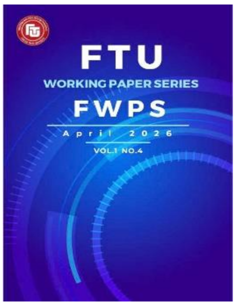

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BỐ TRÍ KHO VÀ CÁC QUY TRÌNH VẬN HÀNH TRONG BÁN LẺ: TRƯỜNG HỢP IKEA PHÚC CHÂU VÀ HÀM Ý ĐỐI VỚI VIỆT NAM

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Tóm tắt

Nghiên cứu này phân tích vai trò của bố trí kho và các quy trình vận hành trong việc nâng cao hiệu quả hoạt động bán lẻ, thông qua trường hợp IKEA Phúc Châu (Trung Quốc). Trong chuỗi cung ứng bán lẻ hiện đại, kho hàng giữ vai trò trung tâm vận hành chiến lược, tác động đến hiệu quả chi phí, mức độ dịch vụ và sự hài lòng của khách hàng. Dựa trên

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mô hình bán lẻ – kho tích hợp của IKEA, nghiên cứu đánh giá cách thiết kế bố trí kho và tổ chức quy trình vận hành hỗ trợ dòng chảy hàng hóa, tự phục vụ của khách hàng và vận hành khối lượng lớn. Thông qua phương pháp nghiên cứu tình huống định tính dựa trên tài liệu thứ cấp, nghiên cứu rút ra các hàm ý thực tiễn nhằm cải thiện bố trí kho và quy trình vận hành trong bối cảnh ngành bán lẻ Việt Nam.

Từ khoá: bố trí kho hàng; logistics bán lẻ, tối ưu hóa lấy hàng, mô hình tích hợp bán lẻ – kho hàng, tích hợp chuỗi cung ứng

WAREHOUSE LAYOUT AND OPERATIONAL PROCESSES IN RETAIL: THE CASE OF IKEA FUZHOU AND IMPLICATIONS FOR VIETNAM

Abstract

This study examines the role of warehouse layout and operational processes in supporting efficient retail operations, using the IKEA Fuzhou store (China) as a case study. In contemporary retail supply chains, warehouses function as strategic operational centres that influence service performance, cost efficiency, and customer satisfaction. Focusing on IKEA's hybrid retail–warehouse model, the research analyses how layout design facilitates product flow, customer self-service, inventory availability, and high-volume operations. Adopting a qualitative, document-based case study approach, the study synthesises existing literature on warehouse design and retail Logistics and evaluates the integration of warehouse and retail functions in the Fuzhou store. The findings aim to generate practical insights and managerial implications for improving warehouse layout and operational practices in Vietnam's rapidly modernising retail sector.

Keywords: warehouse layout, retail logistics, order picking optimization, hybrid retail–warehouse model, supply chain integration

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1. Introduction

In increasingly competitive retail supply chains, warehouses are no longer merely storage facilities but strategic operational units that directly influence cost efficiency, service performance, and customer experience. In large-format retail environments, warehouse layout and operational processes play a critical role in managing product flow and ensuring effective demand fulfilment. Therefore, examining the case of IKEA Fuzhou provides valuable practical insights into how warehouse design supports retail performance and offers relevant implications for the Vietnamese retail sector.

2. Literature review

2.1. Warehouse layout in retail logistics

Warehouse layout is widely recognized in operations management literature as a strategic configuration of functional areas—receiving, storage, picking, packing, and shipping—designed to optimize material flow and resource utilization (Rouwenhorst et al., 2000; Gu, Goetschalckx, & McGinnis, 2007). In retail supply chains, layout decisions directly influence key performance indicators such as travel distance, order cycle time, labor productivity, and throughput capacity. In high-SKU retail environments characterized by demand volatility and frequent replenishment, warehouse layout becomes a strategic operational capability embedded within the broader supply chain system rather than merely a physical design issue.

2.2. Order picking and operational process optimization

Order picking has been identified as the most labor-intensive and cost-consuming warehouse activity, often accounting for 50–70% of total warehouse operating costs (de Koster, Le-Duc, & Roodbergen, 2007). Consequently, substantial research has focused on improving routing policies, storage assignment rules, and batching strategies. Traditional routing heuristics such as S-shaped, return, and midpoint methods remain widely applied. However, increasing operational complexity in retail environments has led to the adoption of metaheuristic approaches, including genetic algorithms and simulation-based optimization models. This body of literature emphasizes the interdependence between spatial layout design and operational decision rules, suggesting that layout configuration and routing logic should be analyzed as integrated components of warehouse performance.

