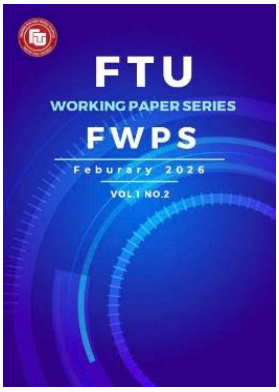


**Working Paper 2026.1.2.3**

**- Vol. 1, No. 2**

# ỨNG DỤNG CHIẾN LƯỢC CROSS-DOCKING TRONG QUẢN LÝ KHO VÀ PHÂN PHỐI CỦA NGÀNH THỜI TRANG NHANH: NGHIÊN CỨU TRƯỜNG HỢP INDITEX (ZARA) VÀ CÁC KHUYẾN NGHỊ ĐỐI VỚI DOANH NGHIỆP MAY MẶC VIỆT NAM

**Phùng Mạnh Chiến Thắng[1], Phạm Lê Anh Thư, Nguyễn Phương Thảo, Vũ Phương Thủy**

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

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

Nguyễn Thị Yến

**Giảng viên Viện Kinh tế** & Kinh doanh quốc tế

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

**Tóm tắt**

Ngành thời trang nhanh đang đối mặt với áp lực ngày càng lớn về vòng đời sản phẩm ngắn, biến động nhu cầu cao và yêu cầu rút ngắn thời gian đưa sản phẩm ra thị trường, trong khi các mô hình kho vận truyền thống dựa trên lưu kho dài hạn làm gia tăng rủi ro lỗi mốt tồn kho và chi phí logistics. Trong bối cảnh đó, cross-docking nổi lên như một chiến lược logistics hiệu quả nhằm tối ưu hóa tốc độ luân chuyển hàng hóa và nâng cao khả năng đáp ứng thị trường. Nghiên cứu này nhằm hệ thống hóa cơ sở lý thuyết về cross-docking trong ngành thời trang nhanh, phân tích mô hình triển khai thành công của Tập đoàn Inditex (Zara) và đề xuất các khuyến nghị phù hợp cho doanh nghiệp may mặc Việt Nam. Phương pháp nghiên cứu định tính được áp dụng, kết hợp phân tích mô tả và so sánh dựa trên dữ liệu thứ cấp từ các báo cáo doanh nghiệp và nghiên cứu học thuật. Kết quả cho thấy thành công của Zara đến từ khả năng đồng bộ hóa dữ liệu thời gian thực, mô hình cross-docking hậu phân phối và quy trình xử lý đơn hàng tốc độ cao, từ đó làm cơ sở xây dựng lộ trình triển khai khả thi cho doanh nghiệp vừa và nhỏ tại Việt Nam.

[1] Tác giả liên hệ, Email: k62.2313530046@ftu.edu.vn

**Từ khóa:** Cross-docking, thời trang nhanh, Zara, quản lý kho, Việt Nam

---

## APPLICATION OF CROSS-DOCKING STRATEGY IN FAST FASHION WAREHOUSE MANAGEMENT AND DISTRIBUTION: A CASE STUDY OF INDITEX (ZARA) AND RECOMMENDATIONS FOR VIETNAMESE APPAREL ENTERPRISES

**Abstract**

The fast fashion industry is facing increasing pressure from short product lifecycles, high demand volatility, and the need to shorten time to market, while traditional warehousing models based on long-term storage increase the risk of outdated inventory and logistics costs. In this context, cross-docking has emerged as an effective logistics strategy to optimize the speed of goods circulation and improve market responsiveness. This study aims to systematize the theoretical basis of cross-docking in the fast fashion industry, analyze the successful implementation model of Inditex Group (Zara), and propose appropriate recommendations for Vietnamese apparel enterprises. A qualitative research approach is employed, combining descriptive and comparative analyses based on secondary data collected from corporate reports and peer-reviewed academic studies. The findings indicate that Zara's success is driven by real-time data synchronization, post-distribution cross-docking, and high-speed order processing, providing a basis for developing a feasible implementation roadmap for small and medium-sized enterprises in Vietnam.

**Key words:** Cross-docking, fast fashion, Zara, warehouse management, Vietnam

---

### 1. Introduction

The fast fashion industry operates within a structural paradox: extremely short product lifecycles, high demand volatility, and time-to-market pressures comparable to those of perishable goods, while most traditional warehousing systems are still designed around long-term storage and space optimization. This misalignment significantly increases the risk of inventory obsolescence, leading to high holding costs, frequent markdowns, and inefficient capital utilization. In this context, throughput velocity is gradually becoming the core competitive metric, replacing the inventory optimization mindset that has dominated traditional logistics.

Under increasingly stringent time pressures, fast fashion businesses are forced to restructure their supply chains by eliminating non-value-adding intermediaries, especially long-term storage at distribution centers. Cross-docking has emerged as an optimal logistics strategy in this context,

allowing goods to be moved directly from the inflow to the outflow with near-zero storage time. Instead of acting as a storage point, warehouses in the cross-docking model become high-speed transit points where processing accuracy and real-time data coordination determine the efficiency of the entire supply chain.

Among the pioneering businesses applying cross-docking on a global scale, Inditex Group, with its flagship brand Zara, is widely recognized as a benchmark case. Zara has successfully built a centralized distribution system that integrates cross-docking, real-time point-of-sale (POS) data, and a flexible production model, enabling a design-to-store cycle of only two to three weeks. However, Zara's massive investment and high level of automation raise questions about its applicability in emerging markets, especially for Vietnamese small and medium-sized enterprises (SMEs) with limited resources.

Based on this reality, the study aims to bridge the gap between global best practices and local implementation. Specifically, the research focuses on three core objectives:

1. To systematize the key factors determining the effectiveness of cross-docking strategies in fast fashion.
2. To conduct an in-depth analysis of Zara's operational mechanisms and data synchronization as a benchmark model.
3. To propose a feasible implementation roadmap and adaptive recommendations for Vietnamese apparel enterprises based on their existing resources.

The contribution of this research lies in identifying a transition path from traditional warehousing to a flow-based model tailored specifically for domestic firms. A qualitative research approach is adopted, combining descriptive and comparative analyses based on secondary data collected from Inditex annual reports, academic journals, and authoritative logistics publications. This design ensures academic rigor while providing a foundational framework for future quantitative studies on the operational efficiency of the Vietnamese textile and garment industry.

## 2. Theoretical basis

### *2.1. Theoretical background of cross-docking*

#### *2.1.1. Concept and classification of cross-docking*

Cross-docking is a logistics strategy designed to minimize inventory holding and accelerate material flows. Van Belle et al. (2012) define cross-docking as the process of transferring products directly from inbound to outbound transportation with minimal intermediate storage, typically not exceeding 24 hours. In this configuration, the facility functions as a transshipment terminal rather than a traditional storage-oriented warehouse.

Unlike conventional warehousing, which involves receiving, storage, order picking, and shipping, cross-docking eliminates the long-term storage and picking stages. This reduction significantly lowers handling costs and lead times while mitigating the risk of inventory obsolescence which is a critical advantage for industries with short product life cycles (Mavi et al., 2020).

Operational classifications are essential for understanding implementation strategies. Boysen and Fliedner (2010) distinguish between "one-touch" (direct transfer) and "two-touch" (staged for consolidation) cross-docking. Furthermore, Van Belle et al. (2012) classify systems based on information timing: pre-distribution (destinations assigned before arrival) versus post-distribution (destinations assigned at the dock). The latter offers superior flexibility in responding to real-time demand, providing a conceptual basis for analyzing Zara's agile distribution model.

### *2.1.2. The operational process model*

The operational logic of cross-docking is consistently described in the literature as a streamlined three-stage process: inbound handling, sorting/consolidation, and outbound dispatch (Boysen & Stephan, 2011; Mavi et al., 2020).

The process begins with inbound handling, where shipments are unloaded and identified. Goods immediately enter the sorting stage, the core value-adding activity where products are classified by final destination rather than by SKU. Effective sorting determines the speed and accuracy of the entire system (Boysen & Fliedner, 2010). Finally, outbound dispatch involves loading consolidated shipments onto vehicles for immediate delivery.

Ideally, the cross-dock operates as a flow-through facility, prioritizing synchronization over space utilization (Van Belle et al., 2012).

