter's Theory of Innovation (Schumpeter, 1934). According to Schumpeter, innovation is a process of "creative destruction" where new ideas, products, or methods replace old ones. A resilient supply chain allows firms to focus on innovation rather than crisis management by reducing costs and downtime. For example, a flexible and agile supply chain enables firms to test new products or services in the market without fearing major disruptions. Moreover, resilience fosters an environment conducive to experimentation and risk-taking, two essential elements for innovative entrepreneurship. Thus, supply chain resilience acts as a catalyst for entrepreneurial innovation (Schumpeter, 1934; Teece, 2014).

Building on this theoretical foundation, the items pertaining to innovative entrepreneurship (our dependent variable) are derived from the works of Albert & Mougenot (1988), Henrekson & Stenkula (2010), and Golubev (2014). These items are presented as follows:

- EI_1: Innovative entrepreneurship makes use of new technologies in the market that provoke an additional advantage;
- EI_2: Innovative entrepreneurship aims to create a more innovative product and service;
- EI_3: Innovative entrepreneurship aims to ensure business growth and economic development;
- EI_4: Innovative entrepreneurship is a vital factor in ensuring competitiveness in a competitive market.

The Schumpeterian perspective further emphasizes that innovative entrepreneurship involves designing new products, adopting renewed production methods, exploring new markets, rethinking supply resources, and transforming business project management (Schumpeter, 1934). This aligns with the operationalized items, particularly EI_1 (technology adoption) and EI_2 (product/service innovation).

3.5 Relationship between variables and formulation of research hypotheses

The formulation of hypotheses is based on a critical analysis of the theoretical and empirical contributions outlined in the previous sections. This approach is based on the key dimensions of the research variables and aims to propose robust causal relationships that will be tested in the empirical framework.

3.5.1. Research hypotheses

Empirical studies by Nasir et al. (2024) and Khan et al. (2023) highlight the strategic role of digital transformation in enhancing proactive logistics risk management. These technologies enable companies to better anticipate, assess and respond to disruptions thanks to several key levers such as the integration of advanced technologies: The use of artificial intelligence (AI), the Internet of Things (IoT) and blockchain offers increased capacity for real-time data collection and analysis, facilitating early detection of anomalies and potential disruptions, the process digitization: Automation enhances traceability and improves the synchronization of logistics flows, reducing operational inefficiencies and the predictive analysis and data management: Big Data enables rapid threat assessment and effective implementation of appropriate response strategies.

The coupling between digital transformation and logistics risk management is crucial, with key elements which include superior technologies, method digitization, predictive evaluation, and identity playing a substantial role. Our first hypothesis states that digital transformation has a wonderful impact on logistics threat management, as supported via the Dynamic Capabilities Theory (Teece, 2007) which emphasizes the usage of technological assets to develop adaptive talents.

Furthermore, effective logistics danger control is critical for supply chain resilience, as highlighted by way of Christopher and Peck (2022) and Ivanov and Dolgui (2021). Proactive change management permits firms to count on disruptions and reduce their effect, consequently increasing organizational flexibility. Our second hypothesis posits that effective logistics risk management complements deliver chain resilience, aligning with the standards of Contingency Theory (Lawrence & Lorsch, 1967) which emphasizes version to unsure environments.

Concerning the mediating role of logistics risk management, the work of Schlegel and Trent (2024) and Hess et al. (2024) highlights an indirect relationship between digital transformation and supply chain resilience, mediated by logistics risk management. More specifically, strengthening risk management practices positively impacts resilience. The dimensions studied in this context include the digital transformation: advanced technologies, digitization of processes, data management, the logistics risk management: identification, assessment, response and the supply chain resilience. according to the previous work of our hypothesis 3 is as follows: Digital transformation positively impacts supply chain resilience by mediating logistics risk management.

This hypothesis is supported by the Resource-Based View (RBV) theory (Barney, 1991), which posits that digital resources (such as AI and IoT) are strategic assets that enhance organizational capabilities. Digital transformation, by improving risk management, acts as a key mediator in strengthening supply chain resilience (Barney, 1991; Schlegel & Trent, 2024).

Innovative entrepreneurship involves identifying opportunities and integrating new ideas, products, or services that transform existing markets or create new ones. Fostering entrepreneurial innovation is crucial to boosting competitiveness and economic growth.

