Evaluating the Digitalization of Trade and Logistics in Algeria: A Combined PESTEL–SWOT and Digital Maturity Approach

تقييم رقمنة التجارة والخدمات اللوجستية في الجزائر:

نهج مشترك لتحليل PESTEL–SWOT والنضج الرقمي

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Abstract:

This study provides an in-depth analysis of the digitalization of trade and logistics in Algeria and its impact on the competitiveness of non-hydrocarbon exporters. The approach is based on a review of secondary data, international reports, regulatory frameworks, and digital maturity models.

The objective is to identify structural, organizational, and technical barriers, as well as key levers to enhance access to financing and optimize logistics flows. Digitalization and innovation are thus presented as strategic factors to support economic diversification and strengthen Algeria's integration into global value chains.

Keywords: Digitalization, Innovation, Logistics, Exports, Competitiveness.

JEL Classification Codes: F13, O33, L87

ملخص:

تقدّم هذه الدراسة تحليلاً معمّقاً لرقمنة التجارة واللوجستيات في الجزائر، ولأثرها على تعزيز تنافسية المصدّرين خارج قطاع المحروقات .ويعتمد هذا العمل .على مراجعة دقيقة للبيانات الثانوية، والتقارير الدولية، والأطر التنظيمية، ونماذج قياس النضج الرقمي

ويهدف البحث إلى تحديد المعيقات البنيوية والتنظيمية والتقنية التي تحدّ من فعالية المنظومة التجارية، إلى جانب إبراز أهم الرافعات الكفيلة بتحسين الوصول إلى التمويل وتطوير سلاسل الإمداد والخدمات اللوجستية .وتُظهر النتائج أن الرقمنة والابتكار يشكّلان عاملين استراتيجيين لدعم جهود التنويع .الاقتصادي وتعزيز اندماج الجزائر في سلاسل القيمة العالمية

كلمات مفتاحية: الرقمنة، الابتكار، اللوجستيات، الصادرات، التنافسية.

تصنيفات JEL : F13, O33, L87

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INTRODUCTION

Economic diversification represents a major strategic challenge for Algeria, whose economy has historically been heavily dependent on hydrocarbon exports. In the context of heightened global economic uncertainty, such dependence constrains both the stability and the long-term sustainability of economic growth. In 2023, hydrocarbons still accounted for more than 90% of Algeria's total exports, (Obeid, 2025) while non-hydrocarbon exports reached approximately USD 5.1 billion representing nearly 2% of GDP despite a noticeable upward trend since 2017 (World Bank, 2025). Against this backdrop, the digital transformation of trade and logistics has emerged as a critical lever for enhancing exporters' competitiveness and improving access to international financing, particularly in emerging economies seeking to diversify their export base. Technological innovation is profoundly reshaping international trade mechanisms through digital instruments that contribute to reducing transaction costs, shortening processing times, and mitigating risks associated with export operations. Recent studies highlight the role of digital trade infrastructure and logistics capabilities in strengthening firms' participation in global value chains and improving export performance.

Nevertheless, Algerian firms continue to face persistent challenges, including limited adoption of modern trade finance instruments, bureaucratic and logistical constraints, and an overall insufficient level of digitalization across trade-related processes. These structural, organisational, and regulatory barriers hinder their effective integration into global value chains and limit the potential gains from trade digitalization. Despite growing policy interest in digital transformation, empirical evidence on the digital maturity of trade and logistics systems in hydrocarbon-dependent economies remains scarce.

This study seeks to address this gap by providing an integrated assessment of the digital maturity of trade and logistics in Algeria. It aims to identify key strengths, weaknesses, opportunities, and threats through complementary PESTEL and SWOT analyses, used as exploratory diagnostic tools, and to formulate policy and managerial recommendations to accelerate digital transformation in support of non-hydrocarbon exports. In order to structure this assessment, the study draws on the Deloitte Digital Maturity Model as an analytical framework, combined with insights from the academic literature on digitalization and logistics capabilities. The central research question therefore examines the extent to which innovation and digitalization can enhance access to trade finance and logistics performance for Algerian exporters, while identifying the main barriers to their effective deployment.

