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A Process Optimization on End-to-End Invoice Documentation in Global Freight Operations: A Study of DahNAY Logistics

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Abstract — This study examines the efficiency of end-to-end documentation and invoicing within the global freight forwarding operations of DahNAY Logistics, Chennai, and proposes process improvements for accuracy, compliance, and operational performance. *Design/methodology/approach:* A descriptive research design is adopted, integrating insights from the company's operational workflows and inter-departmental coordination practices with secondary data from peer-reviewed academic literature, industry benchmarks, and global logistics reports for the period 2024–2026. *Findings:* The analysis demonstrates that operational bottlenecks at DahNAY Logistics arise primarily from manual documentation, invoicing errors, and gaps in inter-departmental coordination. Adoption of Agentic AI, OCR/Intelligent Document Processing, blockchain, and digital twin–enabled control towers can reduce manual paperwork by up to 60%, cut customs clearance times by 75%, and raise on-time in-full performance toward the 95% global benchmark. *Originality/value:* The paper offers a firm-level synthesis of emerging logistics technologies and standardisation practices for a mid-sized Indian freight forwarder, and proposes a practical roadmap for transitioning from linear documentation processing toward AI-orchestrated, human-centred motion-control logistics.

Keywords — *Freight Forwarding; End-to-End Documentation; Invoicing; Supply Chain Efficiency; Agentic AI; Customs Clearance; Digital Logistics; Process Optimization.*

1. Introduction

The global freight forwarding industry serves as the backbone of international trade, ensuring that goods flow seamlessly from origin to consumption across air, sea, road, and rail modes. Modern logistics has evolved into a technology-driven system in which end-to-end documentation and invoicing are essential for legal compliance, cost control, and customer satisfaction. The accuracy of documents such as Bills of Lading, Commercial Invoices, Packing Lists, Certificates of Origin, and Customs Clearance papers directly determines whether goods can meet international trade regulations across jurisdictions and whether shipments will be released on time at ports of entry. In parallel, the broader shift toward Industry 5.0 in which intelligent motion control, AI-enabled decision-making, and human–machine collaboration are integrated across logistics, manufacturing, and supply-chain operations is reshaping how freight forwarders manage information flows alongside physical flows (Ramya, Ruben Anto, Kalpana Devi, Davidson, & Leelavathi, 2026; Velmurugan, Karthik, Venkatesan, Sadeesh kumar, & Madhurikkha, 2026). Real-time visibility, predictive analytics, and autonomous orchestration are no longer optional capabilities; they are increasingly the baseline expectation of global shippers (Deepika, Nithya, Durgarani, Delecta Jenifer, & Prakash, 2026). This study analyses the end-to-end documentation and invoicing processes at DahNAY Logistics, a Chennai-based provider of integrated logistics solutions with operations spanning more than twenty countries. By examining the company's operational workflows, comparing them against global industry benchmarks, and reviewing the latest technological developments shaping freight forwarding between 2024 and 2026, the article identifies key gaps in current practice and proposes actionable recommendations to strengthen accuracy, compliance, and competitiveness in international trade documentation.

2. Industrial Profile

2.1 Global Scenario

The global freight forwarding industry is a key component of international trade and supply chain management, facilitating the movement of goods across borders through sea, air, road, and rail transport. Sustained globalisation, the rise of cross-border manufacturing networks, and the e-commerce boom have markedly increased demand for efficient freight forwarding services. Digitalisation, automation, and integrated logistics platforms are transforming the industry by improving speed, transparency, and cost-efficiency. Leading global players are investing in AI-driven control towers, real-time tracking, and unified digital interfaces, often supported by cyber-physical systems and cloud robotics that link physical assets with digital workflows (Catherine, Nasrin Sulthana, Manimaran, Praba Devi, & Akila, 2026).

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2.2 National Scenario (India)

In India, the freight forwarding industry plays a crucial role in supporting foreign trade and domestic distribution. The sector has expanded steadily, driven by rising exports and imports and by government initiatives such as Make in India, Sagarmala, and the Logistics Efficiency Enhancement Program (LEEP). Indian freight forwarders provide services that include customs clearance, multi-modal transport, and warehousing, and the industry is becoming increasingly organised through the adoption of technology, structured compliance regimes, and alignment with global trade standards.