In this respect, one of the first to highlight the importance of innovation in entrepreneurship was Schumpeter (1934), who defined it as an essential element of creative destruction, where new ideas replace old ones. Moreover, according to Drucker (1985), entrepreneurs can develop sustainable competitive advantages by using new technologies and improving existing processes.

According to Helfat and Peteraf (2003), entrepreneurial innovation is highlighted in the context of the dynamics of corporate resources and capabilities, highlighting the importance of reorganizing resources to generate new business opportunities.

It is essential for supply chain resilience and modern entrepreneurship to interact in an effort to assist groups adapt to new monetary realities and hold their competitiveness. Supply chain resilience can sell innovation with the aid of enabling corporations to speedy respond to modifications and take benefit of latest possibilities offered with the aid of emerging technology or modern enterprise fashions (Koellinger, 2008). Additionally, Teece (2014) explains how corporations can use their dynamic capabilities to innovate and adapt to modifications hastily, with a resilient supply chain which can deal with market demanding situations. Our fourth speculation states that there may be a massive correlation between deliver chain resilience and modern entrepreneurship. This speculation is supported via Schumpeter's Theory of Innovation (1934), which underscores the significance of innovation in financial growth. A resilient deliver chain allows businesses to recognition on innovation by means of decreasing charges and risks related to disruptions, therefore selling progressive entrepreneurship (Schumpeter, 1934; Teece, 2014).

3.5.2. Synthesis and contribution of hypotheses

The hypotheses developed above are part of an integrative approach that links the conceptual and empirical dimensions of the variables studied. They highlight the complex interdependencies between digital transformation, logistics risk management and supply chain resilience. In other words, the supply chain is a key lever in the development of innovative entrepreneurship. These hypotheses offer an innovative perspective for investigating the dynamics underlying these interactions, while responding to the strategic challenges of contemporary supply chains. More specifically, they enable us to assess:

- The direct relationship between digital transformation and logistics risk management;
- The influence of risk management on supply chain resilience;
- The mediating role of risk management in the relationship between digital transformation and organizational resilience;
- The impact of supply chain resilience on innovative entrepreneurship.

This approach is based on an in-depth analysis of theoretical and empirical contributions, reinforcing the scientific validity of the proposed conceptual model. It also guarantees a solid basis for future empirical analyses, while making a significant contribution to understanding the complex interactions within modern Supply Chains. This transition reflects the coherence between the theoretical framework, the hypotheses formulated and the research objectives, thus ensuring a rigorous and logical progression towards empirical analyses. The following section will present the methodologies adopted to test these hypotheses and validate the relationships established.

3.6 Proposed conceptual research framework

This conceptual framework is based on the empirical and conceptual analysis in this study. It shows the dynamic relationships between the variables, their dimensions and the mediating role of logistics risk management between digital transformation and supply chain resilience. This integrated view allows us to test the hypothesized relationships and provides a base to explore the implications of these interrelationships.

3.6.1. Conceptualizing interactions between study variables

The relationships between digital transformation, logistics risk management and supply chain resilience are the heart of this conceptual framework. They are described as:

Digital Transformation → Logistics Risk Management (H1): Technologies along with AI, IoT, and blockchain decorate threat management capabilities, enhancing the performance of identifying, assessing, and responding to threats in supply chains;

Logistics Risk Management → Supply Chain Resilience (H2): Effective risk control leads to method flexibility, decreased inefficiencies in the course of disruptions, and faster recovery following a disaster;

Digital transformation → Supply Chain resilience (H3, mediated by risk management): Digital transformation strengthens deliver chain resilience via improving danger control practices. This mediation highlights increased supply chain adaptation and recovery capabilities.

These relationships highlight a multidimensional dynamic, underscoring the need for an integrated approach to assess the combined effects of variables.

Their dimensions are the conceptual framework is based on three main variables, each broken down into key dimensions identified in the literature. Indeed, the independent variable (Digital Transformation) defined as the strategic integration of digital technologies to improve organizational performance, this element encompasses the following dimensions, like the advanced technologies: AI, IoT, blockchain, the process digitization: Automation and synchronization of logistics flows, the data management: Use of Big Data and predictive analytics tools to support decision-making.

However, the mediating variable (Logistics risk management) are the Risk identification, the risk assessment, the risk response, the dependent variable (Supply Chain Resilience), flexibility, the redundancy, the speed of recovery and the sustainability: Integration of ESG-compliant practices.

