



**Working Paper 2025.1.5.18**

**- Vol. 1, No. 5**

---

## **PHÂN TÍCH CHIẾN LƯỢC CROSS-DOCKING TRONG QUẢN LÝ KHO HÀNG VÀ PHÂN PHỐI CỦA AMAZON**

**Ngô Trần Phương Thảo<sup>1</sup>, Triệu Thủy Vi, Nguyễn Thị Bảo Linh**

Sinh viên K61 CLC Kinh tế đối ngoại – Viện Kinh tế và Kinh doanh quốc tế

**Nguyễn Như Vân**

Sinh viên K62 CLC Logistics và Quản lý chuỗi cung ứng – Viện Kinh tế và Kinh doanh quốc tế

*Trường Đại học Ngoại thương, Hà Nội, Việt Nam*

**Nguyễn Thị Yến**

Giảng viên Viện Kinh tế và Kinh doanh quốc tế

*Trường Đại học Ngoại thương, Hà Nội, Việt Nam*

---

### **Tóm tắt**

Trong bối cảnh thương mại toàn cầu tiếp tục mở rộng nhanh chóng, các giải pháp logistics hiệu quả ngày càng trở nên quan trọng để duy trì lợi thế cạnh tranh trong môi trường kinh doanh năng động hiện nay. Trong số các chiến lược logistics khác nhau, cross-docking nổi bật như một phương pháp mạnh mẽ giúp tinh gọn chuỗi cung ứng bằng cách giảm thiểu thời gian lưu kho, cắt giảm chi phí xử lý và đẩy nhanh dòng chảy sản phẩm. Kỹ thuật này, bao gồm việc chuyển trực tiếp hàng hóa từ phương tiện nhập vào phương tiện xuất với thời gian lưu kho tối thiểu hoặc không lưu kho, đã chứng minh được hiệu quả cao trong việc nâng cao hiệu suất và sự hài lòng của khách hàng. Amazon, một tập đoàn dẫn đầu toàn cầu trong lĩnh vực thương mại điện tử và logistics, đã thiết lập tiêu chuẩn trong việc áp dụng các phương pháp cross-docking tiên tiến trong hệ thống quản lý kho hàng tinh vi của mình. Bằng cách tận dụng phân tích dữ liệu thời gian thực, tự động hóa và bố trí cơ sở hạ tầng chiến lược, Amazon không chỉ tối ưu hóa hoạt động chuỗi cung ứng mà còn duy trì lợi thế cạnh tranh trên thị trường toàn cầu. Nghiên

---

<sup>1</sup> Tác giả liên hệ, Email: k61.2214150631@ftu.edu.vn

cứu này đi sâu vào mô hình cross-docking của Amazon, đánh giá các yếu tố thành công chính và lợi ích vận hành, đồng thời khám phá cách áp dụng những hiểu biết này để cải thiện chiến lược quản lý kho hàng cho các doanh nghiệp bán lẻ tại Việt Nam, nơi các phương pháp logistics truyền thống vẫn chiếm ưu thế bất chấp sự tăng trưởng nhanh chóng của thị trường và nhu cầu tiêu dùng ngày càng tăng.

**Từ khoá:** Cross-docking, Amazon, quản lý kho, vận tải, Việt Nam

## **CROSS-DOCKING STRATEGY IN WAREHOUSE MANAGEMENT AND DISTRIBUTION: CASE STUDY OF AMAZON**

### **Abstract:**

As global trade continues to expand rapidly, effective logistics solutions have become increasingly vital for maintaining a competitive edge in today's dynamic business environment. Among various logistics strategies, cross-docking stands out as a powerful method for streamlining supply chains by minimizing storage time, reducing handling costs, and accelerating product flow. This technique, which involves direct transfer of goods from inbound to outbound transportation with minimal or no storage, has proven highly effective in enhancing efficiency and customer satisfaction. Amazon, a global leader in e-commerce and logistics, has set a benchmark in implementing advanced cross-docking practices within its sophisticated warehouse management system. By leveraging real-time data analytics, automation, and strategic facility placement, Amazon has not only optimized its supply chain operations but also maintained its competitive advantage in the global market. This study delves into Amazon's cross-docking model, evaluating its key success factors and operational benefits, and explores how these insights can be adapted to improve warehouse management strategies for FMCG retailers in Vietnam, where traditional logistics practices still dominate despite rapid market growth and increasing consumer demand.

**Keywords:** Cross-docking, Amazon, Warehouse Management, Logistics, Vietnam

---

### **1. Introduction**

In today's competitive global market, efficient supply chain and warehouse management strategies are crucial for maintaining competitive advantage. One such strategy, cross-docking, has gained prominence for its potential to streamline operations by minimizing storage time and expediting product flow from suppliers to customers. Cross-docking involves

the direct transfer of products from inbound to outbound transportation with minimal or no storage in between, thereby reducing handling costs and delivery times.

Amazon, a global leader in e-commerce and logistics, has been at the forefront of implementing innovative warehouse management practices. The company's extensive distribution network includes various facility types, such as cross-dock centers, fulfillment centers, sortation centers, and delivery stations, each designed to optimize different aspects of the supply chain. Notably, Amazon's cross-dock centers receive products directly from suppliers and redistribute them to other logistics centers within a short timeframe, exemplifying the company's commitment to reducing storage durations and enhancing operational efficiency. Despite Amazon's advancements in logistics, the dynamic nature of consumer demand and the continuous expansion of product lines present ongoing challenges in warehouse management. Implementing or enhancing cross-docking strategies could offer solutions to these challenges by further reducing inventory holding costs and improving delivery times. This research provides insights into optimizing Amazon's cross-docking strategy and contributes to the broader field of supply chain management. It also offers valuable lessons for logistics firms, including those in Vietnam, where e-commerce growth demands more efficient distribution systems. By understanding Amazon's best practices, businesses in emerging markets can enhance their logistics operations and last-mile delivery efficiency.

## **2. Theoretical framework**

### ***2.1. Overview of Warehouse Management in Supply Chain:***

A supply chain is a network of various entities, including suppliers, manufacturers, distribution centers, and warehouses, that work together to source materials, produce intermediate or finished goods, and deliver them to customers. Supply chain management aims to ensure the seamless flow of goods and information, adhering to the principle of delivering "the right goods to the right place at the right time." It encompasses all activities involved in transforming raw materials into final products for end users, including procurement, production scheduling, order processing, inventory management, transportation, warehousing, and customer service.

