Six Sigma Kaizen

SUPPLY CHAIN MANAGEMENT

COMPLETE GUIDE SERIES

GUIDE 6 OF 10

Logistics and Transportation Management

Modes, Networks, Carriers, and Costs:

The Complete Practitioner Guide to Moving Freight Profitably

Meridian Industrial Components Case Study Included

Table of Contents

Introduction: Transportation Is Where Supply Chain Meets the Customer

Every supply chain decision made upstream — what to buy, how much to produce, where to stock inventory — is ultimately tested at the moment of delivery. Transportation is the physical execution layer of the supply chain: the mechanism that converts an inventory position into a customer experience. It is the last activity before the customer's hands, and the one most directly correlated with their perception of service quality.

Transportation is also one of the largest and most manageable cost pools in the supply chain. For most manufacturers and distributors, freight costs represent 5 to 10 percent of revenue. Optimized transportation networks, intelligently managed carrier relationships, and disciplined freight procurement can reduce those costs by 10 to 20 percent while simultaneously improving service levels — a combination that is rare in supply chain optimization.

This guide covers the complete logistics and transportation management discipline: the modes of transportation and their trade-offs, the structure of inbound versus outbound logistics, carrier selection and freight procurement, transportation management systems, international logistics and customs, last-mile delivery, and the 3PL management model. The Meridian Industrial Components case study shows a manufacturer rationalizing a fragmented, plant-managed transportation network into a coordinated, cost-efficient logistics operation.

> **MERIDIAN INDUSTRIAL COMPONENTS — GUIDE 6 CONTEXT**
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> In Guide 1, MIC identified transportation as a significant cost opportunity: inbound freight at 2.8% of revenue versus a 2.0% benchmark, and outbound at 2.1% versus 1.5% — a combined $2.9M annual gap. Transportation was managed plant-by-plant, with 14 active carriers, no consolidated freight volumes, and no TMS. Guide 6 follows MIC's logistics team as it executes a transportation transformation: consolidating carriers, running a freight RFP, implementing TMS, and restructuring inbound and outbound networks to capture the identified opportunity.

Section 1: Transportation Fundamentals

The Role of Transportation in Supply Chain Strategy

Transportation decisions are inseparable from network design decisions. The number and location of distribution centers, the inventory positioning strategy, the supplier lead time targets — all of these interact with transportation mode, cost, and speed. An organization that designs its inventory network without modeling transportation costs will consistently produce suboptimal total network cost, and an organization that optimizes transportation independently of inventory will miss the interactions that determine true total cost.

The fundamental transportation trade-off is speed versus cost. Faster modes cost more. Direct shipments are faster than consolidated loads. Premium expediting services cost multiples of standard freight. Every transportation decision is an implicit or explicit judgment about how much service value justifies what level of cost — and those judgments should be made explicitly, not by default.

Transportation Cost Structure

Understanding transportation cost structure is prerequisite to managing it. Transportation costs consist of both fixed and variable components that respond differently to volume, route, and mode decisions.

Cost Component	Nature	Description	Management Lever
Line Haul	Variable (distance + weight/volume)	The primary freight charge: movement of goods from origin to destination. Typically quoted per mile, per hundredweight (cwt), or per shipment.	Route optimization; mode selection; load consolidation; lane volume aggregation for rate leverage
Fuel Surcharge	Variable (fuel price index)	Percentage of base rate adjusted weekly or monthly based on DOE fuel price index. Adds 20-35% to base rate in typical markets.	Negotiate cap or collar; fuel efficiency incentive provisions; mode shift to rail reduces fuel surcharge exposure
Accessorial Charges	Event-triggered	Additional charges for services beyond standard pickup and delivery: liftgate, residential delivery, inside delivery, detention, layover, redelivery, fuel surcharges on accessorials	Reduce through operational discipline: eliminate detention through dock efficiency; eliminate liftgate through equipment investment; audit accessorials for legitimacy
Dimensional Weight (DIM) Billing	Variable (cube)	For lightweight, large-volume shipments: carriers bill on dimensional weight (L x W x H / 139 for air; 166 for parcel) rather than actual weight when DIM exceeds actual weight	Packaging optimization to reduce cube; right-size packaging to product; challenge DIM calculations with accurate measurement
Minimum Charges	Fixed per shipment	Carrier minimum charge per shipment regardless of weight or distance. LTL minimum charges make very small shipments extremely expensive per unit.	Consolidate small shipments; eliminate below-minimum shipments; use parcel for very small orders rather than LTL minimums

Terminal Handling	Fixed per shipment	LTL terminal handling charges: unloading, sorting, and reloading at carrier hub facilities. Applied per shipment, not per weight.	Increase shipment size to spread terminal handling over more weight; direct load (TL) eliminates terminal handling entirely

THE TOTAL FREIGHT COST ICEBERG

Quoted freight rates are the visible tip of total logistics cost. The full iceberg includes: accessorial charges (often 15-30% of base freight), freight claims for damaged or lost goods, internal logistics labor (dock staff, traffic desk), packaging cost, carrier management overhead, TMS and freight audit technology, and the cost of freight-related customer service issues. Best-practice freight cost analysis captures all of these elements. Organizations that optimize only the quoted rate while ignoring accessorials, claims, and packaging consistently undercount their true logistics cost and therefore under-invest in the right optimization levers.

Section 2: Transportation Modes — Capabilities, Costs, and Trade-offs

Mode selection is one of the most consequential transportation decisions. Each mode offers a distinct combination of speed, capacity, cost, reliability, and geographic reach. Optimal mode selection matches these attributes to the specific requirements of the shipment: weight, volume, time sensitivity, origin-destination geography, and product characteristics.

