Revue Internationale des Sciences de Gestion
ISSN: 2665-7473
Volume 8 : Numéro 2

AI implementation in Supply Chain Management: Opportunities and challenges for the Moroccan context

Mise en œuvre de l'IA dans la gestion de la chaîne d'approvisionnement : Opportunités et défis pour le contexte marocain

EL HADDADI Mariam
Phd Professor Researcher
Macroeconomics and Public Policy Research Team, Faculty of Legal, Economic and Social Sciences – Salé, Mohammed V University, Rabat, Morocco

LAHJOUJI Hamida
Phd Professor Researcher
Laboratory of Research in Theoretical and Applied Economics, Hassan 1st University, Settat, Morocco

MOUAD Ikram
Ingénieur financier
Ecole Marocaine des Sciences de l'ingénieur
Université Honoris
Maroc

Date submitted : 12/04/2025

Date of acceptance : 08/05/2025

To cite this article :

EL HADDADI M. & al. (2025) «AI implementation in Supply Chain Management: Opportunities and challenges for the Moroccan context », Revue Internationale des Sciences de Gestion « Volume 8 : Numéro 2 » pp : 665 - 680

Abstract

Using artificial intelligence (AI) in business, particularly in supply chain management (SCM), has been a real organizational preoccupation for optimizing costs, improving visibility, and proactively managing risks. This article aims to explore the opportunities and challenges of implementing AI in SCM in Morocco. A qualitative methodology was adopted to analyze the Moroccan SCM context and the using AI in SCM. The findings, reveal the Moroccan supply chain suffers from high logistics costs, infrastructure limitations and lack of regularity and compliance. However, AI offers significant opportunities to optimize process and flows and reduce costs and ecological footprint. Moreover, we conclude that scientific research in Morocco plays a key role in developing AI solutions tailored to local companies' needs in SCM. The paper suggests some actionable recommendations for Supply chain managers, industry practitioners and researchers.

Keywords : Artificial Intelligence ; Morocco; Optimization; Supply Chain Management.

Résumé

L'utilisation de l'intelligence artificielle (IA) dans les entreprises, en particulier dans la gestion de la chaîne d'approvisionnement (SCM), a été une véritable préoccupation organisationnelle pour optimiser les coûts, améliorer la visibilité et gérer les risques de manière proactive. Cet article vise à explorer les opportunités et les défis de la mise en œuvre de l'IA dans la GCL au Maroc. Une méthodologie qualitative a été adoptée pour analyser le contexte marocain de la GCL et l'utilisation de l'IA dans la GCL. Les résultats révèlent que la chaîne d'approvisionnement marocaine souffre de coûts logistiques élevés, de limitations de l'infrastructure et d'un manque de régularité et de conformité. Cependant, l'IA offre des opportunités significatives pour optimiser les processus et les flux et réduire les coûts et l'empreinte écologique. En outre, nous concluons que la recherche scientifique au Maroc joue un rôle clé dans le développement de solutions d'IA adaptées aux besoins des entreprises locales en matière de gestion de la chaîne d'approvisionnement. Le document propose quelques recommandations exploitables pour les gestionnaires de la chaîne d'approvisionnement, les praticiens de l'industrie et les chercheurs.

Mots clés : Intelligence artificielle ; Maroc ; Optimisation ; Gestion de la chaîne d'approvisionnement.

Introduction

Globalization, trade openness, and the constant increase in risks and costs associated with logistics are factors which combination has generated a revolution in the business world. However, supply chains have evolved towards network management based on the mutual interests of companies, thereby generating new opportunities. Given the range of functions involved, the supply chain is an organizational and operational structure that brings together actors who cannot, by nature or economic interest, perform all the required functions alone (Tapiero, S. 2008).

In the national context, the supply chain continues to grow in importance and constitutes a major response to the challenges posed by the current changes in the business environment both in Morocco and other countries. This observation leads us to the central question of this study: What role could artificial intelligence play in enhancing supply chain performance within the Moroccan context?