Warehouses, a crucial component of supply chain management, play a key role in restructuring and repackaging products. They are responsible for breaking down large quantities of goods and redistributing them into smaller portions. More specifically, they receive bulk shipments, frame them, retrieve and sort SKUs (stock-keeping units), and then send them to

buyers. The physical processes of warehouse activities can be divided into inbound and outbound processes, each consisting of different stages (Bartholdi & Hackman, 2008).

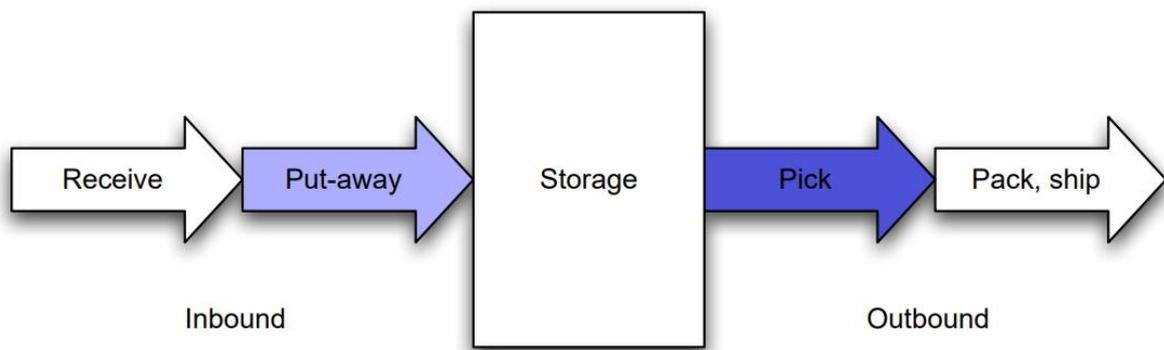


Figure 1. Physical flow of warehouse management activities

- *Types of warehouses:*

According to *Warehouse & Distribution Science* by Bartholdi and Hackman (2008), warehouses might be categorized into several types based on customer segments:

*Retail distribution centers* generally provide a huge number of products to retail stores.

*Service parts distribution centers*, which store a wide variety of parts, experience significant demand fluctuations and require substantial safety stock.

*Catalog fulfillment or e-commerce distribution centers* receive customers' orders by phone, fax, or the Internet. Those orders are typically small and able to be shipped immediately after receipt.

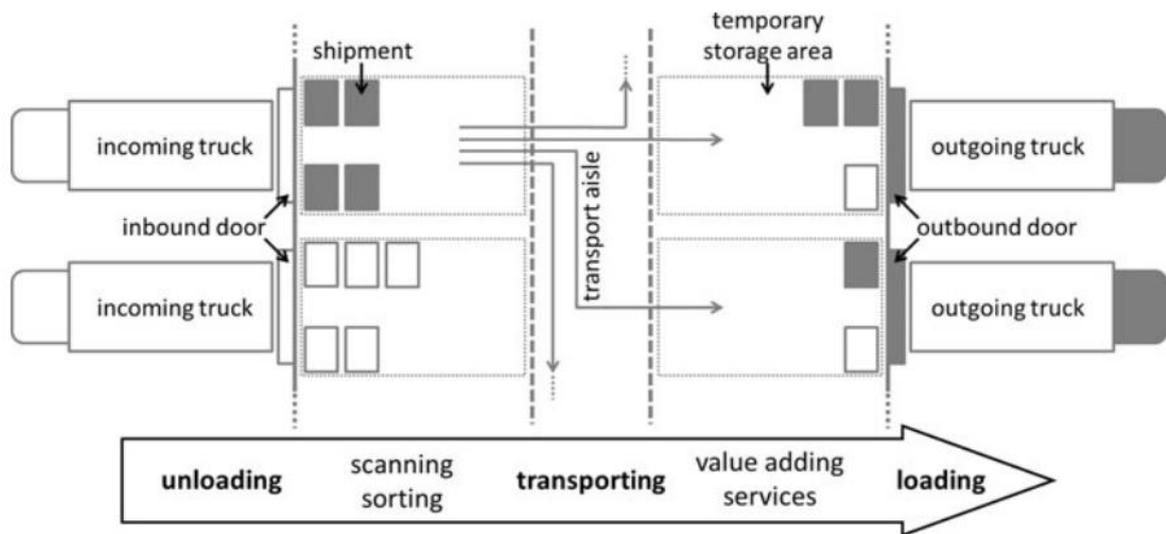
*3PL warehouses* refer to third-party logistics providers that offer various services for customers, including storage, inventory management, order fulfillment, packaging, and shipping. By outsourcing to 3PL warehouses, companies can focus on core operations while benefiting from economies of scale.

*Perishable warehouses* are specifically designed for short-shelf-life products such as food, beverages, vaccines, and other temperature-sensitive items. These facilities must meet strict inventory management requirements such as FIFO (First-In-First-Out) or FEFO (First-Expired-First-Out) and comply with regulations regarding product storage, including proper positioning and temperature control to minimize risks.

## 2.2. Overview of Cross-docking:

Following Walmart's pioneering work in applying cross-docking in the 1980s, more companies have implemented this logistic strategy in recent years. Cross-docking can be

defined as the process of consolidating products from different origins but the same destinations, with little or no storage time between loading and unloading goods (Belle et al., 2012). A cross-dock is an intermediate terminal in a distribution network dedicated to cross-docking, allowing small shipments to be combined into full truckloads before transportation. The process in this terminal begins with the arrival of inbound deliveries, where incoming shipments are assigned a dock door. Afterward, goods are unloaded, scanned, sorted by final destinations, and moved across the dock to minimize delays. Finally, they are loaded onto outbound trucks and immediately head to the following destination in the distribution system. This process ensures that goods are moved swiftly with minimal handling and storage (Boysen & Stephan, 2011) (Boysen & Fliedner et al., 2010). In practice, cross-docks are commonly designed in the shape of an I, L, or T, but there are other unusual ones, such as U, H, and E-shaped (Bartholdi & Gue, 2004).



*Figure 2. Schematic representation of a cross-docking terminal*

In traditional warehouses, goods are processed through four main steps: receiving, storage, picking, and shipping, leading to high costs in inventory holding and labor intensive. In contrast, cross-docking eliminates these costs by passing storage and directly handling shipments, which offers several advantages, including cost reductions, faster delivery times from supplier to customer, less storage space, and minimizing the risk of overstocking or damage (Belle et al., 2012).