1. Conceptual framework

1.1.Innovation in international trade

In the context of international trade, innovation extends beyond the mere introduction of new products to encompass the adoption of novel processes, organisational improvements, and the integration of new managerial practices. In an increasingly globalised economy, the diffusion of technological innovations in trade-related services, particularly in finance and logistics, plays a critical role in reducing transaction costs, streamlining processes, accelerating time-to-market, and enhancing exporters' competitiveness. Service innovations are particularly salient in this regard. These include electronic invoicing, digital payment platforms, international B2B

marketplaces, and integrated supply chain management solutions. Such innovations enable firms to coordinate more effectively with international partners and to respond more rapidly to market demands. Innovation thus emerges as a strategic lever for firms seeking to integrate more effectively into global value chains, especially in environments characterised by intense competition and heightened uncertainty. Empirical evidence supports this relationship. According to assessments by international organisations such as UNCTAD, the capacity of countries and firms to innovate in trade-related services, namely trade finance, logistics, and digital commerce is strongly associated with improved export performance and greater resilience to external shocks (UNCTAD, 2021). From this perspective, innovation in international trade should be understood not only as a technological phenomenon, but also as an institutional and organisational process shaping firms' international competitiveness.

1.2.Digitalization of trade finance

The digitalization of trade finance represents a multidimensional transformation encompassing a set of interconnected innovations. These include the use of electronic letters of credit (e-LC), the adoption of electronic rules issued by the International Chamber of Commerce (ICC), such as the eUCP and eURC, the issuance of electronic bills of lading (eBL), and the growing reliance on supply chain finance (SCF) platforms, as well as blockchain and distributed ledger technologies (DLT) to ensure document authenticity and interoperability.

These digital tools are fundamentally reshaping traditional trade finance operations by replacing paper-based document flows with electronic processes. As a result, they enhance transaction speed, security, transparency, and traceability, while reducing operational risks and administrative costs. Studies by BAFT and the ICC indicate that the COVID-19 crisis acted as a catalyst for the adoption of digital trade finance solutions, as physical document handling became increasingly constrained during periods of restricted mobility (BAFT, 2021). Among these technologies, blockchain plays a particularly catalytic role. Sectoral analyses suggest that blockchain-based solutions enable the creation of shared and immutable records of trade transactions such as payment commitments, transport documents, and invoices thereby reducing fraud, limiting operational errors, and strengthening trust among stakeholders (McKinsey, 2022). However, despite their potential benefits, the adoption of these technologies remains uneven across countries and firms, often constrained by regulatory, institutional, and technological barriers.

1.3.Logistics digitalization

In the logistics domain, digitalization manifests across multiple layers of the supply chain. Key technologies include the Internet of Things (IoT) for real-time cargo tracking, port community systems facilitating data exchange among port stakeholders, digital freight-forwarding platforms, and the dematerialisation of customs and transit documentation through electronic documentation systems.

These digital solutions enhance real-time visibility over physical flows, reduce the risks associated with documentation disputes, accelerate clearance and transit procedures, and lower

costs arising from errors, delays, or information asymmetries. By improving coordination and information sharing among supply chain actors, logistics digitalization contributes to more efficient and reliable trade operations.

Evidence from industry surveys supports these findings. An ICC study conducted within the framework of the Digital Trade Standards Initiative highlights the growing importance of electronic bills of lading, with users reporting significant gains in efficiency, data accuracy, and security compared to traditional paper-based (ICC, 2021). Consequently, logistics digitalization constitutes a critical complement to trade finance digitalization in enhancing overall export performance and supply chain resilience.

2. Historical development of trade digitalization: a synthetic review

The evolution of digitalization in international trade can be analysed through three chronological phases.

Before 2010: Digitalization was largely superficial. Firms primarily relied on Enterprise Resource Planning (ERP) systems to manage production or finance, while document management remained overwhelmingly paper based. Digital copies were limited, and interoperability among banking, logistics, and commercial systems was virtually nonexistent. Consequently, trade operations were constrained by slow manual processes and fragmented information flows, limiting firms' responsiveness to global market demands.

2010 - 2020: This period witnessed the emergence of Software-as-a-Service (SaaS) platforms dedicated to trade, the automation of banking processes through trade finance portals, and the development of initial standardised supply chain finance solutions. Banks and firms increasingly adopted digital workflows, though key documents such as letters of credit and bills of lading often remained paper based. Empirical evidence from emerging Southeast Asian markets indicates the productivity potential of partial digitalization: for instance, digitalising letters of credit in certain banks reduced LC processing time from seven to three days (ICC, 2018). Despite these gains, adoption remained uneven, and structural, regulatory, and technological barriers limited the full-scale deployment of digital trade solutions.