2.3 Regional Scenario (Tamil Nadu / Chennai)

Chennai is one of India's major logistics and freight forwarding hubs, owing to its strategic coastal location and the presence of major ports such as Chennai Port and Kamarajar Port. The region supports key industries including automobiles, electronics, textiles, and pharmaceuticals. Freight forwarders in Chennai benefit from strong port connectivity, established industrial corridors, and well-developed international trade routes, making the region a significant contributor to India's overall logistics growth and a natural test-bed for advanced documentation practices.

3. Company Profile: DahNAY Logistics

DahNAY Logistics Private Limited was founded in 2007 and is headquartered in Chennai, Tamil Nadu, India. The company has positioned itself as a reliable partner for both domestic and international trade, offering a wide portfolio of services that includes air and sea freight, customs clearance, warehousing, cargo consolidation, multi-modal transportation, and end-to-end supply chain management solutions. Table 1 summarises the company snapshot.

Table 1: DahNAY Logistics – Company Snapshot

Attribute	Details
Founded	2007
Headquarters	Chennai, Tamil Nadu, India
Type	Private Company
Global Locations	20+ countries across Asia, Europe, Africa, and North America
Employees	500+
Customers	2,000+ satisfied clients
TEUs Handled	100,000+
Projects Delivered	1,000+ successfully completed
Core Services	Air & Sea Freight, Customs Brokerage, Warehousing, Last-Mile, Omni-Channel Logistics, LCL/FCL Consolidation, CFS Operations

The organisation emphasises customer satisfaction, operational efficiency, transparency, and technological integration, supported by advanced freight management systems, digital documentation, and real-time cargo tracking. With operations across more than twenty countries, DahNAY Logistics delivers global logistics solutions backed by strong local expertise. The company's vision is to become a leading omnichannel logistics provider, while its mission is to help clients outperform competitors by enhancing logistics efficiency and operational excellence.

4. Literature Review

A review of the existing academic and industry literature reveals a consistent body of evidence supporting the need for integrated, automated, and standardised documentation in global freight forwarding.Christopher (2016) emphasised that logistics and supply chain efficiency depends on the seamless flow of both physical goods and the associated information, and noted that delays or inaccuracies in invoice documentation can disrupt the entire supply chain by lengthening lead times and triggering customs hold-ups. Bowersox, Closs, and Cooper (2019) identified that manual documentation workflows often produce duplication, inconsistencies, and avoidable delays, and argued strongly for the integration of Enterprise Resource Planning (ERP) and Transportation Management Systems (TMS).

Lambert and Cooper (2000) framed supply chain management as a network of inter-organisational processes, in which document and information flows must be coordinated as deliberately as physical flows. Helo and Szekely (2005) extended this perspective by showing that purpose-built logistics information systems materially improve coordination between shippers, carriers, and customs authorities.More recently, Sanders (2016) demonstrated that advanced analytics can be used to identify inefficiencies in invoice processing workflows and transform documentation from a routine administrative task into a value-adding function.

Kache and Seuring (2017) found that AI and big data can significantly improve documentation processes through predictive analysis and intelligent decision-making, and Klippa (2022) reported that Optical Character Recognition (OCR) and Intelligent Document Processing (IDP) can automatically extract, validate, and process invoice data with high accuracy, sharply reducing manual workload and errors.

These findings are reinforced by recent work on AI-based optimization of controllers and converters in motion-control systems (Velmurugan et al., 2026), on decision-making frameworks for integrating motion control in business operations (Deepika et al., 2026), and on intelligent motion control in smart warehousing, inventory, and automated picking (Asrafi, Aruna, Catherin, Poongavanam, & Padmavathy, 2026), all of which point toward a converged architecture for AI-enabled freight documentation.