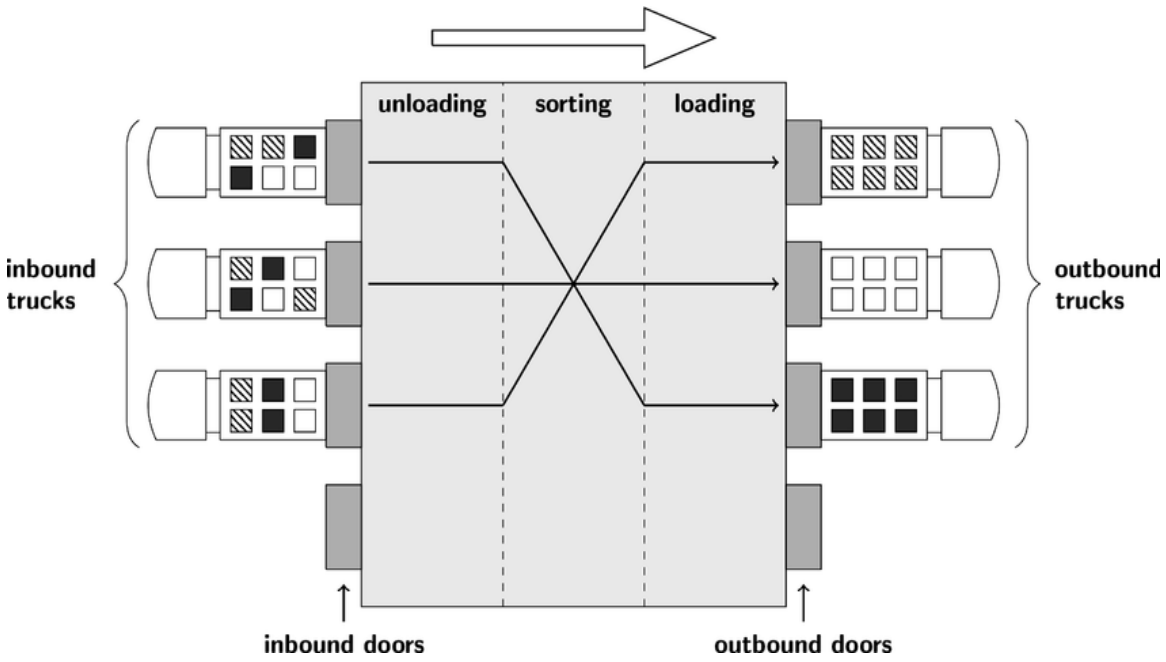


**Figure 1:** The operational process model of cross-docking

*Source: Adapted from Boysen and Fliedner (2010)*

Figure 1 illustrates this continuous flow, showing how inbound goods are rapidly redirected to outbound transportation. This operational process model therefore serves as the standardized analytical framework for examining Zara's distribution system and for identifying process inefficiencies and redesign opportunities in Vietnamese apparel warehouses.

### *2.2. Factors affecting cross-docking implementation (enabling factors)*

Successful cross-docking implementation relies not only on strategic intent but also on specific enabling conditions. Synthesizing findings from systematic reviews by Van Belle et al. (2012) and Mavi et al. (2020), these prerequisites can be categorized into four critical dimensions: technological, infrastructural, organizational, and product characteristics. This classification provides a comprehensive framework to analyze the alignment between operational capabilities and logistics strategy.

- Technological factors: Information and Communication Technology (ICT) acts as the backbone of cross-docking. Technologies such as Electronic Data Interchange (EDI), Warehouse Management Systems (WMS), and RFID are essential for ensuring real-time visibility and synchronization of inbound and outbound flows. Without these tools, the "zero-latency" requirement of cross-docking cannot be met due to manual errors and processing delays (Boysen & Fliedner, 2010).
- Infrastructural & layout factors: Physical facility design dictates operational capacity. Research emphasizes that the layout shape (e.g., I-shaped vs. U-shaped) and the number of dock doors directly impact congestion levels and material flow speed. An optimal layout

minimizes travel distance and prevents bottlenecks during peak sorting hours (Bartholdi & Gue, 2004).

- Organizational & partnership factors: Cross-docking necessitates tight coordination beyond the warehouse walls. It requires high levels of trust and information sharing between suppliers, the focal firm, and distributors. Precise synchronization of arrival and departure schedules is critical to achieving a "Just-in-Time" flow (Van Belle et al., 2012).
- Product factors: Not all products are suitable for this strategy. Items with high demand volatility, short life cycles (such as fast fashion), and high turnover rates are theoretically optimal candidates for cross-docking, as the cost of holding them in stock outweighs the cost of frequent transport (Mavi et al., 2020).

These four factors form the core analytical lens of this study and will be systematically applied to evaluate Zara's cross-docking excellence and to identify capability gaps in Vietnamese apparel enterprises.

### *2.3. Performance measurement framework*

To evaluate operational efficiency, this study adopts the Supply Chain Operations Reference (SCOR) model version 12.0, developed by the Association for Supply Chain Management (APICS, 2017). As a process-oriented framework that comprehensively covers Source and Deliver activities, SCOR provides a standardized metric system perfectly aligned with the assessment of warehousing and cross-docking performance.

The framework consists of five distinct performance attributes, which are contextualized for this study as follows:

- Reliability: Defined as the ability to perform tasks as expected, represented by the Perfect Order Fulfillment metric (APICS, 2017). In this study, it measures the accuracy of the sorting process, ensuring the right products reach the correct retail destinations without errors.
- Responsiveness: Defined as the speed at which tasks are performed (APICS, 2017). In the context of this research, it is operationalized as "dock-to-dock time" - the duration from inbound unloading to outbound dispatch - reflecting the critical throughput velocity required by the fast fashion business model.
- Agility: Defined as the ability to respond to external influences, the ability to respond to marketplace changes to gain or maintain competitive advantage (APICS, 2017). In this study, it assesses the system’s scalability during peak seasons and its flexibility in re-routing shipments (post-distribution cross-docking) to align with real-time demand volatility.
- Cost: Defined as the cost of operating the supply chain processes (APICS, 2017). This study applies this attribute to analyze trade-off efficiency, specifically evaluating how

cross-docking - while potentially increasing transportation frequency - significantly reduces Total Supply Chain Management Costs by eliminating inventory holding and obsolescence expenses.

- Asset Management Efficiency: Defined as the ability to efficiently utilize assets (APICS, 2017). In this paper, it focuses on Inventory Days of Supply and Cash-to-Cash Cycle Time, demonstrating how cross-docking minimizes the working capital tied up in stagnant stock and physical storage space.

In summary, these five SCOR performance attributes form an evaluation framework for analyzing the operational outcomes of the cross-docking strategy and for comparative analysis with Vietnamese garment businesses.

## 3. Case study: the gold standard of Inditex (Zara)

### *3.1. Overview of Zara's global distribution model*

Inditex Group, the owner of Zara, operates a highly centralized and optimized global distribution system. Headquartered in Arteixo, Galicia (Spain), the group manages its core operations and distribution from this center. According to industry risk assessments published by Mapfre Global Risks (2019), Inditex operates in 202 markets with over 7,420 stores worldwide, all supplied through a distribution system managed centrally from Spain. All products, regardless of manufacturing location, are first shipped to logistics centers in Spain - primarily in Arteixo, with additional warehouses in Zaragoza and other provinces - before being distributed internationally. A key feature of Zara's supply chain is its emphasis on geographical proximity, with nearly 57% of suppliers located in Spain, Portugal, Turkey, and Morocco, enabling faster delivery and greater responsiveness to new fashion trends (Mapfre Global Risks, 2019).

