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Reframing Global Logistics and Delivery Systems:

From DfL Principles to the GVIDS Execution System

Contents

1 Executive Summary

Global logistics and delivery systems are experiencing a persistent decline in predictability due to exogenous shocks, trade policy uncertainty, structural physical and network constraints and traditional execution model limitations. In response, LC Sign redefines the traditional delivery model ("Design → Manufacturing → Logistics → Installation") by introducing **Design for Logistics (DfL)**, where logistics is no longer a downstream function but an embedded design constraint, reshaping the workflow into a constraint-driven system.

Building on this principle, LC Sign develops **the GVIDS(the Global Visual Infrastructure Delivery System) framework** as an operational system that translates external constraints into deterministic execution outcomes through a three-layer architecture. The Constraint Layer defines system feasibility boundaries, the Engineering Layer converts constraints into modular and optimized design solutions, and the Execution Layer ensures coordinated global production, logistics orchestration, and RTI (Ready-to-Install) delivery.

This integrated system delivers five dimensions of commercial value: cost predictability, schedule reliability, risk mitigation, execution consistency, and scope clarity. The Jambo Mart project further validates the system through modular engineering adaptation, environmental constraint pre-configuration, and RTI execution in real-world cross-border conditions. Overall, GVIDS represents LC Sign's structured response to increasing global delivery uncertainty, offering a scalable and constraint-driven approach to modern international logistics and delivery systems.

2 Opening: Global Logistics and Delivery Systems are Losing Their Predictability

Traditional international logistics and delivery systems are undergoing a structural transformation, marked by a steadily increasing loss of predictability. While such uncertainties are difficult to measure and often complex to interpret, recent studies and measurement initiatives have increasingly documented heightened levels of uncertainty[1]. What was once a relatively stable and rule-based global flow of goods is now increasingly exposed to multi-dimensional sources of disruption, making planning, execution, and performance assurance significantly more complex.

[1] The Organisation for Economic Co-operation and Development-Economic Security in a Changing World: https://www.oecd.org/en/publications/economic-security-in-a-changing-world_4eac89c7-en/full-report/economic-security-and-vulnerabilities-in-international-supply-chains_dc88aefa.html

This growing unpredictability is not an isolated phenomenon but a systemic condition emerging across global trade networks. It introduces compounding challenges for multiple stakeholders, including manufacturers, logistics providers, and end clients. These challenges are reflected in rising uncertainty in lead times, increased variability in transport reliability, and reduced visibility across end-to-end delivery chains.

As a result, decision-making in global logistics is shifting from deterministic planning toward probabilistic and risk-adjusted execution environments, where variability has become a structural feature rather than an exception.

3 The Core Problem: Systemic Predictability Breakdown

The core problem is a systemic breakdown in the predictability of global logistics and delivery systems, closely associated with the increasing interaction and amplification of diverse and interconnected supply chain risks. According to the 2025 OECD Supply Chain Resilience Review Launch, in recent years we have observed the emergence and intensification of a range of risks, including external shocks, trade policy uncertainty, infrastructural and network bottlenecks and traditional execution model limitations[2].

The supply chain forms the structural and value flow foundation of global logistics and delivery systems, while logistics functions as the operational architecture. Disruptions propagate through their interconnected dynamics, creating systemic impacts on global logistics and delivery performance.

3.1 Exogenous Shocks

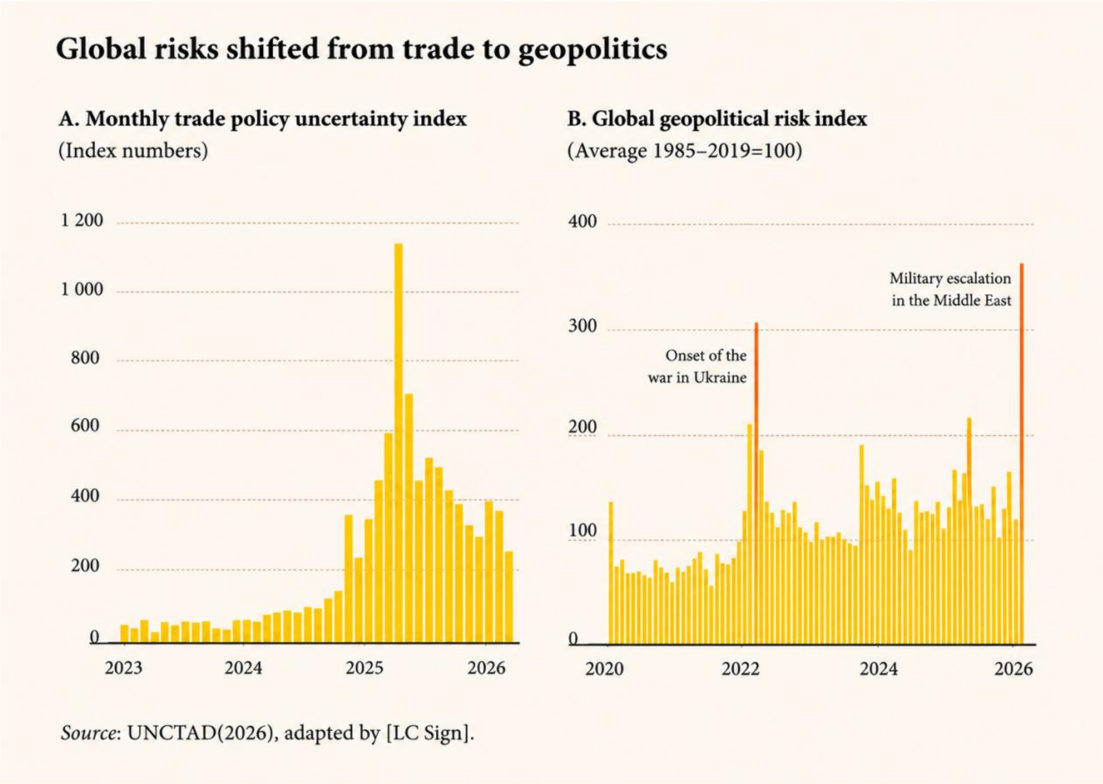
Exogenous shocks represent a primary driver of systemic predictability breakdown in global logistics and delivery systems. Events such as pandemics, armed conflicts, and extreme weather can disrupt cross-border flows, increase energy costs, and destabilize transportation networks[3]. **While 2025 was largely shaped by trade policy uncertainty, early 2026 has been marked by heightened geopolitical risks** (Figure 1). In early March 2026, escalating conflict in the Middle East triggered significant volatility in global energy markets, with o**il prices rising by**