Post - 2020: The COVID-19 pandemic dramatically accelerated trade digitalization. Stakeholders including banks, freight forwarders, and port authorities sought to dematerialise documents, automate processes, and adopt blockchain-based solutions. Industry associations such as BAFT documented this acceleration, publishing frameworks like the Distributed Ledger Payment Commitment (DLPC) to transform payment commitments into digitally interoperable assets across DLT platforms (BAFT, 2021). Concurrently, the International Chamber of Commerce (ICC) updated its regulatory frameworks to accommodate digital trade: the eUCP (electronic Uniform Customs and Practice for Documentary Credits) and eURC (electronic Uniform Rules for Collections) were introduced to regulate the use of electronic documents in documentary credits and collections (ICC, 2019). These frameworks aim to ensure interoperability, legal certainty, and international acceptance of digital documents, thereby facilitating more efficient and secure trade finance operations.

3. Algerian specificities institutional framework and recent progress

Algeria presents a rapidly transforming digital ecosystem, yet persistent challenges remain. According to the UNCTAD eTrade Readiness assessment, several key observations emerge. While the ICT infrastructure is robust characterised by high mobile internet penetration, extensive 4G coverage, and increasing fibre-optic deployment the majority of e-commerce transactions remain domestic, and the share of electronic payments for goods continues to be low (DataReportal, 2025). Moreover, export procedures are only partially digitalised, highlighting the need for comprehensive digital platforms. UNCTAD emphasizes the importance of establishing a national single-window platform to streamline customs and trade formalities, a critical step towards facilitating international trade.

The Algerian legal framework has also strengthened in recent years. Legislation on e-commerce, electronic signatures, digital certification, and data protection has been enacted or is under development. Electronic signatures are now legally recognized, granting official status to digital documents a key milestone for the digitalization of commercial and financial transactions (Njoya, 2025). However, adoption among export firms remains limited, and national legislation is not yet fully aligned with international standards, such as those established by UNCITRAL. This partial alignment may hinder the interoperability of digital transactions with global trade partners.

Access to digital financing constitutes another major challenge, particularly for startups and SMEs. While initiatives such as startup funds and crowdfunding schemes exist, innovative financing mechanisms including equity crowdfunding are still underutilized in the context of digital trade and export operations (UNCTAD, 2024). Consequently, the combination of regulatory gaps, limited adoption of digital tools, and constrained access to innovative financing continues to impede Algeria's integration into global digital trade networks.

4. Analysis of innovation and digitalization in trade finance and logistics in algeria

Digital transformation has become a major lever for enhancing the competitiveness of emerging economies in international trade. In Algeria, modernising trade finance and logistics processes is a strategic imperative to boost non-hydrocarbon exports. This section provides an in-depth analysis to assess the progress made, current constraints, and opportunities arising from digitalization.

To achieve this, we employ a PESTEL framework (Johnson, G, Whittington, R, & Scholes, K, 2011) in combination with a Digital Maturity Assessment.

- PESTEL examines the national environment influencing trade digitalization.
- Digital Maturity Model provides a structured evaluation of the digitalization of logistics and financial processes (Deloitte, 2020).
- Together, these approaches offer a dual perspective: macro-level analysis of the national environment and micro-level assessment of internal system capabilities.

4.1.PESTEL analysis of trade and logistics digitalization in Algeria

This analysis identifies national factors that facilitate or hinder digitalization.

4.1.1. Political factors (p)

Since 2020, the Algerian government has demonstrated a clear commitment to modernising trade and promoting non-hydrocarbon exports. Digitalization is a strategic priority embedded in the Government Action Plan 2021–2024, which emphasises digital transformation of administration, deployment of online platforms, and simplification of customs procedures (RADP, 2021). Political support constitutes a major enabler of digital trade finance and logistics, as these sectors are highly regulated (e.g., letters of credit, CAD, customs formalities). Government mandates or incentives encourage banks, ports, public enterprises, and private exporters to adopt digital tools (JORADP, 2025).
However, the political environment remains highly centralised, which can slow the adoption of new technologies such as electronic signatures, eBL, or blockchain. Reforms progress gradually, limiting the acceleration of digital transformation.

4.1.2. Economic factors (e)

Algeria's economy remains heavily dependent on hydrocarbons, which account for approximately 92% of export revenues (World-Bank-Group, 2023). This dependence historically reduced the urgency to digitalise non-oil exports.
Nevertheless, policy measures aimed at diversification have stimulated demand for increased competitiveness. Between January and July 2025, non-hydrocarbon exports grew by 23% compared to the same period in 2024, reflecting a shift in economic incentives.
Digitalization presents several economic benefits:

- Automation of documentation flows → reduced processing times → enhanced attractiveness of Algerian exporters.
- Reduction of transit, port, and banking costs.
- Improved productivity across logistics chains.