2.3. Warehouse–retail integration in large-format furniture retailing

In large-format retail settings, warehouse functions are closely integrated with in-store operations. IKEA provides a distinctive example of a hybrid retail–warehouse model, where self-service storage areas are combined with back-end distribution processes. Studies of IKEA's global supply chain highlight standardized warehouse architecture, centralized planning systems, and warehouse management systems (WMS) as mechanisms supporting operational efficiency and cost leadership (Jonsson, Rudberg, & Holmberg, 2013). Empirical research on IKEA Fuzhou further demonstrates that advanced routing optimization, such as genetic-algorithm-based models, can significantly improve picking efficiency compared to traditional heuristics (Zeng et al., 2024). These findings reinforce the argument that warehouse layout effectiveness depends on its alignment with operational processes and technological systems.

2.4. Research gaps and emerging market relevance

Despite extensive research on warehouse design and order picking optimization, gaps remain in retail-specific contexts. Much of the existing literature focuses on manufacturing or generic distribution centers rather than hybrid retail–warehouse environments characterized by high SKU diversity and customer self-service integration. Moreover, empirical studies on IKEA operations in emerging Asian markets remain limited, and the transferability of advanced layout and optimization models to developing retail sectors such as Vietnam has not been sufficiently examined.

Given the rapid modernization of Vietnam's retail industry, investigating warehouse layout and operational integration in an established large-format retailer provides both theoretical and practical value. Addressing these gaps contributes to a more contextualized understanding of retail logistics performance in transitional economies.

3. Research objective and questions

This study aims to analyze how warehouse layout and operational processes support efficient retail operations in the IKEA Fuzhou store. It further seeks to evaluate the integration between warehouse and retail functions and to derive practical implications for improving warehouse practices in Vietnam's retail sector.

Research question (RQ) is: How do warehouse layout and operational processes contribute to retail efficiency in the IKEA Fuzhou store, and what implications can be drawn for the Vietnamese retail sector?

To operationalize this central question, the following investigative questions (IQs) are developed:

- **IQ1:** How is the warehouse layout of the IKEA Fuzhou store structured to facilitate product flow and customer self-service?
- **IQ2:** What key operational processes (receiving, storage, picking, and shipping) are implemented to support warehouse performance?
- **IQ3:** How does the integration of warehouse and retail functions enhance operational efficiency and customer experience?

- **IQ4:** What practical lessons can be derived from the IKEA Fuzhou case to improve warehouse layout and operational processes in Vietnam's retail industry?

The investigative questions are addressed through the structure of the analysis sections in this study. Specifically, IQ2 is examined in Section 6.2, which analyzes the core warehouse processes including receiving, storage, picking, and shipping. IQ1 and IQ3 are primarily discussed in Section 6.3 and Section 6.4, where warehouse layout design and the integration between warehouse and retail functions are evaluated to explain their impact on product flow, operational efficiency, and customer experience. Finally, IQ4 is addressed in Section 6.6, which synthesizes the findings from the case analysis to derive practical implications for improving warehouse layout and operational processes in Vietnam's retail sector.

4. Theoretical framework

The theoretical framework structures warehouse management from classification to performance evaluation. It begins with warehousing types (van den Berg and Zijm, 1999), examines four core processes (Rouwenhorst et al., 2000), and focuses on five design dimensions influenced by factors such as inventory characteristics and labor costs (Gu et al., 2010; Bartholdi & Hackman, 2019). The effectiveness of these decisions is evaluated through throughput, cost, and service level (Rouwenhorst et al., 2000).