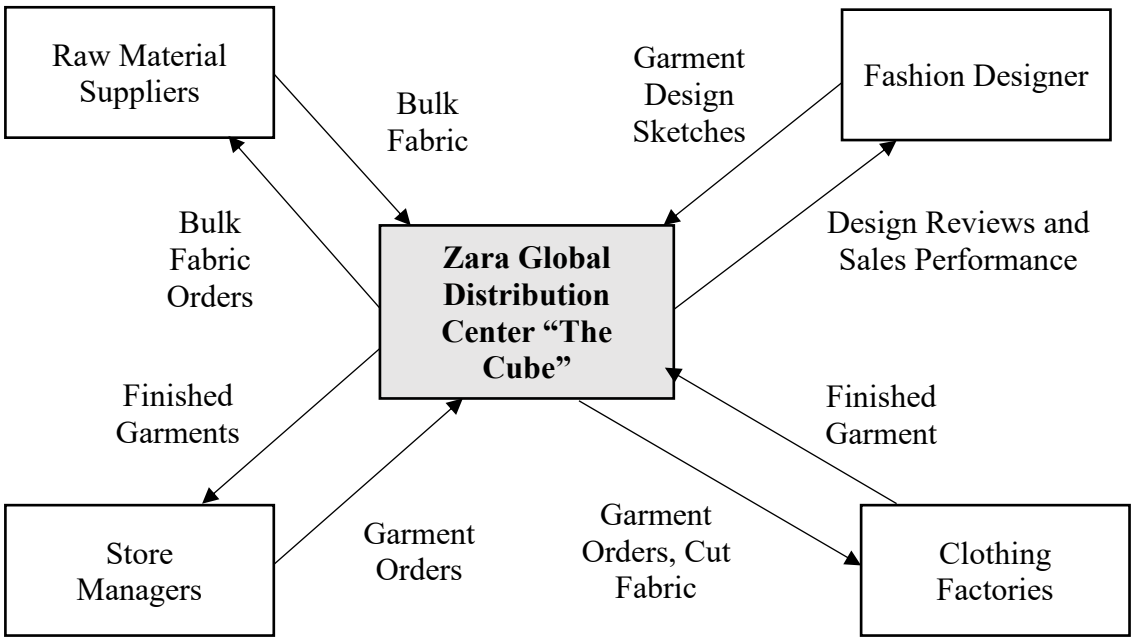


**Figure 2:** Zara's global supply chain and distribution model

*Source: SCM Globe (2023), Zara clothing company supply chain*

- Central warehousing and cross-docking system: Zara operates two main transshipment centers in Arteixo and Zaragoza, each running at approximately 50% capacity. These facilities are designed as modern cross-docking hubs, equipped with automated sorting systems and high-speed conveyor lines. For example, the Arteixo center can process more than 45,000 items per hour, and each product is stored for only a few hours to a maximum of three days (Ferdows, Lewis, & Machuca, 2004; Closa, 2015). As a result, goods reach stores rapidly without the need for large inventories at local warehouses. Shipments are delivered to stores twice a week by road or air, eliminating the need for additional regional warehouses abroad. This cross-docking strategy minimizes inventory accumulation, accelerates turnover, and enhances Zara's ability to respond quickly to changes in customer demand.
- Quick response capability: Owing to continuous real-time data collection from retail stores and centralized decision-making, Zara is able to deliver products to European stores within approximately 36 hours and to most global markets within 48 to 72 hours after order confirmation (Ferdows et al., 2004; Christopher, Lowson, & Peck, 2004). Moreover, the time required to move a product from design conception to in-store availability is typically around two weeks, compared with the industry average of 10 to 14 weeks. This compressed design-to-delivery cycle enables Zara to refresh collections continuously, align supply closely with actual market demand, and significantly reduce the risk of inventory obsolescence.

Overall, Zara's global distribution model is characterized by centralized coordination, cross-docking-based logistics, and high-frequency distribution. Consistent with the theoretical framework, this model demonstrates how integrating cross-docking processes with enabling factors such as technology, infrastructure, organizational and product factors can create superior responsiveness and sustainable competitive advantage in fast fashion distribution.

### *3.2. Zara's cross-docking process analysis*

The cross-docking strategy is a core component of Zara's global distribution model, enabling the firm to maintain superior responsiveness in the fast-fashion industry. Unlike traditional warehousing systems that emphasize storage, Zara's distribution centers are designed around a "flow-through" philosophy, in which goods pass through the facilities for only a very short time before being dispatched to stores. Consistent with the theoretical framework, Zara's cross-docking process can be systematically analyzed through a three-stage operational model: inbound, sorting/consolidation, and outbound.

#### *3.2.1. Inbound*

Zara's products are transported from satellite manufacturing facilities to centralized distribution centers in Spain, mainly in Arteixo (Galicia) and Zaragoza. A key feature of Zara's logistics strategy is its emphasis on proximity sourcing. According to Ferdows, Lewis, and Machuca (2004), more than 50% of Zara's production is carried out in Spain and neighboring countries, which significantly reduces inbound lead times and enhances quality control.

At the Arteixo center, goods are delivered directly to the receiving area through highly mechanized internal transport systems. Notably, products are not stored for long-term holding but are immediately transferred to the sorting area. This accurately reflects the essence of cross-docking, in which the warehouse functions as a transshipment point rather than a storage facility (Ferdows et al., 2004; Harvard Business School, 2015).

#### *3.2.2. Sorting & consolidation*

The sorting and consolidation stage is considered the "heart" of Zara's cross-docking system. Unlike pre-allocated cross-docking, Zara uses post-allocated cross-docking, where the final destination of goods is determined only after they arrive at the distribution center.

This allocation is based on real-time sales data collected from POS (Point of Sale) systems at stores worldwide. The data is transmitted directly to the central headquarters and processed to determine the precise demand of each store by SKU. Based on this, Zara's automated distribution system sorts and consolidates goods for each specific destination (Ferdows et al., 2004; Inditex, 2022).

According to Ferdows et al. (2004), Zara's distribution centers are equipped with highly mechanized automated conveyor systems, capable of handling tens of thousands of items per hour

with near-perfect accuracy. The use of RFID allows Zara to track the location and status of each product during sorting, minimizing errors and enhancing the reliability of the goods flow (Inditex, 2022).

#### *3.2.3. Outbound*

After sorting and consolidation, goods are packaged and moved to the outbound stage. All Zara products are labeled with price tags, barcodes, and security devices at the distribution center, allowing stores to place items on shelves immediately upon receipt without additional processing (Ferdows et al., 2004).

Products typically remain at the distribution center for only a few hours and rarely exceed a maximum dwell time of 24 hours, which is fully consistent with the cross-docking principle of minimizing inventory holding (Ferdows et al., 2004; Harvard Business School, 2015). Zara maintains a fixed delivery schedule in which each store worldwide receives shipments twice per week, regardless of market size. As a result, goods can reach European stores within approximately 24-48 hours and more distant markets, such as the United States or Asia, within 48-72 hours after dispatch (Ferdows et al., 2004).

Maintaining a consistent and high-frequency distribution rhythm ensures that Zara's product flow is continuously refreshed while minimizing the risk of inventory obsolescence.

Overall, this tightly synchronized inbound–sorting–outbound process exemplifies an effective application of cross-docking in a fast-fashion context and provides the operational foundation for Zara's superior responsiveness.

### ***3.3. Analysis of Zara's implementation factors (enabling factors)***

Zara's superior supply chain performance is not the result of individual operational decisions, but rather a high degree of synchronization between four key enabling factors: technological, infrastructural & layout, organizational & partnership, and product factors. These elements collectively support the company's cross-docking strategy and flexible production system, allowing Zara to transition from a traditional push-based model to a hybrid push-pull system driven by real market demand.

The following analysis examines how each factor contributes to the effective implementation of cross-docking within Zara's global distribution network.

#### *3.3.1. Technological factors*

Technology allows Zara to implement cross-docking by ensuring real-time visibility and precise coordination of material flows. Zara integrates RFID technology directly into the security tags of each product, enabling item-level tracking throughout the supply chain. According to Ercan Zhang (2024), RFID implementation has significantly improved inventory accuracy and reduced

stock counting time at retail stores from several days to only a few hours. For distribution centers, this technology allows goods to be identified and routed accurately without opening packages, which is essential for post-allocation cross-docking operations.

In addition, research by Aftab et al. (2018) indicates that Zara employs centralized information systems which support algorithm-based allocation decisions by combining real-time sales data with short-term demand forecasts. Data from store managers POS and PDA systems is sent to headquarters twice a week. As a result, shipment decisions from distribution centers to individual stores can be generated within a few hours, significantly enhancing responsiveness.

Overall, digital integration across design, inventory, and logistics functions enables Zara to execute cross-docking with high operational accuracy and minimal latency, which is critical in a time-sensitive fast fashion environment.

*3.3.2. Infrastructural & layout factors*

Zara's infrastructure is designed to support a continuous and uninterrupted flow of goods. The company uses a centralized Hub and Spoke model with the Cube distribution center, spanning over 460,000 m², directly connected to the surrounding Spokes satellite factories (Md Afzalul Aftab, 2018). The central warehouse is designed with many entry and exit gates, allowing goods to move directly from incoming trucks to outgoing trucks without prolonged storage. An automated rail system, over 200 km long, transports goods automatically between factories and the central warehouse, directly connecting to 11 Zara stores within a 16 km radius, helping to maintain a stable flow of goods for sorting and shipping (Ferdows et al., 2004).

*3.3.3. Organizational & partnership factors*

Zara's success lies in breaking down barriers between departments, prioritizing interdepartmental collaboration for instant decision-making. At its Arteixo headquarters, the design team, commercial specialists, and logistics coordinators work together in a single open space. When RFID data indicates a best-selling item, the design department can make adjustments, and logistics can plan shipments immediately. This allows for instantaneous coordination, when the commercial department notices a selling item via PDA, they can request design adjustments, and logistics can plan cross-docking within minutes. Zara also keeps approximately 50% of its production in nearby regions such as Spain, Portugal, and Turkey (Bruce and Daly, 2006). Besides geographical advantages, these partners are integrated into Zara's information system, receiving orders for small batch production and high frequency deliveries, meeting the exact requirements of the cross-docking system.

*3.3.4. Product factors*

Zara designs its products using a Vanilla Box approach. The products are designed for quick final finishing touches, such as dyeing or adding details depending on trends. This ensures

that goods are ready for distribution as soon as demand is forecasted. Approximately 35% of the goods shipped are ready for shelf placement, already equipped with RFID chips, price tags, and barcodes (Aftab et al., 2018; Ferdows et al., 2004). When goods arrive at the store via the cross-docking system, staff only need a few minutes to place them on the shelves, bypassing any point-of-sale logistics. However, because the products are highly fashionable and limited in quantity, the pressure to move them immediately becomes a top priority to avoid becoming outdated.