The entrepreneurial ecosystem is also evolving, with the emergence of logistics and fintech startups, indirectly fostering innovation in international trade (e.g., Yassir Logistics). Yet, economic volatility, oil dependency, and foreign currency restrictions continue to limit investments in advanced technologies such as TMS, WMS, and blockchain.

4.1.3. Sociocultural factors (s)

In 2025, Algeria had 36.2 million internet users (76.9% penetration) and 54.8 million active mobile connections (116% of the population) with 91.4% high-speed coverage (3G/4G/5G) (DataReportal, 2025). This high digital literacy creates a sociocultural environment conducive to digital adoption. However, in trade, logistics, and banking sectors, traditional practices; paper documentation, stamps, and handwritten signatures, remain prevalent. Resistance to change persists due to perceived legal and operational risks.
A positive cultural shift is emerging, driven by entrepreneurial interest among young university students, inspired by successful export ventures such as El Mordjane. This entrepreneurial

momentum fosters an environment more receptive to innovation, exports, and economic openness.

4.1.4. Technological factors (t)

While national ICT infrastructure is improving through broader internet coverage, cloud solutions, and a growing tech startup scene, international trade digitalization requires advanced technologies (ICC, 2021):

- Logistics management systems (WMS/TMS)
- Port community systems (PCS)
- Blockchain for trade documents
- Electronic Bills of Lading (eBL)
- OCR and automated customs documentation

Currently, these technologies are partially deployed: some ports (e.g., DP World El Djenina) are digitalising operations but lack full automation; banks offer basic digital services without real e-LC or trade finance digitalization; and logistics chains remain poorly IT integrated (World-Bank, 2024).

4.1.5. Environnemental factors (e)

Digitalization reduces the environmental impact of trade operations (Zhilong Lou, Nan Gao, & Min Lu, 2024), through paperless workflows, route optimisation, and automated planning.

For Algeria, environmental challenges are twofold:

- ❖ Increase logistics efficiency and reduce energy losses.
- ❖ Align with international environmental standards (Emily Jones & Christopher Adam, 2023), including EU regulations on carbon border adjustment and logistics decarbonisation.

Exporters will soon need to demonstrate sustainable supply chains, making digitalization a prerequisite for market access.

4.1.6. Legal factors (l)

Significant progress has been made:

- E-Commerce Law (2018/2020) (Gouvernement-Algérien, 2020) ; Law n° 18-05 of 10 May 2018, regulates online commerce, e-contracts, consumer rights, and mandates commercial registration and national domain usage, providing a legal basis for digital transactions.
- Electronic signature framework (2025 draft law): Modernises electronic transactions and digital identity, enabling e-contracts, e-LC, and e-BL.
- Customs reforms: Implementation of ALCES for electronic processing of customs procedures improves traceability and reduces costs.

- International standards alignment: Algeria partially aligns with (UNCITRAL, 2021) for electronic documents and contracts, but has not yet fully adopted MLETR, limiting recognition of e-documents in international trade.

As a result, while the legal framework provides initial support, incomplete harmonisation with international standards constrains full adoption of e-LC, e-BL, and cross-border e-invoicing, and creates concerns over legal security in case of disputes.

4.1.7. Summary of PESTEL analysis

Algeria's environment presents favourable dynamics for trade and logistics digitalization, driven by institutional modernisation and gradual digital reforms in electronic transactions and customs systems. Economically, hydrocarbon dependence remains a constraint, yet growth in non-oil exports and macroeconomic stabilisation encourage adoption of digital solutions to enhance competitiveness. Digital usage spreads progressively among firms and consumers, albeit with disparities in skills and technology access. Emerging technologies; e-commerce, digital payments, blockchain, IoT, and e-documentation, facilitate faster, more traceable, and secure logistics. Environmental imperatives further motivate optimisation of supply chains and adoption of eco-efficient solutions. Finally, evolving legal frameworks strengthen trust in digital transactions and support gradual integration with international standards, creating conditions conducive to digital transformation of trade and logistics in Algeria.