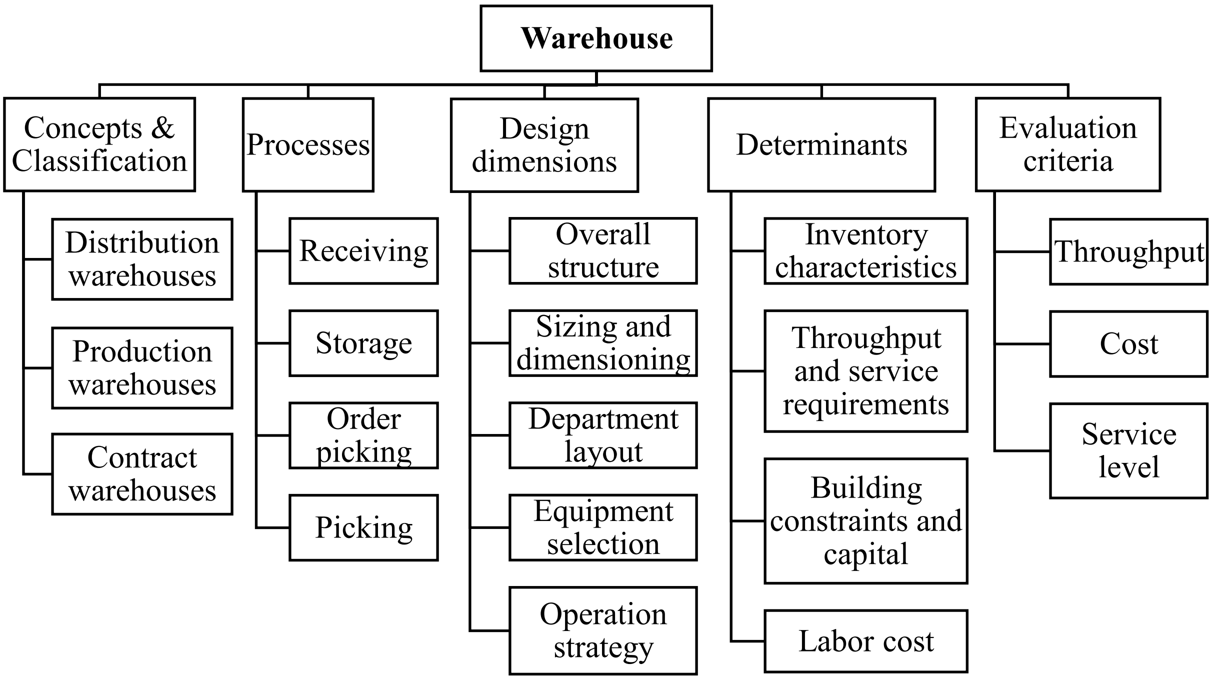

Figure 1: Theoretical framework for warehouse design and operational processes.

(Source: Synthesized by author based on van den Berg & Zijm (1999), Rouwenhorst et al. (2000), and Gu et al. (2010))

4.1. Warehouse concepts and classification

Warehousing is a core component of material handling, which involves the movement of materials to, within, and from production and storage facilities (van den Berg & Zijm, 1999). Specifically, warehousing refers to material handling activities conducted within a warehouse and its receiving and shipping areas. Core functions include receiving, storage, order picking, sorting, and shipping.

Warehouses can be classified into three main types (van den Berg & Zijm, 1999):

- Distribution warehouses: consolidate products from multiple suppliers for delivery to customers.
- Production warehouses: store raw materials and finished goods within manufacturing facilities.
- Contract warehouses: manage storage and inventory on behalf of third-party clients.

4.2. Warehouse Processes

Warehouse operations are typically divided into four main processes (Rouwenhorst et al., 2000):

- Receiving: accepting, checking, and preparing incoming goods.
- Storage: assigning products to reserve or forward picking areas.
- Order picking: retrieving items to fulfill orders, often followed by sorting and consolidation.
- Shipping: checking, packing, and dispatching outbound orders.4.3. Warehouse design dimensions

