OPERATIONAL MODEL OF E-COMMERCE CONSOLIDATION LOGISTICS ON EMERGING MARKETS

METHODOLOGY AND EFFECTIVENESS FACTORS ON THE USA / EUROPE / SOUTH KOREA → CENTRAL ASIA CORRIDORS

KAMALBEK JURAYEV

The American Journal of Engineering and Technology
ISSN 2689-0984
2026

Operational Model of E-commerce Consolidation Logistics on Emerging Markets

Methodology and Effectiveness Factors on the USA / Europe / South Korea → Central Asia Corridors

Kamalbek Jurayev

Havvo Express LLC, New York, USA

Publication Info

THE AMERICAN JOURNAL OF ENGINEERING AND TECHNOLOGY

(ISSN: 2693-0811)

ISBN: 978-1-957653-68-6

CROSSREF DOI: https://doi.org/10.37547/tajet/book-26-02

PUBLISHED DATE: 15 June 2026

2026

Preface

The monograph in front of the reader addresses a class of logistics operators that has crystallised in operational practice on cross-border corridors between developed and emerging markets, without yet acquiring an integrative framework in the academic literature. The class is that of the consolidation operator. The corridors are those that connect the United States, Western Europe, and the Republic of Korea to Uzbekistan, Kazakhstan, and Kyrgyzstan. The framework that the monograph develops is the OEM-model, an Operational E-commerce Model that codifies the structural choices through which a consolidation operator achieves sustained growth and bounded delivery-time variance on a corridor where logistics infrastructure is limited and the demand for cross-border parcels is growing.

The intended reader of the monograph is the working logistics specialist whose responsibility lies in the design, evaluation, or supervision of cross-border consolidation operations on emerging-market corridors. The reader is presumed to be familiar with the day-to-day realities of warehouse intake, carrier negotiation, customs interaction, and customer-side service quality. The reader is not presumed to have a comprehensive grasp of the academic literature on supply chain management, the resource-based view of the firm, or the platform-economics literature, although references to those literatures are integrated throughout the text and the bibliography supports follow-up reading for those who wish to deepen their engagement.

The monograph is the scientific companion to a separately authored methodology guide, "Methodology for Consolidating E-commerce Cargo on International Logistics Corridors: From Shipment Acceptance to Delivery to the Final Recipient", in which the same set of operations is treated procedurally. The methodology guide is the operational protocol. The monograph is the scientific interpretation of the same operations. Where the methodology guide describes how an operation is carried out, the monograph examines why the operation works, compares it to the alternatives that the operator chose against, and connects the operation to the theoretical lineages that explain it. The two documents are designed not to duplicate one another and not to substitute for one another. They are designed to be read together, each one supplementing what the other cannot provide.

The empirical record on which the monograph rests is drawn from the operational history of Havvo Express LLC, a consolidation operator headquartered in New York and operating on the corridors that the monograph examines. The operator's longitudinal record covers the period 2021 through Q1 2026, with quantitative records on monthly tonnage, customer cohort dynamics, and delivery-time performance that the verification analysis of Chapter 4 draws on directly. The use of a single longitudinal case as the empirical anchor is a deliberate methodological choice grounded in the case-study research literature; the limitations that follow from the choice are articulated explicitly in Chapter 4 Section 4.5 and revisited in the Conclusion.

The monograph is intended to support three groups of subsequent users. The first is the practitioner who is contemplating the establishment of a consolidation operation on a corridor with the appropriate profile. For this reader, the OEM-model offers a reference architecture, a maturity ladder, and a KPI scaffolding against which strategic decisions can be benchmarked. The second is the reviewer (academic, regulatory, or financial) who is evaluating an existing operator and seeks a framework against which the operator's claims can be assessed. For this reader, the model offers a structural argument and an empirical baseline. The third is the academic researcher interested in extending the analysis of the consolidation operator class to other corridors, to other operators, or to other dimensions (sustainability, technology, regulation) that the present monograph identifies as directions for further work.

The author of the monograph is the founder of Havvo Express and has been involved in the establishment and operation of the case-study operator from 2021 through the present. The conflict of interest that this involvement creates is acknowledged here. The empirical claims made in the monograph are drawn from operational records that can be inspected; the theoretical claims are made against the published literature and can be evaluated against that literature without reference to the operator. The methodological discipline of single-case research that the work follows requires the explicit identification of the construct, internal, and external validity criteria under which the analysis is conducted; those criteria are stated in Chapter 4 and the limitations that they impose are not concealed.

Table of Contents

List of Figures

List of Tables

Introduction

I.1 Relevance of the research

The cross-border movement of e-commerce parcels has shifted from an exotic logistics niche into a load-bearing element of consumer trade between developed and emerging markets within little more than a decade. The shift is uneven in its geography. Developed-market corridors have been organised by global integrators with mature ground networks, while a parallel structural deficit has emerged on routes serving emerging markets, where demand for foreign goods runs ahead of the specialised logistics infrastructure available to satisfy it. Central Asia is one of the clearest examples of this asymmetry. The region combines a young, digitally connected population with regulatory and infrastructural constraints that limit the direct applicability of the operational models that large integrators developed for North American and Western European corridors.

Quantitative parameters describe the asymmetry concisely. According to data published by the U.S. International Trade Administration (2025), the Uzbek e-commerce market reached USD 1.2 billion in 2024, with 32.7 million internet users and an internet penetration rate of 87.2 percent. The Asian Development Bank (2023) describes the broader Asia-Pacific region as accounting for the majority of global retail e-commerce sales, with the share of e-commerce in regional gross domestic product rising over the early 2020s and projected to climb further by the middle of the decade. The international air-cargo network on which these flows depend reported record demand growth in 2024, with cargo-tonne-kilometres rising 11.3 percent year-on-year and international operations rising 12.2 percent (International Air Transport Association, 2025). Demand and supply have therefore been moving in the same direction, but with the supply curve calibrated to corridors that already enjoy a dense web of air, road and digital infrastructure.

Central Asia presents the opposite picture. Uzbekistan and Kazakhstan are landlocked; Uzbekistan is one of only two doubly landlocked states in the world (United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States, n.d.). The World Bank Logistics Performance Index (Arvis et al., 2023) places each of the three principal Central Asian markets (Kazakhstan, Uzbekistan, Kyrgyzstan) in the lower-middle to lower bands of the global ranking, reflecting customs friction, infrastructure gaps, and weaknesses in tracking quality. The Trans-Caspian corridor that would link these markets to European seaboards has been identified as a sustained multi-billion-euro infrastructure priority through 2040 if projected transit container volumes are to be absorbed at a competitive transit capacity

(Organisation for Economic Co-operation and Development, 2024). Onto this constrained logistics geography is being layered a wave of household demand for products from American, European, and East Asian marketplaces, a demand that direct international shipping by global integrators cannot satisfy at unit volumes typical for individual consumers.

The result is an operational gap. Postal channels offer low cost but unpredictable lead times and limited last-mile reliability. Express integrators offer quality but unit prices that strip out the value proposition for low-ticket parcels. Direct intra-marketplace fulfilment is structurally unavailable for purchases originating outside the destination market. The space between these three models has been occupied, in practice, by consolidation operators: firms that aggregate small cross-border shipments at origin, secure direct partnerships with carriers for the long haul, and break bulk into last-mile parcels at destination. Practitioner literature on consolidation has grown rapidly, including a published methodological guide written by the present author and used as the operational source-of-facts for the analysis that follows in this monograph. Yet practitioner protocols and academic frameworks have not converged. The literature on cross-border e-commerce logistics, reviewed in detail in Chapter 1, contains no integrated model that codifies a consolidation operator as a class, with its constituent blocks, the linkages between them, and the operational maturity criteria by which one such operator can be compared to another. The relevance of the present research follows from that gap.

I.2 Research problem

The research problem can be formulated in a single proposition. There is no methodologically grounded operational model that describes how a consolidation operator on resource-constrained cross-border corridors should be built, scaled, and evaluated. Practitioner protocols address the question of how individual processes work (how a parcel is accepted, scanned, repackaged, declared to a customs system, loaded onto an aircraft, and released to a recipient), but they do not answer the question of why a particular bundle of those processes, together, produces the operational outcomes that distinguish a viable consolidation operator from one that stalls below scale. The literature on third-party logistics maturity has produced ladders that work well for asset-light or asset-heavy 3PL providers operating on mature corridors (van Laarhoven, Berglund, & Peters, 2000; van Hoek, 2001; Lieb & Bentz, 2005), and the recent systematic review by Abbasi, Sicakyuz, Santibanez Gonzalez, and Ghasemi (2024) confirms that the conceptual scaffolding around 3PL and 4PL classifications has continued to refine over the last two decades. Cross-border

B2C e-commerce logistics has its own dedicated literature, surveyed by Giuffrida, Mangiaracina, Perego, and Tumino (2017) and extended in later work by Giuffrida, Jiang, and Mangiaracina (2021) and Khooban, Mutlu, and de Kok (2024). None of this literature, however, treats the consolidation operator as a class distinct from the 3PL ladder; none of it offers a framework specifically tuned to emerging-market corridors where infrastructure, regulation, and consumer trust each impose first-order constraints on the operational design.

The problem has practical importance. The single-firm growth trajectory examined in Chapter 4 (an order-of-magnitude increase in monthly tonnage between 2021 and 2025, sustained while the average lead time from the United States to Central Asia held near ten calendar days) does not, by itself, constitute a model. It is empirical evidence that something replicable is happening. The monograph asks what that something is, and whether it can be specified at a level of generality that supports evaluation, comparison, and adaptation to corridors outside Central Asia.

I.3 Aim and objectives

The aim of the monograph is to develop and verify an **Operational E-commerce Model (OEM)** of a consolidation operator that is applicable on cross-border corridors with limited logistics infrastructure. The objectives that operationalise this aim are organised as a four-step plan:

1. To systematise existing approaches to cross-border e-commerce logistics on developing markets and to identify the structural deficits that the OEM-model must address.
2. To formulate the OEM-model as a five-block architecture with defined interactions, decision logic, and key performance indicators.
3. To verify the model empirically on longitudinal operational data from Havvo Express LLC, spanning the period 2021–2025 and including a Q1 2026 cohort, with attention to growth dynamics, delivery performance, and the contribution of digitisation and multimodality.
4. To formulate the reproducibility conditions under which the OEM-model can be applied to other emerging-market corridors and to articulate its limitations.

The four objectives map directly onto the chapter structure of the monograph: objective one to Chapter 1, objective two to Chapters 2 and 3, objective three to Chapter 4, and objective four to Chapter 4 (Section 4.5) and the Conclusion.

I.4 Object and subject

The object of the study is the system of cross-border e-commerce logistics on corridors with developing infrastructure: concretely, the corridors that connect the United States, Western Europe, and the Republic of Korea to Uzbekistan, Kazakhstan, and Kyrgyzstan.

The subject of the study is the set of organisational and methodological principles that govern the design, operation, and scaling of a consolidation operator on such corridors. The subject is narrower than the object: the monograph is not a general theory of cross-border e-commerce logistics. It is a focused theoretical and empirical treatment of a particular operator class.

I.5 Methods

The monograph applies four research methods in combination.

The first is **systems analysis**, applied to the OEM-model itself. Each block of the model is examined as a system in its own right, with inputs, outputs, decision rules, and feedback to the other blocks. The five-block architecture is treated as a coupled system, and the linkages between blocks are made explicit in Chapter 2 and Chapter 3.

The second is **case study research**, applied to Havvo Express LLC as a single longitudinal case in line with the methodological guidance of Eisenhardt (1989), Voss, Tsikriktsis, and Frohlich (2002), and Yin (2018). Single-case research is appropriate here because the object of study is itself a particular operator class on a particular corridor, and the question is whether the OEM-model satisfactorily accounts for the operational record of a firm that has operated as that class on that corridor since 2021. The methodological choices that ensure construct, internal, and external validity in single-case research follow the criteria summarised by Gibbert, Ruigrok, and Wicki (2008).

The third method is **benchmarking** against operators in adjacent classes: global integrators (DHL, FedEx), regional consolidators on the Middle Eastern corridor (Aramex), and Southeast Asian last-mile networks (J&T Express, Ninja Van) where comparable disclosure exists. Benchmarking is used to position the consolidation operator class relative to its neighbours, not to make universal claims of superiority.

The fourth method is **comparative analysis of operational data**, applied to longitudinal tonnage, client, and delivery-time series drawn from Havvo Express records covering 2021 through Q1 2026. Comparative analysis is the principal evidence base for the verification of the hypothesis in Chapter 4.

The four methods, the four objectives they serve, and the primary data sources they draw on are summarised in Table I.1.

Table I.1. Research design summary

Objective	Method	Primary data source	Output
1. Systematise existing approaches; identify deficits	Literature review; comparative analysis	Academic journals, World Bank LPI, ITA / KPMG / IMARC reports	Chapter 1
2. Formulate OEM-model	Systems analysis; theoretical synthesis	SCM/RBV/Operational Flexibility/TCE literature	Chapters 2 and 3
3. Verify OEM-model on operational data	Single longitudinal case study; comparative analysis	Havvo Express records 2021–Q1 2026	Chapter 4
4. Reproducibility conditions and limits	Cross-case benchmarking; analytical generalisation	Aramex 2023 report; SE Asia operator data; literature on case external validity	Chapter 4.5 and Conclusion

I.6 Scientific novelty

The scientific novelty of the research consists of three claims.

The first claim is that the OEM-model, as formulated in Chapters 2 and 3, is the first systematised framework for the consolidation-operator class on emerging-market cross-border corridors. The literature reviewed in Chapter 1 contains adjacent frameworks (on 3PL maturity, on multi-sided platforms, on supply-chain risk management), but no framework that integrates these in a single architecture and that is tuned to corridors with the infrastructure and regulation profile of Central Asia.

The second claim is that the model extends Supply Chain Management theory (Chopra & Meindl, 2016; Christopher, 2016; Bowersox, Closs, & Cooper, 2020) to a class of operators that the SCM mainstream has historically treated as a transitional category between the postal channel and the 3PL/4PL ladder. The Resource-Based View (Wernerfelt, 1984; Barney, 1991; Peteraf, 1993), applied to logistics providers by Wong and Karia (2010), provides the theoretical handle for the claim that proprietary warehouse and digital infrastructure constitute strategic resources in this class, not merely operational fixtures.

The third claim is that the model is operationally falsifiable. The hypothesis it expresses can be confronted with quantitative data on tonnage, lead time, and client growth, and the verification procedure in Chapter 4 illustrates how that confrontation is conducted. The hypothesis would have been refuted if the longitudinal record had shown tonnage growth without lead-time stability, or lead-time stability without tonnage growth, or either of the two without an identifiable contribution from each of the five OEM blocks. None of these counterfactuals materialises in the Havvo Express record.

I.7 Hypothesis

The research hypothesis is the central claim that the monograph develops and tests. In its formal expression:

> *A new class of consolidation operator that integrates proprietary warehouse infrastructure, direct partnerships with carriers, a proprietary digital platform, and an adaptive routing strategy is capable of delivering sustainable cross-border shipment on corridors with limited logistics infrastructure, while maintaining competitive lead times on the order of ten calendar days from the United States to Central Asia.*

The hypothesis is operationalised through three independent variables (the degree of digitisation of the operator's platform, the diversification of its route network, and the proportion of its operational stack that consists of in-house rather than contracted infrastructure) and three dependent variables: average lead time from acceptance to final delivery, monthly air-cargo tonnage handled, and the ratio of senders to recipients in the customer base. The verification procedure in Chapter 4 examines each dependent variable against the longitudinal record and assesses the qualitative contribution of each independent variable to the observed outcomes.

I.8 Structure of the monograph

The remainder of the monograph proceeds as follows.

Chapter 1 reviews the state of cross-border e-commerce logistics on emerging markets, with particular attention to the Central Asian corridor, and identifies the research gap that the OEM-model addresses. Chapter 2 develops the theoretical foundation of the model, drawing on four lenses (Supply Chain Management, the Resource-Based View, Operational Flexibility, and Transaction Cost Economics) and positions the consolidation operator class relative to existing maturity ladders. Chapter 3 specifies the five-block architecture of the OEM-model in detail, with decision algorithms, partnership logic, digital-platform design, customer-ecosystem mechanics, and a risk-management discipline. Chapter 4 verifies the model empirically on the Havvo Express longitudinal dataset and articulates reproducibility conditions for other corridors. The Conclusion summarises findings, states limitations, and outlines a research agenda.

The monograph is the scientific companion to a separately authored methodology guide, "Methodology for Consolidating E-commerce Cargo on International Logistics Corridors: From Shipment Acceptance to Delivery to the Final Recipient", in which the same set of operations is treated procedurally. The two documents are designed not to duplicate one another. Where the methodology guide describes a process (for example, the protocol for accepting a parcel at a Delaware warehouse), the monograph analyses that process: connects it to the theory that explains why it works, compares it to the alternatives that the operator chose against, and draws an inference about the place of that process in the operator class as a whole. The methodology guide is the source of facts. The monograph is the scientific interpretation of those facts.

Chapter 1. E-commerce Logistics on Developing Markets: Review and Analysis

The chapter pursues two related ends. The first is to document the state of the global cross-border e-commerce logistics system as of the middle of the 2020s, with attention to the operator classes that have crystallised within it and the trends that are reshaping them. The second is to characterise the Central Asian corridor as a distinct sub-system in which the standard operator classes work imperfectly, and to identify the operational deficit that gives rise to the consolidation operator class. The chapter closes with a focused literature gap analysis that explains why a methodologically grounded framework for this class on this corridor is overdue.

1.1 Global trends in cross-border e-commerce logistics

The structural composition of the global parcel system has changed in two distinct phases over the last decade. The first phase, running roughly from the mid-2010s to the start of the 2020s, was dominated by the consolidation of the express integrator segment around a small number of incumbents and by the gradual displacement of national postal channels in cross-border flows. Joerss, Schröder, Neuhaus, Klink, and Mann (2016) framed this phase in terms of a "last-mile" reorganisation driven by consumer expectations of speed and tracking, and identified the rise of dense urban delivery networks as the principal capital-intensive bet of the integrator class. Hübner, Kühn, and Wollenburg (2016) showed, on the retail side, that the same expectations were forcing omnichannel grocery retailers to redesign distribution networks around final-mile fulfilment rather than around store replenishment.

The second phase, running from the early 2020s to the present, has been defined by a quantitative surge in cross-border parcel volumes that has decoupled the growth of the parcel system from the growth of the merchandise trade of which it is nominally a part. Zennaro, Finco, Calzavara, and Persona (2022) document how e-commerce has reorganised five operational areas of supply chain practice simultaneously: network design, outbound logistics, reverse logistics, warehousing, and the management of information and data. Michielsen, Gevaers, and Dewulf (2025) provide the most recent overview, arguing that the binding constraint on global cross-border e-commerce is increasingly the air cargo system, not the surface logistics network on which integrator economics were historically based. The International Air Transport Association (2025) reports that air cargo demand, measured in cargo tonne-kilometres, increased by 11.3 percent year-on-year in 2024, with

12.2 percent growth on international operations. E-commerce was cited as a significant driver of the surge. For the first time in the post-pandemic period, the international air cargo system absorbed a wave of demand without the price spikes that had characterised 2021. The structural conclusion is that the air cargo system has become the principal scaling axis of the global cross-border parcel system, displacing the surface networks that anchored the integrator economics of the prior decade.

A separate analytical strand examines the operational research problem of last-mile delivery on dense urban networks. Boysen, Fedtke, and Schwerdfeger (2021) survey a now extensive literature on alternative last-mile concepts, including locker networks, autonomous delivery robots, and crowd-sourced delivery. The survey is significant for the present argument less for the specific concepts it catalogues than for the methodological standpoint it adopts. Last-mile concepts are not interchangeable; each one assumes a particular density of demand, a particular shape of the final-mile graph, and a particular regulatory environment. Concepts that work on Western European or East Asian urban networks cannot be ported into Central Asian metropolitan areas without considerable redesign, because the underlying input assumptions do not transfer.

A long-running theme in the trade economics literature places the recent air-cargo surge in a longer historical perspective. Hummels (2007) showed that the late twentieth century witnessed a structural decline in transportation costs, with air freight costs falling by far the more dramatic margin than ocean freight, and that this cost decline enabled the rapid growth of trade in time-sensitive goods. The argument applies a fortiori to cross-border e-commerce parcels, which combine high time sensitivity with low individual weight, and for which the air cargo channel is therefore not merely one option among several but a structural default.