Regarding to this context, using Artificial intelligence in the optimization of the management of supply chain in Morocco, could represent an opportunity for companies in term of logistic process efficiency, reduction of supply chain costs, prediction of risks or gain in sustainability. The research value of the present study is the exploration of the advantages and barriers of the AI use in SCM on the Moroccan business context and the highlight of the scientific contributions of Moroccan research about implementing AI solutions in the supply chain optimization.

A qualitative methodology was adopted based on the analyses of the existent literature review related to this subject during the last decade for the both, national and international background. After the introduction, the first section of this paper will focus on the literature review at the international and national level. The second section will present an overview of the supply chain management in Morocco, highlighting opportunities and challenges. The third section will aim to analyze the advantages of AI use in SCM and to identify the eventual barriers. Finally, the conclusion section will discuss the research results, examine gaps in the literature, and suggest potential directions for future research.

1. Literature review

The exploration of existing literature on the use of artificial intelligence in supply chain management shows that there are several studies related to this subject at both international and national level.

1.1. International background

The existing research related to the implementation of AI in SCM is listed in a systematic literature review (SLR) conducted by Ouahbi, Y., et al. (2025). The findings of the SLR identified 426 articles focusing on machine learning techniques used in SCM. Shekhar, A., et al. (2023), highlight the importance of using AI in SCM for the improvement of international market conditions by increasing transparency and achieving autonomous SCM. Furthermore, Danach, K, et al. (2024), present the revolutionary impact of using AI in supply chain management in terms of business efficiency, process automation, predictive analytics and sustainability.

However, some challenges and barriers to AI implementation in SCM were highlighted by different authors. Shrivastv, M. (2022), presented a list of barriers related to AI implementation in supply chain, by categorizing them on intra and inter- organizational barriers. The study includes technology, talent, geopolitical, change resistance and governance barriers.

Hangl, J., et al. (2022), present the social considerations of AI adoption in SCM, such as substituting existing jobs and impacting law-incomes employees, while the innovative disruption of using AI in SCM was examined by Hendriksen, C. (2023), highlights the interplay between innovative and social aspects of AI implementation, taking into consideration some ethical issues.

1.2. National background

At the national level, several studies were conducted on the use of AI in management. SMILI, S. et al. (2025), conducted semi-directive interviews about the use of logistic-4.0 in Moroccan companies. The results of this study, show that adoption of logistic- 4.0 is a managerial preoccupation in Moroccan compagnies facing several limits and barriers. Similarly, Riad, M., et al. (2024), investigated the use of AI in SCM in industrial Moroccan firms and identified some challenges, such as date issues, organizational change resistance and the up skilling of the existing work force.

Furthermore, Mastour, T. & El Hakmi, S. (2024) highlighted the crucial role of using AI in reducing supply chain costs.

However, Khalifa, A., et al. (2017), conducted quantitative research involving AI solution to manage traffic volume forecasting in Morocco.

1.3. Advancement of Moroccan Scientific research about AI solution in SCM

The scientific research in Morocco interest to conduct studies related to the use of machine learning in supply chain optimization.

Table I. below presents a list of studies modeling AI solutions for supply chain management to be used by compagnies.