4.3. Warehouse design dimensions

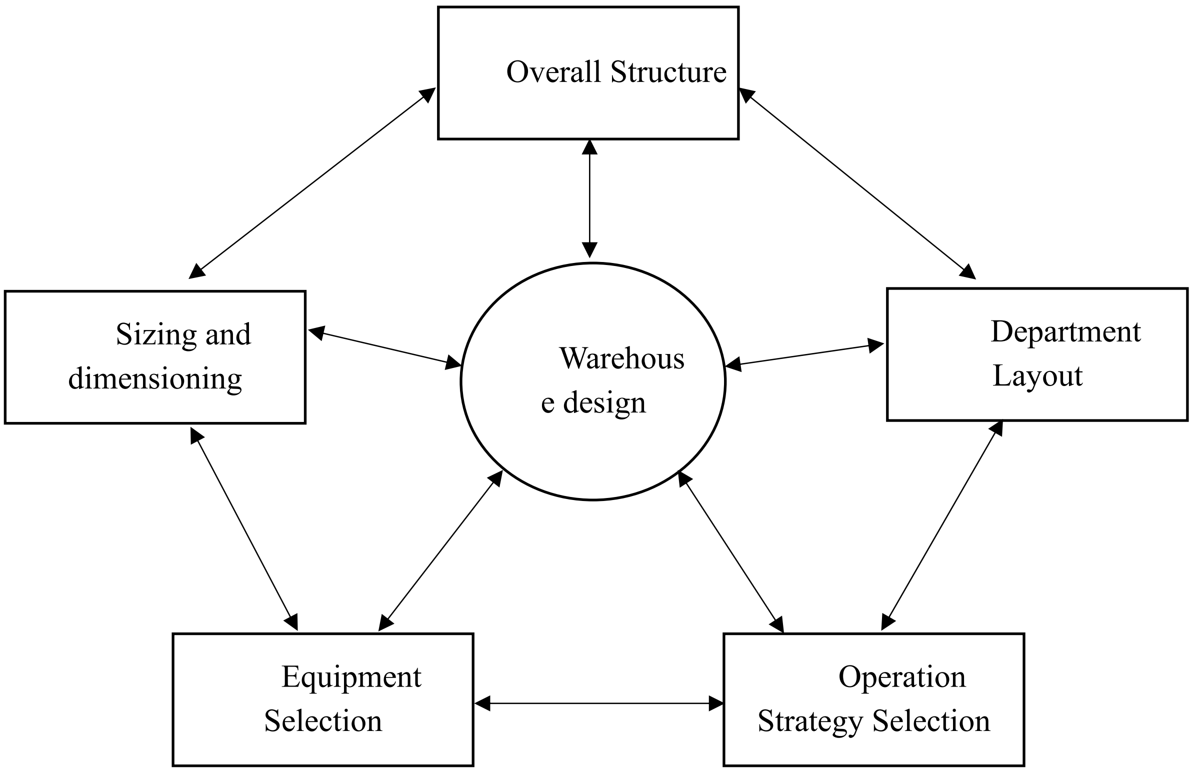

Figure 2: Warehouse design dimensions

Source: Gu et al. (2010)

Warehouse design involves five interconnected decision dimensions (Gu et al., 2010):

(1) Overall structure: defines material flow and functional area arrangement. Common layouts include flow-through (I-shaped) and U-flow configurations (Bartholdi & Hackman, 2019).

(2) Sizing and dimensioning: determines facility size and space allocation.

(3) Department layout: designs internal configurations such as aisles or storage systems.

(4) Equipment selection: decides the level of automation and material handling technologies.

(5) Operational strategy: establishes storage policies and picking methods.

These dimensions are interdependent, and early design decisions strongly affect long-term operational performance (Gu et al., 2010).

4.4. Determinants of warehouse design

Warehouse design balances two costly resources: space and labor (Bartholdi & Hackman, 2019). Four key determinants shape design decisions:

- Inventory characteristics: SKU variety, size, and turnover rates.

- Throughput and service requirements: order volume and response time expectations.
- Building constraints and capital: space availability and investment capacity.
- Labor cost: influences the degree of automation, especially in order picking.

4.5. Evaluation criteria

Warehouse designs are commonly evaluated based on three criteria (Rouwenhorst et al., 2000):

- Throughput: maximum processing capacity.
- Cost: investment and operating expenses, often assessed via NPV or ROI.
- Service level: response time and order accuracy.

5. Methodology

This study employs a qualitative, document-based case study approach based on secondary data, including academic articles, industry reports, and company publications. The research first reviews relevant literature to establish a theoretical framework on warehouse layout and retail logistics. It then analyzes the IKEA Fuzhou store as a case study, focusing on layout design, product flow, storage strategies, and customer self-service processes. Finally, qualitative analysis is used to evaluate operational effectiveness and derive implications for improving warehouse practices in Vietnam's retail sector.

6. Findings

6.1. Overview of IKEA

IKEA is a leading chain retailer in the furniture industry, operating an integrated model that combines warehousing, distribution, and retail functions within the same facility. The company focuses on well-designed, functional, and affordable products, supported by a global sourcing strategy and a network of approximately 1,500 suppliers across more than 60 countries (Behzad et al., 2021; IKEA Global Report, 2025). As of November 2025, IKEA operates 504 stores in over 63 markets with around 222,000 employees worldwide.

Established in 2017, IKEA Fuzhou functions as a hybrid retail and logistics distribution center. Covering approximately 112,000 square meters, the facility includes commercial leasing areas, self-service warehouse spaces, a furniture showroom, and a restaurant, following the standard IKEA large-format layout design (Zeng et al., 2024). IKEA is a representative enterprise in the chain retail furniture industry. It operates as an integrated entity that combines warehousing, distribution, and sales functions, serving simultaneously as a retail store and a logistics distribution center.

6.2. Warehouse processes

6.2.1. Receiving Process

The warehouse processes are generally similar to those of other facilities and consist of the following main stages:

(1) Arrival of Pallets

- Goods may be transported to the warehouse through various modes of transportation. (Behzad et al., 2021)

(2) Checking of Barcode

- After being unloaded from the trucks, the sealed pallets are moved to the inspection area for registration and processing through a barcode scanning system.
- The barcode contains complete information regarding the storage zone, aisle, and specific shelf location where the products will be placed. (Behzad et al., 2021)

(3) Loading with Forklift

- Once the verification process is completed, the pallets are transported to their designated final storage locations on the shelving system. Forklifts are used to move the goods to the predetermined positions according to the warehouse coding system. This step ensures that products are stored accurately, safely, and in alignment with the warehouse layout structure. (Behzad et al., 2021)

6.2.2. Storage Process

As a retail-oriented operation in the case of IKEA Fuzhou, the company’s storage and distribution division incorporates a fully functional distribution warehouse while simultaneously acting as a product display space for customers. Due to this hybrid structure, the logistics and distribution system implemented must be aligned with online order fulfillment requirements.

The distribution warehouse on the second floor of the shopping mall can be classified as a semi-open warehouse divided into two distinct areas:

- The first area is located in the mall's furniture self-service area, where the merchandise on the lower shelves is made available for consumers to take on their own.
- The second area is separated by partition walls from the furniture self-service area, and is the main workspace for warehouse staff, prohibiting access from con-sumers.