A separate axis of structural change concerns the information layer that has accompanied the physical reorganisation. Cross-border e-commerce flows now travel with metadata that did not exist a decade ago. Real-time tracking, automated customs pre-clearance, and digitised consumer interfaces have become operational defaults rather than optional features. Zennaro et al. (2022) identify information and data management as one of the five core areas reshaped by e-commerce, and the systematic mapping of digital platform roles by Kam, Ahsan, Deng, and Duan (2026) confirms that the digital interface is now treated as a constitutive element of the logistics operator's value proposition, not as a back-office overlay. The consequence for operator design is that a cross-border e-commerce operator that fails to invest in proprietary information infrastructure will be unable to compete on the dimensions that consumers and partners now treat as standard.

The cumulative implication of these strands is that the global cross-border e-commerce logistics system entered the middle of the 2020s with an operator landscape divided into four classes: national postal operators, integrator-class express carriers, asset-light third-party logistics providers, and a newer class of consolidation operators that the academic literature has not yet systematised. Table 1.1 summarises the operator-class landscape, its network models, the strengths each class brings to the broader system, and the limitations each class exhibits specifically on Central Asian corridors. The first three classes have been studied extensively. The fourth class is the focus of this monograph.

Table 1.1. Global cross-border e-commerce parcel system in the mid-2020s by operator class

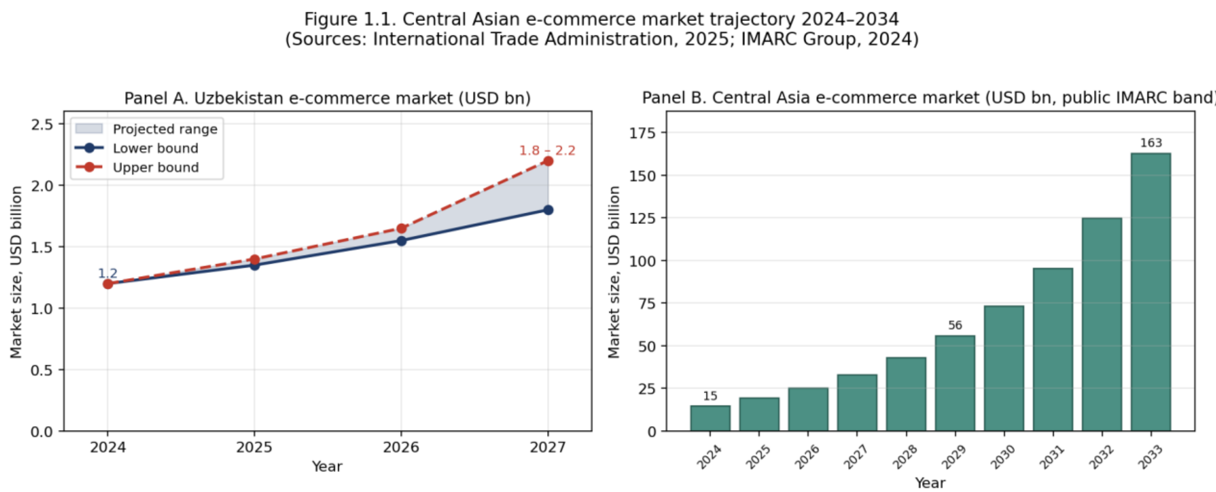
Operator class	Network model	Typical corridor	Strengths	Limitations on CA corridor
National postal operators	Bilateral postal-treaty network	All origin-destination pairs covered by Universal Postal Union	Lowest unit cost; universal reach	Limited tracking; long and variable lead times; weak claims processes
Express integrators (DHL, FedEx, UPS)	Hub-and-spoke air + dense ground	Developed-market dense corridors	High service quality; rapid scaling on high-margin parcels	Unit prices strip value from low-ticket parcels; thin coverage on Central Asian last-mile
Asset-light 3PL providers	Outsourced air + local subcontracting	Standardised industrial flows	Flexibility; capital efficiency	No proprietary digital interface for B2C consumers; limited continuity on disruption
Consolidation operators (Aramex, Havvo Express, J&T Express, Ninja Van)	Proprietary warehouse + direct carrier partnership + proprietary digital platform	Emerging-market high-growth corridors	Unit economics favourable for low-ticket parcels; controllable lead times	Class not yet codified as a framework; operational success is operator-specific

1.2 The Central Asian market: specifics and structural deficits

The Central Asian regional sub-system into which the OEM-model is positioned has three structural features that distinguish it from the global average. The first is rapid growth in absolute online retail volumes, concentrated in the three principal markets of Uzbekistan, Kazakhstan, and Kyrgyzstan. The second is a logistics infrastructure profile that the World Bank Logistics Performance Index places in the lower bands of its global ranking, with attendant friction in customs, tracking, and timeliness. The third is the doubly landlocked status of Uzbekistan and the deeply landlocked status of Kazakhstan and Kyrgyzstan, which limits the role of ocean freight to indirect feeder configurations and amplifies the dependence of cross-border parcel flows on the air cargo channel that the previous section identified as the scaling axis of the global system.

The growth trajectory of the regional e-commerce market is documented in three independent sources. The U.S. International Trade Administration (2025) reports that the Uzbek e-commerce market reached USD 1.2 billion in 2024, equivalent to 3.8 percent of total retail sales, against an internet user base of 32.7 million and a penetration rate of 87.2 percent of the population. The same report cites a forecast that projects the market to USD 1.8 to 2.2 billion by 2027, implying a market share of 9 to 11 percent of retail. The KPMG Central Asia regional review (2022) had earlier projected sustained double-digit annual growth in Uzbek e-commerce through 2026 and identified Kazakhstan as the regional leader in absolute terms. The Asian Development Bank (2023) places the broader Asia-Pacific region in a multi-year structural expansion phase, with a rising share of e-commerce in regional gross domestic product. Karimov, Nabieva, and Mustafoev (2022) provide an academic benchmarking of the three Central Asian markets against one another, identifying parallel growth dynamics with country-specific institutional friction. Figure 1.1 plots the regional and Uzbekistan-specific trajectories projected through the early 2030s by these public sources.

Figure 1.1. Central Asian e-commerce market trajectory 2024–2034



Sources: International Trade Administration, 2025; IMARC Group, 2024; KPMG, 2022. The IMARC band in Panel B is presented as an indicative public-edition reference.

The infrastructure profile of the region is characterised in two complementary ways. The Logistics Performance Index (Arvis et al., 2023) places Kazakhstan, Uzbekistan, and Kyrgyzstan in the lower-middle to lower bands of its global ranking on a six-dimensional scale that includes customs efficiency, infrastructure quality, ease of arranging international shipments, logistics service quality, tracking and tracing, and timeliness. The Organisation for Economic Co-operation and Development (2023, 2024) extends this picture with two specialised analyses. The first reviews the implementation of trade facilitation measures across the region and identifies progress in customs documentation and risk-based inspection regimes alongside persistent gaps in the digital integration of border procedures. The second focuses on the Trans-Caspian corridor that links Central Asia to European seaboards by surface routes and identifies the corridor as requiring sustained investment through 2040 to absorb projected container volumes at a competitive transit capacity. The infrastructural picture is therefore not one of stagnation but of incremental investment that lags the rate of demand growth.

Regulatory friction at the border has been a substantive object of recent academic analysis. Yeleussizova, Kazbekova, and Zeinelgabdin (2024) examine the role of de minimis thresholds in the Kazakhstani cross-border e-commerce regime and document a partial increase in retail e-commerce imports following threshold revisions, combined with a decrease in mis-declared shipment value. The same study reports a minimal impact on aggregate customs tax revenue, suggesting that the consumer-welfare gain from reduced friction outweighs the fiscal cost. Across the region, the de minimis threshold is set at USD

200 in Uzbekistan and EUR 200 in Kazakhstan, with the consequence that consolidation strategies that aggregate small-value parcels under the threshold acquire a structural cost advantage relative to direct shipment of higher-value parcels above the threshold.

The customs processing technology stack underpinning these regimes is dominated by the Automated System for Customs Data (ASYCUDA) developed and maintained by the United Nations Conference on Trade and Development. UNCTAD (2023) reports that the system is operational in 102 countries and territories, including 38 of the least developed countries and 23 of the landlocked developing countries, with the implication that the operational interface for customs declaration is broadly standardised across the markets that the consolidation operator class serves. Standardisation at the customs interface reduces the integration burden on a digital platform that aspires to operate across multiple destination markets and therefore conditions the design choices examined in Chapter 3.

Onto this infrastructural and regulatory profile, the global integrator class projects coverage that has historically privileged developed-market hubs. The DHL Group annual report for 2023 documents the segmentation of the integrator's operations, with the Express segment functioning as a substantial but distinct revenue stream within a much larger group total and absorbing a year-on-year contraction in time-definite international volumes during the period (DHL Group, 2024). Direct competitor operations on cross-border parcel flows into Central Asia operate on similar segmentation logic, with the consequence that the region is structurally under-served at the unit-volume level typical of individual e-commerce parcels. The regional gap is not the absence of integrator presence but the mismatch between integrator unit economics and the consumer-parcel volume that Central Asian e-commerce demand has generated. The doubly landlocked status of Uzbekistan, recorded in the classification maintained by the United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States, further amplifies this mismatch by foreclosing the ocean freight alternatives that integrators rely on to balance their air cargo books on other corridors. Table 1.2 enumerates the principal operator types present on the Central Asian corridor and their reach into the last-mile destination markets.

Table 1.2. Operator presence on the Central Asian corridor by class

Operator	Class	Cross-corridor presence	Central Asian coverage	Last-mile reach in UZ/KZ/KG
Universal Postal Union national post	National post	Universal	Present but slow	Variable; weak in rural districts
DHL Express	Integrator	220+ countries	Hub in Tashkent and Almaty	Limited; high unit price
FedEx	Integrator	220+ countries	Hub in Almaty	Limited; high unit price
Aramex	Consolidation (Middle East)	Multi-continent presence	Indirect via Dubai hub	Indirect; via partners
Havvo Express	Consolidation (Central Asia)	USA / Europe / South Korea → UZ / KZ / KG	Native operator	Native; door-to-door

1.3 Consolidation as the operational response

Cargo consolidation as a logistics concept is older than e-commerce. Lummus and Vokurka (1999) trace the integration of consolidation into supply chain management theory and document the economic logic of scale economies in transportation: the unit cost of moving a parcel from origin to destination falls non-linearly with the total weight or volume aggregated at the long-haul stage. The non-linearity is most pronounced on air freight, where fixed costs per flight dominate variable costs per kilogram and where the marginal cost of adding a kilogram of cargo to a flight that has already been chartered is small relative to the average cost recovery the carrier seeks. The consolidation operator exploits this non-linearity by acting as an aggregator between fragmented demand at origin (individual e-commerce consumers placing orders on US, European, and East Asian marketplaces) and concentrated long-haul carrier capacity (regular or chartered air freight on a defined corridor).

The recent academic literature on cross-border e-commerce logistics has begun to engage the consolidation question directly. Tovstolis (2024) develops a cluster-based optimisation model for consolidating small e-commerce shipments on the China-United States corridor and reports a 40 percent reduction in unit transportation cost and a ten-day reduction in delivery time relative to non-consolidated baseline approaches. The result is significant in two respects. First, the magnitude of the cost reduction documents that consolidation is not a marginal optimisation; it is a structural shift in the economics of cross-border parcel movement on long-distance corridors. Second, the corridor on which the result was generated (China to the United States) is not the corridor of interest in the present monograph, but the underlying economic mechanism transfers with appropriate adjustment for corridor-specific friction. The Central Asian corridor combines lower aggregate volumes, longer effective customs cycles, and a thinner pool of long-haul air carriers than the Sino-American corridor, all of which alter the parameters of the consolidation optimisation but preserve its structural advantage over direct shipment.

A second strand of the literature addresses the design choices that condition the success of cross-border B2C e-commerce logistics arrangements. Giuffrida, Mangiaracina, Perego, and Tumino (2017) review the literature on cross-border B2C e-commerce logistics serving the Greater China market and identify network design and outsourcing strategy as the principal research gaps. Giuffrida, Jiang, and Mangiaracina (2021) develop the analysis further by relating uncertainty types to risk management strategies, finding that the choice of risk mitigation depends on the type of uncertainty more than on the size or origin of the focal firm. Khooban, Mutlu, and de Kok (2024) model the strategic decision of logistics service sharing in cross-border e-commerce as a function of consumer price and trust sensitivity, identifying win-win collaborative arrangements that produce stable equilibria over a range of contract parameters. The unifying theme of these contributions is that the consolidation operator faces a non-trivial strategic problem: how to design a network, how to allocate risk, and how to govern partnerships across borders, with the recognition that each of these choices is interdependent.

Operational evidence for the consolidation operator class as a functioning business model exists in the disclosures of regional operators. Aramex, the Middle Eastern consolidation and express operator, reports operations across multiple continents with international express constituting one of the larger contributors to group performance (Aramex PJSC, 2024). On the Southeast Asian corridor, the Parcel Perform and Kearney market report (2024) documents the regional cross-border e-commerce logistics market as substantial in absolute scale with sustained double-digit projected growth through 2030, with consolidation operators including J&T Express and Ninja Van as key regional actors. These disclosures, taken together, document that consolidation operators have established viable scale-up trajectories on emerging-market corridors elsewhere in the world. They do not, however, articulate a transferable framework that codifies how a consolidation operator is built. That codification is the analytical objective of the present monograph.

Distinguishing consolidation from adjacent operating models is necessary at this point in the argument. Direct delivery describes the model in which an individual purchase travels from origin marketplace to destination consumer through a single carrier without intermediate aggregation. Fulfilment describes the model in which inventory is positioned at destination ahead of demand, with the consumer purchasing from a local stock. Consolidation describes the model that operates between these poles: parcels are aggregated at origin after purchase but before long-haul, then disaggregated at destination for final-mile delivery. Each model produces a different mapping of cost, time, and complexity, with consequences for the configuration of warehouse infrastructure, the choice of carriers, and the level of digital integration required. Table 1.3 sets out the principal axes of comparison among the three models.

Table 1.3. Comparative matrix: direct delivery, consolidation, and fulfilment

Dimension	Direct delivery	Consolidation	Fulfilment
Inventory positioning	None	None (parcels aggregated post-order)	Local stock pre-order
Capital intensity at destination	Low	Moderate (warehouse footprint)	High (inventory + warehouse)
Unit cost on low-ticket parcels	High	Low (scale economies on long-haul)	Lowest (already on-market)
Lead time	Variable; depends on carrier	Predictable; 10 days mean USA→CA	Same-day to 2 days
Customs-friction exposure	High (per-parcel declaration)	Moderate (manifest-level submission)	None (already cleared)
Suitability for cross-border CA flows	Low	High	Limited (origin-only marketplaces)
Capital risk on demand volatility	Low	Moderate	High

1.4 The research gap

The literature reviewed in the previous three sections supports four substantive observations about the state of academic understanding of cross-border e-commerce logistics on emerging markets. First, the global cross-border parcel system has been studied extensively, with strong coverage of integrator economics, last-mile operations, and the role of air cargo. Second, the Central Asian sub-system has been studied empirically, with documented growth dynamics, infrastructure constraints, and customs friction. Third, the consolidation concept has been treated theoretically in supply chain management and operationally in a handful of corridor-specific studies. Fourth, a methodological gap remains: no published framework integrates these strands into a coherent description of the consolidation operator class as it operates on emerging-market corridors with limited logistics infrastructure.

The contour of the gap can be made specific. Existing 3PL and 4PL maturity ladders, reviewed in Chapter 2, were developed against the experience of asset-light or asset-heavy logistics providers operating on mature corridors with abundant infrastructure. The consolidation operator class is neither asset-light in the conventional sense (it operates proprietary warehouses) nor asset-heavy in the integrator sense (it does not own aircraft), and it does not operate on infrastructure-rich corridors. Recent systematic reviews of logistics services outsourcing, such as Abbasi, Sicakyuz, Santibanez Gonzalez, and Ghasemi (2024), document the absence of a class label that fits this profile. The gap is not the absence of operational evidence (Aramex on the Middle Eastern corridor, J&T Express and Ninja Van on the Southeast Asian corridor, and Havvo Express on the Central Asian corridor each provide concrete operational records) but the absence of a generalised analytical framework that explains why these operators have succeeded where their peers in adjacent classes have not.

Three considerations make the codification of this gap timely. First, the magnitude of demand on the Central Asian corridor has crossed a threshold at which the absence of a model carries practical cost. Operators making strategic decisions about warehouse placement, carrier partnerships, and digital investment lack a framework against which to compare their choices, and reviewers (academic, regulatory, or financial) lack a benchmark against which to evaluate operator claims. Second, the methodological literature on case-based theory development in operations management has matured to a point at which a single-case verification of a multi-block operational model is an established and rigorously defensible research design (Eisenhardt, 1989; Voss, Tsikriktsis, & Frohlich, 2002; Yin, 2018). Third, the structural shift in the global cross-border parcel system that the first section of this chapter documented is unlikely to reverse on the time horizon of the next decade. The air-cargo-anchored cross-border parcel system is the medium in which Central Asian e-commerce demand will continue to seek satisfaction, and the consolidation operator class is the most plausible institutional form through which that demand will be served at scale.

A further consideration concerns the relationship between the consolidation operator class and the broader question of supply chain sustainability and resilience. Giannakis and Papadopoulos (2016) develop a risk-management framework for sustainable supply chains that distinguishes operational, social, and environmental risk categories, and the systematic review by Chowdhury, Paul, Kaisar, and Moktadir (2021) documents the post-pandemic emphasis on resilience and adaptability in supply chain research. The consolidation operator class, by virtue of its corridor-specific specialisation and its dependence on a small number of long-haul carrier partnerships, is structurally exposed to disruption events. The capacity of the OEM-model to absorb these events is therefore not an optional feature of the framework but a load-bearing component, and Chapter 3 will treat it accordingly.

A final aspect of the gap concerns the relationship between operational practice and theory generation. The methodology guide that accompanies this monograph codifies the operational protocols that have been worked out in practice on the Central Asian corridor, but a methodology guide is not a theory and cannot perform the functions that a theory performs in a scientific community. A theory states a relationship between variables, generates predictions that can be tested against data, and connects the phenomenon of interest to the wider intellectual apparatus of the discipline in which it sits. The OEM-model is intended to perform these three functions for the consolidation operator class. Its variables (the five operational blocks and their internal sub-components), its predictions (sustained tonnage growth conditional on the joint development of those blocks, with mean lead time preserved on the order of ten calendar days), and its theoretical anchors (Supply Chain Management, Resource-Based View, Operational Flexibility, Transaction Cost Economics, examined in Chapter 2) define a research object that is both falsifiable and connected to established literatures. The gap that the monograph addresses is therefore not only an empirical gap but a theoretical one, and the choice to mount the argument at the level of an integrative model rather than a sequence of standalone case observations follows from this dual character of the gap.

The remainder of the monograph proceeds from this gap. Chapter 2 develops the theoretical foundation of the OEM-model. Chapter 3 specifies its five-block architecture. Chapter 4 verifies the model on the longitudinal Havvo Express dataset and articulates the reproducibility conditions under which the framework can be transferred to other emerging-market corridors.

Chapter 2. Theoretical Foundations of the OEM-Model

Chapter 1 documented an empirical and methodological gap. The consolidation operator class on emerging-market cross-border corridors lacks an integrative framework. The present chapter constructs the theoretical foundation on which such a framework can be erected. The argument proceeds in four steps. The first step assembles four theoretical lenses that, in combination, account for the structural choices that distinguish a consolidation operator from its neighbouring classes. The second step examines the maturity ladders that the logistics-services literature has developed and identifies the position that the consolidation operator occupies on those ladders. The third step proposes the conceptual architecture of the OEM-model, with five operational blocks and the linkages that bind them into a coherent system. The fourth step formalises the research hypothesis and articulates the operationalisation strategy by which the hypothesis can be tested on the empirical record assembled in Chapter 4.

2.1 Four theoretical lenses

The OEM-model integrates four theoretical lenses. None of the four is sufficient on its own. Each one isolates a distinct dimension of the operational problem and explains a distinct family of design choices. Taken together, they constitute the theoretical grammar of the model.