Logistics risk management plays a crucial role in mediating these relationships, maximizing the impact of digital transformation on resilience. This role underlines the need for in-depth analysis of the specific dimensions of these variables to better understand their complex interactions and influence on modern supply chains.

3.6.2. Presentation of the study's conceptual analysis model

The mechanisms by which digital transformation influences supply chain resilience remain partially studied, particularly with regard to the mediating role of logistics risk management. Moreover, few studies have focused on investigating the correlation between supply chain resilience and innovative entrepreneurship. *This theoretical gap raises an essential question. To what extent do digital transformation, logistics risk management and supply chain resilience interacts to reinforce the development of innovative entrepreneurship?*

The main objective of this study is to design a conceptual model to better understand the interactions between digital transformation, logistics risk management and supply chain resilience. More specifically, this approach aims to: identify the key dimensions associated with each of the variables examined, empirically test the hypothetical relationships linking them, and assess the extent to which logistics risk management plays a mediating role between digital transformation and supply chain resilience.

The contributions of this study can be summarized in three major axes:

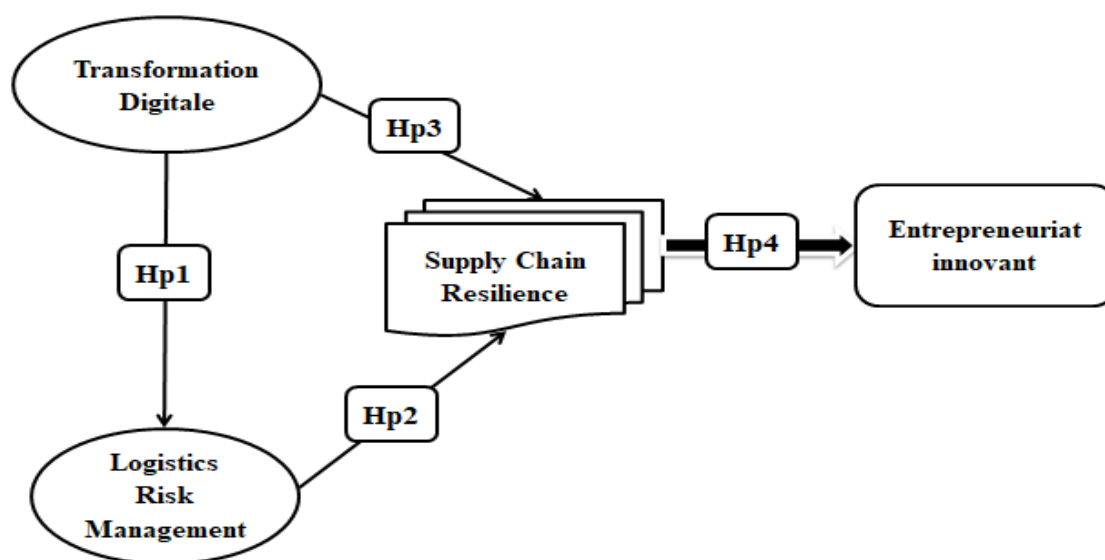
Theoretical: By enriching the existing literature, this research proposes an integrative conceptual model that combines technological, organizational and strategic dimensions;

Empirical: Through quantitative analysis, it validates the relationships between digital transformation, risk management and supply chain resilience, using the structural equation method;

Practical: The results will offer concrete guidance to decision-makers, facilitating the strategic adoption of digital technologies and risk management practices to maximize supply chain resilience.

Based on the dynamic theory formulated by Teece et al (1997) and Eisenhardt and Martin (2000), companies are able to interact with their environment, while taking internal action to build their ecosystem. Thanks to this theory, combined with the theoretical basis already developed, this conceptual model represents a significant contribution in linking theory and practical application, while providing a solid foundation for future empirical analysis.

Figure 3: Conceptual model and research hypotheses



Source: Author

The proposed conceptual framework provides a robust basis for in-depth empirical investigation. It provides a clear analytical structure for testing hypothetical causal relationships and assessing the impact of technological and organizational dimensions on supply chain resilience. The model is consistent with the theoretical and empirical results analyzed. By integrating the interactions between digital transformations, logistics risk management and resilience; it highlights significant scientific, practical and methodological contributions. Finally, this framework will serve as a foundation for validating the hypotheses formulated through empirical analyses, while proposing strategic recommendations for economic players involved in supply chain management.