The storage of goods on the warehouse shelves follows a typical upper storage and lower retrieval warehouse model. The upper floors of the shelves are reserved for goods storage units, while the lower floors are utilized for the goods picking units. (Zeng et al., 2024)

6.2.3. Order picking Process

The picking process of the IKEA Fuzhou distribution center is generally divided into several key stages:

(1) Order Allocation

- The allocation of orders at the IKEA Fuzhou branch generally follows the principle of proximity, meaning that the distribution of employees assigned to pick items is based on the distance of the collective items waiting to be selected from each employee. (Zeng et al., 2024)

(2) Goods Picking

- Upon receiving the picking task, the picking personnel at the IKEA Fuzhou distribution warehouse log in to the PDA with their personal accounts, select and click the corresponding order, and officially enter the goods picking stage. (Zeng et al., 2024)
- The order task is in an exclusive state, and others cannot select the task again, as the order will disappear on the task list to avoid duplicate picking. (Zeng et al., 2024)
- The employees usually start by picking up a trolley from the trolley storage area and then proceed to the corresponding shelf number prompted on the PDA to scan and place the goods into the trolley, repeating the process for each product until all goods are picked. (Zeng et al., 2024)

(3) Task Submission

- Finally, the IKEA Fuzhou employee pushes the trolley back to the logistics center, where they must complete the submission feedback of the picking task on the PDA. (Zeng et al., 2024)

- The system will then automatically print out the picking completion list, and after the employee manually signs the list, the goods-picking process is officially completed. (Zeng et al., 2024)

6.2.4. Shipping Process

After the goods have been checked, the workflow at the IKEA Fuzhou distribution warehouse advances to the delivery phase:

(1) Goods Handover

- The verification personnel hand over the goods and the goods list to the third-party logistics company. (Zeng et al., 2024)

(2) Verification and Receipt

- The logistics company then checks the name and contents of the goods. (Zeng et al., 2024)
- Once confirmed, the personnel responsible from the logistics company sign the receipt, meaning the entire picking and delivery process from IKEA's internal product order to the third-party logistics company is officially completed. (Zeng et al., 2024)

6.3. Warehouse design and layout

Warehouse design is a complex and interrelated decision-making process involving multiple structural and operational dimensions. According to Gu et al. (2010), warehouse design can be classified into five interconnected decision areas: overall structure, department layout, operation strategy selection, equipment selection, and sizing and dimensioning. The warehouse system of IKEA Fuzhou can be systematically analyzed under this framework.

6.3.1. Overall Structure

According to Zeng et al. (2024), the IKEA Fuzhou facility adopts a rectangular block-structured floor layout integrating both retail and logistics functions within the same operational level. Unlike conventional standalone distribution centers, this configuration incorporates furniture display areas, self-pick-up zones, non-self-pick-up storage, logistics centers, and distribution centers into a unified spatial system.

The internal warehouse structure consists of high-rise shelving units arranged along parallel longitudinal aisles. Each shelving block exhibits a vertically segmented rectangular prism shape, divided into an upper storage area and a lower picking area. The longitudinal aisle configuration enables linear movement of picking trolleys and forklifts, thereby reducing cross-traffic interference. This structural design corresponds to a flow-oriented layout, which aims to streamline travel paths and minimize congestion within the picking zone (Zeng et al., 2024).

The hybrid retail–logistics arrangement reflects a strategic trade-off between customer accessibility and operational efficiency. By positioning the self-pick-up area between the display zone and logistics center, the system facilitates direct customer retrieval while maintaining backend replenishment capability.