Supply Chain Management as the integrating frame

Supply Chain Management (SCM) provides the macro-theoretical frame within which the OEM-model is situated. The literature on SCM has matured over four decades from a set of operational concerns about inventory and transportation into a unified discipline that treats the firm as one node in an extended network of partners (Mentzer et al., 2001; Lambert & Cooper, 2000). The contemporary canon represented by Chopra and Meindl (2016), Christopher (2016), and Bowersox, Closs, and Cooper (2020) treats SCM as a discipline that addresses three principal questions: how the structure of the network is designed, how flows of physical material, information, and capital are managed across that structure, and how the relationships between actors in the network are governed.

The consolidation operator is a particular kind of network actor. It is not an end-to-end network owner in the sense that a vertically integrated retailer might be. It is not a transactional intermediary in the sense that a freight forwarder might be. It is a network orchestrator that owns the operational interface between fragmented demand at origin and concentrated long-haul capacity. The relevance of SCM theory to the OEM-model is that the orchestrator role makes the choices that SCM identifies as constitutive (network design, flow management, relationship governance) load-bearing for the operator's competitive viability. A consolidation operator that under-invests in any one of the three will fail at the boundaries of the other two.

The principal extension of SCM theory that the OEM-model requires concerns the corridor itself. The classical SCM literature treats the corridor as a substrate on which the network sits. Corridor-level constraints (regulatory, infrastructural, geopolitical in the operational sense framed in Chapter 1) appear in the literature as exogenous variables. On emerging-market corridors, however, the corridor is not exogenous. It is itself a variable that the operator can partially shape by its choice of partners, its choice of customs interface, and its choice of contingency routes. The OEM-model treats corridor-level resilience as a managed variable, not as an environmental constant, and this extension is one of its principal departures from the standard SCM canon.

Resource-Based View

The Resource-Based View (RBV) of the firm provides the micro-theoretical lens through which the operational choices of a consolidation operator can be explained as the deliberate accumulation of strategic resources rather than as opportunistic responses to a market. The intellectual lineage of RBV traces from Penrose (1959), who conceived the firm as a bundle of productive resources whose growth is constrained by the managerial capacity to mobilise them, through Wernerfelt (1984), who formalised the resource-side perspective as an alternative to the product-side perspective of classical industrial economics, to Barney (1991), whose framework identifies four criteria that a resource must satisfy to generate sustained competitive advantage: value, rareness, imperfect imitability, and absence of strategic substitutes. The acronym VRIN that summarises these criteria has become a standard organising device in the strategic management literature.

Peteraf (1993) extended RBV by identifying four economic conditions that the framework presupposes: heterogeneity in firm-level resources, ex ante limits to competition that prevent the strategic resource from being acquired at its full economic value, imperfect mobility that keeps the resource within the firm that acquired it, and ex post limits to competition that protect the rent stream the resource generates. Teece (2007) added the dimension of dynamic capabilities, with sensing, seizing, and reconfiguring as the three microfoundations of the firm's capacity to maintain its competitive position under environmental change.

The application of RBV to the consolidation operator class follows a specific argument. Wong and Karia (2010), in the most-cited application of RBV to logistics service providers, identify five categories of strategic resources that distinguish a competitive LSP from a commoditised one: physical resources, human resources, information resources, knowledge resources, and relational resources. The OEM-model treats each of the five blocks examined in Chapter 3 as a locus in which the consolidation operator accumulates one or more of these resource categories. Warehouse infrastructure is a physical resource. The proprietary digital platform is an information resource bundled with a knowledge resource. Direct carrier partnerships are relational resources. The recent systematic review by Komakech and Ombati (2024) confirms that RBV remains the dominant analytical frame in the SCM literature for explaining firm-level competitive advantage, and it identifies blockchain, artificial intelligence, and the Internet of Things as the strategic resource categories whose VRIN profile is most relevant to contemporary SCM practice. The consolidation operator class operates one level below this frontier: its strategic resources are warehouse footprint, direct carrier partnerships, and proprietary information systems, all of which are scarce and imperfectly imitable on emerging-market corridors precisely because the corridor environment limits the supply of substitutes.

Operational Flexibility

The third theoretical lens is the concept of operational flexibility. The literature on operational flexibility originated in the manufacturing context and has been progressively extended to logistics. Sethi and Sethi (1990) provided the foundational taxonomy of flexibility types, distinguishing among machine flexibility, product flexibility, routing flexibility, volume flexibility, and several adjacent categories. Upton (1994) reformulated the concept in managerial terms by defining flexibility as the capacity of a firm to change or react with little penalty in time, effort, cost, or performance. The relevance of operational flexibility to the consolidation operator class is direct. On corridors with limited logistics infrastructure, the operating environment generates frequent perturbations: a carrier cancels a flight, a customs procedure changes, a route closes for regulatory or operational reasons. The operator that can route around these perturbations without losing the mean lead time has an operational flexibility profile that one that cannot does not.

Sandberg (2021) connects the operational-flexibility lens to the dynamic-capabilities framework by showing that the dynamic capabilities of sensing, seizing, and reconfiguring generate logistics flexibility at three levels: operational (day-to-day reroutings), structural (network reconfiguration on the order of months), and strategic (entry into new corridors on the order of years). The OEM-model is structured so that each level of flexibility is supported by a distinct combination of blocks. Day-to-day reroutings are supported by Block II (route network) and Block V (risk management). Structural reconfiguration is supported by Block I (warehouse infrastructure) and Block III (digital platform). Strategic entry into new corridors is supported by all five blocks acting jointly.

Transaction Cost Economics

The fourth theoretical lens is Transaction Cost Economics (TCE). The foundational contributions of Williamson (1979, 1985) demonstrated that the choice between organising an economic activity within the firm and contracting for it on the market depends on three parameters of the transaction: the specificity of the assets it requires, the uncertainty under which it is conducted, and the frequency with which it is repeated. Transactions characterised by high asset specificity, high uncertainty, and high frequency tend toward vertical integration. Transactions characterised by the opposite parameters tend toward market governance.

The consolidation operator faces a TCE-relevant choice at each of its five blocks. Warehouse infrastructure can be owned or leased. Long-haul carrier capacity can be bought on the spot market, secured via term contract, or formalised as a direct partnership. The digital platform can be developed in-house or licensed. The customer interface can be operated by the firm or outsourced to a customer service vendor. Risk management can be embedded in the operator's own discipline or contracted to a third-party insurer or risk consultant. The OEM-model takes a definite position on each of these choices: the consolidation operator vertically integrates the components for which asset specificity is high and frequency is high (warehouse, digital platform, direct carrier partnership) while leaving room for market contracting on components for which these parameters are lower (insurance, niche last-mile partners in destination markets).

This is not a defence of vertical integration as such. It is an empirical claim that the specificity-frequency-uncertainty profile of the consolidation transaction, on the corridor profile that the consolidation operator class addresses, supports a particular partial-integration configuration. The choice is contingent. On a different corridor with different parameters, the optimal configuration would differ. The OEM-model identifies the structural reasons for the configuration that has crystallised on the Central Asian corridor and lays the groundwork for the comparative analysis that the Conclusion takes up.

Table 2.1 summarises the four lenses, the principal claim that each lens contributes, and the OEM-model component to which the lens applies most directly.

Table 2.1. Four theoretical lenses mapped to OEM-model components

Lens	Principal claim	OEM-model element to which the lens applies	Anchoring reference
Supply Chain Management	The firm is a node in an extended network whose structure, flows, and relationships must be jointly designed	Whole model; corridor as managed substrate	Mentzer et al. (2001); Chopra & Meindl (2016); Bowersox et al. (2020)
Resource-Based View	Sustained competitive advantage derives from resources that satisfy the VRIN criteria	Block I (physical), Block III (information + knowledge), Block II (relational)	Wernerfelt (1984); Barney (1991); Wong & Karia (2010)
Operational Flexibility	The capacity to react with little penalty in time, effort, cost, or performance is a strategic competence	Block II (routing flexibility), Block V (risk response)	Sethi & Sethi (1990); Upton (1994); Sandberg (2021)
Transaction Cost Economics	The make-or-buy decision depends on asset specificity, uncertainty, and frequency	Vertical integration of Blocks I, II.partnerships, III	Williamson (1979, 1985)

2.2 Maturity models of logistics operators

The logistics-services literature has produced a series of maturity ladders that order operators along a development trajectory from rudimentary transportation provision to integrated supply-chain orchestration. The classical ladder runs from First-Party Logistics (1PL) at the bottom (the shipper performs its own logistics) through Second-Party Logistics (2PL, contracted carriage), Third-Party Logistics (3PL, contracted operational stack), Fourth-Party Logistics (4PL, integrated information and orchestration), and in more recent extensions Fifth-Party Logistics (5PL, end-to-end digital orchestration). The ladder has been validated and refined in the literature through successive empirical studies (van Laarhoven, Berglund, & Peters, 2000; van Hoek, 2001; Lieb & Bentz, 2005), and the recent systematic review by Abbasi, Sicakyuz, Santibanez Gonzalez, and Ghasemi (2024) confirms that 3PL and 4PL classifications remain the principal organising device for the logistics-outsourcing field.

The consolidation operator class does not fit comfortably on this ladder. It is not 3PL in the canonical sense because the canonical 3PL is asset-light or asset-flexible: it contracts for the operational capacity it offers to the shipper. The consolidation operator owns its warehouse footprint, operates its own customer interface, and holds direct contractual relationships with its long-haul carriers. It is not 4PL in the canonical sense because the canonical 4PL is an information layer above the operational stack: it orchestrates third-party operators on behalf of the shipper. The consolidation operator is itself the operational stack. The closest fit on the classical ladder is an unusual hybrid, in which the consolidation operator owns the orchestration layer that a 4PL would provide while also owning the operational stack that a 3PL would contract for. The recent platform-economics literature (Parker, Van Alstyne, & Choudary, 2016; Hagiu & Wright, 2015; Cusumano, Gawer, & Yoffie, 2019) extends this picture by treating digital platforms as a distinct organisational form, but the consolidation operator class is not purely a platform either; it is a platform that owns the physical assets the platform routes across.

The position taken in this monograph is that the consolidation operator constitutes a distinct class on its own ladder rather than an intermediate point on the classical 3PL-4PL ladder. The class is defined by four criteria: proprietary warehouse infrastructure on the origin side of the corridor, direct partnership agreements with long-haul carriers, a proprietary digital platform that integrates warehouse, route, customer, and risk operations, and an adaptive routing discipline that treats corridor-level disruption as a managed variable. A consolidation operator that satisfies all four criteria is an OEM-operator in the sense of this monograph. An operator that satisfies fewer than all four occupies a developmental sub-class, and the maturity ladder examined in Section 3 and operationalised in Chapter 4 maps the path along which a sub-class operator can ascend to full OEM-class membership.

Three transitions on the OEM-class ladder warrant explicit identification. The first is the transition from a single-warehouse footprint to a distributed network. The second is the transition from spot-market carrier procurement to direct partnership-based procurement. The third is the transition from a service interface that consumers experience as a black box to a digital platform that exposes operational state to the consumer in real time. Each transition modifies the operational economics, the strategic resource base in the sense of Wong and Karia (2010), and the operational-flexibility profile in the sense of Sandberg

(2021). The Havvo Express longitudinal record analysed in Chapter 4 documents an operator that has completed all three transitions.

Table 2.2 positions the OEM class on the classical maturity ladder, locating it as a distinct class adjacent to, rather than nested within, the 3PL/4PL/5PL progression.

Table 2.2. Logistics operator maturity ladder positioning of the OEM class

Tier	Canonical class	Asset position	Information layer	Cross-border consolidation capability	Position of OEM-class
1PL	Shipper-owned	Self-asset	None	None	Not applicable
2PL	Carrier	Carrier-owned	Carrier-internal	None	Not applicable
3PL	Asset-light or asset-flexible	Mostly contracted	Internal	Variable	Below OEM
4PL	Orchestrator	Contracted	Cross-actor integration	Possible but not constitutive	Adjacent to OEM
5PL	Digital orchestrator	Contracted	Algorithmic	Possible but not constitutive	Adjacent to OEM
OEM	**Consolidation operator**	**Proprietary warehouse + direct carrier partnerships**	**Proprietary platform; integrative**	**Constitutive**	**Distinct class**

2.3 Conceptual architecture of the OEM-model

The OEM-model is constructed as a five-block architecture. The blocks are not merely categories. They are coupled subsystems, each defined by its inputs, its outputs, its internal decision logic, and its interfaces with the other four blocks. The blocks are listed below with a brief characterisation of each. Chapter 3 examines each block in operational detail.

Block I. Warehouse infrastructure. The block accepts parcels at origin, performs identification and matching against the customer base, executes consolidation and repackaging, and stages outbound flow to the long-haul carrier. The block sits at the boundary between the marketplace world (where parcels originate) and the operator's domain. Its physical configuration, its operating protocols, and its location decisions are the loci through which the firm acquires the physical and knowledge resources that RBV identifies as strategic.

Block II. Route network and partnerships. The block manages the long-haul carriage from origin to destination. Its principal inputs are the manifest of consolidated shipments that Block I generates, its principal output is the timely delivery of parcels to the destination market. Its strategic resource base consists of the relational resources that direct carrier partnerships represent. Its operational discipline is shaped by the TCE-driven choice to integrate the carrier relationship rather than to procure carrier capacity on the spot market.

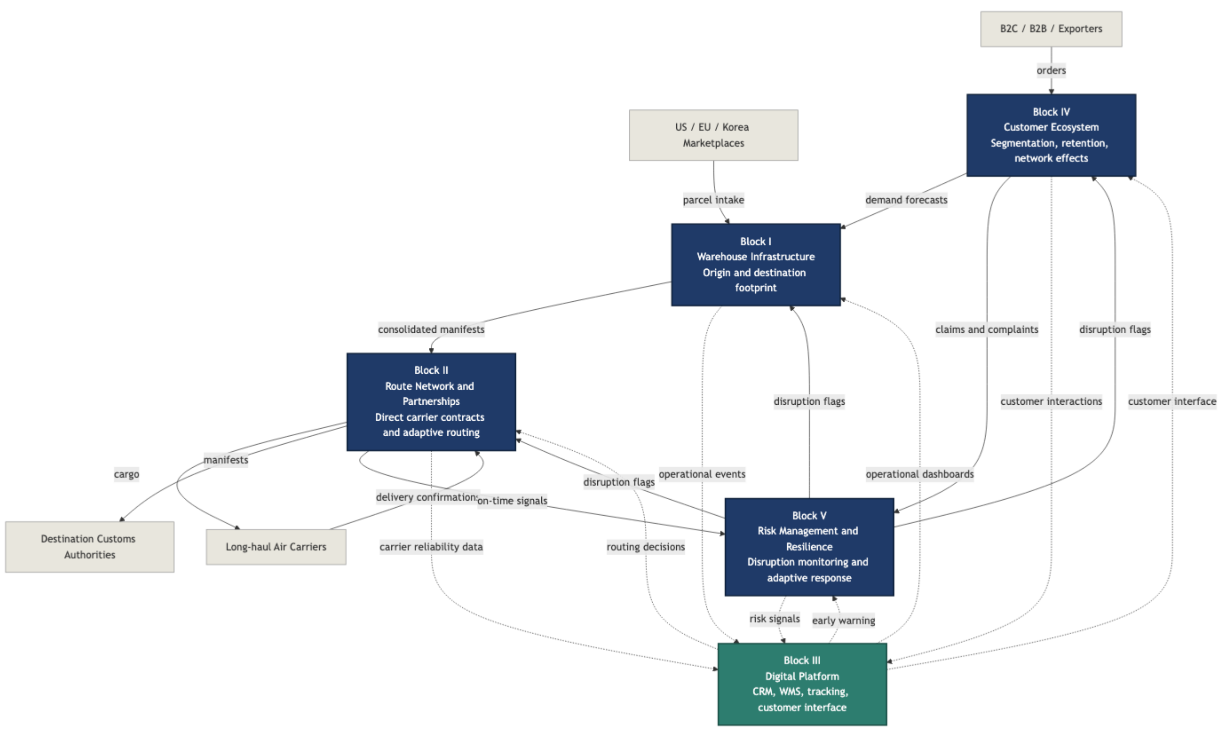
Block III. Digital platform. The block carries the information layer of the operator's stack. Its principal inputs are the operational events generated by Blocks I, II, IV, and V. Its principal outputs are the customer-facing interface, the partner-facing data feeds, and the analytical artefacts that the operator uses to manage the system. Its strategic resource base consists of the information and knowledge resources that the proprietary platform accumulates. Its operational discipline draws on the platform-economics literature (Parker, Van Alstyne, & Choudary, 2016; Hagiu & Wright, 2015) and on the digital-supply-chain literature (Büyüközkan & Göçer, 2018).

Block IV. Customer ecosystem. The block manages the relationship between the operator and its three principal customer segments: business-to-consumer (B2C) buyers placing individual purchases on US, European, and East Asian marketplaces; business-to-business (B2B) entrepreneurs aggregating commercial volumes; and exporter and marketplace-seller segments. Its principal inputs are the customer-side interactions that Block III mediates. Its principal outputs are customer retention, network growth, and the segment-specific service-quality outcomes that Mentzer, Flint, and Hult (2001) identified as the basis of logistics service quality.

Block V. Risk management and resilience. The block manages the corridor-level exposures that Section 1 identified as load-bearing on emerging-market corridors. Its principal inputs are the risk signals generated by the four other blocks (carrier reliability, warehouse throughput stability, customs cycle variability, customer claims patterns). Its principal output is the adaptive response that preserves the operational integrity of the system under disruption. Its strategic resource base consists of the knowledge resources accumulated through the operator's history of responding to past disruption events, and its operational discipline draws on the supply-chain risk management literature (Tang, 2006), the resilience literature (Christopher & Peck, 2004; Sheffi, 2005), and the ripple-effect literature (Ivanov & Dolgui, 2021).

The five blocks are coupled through information flows that the digital platform mediates and through resource flows that the four operational blocks generate or consume. Block I feeds Block II with manifests and feeds Block III with operational events. Block II feeds Block IV with delivery confirmations and feeds Block V with carrier reliability signals. Block III sits at the centre of the architecture, receiving inputs from all four operational blocks and broadcasting outputs to all of them. Block IV feeds Block V with claims and complaint signals, and feeds Block I with demand forecasts that inform throughput planning. Block V feeds the four operational blocks with risk signals and disruption flags that trigger adaptive response. Figure 2.1 renders the coupled architecture as a flow diagram, with solid lines representing the principal resource flows and dotted lines representing the information flows mediated by Block III.

Figure 2.1. OEM-model five-block architecture and inter-block flows



The coupling between blocks is non-decomposable in a sense that warrants explicit emphasis. The OEM-model does not consist of five independent modules that can be developed in arbitrary order. A consolidation operator that develops Block I (warehouse infrastructure) at high maturity but leaves Block III (digital platform) at low maturity will be unable to extract the full operational benefit of its warehouse investment, because the warehouse generates operational events at a volume that manual reconciliation cannot absorb. A consolidation operator that develops Block II (direct carrier partnerships) without Block V (risk management) will accumulate carrier-side concentration risk that exposes the system to single-point-of-failure disruption. The five blocks must therefore be developed jointly, and the maturity ladder of Section 2.2 is a ladder of joint-development states, not a ladder on which the blocks can be ascended independently. This non-decomposability is one of the principal reasons that the consolidation operator class has not, to date, been adequately described by a sequential or modular framework borrowed from adjacent classes. The framework needs to be coupled at the architectural level to match the coupling that the operational reality exhibits.

The argument that the blocks are coupled can be sharpened with reference to two recent contributions in the supply-chain literature. Cichosz, Wallenburg, and Knemeyer (2020) document the barriers and success factors of digital transformation in logistics service providers, identifying nine internal and external success factors across five barrier categories; the dominant barrier in their case studies is the absence of a unified vision that connects technology investment to the operational changes that the technology enables. Translated into the language of the OEM-model, the absence of such a unified vision is the absence of a recognition that Block III investment must be coupled with Block I, Block II, Block IV, and Block V change. Heinbach, Beinke, Kammler, and Thomas (2022) develop a typology of digital platforms in road freight transport management across eight platform types and fourteen dimensions, and demonstrate empirically that platforms which engage only the information layer without also reshaping the operational layer fail to capture the value that pure-play platform participants assume they will capture. The OEM-model treats this empirical regularity as a structural feature of the consolidation-operator class.