To synthesize the analysis above and ensure consistency with the theoretical framework, Table 1 summarizes the key enabling factors supporting Zara's cross-docking implementation and their operational implications.

**Table 1:** Enabling factors for cross-docking implementation at Zara

| Enabling factor | Key practices at Zara | Contribution to cross-docking performance |
|---|---|---|
| **Technological factors** | RFID, POS/PDA systems, real-time data integration | Accurate post-allocation, reduced sorting errors |
| **Infrastructural & layout factors** | Centralized DCs, automated conveyors, flow-oriented layout | Reduced dwell time, high throughput |
| **Organizational & partnership factors** | Cross-functional teams, nearshore suppliers | Faster decision-making, synchronized inbound flows |
| **Product factors** | Modular design, postponement, store-ready products | Compatibility with fast, demand-driven distribution |

*Source: Author's synthesis based on Ferdows et al. (2004), Bruce and Daly (2006), Aftab et al. (2018), and Inditex Annual Report (2022)*

In summary, Zara's implementation of a cross-docking system is achieved through a close coordination of technological, infrastructural & layout, organizational & partnership, and product factors. Instead of optimizing these elements independently, Zara integrates them into a coherent system that supports rapid logistics and responsiveness. This coordination explains how cross-docking serves as a core mechanism enabling Zara to respond quickly and maintain a sustainable competitive advantage in the fast fashion industry.

### *3.4. Evaluation of performance*

This section will measure the actual effectiveness of Zara's supply chain. The evaluation is based on the five performance attributes of the SCOR Performance Attributes model, aiming to

clarify how cross-docking and vertical integration contribute to competitive advantages in terms of reliability, responsiveness, agility, cost and asset management efficiency.

### *3.4.1. Reliability*

The Reliability index in the SCOR model focuses on the ability to execute supply chain activities accurately and on time, thereby creating a perfect order rate.

Zara's Reliability aspect is shown through its ability to meet market demand with absolute accuracy and timeliness thanks to its vertically integrated supply chain. Unlike its competitors, Zara directly owns its factories, controlling everything from design and fabric cutting to dyeing, thus reducing errors from external stakeholders. Over 50% of Zara's products are manufactured in Spain and neighboring countries, with only basic items like T-shirts being outsourced to Asia. (Bruce and Daly, 2006).

Furthermore, Zara operates a cross-docking system with virtually zero inventory at its distribution centers. Specifically, Zara uses Point of Sale (POS) technology to collect real-time sales data and RFID (Radio Frequency Identification) to manage inventory and optimize distribution. POS provides accurate information on consumer trends and transmits this information back to the design center to adjust production. Afterward, the system ADS knows exactly how many items each store needs, uses laser scanners to read RFID codes on moving shipping containers, automatically sorting goods based on orders from each specific store. RFID technology enables automatic out-of-stock alerts, theft prevention, rapid shelf replenishment, and enhanced customer experience by providing instant availability checks and minimizing errors in sorting and order consolidation.

As a result, Zara's unsold inventory rate is only 10% which means a high perfect delivery rate, with 85% of products sold at the listed price (Monu Jangir, 2020).

### *3.4.2. Responsiveness*

While traditional competitors need an average of 6 to 9 months to bring a design to the shelves, Zara has redefined this standard by completing the cycle from concept and design to product availability in stores in just 2 to 3 weeks, around 15 to 21 days (Md Afzalul Aftab, 2018).

This speed is maintained through close coordination between stages. Zara stores globally have an extremely high restocking frequency, with new items replenished twice a week. Delivery is organized quickly, within 8 hours of successful order placement, with goods from "The Cube" center delivered to European stores within 24 to 48 hours and to more distant markets within 48 to 72 hours (Md Afzalul Aftab, 2018). Because the products are already tagged, store staff can immediately place the products on display shelves. Each year, Zara produces approximately 12,000 new designs, maintaining a consistently fresh product catalog, encouraging customers to visit the store an average of 17 times a year (Monu Jangir, 2020). This loyalty stems from

customers' expectation of finding new items each time they visit, thanks to the rapid pace of design changes.

*3.4.3. Agility*

Zara adopts a demand-based production model, committing to producing only 15% to 25% of the expected seasonal inventory and dedicating the remaining 50% to 85% to design and production during the season based on actual sales data (Ferdows et al., 2004). This small-batch production strategy minimizes the risk of outdated inventory.

Zara stores act as market sensors, sending daily sales data via POS systems and handheld PDAs directly to headquarters. The Cube distribution center, spanning over 460,000 m², operates as a central hub, processing and forwarding goods within hours to a maximum of three days (Md Afzalul Aftab, 2018). Thanks to this centralized information system, the merchandise load in each delivery truck is precisely customized according to the orders of each store manager via PDA. This flexibility allows the company to discontinue production of unprofitable items within two weeks and completely replace 75% of its display inventory every three to four weeks (Monu Jangir, 2020).

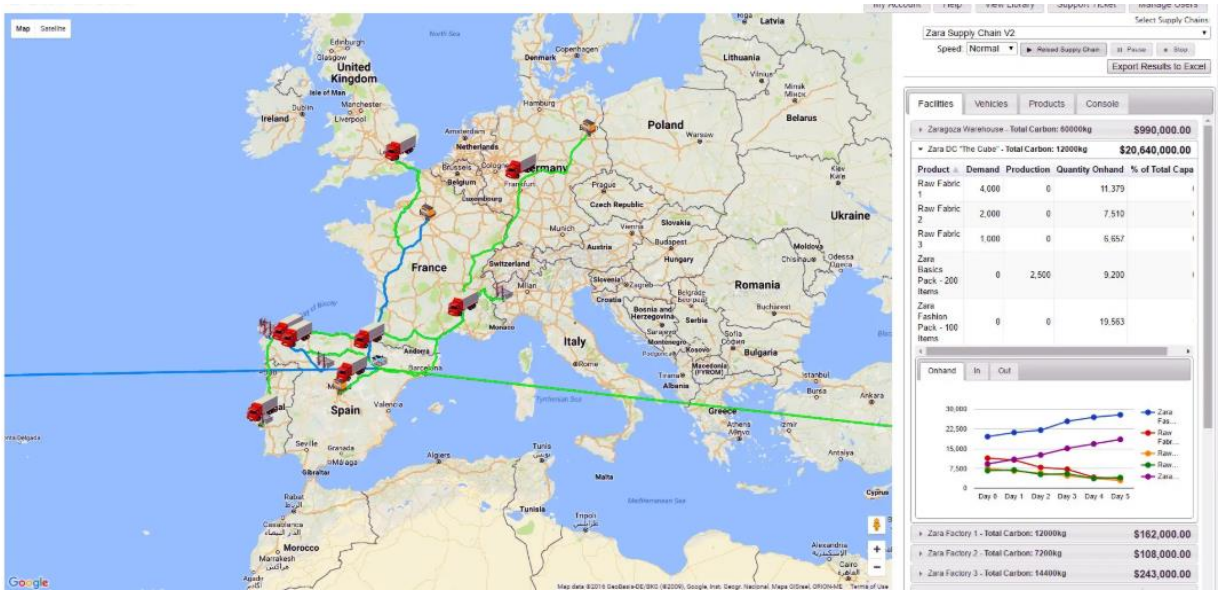


**Figure 3:** Continuous operational adjustments in Zara's responsive supply chain

*Source: M.Hugos (2020, January 4)*

Supply chain planners and managers are always watching customer demand and making adjustments to manufacturing and supply chain operations. The map shows continuous adjustments need to be made to factory production rates, vehicles, delivery routes, and schedules to keep this supply chain working well.

*3.4.4. Cost*

Zara uses expensive shipping methods such as air freight, accounting for approximately 20% of total shipments to deliver goods to distant markets such as the US and Asia within 48 to 72 hours (Aftab, M. A., Yuanjian, Q., Kabir, N., & Barua, Z, 2018). The company operates trucks with a fixed frequency of twice a week, regardless of whether the trucks are full, to ensure the fast fashion pace. Zara accepts high initial investment costs in exchange for speed, flexibility, and market responsiveness, thereby optimizing overall profitability.

Zara has compensated costs through the development of the Cube as a transit point, with goods remaining in storage for only a few hours to a maximum of three days. Not having to maintain regional warehouses significantly saves Zara €500,000 per day in warehousing and management costs (Aftab, M. A., Yuanjian, Q., Kabir, N., & Barua, Z, 2018). Furthermore, by producing in small batches and closely following actual demand, the company minimizes losses due to cheap inventory. According to a 2020 report by Monu Jangir, Zara's rate of price discounts is only about 15%. Monu Jangir also found that Zara spends only about 0.3% of its revenue on advertising. This enormous savings are reinvested in logistics systems and prime store locations.