Table (1): Summary of PESTEL Analysis – Digitalization in Algerian Trade and Logistics

Factor	Impact	Outcome
Political	+	Driver but slow progress
Economic	+	Strong diversification opportunities
Sociocultural	±	High acceptance but traditional practices persist
Technological	−	Technological level still insufficient
Environnemental	+	Positive international pressure
Legal	−	Incomplete framework constraining B2B export e-commerce

Source: Authors' compilation from the above analysis

4.2.Digital Maturity Assessment of trade finance and logistics in algeria

This section evaluates the digital maturity of trade finance and logistics in Algeria using the Deloitte Digital Maturity Model, which assesses organizational digital transformation across five key dimensions:

- Digital Strategy measures the vision and digital initiatives implemented by public and private institutions.
- Processes & Operations assesses workflow digitization, integration between stakeholders, and operational automation.
- Technology: evaluates the adoption and effectiveness of digital infrastructures and tools.
- Organization & Culture examines the capacity of institutions and human actors to adapt to digital changes.
- User Experience considers the quality and efficiency of digital services for end-users, particularly exporting companies.

4.2.1. Digital Strategy

Algeria's strategic orientation demonstrates a clear commitment to advancing a digitized economy, particularly in foreign trade. The government has implemented several structural reforms, such as the generalization of single-window platforms (GUCE, ANDI), progressive digitization of customs procedures (online declarations, digital tracking), and programs to modernize e-commerce and trade. In the banking sector, institutions have begun to digitize certain aspects of trade finance, including electronic document submission, online dossier consultation, and internal platforms for managing letters of credit (MF, 2024). However, exporting companies remain behind: few have formal digital strategies, investments in digital integration are low, and adoption of trade automation solutions remains limited.

4.2.2. Processes & Operations

International trade operations in Algeria are moving toward partial but uneven digitization. Port terminals operated by DP World have implemented digitized processes (appointment scheduling, flow management, container handling optimization), improving operational fluidity (DP-World, 2025). Nevertheless, integration between banks, freight forwarders, logistics platforms, and exporters remains weak, causing delays, duplications, and errors. Most trade documents (certificates of origin, invoices, bills of lading, LC dossiers) remain in paper format, generating higher processing costs and operational risks.

According to the ICC Digital Standards Initiative (DSI), lack of interoperability among stakeholders is a key barrier in emerging markets, which aligns with the Algerian case.

4.2.3. Technology

Le paysage technologique progresse mais reste inégal. Certaines solutions locales se développent, par exemple The technological landscape is progressing but unevenly. Local solutions, such as delivery tracking and fleet optimization platforms (e.g., Yassir Logistics), demonstrate growing digital capacity in logistics.

However, advanced technologies in international trade, such as blockchain for document traceability, electronic Bills of Lading (eBL), OCR for mass document digitization, and workflow automation, are still minimally deployed (Jovanović, Marin, Kostić, Nikola,

Sebastian, Ina M, & Sedej, Tomaz, 2022), Bien que TradeLens n'opère pas en Algérie, les obstacles identifiés ; faible interopérabilité, complexité de la gouvernance, reflètent probablement les défis rencontrés par les acteurs algériens dans l'adoption de solutions avancées de commerce international. While ICT infrastructure is improving (ITU, 2023), limited access to fixed high-speed broadband in some areas may constrain end-to-end digitalization, limiting the efficiency of fully integrated trade processes.

4.2.4. Organisation & Culture

Organizational culture remains predominantly paper-based across companies, administrations, and banks. Training in digital trade finance tools is limited, and exporters often rely on traditional procedures, hindering adoption even when digital solutions exist. Banks operate with hierarchical structures and heavy processes, slowing the introduction of digital workflows and automated compliance mechanisms. BCG studies in emerging markets (BCG, 2025) indicate that these organizational constraints are common barriers to digitalization in comparable countries.

4.2.5. User Experience

Digital services for companies have improved, particularly in banking (online account management, e-payments, online appointment scheduling). However, there is no unified national portal (World-Bank, 2025) allowing exporters to manage all procedures (customs, banks, certifications, logistics). World Bank surveys still classify Algeria among countries where import/export procedures remain lengthy and complex (World-Bank, 2019), due to limited end-to-end digitalization and the involvement of multiple unconnected stakeholders.

4.3.Synthesis and interpretation of results: SWOT analysis

To assess Algeria's digital maturity in trade finance and logistics, a SWOT framework was applied (Pearce, J. A & Robinson, R. B, 2013). This approach is widely recognized in strategic management for:

- Identifying internal strengths and weaknesses of existing systems (banks, ports, exporting companies).
- Highlighting external opportunities and threats (regulatory environment, regional competition, emerging technologies).
- Providing a structured, decision-oriented overview that informs targeted strategies to accelerate digital transformation.

4.3.1. Strengths

- Strong political commitment and clear digitalization agenda, including national programs, single-window platforms, and progressive customs digitization, creating a stable foundation for reform.