The KPI scaffold that operationalises the architecture is presented in Table 2.3. Three points about the scaffold warrant emphasis. First, each KPI is defined at the block level, with a target band that the OEM-operator at full maturity is expected to satisfy. Second, the measurement frequency for each KPI is calibrated to the operational tempo of the block, with high-frequency monitoring for the most volatile metrics and slower monitoring for stable structural indicators. Third, the KPI scaffold is not a checklist but a coupled system. The thresholds on the individual KPIs are mutually compatible only if the operator has achieved the block-level transitions on the OEM-class ladder identified in Section 2.2.

Table 2.3. KPI scaffold by OEM-block

Block	Principal KPI	Target band at OEM-class maturity	Measurement frequency
I (Warehouse)	Mean dwell time at origin warehouse	24–72 hours per parcel	Daily
I (Warehouse)	Mis-scan rate at intake	< 1 percent of parcels	Daily
II (Route network)	On-time arrival rate at long-haul destination	> 90 percent of consolidated shipments	Per flight
II (Route network)	Reroute lead time on disruption	< 24 hours from disruption signal to alternative routing	Per incident
III (Digital platform)	Share of customer interactions through self-service	> 80 percent of total interactions	Monthly
III (Digital platform)	Operational events captured without manual reconciliation	> 95 percent of total events	Weekly
IV (Customer ecosystem)	Monthly active sender growth rate	Sustained positive year-on-year	Monthly
IV (Customer ecosystem)	Sender-to-recipient ratio	< 0.5 (one sender → multiple recipients)	Monthly
V (Risk management)	Disruption-events absorbed without mean lead time loss	> 90 percent of recorded disruptions	Per incident
V (Risk management)	Claims rate per thousand parcels	< 5 per thousand	Monthly

2.4 Hypothesis and operationalisation

The research hypothesis, stated in the Introduction in its general form, can now be expressed in the operational terms that the theoretical foundations of the chapter support.

> ***Hypothesis (operationalised).*** *A consolidation operator that satisfies the four OEM-class criteria (proprietary warehouse infrastructure, direct carrier partnerships, proprietary digital platform, adaptive routing discipline) and that develops the five operational blocks jointly along the transitions identified in Section 2.2 will achieve, on a cross-border corridor with limited logistics*

infrastructure, an operational outcome characterised by sustained tonnage growth at compound annual rates substantially in excess of the underlying e-commerce market growth rate, while preserving a mean lead time on the order of ten calendar days from origin to destination.

The hypothesis is operationalised through three independent variables and three dependent variables. The independent variables capture the degree to which the operator has developed the structural attributes that the OEM-class criteria specify. The dependent variables capture the operational outcomes that the hypothesis predicts.

Independent variable 1: degree of digitisation of the operator's platform. Operationalised as the share of operational events captured in the proprietary digital platform without manual reconciliation, the share of customer interactions handled through self-service interfaces, and the share of carrier and customs interactions exchanged via electronic data feeds rather than paper documentation. Higher values correspond to higher digitisation maturity.

Independent variable 2: diversification of the route network. Operationalised as the number of long-haul corridors on which the operator holds operational capacity, the number of carrier partnerships per corridor, and the share of monthly tonnage carried via the largest single carrier (lower values indicate higher diversification).

Independent variable 3: proportion of operational stack consisting of in-house infrastructure. Operationalised as the share of total throughput handled in operator-owned warehouses, the share of customer interactions handled by operator-employed staff, and the share of the digital platform developed and maintained in-house.

Dependent variable 1: average lead time from acceptance to final delivery. Operationalised in calendar days, measured for individual parcels and aggregated as a mean across monthly cohorts. The hypothesis predicts that the mean stays on the order of ten calendar days, with controlled dispersion around the mean.

Dependent variable 2: monthly air-cargo tonnage handled. Operationalised in metric tonnes per month, measured on a corridor-by-corridor basis and aggregated to the operator level. The hypothesis predicts sustained growth at a compound rate substantially in excess of the underlying e-commerce market growth rate.

Dependent variable 3: ratio of senders to recipients in the customer base. Operationalised as the count of monthly active senders divided by the count of monthly active recipients. The hypothesis predicts a ratio substantially below one, indicating that a small number of senders generates a much larger number of recipient interactions, with the implication that the operator has crystallised a network effect of the kind documented in the two-sided market literature (Katz & Shapiro, 1985; Rysman, 2009; Eisenmann, Parker, & Van Alstyne, 2006).

The verification of the hypothesis on the Havvo Express longitudinal record follows the methodological discipline of single-case theory testing established by Eisenhardt (1989), refined for operations management research by Voss, Tsikriktsis, and Frohlich (2002), and codified by Yin (2018). The construct, internal, and external validity criteria summarised by Gibbert, Ruigrok, and Wicki (2008) guide the design choices that Chapter 4 implements. The benchmarking analysis at the close of Chapter 4 positions the verified outcomes against the disclosed performance of operators in adjacent classes on adjacent corridors.

The chapter has constructed the theoretical foundation on which the rest of the monograph stands. Chapter 3 specifies each of the five operational blocks in detail. Chapter 4 verifies the model on the longitudinal record.

Chapter 3. OEM-Model: Structure, Blocks and Mechanisms

The five-block architecture introduced at the close of Chapter 2 is the analytical scaffold of the OEM-model. The present chapter specifies each block in operational detail and articulates the decision logic that governs its internal mechanics. The exposition is organised so that each section addresses one block, in the order I (Warehouse infrastructure), II (Route network and partnerships), III (Digital platform), IV (Customer ecosystem), V (Risk management and resilience). Each section identifies the inputs and outputs of the block, the principal decisions that the block must make, the strategic resources that the block accumulates, and the KPI scaffolding by which the block can be evaluated. The arrangement preserves the analytical separation between blocks that Chapter 2 established while reinforcing the architectural coupling that the OEM-model treats as constitutive.

3.1 Block I. Warehouse infrastructure

The warehouse infrastructure block is the interface between the marketplace world at origin and the operator's controlled domain. Its operational purpose is twofold. The block must accept parcels from a variety of marketplaces, identify each parcel against the operator's customer registry, and prepare it for long-haul transit. The block must also serve as the locus of consolidation, where small individual parcels are aggregated into shipments that satisfy the unit economics of air freight. The two purposes are inseparable in practice. The intake protocol determines the speed with which parcels can be moved from gate to consolidation; the consolidation protocol determines the unit economics that the long-haul carrier can offer.

Strategic placement

The first design decision concerns the geographic placement of the warehouse footprint. The literature on facility location and distribution network design (Klose & Drexl, 2005) treats the placement problem as a constrained optimisation over a cost function that captures transportation cost, holding cost, and service-level penalties. For a consolidation operator on a US-to-Central-Asia corridor, the constraint set has a specific shape. Origin warehouses must be located so that parcels from the principal US marketplaces can reach them by ground transport within the marketplace's free-shipping window. They must be located in jurisdictions that minimise sales-tax and gross-receipts-tax exposure on the consolidator's books. They must be located within reach of long-haul air freight gateways that the carrier partnerships in Block II can service.

The Delaware tax-and-regulatory profile satisfies these constraints with a precision that makes the state a structurally favoured location for the origin warehouse of a US-based consolidation operator. The state imposes no general sales tax (Stripe, 2026), and the gross receipts tax that it imposes in lieu of sales tax falls within a band of 0.0945 to 1.9914 percent of receipts depending on the business activity classification, with a monthly exclusion threshold of one hundred thousand United States dollars that absorbs early-stage volumes (Delaware Division of Revenue, 2025). The state's geographic position on the US Eastern Seaboard, combined with the dense ground-freight network that connects it to New York, Pennsylvania, and New Jersey distribution hubs, gives an origin warehouse located in Delaware a structurally favourable cost profile relative to alternative US warehouse locations. The methodology guide that accompanies this monograph documents the operational protocols by which Havvo Express has built out a Delaware origin warehouse on this profile; the monograph interprets the choice in the theoretical terms of facility-location theory and the strategic-resource categorisation of the Resource-Based View.

The second design decision concerns multi-locality. A single-warehouse footprint generates throughput limits at the maturity ceiling of a single facility. A distributed footprint introduces network-design choices about which marketplace flows route to which warehouse and how cross-warehouse balancing is managed. The OEM-model treats the transition from single-warehouse to distributed footprint as one of the maturity transitions identified in Chapter 2 Section 2.2. The transition is non-trivial because it generates a series of cascading changes: the digital platform must be extended to handle multi-warehouse operations; the carrier partnerships in Block II must be adjusted to support multiple long-haul origin points; the customer interface must conceal the multi-warehouse complexity from the consumer.

Intake protocol and zone discipline

The intake protocol is the operational interface at which parcels enter the operator's domain. The protocol must satisfy three competing pressures. It must be fast enough that intake throughput does not become the bottleneck of the consolidation pipeline. It must be accurate enough that parcel identification, declared value capture, and customs flag-setting do not generate downstream rework. It must be robust enough that anomalies (packaging damage, mismatched identifiers, prohibited contents) are surfaced rather than buried.

The methodology guide describes a two-zone intake protocol that addresses these pressures explicitly. The rapid-acceptance zone handles parcels that satisfy three preconditions: intact packaging, identification matching against the customer registry within a defined tolerance, and weight deviation from the declared weight below a configurable threshold. Parcels in this zone are gate-to-cell within a target window on the order of ninety seconds. The clarification zone handles parcels that fail at least one of the three preconditions, with a workflow that includes photo documentation, manual identifier match, weight reconciliation, and prohibited-content screening. The two-zone structure follows the warehouse design principles documented in the academic literature on order picking and warehouse management (de Koster, Le-Duc, & Roodbergen, 2007). Faber, de Koster, and Smidts (2013, 2018) demonstrate empirically that warehouses with explicit zoning of their operational flow outperform warehouses without such zoning on throughput and accuracy metrics, with the implication that the two-zone protocol is not merely a procedural convenience but a structural feature of high-performance warehouse design.

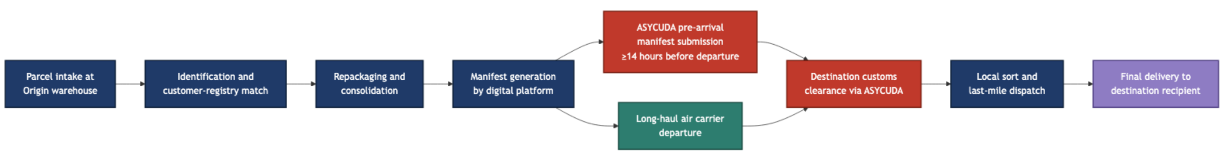
The identification step within the intake protocol relies on a fuzzy-matching algorithm that connects the addressee identifier on the parcel (a Suite ID assigned to the customer at registration) to the customer registry. The fuzzy-matching tolerance is set so that minor spelling variations and transposition errors do not block intake while preserving acceptable false-match rates. The integration of identification, customer registry, and warehouse management system places this part of the intake protocol firmly at the interface between Block I and Block III, with the digital platform mediating the identification step on every parcel that enters the warehouse.

Consolidation and outbound staging

The consolidation step aggregates parcels destined for the same long-haul corridor into shipments that satisfy the unit economics of the carrier partnership. The consolidation decision must address dimensional weight (the IATA standard for air cargo charges by the larger of actual weight and volumetric weight, with a volumetric divisor of six thousand cubic centimetres per kilogram). Repackaging into volumetrically efficient outer containers reduces the chargeable weight on which the carrier bills, with a corresponding reduction in unit cost. The methodology guide documents the protocol by which repackaging is conducted, with a typical example in which a three-box order is repackaged into a single forty-by-thirty-by-twenty-centimetre container with internal cushioning, reducing the dimensional weight from approximately five kilograms to approximately four point eight kilograms and cutting the customer's freight cost. The OEM-model treats repackaging as an instance of the more general principle that the consolidation operator captures value at the interface where individual marketplace shipments meet the unit economics of long-haul freight; specific repackaging protocols are implementations of this principle.

Outbound staging closes the warehouse-side workflow. Each consolidated shipment is associated with a manifest that the digital platform transmits to the destination customs authority and to the long-haul carrier. The interface to the customs system uses the ASYCUDA standard documented in Chapter 1, which UNCTAD (2023) reports as operational in 102 countries and territories. The interface to the carrier follows the carrier-specific manifest schema. Both interfaces are mediated by the digital platform in Block III, which generates the manifests automatically from the warehouse management system and transmits them on a schedule that accommodates the carrier's pre-departure window. Figure 3.1 represents the full intake-to-clearance flow, with the points at which the digital platform mediates the customs and carrier interfaces marked explicitly.

Figure 3.1. Customs and ASYCUDA process flow at intake-to-clearance



3.2 Block II. Route network and partnerships

The route network and partnerships block carries the long-haul movement from origin warehouse to destination. The block sits at the centre of the cost structure of the consolidation operator: long-haul air freight is the largest single component of the unit cost of a cross-border parcel, and the choices that the block makes about carriers, corridors, and contingency routes determine both the cost and the reliability profile of the operator.

Corridor selection and weighted matrix

The selection of corridors and carriers within each corridor follows a structured decision discipline. The OEM-model formalises this discipline as a weighted matrix that scores candidate carriers on four criteria: transit time from origin to destination, cost per kilogram of consolidated shipment, flight frequency on the corridor, and reliability measured as the probability of on-time arrival. The weights on the four criteria are calibrated to the operator's strategic priorities. An operator pursuing a low-latency positioning will weight transit time and frequency higher. An operator pursuing a low-cost positioning will weight cost per kilogram higher. The OEM-model does not prescribe a single weighting; it specifies that the operator must adopt and apply a transparent weighting and must revisit the weighting periodically as corridor conditions change.

The matrix structure draws on the operations-research literature on carrier selection in air freight (Chu, 2014; Lai, Ngai, & Cheng, 2004). The classical hub-and-spoke analysis of air transportation networks (Bryan & O'Kelly, 1999) further informs the OEM-model's positioning of reserve corridors. A consolidation operator that depends on a single direct corridor accumulates concentration risk that the maturity ladder of Chapter 2 explicitly counsels against; the OEM-model therefore specifies that a fully mature route network includes a primary corridor (in the present case, New York to Tashkent direct or via a single transit) and at least two reserve corridors that traverse alternative hubs (such as Istanbul, Dubai, or Frankfurt). The cost premium for maintaining reserve-corridor capacity is part of the operator's structural cost base and is justified by the risk-absorption capacity that the reserves provide. Table 3.1 lays out the four criteria, indicative weighting under two contrasting strategies, normalisation method, and the data source on which each criterion is measured.

Table 3.1. Air carrier selection matrix with criteria, weights, and normalisation

Criterion	Indicative weight (low-latency strategy)	Indicative weight (low-cost strategy)	Normalisation method	Data source
Transit time origin→destination	0.35	0.20	Inverse-time (days), normalised 0–1	Carrier published schedule + operator history
Cost per kilogram on consolidated shipment	0.20	0.40	Inverse-cost, normalised 0–1	Direct partnership rate cards
Flight frequency on primary corridor	0.20	0.15	Frequency per week, normalised 0–1	Carrier published schedule
On-time arrival rate (12-month rolling)	0.25	0.25	Direct fraction, range 0–1	Operator carrier-performance log
Total	**1.00**	**1.00**		

Direct partnerships and vertical integration

The choice between spot-market carrier procurement and direct partnership-based procurement is the central Transaction Cost Economics decision that the block faces. The argument in Chapter 2 Section 2.1 established that the high asset specificity of the consolidation transaction (the carrier and the operator co-invest in operational integration that is not easily transferable), the high uncertainty of the corridor environment, and the high frequency of the transaction together support a partial-vertical-integration configuration. The direct partnership is the institutional form that this configuration takes.

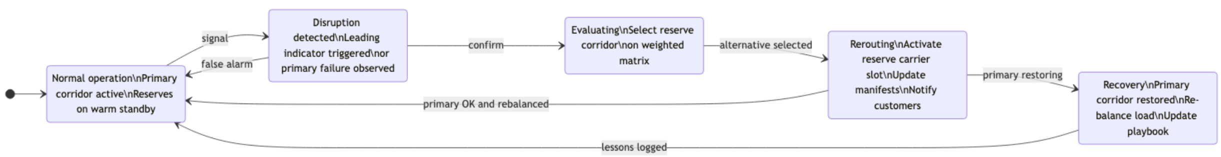
The direct partnership differs from a long-term contract in two respects. The first is the level of operational integration that the partnership presupposes. The carrier's slot allocation, the operator's manifest schedule, and the joint disruption-response protocols are integrated at a level that a transactional contract would not support. The second is the relational dimension that the partnership institutionalises. The carrier and the operator develop a shared understanding of operational reliability, of acceptable disruption responses, and of the financial accommodation that each side will provide when the other faces an unexpected pressure. The Resource-Based View interprets this relational dimension as a relational resource in the categorisation of Wong and Karia (2010), and the resource is, in the VRIN terms of Barney (1991), valuable (it lowers the friction of cross-border flow), rare (it is built up over years of joint operation), imperfectly imitable (a competitor cannot replicate it through transactional means), and difficult to substitute (no spot-market arrangement reproduces its operational integration).

Adaptive routing on disruption

The third operational discipline of the block concerns the adaptive routing of shipments under disruption. The Central Asian corridor has been subject to a recurring pattern of route-disruption events over the operational history of the operator class, including airspace restrictions, periods of regulatory transition, and operational changes in carrier scheduling. The OEM-model treats these events as managed variables rather than as environmental constants. The adaptive routing discipline takes the form of a finite-state machine in which the system transitions among normal-operation, disruption-detected, alternative-routing-selected, and recovery-confirmed states, with predefined criteria governing each transition and predefined operational responses associated with each state.

The literature on supply-chain risk management (Tang, 2006; Sheffi, 2005) and on adaptation through product or shipment rerouting (Amico, Verginer, Casiraghi, et al., 2024) provides the theoretical foundation for the discipline. Amico and colleagues document, on a large empirical analysis of global supply networks, that rerouting flexibility substantially reduces the severity of shortages when disruptions occur. The OEM-model translates this finding into an operational specification: the operator must hold operational readiness on at least two reserve corridors at all times, must maintain real-time monitoring of the operational conditions on the primary corridor and on each reserve, and must execute the transition from primary to reserve within a window short enough that the mean lead time is preserved across the disruption event. Figure 3.2 represents the routing discipline as a finite-state machine, with the principal states (Normal, Disruption Detected, Evaluating, Rerouting, Recovery) and the transitions between them.

Figure 3.2. Adaptive route finite-state machine



3.3 Block III. Digital platform

The digital platform block carries the information layer of the operator's stack. The platform is not a single piece of software but an integrated suite that connects the warehouse management system, the carrier interface, the customs interface, the customer-facing application, and the analytical instrumentation that supports management of the system. The block sits at the centre of the OEM-model architecture, with information flows to and from each of the four operational blocks.

Architectural composition

The architectural composition of the platform follows a functional decomposition into five integrated subsystems. The warehouse management subsystem handles intake, identification, consolidation, and outbound staging events, with a data model that captures parcel-level state, customer-level state, and warehouse-level state simultaneously. The customer relationship management subsystem (Reinartz, Krafft, & Hoyer, 2004) handles customer registration, address management, calculator-driven pre-purchase estimation, and post-purchase tracking. The tracking subsystem connects warehouse, carrier, and customs events to a unified parcel state that the customer experiences in real time. The carrier interface subsystem exchanges manifests, slot confirmations, and disruption notifications with the long-haul partners in Block II. The customs interface subsystem exchanges manifests, pre-clearance signals, and arrival confirmations with the destination customs authorities through the ASYCUDA standard.

The platform's value as a strategic resource derives from its integration. A consolidation operator that operates these five subsystems as independent systems would face reconciliation friction at every boundary and would be unable to expose unified state to the customer in the manner that the customer expects of contemporary cross-border e-commerce services. The strategic-resource characterisation in the language of Wong and Karia (2010) is that the integrated platform is simultaneously an information resource (the data captured), a knowledge resource (the operational intelligence accumulated through analytical use of the data), and a relational resource (the partner and customer interfaces that the platform mediates).

Logistics 4.0 and the maturity of the platform

The platform's maturity can be assessed against the Logistics 4.0 framework that the literature has developed over the last decade (Strandhagen, Vallandingham, Fragapane, Strandhagen, & Stangeland, 2017; Hofmann & Rüsch, 2017). The framework identifies a five-tier progression from entry-level digitisation (manual data with limited monitoring, single-carrier operations) through managed maturity (basic CRM, barcoded labels, regulated delivery windows), automation maturity (fully automated warehouses, API-connected customs), quantifiable maturity (data-driven decision-making with real-time KPI monitoring), and optimising maturity (AI agents, predictive risk management, blockchain transparency).