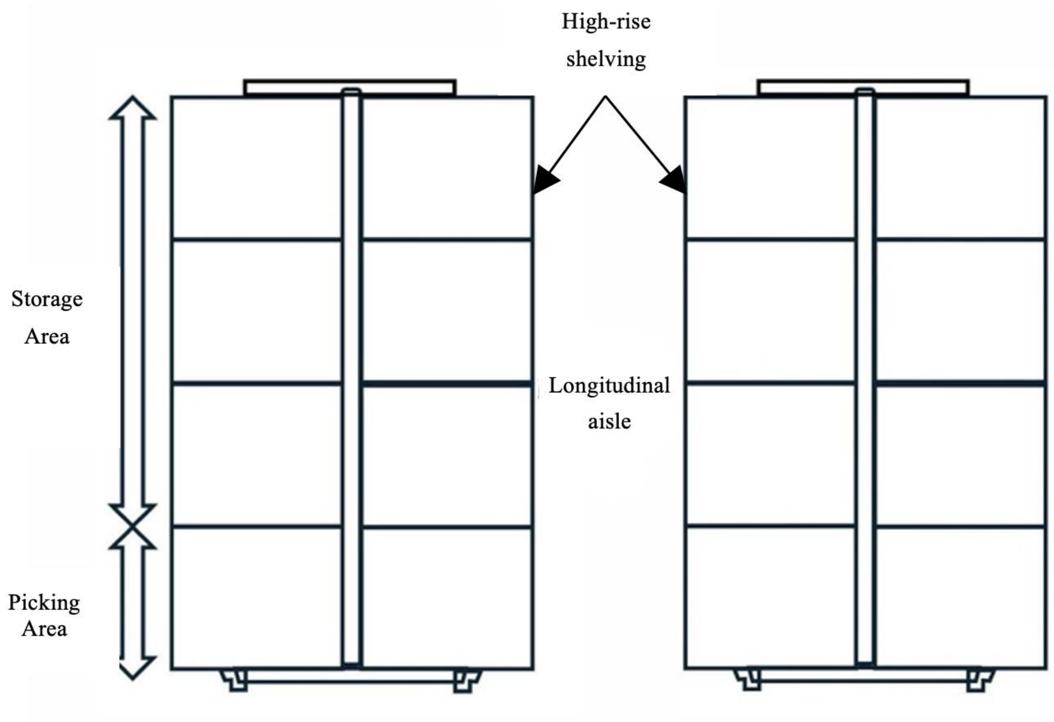

Figure 3: Distribution of IKEA distribution warehouse shelf picking.

Source: Zeng et al., 2024

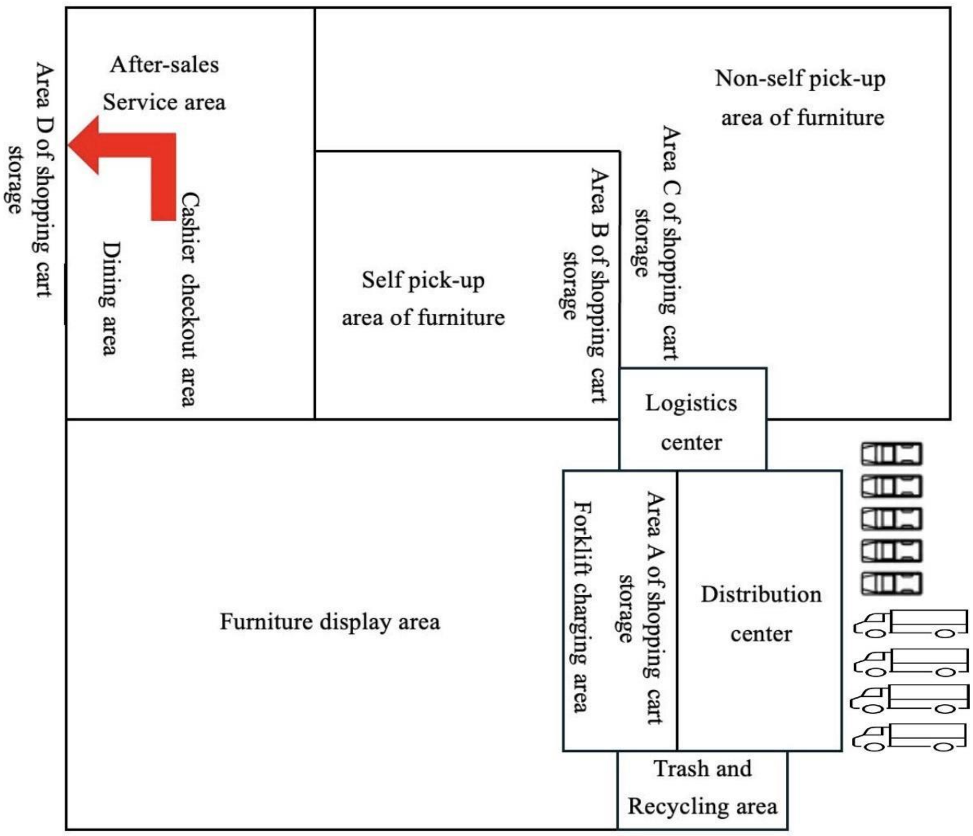

Figure 4: Layout of operations on the second floor of Fuzhou IKEA.

Source: Zeng et al., 2024

6.3.2. Department Layout

In IKEA Fuzhou, functional zoning is clearly defined to reduce travel distance and improve order processing efficiency.

The receiving dock is positioned adjacent to inbound staging areas to facilitate rapid pallet unloading. Bulk storage areas occupy the central portion of the warehouse and utilize high-bay racking systems designed to accommodate IKEA's flat-pack furniture format. The picking zones are organized by aisle and rack coding, enabling systematic SKU identification and reducing search time.

Importantly, consolidation and packing stations are located near outbound docks to minimize post-picking transport distance. This spatial logic aligns with layout optimization principles aimed at reducing internal material handling costs.