- High digital adoption among youth and startups, especially in logistics and fintech, fostering experimentation and innovation in export processes.
- Institutional initiatives and platforms (GUCE, ANDI, digital banking portals) support integration and provide a framework for scaling digital trade solutions.

Strategic insight: These strengths form a catalytic environment where public-private collaboration can accelerate digital trade adoption, particularly for non-oil exporters.

4.3.2. Weaknesses

- Persistent reliance on paper-based processes in trade documentation, slowing workflow efficiency and increasing operational risk.
- Limited integration between banks, customs, logistics providers, and exporters, creating fragmentation and delays.
- Insufficient technological capacity in ports, terminals, and financial institutions, limiting the deployment of advanced solutions like blockchain or eBL.

Strategic insight: Without targeted interventions, these weaknesses risk reducing competitiveness and constraining the full benefits of digital transformation.

4.3.3. Opportunities

- Adoption of blockchain, eBL, and fully digitalised letters of credit aligned with ICC standards, offering significant efficiency gains.
- Development of national digital platforms for exporters to streamline operations and improve end-to-end visibility.
- International partnerships (ICC, UNCTAD, ITU) can accelerate learning, provide best practices, and reduce adoption barriers.

Strategic insight: Exploiting these opportunities could rapidly modernize Algeria's trade finance ecosystem, increase export efficiency, and enhance global competitiveness.

4.3.4. Threats

- Regulatory lag compared to Tunisia, which may weaken Algeria's position in regional trade.
- Growing cybersecurity risks as digital adoption increases.
- Regional competition and global standards pressures, requiring urgent digital upgrades to maintain market access.

Strategic insight: Addressing these threats is critical to protecting export growth and ensuring that digitalization delivers tangible benefits rather than introducing new vulnerabilities.

Table (2): PESTEL vs SWOT Analysis of digital maturity in algerian trade finance and logistics

PESTEL ↓ / SWOT →	Strengths	Weaknesses	Opportunities	Threats
Political	Political commitment provides institutional legitimacy for digital reforms, creating a favorable top-down impulse.	Centralized decision-making slows implementation, reducing the effectiveness of announced reforms.	Ongoing reforms could enable the creation of an integrated national digital trade platform.	Delays in execution may widen the gap with faster-moving regional peers.
Economic	Diversification objectives increase strategic interest in digital trade and logistics efficiency.	Budget constraints and oil dependency limit sustained investment in advanced digital solutions.	Digitalization can reduce transaction costs and improve export competitiveness.	Macroeconomic volatility may postpone digital investments and weaken reform continuity.
Sociocultural	A young, digitally connected population represents strong latent demand for digital trade solutions.	Persistence of paper-based culture reflects organizational inertia and resistance to change.	New export-oriented entrepreneurs increase pressure for simplified, digital procedures.	Cultural resistance may slow adoption even when digital tools are available.
Technological	Emerging local startups and basic digital systems provide a foundation for further upgrades.	Limited interoperability and low adoption of advanced technologies constrain scalability.	Adoption of eBL, blockchain and ICC standards enables leapfrogging effects.	Cybersecurity risks and technological lag may undermine trust in digital trade systems.
Environmental	Digital tools support efficiency gains and reduced environmental footprint in logistics.	Absence of digital monitoring limits carbon traceability in export chains.	Alignment with EU environmental requirements (e.g. CBAM) can strengthen market access.	Failure to meet environmental standards may exclude exporters from regulated markets.
Legal	Existing laws on e-signature and e-commerce provide	Lack of full alignment with international	Legal harmonization could unlock full	Regulatory uncertainty may discourage

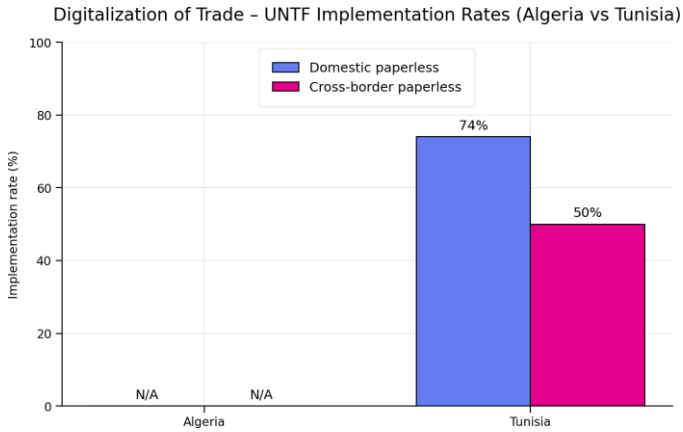
PESTEL ↓ / SWOT →	Strengths	Weaknesses	Opportunities	Threats
	a partial legal foundation.	frameworks (e.g. MLETR) limits legal certainty.	digitalization of trade finance instruments.	banks and exporters from adopting digital solutions.