Cross-docks can be categorized into various types based on several characteristics. According to the number of goods-handling stages, one-touch or pure cross-docking involves

the direct transfer of goods from inbound to outbound trucks with only one-time touching, whereas two-touch (single-stage) cross-docking requires goods to be temporarily staged before being loaded onto outbound transportation. In multiple-touch (two-stage) one, products are reconfigured before finally loading.

Cross-docking can also be classified according to the timing of customer assignments. In pre-distribution cross-docking, shipments are assigned to customers before leaving the supplier, enabling faster handling at the terminal. In contrast, post-distribution cross-docking assigns customers at the cross-dock, offering greater flexibility but requiring extra processing time. Additionally, cross-docks can be categorized based on physical attributes such as shape, dock door count, and internal transportation systems, as well as operational features and the flow of goods.

Cross-docking is not only effective for consolidation of shipments, but also beneficial for seasonal merchandise, ensuring swift distribution to meet periodic demand spikes. Additionally, it facilitates the rapid delivery of high-demand products, enhancing customer satisfaction. This approach is ideal for perishable goods that require quick distribution to prevent spoilage. Furthermore, when goods are pre-sorted at the manufacturing site, cross-docking enables immediate distribution, eliminating the need for additional storage.

### **3. Analysis of Amazon's Warehouse Management and Cross-docking Practices**

#### ***3.1. Overview of Amazon and Its Warehouse Management:***

Amazon is the world's largest online retailer and a global technology giant, founded in 1994 by Jeff Bezos in Seattle, Washington, U.S. Originally launched as an online bookstore in 1995, Amazon quickly expanded into a wide range of consumer products, including music, videos, electronics, and toys. Today, Amazon operates one of the world's largest online marketplace offering millions of products across categories such as apparel, automotive, industrial supplies, and beauty. The company has also developed innovative services, including smart devices (Alexa, Echo, Fire TV), subscription services (Amazon Prime), and entertainment platforms (Prime Video, Amazon Originals, Audible).

Amazon initially partnered with major logistics companies like DHL, UPS, and FedEx to handle deliveries. However, since 2020, the company has strategically reduced its reliance on third-party carriers by building its own logistics empire. Today, Amazon operates one of the most advanced supply chain networks in the world, designed for rapid order fulfillment, seamless logistics, and high customer satisfaction. The company's supply chain is powered by a global network of fulfillment centers. Since the mid-1990s, Amazon's storage capacity has

grown from a few shelves in its Seattle office to over 185 fulfillment centers worldwide, including 110 active centers in the U.S. and facilities across North America, Europe, Asia, and Australia. These facilities are typically at least 100,000 square feet in size and house all kinds of product inventory. Amazon's warehouses are called "Fulfillment Centers" because they provide more than just storage; they handle the entire order fulfillment process, including picking, packing, and shipping. Due to increasing demand, Amazon.com was compelled to invest in automation to make their Fulfillment Centers more efficient. To expand the marketplace and logistics network, Amazon uses cross-docking in these fulfillment centers as a key logistics strategy to streamline inventory management, reduce costs, and enhance delivery speed. This approach allows Amazon to bypass long-term storage by directly transferring goods from inbound shipments (suppliers) to outbound distribution (customers or fulfillment centers) with minimal handling. Most of the fulfillment centers are strategically built near major highways, airports, and transportation hubs to facilitate the efficient movement of goods. This ensures a seamless connection between manufacturers, Amazon's distribution system, and customers.

### ***3.2. Implementation of Cross-docking at Amazon:***

Amazon faces enormous challenges in its supply chain: from handling a massive volume of global orders and ensuring ultra-fast delivery speeds (with Amazon Prime's famous 1-2 day shipping) to maintaining absolute precision in every stage of operations. Even a minor mistake can significantly impact customer experience. Additionally, unlike traditional retailers (e.g., Walmart) that ship large replenishment orders to stores using private fleets, Amazon must deliver small orders to a widely dispersed customer base, making transportation efficiency harder to achieve. To overcome these challenges, Amazon has implemented breakthrough solutions, including Inbound Cross-Docking (IXD) - a strategy designed to optimize the flow of goods, accelerate processing times, and reduce logistics costs. An Inbound Cross Dock (IXD) is a specialized Amazon warehouse designed to receive freight from vendors and sellers before redistributing products to Fulfillment Centers (FCs).

As of 2022, Amazon operated 36 IXD facilities, each serving nearly 30-40 FCs, strategically positioned near major port gateways and transportation corridors - most notably in New York and Los Angeles, the country's largest trade entry points. The primary function of IXDs is to transload imported goods from containers into truckloads before shipment to e-fulfillment centers. Inland IXDs are strategically placed near major intermodal terminals and manufacturing clusters, allowing them to handle both imported goods and domestic

procurement. Notably, no IXD facilities are co-located—each one operates independently to maintain efficiency and avoid logistical conflicts. Amazon's IXD locations align with the demographic center of the U.S, specifically around southern Missouri, ensuring efficient nationwide distribution.



Figure 3. Amazon Inbound Cross Dock Facilities Network

### 3.2.1. Amazon Inbound Cross-Dock Operation:

Unlike FCs, IXDs do not ship orders directly to customers. Previously referred to as redistribution centers, Amazon developed the IXD network to enhance the efficiency of goods flowing into its fulfillment system. IXD facilities function similarly to import distribution centers, acting as reception hubs, break-bulk locations, and temporary storage buffers for imported containers from international suppliers. To be more specific, the process begins at distribution centers (DCs), where orders are aggregated and batched based on customer proximity to maximize efficiency. Instead of shipping individual orders via expensive parcel carriers, Amazon bundles orders bound for the same region and transports them in bulk using LTL (Less Than Truckload) or TL (Truckload) carriers to these IXDs. Once at the hubs or IXDs, packages are sorted and handed over to local parcel carriers for last-mile delivery. This system drastically reduces long-haul shipments - for instance, rather than executing 1,000 separate long-haul deliveries to a region like the San Francisco Bay Area, Amazon consolidates them into a single bulk shipment, followed by 1,000 last-mile deliveries. IXD facilities are configured with bay doors on both sides and are functionally like transloading facilities but service exclusively e-fulfillment centers. On one side of the facility, inbound cargo loads (mainly

containers) are unloaded and stored. Within the facility, the inventory is stored until needed, implying that the IXD is a crucial buffer in large scale e-commerce supply chains. On the other side of the facility, full truckloads are assembled according to demand and sent to specific e-fulfillment facilities. IXDs are the point of entry for the fulfillment process in e-commerce by synchronizing inbound procurement logistics with the distributional capabilities of e-fulfillment centers.