Furthermore, SKU placement follows demand-based allocation principles. High-demand items are positioned closer to dispatch areas, while low-frequency items are stored deeper within the warehouse. This configuration supports travel distance reduction strategies identified in picking optimization studies (Zeng et al., 2024).

6.3.3. Operation Strategy Selection

IKEA Fuzhou adopts a zone-based picking strategy combined with an S-shaped routing method. Under this approach, pickers are assigned specific zones, and within each aisle containing at least one required SKU, they traverse the full aisle before proceeding to the next.

This strategy reduces routing complexity while maintaining acceptable travel efficiency, particularly in large rectangular layouts. The order fulfillment process typically follows a structured sequence: order release, picker assignment, item picking, verification, consolidation, and dispatch. Such a sequential workflow is consistent with Petri net-based process modeling, where operational states are interlinked to ensure throughput optimization and delay minimization.

The hybrid fulfillment model—serving both offline retail customers and online orders—further necessitates synchronized scheduling and resource allocation to prevent congestion.

Zeng et al. (2024) describe a structured multi-stage fulfillment process at IKEA Fuzhou, including: Order generation => Order allocation => Goods picking => Goods checking => Goods delivery => Order completion.

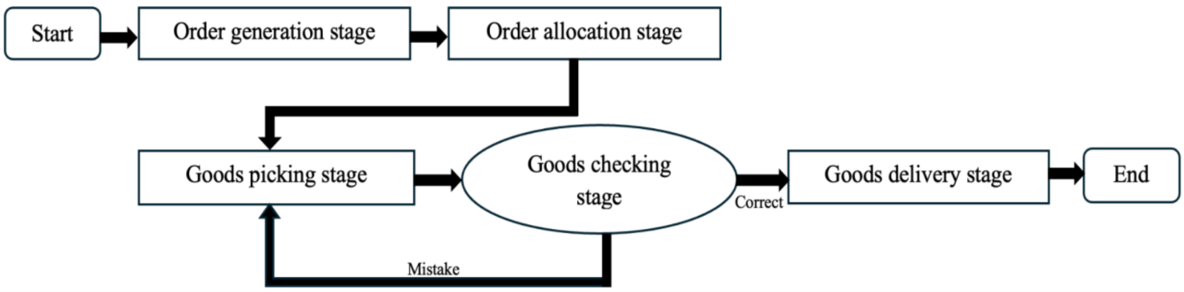

Figure 5: Picking process of distribution warehouse

Source: Zeng et al., 2024

A feedback loop embedded within the goods checking stage allows errors detected during checking to trigger rework in the picking stage, thus ensuring order completeness and integrity.

In addition, task allocation is based on a proximity principle that assigns pick tasks to employees closest to required items. Exclusive task assignment prevents duplicate picking, enhancing operational control and reducing congestion during peak fulfilment periods.

6.3.4. Equipment Selection

Equipment selection in IKEA Fuzhou is aligned with both warehouse shape and operational strategy. The facility employs forklifts, pallet jacks, and picking trolleys compatible with parallel aisle systems. The aisle width is calibrated to allow safe maneuverability of forklifts while maintaining high storage density.

The use of selective pallet racking and high-bay shelving maximizes vertical space utilization within the rectangular structure. The flat-pack nature of IKEA products enhances cube utilization and reduces void space, increasing storage efficiency (Zeng et al., 2024).

6.3.5. Sizing and Dimensioning

IKEA Fuzhou covers about 112,000 m², operating as a large integrated retail–logistics facility. It includes four floors: a basement parking level, ~15,000 m² of leasing space on the first floor, and ~40,000 m² on the second and third floors for combined retail and warehousing (Zeng et al., 2024). The rectangular layout supports clear zoning and efficient flows, while the large single-floor configuration reduces vertical transfers.

Vertical space is maximized through high-bay racking, increasing capacity without expanding footprint (Wang, Li & Hu, 2024). Aisle width reflects a trade-off: narrow aisles improve storage density, while wider aisles enhance movement efficiency and safety (Saptadi et al., 2025). Thus, layout decisions must align with equipment and throughput, and be optimized together with picking and handling systems (Boysen et al., 2019).

Space allocation is demand-driven, with large areas for storage and picking due to high SKU variety, and appropriately sized receiving, staging, and dispatch zones to avoid bottlenecks. Overall, sizing decisions directly affect capacity and service: under-sizing causes congestion, while over-sizing leads to underutilization and higher costs, requiring alignment with demand and long-term strategy.

6.4. Integration of warehouse and retail

6.4.1. Structural integration model

IKEA Fuzhou implements a vertically integrated warehouse–retail configuration, in which showroom, self-service storage, and outbound logistics functions are co-located within a single facility. In contrast to conventional retail formats—where distribution centers are physically separated from stores—IKEA consolidates customer-facing retail activities and storage operations under one roof. This integrated approach is enabled by IKEA's standardized flat-pack product strategy, which facilitates palletized storage that is directly accessible to customers (Zeng et al., 2024).