*3.4.5. Asset management efficiency*

Zara plans using a feedback mechanism based on actual demand. Instead of producing based on year-long forecasts, Zara stores submit order reports twice a week. The company also stockpiles up to 50% of its fabric in undyed form; dyeing and finishing are only carried out when actual consumer trends are clear, according to research by Ferdows, Lewis, and Machuca (2004). This allows the design and production teams to adjust plans almost immediately, thereby minimizing excess inventory.

In production, Zara employs a Just-in-Time (JIT) strategy. The production system is designed for high adaptability, allowing factories to flexibly increase or decrease output based on market signals. By not maintaining large production runs, and leveraging economies of scale, Zara frees up a significant amount of working capital instead of having it frozen as finished goods inventory in warehouses. Zara's distribution efficiency is centered at The Cube logistics center in Spain. This centralization allows Zara to comprehensively control the flow of goods, enabling the sorting and transportation of products from factories to distribution centers to occur almost instantaneously.

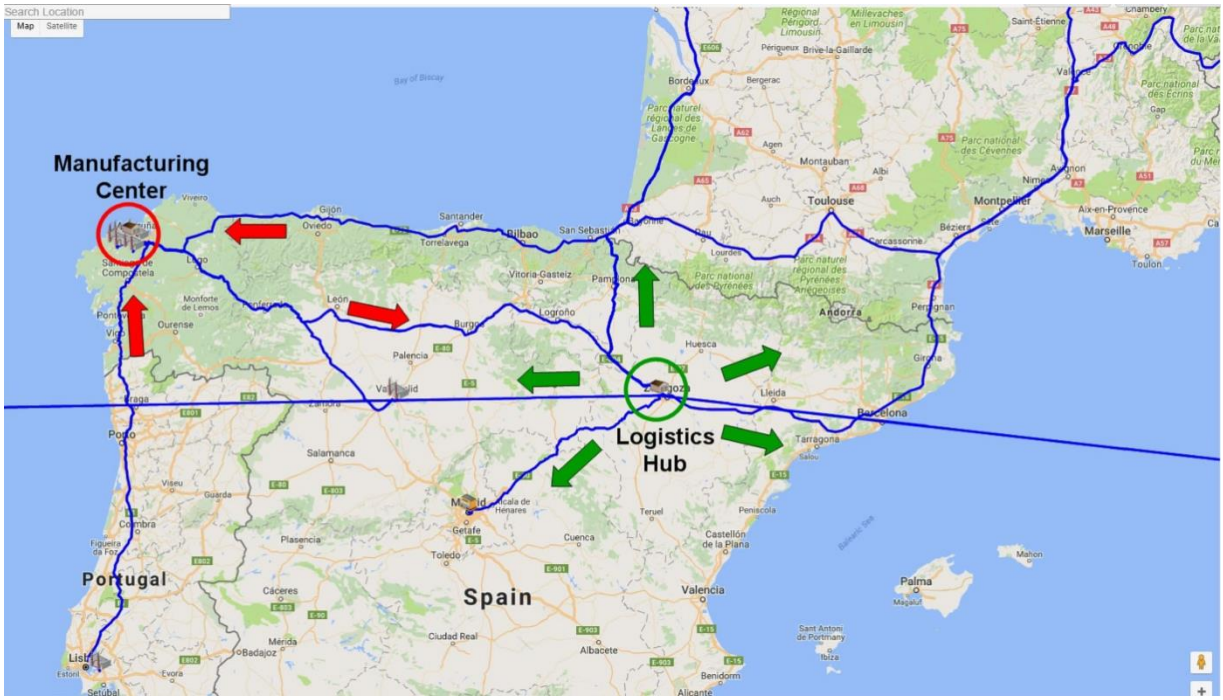


**Figure 4:** Zara's supply chain organization and logistics hub in Zaragoza

*Source: M.Hugos (2020, January 4)*

The map illustrates how the Zara supply chain is organized. Manufacturing is centered in northwestern Spain where company headquarters and the Cube are located. But for their main distribution and logistics hub they chose a more centrally located facility. That facility is located in Zaragoza in a large logistics hub developed by the Spanish government.

### *3.5. Critical assessment: key success factors of Zara*

Based on the detailed analysis of the operational process and implementation factors, it can be concluded that Zara's success in applying cross-docking does not stem from a single logistics solution, but rather from a comprehensive synchronization between strategy, technology, and organizational structure. Figure 5 summarizes Zara's vertically integrated operational framework and illustrates how real-time market signals are translated into tightly coordinated design, production, and distribution decisions across the entire value chain.

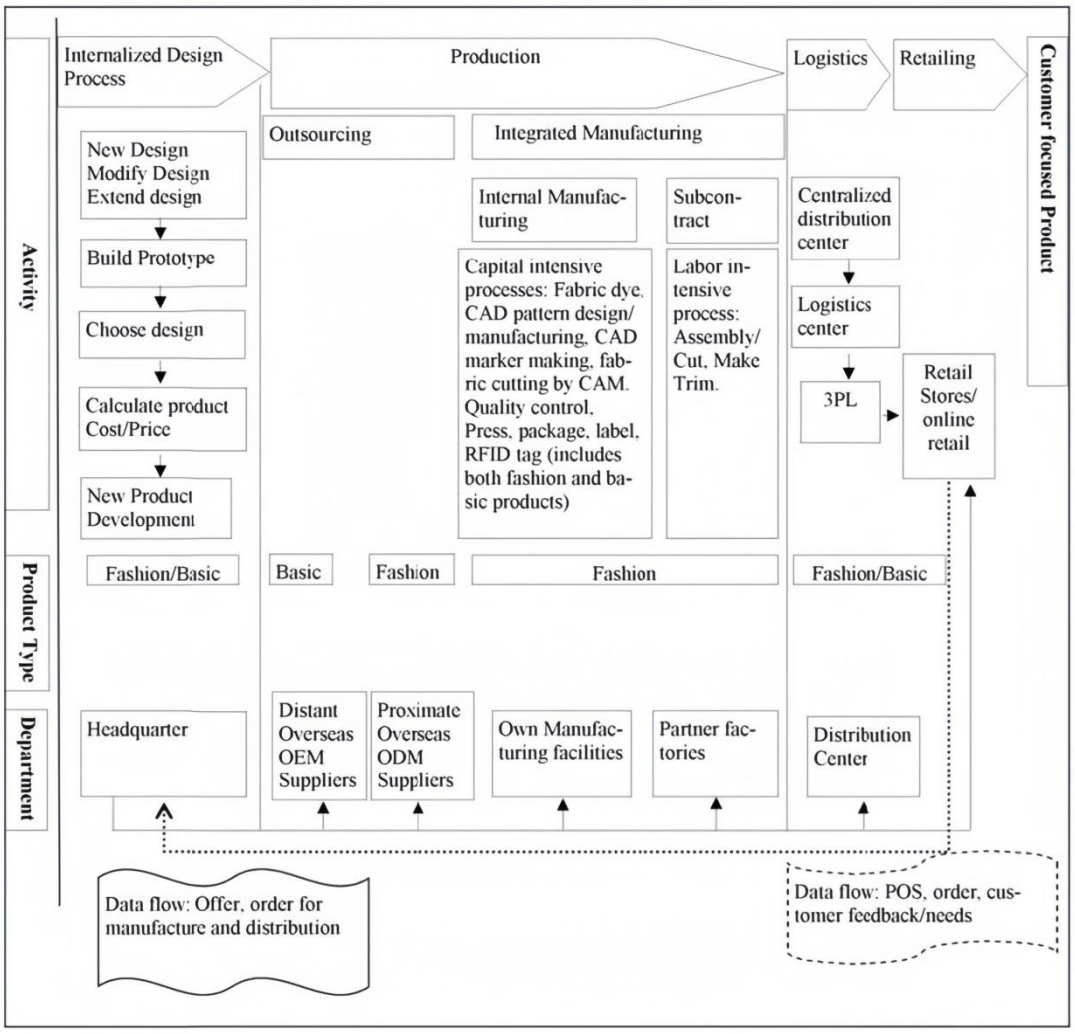


**Figure 5:** Integrated operational framework of Zara's fast fashion supply chain

*Source: Adapted from Mazaira, González, and Avendaño (2003); Aftab, Yuanjian, and Kabir (2017); Inditex Annual Report (2017)*

From a critical perspective, the effectiveness of this model relies on the following three fundamental links:

First, the consistency between logistics strategy and competitive priorities (responsiveness over cost). Unlike traditional models that often optimize transportation costs by consolidating full truckloads, Zara accepts a trade-off in cost efficiency to maximize responsiveness and agility. Maintaining a twice-weekly delivery frequency and utilizing air freight extensively - despite increased logistics costs - clearly demonstrates that cross-docking is only truly effective when serving a clear strategic objective: shortening the design-to-store cycle to 2-3 weeks and minimizing the risk of outdated inventory. Thus, high operating costs in distribution are offset by a high percentage of full-price sales and a rapid capital turnover.