Primary Transportation Modes

Mode	Best For	Transit Speed	Cost Level	Reliability	Capacity	Limitations
Truckload (TL / FTL)	Large shipments filling a full trailer (typically 20,000+ lbs or 1,500+ cubic feet); point-to-point without intermediate handling	1-5 days domestic	Medium	High: direct, no terminal handling	48,000 lbs max; 53-foot trailer standard	Minimum shipment size for efficiency; driver availability constraints (HOS)

Less-Than-Truckload (LTL)	Shipments 150-20,000 lbs sharing trailer space with other shippers; common for B2B industrial shipments	1-7 days depending on distance and carrier network density	Medium-High (per unit)	Moderate: multiple handling points increase damage and delay risk	Flexible: any weight from 150 lbs to full trailer	Terminal handling increases damage risk and transit time; complex pricing; accessorial charges
Rail (Intermodal)	Long-distance, high-volume shipments; containers moving 1,500+ miles; bulk commodities	3-10 days domestic (slower than TL for short haul)	Low (10-40% less than TL for long haul)	Moderate: on-time performance improving but variable	High: 286,000 lb gross rail car; containers standard	Limited door-to-door without drayage; not cost-effective under 500 miles; limited pickup/delivery flexibility
Air Freight	Time-critical, high-value, low-weight shipments; international express; emergency parts and materials	Same day to 3 days international	Very High (5-10x ocean; 2-5x TL)	High: schedules reliable in normal conditions; weather/capacity disruptions possible	Limited: weight and dimensional restrictions; belly vs. freighter capacity	Cost prohibitive for routine freight; not suitable for hazmat or oversized; CO2 impact significant
Ocean Freight (FCL)	International shipments filling a full container (20-foot or 40-foot); bulk international trade	14-30+ days port-to-port	Low (per unit for high volume)	Variable: port congestion, weather, and carrier schedule reliability highly variable	Very high: 20,000-28,000 kg per container; container fleet globally available	Very long transit time; port congestion risk; drayage required; minimum container quantities
Ocean Freight (LCL)	International shipments too small for a full container; consolidati	16-35+ days (slower than FCL due to consolidation/deconsolidation)	Medium (higher per unit than FCL)	Moderate: multiple handling events increase damage and delay risk	Flexible: any volume	Even slower than FCL; higher handling risk; consolidation delays

	on with other shippers					
Parcel (UPS, FedEx, USPS)	Small packages up to 150 lbs; e-commerce; urgent documents and samples; B2C delivery	Overnight to 5 days domestic; 2-10 days international	High per unit; low minimum	High: tracking, network density, and guaranteed service options	Per package: typically up to 150 lbs and 165 inches girth+length	Expensive for heavy shipments; DIM weight billing for large-cube items; limited for freight-class items
Expedite / Hot Shot	Emergency, time-critical shipments; production line down situations; single-stop urgent delivery	Same-day to next-day	Extreme (3-10x standard TL)	Very high: dedicated vehicle, no other stops	Flexible: sprinter van to full truck depending on size	Cost limits routine use; managed as emergency option only; requires established emergency carrier relationships

Mode Selection Decision Framework

Shipment Scenario	Recommended Mode	Key Decision Factor	Watch For
Domestic, 5,000+ lbs, 1-3 day transit acceptable	TL / FTL	Full trailer load eliminates LTL premium; point-to-point reduces handling damage	Backhaul opportunities to reduce empty miles cost
Domestic, 500-5,000 lbs, 3-5 day transit acceptable	LTL	Weight in LTL sweet spot; consolidation with other shippers economical	Accessorial charges; damage claims; service level inconsistency by lane
Domestic, <500 lbs, any transit	Parcel	Below LTL minimum weight threshold; parcel per-unit cost competitive	DIM weight billing; residential surcharges; consider TL consolidation if regular lane
Long domestic haul, 1,000+ miles, 5-10 day transit acceptable	Intermodal (Rail + Drayage)	Rail cost advantage over TL significant beyond 1,000 miles; CO_2 reduction	Transit time reliability; port/ramp congestion; last-mile drayage coordination

International, high volume, 4+ week transit acceptable	Ocean FCL	Lowest cost per unit for volume; global reach	Port congestion, blank sailings, container availability, lead time variability
International, small volume or time-sensitive	Air Freight (high value) or Ocean LCL (lower value)	Cost-value trade-off: air justified only for high-margin or time-critical goods	Air: very high cost; LCL: consolidation delays and handling risk
Emergency / production line down	Expedite (hot shot or air)	Speed is non-negotiable; cost secondary to business impact	Prevention through safety stock and supplier reliability is far cheaper than frequent expediting

COMMON ERROR: DEFAULTING TO PREMIUM MODES WITHOUT COST-BENEFIT ANALYSIS

Air freight and expedite services are appropriate for genuine emergencies. They become chronic problems when used to compensate for poor planning, inaccurate forecasting, or unreliable suppliers. An organization that regularly ships by air what should move by ocean, or hot-shots what should have been planned into standard TL, is paying a significant and avoidable premium. Every premium freight event should be analyzed: what was the root cause? Was this a planning failure, a supplier failure, or a genuine external disruption? Tracking premium freight cost and root cause by category systematically identifies the highest-priority prevention opportunities.

Section 3: Inbound vs. Outbound Logistics

Logistics management has two distinct orientations — inbound (freight moving from suppliers to the organization's facilities) and outbound (freight moving from the organization to customers) — that require different strategies, different ownership models, and different performance metrics. Most organizations manage outbound logistics well because customer-facing delivery directly affects revenue and customer satisfaction. Inbound logistics is frequently neglected, yet it represents a comparable freight spend with equal or greater cost reduction potential.

Inbound Logistics Management

Inbound logistics — managing the freight movement from suppliers to plants, warehouses, or distribution centers — is often controlled by the supplier rather than the buyer, with freight cost embedded in the unit price as a delivered cost. This "supplier collect" or "prepaid" freight arrangement is comfortable for buyers but systematically surrenders freight optimization leverage.

Inbound Model	How It Works	Buyer Control	Cost Optimization Potential	Best Fit
Supplier-Collect (Prepaid)	Supplier arranges and pays for freight; includes freight cost in unit price. Buyer has no visibility to actual freight cost.	Low: buyer cannot influence carrier selection, routing, or freight cost	Low: freight cost hidden in unit price; buyer cannot aggregate volume for leverage	Acceptable for low-spend, simple supplier relationships; common default but not best practice for significant spend
Buyer-Collect (Third-Party Billing)	Buyer selects carrier and routing; freight bill comes to buyer directly; supplier packages and coordinates with buyer's carrier	High: buyer controls all freight decisions	High: buyer aggregates all inbound volumes for carrier leverage; can optimize routing and consolidation	Best practice for any supplier relationship above minimum freight threshold; requires routing guide management
Supplier-Controlled with Buyer Routing Guide	Supplier arranges freight but must use buyer's approved carriers and routing; buyer reviews and approves freight invoices	Moderate: buyer specifies carriers and modes; supplier coordinates	Moderate: buyer captures some volume leverage; cannot fully optimize consolidation	Transition step from prepaid to buyer-collect; useful when buyer-collect operationally complex
Cross-Dock Consolidation	Regional or national consolidator picks up from multiple suppliers; consolidates into full TL loads to buyer's facilities	High: buyer controls consolidation network design	Very High: full consolidation leverage; LTL-to-TL conversion reduces cost 30-50% for fragmented supplier base	Ideal for suppliers clustered in a region sending below-TL quantities; requires volume threshold for consolidation economics
Milk Run	Scheduled route visits multiple suppliers in sequence; picks up partial loads from each; delivers consolidated load to buyer's facility	Very High: buyer designs and manages routes	Very High: eliminates LTL minimum charges; enables frequent small-quantity deliveries supporting lean production	High-density supplier clusters with daily or frequent small-quantity deliveries; Toyota pioneered this model with Japanese suppliers