In order to succeed with this strategy, Amazon.com needs a sufficient scale of customers in an area and a service window that allows for order aggregation. The service window is the amount of days within which Amazon.com promises delivery. Amazon.com offers customers different shipping options for different prices on its website as well as free shipping for most orders over \$25. In this way, they provide customers with an incentive to increase the service window. Order aggregation at the DC and longer lead time long-haul transportation both are dependent upon a certain service window to achieve the scale necessary for transportation hubs or inbound cross-dockings (IXDs) to succeed.

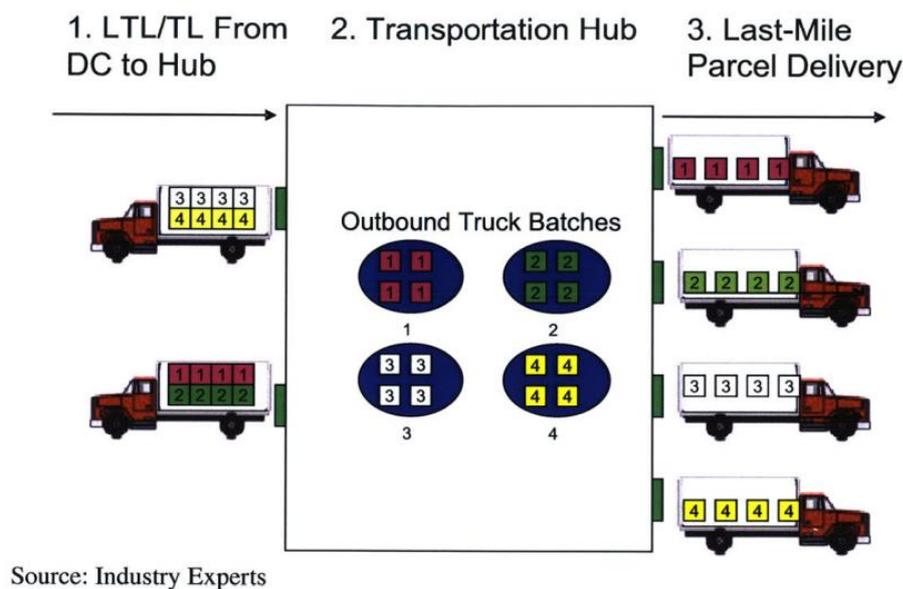


Figure 4. Amazon's cross-docking process

Source: Industry Experts

According to Schoder (2021) and Birenbaum (2018), Amazon's Inbound Cross-dock Process includes three major stages: inbound receive, sortation and end-of-line, which normally keeps freight staying less than 12 hours in an IXD. While each cross-dock facility varies in location, design, and connections to fulfillment centers (FCs), they all share the primary objectives of efficiently distributing products closer to customers and consolidating shipments to maximize full truckloads for final delivery.

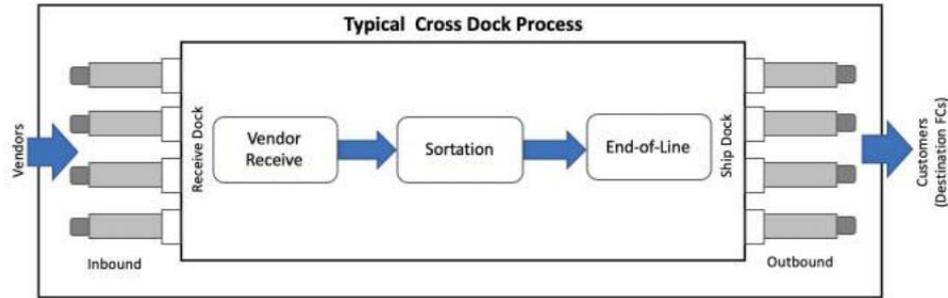


Figure 5. Typical inbound cross-dock process flow

*Receive from Vendor:* There are three main ways to receive a product including through the License Plate (LP) Receive process, the Each Receive Process, and the Pallet Receive Process. The first method utilizes a parcel identification unit (PID) to automatically process incoming products through barcode scanning with the aim to efficiently receive products from trusted vendors. On the other hand, in the second method, Amazon associates (AA) open the product cases and manually scan them back into the case by a barcode scanner, leading to an increase in the overall cost of product fulfillment. If the original case is too heavy or the associate has difficulty repacking all items, the products will be placed in a yellow tote. Despite also being processed manually, the single-ASIN pallet in the third method remains intact and each ASIN is not scanned, which is highly efficient and lower variable cost per unit (VCPU).

*IXD Sortation:* After the Vendor Product Receive Process, the Inventory Transfer Service (ITS) network optimization algorithm determines products' routes and final inventory locations via Case Sort (Down stack) or Each Sort process. In the first one, low-velocity single-ASIN pallets can be broken down into individual cases to ensure the inventory levels at each FC remain within the required days of cover. In the second process, products are sorted into totes based on demand, allowing ASINs to be distributed across different regions and improving fast-track capabilities.

*IXD End-Of-Line at the Outbound Ship dock:* The products arrive at ship sorter and then are configured as floor loads or palletized loads. In the floor loading, individual cases and totes are manually loaded onto a trailer and routed to FC-specific production lines in outbound processing. In palletized loading, a mixture of different pallet types are formed layer by layer and then moved via pallet jack to the staging area.

### 3.2.2. Amazon National Inbound Cross Dock:

In the 2023 shareholder letter, Amazon CEO Andy Jassy emphasized creating an entirely new inbound receiving network as key focus areas for 2024. Traditional IXDs, however, are not storage facilities - they are designed for immediate redistribution. Most IXDs typically measure around 600,000 square feet. However, in recent months, Amazon has rapidly expanded its IXD network, opening twelve additional large-scale IXD facilities, each 1 million square feet or more. It is predicted that Amazon will build a total of 24 such facilities, with IXD growth playing a crucial role in Amazon’s logistics expansion in 2024. A lot of the large domestic vendors of branded products that ship on Amazon are now moving goods into these nIXD buildings, which are essentially large, holding tanks for inventory - many thousands of pallet positions per building.