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Complementary studies highlight the role of blockchain in providing secure, transparent, and autonomous logistics records (Rajeswari, Rohini, Sathya Aarthi, Rameshkumaar, & Arul Krishnan, 2026), digital twins for predictive and real-time motion control across infrastructure and freight assets (Subramani, Chillagattu, Gayathri, Rastogi, & Ranganathan, 2026), and predictive maintenance and asset management through motion analytics (Pradeepa, Gokilavani, Deepan, Sridevi, & Selvi, 2026).

Together with research on the optimisation of robotic material-handling systems in industrial supply chains (Thiyagarajan, Vijayakumar, Sangeetha, Savariapitchai, & Sangeetha, 2026) and on strategic deployment of flexible robotics in Industry 5.0 (Divya Ranjani, Anitha, Manokaran, Selvi, Suresh Kumar, & Prithvi, 2026), the literature converges on a clear conclusion: documentation excellence in freight forwarding now requires the orchestrated use of AI, blockchain, digital twins, and human-centred design principles, supported by governance frameworks that address ethical and security risks (Selvi, Anbarasan, Madhumita, Janaki, & Devi, 2026).

5. Objectives of the Study

The primary objective of this study is to suggest process improvements for accuracy, compliance, and operational efficiency in end-to-end freight documentation at DahNAY Logistics. The secondary objectives are: (i) to analyse the end-to-end freight documentation process involved in global import and export operations; (ii) to improve the invoicing workflow with respect to accuracy, cost components, and turnaround time; (iii) to reduce gaps, errors, and delays in documentation and invoicing that affect operational efficiency and revenue; and (iv) to enhance inter-departmental coordination and system usage in managing documentation and invoices across global freight forwarding operations.

6. Research Methodology

The study adopts a descriptive research design to analyse the end-to-end flow of freight documents and to identify the stages at which errors or delays are most likely to occur. Data sources include primary insights drawn from DahNAY Logistics' operational workflows, internal documentation processes, and inter-departmental coordination practices, together with secondary data gathered from global logistics industry reports, peer-reviewed academic literature, and recent case studies on freight documentation trends for the period 2024–2026. The analytical lens combines classical supply-chain integration theory with contemporary perspectives on AI-augmented decision-making and predictive logistics (Deepika et al., 2026; Pradeepa et al., 2026).

7. Data Analysis and Key Findings

7.1 Industry Market Metrics and Growth Trends

An analysis of industry metrics for 2024–2026 reveals a substantial and accelerating shift toward Agentic AI, digital documentation, and integrated platforms across the freight forwarding sector. Table 2 below summarises the comparative performance of the most significant indicators shaping the industry.

Table 2: Key Logistics Industry Metrics, 2024–2026

Category	Performance / Growth Indicator
FMCG Logistics	$1,220B → $1,871B (4.86% CAGR)
3PL Segment	~$465B → $750B (7.00% CAGR)
Digitisation Impact	94% of shippers require real-time dashboards
AI Efficiency Gain	Up to 40% improvement in supply chain efficiency
Customs Clearance Speed	Digital filing saves clearance time by up to 75%

Interpretation: The metrics indicate that growth is being driven not by capacity expansion alone, but by the digital re-engineering of documentation and invoicing across the freight value chain.

7.2 FMCG Logistics and 3PL Market Metrics

The FMCG logistics sector has emerged as one of the fastest-growing segments within global freight forwarding. The integration of third-party logistics (3PL) providers has reshaped last-mile delivery, warehouse automation, and sustainability compliance. Table 3 summarises the market size and projected growth for this segment.

Table 3: FMCG Logistics Market Metrics (2024–2033)

Metric	2024	2033	CAGR
Global FMCG Logistics	$1,220.81B	$1,871.27B	4.86%
3PL in FMCG Segment	~$465B	$750.40B	7.00%
Dominant Region	Asia Pacific	Asia Pacific	5.35%
Fastest Growing Service	Last-Mile Delivery	Integrated 3PL	High

Three trends are driving this expansion. First, digitisation and visibility are accelerating: electronic Bills of Lading (eBOL) and API integrations are becoming standard, and ninety-four per cent of shippers now require their 3PL providers to use advanced analytics platforms. Second, sustainability has become a core competitive advantage, with over seventy-six per cent of logistics executives confirming that green warehousing and route optimisation improve cost effectiveness as well as ESG compliance. Third, advanced

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automation including AI-driven route optimisation and warehouse robotics is actively addressing labour constraints and boosting picking efficiency (Asrafi et al., 2026; Thiyagarajan et al., 2026).