BEST PRACTICE: CONVERT INBOUND TO BUYER-COLLECT FOR TOP SUPPLIER LANES

For any supplier lane with annual freight cost exceeding $25,000-$50,000, converting from supplier-collect to buyer-collect consistently delivers 10-20% freight cost reduction. The savings come from three sources: (1) the buyer aggregates inbound volumes with outbound in carrier negotiations, increasing leverage; (2) the buyer can optimize routing, mode, and consolidation independently; and (3) buyers are better positioned to manage accessorial charges and freight claims. The conversion requires a routing guide and supplier communication but is operationally straightforward. For a manufacturer with $8M in inbound freight, converting the top 30 lanes typically captures $600K-$1.2M in annual savings.

Outbound Logistics Management

Outbound logistics — delivering finished goods to customers — is the most customer-visible part of the supply chain and directly affects customer satisfaction, revenue recognition, and competitive positioning. Outbound logistics strategy must balance service level commitments with cost efficiency across a potentially complex network of customers, order sizes, and delivery requirements.

Outbound Decision	Key Trade-off	Cost Implication	Service Implication
Direct vs. Consolidated Delivery	Speed vs. cost: direct shipment is faster but more expensive per unit; consolidation reduces cost but adds transit time	Consolidation reduces freight cost 30-50% vs. same-weight shipped direct; smaller, more frequent shipments cost significantly more per unit	Direct: faster, more responsive. Consolidation: predictable but less flexible; requires advance planning
Delivery Frequency	Replenishment interval: daily, weekly, or less frequent delivery cycles	More frequent delivery increases freight cost per unit; less frequent delivery requires customer to carry more inventory	High frequency: low customer inventory requirement, high service flexibility. Low frequency: customer carries buffer
Customer Pickup vs. Buyer-Deliver	Who controls freight: customer arranges pickup (collect) or seller arranges delivery (prepaid)	Prepaid: seller controls cost but bears responsibility. Collect: customer may have better carrier rates for their network	Service accountability: prepaid gives seller control over delivery performance measurement; collect shifts responsibility to customer carrier
Standard vs. Expedite Service Tier	Transit time: standard service (2-5 days) vs. expedite (same day or next day)	Expedite premium: 2-5x standard freight cost; must be justified by order value or customer criticality	Customer service: premium service tier for critical orders or high-value customers; standard for routine replenishment

Section 4: Carrier Selection and Freight Procurement

Carrier selection is procurement applied to transportation services. The same principles that govern strategic sourcing — spend analysis, competitive bidding, total cost evaluation, performance management — apply directly to freight procurement, with adaptations for the unique characteristics of transportation markets.

The Freight RFP Process

A freight Request for Proposal (RFP) is the structured competitive process through which a shipper solicits rate proposals from carriers across its freight lanes, evaluates proposals on a total cost basis, and selects a carrier portfolio that balances cost, service, and network coverage. For organizations spending more than $2M annually on freight, a systematic freight RFP every 2-3 years is one of the highest-return logistics investments available.

RFP Stage	Activity	Timeline	Key Output
1. Spend and Lane Analysis	Pull 12-24 months of freight invoice data; clean and normalize; classify by mode, lane (origin-destination pair), weight band, and carrier; calculate total freight spend by carrier and lane	3-4 weeks	Lane file: list of all lanes with annual volume, weight, and current spend; carrier spend summary
2. Carrier Identification and Invitation	Identify carrier candidates for each mode: national vs. regional vs. local carriers; specialty carriers for specific commodities or equipment types; shortlist 3-6 carriers per lane segment	1-2 weeks	Invited carrier list by mode and geographic coverage
3. RFP Package Development	Develop lane file for carrier pricing; define service requirements (transit time, tracking, claims ratio); establish evaluation criteria and weightings; document terms and conditions	2-3 weeks	RFP package: lane file, service requirements, evaluation criteria, commercial terms
4. Carrier Response Period	Distribute RFP package; conduct carrier briefing calls; answer questions; collect responses by deadline	2-4 weeks	Carrier responses: proposed rates by lane and weight band; service commitments

5. Analysis and Modeling	Load carrier responses into transportation modeling tool; calculate total cost for each carrier scenario; model service coverage; identify optimal carrier allocation by lane	2-3 weeks	Carrier allocation model: optimal carrier by lane minimizing total cost at required service level
6. Negotiation and Award	Negotiate with finalists; request best-and-final offers; finalize lane awards; execute carrier agreements; update routing guide	2-4 weeks	Executed carrier agreements; updated routing guide; projected savings vs. current rates
7. Implementation and Transition	Communicate new routing guide to shipping locations; transition current carriers where changed; configure TMS with new rates; monitor performance in first 90 days	4-8 weeks	Routing guide in use; TMS rate tables updated; performance baseline established

Carrier Evaluation Criteria

Criterion	Weight	Measurement Method	Key Questions
Total Cost (all-in rate including surcharges)	45%	Model total cost per shipment across all lanes using actual volume data; normalize for fuel surcharge methodology differences	What is the all-in cost per lane, not just the base rate? How is the fuel surcharge calculated? Are there minimum charges that affect our shipment profile?
Service Performance (OTD, transit time)	25%	Request carrier-reported on-time delivery percentage by lane; validate with reference shippers on same lanes; Carrier OTD data from FMCSA and broker platforms	What is their OTD by specific lane, not national average? How is on-time defined? What is their performance when capacity is tight?
Claims Ratio and Resolution	10%	Request carrier claims ratio (claims paid / freight charges); reference check on claims handling responsiveness; review claims filing and resolution SLA	What percentage of freight revenue is paid in claims? How quickly are claims resolved? What is their damage rate for our commodity type?
Network Coverage and Capacity	10%	Verify carrier coverage in all required lanes; assess capacity availability during	Do they serve all our lanes with their own network (not brokered)? What is

		peak seasons; evaluate equipment availability and fleet age	their capacity position in peak season? What equipment types are available?
Technology and Visibility	5%	Evaluate TMS integration capability (EDI 214 status updates, API connectivity); tracking platform quality; electronic POD; self-service reporting	Can they integrate with our TMS? Do they provide shipment-level status updates? Can we access electronic POD?
Financial Stability	5%	Review carrier financial health; check FMCSA safety rating; verify insurance coverage; Carrier 411 and similar carrier vetting services	Are they financially stable? What is their FMCSA safety rating? Do they carry adequate cargo insurance?