Facility Name	Size	Opened
<a href="#">TMB8</a> Homestead, FL	1 million sq ft	September 2024
<a href="#">BNA6</a> Clarkesville, TN	1.1 million sq ft	May 2024
<a href="#">LBE1</a> New Stanton, PA	1 million sq ft	July 2024
<a href="#">RYY2</a> White, GA	1.1 million sq ft	September 2024
<a href="#">MIT2</a> Shafter, CA	1 million sq ft	August 2024
<a href="#">RDU4</a> Fayetteville, NC	1.5 million sq ft	July 2024
<a href="#">PSC2</a> Pasco, WA	1.07 million sq ft	October 2024
<a href="#">HIA1</a> Middletown, PA	1.5 million sq ft	August 2024
<a href="#">PBI3</a> Port St. Lucie, FL	1 million sq ft	August 2024
<a href="#">HGR6</a> Hagerstown, MD	1 million sq ft	June 2024
<a href="#">GEU3</a> Buckeye, AZ	1 million sq ft	September 2024
<a href="#">ABQ2</a> Los Lunas, NM	1.3 million sq ft	August 2024

Amazon IXDs opened since May 2024 of 1 million or more square feet

*Figure 6. Number of newly established Amazon’s IXDs*

Amazon is now operating two types of IXD facilities:

- (i) Regional IXDs (rIXDs) – Traditional IXDs, responsible for distributing goods to fulfillment centers within a specific geographic region.
- (ii) National IXDs (nIXDs) – Larger, newly introduced IXDs that aggregate and distribute inventory across multiple regions.

Amazon’s rapid expansion of nIXDs aligns with its broader regionalization strategy, introduced to reduce shipping costs after the pandemic-driven logistics boom. The U.S. has

been divided into eight fulfillment regions, with the goal of minimizing long-distance shipments and reducing reliance on costly air freight. Instead of a single IXD sending inventory to fulfillment centers (FCs) nationwide, nIXDs distribute products to rIXDs, using slower, bulk truckloads rather than relying on expensive air transport or long-distance FC fulfillment.

### ***3.3. Evaluation of Cross-docking Effectiveness in Amazon***

Amazon's vast fulfillment network relies heavily on cross-docking through Inbound Cross-Dock (IXD) centers strategically located near major ports, rail hubs, and highways. These facilities act as intermediary hubs where bulk shipments from suppliers are sorted and redistributed to fulfillment centers or directly to customers. Amazon has expanded its cross-docking network to enhance regionalization, which allows inventory to be distributed closer to demand centers, reducing the need for long-haul transportation. This strategy has been instrumental in improving delivery speeds, lowering operational costs, and increasing supply chain efficiency.

#### ***3.3.1. Advantages of Cross-Docking in Amazon's Operations:***

A key advantage of cross-docking in Amazon's logistics network is the reduction in storage costs and inventory holding. Traditional warehouse models involve storing large inventories, increasing costs and capital investment. By contrast, Amazon's cross-docking strategy minimizes long-term storage by moving goods quickly through the supply chain. Amazon's IXD center in California, near the Port of Los Angeles, handles millions of shipments daily, reducing storage requirements by 40% compared to traditional fulfillment centers. Financial reports from Amazon in 2023 indicated that expanding cross-docking operations led to a 17% decrease in warehousing costs. Additionally, Amazon's fulfillment efficiency has resulted in cost savings exceeding \$3 billion annually by optimizing inventory flow and reducing waste.



Figure 7. Amazon's fulfillment cost savings

Another critical benefit is faster order fulfillment and improved delivery times. Cross-docking allows Amazon to accelerate goods movement by bypassing conventional warehousing processes, enabling same-day or next-day delivery for many Amazon Prime orders. During the 2022 holiday season, Amazon leveraged cross-docking to manage a 35% surge in e-commerce orders without expanding warehouse capacity. Data from Amazon Logistics shows that IXD centers have contributed to an average 25% reduction in delivery times across key urban markets, allowing the company to compete effectively with rapid delivery services. The regionalized IXD strategy enables more dynamic and responsive inventory movement, particularly for fast-moving consumer goods, ensuring product availability without overstocking fulfillment centers.

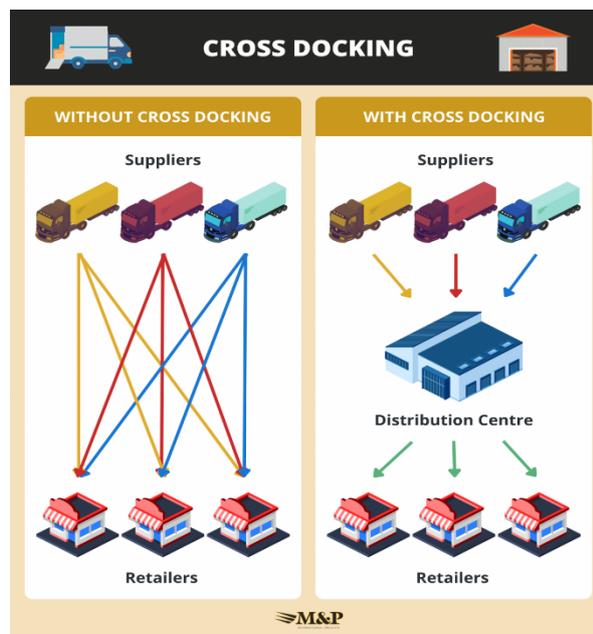


Figure 8. Cross docking process

Cross-docking significantly improves supply chain efficiency and coordination by consolidating inbound and outbound shipments at Amazon's Inbound Cross-Dock (IXD) centers. At the Texas IXD Center, optimized scheduling and load balancing have reduced truck idle time by 25%, translating to an annual fuel cost savings of approximately \$15 million. This reduction is achieved through real-time route optimization, which ensures that incoming shipments are swiftly sorted and dispatched, minimizing dwell time and congestion at distribution hubs.

Additionally, Amazon's regional fulfillment strategy integrates its nationwide IXD network to dynamically align inventory allocation with shifting customer demand. By strategically positioning cross-docking facilities near high-demand areas, such as major metropolitan regions and logistics corridors, Amazon reduces unnecessary long-haul transportation and ensures faster replenishment of fulfillment centers. This approach enhances last-mile delivery efficiency, allowing Amazon to maintain rapid fulfillment speeds while reducing overall transportation costs and environmental impact.