Source: Authors' compilation from the above analysis

5. Comparative overview of trade & logistics digitalization: Algeria and Tunisia

To anchor the macro–micro diagnostic in comparable evidence, Figure 2 reports UN Global Survey on Digital & Sustainable Trade Facilitation (UNCTAD, 2025) implementation rates for paperless trade and cross-border paperless trade. Tunisia shows significant progress in digital trade facilitation, whereas Algeria's 2023 country profile does not publish comparable results, precluding a direct performance comparison for that year. This evidence supports the need to accelerate dematerialization prior to the digital maturity deep dive.

Fig (1): Digitalization of trade – UNTF 2025 Implementation rate



Source: Author's compilation from (UNCTAD, 2025)

Note: Algeria's UNTF 2025 country profile does not publish digital-trade results; therefore "N/A" is shown for Algeria. For context only, Algeria's Logistics Performance Index (LPI) score is 2.5/5 (World-Bank, 2023), reflecting broader logistics performance challenges.

Table (3): Comparative overview (Algeria and Tunisia)

Analytical Dimension	Algeria	Tunisia
National Single Window	Partial/fragmented, under construction: export digital single window announced;	Integrated (TTN): long-standing e-single window and e-invoicing

	APCS–ALCES port–customs interconnection launched.	operator; cross-border integration remains partial.
e-LC / e-BL adoption	Very limited (pilots); no MLETR alignment yet.	Moderate and rising: e-invoicing in place; UN Survey shows paperless LC payment implemented, but eBL not generalized.
Legal recognition of digital trade docs	Partial: MLETR not adopted.	Progressive alignment (e-signature/e-invoice), but MLETR not adopted.
Bank–Port–Customs interoperability	Low but improving (APCS–ALCES interconnection) (Algerie Eco, 2024).	Medium (TTN connects core actors; cross-border still partial).
Strategic positioning	Catch-up phase.	Intermediate.

Source: Author's compilation from (Ministry of Finance – Algeria, 2025); (World Bank, 2017); (World Bank, 2023); (UNCTAD/United Nations, 2014–2018); (UNTF, 2025).

From a comparative standpoint, Algeria's trade and logistics digitalization remains at an earlier stage than Tunisia, particularly in terms of system integration and the operationalization of digital trade platforms. While recent reforms in Algeria, such as the planned export single window and port–customs interconnection, indicate a trajectory toward acceleration, implementation gaps and limited interoperability continue to constrain progress (Ministry of Finance – Algeria, 2025).

6. Strategic recommendations for advancing trade and logistics digitalization in algeria

Digitalization has become a critical determinant of international trade competitiveness, particularly for emerging economies seeking deeper integration into global value chains. In Algeria, export-oriented firms and financial institutions continue to face fragmented information flows, paper-based trade documentation, and lengthy logistics and financing processes, which constrain efficiency and limit export performance beyond hydrocarbons.

Building on the results of the digital maturity assessment and the SWOT analysis, this section proposes a set of targeted and prioritised strategic recommendations aimed at accelerating the digital transformation of trade finance and logistics in Algeria. Rather than reiterating diagnostic findings, these recommendations translate analytical insights into actionable policy and managerial measures, addressing government authorities, financial institutions, and exporting firms.

6.1. Deploying a fully integrated national digital single window (Government-led Action)

The establishment of a fully operational digital Single Window represents a foundational reform for trade digitalization. Such a platform should enable exporters and importers to manage all trade-related procedures through a unified interface, including customs declarations, certificates

of origin, regulatory approvals, banking documentation, electronic payments, and shipment tracking.

Although Algeria has initiated a Single Window framework through existing platforms such as the GUCE, its current scope remains limited and insufficiently connected to banking systems and logistics operators. A comprehensive digital Single Window should integrate e-trade services, interoperable payment solutions, and real-time logistics data exchange.

International experience suggests that fully integrated Single Window systems can reduce trade processing times by 20–30%, significantly lower documentation errors, and enhance transparency and coordination across public and private stakeholders. For Algeria, such a reform would directly improve export reliability and procedural efficiency.