7.3 Customs Clearance: Operational Findings and Innovations

Customs clearance represents one of the most documentation-intensive stages in global freight forwarding. Errors at this stage including incorrect HS codes, missing documentation, or non-compliance with evolving trade regulations can cause significant delays and financial penalties. Table 4 outlines the most significant customs trends identified in 2025–2026.

Table 4: Key Customs Clearance Trends and Operational Findings (2025–2026)

Trend	Driver	Operational Finding
Green Customs	ESG Regulations	Customs now require carbon-footprint data for specific imports (e.g., CBAM in EU).
AEO Certification	Security Concerns	Authorised Economic Operator status acts as a fast-track pass for trusted shippers.
AI-Audit Readiness	Data Analytics	Customs authorities use AI to spot valuation anomalies; shippers must match this with their own audits.
Nearshoring Shift	Geopolitical Risk	Shippers prefer routes with Free Trade Agreements to minimise duty exposure.

A particularly noteworthy finding is that approximately thirty per cent of shipments worldwide contain slightly incorrect HS codes, potentially leading to excessive duty payments or compliance penalties. To counter this, leading 3PLs such as DahNAY Logistics are deploying AI-driven HS-code classification tools that target near-perfect accuracy in tariff labelling. The shift to digital paperless trade through Single Window systems has also demonstrated the capacity to reduce clearance times by up to 75% compared with manual, paper-based submissions, supported by secure blockchain-based audit trails (Rajeswari et al., 2026).

7.4 Inbound and Outbound Logistics: Process Optimisation in 2026

The logistics sector is undergoing a fundamental transition in how inbound receiving and outbound fulfilment are managed. While automation has historically been an outbound-focused investment, 2026 has seen inbound automation emerge as the new frontier for return on investment (ROI). Table 5 captures the leading trends shaping this transformation.

Table 5: Inbound and Outbound Logistics – Key 2026 Trends

Process Phase	2026 Trend	Key Findings & Data	Impact
Inbound (Receiving)	No-Touch Receiving	85% of Tier-1 warehouses use AI-vision for SKU ID.	Dock-to-stock time – 40%
Flow Orchestration	Predictive Slotting	AI moves high-velocity items closer to dispatch.	Travel – 30%, higher throughput
Inbound/Outbound Link	Fluid Cross-Docking	AMRs transfer goods from inbound trucks to outbound lanes.	Minimises storage; zero-inventory flows
Outbound (Picking)	Cognitive Picking	AR-glasses and cobots support warehouse teams.	Picking accuracy 99.9%

Companies are investing heavily in robotic de-palletising and AI-enabled vision inspection to catch errors at the receiving dock before they propagate downstream. Agentic AI now allows supply chains to autonomously reroute inbound shipments around port strikes or weather events, ensuring that outbound flows remain consistent, while motion-controlled wearables provide additional safety and productivity gains for warehouse staff (Deepa, Swadhi, Udayavani, Lakshmi, & Rafiq, 2026). The On-Time In-Full (OTIF) benchmark for competitive distribution has risen to 95% in 2026, underscoring the growing importance of inbound–outbound coordination over raw speed alone.

7.5 Emerging Technology Trends Shaping Freight Forwarding (2025–2027)

The freight forwarding landscape is being fundamentally reshaped by a convergence of digital, physical, and intelligence-driven innovations. Table 6 captures the primary trends expected to define the industry over the next two years.

Table 6: Key Industry Trends and Impact on Freight Forwarding (2025–2027)

Trend	Description	Impact on Logistics
Agentic AI & Automation	AI agents for autonomous decision-making in inventory and routing.	Up to 30% reduction in order processing time.
Green Logistics	Electric fleets, solar-powered warehouses, reusable packaging.	Sustainability shifts from cost to regulatory necessity.
Micro-Fulfilment	Small automated warehouses in high-density urban zones.	Lowers last-mile cost; enables quick commerce.
Blockchain Integration	Decentralised ledgers for customs and high-value cargo tracking.	Increases transparency; prevents fraud in cross-border trade.