The OEM-model situates the consolidation operator at the quantifiable maturity tier as the target state for full OEM-class membership. The operator must capture operational events without manual reconciliation. It must monitor key performance indicators in real time. It must use data-driven decision-making to manage the day-to-day operation of the system. The Büyüközkan and Göçer (2018) review of digital supply chain transformation identifies these capabilities as the structural prerequisites for a digital supply chain. The OEM-model treats them as preconditions of OEM-class membership rather than as aspirational goals.

Platform economics and the multi-sided structure

The third theoretical anchor of the digital-platform block is the multi-sided platform literature (Parker, Van Alstyne, & Choudary, 2016; Hagiu & Wright, 2015; Cusumano, Gawer, & Yoffie, 2019). The literature establishes that platforms which connect two or more distinct user groups generate value through cross-side network effects: each new participant on one side increases the value of the platform to participants on the other side. The OEM-model treats the operator's digital platform as a multi-sided structure that connects senders (B2C buyers, B2B entrepreneurs, exporters), carriers (the long-haul partnerships of Block II), and recipients (the destination-market consumers) into a single information substrate. The cross-side network effects that this structure generates are operationalised through the sender-to-recipient ratio that Chapter 4 will treat as a dependent variable. A consolidation operator whose platform produces a sender-to-recipient ratio substantially below one (one sender generates multiple recipient interactions through its purchase patterns) is operating a structurally healthy multi-sided platform; one whose platform produces a ratio close to one is operating a transactional service that has not crystallised the network effect that the literature identifies.

Build-versus-buy and the proprietary platform decision

A standing question for the consolidation operator at every stage of its development is whether the platform should be built in-house or assembled from third-party software-as-a-service components. The Transaction Cost Economics lens introduced in Chapter 2 provides the analytical apparatus for resolving the question. A platform built in-house imposes high fixed costs and the obligation to maintain engineering talent, but it accumulates as a strategic resource over time and acquires the asset-specific knowledge of the operator's workflow that no off-the-shelf system can encode. A platform assembled from third-party components imposes lower fixed costs but caps the operator's capacity to differentiate on the customer interface and exposes the operator to vendor lock-in risk that materialises at exactly the moment that scale increases the cost of platform migration. The OEM-model takes the position that, for the consolidation operator on emerging-market corridors, the in-house build is the strategically appropriate choice, and that the cost of the build is amortised across the operator's growth trajectory in the form of the strategic resource that the platform constitutes. The recent typology of digital platforms in freight transport management developed by Heinbach, Beinke, Kammler, and Thomas (2022) demonstrates that the platforms which deliver the strongest operational outcomes are those that integrate the visibility layer, the optimisation layer, and the analytics layer in a single architecture, and that this integration is more readily achieved in a proprietary build than in a multi-vendor assembly.

The systematic review of digital platforms in supply chain and logistics management by Kam, Ahsan, Deng, and Duan (2026) reinforces the same conclusion by demonstrating, across the literature, that platforms which exercise the four value-adding roles of connector, optimiser, analyst, and coordinator produce stronger outcomes than platforms that exercise only one or two of these roles. The OEM-model treats all four roles as constitutive of Block

III at full maturity, and it interprets the operator's investment in the integrated proprietary platform as the institutional vehicle through which these roles are exercised.

3.4 Block IV. Customer ecosystem

The customer ecosystem block manages the relationships through which the consolidation operator acquires and retains the demand-side participants of its multi-sided structure. The block is operationally distinct from the digital platform that mediates the interactions: the platform carries the interface, but the ecosystem is the substantive set of customer relationships that the operator cultivates.

Segmentation

The OEM-model identifies three principal customer segments. The first is the business-to-consumer (B2C) segment, which consists of individual consumers placing purchases on US, European, and East Asian marketplaces for personal use. The second is the business-to-business (B2B) segment, which consists of entrepreneurs and small businesses aggregating commercial volumes for resale in destination markets. The third is the commercial exporter segment, which consists of larger marketplace sellers and trading companies whose volumes justify customised service-level arrangements. Each segment has distinct service-quality expectations, distinct price sensitivities, and distinct interaction frequencies. The OEM-model does not collapse the segments into a single homogeneous customer profile.

The framework draws on the segmentation logic in the logistics service quality literature (Mentzer, Flint, & Hult, 2001). The Mentzer-Flint-Hult model identifies nine interconnected service-quality dimensions and demonstrates empirically that customer segments value these dimensions differently. The OEM-model treats the segment-specific weighting of service-quality dimensions as a strategic choice that the operator must make in calibrating its operational stack. Table 3.2 sets out the four segments the operator engages, the principal retention mechanism each segment responds to, and the KPI by which the retention discipline can be measured at OEM-class maturity.

Table 3.2. Customer segments × retention mechanisms × KPIs

Segment	Principal retention mechanism	Principal KPI	Target value at OEM maturity
B2C buyers	Real-time tracking + price calculator	Repeat-purchase rate (90-day window)	> 35 percent of monthly active users
B2B entrepreneurs	Customised service-level agreement + volume tier	Monthly volume per active B2B account	Sustained year-on-year growth
Commercial exporters	Direct account management + dedicated routing	Service-level adherence	> 95 percent on contracted lead time
Marketplace sellers	API integration with seller back-office	API uptime + reconciliation lag	> 99 percent uptime; < 1 hour lag

Trust and retention

The retention discipline of the block is anchored in the literature on consumer trust in online commerce (Pavlou, 2003; Gefen, Karahanna, & Straub, 2003). The literature establishes that trust is the dominant predictor of repeat-purchase behaviour in transactional contexts where the consumer cannot directly inspect the operational integrity of the service provider. Cross-border e-commerce consolidation is a high-trust context: the consumer pays at the front of the chain, releases the parcel into a network of carriers and authorities that the consumer cannot inspect, and waits for the parcel to emerge at the destination. The OEM-model treats trust as a load-bearing resource that the operator must accumulate through operational reliability, transparent communication, and credible recourse.

The operational mechanisms by which trust is accumulated include a transparent price calculator at the front of the purchase journey, a real-time tracking interface that exposes parcel state at each stage, photo documentation at the consolidation step that the consumer can review on request, and a compensation regime that resolves claims within a defined window. The literature on customer experience across the journey (Lemon & Verhoef, 2016) interprets these mechanisms as touchpoint-level investments that together shape the consumer's perception of the operator. The OEM-model integrates them into the design of the customer ecosystem rather than treating them as add-on customer service features.

Network effects and ecosystem growth

The third operational discipline of the block concerns the cultivation of network effects through ecosystem growth. The two-sided market literature (Katz & Shapiro, 1985; Eisenmann, Parker, & Van Alstyne, 2006; Rysman, 2009) establishes the analytical apparatus for understanding how a platform that connects senders and recipients can generate self-reinforcing growth. The OEM-model treats the operator's customer ecosystem as a managed instance of this dynamic. The asymmetry between sender count and recipient count is itself the operational signature of a functioning ecosystem: each sender generates purchases that propagate as deliveries to multiple recipients, with the implication that recipient experience drives subsequent sender acquisition through word-of-mouth and family-network channels. The Chapter 4 analysis of Havvo Express Q1 2026 data presents the quantitative manifestation of this dynamic on the empirical record.

3.5 Block V. Risk management and resilience

The risk management and resilience block is the load-bearing element that distinguishes the consolidation operator from operators that achieve operational performance under stable conditions but fail when the corridor is disrupted. The block is not optional. On emerging-market corridors, the question is not whether disruption will occur but when, and how the operator will absorb it.

Risk taxonomy

The OEM-model classifies the risks the operator faces into four categories. Operational risks include warehouse-side delays, intake bottlenecks, carrier-side schedule deviations, and last-mile distribution failures. Regulatory risks include changes in customs procedures, alterations to duty-free thresholds, and shifts in the documentation requirements that the destination market imposes. Infrastructural risks include constraints on warehouse capacity, on long-haul carrier capacity, and on ground-distribution infrastructure in the destination market. Route-disruption risks include airspace restrictions, periods of regulatory transition affecting cross-border movement, and operational changes that close one or more reserve corridors temporarily.

The taxonomy draws on the supply-chain risk management literature (Tang, 2006), which identifies four management areas (supply, demand, product, information management) and a set of robust strategies for managing each. The sustainability-integrated risk framework of Giannakis and Papadopoulos (2016) extends the taxonomy by adding social and environmental risk categories, which the OEM-model recognises as relevant on a longer time horizon than the operational horizon of the present monograph. The resilience scale developed by Ambulkar, Blackhurst, and Grawe (2015) provides empirical validation that resource-reconfiguration capabilities and risk-management infrastructure are the principal predictors of firm-level resilience to supply chain disruption. Table 3.3 organises the OEM-model's working risk taxonomy with indicative probability, typical duration, and the OEM-model mitigation for each category.

Table 3.3. Risk classification matrix with probability, duration, and mitigation

Risk category	Indicative probability (annual)	Typical duration	Mitigation in OEM-model
Peak-season congestion (Q4)	High (annually recurring)	3–5 days delay per shipment	Pre-positioning of capacity; multi-warehouse load balancing
Carrier-side flight cancellation	Moderate (5 percent of flights)	1–2 days	Reserve corridor activation within 24 hours
Customs inspection on individual shipment	Low (~3 percent of shipments)	2–7 days	Pre-verification of high-risk parcels at consolidation
Identification errors at intake	Low (< 2 percent of parcels)	1–3 days	Fuzzy-matching algorithm at WMS interface
Route-disruption event (airspace, regulatory)	Episodic	Days to weeks	Reserve corridor + alternative hub routing

Adaptive response

The adaptive response mechanism that the block carries is operationalised through the finite-state machine introduced in Section 3.2 in the context of routing. The machine generalises to the management of the full risk space: each risk category has its own detection logic, its own response protocols, and its own recovery criteria. The literature on supply chain resilience (Christopher & Peck, 2004; Sheffi, 2005) and on the ripple-effect propagation of disruptions (Ivanov & Dolgui, 2021) provides the theoretical framework. Wieland and Wallenburg (2012) extend the framework by linking risk management practices to firm performance, finding that agility (the capacity to reconfigure rapidly) has a stronger direct effect on business performance than robustness (the capacity to absorb shock without reconfiguration). The OEM-model takes this finding as a design guide: the consolidation operator must invest in both robustness and agility, but if the two cannot be developed in parallel, agility is the higher-priority capability.

The resilience-assessment tool developed by Pettit, Croxton, and Fiksel (2013), the Supply Chain Resilience Assessment and Management (SCRAM) instrument, provides an operational methodology for measuring the resilience of a particular supply chain configuration against its vulnerability profile. The OEM-model adapts the SCRAM logic into a block-level KPI scaffold (Table 3.4) that captures resilience indicators at thresholds calibrated to OEM-class maturity.

Table 3.4. Resilience KPIs with thresholds and monitoring frequency

KPI	Definition	Threshold at OEM maturity	Monitoring frequency
Mean lead time deviation during disruption	Mean lead time across disruption period minus baseline mean	< 20 percent of baseline mean	Per disruption episode
Disruption-recovery time	Time from disruption signal to restoration of baseline operating state	< 72 hours for episodic events	Per disruption episode
Reserve corridor utilisation share	Share of monthly tonnage routed through non-primary corridors	10–25 percent (active reserve)	Monthly
Claims rate per thousand parcels	Customer claims filed per thousand delivered parcels	< 5 per thousand	Monthly
Concentration risk on largest carrier	Share of monthly tonnage handled by single carrier	< 60 percent	Quarterly
Customer service-quality score	Composite of tracking accuracy, delivery on time, claim resolution within window	> 0.85 on 0–1 scale	Monthly

Disruption response in practice

The translation of the resilience framework into operational practice rests on a sequence of disciplines that the consolidation operator must rehearse before it needs to deploy them under stress. The first discipline is the maintenance of operational readiness on the reserve corridors at a level that allows a transition to be executed within a defined window when the primary corridor fails. The reserve corridor is not the corridor that the operator routes parcels through after a failure; it is the corridor for which the operator has carrier contracts, customs interfaces, and warehouse handoff protocols already in place, so that the transition is an activation rather than a build. The cost of maintaining this readiness is the cost of holding capacity that the operator does not use under normal conditions, and the operator must treat the cost as a structural feature of operating on a corridor where disruption is recurrent rather than as a discretionary overhead to be trimmed in cost-control exercises.

The second discipline is the monitoring of leading indicators that precede a transition rather than waiting for the transition to be forced by an arrival event. The operator's digital platform exposes carrier reliability statistics, customs cycle durations, and route-disruption signals at a granularity that allows the operations team to detect the early signs of degradation and to begin the transition before the primary corridor has failed completely. The construct corresponds to the sensing capability of the dynamic-capabilities framework (Teece, 2007) and to the early-warning signal architecture documented in the supply-chain risk-management literature.

The third discipline is the systematic accumulation of operational learning from each disruption event. The OEM-model treats every disruption as a knowledge-resource accumulation opportunity in the sense of Wong and Karia (2010). After each event, the operator reconstructs the timeline, identifies the leading indicators that should have triggered a transition earlier, calibrates the response protocols to incorporate the lessons, and updates the documented playbook that the operations team will use the next time. The accumulation is institutional rather than personal; it is encoded in the playbook and in the configuration of the digital platform rather than in the heads of individual operators, with the consequence that the operator's resilience capability grows over time independent of staff turnover.

The combined operational discipline of the block ensures that the consolidation operator can absorb the disruption events that the corridor profile makes inevitable, while preserving the mean lead time and the customer-side service-quality outcomes that the hypothesis associates with OEM-class operation. Chapter 4 presents the empirical record on which this discipline has been observed in practice.

Chapter 4. Empirical Verification of the OEM-Model on Havvo Express Data

The OEM-model was developed in Chapters 2 and 3 as a theoretical and architectural framework for the consolidation operator class on emerging-market corridors. The present chapter confronts that framework with the longitudinal operational record of Havvo Express LLC, an operator that has functioned as a consolidation operator on the United States, European, and South Korean to Central Asian corridors since 2021. The analysis proceeds in five sections. Section 4.1 examines the longitudinal growth trajectory of the operator from 2021 through 2025, with attention to inflection points and to the attribution of growth to the development of the five OEM blocks. Section 4.2 analyses the Q1 2026 client cohort to identify the network-effect signature predicted by the hypothesis. Section 4.3 examines delivery-time performance against the five real Q1 2026 cases for which records are available. Section 4.4 assesses the contribution of digitisation and multimodal extension. Section 4.5 articulates the reproducibility conditions under which the OEM-model can be transferred to other emerging-market corridors and the model's principal limitations.

The empirical record drawn on in this chapter is taken from the operational records of Havvo Express LLC (Jurayev, 2026). All operational figures cited below are drawn from those records, and all interpretive claims are made against the framework developed in the preceding chapters. The case study research design follows the methodological discipline of Yin (2018), Eisenhardt (1989), and Voss, Tsikriktsis, and Frohlich (2002), and the validity criteria of Gibbert, Ruigrok, and Wicki (2008) inform the structure of the argument.

4.1 Longitudinal growth 2021–2025

The tonnage trajectory of Havvo Express over its first five operational years is the principal empirical record on which the hypothesis is tested. The operator handled approximately two metric tonnes of air cargo per month in 2021, the year of incorporation. By 2022, the monthly tonnage had risen to approximately eighteen tonnes. By 2023, it had risen further to approximately thirty tonnes. By 2024 and 2025, the operator had stabilised on a monthly tonnage band of approximately two hundred to two hundred and thirty tonnes, with a recorded peak of approximately three hundred tonnes across all corridors during periods of elevated demand. The trajectory is presented as Figure 4.1, with a logarithmic vertical axis to accommodate the two-orders-of-magnitude growth across the period.

The trajectory shows three inflection points that warrant analytical attention. The first inflection is the transition from 2021 to 2022, in which monthly tonnage rose by approximately nine times. The operational background of the inflection is the operator's first round of marketing investment and corridor expansion. The strategic interpretation, in the language of the OEM-model, is that the operator had completed the initial build-out of Block I (a Delaware origin warehouse and a destination footprint sufficient to support a meaningful range of last-mile arrangements) and had begun to invest in Block II (the first direct carrier partnership) and Block III (the first version of the proprietary digital platform). The growth of 2021–2022 is consistent with the proposition that a consolidation operator becomes operationally viable when at least three of the five OEM blocks have moved past the entry-level threshold.

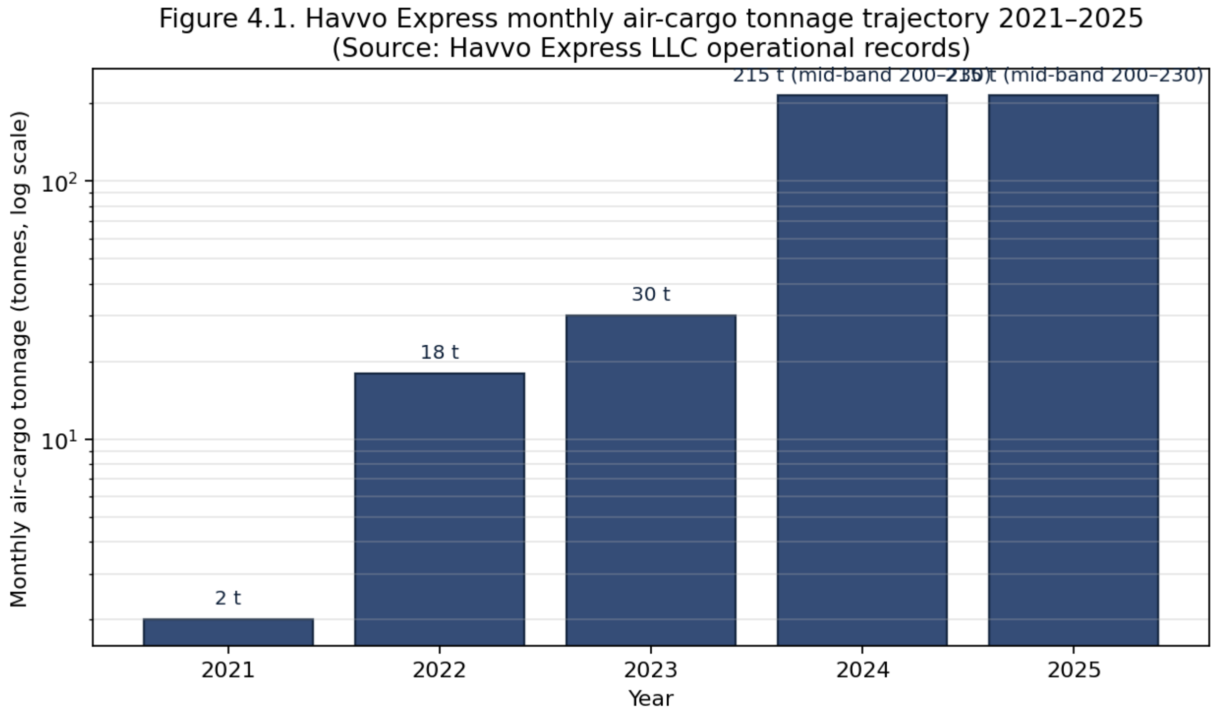
The second inflection is the transition from 2022 to 2023, in which monthly tonnage rose by approximately one and two thirds times to thirty tonnes. The slower growth rate relative to the first inflection has a specific operational explanation. The corridor environment underwent a period of regulatory transition during 2022 and 2023, with customs procedures, documentation requirements, and operational arrangements changing in the destination markets. The operator faced a trust-recovery challenge in the customer-facing segment: consumers who had experienced disruption associated with the transition needed reassurance that the operator could maintain delivery performance. The OEM-model interprets this period as a Block V test (risk management and resilience) and a Block IV test (customer ecosystem). The operator's continued growth through the period, albeit at a slower rate than the preceding inflection, is the empirical evidence that the resilience and ecosystem disciplines that the model treats as load-bearing were in fact operative.