### *3.3.2. Limitations of Cross-Docking in Amazon's Operations:*

One of the primary limitations is the high initial infrastructure investment. While cross-docking ultimately reduces long-term costs, it requires significant upfront spending on infrastructure, technology, and automation. Amazon's financial reports indicate that in 2021, the company allocated \$2.5 billion to expanding its IXD centers across North America. The company's 2024 logistics report highlights that continued investment in warehouse management systems is essential to sustaining cross-docking operations. Although this investment pays off in efficiency gains, the high cost of setting up such a system can be a barrier for companies looking to adopt similar strategies. and warehouse management systems are essential to sustaining cross-docking operations.

Supplier coordination is another challenge in cross-docking implementation. The effectiveness of this logistics strategy depends on precise timing between suppliers, IXD centers, and outbound logistics networks. Any delay in the supply chain can cause disruptions. In 2023, Amazon's IXD center in New Jersey experienced congestion, delaying 50,000 shipments per day due to supplier misalignment. To mitigate these risks, Amazon uses real-time inventory tracking and predictive analytics to align supplier schedules and prevent bottlenecks. The success of cross-docking depends heavily on streamlined collaboration across all stakeholders, requiring advanced data-sharing capabilities and improved supplier compliance measures.

Cross-docking has been a key logistics strategy for Amazon, reducing storage costs, speeding up deliveries, and improving supply chain coordination. However, it requires significant investment, supplier collaboration, and precise inventory management. By continuously refining these strategies, Amazon stays competitive in global logistics. These insights can help enhance Vietnam's warehousing and logistics efficiency, which will be explored next.

#### **4. Recommendations for Warehouse Management Systems in Vietnam**

##### ***4.1. Current Warehouse Management in Vietnamese Companies:***

Vietnam's warehousing sector has witnessed substantial growth, with modern warehouse space expanding to 3.9 million square meters by the end of 2023. The adoption of Warehouse Management Systems (WMS) is growing, particularly among major logistics firms like Gemadept, ITL, and DHL Vietnam, and the Vietnamese WMS market is projected to reach \$16.69 million by 2025. This development reflects the country's strategic efforts to enhance its logistics infrastructure, driven by both domestic demand and foreign investment. Domestically, the rapid expansion of Vietnam's digital economy and the booming e-commerce sector have significantly increased demand for warehouse space, particularly in Tier 2 and Tier 3 cities. To accommodate diverse market needs, a combination of Grade A, B, and C warehouses is utilized, ensuring flexibility in storage solutions for various industries. Strategically, Vietnam's geographical position provides a distinct logistical advantage, particularly in the context of the "China Plus One" strategy. As businesses seek to diversify their supply chains amid geopolitical uncertainties, Vietnam has emerged as a preferred alternative manufacturing and distribution hub. The country's proximity to China, combined with a coastline exceeding 3,000 kilometers and a network of 320 ports, reinforces its potential as a key player in global logistics. Notably, Cat Lai Port in Ho Chi Minh City stands as Vietnam's largest and most technologically advanced port, supporting large-scale trade operations.

Despite its rapid growth, Vietnam's warehousing sector faces significant structural and operational challenges that must be addressed to ensure long-term sustainability and competitiveness. One of the primary challenges is the sector's fragmentation, with modern distribution centers concentrated primarily in Ho Chi Minh City, Hanoi, and Da Nang, limiting access to efficient storage solutions in other regions. Additionally, Vietnam's logistics infrastructure remains inadequate, particularly due to the lack of a comprehensive multimodal transport system. This deficiency disrupts seamless connectivity between road, rail, air, and maritime transport, slowing down supply chain operations. Another major issue is the limited

availability of warehouse floor space, which exacerbates leasing difficulties as current supply struggles to keep pace with rising demand. The foreign companies dominate the market share in logistics services in Vietnam, controlling over 75% of warehouse rental space, with companies like Mapletree and BW Industrial leading the way. This serves as a strong "urge" for Vietnamese companies to accelerate the development of logistics services and warehouse distribution management. While major urban centers experience high occupancy rates, warehouse vacancy remains disproportionately high in northern regions, with approximately 20% of warehouses nationwide unoccupied. This geographical imbalance in demand distribution hinders efforts to optimize logistics efficiency across the country.

All the above challenges are due to the fact that Vietnam's warehousing sector has yet to fully address the country's rapidly growing demand for modern storage and distribution solutions. A key challenge is the distribution network remains underdeveloped, with many domestic companies lacking an integrated logistics model and relying heavily on third-party logistics (3PL) providers for supply chain optimization. Despite the increasing need for efficient inventory transfer, Vietnam has yet to establish a well-defined cross-docking system, leading to its underutilization. Only a small number of companies have implemented cross-docking, limiting the potential for faster product movement and reduced storage costs. This gap in logistics capabilities contributes to higher warehousing expenses, longer lead times, and inefficiencies in last-mile delivery, particularly in the retail and manufacturing sectors, where rapid inventory turnover is critical.

#### ***4.2. Recommendations on Improving Warehouse Management of Vietnamese Companies:***

In light of these challenges, Vietnamese companies can enhance their logistics efficiency by adopting Amazon's National Inbound Cross-Docking (nIXD) model, which consolidates inbound shipments at central hubs and transfers them directly to outbound carriers, reducing handling times and accelerating distribution. This approach minimizes storage time, enabling faster order processing, lower inventory holding costs, and improved customer satisfaction. Additionally, optimized transportation routes lead to cost savings in warehousing and logistics, while real-time inventory tracking enhances stock accuracy, mitigating risks of stockouts and overstocking. With its scalability and flexibility, the nIXD model allows businesses to quickly adapt to market demand fluctuations and evolving consumer preferences, making it a strategic solution for modernizing supply chains

However, implementing the nIXD model requires significant investments in infrastructure, technology, and staff training. Vietnam's logistics network, particularly road and

port connectivity, must improve to support a large-scale cross-docking system. Furthermore, successful cross-docking implementation requires close coordination among suppliers, carriers, and distribution centers to avoid bottlenecks and shipment delays. Large retail corporations in Vietnam, such as Masan, Afood, BigC, and Winmart, with their robust financial capabilities and extensive distribution networks, are well-positioned to adopt this model. These companies already have the resources to invest in the necessary infrastructure and technology to implement nIXD effectively. By establishing cross-dock facilities at strategic locations, these retailers can streamline their supply chains, reduce transportation costs, and improve service levels, ultimately leveraging the advantages of the nIXD model.