Table N°1 : Moroccan scientific contributions proposing AI solutions for SCM

Authors	Title	Main Theme	Key Contributions
Khalifa, A., Idsougnou, Y., Benabhou, L., & Zirari, M. (2017)	Machine Learning Approaches for Traffic Volume Forecasting: Case Study of the Moroccan Highway Network	Traffic Forecasting using AI	Application of machine learning techniques to forecast traffic volume on Moroccan highways, thereby improving logistics management
Harbaoui Dridi, L., Kammarti, R., Borne, P., & Ksouri, M. (2010)	A Genetic Algorithm for the Pickup and Delivery Problem with Time Windows for Multiple Vehicles	Logistics Optimization with AI	Proposal of a genetic algorithm to optimize pickup and delivery routes, contributing to logistics efficiency
EL Moussaoui, A., El Moussaoui, T., Benbba, B., Jaegler, A., El Andaloussi, Z., (2023)	Understanding the Choice of Collection & Delivery Point by the E-Consumer via a Machine Learning Model: Moroccan Case Study	-Delivery -Machine learning -Last mile logistics	Use the Optimized random forest model to optimize the pickup point delivery
Nafi, Z., Essaber, F., El Haroumi, F. & Benmoussa, R. (2023)	An approach based on machine learning and discrete event simulation for supply chain optimization: The case of on-stock chains	-Supply chain optimization -Stock Chain management -Machine learning	Use of a mathematical model to formalize the problem of delivery delay
Rezki, N., Mansouri, M., (2024)	Machine learning for proactive supply chain risk management: predicting delays and enhancing operational efficiency	-Machine learning -SC risk management -Supplier performance	Use of ML to identify risk suppliers and anticipate delay
Douaioui, K., Oucheigh, R., Charif, M., (2024)	Enhancing Supply Chain Resilience: A Deep Learning Approach to Late Delivery Risk Prediction	-Deep learning technique -Supply chain resilience -Risk prediction	Use of a deep learning models (Neural Network) to improve SC resilience, and proactive risk management

Hmamed, H., Cherrafi, A., & Benghabrit, Y. (2024)	Machine Learning for the Future Integration of the Circular Economy in Waste Transportation and Treatment Supply Chain	-Sustainable SCM -Waste transportation -Circular economy integration	Propose ML algorithms to optimize waste transportation and route planning

Source: Realized by author's

These studies are converging on the integration of artificial intelligence (AI) and digital technologies in supply chain and logistics management. This research explores various applications of AI, such as optimizing delivery routes, proactively managing risk, forecasting demand, and improving operational efficiency. Thus, the common point between these papers is their focus on the use of advanced technologies to transform and optimize logistics and supply chain processes, thereby contributing to better business performance and competitiveness.

2. Overview of the SCM context in Morocco: opportunities and challenges

Supply Chain Management (SCM) in Morocco has undergone significant evolution, influenced by globalization, digital transformation, and the country's strategic position as a trade hub between Europe and Africa. However, in spite of these advancements, Moroccan supply chains still face several challenges and opportunities that shape their performance and competitiveness.

2.1. Opportunities for enhancing SCM in Morocco

According to the World Bank Report (Raballand, Arvis & Bellier, 2006), Morocco's supply chain faces high costs and regulatory constraints but holds strong growth potential. Strategic trade agreements, government digital initiatives, AI adoption, and infrastructure investments can enhance efficiency and position Morocco as a regional logistics hub (Boulitama, et al. , 2025).

Morocco's proximity to Europe and its strategic trade agreements, such as the African Continental Free Trade Agreement (AFCFTA), provide opportunities for strengthening supply chains. These agreements facilitate market expansion and foreign direct investment (Margoum, et al., 2020), making Morocco an attractive logistics hub for global trade.

The Moroccan government has launched initiatives such as the National Strategy for Financial Inclusion, aimed at supporting SMEs through digital payment systems and financial accessibility (IFC, 2020). Additionally, public-private partnerships focusing on digital logistics and AI adoption can bridge the gap in supply chain technology integration.

The adoption of AI and predictive analytics presents a major opportunity for Moroccan supply chains. As discussed by Danach, El Dirani, and Rkein (2024), AI-driven solutions can enhance supply chain visibility, automate inventory management, and optimize logistics operations (Danach, El Dirani, & Rkein, 2024). Implementing AI-based forecasting tools can help businesses reduce costs and improve efficiency.

With investments in logistics hubs, railway expansions, and port modernization projects like Tanger Med, Morocco is positioning itself as a regional leader in multimodal transport. According to Tanger Med Port Authority (2024), integrating road, rail, and maritime logistics enhances efficiency and reduces costs, strengthening Morocco's role as a global trade gateway Collaborations between government bodies, private enterprises, and international investors can facilitate technology transfer, infrastructure development, and skill-building initiatives to modernize Moroccan supply chains.

To address the skills gap, Moroccan universities and technical institutions are expanding programs in logistics and supply chain management. Enhanced training programs and professional certifications can improve workforce readiness for modern SCM practices.