[2] The Organisation for Economic Co-operation and Development-2025 OECD Supply Chain Resilience Review Launch: https://www.oecd.org/en/about/news/speech-statements/2025/06/2025-oecd-supply-chain-resilience-review-launch.html

[3] World Trade Organization-Global Trade Outlook and Statistics March 2026: https://www.wto.org/english/res_e/booksp_e/gtos0326_e.pdf

more than 60% and gas prices more than doubling within days (Figure 2). These sudden disruptions demonstrate how external shocks can rapidly transmit through global supply chains, affecting transportation costs and delivery predictability.

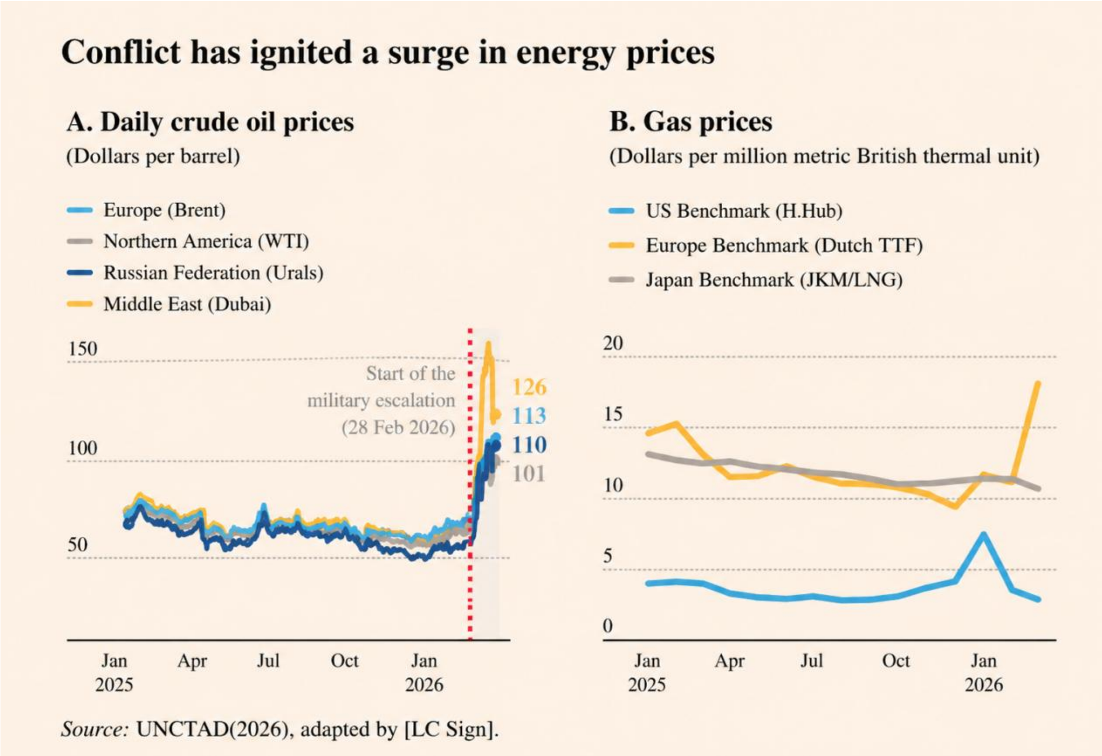
Figure 1: Global riks shifted from trade to geopolitics



Source: UNCTAD(2026)[4]

[4] The United Nations Conference on Trade and Development-Trade and Development Foresights 2026 Global Economy Faces a Geopolitical Challenge: https://unctad.org/system/files/official-document/gds2026d1_en.pdf

Figure 2: Conflict has ignited a surge in energy prices



Source: UNCTAD(2026)[5]