Secondly, the integration of the "post-allocation" model and real-time data. The core strength of Zara's cross-docking process lies in the shift from a "push" to a "pull" mechanism through post-allocation techniques. However, this operational method would be impossible without a synchronized data infrastructure. The seamless connection between demand data at the store (via POS/PDA) and allocation algorithms at the distribution center allows for a continuous flow of goods without intermediate warehousing. This implies that, for successful cross-docking, the physical infrastructure (such as automated conveyor systems, The Cube) must be perfectly mirrored by the digital infrastructure (RFID, real-time data), transforming the distribution center into a high-speed transit point rather than a purely storage warehouse.

Thirdly, the role of vertical integration as a prerequisite for speed. Investing in technology alone cannot guarantee a lead time of less than 24 hours without the support of an organizational structure. Zara's vertical integration model and geographical concentration (with most factories located near its headquarters in Spain) play a key role in eliminating information delays. The ability to make decisions centrally within an open space - where design, commerce, and logistics teams are directly connected - allows cross-docking orders to be executed on market signals. This is a structural advantage that fragmented or outsourced supply chains would find difficult to replicate.

In conclusion, the Zara case exemplifies cross-docking as more than just a warehousing technique; it is a strategic capability built on system synchronization. This model demonstrates that high-speed distribution requires a significant investment in infrastructure (automation and transportation), but delivers superior efficiency in terms of product liquidity. While Zara's scale and capital intensity create significant barriers to replication, the fundamental principles - including prioritizing flow over storage, integrating multi-functional data, and synchronizing logistics with market speed - offer valuable lessons. These principles provide a conceptual foundation for assessing the actual capacity gap of apparel enterprises in emerging markets such as Vietnam, thereby forming the basis for the recommendations presented in the following section.

## 4. Recommendations for Vietnamese apparel enterprises

### *4.1. Current status & gap analysis*

#### *4.1.1. Overview*

Currently, most Vietnamese textile and garment companies still operate warehouses using a traditional model, where goods are stored for relatively long periods before distribution. Warehouses are often designed in a linear layout (FIFO/LIFO) and hold large inventories to meet seasonal demand, resulting in high storage costs. According to Vinatex, warehousing accounts for up to 21.9% of total logistics costs, largely due to outdated storage and handling equipment, mostly manual processes, and a lack of synchronization. Traditional warehouse management reduces

efficiency, increases the risk of errors during inbound and outbound operations, and makes accurate inventory tracking difficult.

In response to the fast-fashion trend and the boom of e-commerce, many companies have begun adopting smart warehouses. Modern apparel warehouses implement warehouse management systems (WMS) along with barcodes or QR codes to automatically track inventory location and quantity. Racks are designed specifically for hanging or folded garments, with separate areas for packaging and quality control (QC) to process orders quickly. Many logistics providers also offer integrated warehouse services combined with transportation and e-commerce fulfillment. This approach minimizes intermediate storage time, allows flexible adjustment of warehouse space according to seasonal demand, and improves delivery speed and responsiveness across the global supply chain.

*4.1.2. Gap analysis*

To clarify the limitations and gaps in the warehouse and logistics systems of Vietnamese garment companies compared to Zara's standard model, Table 2 summarizes and contrasts key criteria related to processes, technology, and supply chain integration. The table is based on a synthesis and analysis of reputable secondary sources, including the classic study on Zara's distribution and cross-docking model by Ferdows, Lewis, and Machuca (2005), national logistics capability data from the World Bank (2023) via Vietnam's Logistics Performance Index, and academic research on supply chain integration in Vietnam's textile and garment sector by Thi Thu Hien Phan, Xuan Toan Doan and Thi Thanh Tam Nguyen (2020). In addition, the table draws on industry reports and online resources to provide practical insights into warehouse and logistics operations in Vietnam. It serves as the basis for identifying performance gaps and developing recommendations in the following sections.

**Table 2:** Performance gap between Zara's cross-docking model and Vietnamese apparel SMEs

| Factor | Criteria | Zara | Vietnam SMEs | Performance Gap |
|---|---|---|---|---|
| **Technology** | Warehouse Management System (WMS) | Fully integrated WMS with real-time connectivity to ERP, POS, and the global store network | Standalone WMS; many firms still rely on Excel or basic WMS solutions | Low reliability and responsiveness due to lack of data synchronization |
| | Level of automation | Automated sorting systems, conveyor belts, sorters, and | Predominantly manual handling, limited conveyor | High labor costs, slow processing speed, and |

| | | | | |
|---|---|---|---|---|
| | | RFID at distribution centers | usage, almost no RFID | frequent operational errors |
| | Data processing & demand forecasting capability | AI and advanced analytics for store-level demand forecasting | Forecasting mainly based on managerial experience and limited historical data | Low agility and slow response to demand fluctuations |
| | IT integration with partners | Tight IT integration with factories, 3PLs, and retail stores | Fragmented connections, lack of EDI systems | Long lead times, difficulty in implementing true cross-docking |
| **Process** | Warehouse operating model | Pure cross-docking model with extremely low dwell time (near zero inventory) | Traditional storage-based warehouses with high inventory levels | Low asset management efficiency and capital tied up in inventory |
| | Process standardization | Globally standardized and highly detailed processes by SKU | Lack of standardization; processes vary by warehouse | Low reliability and limited scalability |
| | Distribution frequency & rhythm | Fixed delivery schedule of 2–3 times per week for each store | Large-batch shipments with low delivery frequency | Poor responsiveness, unable to keep pace with fast fashion |
| | Sorting & consolidation | Sorting and consolidation by store, market, and route directly at DCs | Sorting by production batch or customer orders | Inefficient cross-docking, increased re-handling |
| | Inventory management | Extremely low inventory levels with high turnover | High inventory maintained as a “risk buffer” | High costs and high risk of fashion obsolescence |
| | Logistics management capability | Professional SCM experts; logistics treated | Logistics viewed mainly as a support function | Lack of strategic supply chain mindset |

| | | | | |
|---|---|---|---|---|
| **Human Resources** | | as a core competence | | |
| | Operational skill level | Well-trained workforce, familiar with advanced technologies | Low-skilled labor, short-term training | High operational error rates, difficulty adopting new technologies |
| | Decision-making culture | Data-driven decision-making with rapid execution | Experience-based decisions, rigid hierarchical structure | Low agility and slow response |
| | Internal coordination | Strong coordination among design, production, logistics, and retail | Functional silos across departments | Information fragmentation, reduced cross-docking effectiveness |
| | Partner relationships | Long-term strategic partnerships with suppliers and 3PLs | Short-term, transactional relationships | Low trust and poor supply chain synchronization |
| **Overall Performance** | Reliability | On-time, complete, and accurate deliveries | Frequent delays, shortages, and SKU mismatches | Significant gap |
| | Responsiveness | Reaction within days | Reaction within weeks | Very large gap |
| | Agility | Rapid adjustment to changing consumer preferences | Slow adjustment | Incompatible with fast-fashion requirements |
| | Cost | Optimized logistics costs relative to revenue | High logistics costs | Low cost efficiency |
| | Asset Efficiency | Very high inventory turnover | Low inventory turnover | Capital lock-in |

*Source: Author's compilation based on Ferdows et al. (2005), World Bank (2023), and Nguyen & Tran (2020)*

### *4.2. Proposed recommendations*

#### *4.2.1. Basis of recommendations*

The recommendations proposed in this section are derived from the theoretical framework of cross-docking and standardization of this study, the benchmark analysis of Zara's logistics system, and the gap analysis of Vietnamese textile and garment enterprises.

Based on the gap and limitation analysis, the study has highlighted the problems of Vietnamese businesses, especially the three biggest bottlenecks: reliability and responsiveness. While Zara achieved order accuracy of up to 98.9%, Vietnamese businesses still face SKU errors and slow deliveries due to manual processing.

As analyzed above, warehousing costs account for 21.9% of the total logistics costs of domestic textile firms. Furthermore, studies show that applying cross-docking can significantly reduce goods handling time and storage costs, while increasing distribution efficiency by shortening storage time to almost zero and getting goods to customers faster (MDPI, 2020).

Zara's model is a practical example of this benefit in the fast fashion industry. However, the implementation of a fully automated system and massive investment is not suitable for small and medium-sized enterprises in Vietnam. Therefore, this recommendation focuses on a feasible solution based on a suitable feasible solution based on appropriate re-designing warehouse layouts, standardized operational processes, and applied appropriate technology. Instead of completely replicating an expensive automation system, the study will focus on the Flow-through philosophy, which prioritizes flow synchronization over maximizing storage space. Zara's lessons learned from using post-distribution data will be adapted into standardized processes suitable for the current IT capabilities of Vietnamese enterprises.

#### *4.2.2. Re-designing warehouse layout*

To overcome the limitations of manual operations and high storage costs, restructuring the warehouse layout from a linear storage model (FIFO/LIFO) to a continuous flow model (Flow-through) is a prerequisite for effective cross-docking implementation.