While Moroccan supply chains face several structural and technological challenges, there are considerable opportunities for growth through AI-driven innovations, improved financial accessibility, and infrastructure development. Future research should explore how AI implementation can address these challenges and enhance the competitiveness of Moroccan supply chains.

2.2. Challenges of SCM in Morocco

Moroccan supply chains face multiple challenges that hinder their efficiency and competitiveness. Financial constraints, inadequate infrastructure, regulatory complexities, and slow digital transformation create significant obstacles for businesses. Additionally, limited AI adoption and technological resistance further reduce supply chain optimization. Overcoming these barriers is essential for improving logistics performance and fostering economic growth.

According to the International Finance Corporation (IFC) (2020), Moroccan SMEs, which constitute over 95% of businesses, face substantial financial constraints. These firms struggle with limited access to working capital, as 84% of bank loans require collateral, creating liquidity challenges (IFC, 2020). Furthermore, long payment delays from both private and public sector clients exacerbate financial instability, limiting their ability to invest in supply chain improvements.

Margoum et al. (2020) highlight that Moroccan logistics infrastructure, although improving, still poses significant challenges to SCM efficiency. The study, using a gravity model, confirms that inadequate infrastructure impacts the competitiveness of Moroccan exports, as inefficiencies in transportation and port operations result in higher logistics costs (Margoum, El Khider, & El Bouhadi, 2020). Additionally, customs clearance procedures remain slow, causing delays in supply chain processes.

Balambo and Houssaini (2011) examine the complexities of regulatory frameworks affecting Moroccan supply chains. They argue that the lack of standardized supply chain integration policies creates inefficiencies, making it difficult for firms to collaborate effectively (Balambo & Houssaini, 2011). Moreover, bureaucratic hurdles in trade facilitation negatively impact the smooth flow of goods and services.

Heddoun and Benrezzouq (2019) discuss how Moroccan businesses face challenges in integrating digital technologies into their supply chains. Despite efforts to digitize supply chain operations, issues such as low digital literacy, resistance to change, and limited investments in AI-based solutions hinder progress (Heddoun & Benrezzouq, 2019). Without widespread adoption of AI-driven solutions, Moroccan companies struggle to enhance supply chain efficiency, demand forecasting, and inventory management.

3. Using AI in SCM in Morocco: opportunities and barriers

Optimizing logistics chains is a major challenge for Moroccan companies, given the growing complexity of goods flows and the challenges posed by infrastructure. Integrating artificial intelligence (AI) into logistics management offers innovative solutions for improving efficiency, reducing costs and boosting the sector's competitiveness.

3.1. Opportunities for AI implementation in SCM

The rise of new technologies and the increasing digitalization of supply chains have placed artificial intelligence (AI) at the heart of logistics optimization strategies. In Morocco, where the logistics sector represents a key lever for economic development, the adoption of AI offers promising prospects for overcoming various challenges related to operational efficiency, transport costs, inventory management and distribution (Smili et al., 2023).

In this section, we will examine the main solutions that AI brings to Moroccan logistics, highlighting its role in inventory management, optimizing transport routes, last-mile logistics, securing flows and reducing the environmental footprint.

AI can improve inventory management by using predictive algorithms based on machine learning. According to Khalifa et al (2017), AI can analyze vast amounts of historical and real-time data to accurately forecast demand, avoiding stock-outs and unnecessary surpluses. Intelligent systems can also adapt supply to seasonal variations and market trends (Bahnasseb et al., 2024).

Change number of columns: Select Columns icon AI optimizes transport routes by considering traffic conditions, weather and energy costs. Harbaoui Dridi et al (2010) have developed a genetic algorithm for optimizing logistics vehicle routes according to time windows, thereby reducing transport times and costs. This approach is particularly relevant to Morocco, where transport infrastructure varies from region to region. This automation helps to reduce distances travelled, minimize fuel costs and improve delivery times, thereby contributing to more efficient resource management (Chbaika et al., 2024). These technologies also make it possible to monitor the condition of the vehicle and the goods it is carrying in real time, providing greater visibility of the supply chain (Bahnasseb et al., 2024).