COMMON ERROR: AWARDING ALL FREIGHT TO THE LOWEST BIDDER

A carrier that bids 15% below market rate on paper may be offering rates they cannot sustain profitably, leading to service failures, capacity withdrawal during peak seasons, or financial distress within 12-18 months. Freight rates that are below market are a supply risk, not just a cost opportunity. Best-practice freight procurement allocates volume across a primary carrier (typically the best total-cost-and-service combination) and one or two backup carriers per lane, maintaining competitive tension without sole-sourcing. A carrier portfolio provides resilience when capacity tightens — which it does in every freight market cycle.

The Routing Guide

The routing guide is the operational document that translates the carrier award decisions from the RFP into daily shipping instructions. It specifies, for each lane or lane segment, which carrier to use (primary, secondary, and tertiary), the mode, service level, and any special handling requirements. The routing guide is the bridge between freight strategy and freight execution.

Routing Guide Element	Description	Operational Importance
Lane Definition	Origin ZIP/region and destination ZIP/region or state pair defining the geographic scope of the routing instruction	Must be granular enough to capture rate differences but manageable for shipping teams to execute
Weight Breaks	Different carrier assignments for different weight bands within a lane (e.g., <150 lbs = parcel; 150-5,000 lbs = LTL primary; >5,000 lbs = TL primary)	Weight is the primary driver of mode economics; routing guide must reflect the break points where mode economics change

Primary Carrier	First-choice carrier for the lane: should be used for at least 70% of volume; primary has committed capacity and rates	Volume commitment to primary carrier sustains the negotiated rate; cherry-picking lanes destroys rate leverage
Secondary Carrier	Backup carrier when primary is unable to service: capacity issues, service failure, equipment availability	Must be qualified and rate-contracted before being needed; cannot scramble for backup during a peak period
Tertiary / Spot	Third option for exceptional circumstances; may include freight broker for spot market access when contract carriers unavailable	Spot market rates are typically 20-40% higher than contracted rates; tertiary option protects against capacity crises
Special Instructions	Commodity-specific requirements: hazmat certifications, temperature control, team drivers for time-sensitive long haul, liftgate at delivery	Special requirements narrow carrier options; must be pre-qualified; cannot be discovered at shipment booking

Section 5: Transportation Management Systems (TMS)

A Transportation Management System (TMS) is the technology platform that automates, optimizes, and provides visibility to the transportation function. It is the operational backbone of a mature logistics operation — the system of record for freight rates, carrier relationships, shipment execution, and logistics performance data. Organizations shipping more than $5-10M in annual freight that do not have a TMS are leaving significant value unrealized and operating without the data infrastructure required for continuous improvement.

Core TMS Capabilities

TMS Module	Function	Business Value	Maturity Required
Rate Management	Stores and manages carrier rate tables for all contracted lanes and modes; applies correct rate based on shipment parameters	Eliminates rate errors; ensures contracted rates are applied; enables instant freight cost calculation at order entry	Foundation capability: implement first; required for all other TMS value
Load Planning and Optimization	Optimizes shipment consolidation, mode selection, and carrier assignment across multiple orders; identifies TL vs. LTL	Reduces freight cost 5-15% through consolidation and mode optimization; replaces manual load planning with algorithm-driven decisions	Core capability: high ROI; requires clean rate data and order integration

	breaks; multi-stop route building		
Carrier Tendering and Execution	Electronically tenders loads to carriers in routing guide sequence; captures acceptance or rejection; escalates to backup carriers; tracks tender acceptance rate	Eliminates phone and email tendering; enforces routing guide; accelerates booking; creates data on carrier capacity behavior	Core capability: required for routing guide enforcement at scale
Shipment Tracking and Visibility	Real-time or near-real-time tracking of shipments in transit; milestone updates (pickup, in-transit, delivery); exception alerting for at-risk shipments	Proactive issue management; customer service improvement; carrier accountability; inventory accuracy for in-transit goods	Core capability: customer-facing value significant; API and EDI integration with carriers required
Freight Audit and Payment	Automated comparison of carrier invoices against contracted rates; identifies billing errors and overcharges; processes approved invoices for payment	Freight invoice errors average 2-5% of freight spend; audit and recovery directly reduces cost; eliminates manual invoice review	High-value capability: freight audit recoveries typically fund a significant portion of TMS cost
Analytics and Reporting	Freight cost by carrier, lane, mode, business unit; carrier performance analytics; service level reporting; benchmark comparison	Enables data-driven carrier management; identifies cost optimization opportunities; supports freight RFP with historical data	Advanced capability: builds on transaction data from other modules; value increases with data history
Dock Scheduling	Appointment scheduling for inbound and outbound docks; carrier appointment management; dock productivity analytics	Reduces carrier detention and demurrage charges; improves dock throughput; reduces driver wait time that strains carrier relationships	Operational capability: high ROI in high-volume dock environments; lower priority for low-volume sites

TMS ROI: THE BUSINESS CASE

The ROI calculation for TMS investment is typically straightforward for organizations with freight spend above $5M annually. Direct financial benefits include: rate management accuracy (eliminates overpayments); load optimization savings (5-15% of freight spend);

freight audit recoveries (2-5% of spend); and reduced premium freight through better planning visibility. For a $10M freight organization, these benefits typically sum to $800K-$2M annually. TMS software costs for a mid-market shipper typically range from $150K-$400K annually (SaaS model). Payback periods of 6-18 months are typical. The business case should be built bottom-up with actual freight data, not industry averages.

TMS Implementation: The Critical Success Factors

1. **Rate data quality first:** Load all contracted carrier rates accurately before go-live. A TMS with wrong rates produces wrong routing decisions — worse than no TMS.
2. **ERP and WMS integration:** TMS value multiplies when connected to order management (ERP) and warehouse execution (WMS). Integrate before expecting full value.
3. **Carrier connectivity:** EDI or API connections with primary carriers for tendering, tracking, and invoice exchange. Manual carrier communication defeats TMS efficiency.
4. **Routing guide configuration:** Routing guide logic must be loaded into the TMS before it can enforce carrier selection. This requires the freight RFP to be complete.
5. **Change management:** Shipping location training and buy-in is critical. TMS value is destroyed when shipping teams override the system's routing recommendations without reason.
6. **Freight audit from day one:** Enable freight audit capability at launch. Early recoveries help fund the implementation and build organizational confidence in the investment.