6.2. Accelerating the adoption of e-LC and e-BL (joint action by government, banks, and firms)

The transition toward electronic Letters of Credit (e-LC) and electronic Bills of Lading (e-BL) is essential to modernising trade finance and securing cross-border transactions. Digital trade documentation enhances traceability, reduces fraud risks, and shortens processing cycles, in line with ICC trade digitisation standards.

While mature international solutions such as Bolero or essDOCS demonstrate the feasibility of fully digital trade documentation, adoption in Algeria remains limited due to regulatory uncertainty and weak interoperability between banks, logistics providers, and port authorities. A phased national adoption strategy, starting with pilot projects in major ports (Algiers, Oran, Annaba) and leading export-oriented banks, would allow stakeholders to test, adapt, and gradually scale these solutions. Such an approach would improve documentary compliance, accelerate transaction settlement, and strengthen Algeria's integration into global trade finance networks.

6.3.Strengthening digital skills and changing management for exporters (firm-level action with public support)

Digital transformation is not solely a technological challenge but also an organisational and human one. Many Algerian exporting firms, particularly SMEs, lack practical expertise in digital trade platforms, cybersecurity practices, and electronic documentation workflows. To address this gap, structured and continuous capacity-building programmes should be implemented, combining technical training, applied workshops, and advisory support. Initiatives such as digital mentoring schemes, export-focused incubators, and university–industry partnerships could play a key role in facilitating knowledge transfer and accelerating adoption. By strengthening digital capabilities at the firm level, exporters can reduce operational errors, improve compliance, and fully leverage the efficiency gains offered by digital trade systems.

6.4.Investing in smart and connected logistics infrastructure (private investment with institutional support)

Effective digitalization requires physical logistics infrastructures to be digitally connected and data driven. Key technologies include Transport Management Systems (TMS), Warehouse Management Systems (WMS), RFID and IoT solutions for cargo tracking, and automated document processing tools such as OCR. For example, container terminals such as DP World Algiers could integrate RFID-enabled tracking systems and TMS platforms connected to banking and customs systems, enabling real-time visibility of cargo flows and financial transactions. Such integration would enhance operational transparency, reduce disputes, and improve end-to-end logistics performance, potentially generating productivity gains of up to 25% in cargo handling and coordination.

6.5. Promoting public–private technological partnerships (System-wide Action)

Public–private partnerships represent a strategic lever for accelerating digital innovation while reducing individual investment risks. Collaboration between government agencies, banks, logistics operators, startups, and international technology providers can facilitate experimentation and local adaptation of advanced digital trade solutions. Pilot partnerships involving actors such as logistics startups, port operators, and domestic banks could support the testing of e-LC, e-BL, and export tracking platforms. Government support through fiscal incentives, regulatory sandboxes, and interoperability standards would further accelerate diffusion and scalability, particularly for SMEs.

Conclusion

Algeria possesses significant potential for digital transformation, supported by political commitment, a digitally connected youth population, and ongoing institutional reforms. Nevertheless, the transition toward fully digital trade and logistics systems remains constrained by structural, organisational, and regulatory limitations, as well as the persistent reliance on paper-based processes.

This study addressed the central question of how innovation and digitalization can enhance access to trade finance and logistics performance for Algerian exporters, and what barriers continue to hinder this transformation. The findings demonstrate that process optimisation, advanced technology adoption, and capacity-building among exporters are critical enablers of effective digitalization.

The implementation of integrated digital Single Windows, electronic trade documents, smart logistics infrastructure, and coordinated public–private initiatives constitute not merely a technical upgrade, but a strategic pathway toward export diversification and deeper integration into global value chains. In this sense, digitalization emerges as a key driver of long-term competitiveness, economic diversification, and resilience of Algeria’s external trade system.

List of abbreviations

Abbreviation	Meaning
UNCTAD	United Nations Conference on Trade and Development

ICC	International Chamber of Commerce
eUCP	Electronic Uniform Customs and Practice for Documentary Credits
eURC	Electronic Uniform Rules for Collections
SCF	Supply Chain Finance
DLT	Distributed Ledger Technology
BAFT	Bankers Association for Finance and Trade
DLPC	Distributed Ledger Payment Commitment
TMS	Transport Management System
WMS	Warehouse Management System
PCS	Port Community System
CBAM	Carbon Border Adjustment Mechanism
UNCITRAL	United Nations Commission on International Trade Law
ALCES	Algerian Customs Electronic System
MLETR	Model Law on Electronic Transferable Records
DSI	Information Systems Department
OCR	Optical Character Recognition
ITU	International Telecommunication Union

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