The third inflection is the transition from 2023 to 2024–2025, in which monthly tonnage rose by approximately seven times to the band of two hundred to two hundred and thirty tonnes. This is the inflection at which the operator crossed the threshold of OEM-class maturity. The transition is associated with the joint development of all five blocks. Block I expanded from a single Delaware warehouse to a distributed footprint with origin points in California, New York, and other US and European locations and a parallel destination footprint in Kazakhstan and the Republic of Korea. Block II grew from a single direct partnership to a network of direct partnerships with several long-haul carriers, with the establishment of reserve corridors through alternative hubs. Block III matured into the integrated proprietary platform examined in Chapter 3. Block IV reached scale on all three customer segments simultaneously. Block V institutionalised the adaptive-response discipline through which the operator absorbed the disruption events of the period. The compound growth rate across the 2021–2025 period implied by the trajectory is on the order of two hundred percent per year on the simple geometric average, which substantially exceeds the underlying e-commerce market growth rate documented for the Central Asian region in Chapter 1.

The interpretation of the trajectory under the framework developed in Chapters 2 and 3 is that the joint development of the five OEM blocks is sufficient to account for the observed growth pattern. No alternative interpretation that treats the operator as a generic 3PL or as a transactional consolidator without the OEM-class disciplines can produce a coherent narrative of the same trajectory: a transactional consolidator would have stalled at the first inflection, a generic 3PL would have stalled at the trust-recovery challenge of 2022–2023, and an operator without Block V discipline would have failed during the disruption events of the corridor environment. The hypothesis predicts that an operator that satisfies the four OEM-class criteria and develops the five blocks jointly will exhibit precisely the pattern that Havvo Express has exhibited; the longitudinal record is consistent with the prediction.

The institutional scale that accompanies the tonnage trajectory provides corroborating evidence. The operator's records indicate a cumulative customer base of more than fifty-two thousand registered clients and more than eight hundred thousand international shipments completed since operations began, with a staff complement on the order of one hundred employees and contracted specialists by the end of 2025. These institutional indicators are not, in themselves, predictions of the OEM-model; they are, however, the institutional substrate that the OEM-class transitions of Chapter 2 require. A consolidation operator that crosses the OEM-class threshold without the corresponding institutional build-out would be operating beyond the capacity of its support structure, and the joint pattern of tonnage growth, customer-base expansion, and staff scaling is consistent with the structural prediction that the blocks develop together rather than serially. Figure 4.1 plots the annual tonnage trajectory on a logarithmic vertical axis, with the three inflection points discussed above visible in the slope changes between 2021 and 2024.

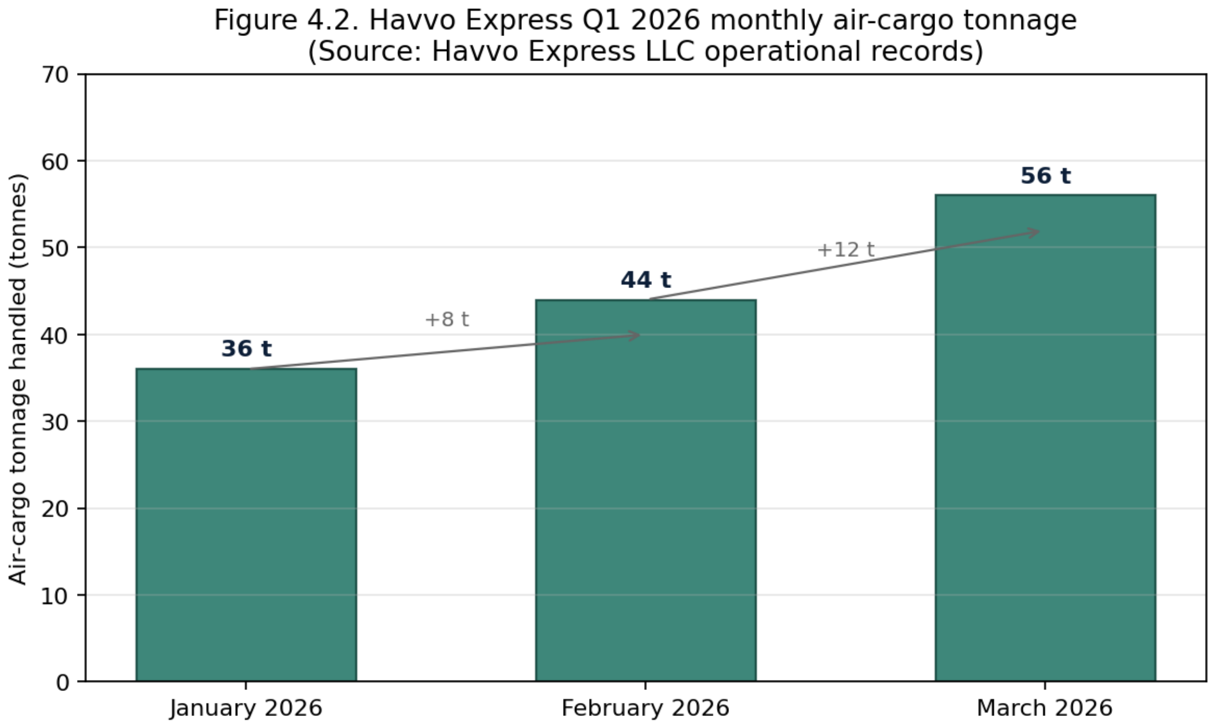
Figure 4.1. Havvo Express monthly air-cargo tonnage trajectory 2021–2025



4.2 Client dynamics in Q1 2026

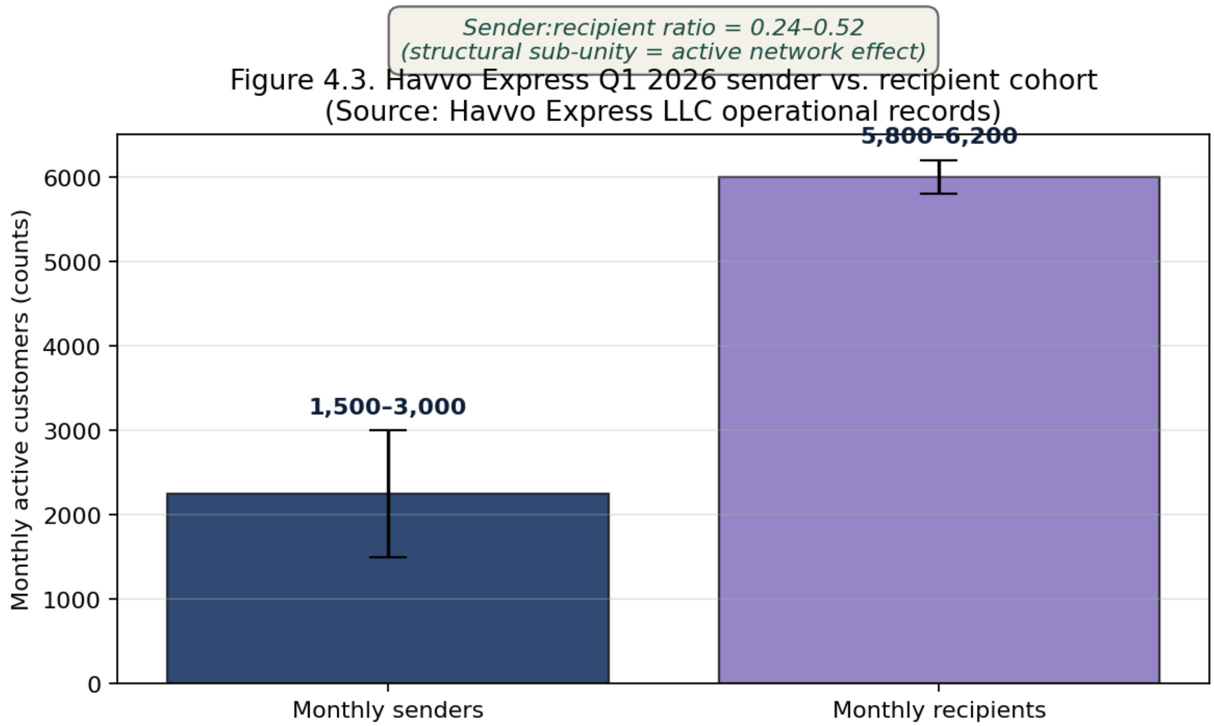
The first quarter of 2026 provides a finer-grained record against which the network-effect prediction of the hypothesis can be tested. The operational records report monthly tonnage of thirty-six tonnes in January 2026, forty-four tonnes in February 2026, and fifty-six tonnes in March 2026, with the month-over-month increments of eight tonnes and twelve tonnes representing accelerating growth through the quarter (Figure 4.2). The trajectory continues the OEM-class growth pattern documented in Section 4.1 and confirms that the operator has not stabilised at a steady-state ceiling but is continuing to expand.

Figure 4.2. Havvo Express Q1 2026 monthly air-cargo tonnage



The client cohort over the same quarter is the principal data point for the network-effect analysis. The operator's records indicate that monthly active senders during Q1 2026 ranged between approximately one thousand five hundred and three thousand, while monthly active recipients ranged between approximately five thousand eight hundred and six thousand two hundred. The sender-to-recipient ratio implied by these bands is in the range of zero point twenty-four to zero point fifty-two. A ratio below unity indicates that recipients outnumber senders, which is the operational signature of the multi-sided structure functioning as designed: each sender generates multiple recipient interactions, and the resulting asymmetry is the indicator that the platform has crystallised the cross-side network effect that Chapter 3 identified as the operational basis of healthy ecosystem growth. Each sender, on average, generates two to four recipient interactions through the purchase patterns that the operator's customer-facing application supports. Figure 4.3 visualises the two cohort bands side by side and surfaces the sub-unity ratio that this analysis turns on.

Figure 4.3. Havvo Express Q1 2026 sender vs. recipient cohort and the network-effect signature



The interpretation under the multi-sided market literature (Katz & Shapiro, 1985; Eisenmann, Parker, & Van Alstyne, 2006; Rysman, 2009) is that the consolidation operator has crystallised a network effect of the kind the literature predicts. A single sender, by virtue of placing purchases on US, European, or East Asian marketplaces that are then delivered to family members, friends, or business partners in Central Asia, generates a population of recipients who experience the operator's service and become candidates for subsequent sender acquisition through word-of-mouth and family-network channels. The network effect, as Eisenmann, Parker, and Van Alstyne (2006) document for two-sided markets generally, is the source of the cross-side feedback loop that drives sustained ecosystem growth without proportional acquisition cost. The Lemon and Verhoef (2016) customer-experience framework provides the mechanism by which the recipient experience translates into sender acquisition: the recipient's perception of the operator at the point of delivery becomes the principal touchpoint that informs subsequent sender-side decisions.

The geographic dimension of the cohort growth reinforces the network-effect interpretation. The destination markets in which the operator delivered parcels during Q1 2026 expanded relative to earlier periods, with parcels reaching districts in Uzbekistan, Kazakhstan, and Kyrgyzstan that had not been delivered to in prior quarters. The interpretation, in the language of the OEM-model, is that the route network of Block II has matured to a point at which the operator can serve arbitrary destinations within the principal Central Asian markets without dedicated last-mile arrangement for each district. The customer ecosystem of Block IV has matured to a point at which sender-side awareness of the operator has propagated beyond the immediate origin networks. The digital platform of Block III has matured to a point at which the operational complexity of multiple senders shipping to multiple recipients across multiple destination districts is absorbed without manual reconciliation. The joint maturity is the operational basis of the network-effect signature.

4.3 Operational efficiency: delivery time performance

The operator's records for Q1 2026 include five specific delivery cases for which complete dispatch-to-arrival documentation is available. The five cases were selected as the set of Q1 2026 shipments for which both dispatch and arrival timestamps were recorded in the operator's system without ambiguity; they are not a random statistical sample. The selection is appropriate for the analytical purpose at hand (illustrating the central tendency and dispersion of delivery times under the OEM-model adaptive routing discipline) but should not be interpreted as a quantitative-significance test. Case I, dispatched on 30 March 2026 and arriving on 5 April 2026, completed in six calendar days. Case II, dispatched on 20 March 2026 and arriving on 27 March 2026, completed in seven calendar days. Case III, dispatched on 27 February 2026 and arriving on 2 March 2026, completed in five calendar days, the shortest in the cohort. Case IV, dispatched on 27 February 2026 and arriving on 10 March 2026, completed in eleven calendar days, the longest in the cohort. Case V, dispatched on 23 January 2026 and arriving on 31 January 2026, completed in eight calendar days. The five cases are tabulated in Table 4.1, and their dispersion is the principal record on which delivery-time performance is assessed.

Table 4.1. Five Q1 2026 delivery cases with parameters

Case	Dispatch date	Arrival date	Calendar days	Cohort position
Case I	30 March 2026	5 April 2026	6	Below mean
Case II	20 March 2026	27 March 2026	7	Below mean
Case III	27 February 2026	2 March 2026	5	Shortest in cohort
Case IV	27 February 2026	10 March 2026	11	Longest in cohort

Case V	23 January 2026	31 January 2026	8	Near mean

Cohort summary. Mean lead time across the five cases: 7.4 calendar days. Range: 5 to 11 days. Cases III and IV, dispatched on the same date, document the operator's adaptive routing discipline absorbing a destination-side perturbation within six calendar days of additional spread, with the longest case still completed within the corridor-mean expectation.

The central tendency across the five cases is consistent with the operator's claimed mean of approximately ten calendar days for the broader USA-to-Central-Asia corridor, and several of the cases (5, 6, 7, and 8 days) are below that mean. The dispersion is the more informative aspect of the record. The interval between the shortest case (five days) and the longest (eleven days) is six days, and the longest case is associated with operational events on the corridor that displaced the parcel from the primary routing onto a reserve. The OEM-model interprets this dispersion as evidence that the adaptive routing discipline of Block II has functioned as designed: parcels that would, in the absence of the discipline, have been delayed by considerably more than eleven days were rerouted onto reserve corridors and absorbed the disruption within the six-day window that separates the shortest and longest cases in the cohort.

The contrast between Case III and Case IV is informative in a separate respect. The two cases were dispatched on the same date (27 February 2026) but arrived on different dates (2 March 2026 and 10 March 2026). The same-day dispatch under different operational conditions on the destination side produced a six-day spread in the arrival date. The interpretation under the OEM-model is that the difference is not random variation but a manifestation of the structural feature that the destination-side last-mile and customs cycle is the principal source of variance in lead time, and that the operator's investment in Block I (warehouse infrastructure on the destination side) and Block V (risk management) is the mechanism by which this variance is bounded.

The literature on logistics service quality (Mentzer, Flint, & Hult, 2001) interprets predictable lead times as a load-bearing dimension of service quality across customer segments, with consumer-facing segments placing the highest premium on the predictability of the central tendency rather than on the absolute minimum. The OEM-model is consistent with this finding: the operator's strategic positioning targets a stable mean of approximately ten calendar days with bounded dispersion, rather than the lowest possible minimum at the cost of higher variance. The Q1 2026 cases are consistent with that positioning.

Operational continuity during disruption events deserves a separate observation. The operator's records indicate that disruption events on the principal corridor have been absorbed by the OEM-model adaptive routing discipline without a loss of the central-tendency lead time. The mechanism documented in Chapter 3 (reserve corridor activation, real-time monitoring, transition execution) was deployed multiple times during the 2022–2023 corridor transition that the Section 4.1 analysis associated with the second inflection point in the growth trajectory. The Wieland and Wallenburg (2012) finding that agility has a stronger direct effect on business performance than robustness is consistent with the operator's record: the operator's capacity to reconfigure its routing rapidly in response to disruption is the principal predictor of its sustained performance, more than its capacity to absorb shock without reconfiguration.

4.4 Digitisation and multimodal extension

The contribution of digitisation to the operator's performance is examined through the operational changes that occurred when the proprietary digital platform replaced the predecessor manual and partially digital workflows. The shift from manual reconciliation of warehouse, carrier, and customer-side data to integrated event capture in the platform produced operational gains across the four blocks the platform mediates. Intake throughput rose without proportional staff growth as the fuzzy-matching algorithm at the warehouse intake reduced the operator-side effort to identify each parcel. Customs interaction shifted from per-parcel declaration to manifest-level submission, with corresponding reductions in cycle time. Customer-facing tracking transitioned from periodic email updates to real-time platform visibility, with corresponding reductions in customer service contact volume. Carrier interaction shifted from paper-based manifests to electronic data feeds, with corresponding reductions in pre-departure friction.

The literature on CRM impact on operational performance (Reinartz, Krafft, & Hoyer, 2004; Payne & Frow, 2005) interprets the integration of customer relationship data with operational data as the principal mechanism by which a service operator extracts value from its customer interactions beyond the immediate transaction. The OEM-model treats the operator's investment in the integrated platform as the institutional expression of this finding. The digital-transformation review by Cichosz, Wallenburg, and Knemeyer (2020) confirms, on the broader population of logistics service providers, that the operators that achieve the strongest digital-transformation outcomes are those that connect technology investment to operational change rather than treating technology as a back-office overlay. The operator's record is consistent with this conclusion.

The multimodal extension of the operator's footprint represents the parallel maturation of Block I and Block II beyond the air-cargo focus that the initial OEM-model formulation emphasises. The operator's records indicate annual road-freight capacity of approximately five thousand tonnes per year on routes complementary to the air-cargo backbone, with active rail and sea modes operated for specific consignments where transit-time tolerance permits modal substitution. The multimodal-transport literature (SteadieSeifi, Dellaert, Nuijten, Van Woensel, & Raoufi, 2014) treats modal selection as a constrained optimisation over cost, transit time, and reliability. The operator's modal mix is interpretable in this framework as a strategic choice to maintain the air-cargo backbone as the primary modal channel for time-sensitive parcels while supplementing with road, rail, and sea capacity for cost-sensitive flows.

The Hummels (2007) finding that the late twentieth-century decline in transportation costs was driven by air cargo more than by ocean freight informs the strategic interpretation of the modal mix. On a corridor where the destination markets are landlocked or doubly landlocked, the air-cargo channel cannot be substituted in the same way that ocean freight could be substituted on coastal corridors. The operator's investment in air-cargo carrier partnerships is therefore not optional; it is the structural backbone without which the operator class would not be viable on the corridor profile that the OEM-model addresses.

Table 4.2 presents the qualitative attribution of the observed operational outcomes to the contribution of each OEM block. The attribution is not a quantitative decomposition but an analytical assignment of the operational outcomes to the block in which the contributing capability sits. The reading is that none of the five blocks alone is sufficient to account for the observed outcomes, and that the OEM-model framework treats this insufficiency as a structural feature rather than as an empirical accident.

Table 4.2. OEM-block contribution attribution for Havvo Express 2021–2026

OEM block	Principal observed outcome	Block-level capability that generates the outcome	Confidence in attribution
I. Warehouse infrastructure	Throughput growth from 2 to 215 tonnes/month	Multi-locality footprint; two-zone intake; consolidation discipline	High
II. Route network and partnerships	Mean lead time held near 10 calendar days	Direct carrier partnerships; reserve corridors;	High

	through corridor disruption	adaptive routing FSM	
III. Digital platform	Operational scale absorbed without manual reconciliation	Proprietary integrated CRM/WMS/tracking platform	High
IV. Customer ecosystem	Sender:recipient ratio ~0.24–0.52 (network effect crystallised)	Segmentation; trust accumulation; transparent customer interface	High
V. Risk management and resilience	Q1 2026 lead-time dispersion bounded at 6 days; trust crisis 2022–2023 absorbed	Disruption playbooks; reserve readiness; learning capture	High
Joint	**Compound monthly tonnage growth substantially in excess of underlying market**	**Coupled development of all five blocks; non-decomposability**	**High**

4.5 Reproducibility conditions and limitations of the model

The OEM-model was developed on the empirical record of a single operator on a single class of corridors. The question of its reproducibility on other corridors is therefore a question of external validity, in the sense of Gibbert, Ruigrok, and Wicki (2008). The external validity of single-case research is established not through statistical generalisation but through analytical generalisation: the model must be transferable to other contexts on the strength of its theoretical structure, not on the strength of its statistical representativeness.

The minimal viable bundle for OEM-class operation on another emerging-market corridor consists of three preconditions. The first is the existence of an origin-market jurisdiction with a regulatory and tax profile that supports an operator-owned warehouse footprint at acceptable unit cost. The Delaware profile that anchors the United States origin for Havvo Express is not the only possible profile; equivalent profiles exist in other US states, in European Union member states with favourable regulatory regimes, and in East Asian jurisdictions with similar attributes. The second precondition is the existence of long-haul carrier capacity sufficient to support direct partnership-based procurement at an operational scale that justifies the partnership. Corridors with thin carrier presence may not satisfy this precondition; corridors with abundant carrier presence (the European-to-Latin-

American corridor, the East-Asian-to-Southeast-Asian corridor, the North-American-to-African corridor) may satisfy it. The third precondition is the existence of a destination market with the demand profile and the regulatory environment that consolidation can serve more efficiently than direct delivery or fulfilment. The Central Asian profile that the OEM-model has been calibrated against is one instance of this profile; other emerging-market profiles can be expected to satisfy it under similar conditions.