The work of Nasir et al (2024), Khan et al (2023) and Schlegel & Trent (2024) was used to identify the reflective items of digital transformation. In addition, studies by Christopher & Peck (2022), Ivanov & Dolgui (2021) and Schlegel & Trent (2024) on logistics risk management highlight the crucial importance of anticipatory strategies in an increasingly complex and unstable global supply chain. We have thus been able to determine their items.

Resilience in logistics risk management, as discussed by Schlegel & Trent (2024), Hess et al. (2024), and Christopher & Peck (2022), focuses on the ability of supply chains and logistics systems to rapidly cope with, adapt to, and recover from disruptions. Through these works, we have dissected the items of resilience in risk management. Also, the research by Albert & Mougenot (1988), Henrekson & Stenkula (2010) and Golubev (2014) offers insights on innovative entrepreneurship. Each study sheds light on different parts of creating and growing innovative businesses. These works helped us identify the key elements of innovative entrepreneurship.

The table below shows a breakdown of the study's variables, their specific aspects, and the researchers who explored them. This layout helps us see the theoretical basis of the research more. It also ensures we understand the components examined in this study.

Table 1: Summary of research variables and dimensions

Variables	Dimension	Code	Authors
Digital transformation (DT)	Advanced technologies (AI, IoT, blockchain)	DT_1	Nasir et al. (2024), Khan et al. (2023), Schlegel & Trent (2024)
	Digitization of processes	DT_2	
	Data management (Big Data, predictive analysis)	DT_3	
Logistics risk management (LRM)	Risk identification	LRM_1	Christopher & Peck (2022), Ivanov & Dolgui (2021), Schlegel & Trent (2024)
	Risk assessment	LRM_2	
	Risk response.	LRM_3	
Supply Chain Resilience (SCR)	Risk identification	SCR_1	Schlegel & Trent (2024), Hess et al. (2024), Christopher & Peck (2022)
	Redundancy	SCR_2	
	Speed of recovery	SCR_3	
	Sustainability	SCR_4	
Innovative entrepreneurship (IE)	Use new technologies on the market	IE_1	(Albert & Mougenot, 1988 ;Henrekson & Stenkula, 2010); Golubev, 2014)
	Aims to create more innovative goods and services	IE_2	
	Aims to guarantee business growth	IE_3	
	Is a key factor in developing competitiveness	IE_4	

Source: Author's

4 Methodology

Our study looks at how digital transformation, logistics risk management, supply chain resilience, and innovative entrepreneurship connect. We used a hypothetico-deductive method and analyzed data with SMART PLS software to achieve our goal.

4.1 Research design and data collection

We built the questionnaire on a strong theoretical base to ensure content validity, reliability, and the statistical power of the collected data. We crafted the questions to show practices linked to the interaction between digital transformation, logistics risk management, and supply chain resilience as well as their impact on innovative entrepreneurship. This thoughtful approach boosts the statistical validity of the results and matches the research aims.

To collect strong numerical data, we decided to carry out self-administered online research (Thiétart 1999; Curchod 2003). We sent out the electronic survey through specialized platforms, which helped us reach a broad range of companies in different industries in the Tânger-Tetuane area. This approach was adaptable and productive helping to cut costs and allowing participants to answer at their convenience, which led to a high response rate and reliable data. We then compiled and organized the data to analyze using SPSS version 26, which made data handling easier.

Researchers examined the data using structural equations modeling with Smart PLS software to test hypotheses and find cause-and-effect links between dependent and independent variables (Hair et al. 2019). The partial method of Square Minimums (PLS), which Wold (1985) first introduced and Lohmöller (1984, 1987, 1989) and Chatelin et al. (2002) later improved, works well to analyze complex cause-and-effect relationships when dealing with small sample sizes. This method allows researchers to explore multiple connections between explanatory variables

and provides insights at different levels of analysis. It also fits studies where measurements might not be exact making it a good choice for analyzing data in this context (TERU, 1998).

4.2 Data analysis and statistical tools

Our data analysis happened in two separate steps:

The first step, correlation testing, checked how good our collected data was, while the second step confirmatory analysis made sure the links between variables were solid. This part let us check if the answers made sense find any missing data, and handle it the right way. Also, we did a multi-collinearity test to make sure the variables we picked didn't have too much in common, which could mess up our results.