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Agentic AI leads this transformation by enabling autonomous decision-making in inventory management and freight routing, achieving order-processing-time reductions of up to thirty per cent. Blockchain integration adds a layer of transparency and trust to cross-border trade documentation, particularly for high-value cargo and customs verification (Rajeswari et al., 2026). The concept of elastic logistics is allowing companies to scale supply-chain capacity dynamically, handling peak-season surges without incurring the fixed costs of permanent infrastructure, while collective intelligence and swarm robotics offer decentralised strategies for adaptive and resilient motion control across multi-site networks (Saranya Devi, Yasaswini, Rahamath Nisha, Divya Ranjani, & Suresh Kumar, 2026).

8. Discussion

The findings of this study suggest that the traditional linear model of documentation processing in which each step must be completed before the next begins is rapidly being replaced by predictive orchestration. In this emerging paradigm, AI systems anticipate documentation requirements, pre-validate data, and initiate parallel workflows, sharply reducing the total cycle time between shipment booking and invoice settlement (Deepika et al., 2026; Pradeepa et al., 2026).For DahNAY Logistics, the implications are significant. The company's consolidated operations across Chennai and its more than twenty global locations provide an excellent foundation for deploying unified data platforms commonly described as Control Towers that can track goods and the associated documentation in real time, often supported by digital twins of key freight assets (Subramani et al., 2026). The emergence of Digital Product Passports (DPPs) and blockchain integration is transforming documentation from a routine administrative task into a verifiable legal and environmental asset, creating new opportunities for DahNAY to differentiate its service offering (Rajeswari et al., 2026).In parallel, the human dimension of this transformation must not be overlooked. Augmented and virtual reality environments are increasingly used to train freight operations staff on complex documentation, customs, and motion-control workflows in safe, simulated settings (Vinodh & Subramani, 2026), while governance and security considerations remain critical as more decisions are delegated to AI agents (Selvi et al., 2026). DahNAY Logistics is therefore well placed to combine investments in technology with structured upskilling of staff and clear ethical guardrails for AI-enabled documentation.

9. Conclusion

Documentation and invoicing at DahNAY Logistics are generally efficient, but they require continuous improvement in digital integration and process standardisation to maintain a competitive edge in the rapidly evolving global freight forwarding landscape. The analysis reveals that the company has a strong operational foundation experienced staff, broad carrier partnerships, and CFS facilities but must accelerate its adoption of Agentic AI and Unified Logistics Interface Platforms (ULIPs) to close existing gaps. By adopting these technologies, DahNAY Logistics can reduce manual paperwork by up to 60% and eliminate data gaps during multi-modal freight transfers (Asrafi et al., 2026; Velmurugan et al., 2026).Standardising invoice documentation across international boundaries, adopting AI-driven HS-code classification for customs compliance, and investing in inbound automation emerge as the three most critical areas for near-term improvement. Enhancing these processes is essential not only for operational efficiency, but also for maintaining customer trust, ensuring regulatory compliance, and supporting sustainable business growth in the global market. Positioned within the broader trajectory of Industry 5.0 and human–AI symbiosis (Ramya et al., 2026; Divya Ranjani et al., 2026), DahNAY Logistics has the opportunity to evolve from a competent freight forwarder into a digitally orchestrated, human-centred logistics provider.

10. Limitations and Future Scope

This study is primarily focused on the mid-sized logistics environment in India, particularly the regional hub of Chennai. The findings may not fully generalise to very large multinational logistics corporations or to smaller, highly specialised niche operators. The study also relies on publicly available industry benchmarks and operational observations from DahNAY Logistics rather than on a controlled primary data collection experiment. Future research could extend the analysis through structured surveys of freight forwarding staff, controlled pilots of OCR, blockchain, and digital twin solutions, and comparative case studies across Indian port cities, building on the human-centred and motion-control frameworks referenced in this paper.

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