The widespread adoption of the nIXD model can be further supported by large enterprises such as Vinamilk and Masan Group. These companies, with their strong distribution networks, are in an advantageous position to optimize inventory turnover through cross-docking. By focusing on strategic location planning and fostering collaboration with suppliers, these firms can overcome the challenges associated with cross-docking implementation. With improved supplier coordination, precise scheduling, and real-time visibility, they can achieve a more synchronized and cost-effective distribution process. This alignment positions them to effectively adopt cross-docking as a viable alternative to traditional warehousing, enhancing their competitiveness in both regional and global markets.

In conclusion, adopting the nIXD model presents a strategic opportunity for Vietnamese companies to modernize their warehousing and distribution operations. By embracing this approach, businesses can achieve greater efficiency, reduce costs, and improve customer satisfaction, thereby strengthening their competitiveness in both domestic and international markets.

## **5. Conclusion:**

Amazon's implementation of cross-docking, particularly through its Inbound Cross-Dock (IXD) model, has significantly enhanced its supply chain efficiency by reducing storage time, lowering handling costs, and accelerating order fulfillment. However, challenges such as high initial infrastructure investments and the complexity of supplier coordination require the need for continuous refinement in cross-docking operations. For large retail enterprises in Vietnam, adopting Amazon's IXD model presents a transformative opportunity to modernize warehouse management. By minimizing storage requirements and streamlining distribution, companies can enhance operational efficiency and meet growing consumer demands for fast delivery. Success in implementing cross-docking will depend on strategic warehouse

reconfiguration, improved supplier coordination, and a phased rollout of pilot programs to optimize logistics processes.

## References

Akkerman, F., Lalla-Ruiz, E., Mes, M. and Spitters, T. (2022). Cross-Docking: Current Research Versus Industry Practice and Industry 4.0 Adoption. *Advanced Series in Management*, 28, pp.69–104. doi:<https://doi.org/10.1108/s1877-636120220000028007>.

baogiaothong.vn (2018). ‘Đế chế’ Amazon sắp chiếm lĩnh thị trường logistics thế giới. [online] Baogiaothong.vn. Available at: [https://www.baogiaothong.vn/de-che-amazon-sap-chiem-linh-thi-truong-logistics-the-gioi-192269669.htm?utm\\_source=chatgpt.com](https://www.baogiaothong.vn/de-che-amazon-sap-chiem-linh-thi-truong-logistics-the-gioi-192269669.htm?utm_source=chatgpt.com) [Accessed 25 Feb. 2025].

Bartholdi, J.J. and Gue, K.R. (2004). The Best Shape for a Crossdock. *Transportation Science*, [online] 38(2), pp.235–244. doi:<https://doi.org/10.1287/trsc.1030.0077>.

Birenbaum, J. (Jeffrey P. ) (2018). *Inbound supply chain optimization with ship-mode variation in a fixed-capacity fulfillment center*. [online] dspace.mit.edu. Available at: <https://dspace.mit.edu/handle/1721.1/117981>.

Blancas, L., Isbell, J., Isbell, M., Tan, J. and Tao D I R E C T I O N S I N D E V E L O P M E N T, W. (n.d.). *Efficient Logistics A Key to Vietnam’s Competitiveness Countries and Regions*. [online] Available at: <https://documents1.worldbank.org/curated/zh/646871468132885170/pdf/Efficient-logistics-a-key-to-Vietnams-competitiveness.pdf>.

Bland, A. (2021). *Cross Docking Explained: Meaning, Pros & Cons [w case studies]*. [online] Unleashedsoftware.com. Available at: <https://www.unleashedsoftware.com/blog/cross-docking-101-what-why-and-how-with-case-studies/>.

blog.bukuship.com. (n.d.). *Cross Docking: Benefits, Challenges & Best Practices*. [online] Available at: <https://blog.bukuship.com/cross-docking-benefits-challenges-best-practices>.

Boysen, N. and Flidner, M. (2010). Cross dock scheduling: Classification, literature review and research agenda. *Omega*, 38(6), pp.413–422. doi:<https://doi.org/10.1016/j.omega.2009.10.008>.

Capital One (2023). *Amazon Logistics Statistics (2023): Number of Package Deliveries*. [online] Capital One Shopping. Available at: <https://capitaloneshopping.com/research/amazon-logistics-statistics/>.

Cross-docking. (n.d.). *DHL Logistics of Things*. [online] Available at: <https://lot.dhl.com/glossary/cross-docking/>.

Fong, B.Y. (2024). *Amazon Is Creating a National Inbound Network*. [online] Substack.com. Available at: <https://ontheseams.substack.com/p/amazon-is-creating-a-national-inbound> [Accessed 25 Feb. 2025].

Gue, K.R. and Kang, K. (2002). Staging queues in material handling and transportation systems. *Proceeding of the 2001 Winter Simulation Conference (Cat. No.01CH37304)*. doi:<https://doi.org/10.1109/wsc.2001.977421>.

Hawkins, A. (2024). *Cross-Docking Explained: Definition & Benefits*. [online] Extensiv.com. Available at: <https://www.extensiv.com/blog/cross-docking-explained> [Accessed 25 Feb. 2025].

HOPEE (n.d.). *Assessing Warehouse Management Systems in Vietnam: A HOPEE's Report*. [online] HOPEE. Available at: <https://hopee.com.vn/blog/report/assessing-warehouse-management-systems-in-vietnam-a-hopees-report/>.

<https://sell.amazon.in/grow-your-business/amazon-global-selling>. (2024). *What is cross-docking in international shipping?* [online] Available at: <https://sell.amazon.in/grow-your-business/amazon-global-selling/blogs/cross-docking>.

<https://www.facebook.com/jeanpaul.rodrique.1> (2024). *Amazon Inbound Cross Dock Facilities Network | Port Economics, Management and Policy*. [online] Port Economics, Management and Policy | A comprehensive analysis of the port industry. Available at: <https://porteconomicsmanagement.org/pemp/contents/part2/ports-and-distribution-networks/amazon-inbound-cross-dock/> [Accessed 25 Feb. 2025].

Ιωάννης Πάσχος (2025). Warehouse and Distribution Science - Bartholdi and Hackman. *Scribd*. [online] doi:<https://doi.org/10739305/original/212fceb7a0/1>.

Jenkins, A. (2023). *What Is Cross-Docking?* [online] Oracle NetSuite. Available at: <https://www.netsuite.com/portal/resource/articles/inventory-management/cross-docking.shtml>.

Kot, S. (2014). Principles of global supply chain management.