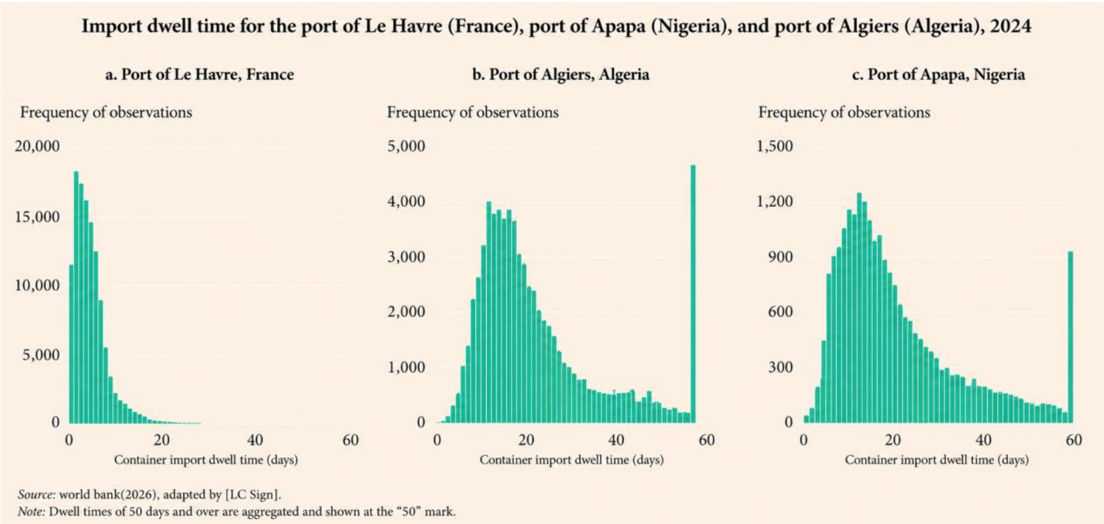
Under normal conditions, companies rely on **Contract Freight**, which provides pre-agreed capacity and pricing stability. However, severe disruptions can reduce available capacity and force greater reliance on **Spot Freight**, where rates fluctuate according to real-time market conditions. This shift increases cost volatility, weakens planning reliability, and creates cascading uncertainties across interconnected global logistics networks.

3.2 Trade Policy Uncertainty

[5] The United Nations Conference on Trade and Development-Trade and Development Foresights 2026 Global Economy Faces a Geopolitical Challenge: https://unctad.org/system/files/official-document/gds2026d1_en.pdf

Trade policy uncertainty represents a second major driver of predictability breakdown in global logistics and delivery systems. These challenges have intensified since 2025, as changes in trade policy have increased regulatory uncertainty and operational complexity[6]. Diverging trade measures across jurisdictions, including changes in market access rules, import requirements, tariffs, and customs procedures, have further increased customs complexity and unpredictability in cross-border supply chains. These uncertainties are often amplified by differences in regional customs and port capabilities.

Figure 3: Import dwell time for the port of Le Havre(France), port of Apapa(Nigeria), and port of Algiers(Algeria), 2024



Source: World Bank(2026)[7]

In well-functioning ports with efficient clearance systems, containers

[6] The United Nations Conference on Trade and Development-Multi-year Expert Meeting on Transport, Trade Logistics and Trade Facilitation, twelfth session: https://unctad.org/system/files/information-document/notification_2026d031_en.pdf

[7] The World Bank-Connecting to Compete 2025-The New Logistics Performance Indicators 2.0: https://documents1.worldbank.org/curated/en/099042226142014971/pdf/P500808-289f34bf-7999-473f-8cbd-63225ad20316.pdf

can be processed and released quickly. For example, in Le Havre (France), 50% of containers leave the port within 3.8 days, while Apapa (Nigeria) and Algiers (Algeria) require 13.4 and 17.6 days respectively, highlighting how trade policy and customs efficiency contribute to logistics uncertainty (Figure 3).

3.3 Physical and Network Constraints

Physical and network constraints represent a third major source of disruption affecting the reliability of global logistics and delivery systems. They include persistent inefficiencies driven by insufficient infrastructure and high return rates, which further constrain overall system performance[8]. These constraints are reflected in very practical physical bottlenecks within transport networks, including shipping capacity, infrastructure throughput, and critical logistics nodes such as ports, hubs, and transfer points. Increasing dependence on logistics hubs and transfer points has intensified pressure on global transportation networks. While around half of containers reach destinations directly, others require multiple transshipments, with some involving up to 8 transfers. Each transfer adds approximately 18 days to maritime lead times, increasing delivery uncertainty caused by hub dependency and network complexity (Figure 4).

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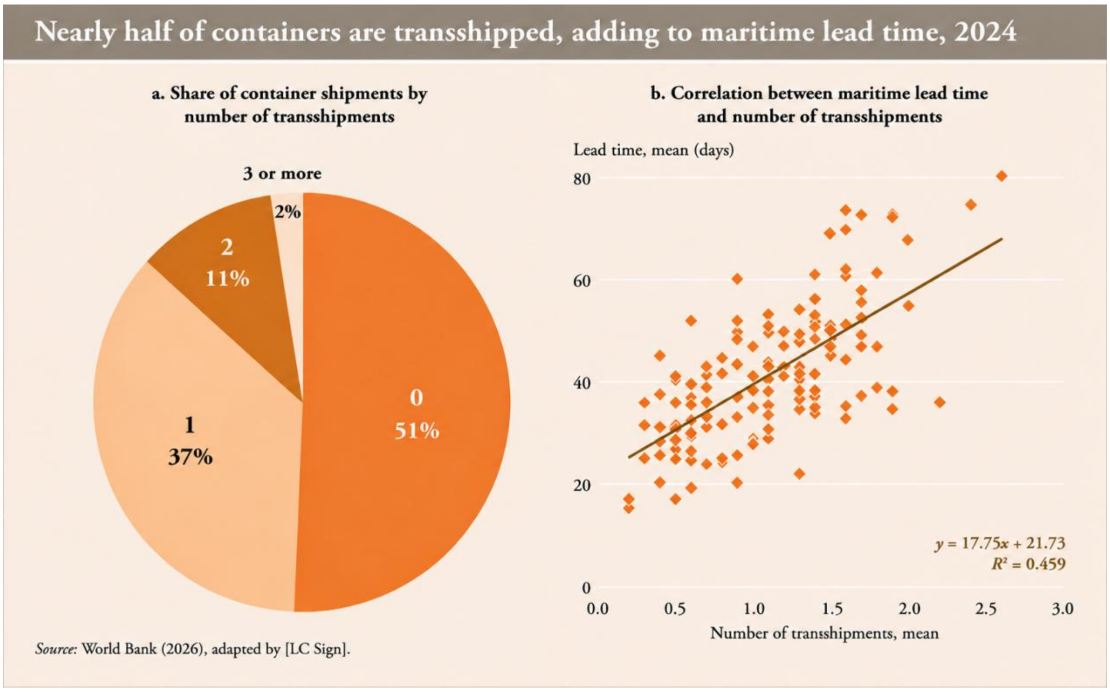
[8] The International Federation of Freight Forwarders Associations-2025 FIATA World Congress Special!: https://fiata.org/n/2025-fiata-world-congress-special/