Section 6: International Logistics and Trade Compliance

International logistics introduces a layer of complexity that domestic logistics does not: customs clearance, import duties and tariffs, export controls, international shipping terms (Incoterms), documentation requirements, and the coordination of multiple parties — freight forwarders, customs brokers, ocean carriers, air carriers, port agents, and inland carriers — in a seamless cross-border movement.

Incoterms: Defining Risk and Cost Transfer

Incoterms (International Commercial Terms), published by the International Chamber of Commerce, define the point in a transaction at which risk and cost transfer from seller to buyer. Selecting the right Incoterm for each international shipment has significant financial and operational implications. The 2020 Incoterms revision includes 11 terms divided into two groups: any mode, and sea and inland waterway only.

Incoterm	Name	Risk Transfer Point	Who Pays Freight	Who Arranges	Who Pays	Best Used When

				Export Customs	Import Duty	
EXW	Ex Works	At seller's premises	Buyer	Buyer	Buyer	Buyer has strong logistics capability; seller wants zero responsibility after production
FCA	Free Carrier	When goods handed to buyer's carrier	Buyer from named point	Seller	Buyer	Most versatile term; works for all modes; buyer controls international freight
CPT	Carriage Paid To	When goods handed to first carrier (risk to buyer from first carrier)	Seller to named destination	Seller	Buyer	Seller wants to control freight cost but not destination risk
CIP	Carriage and Insurance Paid To	As CPT but seller must insure to named destination	Seller (includes insurance)	Seller	Buyer	As CPT but with insurance requirement; CIP is stricter than CIF for cargo insurance
DAP	Delivered at Place	At named destination (not unloaded)	Seller (all freight)	Seller	Buyer	Seller delivers to customer's premises; customer handles import customs and duty
DDP	Delivered Duty Paid	At named destination (buyer receives fully cleared goods)	Seller (all)	Seller	Seller	Maximum seller responsibility; common in e-commerce; buyer wants frictionless receipt
FOB	Free on Board (sea only)	When goods loaded on	Buyer from named port	Seller	Buyer	Traditional ocean freight

		vessel at origin port				term; buyer controls ocean freight and insurance from origin port
CIF	Cost, Insurance, Freight (sea only)	When goods loaded at origin port (risk to buyer from loading)	Seller (freight + insurance to destination port)	Seller	Buyer	Common in commodity trade; seller controls freight; buyer receives at destination port

BEST PRACTICE: NEGOTIATE TO BUYER-CONTROLLED INCOTERMS FOR SIGNIFICANT IMPORT VOLUMES

Just as buyer-collect freight is best practice for inbound domestic logistics, buyer-controlled Incoterms (EXW, FCA, FOB) are best practice for significant import volumes. When the seller controls international freight (CIF, CIP, DAP, DDP), the buyer has no visibility to actual freight cost, no ability to consolidate volumes for leverage, and no ability to select carriers based on performance or rate. Converting from CIF to FOB or FCA for key import lanes — where the buyer then manages ocean freight — typically reduces total import freight cost 10-25% while giving the buyer control over carrier selection and shipment visibility.

Customs Compliance and Duty Management

Customs compliance is a non-negotiable element of international logistics. Shipments that fail customs clearance result in delays, fines, storage charges, and in extreme cases seizure of goods. For organizations with significant international trade flows, customs compliance is a strategic function that deserves dedicated expertise — either in-house or through a qualified customs broker.

Compliance Element	Description	Risk of Non-Compliance	Best Practice
Harmonized Tariff Code (HTS)	The international classification system that determines duty rates for all traded goods. Every product must be correctly classified.	Incorrect classification: underpaid duties (back-assessed with penalties) or overpaid duties (money left on the table)	Formal HTS binding ruling from customs authorities for high-volume items; annual HTS classification audit; Customs Broker review for new products
Country of Origin	The country where goods were substantially	Incorrect origin declaration: penalties,	Document origin accurately; maintain

	transformed; determines duty rates under trade agreements (USMCA, etc.) and potential sanctions restrictions	duty recalculation, potential debarment from trade preference programs	supplier declarations; understand substantial transformation rules; audit annually
Valuation	The customs value of goods on which duty is calculated; transaction value (invoice price) is the standard basis with specific rules for related-party transactions	Undervalued goods: customs audit, back-duty assessment, penalties; overvalued goods: excess duty paid	Use transaction value consistently; document related-party pricing with transfer pricing studies; understand First Sale valuation opportunities
Import Licensing and Permits	Certain products require import licenses or permits: food, pharmaceuticals, firearms, textiles, agricultural products, dual-use goods	Importing without required license: seizure of goods, fines, import privilege suspension	Identify license requirements for each product category before first import; integrate license management into procurement process
Denied Party Screening	Screening of all trade partners (suppliers, customers, freight forwarders, carriers) against government denied party and sanctions lists	Transaction with sanctioned party: severe financial penalties; criminal liability; export privilege revocation	Automated screening at every transaction; screening provider updated against all relevant government lists; documented screening process

Section 7: Third-Party Logistics (3PL) Management

Third-party logistics providers (3PLs) are companies that provide outsourced logistics services — warehousing, transportation, freight brokerage, customs brokerage, value-added services, or integrated supply chain management — to shippers. The 3PL market has grown substantially as organizations recognize that logistics is not always a core competency and that specialized providers can often deliver better performance at lower cost than in-house operations.

Types of Logistics Outsourcing

Provider Type	Services Provided	Relationship Model	Best Fit	Key Risk
1PL: Asset-Based Carrier	Direct transportation using own assets (trucks, aircraft, vessels)	Transactional to contract; carrier owns the means of transport	Standard freight lanes with committed volumes; direct	Capacity constraints in tight markets; limited

			shipper-carrier relationship preferred	flexibility across modes
2PL: Asset-Light Carrier / Freight Broker	Transportation arranged through carrier network; broker does not own assets; freight broker connects shipper to carrier for spot or contract needs	Transactional (spot) to managed (contract brokerage)	Spot market access; backup capacity; flexible lane coverage; small shippers without carrier relationships	Rate volatility in spot market; broker margin reduces cost transparency; carrier quality variable
3PL: Full-Service Logistics Provider	Integrated logistics services: warehousing, transportation management, freight brokerage, customs, value-added services; manages on behalf of shipper	Service provider: shipper outsources logistics function management; 3PL provides expertise and scale	Organizations that lack internal logistics expertise; want access to 3PL carrier relationships and technology; have complex multi-modal needs	Dependency on 3PL performance; loss of internal logistics capability; contract governance complexity
4PL: Lead Logistics Provider	Designs, manages, and continuously optimizes entire supply chain network; manages 3PLs on behalf of shipper; provides strategic and analytical overlay	Strategic partner: 4PL acts as shipper's outsourced supply chain management function	Large, complex global supply chains; organizations without internal supply chain expertise; situations where supply chain is not a core competency	Full dependency on 4PL; complex governance; limited control; significant risk if 4PL relationship fails

Selecting and Managing a 3PL

3PL selection follows the same strategic sourcing principles as any supply category: spend analysis, RFP, total cost evaluation, reference validation, and contract execution. The distinctions from product supplier selection are the service-centric performance measurement, the operational integration requirements, and the transition complexity if the relationship needs to change.