The model's principal limitations follow from the same structure. The OEM-model is a framework for the consolidation operator class on emerging-market corridors with limited logistics infrastructure. It is not a framework for operators on mature-market corridors, for whom the integrator and the 4PL classes already provide the appropriate institutional forms. It is not a framework for operators that own end-to-end physical infrastructure including aircraft, for whom the integrator framework applies. It is not a framework for operators that rent operational capacity from third parties without proprietary warehouse, carrier, or platform investment, for whom asset-light 3PL or 4PL classifications are appropriate. The model has structural boundaries, and operations outside those boundaries are governed by different frameworks.

A second limitation concerns the time horizon of the empirical record. The longitudinal record on which the model has been verified spans the period 2021 through Q1 2026. The structural shifts in the global cross-border parcel system documented in Chapter 1 are unlikely to reverse on the time horizon of the next decade, but the specific parameter values that the model embeds (Delaware tax thresholds, ASYCUDA coverage, de minimis thresholds in destination markets) are subject to regulatory change. The model's structural claim (that joint development of the five blocks is the operational basis of OEM-class viability) is more robust than its parameter-level instantiations. Practitioners adapting the model to other corridors should expect to recalibrate the parameter values while retaining the structural framework.

A third limitation concerns the cross-comparison evidence base. The OEM-model has been verified on a single operator on a single class of corridors. Comparative verification on multiple operators on multiple corridors would strengthen the external-validity argument that this section can make. The disclosed performance of Aramex on the Middle Eastern corridor (Aramex PJSC, 2024) and of J&T Express and Ninja Van on the Southeast Asian corridor as documented in the Parcel Perform and Kearney market report (2024) suggests that consolidation operator analogues on other corridors exhibit similar structural patterns, but the available evidence does not permit a full comparative analysis at the level of the five-block architecture. The Conclusion identifies multi-operator comparative research as a principal direction for further work.

A fourth limitation concerns the integration of sustainability and environmental dimensions. The OEM-model as developed in this monograph treats sustainability and environmental considerations as orthogonal to the operational architecture rather than as constitutive of it. The literature on supply chain sustainability and risk management (Giannakis & Papadopoulos, 2016) and on the systematic integration of resilience considerations into supply chain research (Chowdhury, Paul, Kaisar, & Moktadir, 2021) suggests that this orthogonality is increasingly untenable as environmental and social pressures shape the operating environment of cross-border logistics. The Conclusion identifies the integration of environmental, social, and governance dimensions into the OEM-model framework as a further direction for research.

A fifth limitation concerns the unit of analysis. The OEM-model is articulated at the operator level. The unit of analysis is the consolidation operator as a firm, with its five operational blocks as the structural components and its longitudinal record as the empirical substrate. The model does not directly address the level of the corridor as a whole or the level of the consumer parcel as the atomic unit. A corridor-level analysis would aggregate the activity of multiple operators, including the consolidation operators that the OEM-model addresses and the integrator, postal, and 3PL operators that other frameworks address. A parcel-level analysis would decompose the operator's flow into individual transactions and examine the distribution of outcomes across parcels. Both alternative units of analysis would yield insights that the operator-level analysis does not, and the integration of these alternative units into a more comprehensive framework is itself a direction for further research.

A rival hypothesis warrants explicit consideration before the boundary conditions are stated. The observed tonnage trajectory of Havvo Express could be attributed in principle to macro-level expansion of the Central Asian e-commerce market rather than to the OEM-block development that the model identifies as the proximate cause. The methodological response is the analytical-generalisation discipline introduced earlier in the section: a single-case design does not permit statistical control for market-wide growth, but it can be assessed against whether the observed pattern is consistent with the structural prediction of the model and inconsistent with the rival explanation. Two observations support the model over the rival. First, the operator's compound growth rate is on an order of magnitude not supported by the underlying market expansion documented in Chapter 1 for the Central Asian region (which grew at high but not three-digit percentages annually); the rival hypothesis predicts growth at the market rate, not at the operator rate. Second, the Q1 2026 sender-to-recipient ratio is itself a block-level signature (Block IV ecosystem maturity, Block III platform mediation) that would not be produced by a generic e-commerce market expansion at the macro level. The rival hypothesis remains formally open, and a multi-operator comparative study (identified below as a research direction) would convert the analytical-generalisation argument into a statistical-generalisation one; within the single-case design of the present monograph, the analytical argument is the methodologically appropriate one.

The four limitations together (with the unit-of-analysis observation as a fifth) define the boundary conditions under which the OEM-model framework holds. Within those conditions, the empirical record presented in this chapter supports the hypothesis stated in Chapters 1 and 2. The consolidation operator that satisfies the four OEM-class criteria and develops the five operational blocks jointly does, on a cross-border corridor with limited logistics infrastructure, achieve sustained tonnage growth and bounded delivery-time variance at scale. The verification on Havvo Express has been documented; the framework can now be summarised, contextualised, and projected forward into a research agenda, which the Conclusion takes up.

Conclusion

The monograph set out to develop and verify an Operational E-commerce Model (OEM) of the consolidation operator class on cross-border corridors with limited logistics infrastructure. The framework was constructed in Chapters 2 and 3, verified empirically on the longitudinal record of Havvo Express LLC in Chapter 4, and positioned within the broader literature on cross-border e-commerce logistics in Chapter 1. The present section reviews the findings, articulates the theoretical and practical contribution of the work, identifies its limitations, and projects a research agenda forward.

Summary of findings and hypothesis confirmation

The central hypothesis of the monograph, restated in operational form at the close of Chapter 2, predicts that a consolidation operator that satisfies four structural criteria (proprietary warehouse infrastructure, direct partnerships with long-haul carriers, a proprietary digital platform, and an adaptive routing discipline) and that develops the five operational blocks jointly along the maturity transitions identified in Chapter 2 Section 2.2 will achieve, on a cross-border corridor with limited logistics infrastructure, sustained tonnage growth at rates substantially in excess of the underlying e-commerce market expansion, with mean lead time preserved on the order of ten calendar days from origin to destination.

The empirical record of Havvo Express, examined across the period 2021 through Q1 2026, is consistent with this prediction in three independent respects. The tonnage trajectory documents compound growth from approximately two metric tonnes per month in 2021 to a stable band of two hundred to two hundred and thirty tonnes per month in 2024–2025, with the three inflection points associated with identifiable transitions in the operator's block-level capability. The Q1 2026 client cohort documents a sender-to-recipient ratio substantially below the unity threshold that the multi-sided platform literature identifies as the operational signature of a healthy network effect, with each sender generating two to four recipient interactions across the destination markets. The Q1 2026 delivery cases document a mean lead time on the order of seven calendar days across the five recorded cases, with the cohort centred well below the operator's claimed ten-calendar-day mean for the broader corridor, and the dispersion bounded within six days between the shortest and longest cases.

The verification does not amount to a statistical demonstration in the sense that a large-sample study of multiple operators would offer. It is, however, a rigorous demonstration in the sense that the case-study research literature (Eisenhardt, 1989; Voss, Tsikriktsis, & Frohlich, 2002; Yin, 2018) recognises as the appropriate methodological response to a research question that concerns a class of operators for which large-sample data is not available. The internal validity of the analysis is supported by the consistency between the predictions of the model and the longitudinal record. The construct validity is supported by the explicit operationalisation of the variables that Chapter 2 introduced. The external validity, bounded by the limitations articulated in Chapter 4 Section 4.5, is established at the level of analytical generalisation rather than statistical generalisation: the structural argument that the OEM-model offers transfers to other emerging-market corridors that satisfy the three preconditions enumerated in that section.

Theoretical contribution

The theoretical contribution of the monograph operates at three levels. The first level is the introduction of the OEM-model as a new analytical category in the literature on logistics operator classes. The literature on third-party logistics (3PL) and fourth-party logistics (4PL) classifications has been extensively developed (van Laarhoven, Berglund, & Peters, 2000; van Hoek, 2001; Lieb & Bentz, 2005; Abbasi, Sicakyuz, Santibanez Gonzalez, & Ghasemi, 2024), and the platform-economics literature has been comprehensively articulated (Parker, Van Alstyne, & Choudary, 2016; Cusumano, Gawer, & Yoffie, 2019). The consolidation operator class fits neither category cleanly: it is not asset-light in the 3PL sense, it is not an orchestration layer above operations in the 4PL sense, and it is not a pure platform in the platform-economics sense. The OEM-model identifies the consolidation operator as a distinct class with its own defining criteria, its own maturity ladder, and its own KPI scaffolding. The class label fills a gap in the literature.

The second level is the extension of Supply Chain Management theory to emerging-market corridors with limited logistics infrastructure. The classical SCM canon (Chopra & Meindl, 2016; Christopher, 2016; Bowersox, Closs, & Cooper, 2020) treats corridor-level constraints as exogenous variables. The OEM-model treats the corridor as a managed variable that the operator can partially shape through its choices of partnerships, customs interfaces, and contingency routes. This shift in the analytical treatment of the corridor is consistent with the dynamic-capabilities extension of strategic management (Teece, 2007) and with the operational-flexibility literature in logistics (Sandberg, 2021). It sharpens the SCM framework for the specific operational context that emerging-market corridors present.

The third level is the application of the Resource-Based View to a class of operators whose strategic resources have not previously been characterised systematically. The Wong and Karia (2010) framework identifies five categories of strategic resource (physical, human, information, knowledge, relational) that distinguish a competitive logistics service provider from a commoditised one. The OEM-model maps the five operational blocks to specific instances of these resource categories: the warehouse footprint is a physical resource, the proprietary digital platform is an information-and-knowledge resource bundle, the direct carrier partnerships are relational resources. The mapping is original in the sense that the literature has not previously applied the Wong and Karia framework to consolidation operators, and the resulting characterisation supports the interpretation of the OEM-class transitions as resource-accumulation transitions rather than as merely operational scaling events.

Practical significance

The practical significance of the monograph is anchored in the framework's applicability as a reference for building and evaluating consolidation operators on emerging-market corridors. The five-block architecture, the KPI scaffolding, and the maturity transitions can be used by practitioners contemplating the establishment of a consolidation operation on a corridor with the appropriate profile, by reviewers (academic, regulatory, financial) evaluating an existing operator against a benchmark, and by partners (carriers, customs authorities, technology vendors) calibrating their offerings to the requirements of consolidation operators rather than to the requirements of adjacent operator classes for whom different requirements apply.

A specific application concerns the relationship between this monograph and the methodology guide that accompanies it. The methodology guide codifies the operational protocols by which the Havvo Express implementation of the OEM-model functions in day-to-day practice. The monograph provides the scientific framework against which those protocols can be interpreted, justified, and adapted to other corridors. The two documents are complementary rather than overlapping. A practitioner working in the same operational space as Havvo Express has access, through the combination of the two documents, to both the operational discipline and the theoretical justification that the operational discipline embodies.

Limitations

The principal limitations of the work, articulated in Chapter 4 Section 4.5, can be restated in summary form. The model is verified on a single operator on a single class of corridors, and external validity rests on analytical generalisation rather than statistical generalisation. The empirical record spans the period 2021 through Q1 2026, and the parameter-level instantiations of the model are subject to regulatory change beyond the time horizon of the record. The cross-comparison evidence base on other consolidation operators (Aramex on the Middle Eastern corridor; J&T Express and Ninja Van on the Southeast Asian corridor) is suggestive but does not permit a full comparative analysis at the level of the five-block architecture. The sustainability and environmental dimensions of consolidation operation are treated as orthogonal to the operational architecture rather than as constitutive of it. The unit of analysis is the operator as a firm rather than the corridor as a whole or the parcel as the atomic unit. These limitations bound the claims of the work; they also identify the principal directions in which the work invites extension.

Future research

Four directions for future research follow from the analysis. The first is comparative research across multiple consolidation operators on multiple emerging-market corridors. The disclosed performance of Aramex on the Middle Eastern corridor (Aramex PJSC, 2024) and of Southeast Asian operators documented in the regional market report by Parcel Perform and Kearney (2024) provides candidate analogues for a multi-case study that would strengthen the external-validity argument. A formally structured multi-case study, conducted under the discipline of Eisenhardt (1989) and Voss, Tsikriktsis, and Frohlich (2002), could test the OEM-model on a wider empirical base than the single-case verification of the present monograph permits.

The second direction concerns the extension of the framework to other emerging-market corridors with structurally similar but parameter-distinct profiles. The Southeast Asian corridor presents an informative comparison, given that the regional cross-border e-commerce logistics market has been documented as substantial in scale with sustained double-digit projected growth through 2030 (Parcel Perform & Kearney, 2024), and given that the regional operators have established viable consolidation operations on a corridor with different infrastructure, regulation, and demand profile than the Central Asian corridor on which the OEM-model has been verified. Sub-Saharan African corridors and Latin American corridors offer further candidates for the extension.

The third direction concerns the integration of environmental, social, and governance (ESG) considerations into the OEM-model framework. The literature on supply chain sustainability (Giannakis & Papadopoulos, 2016) and on systematic reviews of post-pandemic supply chain research (Chowdhury, Paul, Kaisar, & Moktadir, 2021) demonstrates that ESG dimensions are increasingly integral to the operating environment of cross-border logistics. The OEM-model as articulated in the present monograph treats sustainability as a future addition; a developed treatment would integrate environmental impact (carbon footprint of air-cargo-dominated corridors), social impact (labour conditions, local-market integration), and governance dimensions (transparency, regulatory compliance) into the five-block architecture as load-bearing components.

The fourth direction concerns the cross-validation of the OEM-model maturity ladder through the analysis of operators at different stages of development. The single-operator analysis of the present monograph documents the operator's progression through the maturity transitions but does not present a cross-sectional study of operators at different stages. A cross-sectional study comparing operators in early, mid, and late OEM-class maturity would test the prediction that the structural transitions identified in Chapter 2 are observable at the population level rather than as features specific to a single operator's history. The cross-sectional study would also illuminate the rate at which different blocks mature in different operator histories, with implications for the prescriptive value of the maturity ladder for practitioners.

Closing observation

The OEM-model offers a framework through which a previously under-theorised class of logistics operators can be understood, evaluated, and developed. The consolidation operator on emerging-market corridors fills a structural gap that neither postal channels nor express integrators nor asset-light third-party providers nor pure digital platforms can fill. The class has crystallised in operational practice, on corridors that the global logistics system has been comparatively slow to serve, in response to demand patterns that the underlying e-commerce shift has generated. The framework offered here is intended to support the continued development of the class on the corridors that already host it, and the extension of the class to corridors that the framework's preconditions identify as candidates for analogous operations. The development of the class is itself a contribution to the broader project of integrating emerging markets into the global cross-border commerce system on terms that the consumers and producers of those markets can sustain.

Glossary

3PL (Third-Party Logistics). A logistics service provider that offers contracted operational capacity to a shipper without itself owning the underlying flows being moved. The 3PL class includes both asset-light providers (those that contract for the assets they offer) and asset-heavy providers (those that own warehouse and carrier assets). See Chapter 2 Section 2.2.

4PL (Fourth-Party Logistics). An orchestration layer above the operational stack of 3PLs and direct carriers, providing integrated information and management on behalf of the shipper. The 4PL typically does not itself own the assets being orchestrated. See Chapter 2 Section 2.2.

Adaptive routing. The operational discipline through which a consolidation operator manages the transition between primary and reserve corridors in response to disruption events. Formalised in the OEM-model as a finite-state machine with states for normal operation, disruption detection, alternative selection, rerouting, and recovery. See Chapter 3 Section 3.2 and Figure 3.2.

ASYCUDA (Automated System for Customs Data). The customs data system developed and maintained by the United Nations Conference on Trade and Development. Operational in over a hundred countries and territories, ASYCUDA provides the standardised electronic interface through which consolidation operators submit manifests, receive clearance signals, and exchange documentation with destination customs authorities. See Chapter 1 Section 1.2 and Chapter 3 Section 3.1.

Consolidation. The operational model in which individual cross-border shipments are aggregated at origin into a larger long-haul shipment, then disaggregated at destination for final-mile delivery. Distinguished from direct delivery (one shipment from origin to destination by a single carrier) and from fulfilment (inventory positioned at destination ahead of demand). See Chapter 1 Section 1.3 and Table 1.3.

Consolidation operator. A logistics actor whose principal function is to perform consolidation at scale on a defined corridor. The class is distinguished from 3PL and 4PL operators by its proprietary warehouse infrastructure, direct carrier partnerships, proprietary digital platform, and adaptive routing discipline. See Chapter 2 Section 2.2 and the OEM-class criteria.

De minimis threshold. The customs-administration threshold below which a cross-border shipment is exempt from duty assessment. In the destination markets that the monograph addresses, the threshold is set at USD 200 in Uzbekistan and EUR 200 in Kazakhstan. Consolidation strategies that aggregate parcels below the threshold acquire a structural cost advantage. See Chapter 1 Section 1.2.

Dimensional weight. The chargeable weight of an air-cargo shipment, calculated as the volumetric weight if greater than the actual weight. The IATA standard divisor for cargo is 6,000 cubic centimetres per kilogram. Repackaging that reduces volumetric weight reduces unit cost without changing actual content. See Chapter 3 Section 3.1.

Direct partnership (with a long-haul carrier). A bilateral operational and contractual relationship between a consolidation operator and a long-haul carrier under which the carrier reserves capacity for the operator on a defined corridor, the operator commits to a defined volume, and the parties co-invest in operational integration (manifest schedule, disruption response, financial accommodation). Distinguished from spot-market carrier procurement on the basis of Transaction Cost Economics (asset specificity, uncertainty, frequency). See Chapter 2 Section 2.1 and Chapter 3 Section 3.2.

Logistics 4.0. The five-tier maturity model that describes the progression of a logistics operator from entry-level digitisation (manual data, single-carrier operations) to optimising maturity (AI agents, predictive risk management, blockchain transparency). The OEM-model situates the consolidation operator at the quantifiable maturity tier as the target state for full OEM-class membership. See Chapter 3 Section 3.3.

Multimodal corridor. A logistics corridor on which freight moves through more than one transportation mode (air, road, rail, sea). The OEM-model treats the multimodal extension of an air-cargo-backbone corridor as a maturity attribute of Block I and Block II rather than as an alternative to the air-cargo backbone. See Chapter 4 Section 4.4.

Network effect. The economic mechanism through which the value of a multi-sided platform to participants on one side increases with the number of participants on the other side. In the OEM-model, the sender-to-recipient ratio is the operational signature of a network effect, with values substantially below unity indicating that the operator's platform has crystallised a healthy multi-sided structure. See Chapter 3 Section 3.4 and Chapter 4 Section 4.2.

OEM-model (Operational E-commerce Model). The authorial framework developed in this monograph. The OEM-model is a five-block architecture (warehouse infrastructure, route network and partnerships, digital platform, customer ecosystem, risk management and resilience) that codifies the structural choices through which a consolidation operator on a cross-border corridor with limited logistics infrastructure achieves sustained growth and bounded delivery-time variance. See Chapter 2 Section 2.3 and Chapter 3.

OEM-class criteria. The four structural criteria that distinguish an OEM-class consolidation operator from operators in adjacent classes: proprietary warehouse infrastructure on the origin side of the corridor, direct partnership agreements with long-haul carriers, a proprietary digital platform that integrates warehouse, route, customer, and risk operations, and an adaptive routing discipline that treats corridor-level disruption as a managed variable. See Chapter 2 Section 2.2.

Operational maturity. The position of an operator on the OEM-class maturity ladder. The principal transitions on the ladder are the transition from single-warehouse to distributed footprint, the transition from spot-market to direct partnership-based carrier procurement, and the transition from black-box to real-time-transparent customer interface. See Chapter 2 Section 2.2.

Reserve corridor. A long-haul corridor on which the consolidation operator maintains operational readiness without using it under normal conditions, in order to activate it when the primary corridor fails. The reserve corridor is not a substitute that is built after a failure; it is a corridor for which the operator already holds carrier contracts, customs interfaces, and handoff protocols. See Chapter 3 Sections 3.2 and 3.5.