Figure 4: Nearly half of containers are transshipped, adding to maritime lead time, 2024



Source: World Bank(2026)[9]

As global trade volumes increase and demand patterns become more volatile, these structural limits reduce the system's ability to absorb shocks and maintain smooth flows. The result is greater congestion, delays, and variability in delivery performance across interconnected logistics networks.

3.4 Traditional Execution Model Limitations

Traditional delivery systems often rely on fixed, non-modular structures rather than modular design principles, limiting transport flexibility and space utilization. Without modularization, products and

[9] The World Bank-Connecting to Compete 2025-The New Logistics Performance Indicators 2.0: https://documents1.worldbank.org/curated/en/099042226142014971/pdf/P500808-289f34bf-7999-473f-8cbd-63225ad20316.pdf

structures are frequently developed without sufficient consideration of transportation efficiency, container utilization, and installation requirements. This increases manufacturing complexity, creates additional logistics constraints, and drives higher costs throughout the delivery process. When projects expand across regions with different infrastructure and regulatory environments, these limitations become more significant, reducing flexibility and increasing the difficulty of maintaining predictable cost and execution outcomes.

4 Insight: Logistics as a Design Constraint

To address the limitations of traditional delivery models, logistics can be repositioned from a downstream execution function into an upstream design consideration, enabling a more integrated and predictable delivery process.

4.1 Limitations of Traditional Delivery Models

The continued growth of global containerized trade reflects the expanding scale and growing importance of containerized transportation in global delivery systems. As these networks expand, global logistics systems become increasingly interconnected and complex. Global containerized trade saw robust growth in 2024, with container volumes rising by over 6 percent (figure 5). According to UNCTAD projections, global maritime trade is expected to grow at an annual rate of 0.5 percent in 2025, while containerized trade is forecast to increase by 1.4 percent. Over the period from 2026 to 2030, UNCTAD anticipates that total seaborne trade will expand at an average annual rate of 2 percent, with containerized trade growing slightly faster at 2.3 percent per year (table 1).

Figure 5: The growth of global containerized trade volumes

Source: UNCTAD(2025)[10]

[10] The United Nations Conference on Trade and Development-Review of maritime transport 2025 Staying the course in turbulent waters: https://unctad.org/system/files/official-document/rmt2025_en.pdf

Table 1: UNCTAD forecasts for international maritime trade

UNCTAD forecasts for international maritime trade

(Annual percentage change)

	Total seaborne trade in tons	Containerized trade in TEU
2025	0.5	1.4
2026	1.0	1.0
2027	2.2	2.5
2028	2.3	2.7
2029	2.2	2.7
2030	2.3	2.7

Source: UNCTAD(2025), adapted by [LC Sign].

Source: UNCTAD(2025)[11]

Traditional delivery models ("Design → Manufacturing → Logistics → Installation") position logistics as the later stage in the process, treating it as secondary in importance to other phases. However, LC Sign has found in practice that this is not the case. This approach may lead to:

- **Container Utilization Inefficiency:** As containerized transportation becomes increasingly central to global delivery, inefficient cargo configuration and limited consideration of container constraints can reduce utilization efficiency and increase logistics costs.
- **Transit Damage Risk:** Improper packaging or suboptimal loading

[11] The United Nations Conference on Trade and Development-Review of maritime transport 2025 Staying the course in turbulent waters: https://unctad.org/system/files/official-document/rmt2025_en.pdf

practices increase the likelihood of product damage during transportation, particularly under multi-modal logistics conditions.

- **On-site Material Disruption:** Insufficient or misaligned delivery of materials results in shortages at the installation stage, leading to project delays and reduced execution efficiency.
- **Customs and Compliance Complexity:** Lack of early-stage alignment between product design and logistics requirements leads to increased complexity in customs documentation, classification, and regulatory compliance processes.
- **Late-stage Risk Exposure:** Critical risks are often only identified during transportation or on-site execution stages, making corrective actions significantly more costly and negatively impacting overall delivery timelines.

Global trade routes are becoming more complex, while goods movement increases cost and friction, requiring enterprises to strengthen capabilities to remain competitive[12]. The OECD's latest analysis indicates that some firms adopt inward-looking strategies in response to increasing supply chain fragmentation and uncertainty; however, such approaches do not necessarily result in greater resilience. Instead, resilience depends on agile, adaptable, and aligned systems that enable firms to respond to

[12] PricewaterhouseCoopers-Transportation and logistics-Intelligent logistics so you can keep the world moving https://www.pwc.com/gx/en/industries/transportation-logistics.html

shocks while maintaining the continuous flow of trade[13].

Figure 6: LC Sign's Global Customer Footprint and Market Coverage ,2025

Building such resilience requires not only a system-based approach but also extensive global experience in managing diverse operational environments. **With more than 100,000 customers across 160 countries**, LC Sign has accumulated experience supporting international projects across different regions, regulatory environments, and logistics conditions(Figure 6).