The last mile is one of the major challenges of modern logistics. Keita et al (2023) point out that AI can make deliveries smoother by integrating intelligent management systems and solutions based on the Internet of Things (IoT). Drones and autonomous vehicles, although still in the experimental phase, could also play a role in urban distribution.

The combination of AI and blockchain enhances the transparency and security of supply chains. El Hakmi and Mastour (2024) have shown that this synergy makes it possible to ensure real-time traceability of products, thereby reducing fraud and improving dispute management. This type of solution is particularly interesting for the export of Moroccan agricultural and industrial products.

Optimizing logistics flows using AI helps to reduce energy costs and CO_2 emissions. Smili et al (2023) studied the impact of AI on logistics 4.0 in Morocco and showed that automation and digitalization lead to better resource management and less waste.

Integrating AI into the Moroccan supply chain represents a major opportunity to improve business competitiveness and modernize the sector.

By using forecasting, automation and traceability technologies, AI is helping to optimize the management of logistics flows, while reducing costs and the ecological footprint. However, its implementation requires investment in infrastructure and training, as well as an appropriate regulatory framework.

3.2. Barriers of AI implementation in SCM

The integration of artificial intelligence (AI) into the supply chain in Morocco offers considerable opportunities for improving efficiency, reducing costs and increasing the competitiveness of businesses. However, despite the potential benefits, several challenges need to be overcome to ensure a successful implementation of AI in the Moroccan logistics sector.

One of the main obstacles to the implementation of AI in the supply chain in Morocco is the lack of adequate technological infrastructure. Moroccan companies, especially SMEs, face limitations in terms of access to advanced technologies, such as intelligent management systems or high-performance AI platforms. Setting up these infrastructures requires significant investment, which many companies find difficult to access, especially in an economic context marked by budgetary constraints (Benali et al., 2023).

In addition, the country lacks the coherent and well-developed digital infrastructure needed to support AI on a large scale. Studies on the impact of information and communication technologies (ICT) on logistics in Morocco point to limited access to high-speed internet networks and advanced data storage systems as a major barrier to the adoption of AI in this sector (Chbaika et al., 2024).

The adoption of AI requires specialized skills that are lacking in the logistics field in Morocco. According to a study conducted by Mohammed VI University (2022), professionals in the Moroccan logistics sector lack training in artificial intelligence, big data management, and emerging technologies. The lack of continuous training and educational programs on AI in Moroccan universities is a major obstacle to the integration of AI in the sector (Bahnasseb et al., 2024).

To address this gap, it is crucial that Morocco develops educational programs tailored to the needs of the logistics sector and AI training to equip professionals with the skills to manage these new technologies. This training challenge is exacerbated by the rapid evolution of AI technologies, requiring constant updating of the knowledge of those involved in the sector.

AI relies on the collection, analysis and exploitation of large quantities of data to generate valuable information. However, data management remains a major challenge for many Moroccan companies. Logistical data is often fragmented, poorly organized or inaccessible, hampering the implementation of effective AI solutions. In addition, companies often struggle to manage data in real time, which limits the ability to optimize routes, stocks and demand forecasts.

The lack of a legal and regulatory framework for data management also complicates the situation. Morocco needs to put in place robust public policies regarding the protection of personal data and the security of information used in AI, to ensure compliance with international standards while making it easier for businesses to access data (Khiata et al., 2022).

Although AI offers many long-term benefits, the initial cost of adoption remains a barrier for many Moroccan businesses. The acquisition of advanced technologies, the integration of intelligent software, and the setting up of adequate infrastructures represent substantial investments. Small and medium-sized enterprises (SMEs), which make up a large part of the Moroccan economic fabric, are finding it difficult to finance these technological innovations (Ouajjia et al., 2023).

Despite government aid and private initiatives to support the adoption of AI technologies, costs remain a major barrier. This challenge can be overcome by public-private partnerships, government subsidies for innovation, or tailored financing solutions that would ease the financial burdens on companies in the implementation phase.