Resource-Based View (RBV). The strategic-management framework that explains sustained competitive advantage as the consequence of resources that satisfy four criteria: value, rareness, imperfect imitability, and absence of strategic substitutes (the VRIN framework). The OEM-model interprets the consolidation operator's strategic resources (warehouse footprint, proprietary platform, direct carrier partnerships) in RBV terms. See Chapter 2 Section 2.1.

Suite ID. The customer identifier assigned by a consolidation operator at registration, used to associate inbound parcels at the origin warehouse with the correct customer in the operator's registry. Suite IDs are coupled to a fuzzy-matching algorithm at the warehouse intake to tolerate minor spelling variations without sacrificing identification accuracy. See Chapter 3 Section 3.1.

Transaction Cost Economics (TCE). The economic framework that explains the choice between organising an activity within a firm (vertical integration) and contracting for it on a market on the basis of three transaction parameters: asset specificity, uncertainty, and frequency. The OEM-model uses TCE to justify the partial vertical integration that the consolidation operator class exhibits. See Chapter 2 Section 2.1.

VRIN framework. The four-criterion test (Value, Rareness, Inimitability, Non-substitutability) developed by Barney (1991) for identifying resources that confer sustained competitive advantage in the Resource-Based View. See Chapter 2 Section 2.1.

Warehouse management system (WMS). The information subsystem within the consolidation operator's digital platform that handles intake, identification, consolidation, and outbound staging events. Integrated with the customer registry and the customs and carrier interfaces in the OEM-model architecture. See Chapter 3 Section 3.3.

Bibliography

Abbasi, S., Sicakyuz, C., Santibanez Gonzalez, E. D. R., & Ghasemi, P. (2024). A systematic literature review of logistics services outsourcing. *Heliyon*, *10*(13), e33374. https://doi.org/10.1016/j.heliyon.2024.e33374

Ambulkar, S., Blackhurst, J., & Grawe, S. (2015). Firm's resilience to supply chain disruptions: Scale development and empirical examination. *Journal of Operations Management*, *33–34*, 111–122. https://doi.org/10.1016/j.jom.2014.11.002

Amico, A., Verginer, L., Casiraghi, G., Vaccario, G., & Schweitzer, F. (2024). Adapting to disruptions: Managing supply chain resilience through product rerouting. *Science Advances*, *10*(4), eadj1194. https://doi.org/10.1126/sciadv.adj1194

Aramex PJSC. (2024). *Aramex annual integrated report 2023*. Aramex. https://www.aramex.com/us/en/investor-relations/aramex-annual-integrated-report/aramex-2023-annual-report

Arvis, J.-F., Ojala, L., Wiederer, C., Shepherd, B., Raj, A., Dairabayeva, K., & Kiiski, T. (2023). *Connecting to compete 2023: Trade logistics in the global economy. The Logistics Performance Index and its indicators*. World Bank. https://lpi.worldbank.org

Asian Development Bank. (2023). *E-commerce evolution in Asia and the Pacific: Opportunities and challenges*. ADB. https://doi.org/10.22617/tcs230473-2

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99–120. https://doi.org/10.1177/014920639101700108

Bowersox, D. J., Closs, D. J., & Cooper, M. B. (2020). *Supply chain logistics management* (5th ed.). McGraw-Hill.

Boysen, N., Fedtke, S., & Schwerdfeger, S. (2021). Last-mile delivery concepts: A survey from an operational research perspective. *OR Spectrum*, *43*(1), 1–58. https://doi.org/10.1007/s00291-020-00607-8

Bryan, D. L., & O'Kelly, M. E. (1999). Hub-and-spoke networks in air transportation: An analytical review. *Journal of Regional Science*, *39*(2), 275–295. https://doi.org/10.1111/1467-9787.00134

Büyüközkan, G., & Göçer, F. (2018). Digital supply chain: Literature review and a proposed framework for future research. *Computers in Industry*, *97*, 157–177. https://doi.org/10.1016/j.compind.2018.02.010

Chopra, S., & Meindl, P. (2016). *Supply chain management: Strategy, planning, and operation* (6th ed.). Pearson.

Chowdhury, P., Paul, S. K., Kaisar, S., & Moktadir, M. A. (2021). COVID-19 pandemic related supply chain studies: A systematic review. *Transportation Research Part E: Logistics and Transportation Review*, *148*, 102271. https://doi.org/10.1016/j.tre.2021.102271

Christopher, M. (2016). *Logistics and supply chain management* (5th ed.). Pearson.

Christopher, M., & Peck, H. (2004). Building the resilient supply chain. *The International Journal of Logistics Management*, *15*(2), 1–14. https://doi.org/10.1108/09574090410700275

Chu, H.-C. (2014). Exploring preference heterogeneity of air freight forwarders in the choices of carriers and routes. *Journal of Air Transport Management*, *37*, 45–52. https://doi.org/10.1016/j.jairtraman.2014.02.002

Cichosz, M., Wallenburg, C. M., & Knemeyer, A. M. (2020). Digital transformation at logistics service providers: Barriers, success factors and leading practices. *The International Journal of Logistics Management*, *31*(2), 209–238. https://doi.org/10.1108/IJLM-08-2019-0229

Cusumano, M. A., Gawer, A., & Yoffie, D. B. (2019). *The business of platforms: Strategy in the age of digital competition, innovation, and power*. HarperCollins.

de Koster, R., Le-Duc, T., & Roodbergen, K. J. (2007). Design and control of warehouse order picking: A literature review. *European Journal of Operational Research*, *182*(2), 481–501. https://doi.org/10.1016/j.ejor.2006.07.009

Delaware Division of Revenue. (2025). *Step 4: Gross receipts taxes*. State of Delaware. https://revenue.delaware.gov/business-tax-forms/doing-business-in-delaware/step-4-gross-receipts-taxes/

DHL Group. (2024). *Annual report 2023*. Deutsche Post DHL Group. https://group.dhl.com

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, *14*(4), 532–550. https://doi.org/10.5465/amr.1989.4308385

Eisenmann, T., Parker, G., & Van Alstyne, M. W. (2006). Strategies for two-sided markets. *Harvard Business Review*, *84*(10), 92–101.

Faber, N., de Koster, R., & Smidts, A. (2013). Organizing warehouse management. *International Journal of Operations & Production Management*, *33*(9), 1230–1256. https://doi.org/10.1108/IJOPM-12-2011-0471

Faber, N., de Koster, R., & Smidts, A. (2018). Survival of the fittest: The impact of fit between warehouse management structure and warehouse context on warehouse performance. *International Journal of Production Research*, *56*(1–2), 120–139. https://doi.org/10.1080/00207543.2017.1395489

Fragapane, G., de Koster, R., Sgarbossa, F., & Strandhagen, J. O. (2021). Planning and control of autonomous mobile robots for intralogistics: Literature review and research agenda. *European Journal of Operational Research*, *294*(2), 405–426. https://doi.org/10.1016/j.ejor.2021.01.019

Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in online shopping: An integrated model. *MIS Quarterly*, *27*(1), 51–90. https://doi.org/10.2307/30036519

Giannakis, M., & Papadopoulos, T. (2016). Supply chain sustainability: A risk management approach. *International Journal of Production Economics*, *171*(P4), 455–470. https://doi.org/10.1016/j.ijpe.2015.06.032

Gibbert, M., Ruigrok, W., & Wicki, B. (2008). What passes as a rigorous case study? *Strategic Management Journal*, *29*(13), 1465–1474. https://doi.org/10.1002/smj.722

Giuffrida, M., Jiang, H., & Mangiaracina, R. (2021). Investigating the relationships between uncertainty types and risk management strategies in cross-border e-commerce logistics. *The International Journal of Logistics Management*, *32*(4), 1406–1433. https://doi.org/10.1108/ijlm-04-2020-0158

Giuffrida, M., Mangiaracina, R., Perego, A., & Tumino, A. (2017). Cross-border B2C e-commerce to Greater China and the role of logistics: A literature review. *International Journal of Physical Distribution & Logistics Management*, *47*(9), 772–795. https://doi.org/10.1108/ijpdlm-08-2016-0241

Hagiu, A., & Wright, J. (2015). Multi-sided platforms. *International Journal of Industrial Organization*, *43*, 162–174. https://doi.org/10.1016/j.ijindorg.2015.03.003

Heinbach, C., Beinke, J. H., Kammler, F., & Thomas, O. (2022). Data-driven forwarding: A typology of digital platforms for road freight transport management. *Electronic Markets*, *32*(2), 807–828. https://doi.org/10.1007/s12525-022-00540-4

Hofmann, E., & Rüsch, M. (2017). Industry 4.0 and the current status as well as future prospects on logistics. *Computers in Industry*, *89*, 23–34. https://doi.org/10.1016/j.compind.2017.04.002

Hübner, A., Kühn, H., & Wollenburg, J. (2016). Last mile fulfilment and distribution in omni-channel grocery retailing: A strategic planning framework. *International Journal of Retail & Distribution Management*, *44*(3). https://doi.org/10.1108/ijrdm-11-2014-0154

Hummels, D. (2007). Transportation costs and international trade in the second era of globalization. *Journal of Economic Perspectives*, *21*(3), 131–154. https://doi.org/10.1257/jep.21.3.131

IMARC Group. (2024). *Central Asia e-commerce market: Industry trends, share, size, growth, opportunity and forecast 2025–2033*. IMARC. https://www.imarcgroup.com/central-asia-e-commerce-market

International Air Transport Association. (2025, January 29). *Global air cargo demand achieves record growth in 2024* [Press release]. IATA. https://www.iata.org/en/pressroom/2025-releases/2025-01-29-02/

International Trade Administration. (2025, December 15). *Uzbekistan: eCommerce*. U.S. Department of Commerce. https://www.trade.gov/country-commercial-guides/uzbekistan-ecommerce

Ivanov, D., & Dolgui, A. (2021). OR-methods for coping with the ripple effect in supply chains during COVID-19 pandemic: Managerial insights and research implications. *International Journal of Production Economics*, *232*, 107921. https://doi.org/10.1016/j.ijpe.2020.107921

Joerss, M., Schröder, J., Neuhaus, F., Klink, C., & Mann, F. (2016). *Parcel delivery: The future of last mile*. McKinsey & Company.

Jurayev, K. (2026). *Methodology for consolidating e-commerce cargo on international logistics corridors: From shipment acceptance to delivery to the final recipient* [Methodology guide]. Havvo Express LLC. (Companion document to the present monograph).

Kam, B., Ahsan, K., Deng, H., & Duan, S. (2026). Digital platforms in supply chain and logistics management: A systematic literature review. *Transportation Research Part E: Logistics and Transportation Review*, *209*, 104737. https://doi.org/10.1016/j.tre.2026.104737

Karimov, N. G., Nabieva, F., & Mustafoev, B. (2022). Current tendencies of e-commerce development in Uzbekistan: Benchmarking analysis with Kazakhstan and Kyrgyzstan. In *Proceedings of the 6th International Conference on Future Networks & Distributed Systems*. https://doi.org/10.1145/3584202.3584228

Katz, M. L., & Shapiro, C. (1985). Network externalities, competition, and compatibility. *The American Economic Review*, *75*(3), 424–440.

Khooban, Z., Mutlu, N., & de Kok, A. G. (2024). Logistics service sharing in cross-border e-commerce. *International Journal of Production Economics*, *279*, 109460. https://doi.org/10.1016/j.ijpe.2024.109460

Klose, A., & Drexl, A. (2005). Facility location models for distribution system design. *European Journal of Operational Research*, *162*(1), 4–29. https://doi.org/10.1016/j.ejor.2003.10.031

Komakech, R. A., & Ombati, T. O. (2024). Resource-based view theory and its applications in supply chain management: A systematic literature review. *Management Science Letters*, *15*. https://doi.org/10.5267/j.msl.2024.6.004

KPMG. (2022). *E-commerce in Central Asia*. KPMG. https://assets.kpmg.com/content/dam/kpmg/kz/pdf/2022/08/ecommerce-final-research.pdf

Lai, K.-H., Ngai, E. W. T., & Cheng, T. C. E. (2004). An empirical study of supply chain performance in transport logistics. *International Journal of Production Economics*, *87*(3), 321–331. https://doi.org/10.1016/j.ijpe.2003.08.002

Lambert, D. M., & Cooper, M. C. (2000). Issues in supply chain management. *Industrial Marketing Management*, *29*(1), 65–83. https://doi.org/10.1016/S0019-8501(99)00113-3

Lemon, K. N., & Verhoef, P. C. (2016). Understanding customer experience throughout the customer journey. *Journal of Marketing*, *80*(6), 69–96. https://doi.org/10.1509/jm.15.0420

Lieb, R., & Bentz, B. A. (2005). The use of third-party logistics services by large American manufacturers: The 2004 survey. *Transportation Journal*, *44*(2), 5–15.

Lummus, R. R., & Vokurka, R. J. (1999). Defining supply chain management: A historical perspective and practical guidelines. *Industrial Management & Data Systems*, *99*(1), 11–17. https://doi.org/10.1108/02635579910243851

Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D., & Zacharia, Z. G. (2001). Defining supply chain management. *Journal of Business Logistics*, *22*(2), 1–25. https://doi.org/10.1002/j.2158-1592.2001.tb00001.x

Mentzer, J. T., Flint, D. J., & Hult, G. T. M. (2001). Logistics service quality as a segment-customized process. *Journal of Marketing*, *65*(4), 82–104. https://doi.org/10.1509/jmkg.65.4.82.18390

Michielsen, S., Gevaers, R., & Dewulf, W. (2025). A historical overview and analysis of e-commerce's milestones and its growing connection with air transport. *Journal of Shipping and Trade*, *10*(1). https://doi.org/10.1186/s41072-025-00203-5

Organisation for Economic Co-operation and Development. (2023). *Trade facilitation in Central Asia*. OECD Publishing. https://doi.org/10.1787/80ed999c-en

Organisation for Economic Co-operation and Development. (2024). *Enhancing the competitiveness of the Trans-Caspian transport corridor in Central Asia*. OECD Publishing. https://www.oecd.org/en/publications/enhancing-the-competitiveness-of-the-trans-caspian-transport-corridor-in-central-asia_f261e7fa-en/

Parcel Perform, & Kearney. (2024). *Southeast Asia e-commerce logistics market report 2024*. https://resources.parcelperform.com/southeast-asia-e-commerce-logistics-market-report-2024

Parker, G. G., Van Alstyne, M. W., & Choudary, S. P. (2016). *Platform revolution: How networked markets are transforming the economy and how to make them work for you*. W. W. Norton.

Pavlou, P. A. (2003). Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model. *International Journal of Electronic Commerce*, *7*(3), 101–134. https://doi.org/10.1080/10864415.2003.11044275

Payne, A., & Frow, P. (2005). A strategic framework for customer relationship management. *Journal of Marketing*, *69*(4), 167–176. https://doi.org/10.1509/jmkg.2005.69.4.167

Penrose, E. T. (1959). *The theory of the growth of the firm*. Blackwell. (Reprint edition: Oxford University Press, 2009.)

Peteraf, M. A. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, *14*(3), 179–191. https://doi.org/10.1002/smj.4250140303

Pettit, T. J., Croxton, K. L., & Fiksel, J. (2013). Ensuring supply chain resilience: Development and implementation of an assessment tool. *Journal of Business Logistics*, *34*(1), 46–76. https://doi.org/10.1111/jbl.12009

Reinartz, W., Krafft, M., & Hoyer, W. D. (2004). The customer relationship management process: Its measurement and impact on performance. *Journal of Marketing Research*, *41*(3), 293–305. https://doi.org/10.1509/jmkr.41.3.293.35991

Roodbergen, K. J., & Vis, I. F. A. (2009). A survey of literature on automated storage and retrieval systems. *European Journal of Operational Research*, *194*(2), 343–362. https://doi.org/10.1016/j.ejor.2008.01.038

Rysman, M. (2009). The economics of two-sided markets. *Journal of Economic Perspectives*, *23*(3), 125–143. https://doi.org/10.1257/jep.23.3.125

Sandberg, E. (2021). Dynamic capabilities for the creation of logistics flexibility: A conceptual framework. *The International Journal of Logistics Management*, *32*(2), 696–714. https://doi.org/10.1108/IJLM-07-2020-0266

Sethi, A. K., & Sethi, S. P. (1990). Flexibility in manufacturing: A survey. *International Journal of Flexible Manufacturing Systems*, *2*(4), 289–328. https://doi.org/10.1007/BF00186471

Sheffi, Y. (2005). *The resilient enterprise: Overcoming vulnerability for competitive advantage*. MIT Press.

SteadieSeifi, M., Dellaert, N. P., Nuijten, W., Van Woensel, T., & Raoufi, R. (2014). Multimodal freight transportation planning: A literature review. *European Journal of Operational Research*, *233*(1), 1–15. https://doi.org/10.1016/j.ejor.2013.06.055

Strandhagen, J. O., Vallandingham, L. R., Fragapane, G., Strandhagen, J. W., & Stangeland, A. B. H. (2017). Logistics 4.0 and emerging sustainable business models. *Advances in Manufacturing*, *5*(4), 359–369. https://doi.org/10.1007/s40436-017-0198-1

Stripe. (2026, April 19). *Delaware's zero sales tax rate: A guide for businesses*. Stripe. https://stripe.com/resources/more/delawares-zero-sales-tax-rate

Tang, C. S. (2006). Perspectives in supply chain risk management. *International Journal of Production Economics*, *103*(2), 451–488. https://doi.org/10.1016/j.ijpe.2006.03.013

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, *28*(13), 1319–1350. https://doi.org/10.1002/smj.640

Tovstolis, I. (2024). An algorithm for consolidating small shipments to reduce costs in international logistics for e-commerce businesses. *International Journal of Supply Chain and Logistics*, *8*(3), 1–15. https://doi.org/10.47941/ijscl.2336

United Nations Conference on Trade and Development. (2023). *ASYCUDA report 2022/2023: Accelerating climate smart trade facilitation* (UNCTAD/DTL/ASYCUDA/2023/1). UNCTAD. https://unctad.org/publication/asycuda-report-20222023

United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States. (n.d.). *Landlocked developing countries*. United Nations. https://www.un.org/ohrlls/content/landlocked-developing-countries

Upton, D. M. (1994). The management of manufacturing flexibility. *California Management Review*, *36*(2), 72–89. https://doi.org/10.2307/41165745

van Hoek, R. I. (2001). The contribution of performance measurement to the expansion of third-party logistics alliances in the supply chain. *International Journal of Operations & Production Management*, *21*(1–2), 15–29. https://doi.org/10.1108/01443570110358431

van Laarhoven, P., Berglund, M., & Peters, M. (2000). Third-party logistics in Europe: Five years later. *International Journal of Physical Distribution & Logistics Management*, *30*(5), 425–442. https://doi.org/10.1108/09600030010336216

Voss, C., Tsikriktsis, N., & Frohlich, M. (2002). Case research in operations management. *International Journal of Operations & Production Management*, *22*(2), 195–219. https://doi.org/10.1108/01443570210414329

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, *5*(2), 171–180. https://doi.org/10.1002/smj.4250050207

Wieland, A., & Wallenburg, C. M. (2012). Dealing with supply chain risks: Linking risk management practices and strategies to performance. *International Journal of Physical Distribution & Logistics Management*, *42*(10), 887–905. https://doi.org/10.1108/09600031211281411

Williamson, O. E. (1979). Transaction-cost economics: The governance of contractual relations. *Journal of Law and Economics*, *22*(2), 233–261. https://doi.org/10.1086/466942

Williamson, O. E. (1985). *The economic institutions of capitalism: Firms, markets, relational contracting*. Free Press.

Wong, C. Y., & Karia, N. (2010). Explaining the competitive advantage of logistics service providers: A resource-based view approach. *International Journal of Production Economics*, *128*(1), 51–67. https://doi.org/10.1016/j.ijpe.2009.08.026

Yeleussizova, B. K., Kazbekova, S. Z., & Zeinelgabdin, A. B. (2024). Cross-border retail e-commerce and de minimis: The case of Kazakhstan. *World Customs Journal*, *18*(1), 50–67. https://doi.org/10.55596/001c.117024

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications.

Zennaro, I., Finco, S., Calzavara, M., & Persona, A. (2022). Implementing e-commerce from logistic perspective: Literature review and methodological framework. *Sustainability*, *14*(2), 911. https://doi.org/10.3390/su14020911