After checking the data, researchers carried out a follow-up study with PLS-SEM and the SMARTPLS tool. This method verifies direct and indirect links between variables making sure the measurement scales are trustworthy and accurate. Using two different ways to analyze the data makes the findings more dependable and provides solid proof for the suggested theories.

4.3 Operationalization of constructs

The research constructs were operationalized on the basis of measures already validated in the academic literature. The items of each variable were evaluated using five-point Likert-type scales (from 1 “strongly disagree” to 5 “strongly agree”) (Vandercammen & Gauthy-Sinéchal, 2014). Digital transformation: Measured through indicators such as the integration of advanced technologies (AI, IoT, blockchain), process digitization and data management (Big Data, predictive analytics), inspired by the work of Nasir et al. (2024) and Khan et al. (2023).

Logistics risk management: Dimensions include risk identification, assessment and response, in line with studies by Christopher & Peck (2022) and Ivanov & Dolgui (2021).

Supply Chain Resilience: Indicators of flexibility, redundancy, speed of recovery and sustainability were selected on the basis of research by Schlegel & Trent (2024) and Hess et al. (2024).

Innovative entrepreneurship: Measured through indicators such as the use of new technologies, the creation of goods and services, SME growth, and competitiveness development.

This operationalization makes it possible to structure data collection in a precise and coherent way, facilitating analysis of the relationships between the variables studied and guaranteeing rigorous scientific validity of the measures employed.

4.4 Measurement reliability and validity

To ensure the reliability and validity of the constructs, we followed a rigorous four-step procedure: (1) Assessing indicator reliability through factor loadings; (2) Evaluating internal consistency using Cronbach's Alpha (threshold > 0.70); (3) Examining convergent and discriminant validity via PLS-SEM, AVE, and cross-loadings; and (4) Testing discriminant validity using the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT).

5 Interpretation and discussion of results

• Study of measurement reliability

A Cronbach's alpha of 0.895 is considered good, with values above 0.7 generally indicating validated reliability.

Table 2: Cranbach's alpha reliability test

Reliability Statistics	
Cronbach's Alpha	N of Items
0,895	14

Source: Author -SPSS 26-

- **Construct reliability**

The table shows that Cronbach's Alpha (α) for all variables is greater than 0.7. Reliability is therefore excellent.

Furthermore, the rho values of all the variables are close to 1. This allows us to deduce that the reliability is robust and high. Furthermore, composite reliability values greater than 0.7 are considered excellent.

Table 3: Reliability of Cronbach's alpha and composite reliability measures

	Alpha de Cronbach	rho_A	composite reliability
Digital transformation	0,790	0,836	0,858
Innovative entrepreneurship	0,926	0,940	0,964
Logistics risk management	0,949	0,953	0,975
Supply Chain Resilience	0,706	0,888	0,836

Source : Author -SMART PLS-

- **Validité convergente**

The AVE for Digital Transformation (AVE = 0.864), Innovative Entrepreneurship (AVE = 0.966), Logistics Risk Management (AVE = 0.876) and Supply Chain Resilience (AVE = 0.838) is greater than 0.5. This indicates strong convergent validity.