Finally, resistance to change is a major human and cultural challenge. In many Moroccan companies, the adoption of AI is perceived as a threat by employees, who fear for their jobs or the transformation of their tasks. The implementation of automated technologies in warehouses or logistics processes could lead to reluctance on the part of workers, who often have a poor grasp of technological tools. Effective change management and awareness-raising strategies are therefore essential to ensure a successful transition to automated supply chains (Benali et al., 2023).

Conclusion

This research aimed to explore the opportunities and challenges of implementing Artificial Intelligence (AI) in Supply Chain Management (SCM) in Morocco. The findings reveal that, despite Morocco's strategic geographic position, trade agreements, and digital transformation efforts, its supply chains face significant obstacles. High logistics costs, inadequate infrastructure, regulatory constraints, limited AI adoption, and financial barriers continue to hinder the efficiency and competitiveness of Moroccan businesses. However, AI presents transformative potential, offering solutions to optimize logistics operations, enhance visibility, improve demand forecasting, and reduce costs and environmental impact.

The study also highlights the role of Moroccan scientific research in developing AI-driven solutions tailored to local business needs, with advancements in machine learning, deep

learning, and predictive analytics contributing to supply chain digitalization. To fully leverage AI in SCM, several key measures should be taken: accelerating AI integration in businesses, strengthening digital infrastructure, enhancing regulatory and financial support, expanding AI education and training, fostering public-private partnerships, and promoting AI-driven sustainable SCM solutions.

By addressing these challenges and capitalizing on AI-driven opportunities, Morocco can modernize its supply chain ecosystem and establish itself as a leading logistics hub in Africa. Future research should focus on industry-specific AI applications, ethical considerations, and strategies to overcome digital adoption barriers, ensuring that AI integration contributes to a more efficient, resilient, and sustainable supply chain in Morocco.

While this study offers practical insights into AI adoption in Moroccan supply chains, several limitations must be acknowledged. The analysis is primarily conceptual and lacks empirical data, which restricts the generalizability of the findings (Yin, 2018). Additionally, the diversity of supply chain contexts and technological readiness across Moroccan industries limits the uniform application of AI solutions (Kshetri, 2018). Beyond methodological constraints, the implementation of AI raises ethical and societal concerns. These include the risk of job displacement, particularly among low-skilled workers (World Bank, 2023), and challenges related to data governance, algorithmic transparency, and equitable access to digital technologies (Benali & Kabbaj, 2021; Floridi et al., 2018). In a context where regulatory frameworks are still developing, ensuring responsible AI integration requires both institutional safeguards and inclusive policy strategies to support social cohesion and digital trust.

REFERENCES

[1] A. El Moussaoui, T. El Moussaoui, B. Benbba, A. Jaegler, Z. El Andaloussi, “Understanding the Choice of Collection & Delivery Point by the E- Consumer via a Machine Learning Model: Moroccan Case Study”, Procedia Computer Science, Vol. 210, 2022. ISSN 1877-0509, https://doi.org/10.1016/j.procs.2022.10.138.

[2] O. Keita, A. El Khazzar, and H. El Ahmadi, "L'intelligence artificielle transforme le dernier kilomètre de la logistique: une revue de littérature," Revue Marocaine de Management, Logistique et Transport, vol. 23, no. 2, pp. 75-90, Dec. 2023.

[3] N. Benali and M. Kabbaj, "Artificial intelligence and data governance in Morocco: Regulatory challenges and prospects," *Moroccan Journal of Public Law*, vol. 5, no. 2, pp. 45–62, 2021.

[4] O. Boulitama, D. Rahli, et K. Sabri. 2025. « Supply Chain Digital : Développement d’une revue de littérature systématique et implications pour les futures recherches ». Revue Française d’Economie et de Gestion. 6, 2 (févr. 2025).

[5] S. Smili, R. Lahrach, and N. Tamouh, "La logistique 4.0 au Maroc: opportunités et défis pour les entreprises," IJAFAME, vol. 23, no. 3, pp. 101-115, Sep. 2023.

[6] S. El Hakmi and T. Mastour, "La synergie innovante entre blockchain et intelligence artificielle pour optimiser les coûts logistiques: une revue de littérature systématique,"Revue FREG, vol. 24, no. 1, pp. 50-70, Jan. 2024.