3PL Selection Criterion	Weight	Assessment Method	Common Discovery
Operational Capability Match	30%	Detailed assessment of facility capabilities, technology systems, labor model, and specialized handling capability against requirements	Capabilities promised in RFP often not verified on-site; required site visit before award
Total Cost (fully loaded)	25%	Model all cost elements: storage (per pallet or per cubic foot),	3PL pricing is notoriously complex;

		handling (per piece or per order), transportation management fee, value-added services, technology, and transition	initial quote often excludes significant cost elements discovered during implementation
Technology and Integration Capability	20%	WMS and TMS platform assessment; ERP integration capability; visibility and reporting; EDI and API capability	Legacy WMS systems are common in 3PL industry; integration capability must be validated technically, not just described in RFP
Track Record and References	15%	References in same industry and similar operation type; customer retention rate; financial stability	Reference list provided by 3PL is curated; request references not on their list and ask specifically about failure modes
Scalability and Capacity	10%	Ability to handle volume growth and seasonal peaks; labor sourcing model; backup facility and capacity	3PL capacity commitments made in RFP are sometimes aspirational; validate with peak season capacity history

COMMON ERROR: TREATING 3PL TRANSITION AS PURELY OPERATIONAL

The most dangerous phase of a 3PL relationship is the transition — moving operations from the current provider (or internal operation) to the new 3PL. Transition failures have caused missed customer shipments, lost inventory, system integration failures, and customer defections that took years to recover from. 3PL transitions require a dedicated transition project manager, a detailed day-by-day transition plan with clear milestones and rollback criteria, parallel operation periods for critical functions, and executive attention throughout. Budget transition conservatively: most 3PL transitions take longer and cost more than planned.

Section 8: Last-Mile Delivery

Last-mile delivery — the final leg of the delivery journey from a distribution facility to the end customer — is simultaneously the most expensive segment of the delivery network on a per-mile basis and the most critical determinant of customer experience. For B2C e-commerce, last-mile cost can represent 28-55% of total delivery cost despite covering only the final few miles of a shipment's journey. For B2B, last-mile performance directly affects production schedules, customer satisfaction, and on-time delivery metrics.

Last-Mile Model	Description	Cost Profile	Service Profile	Best Application

Parcel Carrier Network	National parcel carriers (UPS, FedEx, USPS) deliver individual packages through dense hub-and-spoke network to residences and businesses	High per-package; volume discounts significant at scale; DIM weight billing	Reliable track-and-trace; guaranteed service options; wide geographic coverage	E-commerce B2C; small B2B packages; wide geographic distribution needs
Regional Carriers	Regional carriers serving specific geographies with competitive rates for in-region deliveries; lower cost than nationals in their home territory	10-20% lower than national carriers in region; limited geographic scope	High service quality in home region; tracking and guarantee options comparable to nationals	High-density regional delivery; supplement nationals where regional carrier has rate advantage
Dedicated Last-Mile Delivery	Dedicated delivery fleet (owned or contracted) serving specific geographic area; driver-customer relationship; white-glove service options	Fixed cost for route; very high cost for low density; economical at high stop-per-route density	Highest service quality; appointment windows; white-glove; returns handling; high customer satisfaction	High-value or high-touch B2C (furniture, appliances); dense urban B2B where direct relationship matters
Crowdsourced / Gig Delivery	On-demand delivery using network of independent drivers through platforms (similar to ride-sharing model); flexible capacity	Variable; typically competitive for dense urban areas; less predictable at scale	Variable quality; speed can be high for on-demand; reliability less consistent than asset-based networks	Urban same-day delivery; food and convenience; surge capacity supplement; not appropriate for high-value freight
Customer Pickup (BOPIS / BOPIL)	Customer picks up order from store, locker, or partner location; eliminates last-mile delivery entirely	Zero last-mile cost to shipper; transfers cost and effort to customer	Immediate availability if in stock; eliminates missed delivery issues; requires convenient pickup location	Retail with store network; where customer is willing to collect; effective for time-sensitive orders in urban areas

Section 9: Case Study — Meridian Industrial Components Transportation Transformation

MERIDIAN INDUSTRIAL COMPONENTS: FROM FRAGMENTED TO OPTIMIZED FREIGHT NETWORK

Starting State: Plant-Managed, Fragmented Transportation

At the start of the transportation transformation initiative, MIC's logistics operations are entirely plant-managed: each of the three plants has a traffic desk that independently arranges freight, negotiates with carriers, and manages freight invoices. There is no TMS. Carrier relationships are personal and informal. The freight audit process consists of a buyer reviewing invoices manually before approving payment — a process that catches obvious errors but misses systematic overbilling.

Transportation Element	Current State	Industry Best Practice	Gap / Opportunity
Number of active carriers (all modes)	14 carriers across 3 plants; some carriers active at 2-3 plants with different rates	3-5 primary carriers plus spot market access	Fragmentation eliminates volume leverage; same carrier at different rates across plants
Inbound freight management	90% supplier-collect (prepaid embedded in unit price); 10% buyer-collect	50-70% buyer-collect for top supplier lanes	Estimated $800K-$1.2M annual savings from converting top inbound lanes to buyer-collect
Freight cost visibility	Freight cost embedded in unit cost for 90% of inbound; outbound freight invoices manually processed	Full freight cost visibility by lane, mode, and carrier via TMS	Cannot optimize what cannot be measured; no data for freight RFP or carrier performance management
Carrier performance measurement	Informal: buyer recalls carrier performance from memory and recent conversations	Systematic OTD, claims ratio, and accessorial tracking by carrier and lane via TMS	No data to support carrier negotiations or performance management; over-reliance on relationship quality
Freight audit	Manual review of invoices; estimated 60% of invoices reviewed; no systematic rate comparison	Automated freight audit comparing every invoice to contracted rate; 100% audit	Estimated 3-4% of freight spend overbilled and not recovered: ~$450K-$600K annual leakage
Spot freight process	Phone calls to carrier contacts; no benchmark comparison; rates accepted as given	TMS spot market integration; rate benchmarking; competitive spot bidding	Estimated 15-25% premium on spot shipments vs. contracted rates for comparable lanes
Transportation total cost as % revenue	4.9% (inbound 2.8% + outbound 2.1%)	3.5% (inbound 2.0% + outbound 1.5%)	$2.9M annual opportunity at current revenue levels

The Transportation Transformation Plan

MIC's Supply Chain Director develops a three-phase transportation transformation plan targeting $2.1M in annualized savings within 18 months, with full TMS implementation as the enabling platform.