4.2 Logistics-Driven Delivery Model

Based on these practical challenges, LC Sign proposes a more scientifically grounded framework: **Design for Logistics (DfL)**. DfL

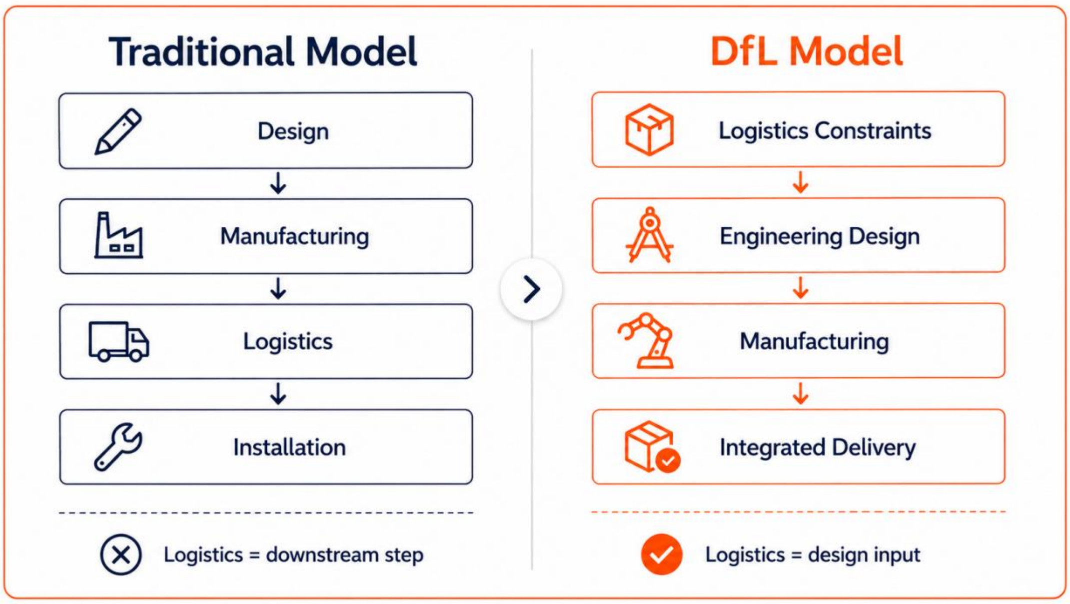
[13] The Organisation for Economic Co-operation and Development-Global value and supply chains https://www.oecd.org/en/topics/global-value-and-supply-chains.html

integrates logistics considerations into the earliest stages of the design process. Logistics is no longer treated as an executional afterthought following design completion; instead, it becomes a core engineering variable that defines the design space itself.

This paradigm shift redefines logistics constraints as upfront design requirements rather than downstream operational considerations, fundamentally restructuring the delivery workflow into:

Logistics Constraints → Engineering Design → Manufacturing → Integrated Delivery.

Table 2: Traditional Model vs. DfL Model



4.3 Business Benefits of DfL

DfL integrates container dimensions, packaging strategies, and modular design considerations from the earliest stages of a project, thereby transforming logistics from a risk factor into a strategic advantage. The main advantages of DfL are as follows.

- **Load Optimization:**DfL integrates transportation constraints such as **CBM (Cubic Meter)**, representing cargo volume, and **GW (Gross Weight)**, indicating total cargo mass, into early-stage design decisions. These factors influence transportation choices between **FCL (Full Container Load)** for larger cargo quantities and **LCL (Less than Container Load)** for smaller loads requiring shared container space. By optimizing cargo configuration, DfL improves container utilization and delivery predictability.
- **Reduced Transportation Damage Risk:** By incorporating logistics conditions into the design phase, DfL ensures that packaging and structural configurations are optimized for transit conditions, thereby minimizing the risk of in-transit damage.
- **Faster On-Site Installation:** DfL pre-defines modular components and assembly logic during the design stage, enabling rapid, low-complexity installation processes at the final execution site.
- **Simplified Customs Clearance:** DfL reduces ambiguity in product classification and documentation by aligning design and logistics

from the outset, enabling faster and more predictable customs processing.

- **Lower Total Project Cost:** Through improved transport efficiency, reduced rework, and minimized delays, DfL contributes to a significant reduction in overall logistics and project execution costs.

5 From DfL to System Execution: The GVIDS Operating Model

Design for Logistics (DfL) establishes the foundational principle that logistics constraints must be integrated directly into the early stages of design, rather than treated as downstream execution considerations. Building on this principle, GVIDS provides a structured operating model that operationalizes DfL across global engineering, manufacturing, compliance, and delivery environments. It translates abstract logistics-driven design logic into a layered system architecture comprising constraint definition, engineering transformation, execution control, and continuous feedback. In this sense, GVIDS functions as the system-level implementation framework through which DfL is consistently enforced and executed at scale.