[7] L. Floridi, J. Cowls, M. Beltrametti, F. Chiarello, R. Chatila, V. Dignum, et al., "AI4People—An ethical framework for a good AI society: Opportunities, risks, principles, and recommendations," *Minds and Machines*, vol. 28, no. 4, pp. 689–707, 2018, doi: 10.1007/s11023-018-9482-5.

[8] A. Khalifa, Y. Idsouguou, L. Benabbou, and M. Zirari, "Approches d'apprentissage automatique pour la prévision du volume de trafic: étude de cas du réseau autoroutier marocain," arXiv, vol. 17, no. 4, pp. 120-135, Dec. 2017.

[9] I. Harbaoui Dridi, R. Kammarti, P. Borne, and M. Ksouri, "Un algorithme génétique pour le problème de ramassage et de livraison avec fenêtres de temps à plusieurs véhicules," arXiv, vol. 10, no. 4, pp. 85-100, Dec. 2010.

[10] A. Bahnasseb, N. Chbaika, and H. Ouajjia, "Robotic and AI-Driven Warehouses: A Revolution for Moroccan Logistics," Moroccan Journal of Logistics, vol. 24, no. 1, pp. 30-45, Jan. 2024.

[11] N. Chbaika, A. Khiata, A. Bahnasseb, and H. Ouajjia, "The Application of Smart Supply Chain Technologies in the Moroccan Logistics," International Journal of Logistics and Supply Chain Management, vol. 24, no. 1, pp. 60-75, Jan. 2024.

[12] N. Kshetri, "AI in emerging economies: Cross-national diffusion and strategic implications," *Journal of Global Information Technology Management*, vol. 21, no. 3, pp. 161–176, 2018, doi: 10.1080/1097198X.2018.1502392.

[13] A. Khiata, A. Bahnasseb, and H. Ouajjia, "Artificial Intelligence for Supply Chain Optimization in Morocco: Challenges and Opportunities," Journal of Supply Chain Management, vol. 22, no. 4, pp. 150-165, Dec. 2022.

[14] M. Benali, A. El Azhary, and H. Ouajjia, "Barriers to AI Adoption in Moroccan Logistics: Challenges and Opportunities," Journal of Logistics and Supply Chain Management, vol. 23, no. 2, pp. 80-95, Sep. 2023. DOI 10.2478/mspe-2024-0033

[15] N. Rezki, M. Mansouri, “Machine learning for proactive supplu chain risk management: Predicting delays and enhancing operational efficiency”, Management system in production engineering, vol. 32, no. 3, 2024.

[16] O. Barakat, N. Bouanba, (2024). The Barriers to AI Adoption in Supply Chains: Case of Moroccan Companies. In: Benadada, Y., Mhada, FZ., Boukachour, J., Ouzayd, F., El Hilali Alaoui, A. (eds) Proceeding of the 7th International Conference on Logistics Operations Management, GOL'24. GOL 2024. Lecture Notes in Networks and Systems, vol 1104. Springer, Cham. https://doi.org/10.1007/978-3-031-68628-3_7

[17] H. Ouajjia, N. Chbaika, and A. Bahnasseb, "AI in the Moroccan Logistics Sector: A Catalyst for Growth and Efficiency," Moroccan Journal of Logistics and Transport, vol. 23, no. 3, pp. 110-125, Sep. 2023.

[18] H. Hmamed, A. Cherrafi, Y. Benghabrit, “Machine learning for the future integration of the circular economy in waste transportation and treatment supply chain”, IFAC-Papersonline, vol.55, issu. 10, 2022. https://doi.org/10.1016/j.ifacol.2022.09.366

[19] C. Hendriksen, “Artificial intelligence for supply chain management: Disruptive innovation or innovative disruption?”, Journal of Supply Chain Management, vol.59(3), pp: 65–76, 2023. https://doi.org/10.1111/jscm.1230

[20] M. A. Balambo and A. Houssaini, "Typologies d’intégration des Supply Chains: Perspectives pour le contexte Marocain," HAL Archives, vol. 11, no. 4, pp. 45-60, Dec. 2011.