Karlheinz Zuerl (2023). Vietnam Supply Chain: Insights on Current Challenges. [online] Available at: [https://www.researchgate.net/publication/367390754\\_Vietnam\\_Supply\\_Chain\\_Insights\\_on\\_Current\\_Challenges](https://www.researchgate.net/publication/367390754_Vietnam_Supply_Chain_Insights_on_Current_Challenges).

Laber, J., Thamma, R. and Kirby, E. (2020). The Impact of Warehouse Automation in Amazon's Success. *IJISSET -International Journal of Innovative Science, Engineering &*

*Technology*, [online] 7(8), pp.63–70. Available at:  
[https://ijiset.com/vol7/v7s8/IJISSET\\_V7\\_I8\\_07.pdf](https://ijiset.com/vol7/v7s8/IJISSET_V7_I8_07.pdf).

Larson, P.D. and Rogers, D.S. (1998). Supply Chain Management: Definition, Growth and Approaches. *Journal of Marketing Theory and Practice*, [online] 6(4), pp.1–5.  
doi:<https://doi.org/10.1080/10696679.1998.11501805>.

Longo, F. (2011). Supply Chain Management Based on Modeling & Simulation: State of the Art and Application Examples in Inventory and Warehouse Management. *Supply Chain Management*. doi:<https://doi.org/10.5772/15103>.

Maersk (2024). *Understanding cross-docking: A comprehensive guide*. [online] Maersk.com. Available at: <https://www.maersk.com/logistics-explained/storage-and-warehousing/2024/06/24/cross-docking>.

Mordor Intelligence (2023). *Vietnam Freight and Logistics Market Size, Share, Trends (2022 - 27)*. [online] [www.mordorintelligence.com](http://www.mordorintelligence.com). Available at:  
<https://www.mordorintelligence.com/industry-reports/vietnam-freight-logistics-market>.

O’Neill, S. (2023). *Sizing down to Scale up: How Amazon Reworked Its Fulfillment Network to Meet Customer Demand*. [online] Amazon Science. Available at:  
<https://www.amazon.science/news-and-features/how-amazon-reworked-its-fulfillment-network-to-meet-customer-demand>.

Press, A. (2019). *Amazon Prime moving to free 1-day shipping instead of 2*. [online] cbs8.com. Available at: <https://www.cbs8.com/article/news/nation-world/amazon-prime-moving-to-free-1-day-shipping-instead-of-2/507-5c6badb7-6e94-42ad-8609-89c25d97fda9> [Accessed 25 Feb. 2025].

Rattner, N. and Palmer, A. (2020). *This map shows how Amazon’s warehouses are rapidly expanding across the country*. [online] CNBC. Available at:  
<https://www.cnbc.com/2020/01/19/map-of-amazon-warehouses.html>.

ResearchGate. (2022). *Designing a warehouse management system in Vietnam*. [online] Available at:  
[https://www.researchgate.net/publication/363333803\\_Designing\\_a\\_warehouse\\_management\\_system\\_in\\_Vietnam](https://www.researchgate.net/publication/363333803_Designing_a_warehouse_management_system_in_Vietnam) [Accessed 26 Feb. 2025].

ResearchGate. (n.d.). (PDF) *The Supply Chain and Logistics of Vietnam in the Context of International Economic Integration*. [online] Available at:  
[https://www.researchgate.net/publication/341738786\\_The\\_Supply\\_Chain\\_and\\_Logistics\\_of\\_Vietnam\\_in\\_the\\_Context\\_of\\_International\\_Economic\\_Integration](https://www.researchgate.net/publication/341738786_The_Supply_Chain_and_Logistics_of_Vietnam_in_the_Context_of_International_Economic_Integration).

- Rickerby, M. (2020). *Walmart supply chain: Winning at inventory logistics*. [online] Extensiv. Available at: <https://www.extensiv.com/blog/supply-chain-management/walmart>.
- Rodrigue, J.-P. (2020). The distribution network of Amazon and the footprint of freight digitalization. *Journal of Transport Geography*, [online] 88(102825), p.102825. doi:<https://doi.org/10.1016/j.jtrangeo.2020.102825>.
- Sancia (2024). *Data Reveals Warehousing Growth in Vietnam*. [online] Jusdaglobal.com. Available at: <https://www.jusdaglobal.com/en/article/warehousing-growth-vietnam-data-reveals/> [Accessed 26 Feb. 2025].
- Schoder, M.T. (2021). *Distribution Network Optimization to Reduce Process Variability and Improve Throughput for an Online Retailer*. [online] dspace.mit.edu. Available at: <https://dspace.mit.edu/handle/1721.1/139406>.
- Shipnetwork.com. (2023). *Amazon Builds on Supply Chain Strategy | Rakuten SL*. [online] Available at: <https://www.shipnetwork.com/post/amazon-is-building-on-its-supply-chain> [Accessed 25 Feb. 2025].
- Statista (2024). *eCommerce - Vietnam | Statista Market Forecast*. [online] Statista. Available at: <https://www.statista.com/outlook/emo/ecommerce/vietnam>.
- Steiner, I. (2018). *Amazon Opens Massive 'Inbound Cross Dock' Distribution Center*. [online] EcommerceBytes. Available at: <https://www.ecommercebytes.com/2018/04/20/amazon-opens-massive-inbound-cross-dock-distribution-center/>.
- Stephan, K. and Boysen, N. (2011). Cross-docking. *Journal of Management Control*, 22(1), pp.129–137. doi:<https://doi.org/10.1007/s00187-011-0124-9>.
- Vietnam Briefing (2024). *Vietnam's Warehouse Market: Foreign Investment Outlook*. [online] Vietnam Briefing News. Available at: <https://www.vietnam-briefing.com/news/vietnams-warehouse-market-foreign-investment-outlook.html/>.
- Vo, V. (2024). Charting the Future: Vietnam's Warehousing Sector Unveiled. [online] Source of Asia. Available at: <https://www.sourceofasia.com/vietnam-warehousing-sector-unveiled/>.
- Yan, H. and Tang, S. (2009). Pre-distribution and post-distribution cross-docking operations. *Transportation Research Part E: Logistics and Transportation Review*, 45(6), pp.843–859. doi:<https://doi.org/10.1016/j.tre.2009.05.005>.
- MWPVL International. (n.d.). *Amazon.com Supply Chain & Fulfillment Operations*. Retrieved from [https://www.mwpvl.com/html/amazon\\_com.html](https://www.mwpvl.com/html/amazon_com.html).