First, current Vietnamese garment warehouses are primarily designed to store large quantities to meet seasonal demand. These designs focus on maximizing racking space, which lengthens travel distances, disrupts flow, and reduces Responsiveness. By applying the Flow-through principle, the focus shifts to turnover speed rather than capacity. This simulates the philosophy of "The Cube" (Zara), where the warehouse acts as a transit point rather than a storage

depot. Goods remain in motion, bypassing the put-away stage entirely. Simply put, goods enter the front door and flow directly out the back door for delivery. This allows businesses to create the shortest possible path for goods, ensuring staff know the immediate destination and maximizing floor utilization.

Second, the research proposes switching to an I-shaped layout. According to Bartholdi & Gue (2004), for apparel goods, an I-shaped layout completely separates inbound and outbound flows, minimizing operational overlap which is a common cause of delays in traditional Vietnamese warehouses. Enterprises should arrange inbound and outbound doors opposite each other across a central zone. This design minimizes travel distance and prevents congestion points.

Furthermore, a staging area occupying 50-60% of the floor space should be established between the dock doors. This is where value-added activities, such as RFID scanning and order consolidation by store take place, replacing high-bay racking systems. Additionally, installing a Garment-on-Hanger (GOH) rail system connecting directly from receiving to packing will help maintain a steady flow and minimize handling time, similar to Zara's approach.

Empirical studies show that re-designing layouts for cross-docking delivers clear performance improvements. Optimizing the floor plan reduces average travel distance by 3.23%, directly boosting labor efficiency and processing speed. In Zara's case, a smart layout allows goods to dwell for only a few hours to a maximum of 3 days, increasing inventory turnover to 12 times/year, which is 3-4 times higher than the industry average.

*4.2.3. Standardizing operational processes*

Re-designing the layout is only a necessary condition; to achieve a dock-to-dock time under 24 hours as recommended by Van Belle et al. (2012), Vietnamese textile enterprises must standardize operations towards flow synchronization. Based on Zara's process analysis and Boysen & Stephan's (2011) theory, the proposed workflow is standardized into three core stages.

*4.2.3.1. Inbound stage*

A common issue in Vietnamese garment firms is wasting too much time at the inbound gate for manual counting and labeling. To resolve this bottleneck, the new process should apply the Pre-labeled receiving principle. Enterprises need to require suppliers or processing factories to apply standard SKU barcodes/QR codes right at the source. This mirrors Zara's strategy, where goods are security-tagged and identified before reaching the distribution center, eliminating low-value tasks at the warehouse. As a result, reducing handling costs and lead times supports businesses in meeting fast fashion speeds and avoiding obsolescence risks.

Furthermore, the old process requires multi-touch handling, increasing the risk of damage or picking errors. Vietnamese enterprises should move towards one-touch cross-docking (Boysen & Fliedner, 2010), meaning goods are unloaded and moved directly to sorting without intermediate

storage or repetitive quality checking. Skipping put-away and picking steps reduces labor costs, total handling costs, and error rates.

*4.2.3.2. Sorting stage*

This is the heart of the cross-docking system. Instead of sorting based on a fixed list (Pre-distribution), the new process requires flexibility based on real-time demand. Even without full automation like Zara, Vietnamese firms need to standardize allocation based on real-time order data. According to Van Belle et al. (2012), post-distribution offers superior flexibility to handle demand volatility. Goods are not allocated based on fixed, pre-determined plans, but rather rely on real-time demand. Merchandise will be allocated precisely according to actual regional requirements, thereby minimizing the risks of stockouts or overstocking at retail stores. Notably, this approach significantly enhances agility in the event of last-minute market shifts; the post-distribution system facilitates the immediate redirection of the flow of goods within the warehouse, enabling enterprises to respond effectively to substantial market volatility.

In the I-shaped layout, after inbound scanning, goods are immediately diverted into lanes representing specific stores or regions, rather than being shelved. This process helps Zara achieve a processing speed of 45,000 items/hour at the Arteixo Center, a benchmark that manual processes cannot match.

*4.2.3.3. Outbound stage*

The biggest efficiency gap between Vietnamese firms and Zara lies in schedule discipline. Instead of waiting for a full truckload, the standardized process requires a fixed schedule (e.g., twice a week) to create a steady rhythm. This synchronizes inbound and outbound trucks, ensuring goods do not stay longer than 24 hours. Eliminating long-term storage cuts Total Supply Chain Management Costs and releases working capital. For smaller orders, a two-touch process is applied in which orders are consolidated in the staging area before being loaded onto the truck. This optimizes truck space while ensuring fast delivery to retail stores.

**Table 3:** Comparison of traditional warehousing process and standardized cross-docking process

| **Stage** | **Current Process** | **Proposed Standardized Process** |
|---|---|---|
| **Inbound** | Receiving -> Manual counting -> Put-away to storage | Receiving pre-labeled goods -> Scanning -> Immediate diversion to sorting lanes |

| | | |
|---|---|---|
| **Sorting** | Pick-from-stock upon order receipt -> Repacking | Post-distribution sorting on the floor based on real-time demand |
| **Outbound** | Dispatch upon full truckload (FTL) or large batching | Dispatch on a fixed schedule synchronized with inbound flows<br>Apply two-touch process for small/fragmented orders |
| **Target KPI** | Dock-to-dock time: 5 - 15 days | Dock-to-dock time: < 24 hours |

*Source: Author's own compilation*

*4.2.4. Applying appropriate technology*

Instead of blindly copying Inditex's expensive automation, SMEs should focus on a practical digitalization roadmap to solve three bottlenecks: data accuracy, processing speed, and connectivity.

*4.2.4.1. Upgrading to Cloud WMS integrated with Auto-ID*

Most Vietnamese firms use Excel or basic standalone WMS, leading to data mismatches. The study proposes switching to a Cloud-based WMS (SaaS). This allows real-time inventory updates from all locations, creating the data foundation for post-distribution. Instead of immediate high-cost RFID investment, firms should mandate GS1 standard barcodes or QR codes for every package. Warehouse staff can use handheld scanners to execute one-touch processing which is scanning to receive and automatically designating the outbound door.

*4.2.4.2. Selective RFID and semi-automation*

While Zara uses extensive automation, Vietnamese firms should apply RFID at the pallet or case level to manage overall flow, reducing chip costs. Item-level RFID should only be used for high-value garments. In the sorting zone of the I-shaped layout, investing in roller conveyors combined with Put-to-Light systems is recommended. This guides staff to sort goods into the correct lanes without needing complex robots like "The Cube."

*4.2.4.3. Supply chain data integration*

IT connectivity between Vietnamese firms and partners is fragmented. The proposed solution is to set up data gateways to synchronize POS Data from stores to the central warehouse. Shifting from experience-based forecasting to using historical sales data allows the system to match inbound trucks with store inventory needs immediately, fulfilling the true nature of cross-docking.

To ensure financial feasibility for SMEs, this research proposes a three-phase implementation roadmap.

**Table 4:** Technology transformation roadmap for Vietnamese SMEs in warehousing operations

| Phase | Current Status (Vietnamese SMEs) | Proposed Technology | Strategic Objectives |
|---|---|---|---|
| **1** | Reliance on Excel; manual data entry. | Cloud-based WMS + Barcode Scanners | Enhance Reliability; eliminate manual data entry errors. |
| **2** | Manual sorting; extensive walking for goods transport. | Roller Conveyors + Put-to-Light systems | Increase Responsiveness (processing speed); reduce manual labor intensity. |
| **3** | Fragmented communication via email/phone. | EDI/ERP Integration with the retail chain | Optimize product flow (Agility); execute Post-distribution strategies. |

*Source: Author's own compilation*

## 5. Conclusion and future directions

### *5.1. Conclusion*

This study has focused on clarifying the strategic role of the cross-docking system in optimizing the fast fashion supply chain, an industry characterized by extreme pressure for speed and highly-volatile demand. Through an in-depth analysis of Inditex (Zara)'s operational model, the research demonstrates that the success of this strategy lies not only in the intermediate transportation activities but is the result of a synchronized ecosystem. The study comprehensively addresses the initial research objectives, from systematizing the prerequisite technological and infrastructural requirements to analyzing the actual operational mechanisms within Zara's distribution centers, where goods are processed in a continuous flow to ensure the shortest possible lead times. Finally, by proposing an adaptive framework, the research establishes a strategic foundation for Vietnamese enterprises to transition toward more agile distribution models.

The primary contribution of this research lies in building a practical reference framework for Vietnamese apparel enterprises in the context of digital transformation in logistics. Instead of mechanically transferring theoretical concepts, the study proposes a roadmap for implementing cross-docking based on product characteristics and the technological readiness of domestic infrastructure. A significant highlight is the emphasis on integrating postponement design with

automated sorting techniques to assist Vietnamese firms in mitigating inventory obsolescence - the primary barrier when domestic enterprises attempt to compete with global brands. Consequently, the study affirms that cross-docking is the "key" for the Vietnamese garment industry to elevate its position within the global value chain.