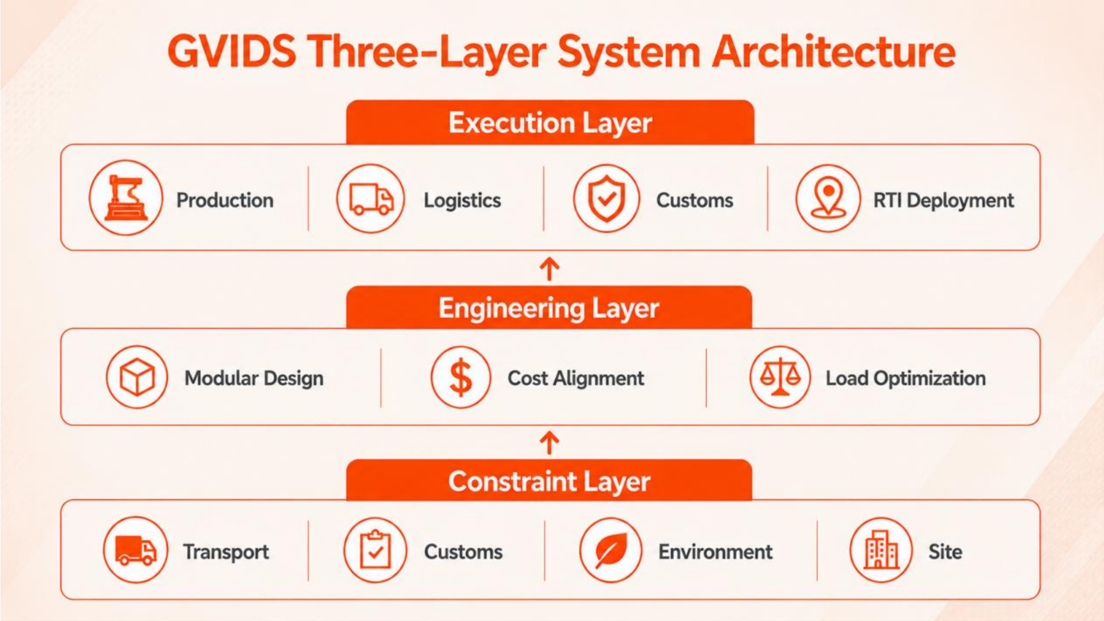
6 GVIDS System Framework and Operational Mechanisms

GVIDS is an integrated operating framework that extends beyond traditional transportation management by embedding logistics constraints into design, manufacturing, and end-to-end delivery execution. It is structured through a three-layer architecture and a set of core capabilities that together define its operational framework and execution logic.

6.1 GVIDS Three-Layer System Architecture

The GVIDS system is structured around a three-layer architecture that integrates constraints, engineering transformation, and execution into a unified operational framework(Figure 7).

Figure 7: GVIDS Three-Layer System Architecture



Constraint Layer

The Constraint Layer serves as the system's input layer, responsible for collecting and integrating real-world constraints and translating them into the boundary conditions for system design. It addresses a fundamental question: what can actually be manufactured and delivered?

This layer includes:

- Transport constraints (e.g., container dimensions, weight limits, and transport modes)
- Customs and regulatory requirements across different countries
- Infrastructure and road transportation conditions
- On-site spatial and construction environment constraints

Engineering Layer

The Engineering Layer functions as the system's transformation layer, converting constraint conditions into executable engineering design solutions. It addresses the question: how can design and manufacturing be achieved within these constraints?

It includes:

- Modular structural design systems
- Cost–structure alignment and optimization models
- Container loading optimization and spatial configuration modeling

Execution Layer

The Execution Layer serves as the system's output layer, responsible for translating engineering designs into real-world delivery outcomes across global project environments. It addresses the question: how can designs be delivered and installed on-site?

It includes:

- Global manufacturing coordination and production scheduling
- International logistics orchestration and route management
- Customs execution and pre-clearance processing
- Last-mile delivery and on-site installation

- Project milestone and schedule control

6.2 Core System Capabilities of GVIDS

Table 3: GVIDS Capabilities

GVIDS Capabilities

Core Capability	Description
Design-to-Cost Engineering	Integrates logistics and cost constraints into early-stage design.
Manufacturing-as-a-Service (MaaS)	Connects global manufacturing resources with project requirements.
Logistics Aggregation	Optimizes shipment consolidation, container utilization, and transport planning.
Customs Compliance System	Aligns product configurations with global customs requirements.
White-glove Last-mile Execution	Delivers components in a Ready-to-Install state for efficient on-site deployment.
Digital Visibility System	Provides real-time tracking and execution control across projects.

The GVIDS system comprises the following capabilities, which enable it to function as an executable framework system. The system encompasses multiple capabilities across the global delivery lifecycle, spanning from upstream planning and engineering to downstream execution and delivery management(Table 3).

- **Design-to-Cost Engineering:** Integrates logistics constraints into early-stage design, embedding cost considerations directly into product architecture to optimize manufacturability, transport efficiency, and overall lifecycle delivery cost.

- **Manufacturing-as-a-Service (MaaS):** Enables flexible, on-demand manufacturing by dynamically aligning production capacity with project requirements, synchronizing fabrication and delivery nodes across distributed global manufacturing networks.
- **Logistics Aggregation:** Leverages strategic partnerships with global carriers, including UPS, DHL, and FedEx, to access preferential shipping rates, optimize carrier selection based on destination requirements, and improve cost efficiency, delivery flexibility, and cross-border delivery predictability.
- **Customs Compliance System:** Provides a global regulatory database, pre-clearance mechanism, and customs review monitoring capability that aligns product configurations with customs classifications, reducing clearance uncertainty and documentation delays.
- **White-glove Last-mile Execution:** Ensures final-stage delivery includes on-site installation and operational readiness, transforming delivery outcomes into fully functional, ready-to-use installations at destination sites.
- **Digital Visibility System:** Delivers end-to-end real-time tracking and anomaly detection across the entire supply chain, enabling proactive intervention and centralized control over global project execution.

Among these capabilities, the Customs Compliance System addresses a key global delivery challenge: managing diverse regulatory requirements across markets. Through pre-clearance and customs review monitoring, GVIDS reduces delays and losses caused by clearance issues.