[21] Nafi, Z., Essaber, F. E., Elharouni, F., & Rachid, B. “An approach based on machine learning and discrete event simulation for supply chain optimization: the case of on-stock chains”. International Journal of Industrial Engineering: Theory, Applications and Practice, vol.30, no.6, 2023. https://doi.org/10.23055/ijietap.2023.30.6.8613

[22] K. Danach, A. El Dirani, and H. Rkein, "Revolutionizing Supply Chain Management With AI: A Path to Efficiency and Sustainability," IEEE Access, vol. 24, no. 1, pp. 100-115, Jan. 2024.

[23] K. Douaioui, R. Oucheikh and C. Mabrouki, "Enhancing Supply Chain Resilience: A Deep Learning Approach to Late Delivery Risk Prediction," *2024 4th International Conference on Innovative Research in Applied Science, Engineering and Technology (IRASET)*, FEZ, Morocco, 2024, pp. 1-7, doi: 10.1109/IRASET60544.2024.10548074.

[24] A. Heddoun and R. Benrezzouq, "La Transformation Digitale de la Supply Chain dans les Entreprises Marocaines," International Journal of Scientific & Engineering Research, vol. 19, no. 4, pp. 75-90, Dec. 2019.

[25] IFC, "Supply Chain Finance in Morocco: Preparing for the Future," International Finance Corporation, World Bank Group, vol. 20, no. 1, pp. 30-45, Jan. 2020.

[26] M. A. Margoum, A. El Khider, and A. El Bouhadi, "Logistique marocaine et performance à l’export: Examen du rôle des infrastructures par usage du modèle gravitationnel," ResearchGate, vol. 20, no. 2, pp. 60-75, Jun. 2020.

[27] G. Raballand, J. F. Arvis, and M. Bellier, "Success Factors for Improving Logistics in a Middle-Income Country," World Bank Report, vol. 6, no. 3, pp. 45-60, Sep. 2006.

[28] I. Rharoubi, K. Talmenssour, and H. Ait Abderrahman, "Exploring the Use of AI in Supply Chain Management: Insights from Moroccan Cases," Outsourcing Management

for Supply Chain Operations and Logistics Service, pp. 87-105, Hershey, PA: IGI Global, 2023.

[29] J. Hangl, V. Behrens, S. Krause, “Barriers, drivers, and social considerations for AI adoption in Supply chain management: A tertiary study”, Logistics, Vol. 6, no. 63, 2022, https://doi.org/10.3390/logistics6030063

[30] A. Shekhar, P. Prabhat, V. Yandrapli, S. Umer, F, Abdul, W. Dibaba, “Generative AI in Supplain chain management”, International Journalon recent and innovation trends in computing and communication, Vol. 11, no. 9 pp. 4179-4189, Jan 2024.

[31] S. Tapiero, “Analyse des risques et prise de decision dans la chaîne logistique”, Revue française de gestion, vol.06, no. 186. 2008.

[32] Y. Ouahbi, S. Ziti, and N. Lagmiri, "Advancing Supply Chain Management Through Artificial Intelligence: A Systematic Literature Review," Indonesian Journal of Electrical Engineering and Computer Science, vol. 38, no. 1, pp. 321-332, Jan. 2025.

[33] M. Shrivastav, “Barriers related to AI implementation in Supply Chain Management”, Journal of global Information Management, Vol. 30, no.08, 2022.

[34] M. Riad, M. Naimi, and C. Okar, "Exploring Artificial Intelligence Impact on Supply Chain's Firms: A Case Study of Industrial Firms in Morocco," Journal of Theoretical and Applied Information Technology, vol. 102, no. 10, pp. 4604-4614, Oct. 2024.

[35] World Bank, *Morocco Economic Monitor: Addressing Labor Market Vulnerabilities*. Washington, DC: World Bank Group, 2023.

[36] R. K. Yin, *Case study research and applications: Design and methods*, 6th ed. Thousand Oaks, CA: Sage Publications, 2018.