### *5.2. Research limitations and directions for future research*

Although positive results have been achieved in systematizing the theoretical and practical models, the study still has certain limitations that need to be considered. The most notable constraint stems from the exclusive reliance on secondary data and qualitative methods, which results in a lack of specific quantitative metrics to directly compare economic efficiency between traditional warehousing and cross-docking applications in the Vietnamese context. Furthermore, due to barriers in accessing proprietary information, the research could not delve deeply into the specific operational algorithms of the Warehouse Management Systems (WMS) currently employed by Zara.

In light of these limitations, future research should be undertaken to strengthen the empirical validity of the topic. Prospective authors should focus on conducting empirical studies or case studies at specific Vietnamese apparel corporations, utilizing statistical methods to accurately measure changes in costs and capital turnover when implementing cross-docking. Additionally, investigating the application of emerging technologies such as Artificial Intelligence (AI) and Machine Learning in demand forecasting to support sorting decisions at the cross-dock terminal represents a high-potential direction, further optimizing goods flow in the fashion 4.0 era.

## References


Van Belle, J., Valckenaers, P., & Cattrysse, D. (2012). *Cross-docking: State of the art*. *Omega, 40*(6), 827–846. https://www.sciencedirect.com/science/article/abs/pii/S0305048312000060?via%3Dihub

Kiani Mavi, R., Goh, M., Kiani Mavi, N., Jie, F., Brown, K., Biermann, S., & Khanfar, A. A. (2020). *Cross-docking: A systematic literature review*. *Sustainability, 12*(11), 4789. https://www.mdpi.com/2071-1050/12/11/4789

Boysen, N., & Stephan, M. (2011). *Cross-docking scheduling with divisible loads: Classification, complexity, and algorithms. European Journal of Operational Research, 212*(2), 258–269. https://www.sciencedirect.com/science/article/abs/pii/S0377221711000944

Boysen, N., & Fliedner, M. (2010). *Cross-dock scheduling: Classification, literature review and research agenda. Omega, 38*(6), 413–422. https://www.sciencedirect.com/science/article/abs/pii/S0305048309000772?via%3Dihub

Bartholdi, J. J., III, & Gue, K. R. (2004). *The best shape for a cross-dock*. *Transportation Science, 38*(2), 235–244. https://pubsonline.informs.org/doi/10.1287/trsc.1030.0067

APICS. (2017). *Supply chain operations reference (SCOR) model: Version 12.0*.

Lockamy, A., III, & McCormack, K. (2004). *Linking SCOR planning practices to supply chain performance: An exploratory study*. *International Journal of Operations & Production Management, 24*(12), 1192–1218. https://www.emerald.com/ijopm/article-abstract/24/12/1192/142631/Linking-SCOR-planning-practices-to-supply-chain?redirectedFrom=fulltext

Closa, S. (2015, December 8). *Zara: Disrupting the fashion industry*. Technology and Operations Management, HBS Digital Initiative. https://d3.harvard.edu/platform-rctom/submission/zara-disrupting-the-fashion-industry/

Escalona Orcao, A. I., & Ramos Pérez, D. (2014). *Global production chains in the fast fashion sector, transports and logistics: The case of the Spanish retailer Inditex*. Investigaciones Geográficas, Boletín del Instituto de Geografía, UNAM, (85), 113–127.

Vaquero, R. C. (2019, October 8). *Inditex's centralized logistics: A successful model for reaching the entire world*. Mapfre Global Risks. https://www.mapfreglobalrisks.com/en/risks-insurance-management/article/inditexs-centralized-logistics-a-successful-model-for-reaching-the-entire-world/

Camara, D. (2025, August 27). *Inside Zara's supply chain, speed and agility at scale*. The Future Factory. https://www.thefuturefactory.com/insights/zara-lean-supply-chain-agility

Ji, Y. (2025). *Research on Zara's supply chain system*. Advances in Economics Management and Political Sciences, 211(1), 36–43. https://doi.org/10.54254/2754-1169/2025.CAU26083

Ferdows, K., Lewis, M. A., & Machuca, J. A. D. (2004). *Rapid-fire fulfillment*. *Harvard Business Review*. https://hbr.org/2004/11/rapid-fire-fulfillment

Closa, S. (2015, December 8). *Zara: disrupting the fashion industry*. *HBS Digital Initiative, Technology and Operations Management, Harvard University*. https://d3.harvard.edu/platform-rctom/submission/zara-disrupting-the-fashion-industry/

Ferdows, K., Lewis, M. A., & Machuca, J. A. D. (2004). *Rapid-fire fulfillment*. *Harvard Business Review*. https://hbr.org/2004/11/rapid-fire-fulfillment

Inditex. (2017). *Inditex annual report 2017*. https://www.inditex.com/documents/10279/792269/Annual+Report+2022.pdf

Inditex. (2022). *Inditex annual report 2022*. https://www.inditex.com/documents/10279/792269/Annual+Report+2022.pdf

Sitaro, T. D. (2020). *Fast fashion and sustainability – the case of Inditex-Zara* (Senior thesis). Fordham University Research Commons. https://research.library.fordham.edu/international_senior/46/

mhugos. (2020, January 4). *Zara clothing company supply chain*. SCM Globe. https://www.scmglobe.com/zara-clothing-company-supply-chain/

Sitaro, T. D. (2020). *Fast fashion and sustainability – The case of Inditex-Zara* (Senior thesis). Fordham University Research Commons. https://research.library.fordham.edu/cgi/viewcontent.cgi?article=1044&context=international_senior

Li, R., Liu, W., & Zhou, S. (2024). *Digital transformation of supply chain management in the fast fashion industry: A case study of Zara*. *SHS Web of Conferences, 181*, 04019. https://doi.org/10.1051/shsconf/202418104019

Xue, L., & Li, Y. (2024). *Behind Zara's success: An analysis of brand marketing and management in fast fashion*. *Advances in Social Science, Education and Humanities Research, 835*, 486–495.

Jangid, M. (2022). *ZARA'S case study – the strategy of the fast fashion pioneer* (Master's thesis). Manipal Academy of Higher Education – Dubai Campus. https://www.researchgate.net/publication/362568585_ZARA%27S_CASE_STUDY_-the_Strategy_of_the_Fast_Fashion_Pioneer_The_Strategy_of_the_Fast_Fashion_Pioneer

Aftab, M. A., Yuanjian, Q., Kabir, N., & Barua, Z. (2018). *Super responsive supply chain: The case of Spanish fast fashion retailer Inditex-Zara*. International Journal of Business and Management, 13(5), 212–224. https://www.researchgate.net/publication/324702528_Super_Responsive_Supply_Chain_The_Case_of_Spanish_Fast_Fashion_Retailer_Inditex-Zara

Yang, B. (2025). *Analysis of Zara's fast fashion supply chain rapid response strategy*. Atlantis Press. https://www.atlantis-press.com/article/126013644.pdf

Vinafco. (n.d.). *Dịch vụ kho hàng may mặc – Giải pháp lưu trữ và phân phối chuyên nghiệp từ Vinafco*. https://vinafco.com.vn/vi/news/dich-vu-kho-hang-may-mac-giai-phap-luu-tru-va-phan-phoi-chuyen-nghiep-tu-vinafco

World Bank. (2023). *Logistics Performance Index (LPI) global ranking*. World Bank. https://lpi.worldbank.org/international/global

Ferdows, K., Lewis, M. A., & Machuca, J. A. D. (2005, February 21). *Zara's secret for fast fashion*. *Harvard Business School Working Knowledge*. https://dwyered.tripod.com/sitebuildercontent/sitebuilderfiles/4-zara_hbs.pdf

Phan, T. T. H., Doan, X. T., & Nguyen, T. T. T. (2020). *The impact of supply chain practices on performance through supply chain integration in textile and garment industry of Vietnam*. *Uncertain Supply Chain Management, 8*, 175–186. https://scispace.com/pdf/the-impact-of-supply-chain-practices-on-performance-through-1k5465rftc.pdf

Kiani Mavi, R., Goh, M., Kiani Mavi, N., Jie, F., Brown, K., Biermann, S., & Khanfar, A. A. (2020). *Cross-docking: A systematic literature review*. *Sustainability, 12*(11), 4789. https://www.mdpi.com/2071-1050/12/11/4789

Bartholdi, J. J., III, & Gue, K. R. (2004). *The best shape for a crossdock*. *Transportation Science, 38*(2), 235–244. https://www.researchgate.net/publication/220413007_The_Best_Shape_for_a_Crossdock

Mazaira, A., González, E., & Avendaño, R. (2003). *The role of market orientation on company performance through the development of sustainable competitive advantage: The Inditex–Zara case*. *Marketing Intelligence & Planning, 21*(4), 220–229.

Aftab, M., Yuanjian, Q., & Kabir, N. (2017). *Postponement application in the fast fashion supply chain: A review*. *International Journal of Business and Management, 12*(7), 115–123.