Table 4: Reliability of the regional issues construct

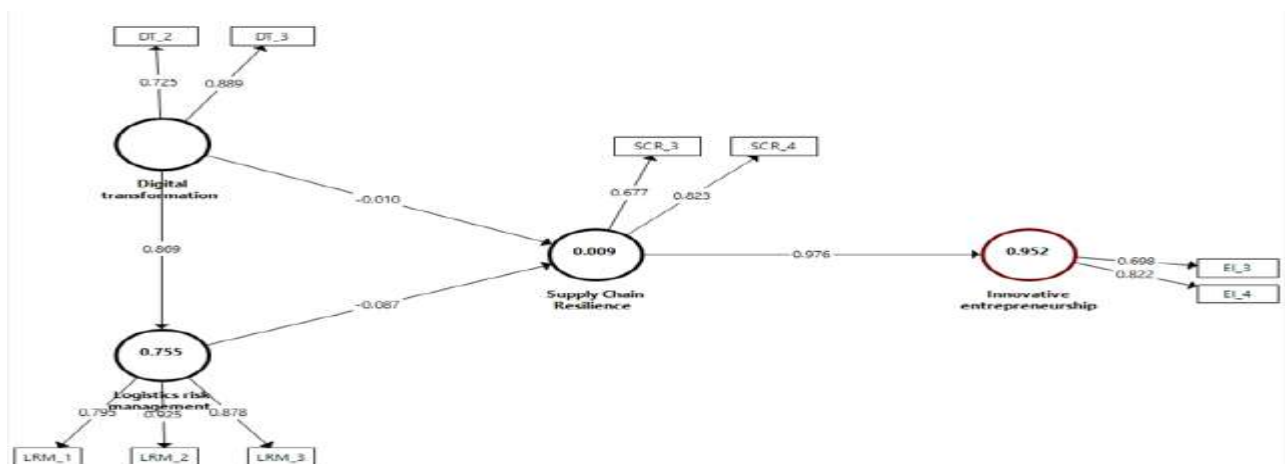
	Average Variance Extracted (AVE)
Digital transformation	0,864
Innovative entrepreneurship	0,966
Logistics risk management	0,876
Supply Chain Resilience	0,838

Source: Author -SMART PLS-

- **Model fitting**

Once items with coefficients below 0.7 have been eliminated, the fitted model is generated using the PLS algorithm.

Figure 4: New measurement model after application of the PLS algorithm



Source: Author -SMART PLS

- **Gof (Goodness of Fit)**

The use of the linear regression technique allowed us to examine our hypotheses. It is necessary to discuss these results at this point before proceeding to their interpretation and comparison with previous research in various contexts in the next section. GOF is calculated using the following formula:

$$GOF = \sqrt{\text{Average Commuality} * \text{Average } R^2}$$

In our situation, GOF is 0.71263, indicating excellent model fit.

Bootstrapping method

According to the Bootstrapping method, the t-values for the relationships between supply chain resilience and innovative entrepreneurship, digital transformation and logistics risk management are 114.944, 20.054, and 0.453, respectively. However, the t-value for the relationship between digital transformation and logistics risk management is 30.135.

Multicollinearity Test among Independent Variables

Analysis of the table reveals that the tolerance and VIF for digital transformation, innovative entrepreneurship, logistics risk management and supply chain resilience are 0.723 and 1.420; 0.646 and 1.744; 0.634 and 2.989; and 0.427 and 2.239 respectively. All these values are below the critical threshold of 10 for the VIF and at the 0.1 significance level for the tolerance.

We conclude that multicollinearity is not a major concern. The model appears to be well organised in terms of the links between the predictor variables.

Table 5: Multicollinearity tests

Model		Collinearity Statistics	
		Tolerance	VIF
	Digital transformation	,723	1,420
	Innovative entrepreneurship	,646	1,744
	Logistics risk management	,634	2,989
	Supply Chain Resilience	,427	2,239

Source: Author -SMART PLS

6 Discussion of results and recommendations

6.1 Discussion of results

The bootstrapping calculation test (t-value = 30.135) confirmed the first hypothesis. Thus, digital transformation has a positive impact on logistics risk management. This finding was revealed by our theoretical study. The work of Nasir et al (2024), Khan et al (2023) and Schlegel & Trent (2024) has already shed light on this impact.

On the other hand, the Bootstrapping calculation test (t-student is 0.453), hence, the second hypothesis is refuted. Contrary to the work of Christopher & Peck (2022), Ivanov & Dolgui (2021), Schlegel & Trent (2024), logistics risk management is not only an effective tool for improving supply chain resilience. It has been found that other factors can integrate into this impact process, such as digitalization, the cognitive behavior of managers and the attitude of employees.

Although Christopher and Peck (2004a) emphasize the importance of creating robust supply chains capable of coping with disruptions. They advocate a proactive approach that incorporates flexibility and redundancy into all supply chain processes to enhance responsiveness and recovery capabilities.

In the Moroccan context, according to our study, risk management does not appear to play a key role in the resilience of supply chains. This is associated with a multitude of contextual, institutional and organizational factors. These include a changing economic context and insufficient and irrational management of resources to proactively control risks. In addition, the organization has limited flexibility, political strategies are deficient and there are problems in assessing the relevant risks.