- **HS Code:** HS Code (Harmonized System Code) is an international product classification system developed by the World Customs Organization (WCO). It classifies over 5,000 commodity groups using standardized six-digit codes and is adopted by more than 200 countries and economies, covering over 98% of global merchandise trade.
- **Customs Bond:** Customs Bond is a U.S. customs requirement that provides a financial guarantee between an importer, a surety company, and U.S. Customs and Border Protection (CBP), ensuring the payment of duties, taxes, and compliance with import regulations.
- **ISF:** The Importer Security Filing (ISF), requires importers to submit shipment information to U.S. CBP at least 24 hours before the cargo is loaded onto a vessel bound for the United States. CBP may impose penalties of up to $5,000 per violation for inaccurate, incomplete, or untimely filings.
- **EORI:** EORI (Economic Operators Registration and Identification) is a unique identification number required for businesses or individuals involved in importing or exporting goods to or from the European Union. It is mandatory for commercial shipments to complete customs clearance within EU countries.

- **CBAM:** The Carbon Border Adjustment Mechanism (CBAM) is an EU regulation that applies carbon pricing to certain carbon-intensive imports, including iron, steel, and aluminium, to encourage lower-carbon production[14]. The signage industry may be affected by CBAM requirements due to its extensive use of metal materials such as aluminium and stainless steel.
- **AFR:** AFR (Advance Filing Rules) requires shipping companies or NVOCCs to submit maritime cargo information electronically to Japan Customs 24 hours before vessel departure. Non-compliance may result in penalties under Japanese customs law[15].

6.3 GVIDS Application Across Global Delivery Models

Under different delivery models, the allocation of transportation, customs, and final-site responsibilities varies significantly. **Regardless of the delivery model selected by customers, GVIDS enables companies to achieve consistent and predictable global delivery performance through integrated management across the delivery lifecycle.**

- **EXW:** EXW (Ex Works) represents the principle of minimum seller responsibility and maximum buyer responsibility. Under this term, the seller only makes the goods available at a designated location, such as

[14] Taxation and Customs Union-Carbon Border Adjustment Mechanism: https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en

[15] Japan Customs-Advance Filing Rules on Maritime Container Cargo Information (the Pre-departure filing): https://www.customs.go.jp/english/summary/advance5/index.htm

a factory or warehouse, while the buyer assumes all costs and risks, including loading, transportation, customs clearance, and insurance. EXW applies to all transport modes.

- **FOB:** FOB (Free On Board) requires the seller to clear the goods for export and load them onto the vessel at the named port of departure. Once the goods are loaded, the buyer assumes the risk and bears subsequent costs, including transportation, import clearance, and duties. FOB applies only to ocean and inland waterway transport.
- **CIF:** CIF (Cost, Insurance and Freight) requires the seller to clear the goods for export, load them on board the vessel, and pay for freight and minimum insurance to the destination port.The buyer assumes risk after loading and is responsible for import clearance, duties, and subsequent costs. CIF applies only to ocean and inland waterway transport.
- **DAP:** DAP (Delivered At Place) requires the seller to deliver goods to the named destination and bear risks until arrival, while the buyer handles unloading costs and risks. Unlike CIF, where risk transfers upon loading on board, DAP transfers risk at destination. DAP applies to all transport modes, while CIF is limited to sea transport.
- **DDP:** DDP (Delivered Duty Paid) places maximum responsibility on the seller, who bears all risks and costs until the goods are delivered

to the buyer. The seller is responsible for transportation, insurance, export and import clearance, duties, taxes, and related documentation.

7 Commercial Value: Five Dimensions of Predictability

GVIDS delivers five dimensions of predictable commercial value through its integrated system design(Table 4).

Table 4: Five Dimensions of predictability in GVIDS

Dimension	GVIDS Impact
Cost Predictability	Stable cost structure through early design integration
Schedule Reliability	Controlled execution with fewer delays and rework
Risk Mitigation	Early identification and resolution of delivery risks
Execution Consistency	Standardized outcomes across global projects
Scope Clarity	Clear RTI-based delivery boundaries.

- **Cost Predictability:** GVIDS improves cost predictability by integrating logistics, packaging, and modular design considerations during the design phase, helping stabilize project costs and reduce late-stage cost escalation. Through strategic partnerships with global express carriers, GVIDS enables optimized shipping solutions and contracted rates, allowing teams to better forecast transportation costs and minimize cost fluctuations. The comparisons below demonstrate GVIDS's impact: Enterprise contract rates enabled by GVIDS logistics integration and strategic carrier partnerships reduce shipping costs by **64.7%–80.3% for China–USA shipments** and **67.9%–82.2% for China–Europe shipments** compared with publicly available standard shipping rates from major international express carriers(Table 5 and 6).

Table 5: China-USA Express Shipping Cost Comparison: Published Cost vs. GVIDS-Optimized Cost

China–USA Express Shipping Cost Comparison: Published Cost vs. GVIDS-Optimized Cost

Shipment Weight (kg)	Published Shipping Cost (Avg., CNY/shipment)	GVIDS–Optimized Shipping Cost (Avg., CNY/shipment)	Estimated Savings
1	731.56	258.41	64.7%
5	2,156.06	563.68	73.9%
10	3,817.30	1,004.51	73.7%
30	9,840.40	1,941.60	80.3%
50	15,981.00	3,228.25	79.8%

Notes:
Published Shipping Cost (Avg.) refers to publicly available standard shipping rates from major international express carriers. GVIDS-Optimized Shipping Cost (Avg.) reflects enterprise contract rates enabled by GVIDS logistics integration and strategic high-volume partnerships with global carriers.