Phase	Timeline	Key Initiatives	Target Savings
Phase 1: Foundation	Months 1-4	(1) Conduct freight spend analysis across all three plants; build consolidated lane file. (2) Select and implement TMS (chose mid-market SaaS TMS at $180K/year). (3) Load all current carrier rates into TMS. (4) Enable freight audit from day one.	$420K from freight audit recoveries (estimated 3.5% of $12M freight spend); implementation investment: $180K TMS + $120K implementation
Phase 2: Freight RFP and Carrier Consolidation	Months 3-8	(1) Run full multimodal freight RFP covering all domestic TL, LTL, and parcel lanes. (2) Consolidate from 14 carriers to 5 primary (2 TL, 2 LTL, 1 parcel) plus spot broker access. (3) Execute routing guide in TMS. (4) Launch carrier performance scorecards.	$940K from carrier consolidation and rate reduction (average 12% rate improvement on competitive lanes)
Phase 3: Network Optimization	Months 6-18	(1) Convert top 18 inbound supplier lanes from supplier-collect to buyer-collect; negotiate supplier purchase price reduction equivalent to freight cost removed. (2) Implement load optimization in TMS for outbound shipments. (3) Evaluate intermodal for 4 long-haul TL lanes. (4) Optimize outbound delivery frequency to reduce per-unit freight cost.	$740K from inbound conversion + $380K from outbound optimization + $120K from intermodal shift

18-Month Results

Metric	Month 0 Baseline	Month 18	Improvement
Total freight cost as % revenue	4.9%	3.7%	-1.2 percentage points; $1.85M annual saving
Active carrier count	14 (fragmented)	6 (5 primary + 1 broker)	Consolidated; volume leverage achieved
Freight audit recovery	$0 (no systematic audit)	$387K in Year 1	Recovered from invoice overbilling; ongoing annual recovery estimated $280K
Carrier OTD (outbound)	Not tracked systematically	97.1% measured	Carrier performance visibility enabled;

			improvement from 3 carrier changes
Spot freight spend	~22% of freight spend at spot rates	8% of freight spend at spot rates	TMS routing enforcement moved volume to contracted carriers; spot used appropriately
Inbound buyer-collect %	10%	58% (18 lanes converted)	Majority of top-spend inbound lanes now buyer-controlled
TMS utilization	0% (no TMS)	94% of outbound loads tendered via TMS	Routing guide enforced; carrier tendering automated
Premium freight cost (expedite + air)	$680K (5.7% of freight spend)	$310K (2.6% of freight spend)	-$370K from better planning, supplier reliability improvement, and safety stock right-sizing

MIC INSIGHT: FREIGHT AUDIT PAID FOR THE TMS

MIC's TMS vendor was selected in part because the freight audit module was included in the base subscription. Within 60 days of go-live, the automated audit had identified $87K in overbilling by a single LTL carrier — incorrect fuel surcharge calculation applied retroactively to 4 months of invoices. The carrier acknowledged the error and issued a credit. The $180K annual TMS subscription cost was effectively covered by audit recoveries in the first year alone, before any route optimization or carrier consolidation savings were counted. The lesson: freight audit capability should be treated as immediate-ROI infrastructure, not an optional add-on.

Section 10: Transportation KPIs and Performance Management

KPI	Definition	World Class Target	Measurement Frequency	Primary Owner
On-Time Delivery (OTD)	% of customer shipments delivered on or before committed delivery date, measured at customer dock	>98%	Daily (tracked); weekly review	Logistics / Customer Service
On-Time Pickup	% of shipments picked up by carrier on confirmed pickup date and time	>97%	Daily (tracked); weekly review	Logistics / Warehouse

Freight Cost as % Revenue	Total freight spend (inbound + outbound) / total revenue x 100	Industry-specific; 3-5% for manufacturer; see benchmarks	Monthly	Finance / Logistics
Freight Cost per Unit / per CWT	Total freight cost / units shipped or total weight (hundredweight)	Track trend; benchmark by lane against market	Monthly	Logistics
Claims Ratio	Total freight claims paid / total freight charges x 100	<0.5% (world class); <1.0% (acceptable)	Monthly	Logistics / Warehouse
Carrier OTD by Carrier	% of loads by each carrier picked up and delivered on time	>97% per carrier; exit carriers consistently below 94%	Weekly (per carrier scorecard)	Logistics
Accessorial Spend as % of Freight	Total accessorial charges / total freight charges x 100	<8%; benchmark by carrier and type	Monthly	Logistics / Finance
Premium Freight Rate	Premium freight spend (expedite + air) / total freight spend x 100	<3%; each event requires root cause	Monthly	Supply Chain / Logistics
Freight Audit Recovery Rate	Freight audit recoveries / total freight invoices reviewed x 100	>1.5% (indicates meaningful overbilling recovered)	Monthly	Logistics / Finance
Routing Guide Compliance	% of shipments tendered to primary carrier in routing guide / total shipments	>90%	Weekly	Logistics / TMS

Section 11: Best Practices, Common Errors, and Tips

Ten Principles of Transportation Excellence

#	Principle	Why It Matters
1	Conduct a freight spend analysis before any carrier negotiation or RFP — data is leverage	Negotiating without lane-level data means accepting the carrier's view of your freight profile; spend analysis shifts the negotiation to objective lane economics
2	Consolidate freight volumes before negotiating rates — leverage requires concentration	Split volumes across many carriers eliminate rate leverage; consolidation to 3-5 primary carriers per mode is the prerequisite to competitive rates