However, the third hypothesis is accepted since (t-student is 20.054). This confirms the work of Schlegel & Trent (2024), Hess et al. (2024), Christopher & Peck (2022). Indeed, digital

transformation positively impacts supply chain resilience by mediatizing logistics risk management. The optimization of loads during the business process may be due to the interest of integrating digital transformation into business operations.

The t-value of 114.944 validates the fourth hypothesis. Consequently, supply chain resilience correlates closely and significantly with innovative entrepreneurship. In addition, Albert & Mougenot, 1988) ;(Henrekson & Stenkula, 2010); (Golubev, 2014) have clearly explained the major role of innovative entrepreneurship in the development of companies and the national economy.

6.2 Recommendations

According to our study, we propose a series of suggestions that governmental and non-governmental organizations should consider:

- It is essential to encourage innovative initiatives, allocate subsidies for scientific research, and provide ongoing training and digital literacy programs;
- It is advisable to support units that integrate digitalization into their activities. This involves financing the use of sophisticated applications such as ERP to develop and automate the management process in companies;
- It is crucial to raise awareness among managers and employees about the benefits of digital transformation and to overcome resistance to change;
- Efficient, flexible and agile supply chains need to be implemented, capable of optimizing workloads and helping to improve overall company profitability. By implementing a system for monitoring performance indicators, this process enables the company to become more competitive in a competitive world;
- Digital transformation can also be leveraged in risk management and anticipation. This allows companies to better align their strategic vision while optimizing time and costs;
- It's worth stimulating the entrepreneurial spirit, encouraging innovative entrepreneurship, guaranteeing a suitable climate for better performance, facilitating internal and external company communication and dissecting suitable financing alternatives.

It would be possible to integrate other more captivating elements into our analysis to give it greater depth. For example, a flexible and inventive organizational culture enables both effective supply chain management and the expansion of innovation.

In addition, carefully designed public policies, particularly in the areas of infrastructure, taxation and innovation, are key tools for strengthening the competitiveness of businesses in Morocco.

Specific economic restrictions can simultaneously hinder certain opportunities and stimulate innovative local resolutions tailored to Morocco's economic and cultural contexts.

Along these lines, business owners should create a flexible company culture, work to bring in more advanced tech like ERP systems and data tools, and take smart risks. It's a good idea to expand business partnerships and team up with local startups or research hubs to come up with new solutions for specific supply chain problems. Also, government officials need to create effective policies to boost innovation. These could include funding for R&D, tax breaks for companies that invest in going digital, and setting up special economic areas to attract investment.

7 Conclusion

In a world with increasing uncertainty and frequent disruptions, this article looks at how digital transformation, logistics risk management, supply chain resilience, and innovative entrepreneurship interact. Digital transformation seems to be a crucial strategy to tackle current challenges and boost innovative entrepreneurship in Morocco. It does this by using cutting-

edge tech like AI, IoT, and blockchain. However, its direct effect on resilience isn't straightforward. Logistics risk management practices play a big part in this relationship. They're key to making Supply Chains more adaptable and better at bouncing back.

The study addresses theoretical gaps by proposing an integrative conceptual model that highlights the relationships between these dimensions and innovative entrepreneurship. The expected results, derived from a hypothetico-deductive approach and validated by the structural equation method (PLS) on a sample of 137 large companies, make a triple contribution. On the theoretical level, this research enriches the literature by clarifying the underlying mechanisms linking digital transformation, risk management, resilience and innovative entrepreneurship. Empirically, it provides robust quantitative evidence for the hypothesized relationships proposed. Finally, on a practical level, it offers strategic recommendations to decision-makers, notably on the optimized adoption of digital technologies, the strengthening of risk management practices and the contribution to the development of entrepreneurship and the importance of innovation.

Ultimately, the results highlight the necessity of effectively integrating digital technologies and proactive risk management strategies to enhance supply chain resilience in an uncertain environment. However, this study has certain limitations, particularly in terms of the generalizability of the findings across different industries and geographic regions. Future research could investigate sector-specific dynamics or longitudinal perspectives to gain deeper insights into the evolution of resilience capabilities over time.

Thus, this article constitutes a significant contribution to the understanding of the complex dynamics shaping modern Supply Chains and its relationship with the promotion of innovative entrepreneurship, while paving the way for new perspectives to strengthen their sustainability and competitiveness in a constantly changing world.

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