Table 6: China-Europe Express Shipping Cost Comparison: Published Cost vs. GVIDS-Optimized Cost

China–Europe Express Shipping Cost Comparison: Published Cost vs. GVIDS-Optimized Cost

Shipment Weight (kg)	Published Shipping Cost (Avg., CNY/shipment)	GVIDS-Optimized Shipping Cost (Avg., CNY/shipment)	Estimated Savings
1	811.25	260.81	67.9%
5	2,141.88	527.79	75.4%
10	3,794.60	924.48	75.6%
30	9,824.00	1,747.74	82.2%
50	16,183.75	2,922.30	82.0%

Notes:
Published Shipping Cost (Avg.) refers to publicly available standard shipping rates from major international express carriers. GVIDS-Optimized Shipping Cost (Avg.) reflects enterprise contract rates enabled by GVIDS logistics integration and strategic high-volume partnerships with global carriers.

- **Risk Mitigation:** GVIDS strengthens risk mitigation by identifying transportation, customs, and cross-border compliance risks early in the process, enabling pre-emptive resolution and reducing execution-stage uncertainty.
- **Schedule Reliability:** GVIDS enhances schedule reliability through standardized execution, structured controls, and real-time monitoring across logistics and delivery stages. By providing shipment visibility, GVIDS minimizes delays and improves project coordination. By leveraging real-time monitoring across multiple logistics and delivery stages, GVIDS improves delivery predictability and schedule reliability. As shown in the comparison, major carriers achieve **88.6%–100% on-time delivery rates within 7 days**, while several services maintain **over 80% reliability within 5 days**, demonstrating

how data-driven visibility and proactive logistics control help minimize delays and support reliable project schedules(Table 7).

Table 7: Carrier On-Time Delivery Performance Demonstrating Schedule Reliability

Carrier	Delivery Within 3 Days	Delivery Within 5 Days	Delivery Within 7 Days
UPS Express	50.34%	93.6%	100.0%
UPS Saver	44.97%	91.0%	94.7%
UPS WWEF	16.39%	51.43%	88.6%
DHL	30.00%	82.5%	97.5%
FedExIP	66.67%	66.7%	100.0%
FedexFICP	45.17%	83.8%	97.6%

- **Execution Consistency:** GVIDS ensures execution consistency through standardized design systems and unified delivery protocols, maintaining uniform project outcomes across different regions and reducing performance variability.
- **Scope Clarity:** GVIDS defines its delivery scope as a Ready-to-Install (RTI) state, excluding on-site execution, and establishing clear responsibility boundaries at the design stage for cross-border delivery clarity.

8 Paradigm Shift: Traditional vs. GVIDS Delivery Systems

The comparison below highlights the structural shift from traditional delivery models to the constraint-driven, system-integrated GVIDS architecture(Table 8).

Table 8: Traditional vs. GVIDS Delivery Systems

Dimension	Traditional Model	LC Sign GVIDS Model
System logic	Design-first workflow	Constraint-driven workflow
Logistics Role	Late-stage operational function	Key input to engineering design
Customs Clearance	Experience-based processing	Design-stage compliance screening
End State	Site delivery	Ready-to-install
Exception Response	Manual coordination	System-level exception correction

9 Validation Case: Jambo Mart Infrastructure Network across East Africa

The Jambo Mart project serves as a real-world validation of the GVIDS system. It demonstrates how logistics constraints, engineering design, and execution delivery are integrated into a unified system architecture, rather than operating as separate and fragmented project stages.

In this project, the delivery logic does not follow the traditional linear sequence of "design–manufacturing–logistics–installation." Instead, it operates under a constraint-driven system logic. Logistics conditions, environmental factors, and site limitations are embedded into the design stage, meaning that structural form, material selection, and modular decomposition are determined at the early design phase, rather than being adjusted later in execution.

Table 9: Three Key Areas Demonstrating GVIDS Effectiveness in the Jambo Mart Project

Validation Area	Project Validation
Modular Engineering Validation	Converted 40HQ container constraints into a five-segment modular structure, verified through digital loading simulation.
Constraint-Driven Engineering Validation	Integrated East African environmental conditions into early-stage engineering decisions, guiding material selection and structural standards.
RTI Deployment Validation	Enabled local teams to complete installation through pre-engineered interfaces and standardized assembly processes.

- **Modular Engineering Validation:** The oversized lightbox structure provides a direct validation of GVIDS's modular and transport-oriented design capability. Since individual components exceeded the dimensional limits of standard 40HQ shipping containers, the system did not treat this as a transportation problem. Instead, it translated it into a design constraint, resulting in a five-segment modular architecture. Digital loading simulations were used to verify the structure and freeze the design before production.
- **Environmental Constraint Pre-Configuration:** The project also demonstrates GVIDS's environmental constraint–driven material and structural pre-configuration capability. High humidity and intense UV exposure characteristic of East African climatic conditions were not treated as post-construction maintenance issues. Instead, they were

translated at the design stage into material selection and structural standards, ensuring weather resistance and long-term durability from the source.

- **RTI Execution Validation:** On-site execution validates the RTI (Ready-to-Install) delivery mechanism of GVIDS. Installation complexity is embedded in the system design in advance. Local installation teams are no longer dependent on highly skilled craftsmanship, as assembly is completed through pre-engineered interfaces and standardized installation logic, effectively decoupling delivery quality from local construction capability.

Overall, this case shows that GVIDS does not simply optimize logistics or design in isolation. Instead, it restructures the relationship between constraints and execution, ensuring that physical delivery outcomes are defined before production begins, thereby transforming uncertainty in delivery into a structured and predictable system outcome.

10 Conclusion: The Irreversible Shift

The shift from traditional delivery models to GVIDS embeds logistics as a design constraint, improving predictability, reducing cost volatility, and strengthening enterprise competitiveness. As global trade becomes more complex, GVIDS represents LC Sign's response to this structural change and the emerging need for more resilient execution systems.

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