3	Convert top inbound lanes from supplier-collect to buyer-collect	Supplier-collect hides freight cost and surrenders optimization opportunity; buyer-collect enables consolidation, carrier selection, and freight audit
4	Implement freight audit as an immediate cost recovery mechanism, not an afterthought	Freight billing error rates of 2-5% are consistently documented; automated audit recovers these immediately and funds a significant portion of TMS investment
5	Match mode to shipment characteristics, not to habit or convenience	Wrong mode selection is one of the largest sources of freight cost waste; each shipment should be routed by the lowest total cost mode that meets service requirements
6	Measure and manage carrier OTD at lane level, not just network level	National carrier OTD averages hide lane-level failures that directly impact customer service; carrier performance measurement must be granular enough to identify and correct specific underperforming lanes
7	Build a routing guide and enforce it through TMS — verbal routing instructions are not routing guides	Without a written, system-enforced routing guide, shipping teams default to familiar carriers regardless of rate or performance; TMS enforcement is required for consistent execution
8	Track and analyze every premium freight event by root cause	Premium freight prevention is far cheaper than premium freight payment; root cause analysis reveals the planning, sourcing, or operational failures that drive expediting spend
9	Negotiate fuel surcharge caps or index-linked caps as part of carrier contracts	Fuel surcharges can add 20-35% to base freight cost; uncapped surcharges expose the shipper to significant cost volatility; cap or collar provisions protect against fuel market spikes
10	Evaluate intermodal for lanes exceeding 750-1,000 miles before assuming TL is the only option	Rail intermodal is 10-40% less expensive than TL for long-haul lanes; transit time difference is often acceptable with appropriate safety stock adjustment; many shippers overlook this significant cost lever

The Five Most Costly Transportation Errors

CRITICAL ERROR 1: MANAGING TRANSPORTATION AS A COST CENTER WITHOUT VISIBILITY

Organizations that do not measure freight cost at lane level, do not audit freight invoices, and do not track carrier performance are operating blind in a market where they are consistently overcharged and underserved. Transportation management without data is not management — it is passive acceptance of whatever the market and carriers deliver. The investment in data infrastructure (TMS, freight audit) is the prerequisite for all other transportation optimization.

CRITICAL ERROR 2: ACCEPTING PREMIUM FREIGHT AS A COST OF DOING BUSINESS

Some organizations carry a chronic premium freight expense of 5-10% of total freight spend and treat it as unavoidable — the cost of serving demanding customers or dealing with supply chain complexity. In reality, most chronic premium freight is symptomatic of fixable planning, sourcing, or operational failures. Every premium freight event should have a documented root cause and an accountable owner. When premium freight events cluster around specific suppliers, products, or customers, the root cause almost always points to a solvable structural problem.

CRITICAL ERROR 3: SOLE-SOURCING FREIGHT WITH A SINGLE CARRIER PER MODE

Sole-source carrier relationships expose the shipper to the same risks as sole-source supplier relationships: capacity withdrawal during tight markets, leverage loss at contract renewal, and no service alternative when the carrier fails. Best-practice transportation programs maintain a primary carrier (receiving 60-70% of lane volume), a qualified secondary (20-30%), and spot market access as a tertiary option. The secondary must be truly active — a carrier that receives no volume is not a real alternative when the primary fails.

CRITICAL ERROR 4: IGNORING ACCESSORIAL CHARGES IN FREIGHT COST ANALYSIS

Base freight rates are the headline number in carrier negotiations, but accessorial charges — detention, liftgate, residential delivery, redelivery, inside delivery, fuel surcharges on accessorials — often add 15-30% to actual freight cost. Organizations that negotiate aggressively on base rates while ignoring accessorials consistently find their actual freight cost higher than their modeled cost. Accessorial management requires: clear contract definitions of when charges apply; operational discipline to reduce avoidable accessorials; and systematic audit to challenge illegitimate charges.

CRITICAL ERROR 5: FREIGHT RFP WITHOUT SPEND DATA AND WITHOUT MODELING

Running a freight RFP without a clean, lane-level freight data file produces incomparable proposals from carriers and prevents meaningful total cost analysis. Running a freight RFP without total cost modeling (applying carrier proposals to actual historical volume to calculate total annual cost) makes carrier selection based on rate comparisons that may not reflect actual spend patterns. Both errors are common and both result in RFP outcomes that underperform their potential. Spend analysis and modeling are not optional steps in freight procurement — they are the steps that determine whether the RFP delivers value.

QUICK REFERENCE: LOGISTICS AND TRANSPORTATION MANAGEMENT

Transportation Mode Selection Quick Reference

Weight / Distance / Time	Recommended Mode	Key Consideration
<150 lbs, any distance, any time	Parcel (UPS/FedEx)	DIM weight billing for large-cube items; guaranteed service options
150-5,000 lbs, domestic, 2-7 days	LTL	Claims risk at multiple handling points; accessorial management critical
5,000+ lbs, domestic, <500 miles, 1-2 days	Truckload (TL)	Direct, no terminal handling; lowest damage risk for high-value goods
5,000+ lbs, domestic, 750+ miles, 3-6 days acceptable	Intermodal (rail+dray)	Significant cost advantage vs. TL; reliability gap closing; evaluate seriously
Time-critical, any weight, domestic	Expedite / Hot Shot	Reserve for genuine emergencies; track root cause for every event
International, high volume, 4+ weeks acceptable	Ocean FCL (40-foot container)	Lowest cost per unit; highest lead time variability risk
International, time-critical, high value	Air Freight	Cost justification required; only for high-value or genuinely critical freight
International, small volume, 3-5 weeks	Ocean LCL or Air (based on value)	LCL for lower-value; Air for time-sensitive or high-value; compare total cost

Incoterms Quick Reference

Incoterm	Seller Responsibility Ends At	Buyer Controls Freight From	Use When
EXW	Seller's premises	Point of origin	Buyer manages everything; maximum buyer control
FCA	Named carrier/departure point	Named point	Most versatile; works all modes; buyer controls international freight
FOB	Origin port vessel loading	Origin port (sea only)	Traditional ocean; buyer controls ocean freight and insurance
CIF	Origin port (risk transfers)	Destination port (cost)	Seller controls freight; buyer receives at port; common commodity trade
DAP	Named destination (unloaded)	Buyer unloads at destination	Seller delivers door; buyer handles customs and unloading

DDP	Named destination (cleared)	Goods arrive cleared	Maximum seller responsibility; friction-free buyer receipt

Transportation KPI Summary

KPI	World Class Target	Primary Owner
On-Time Delivery (at customer dock)	>98%	Logistics / Customer Service
Carrier On-Time Pickup	>97%	Logistics / Warehouse
Freight Cost as % Revenue	Industry-specific (3.5-5.0% for manufacturer)	Finance / Logistics
Claims Ratio	<0.5%	Logistics / Quality
Accessorial % of Freight	<8%	Logistics
Premium Freight Rate	<3% of total freight spend	Supply Chain / Logistics
Routing Guide Compliance	>90%	Logistics / TMS
Freight Audit Recovery	>1.5% of freight invoices	Finance / Logistics
Carrier OTD by Carrier (per lane)	>97% per primary carrier	Logistics

Sources and Further Reading

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