Furthermore, process modeling of IKEA's warehouse operations using modular Petri Nets demonstrates that this configuration reduces redundant handling stages by synchronizing receiving, storage, and picking activities within a unified material flow system (Zeng et al., 2024). From a theoretical perspective, warehouse design is shaped by four key determinants: inventory characteristics, throughput and service requirements, building footprint and capital constraints, and labor cost structure (Bartholdi & Hackman, 2019). IKEA's integrated configuration can thus be systematically interpreted as an alignment of these dimensions to achieve operational efficiency and service effectiveness.

6.4.2. Inventory characteristics

Inventory characteristics—including SKU quantity, physical dimensions, and turnover rates—directly influence storage configuration (Bartholdi & Hackman, 2019). IKEA products are standardized, flat-packed, and geometrically regular, which facilitates dense pallet stacking and high-bay racking systems.

Because a relatively small proportion of SKUs accounts for the majority of sales volume, IKEA differentiates between bulk storage and high-access picking zones. The flat-pack format enables customers to retrieve products directly from pallet racks, allowing the warehouse itself to function as a retail picking area (Zeng et al., 2024).

6.4.3. Throughput and service requirements

Throughput volume and response time requirements shape facility layout (Bartholdi & Hackman, 2019). IKEA operates in a high-volume retail environment where customers expect immediate product availability.

Instead of traditional warehouse staff performing order picking, IKEA transfers picking activity to customers in the self-service warehouse zone. The Petri Net modeling study demonstrates that IKEA's integrated process structure reduces internal processing stages and enhances flow continuity (Zeng et al., 2024).

High throughput demand therefore justifies a layout that minimizes internal travel and material handling steps.

6.4.4. Building footprint and capital constraints

Physical constraints and capital investment influence equipment selection and spatial design (Bartholdi & Hackman, 2019). IKEA concentrates capital into a single large-format building rather than operating separate retail and distribution facilities.

High-bay racking systems are employed to enhance vertical cubic utilization, allowing warehouses to increase storage capacity within existing spatial constraints. Recent academic work shows that configuring warehouse racking to use vertical space efficiently is a key design strategy to maximize storage volume without expanding the building footprint, particularly in environments with high demand for capacity and land cost pressures (Wang, Li & Hu, 2024).

Moreover, the IKEA Sustainability Report (2024) emphasizes logistics efficiency and energy optimization as corporate priorities. Integrating storage and retail functions reduces duplicated transport activities and supports energy-efficient building utilization.

6.4.5. Labor cost structure

Order picking—particularly travel time—is typically the most labor-intensive warehouse activity (Bartholdi & Hackman, 2019). IKEA reduces internal labor dependency by transferring product retrieval tasks to customers in the self-service zone.

This reflects the economic trade-off between space and labor described in warehouse design theory: companies may increase spatial allocation to reduce labor cost. By allowing customer picking, IKEA lowers paid picking labor and simplifies warehouse operations.

Such labor–space substitution is consistent with the conceptual “exchange rate” framework proposed by Bartholdi & Hackman (2019).

6.4.6. Strategic Implications

The integration of warehouse and retail at IKEA Fuzhou represents a strategic alignment of spatial design, inventory characteristics, throughput demand, capital allocation, and labor economics.

This model reduces handling stages, minimizes internal logistics duplication, and supports sustainability objectives through improved energy and transport efficiency (IKEA

Sustainability Report, 2024). The integrated configuration functions as a structural optimization that balances physical space and labor time within a unified operational system.

6.5. Assessment

6.5.1. Strength

(1) Cost Optimization

The self-service warehouse at IKEA Fuzhou uses flat-pack design and high-bay racking to optimize both horizontal and vertical space. Flat-pack reduces product volume, increasing storage density (Jonsson & Foss, 2011). By integrating retail and storage, the model lowers cost per square meter and improves asset utilization compared to traditional separated systems (Bartholdi & Hackman, 2014).

Picking typically accounts for 50–70% of warehouse costs and 30–40% of operating time (Tompkins et al., 2010; Bartholdi & Hackman, 2014). In conventional systems, all picking is internal and labor-intensive. At IKEA Fuzhou, customers perform a significant share of picking, reducing labor costs, improving Picking Cost per Order, and increasing revenue per employee. This shifts part of logistics costs to a customer-participated model and reduces labor pressure during peak periods.

(2) Throughput and service level

Integrating retail and storage shortens the time from display to delivery, improving inventory turnover (Jonsson & Foss, 2011). Stock availability is maintained at above 95% (Silver et al., 2017), with rapid replenishment enabled by the integrated design without significantly increasing safety stock.

The S-shaped routing strategy reduces travel distance and improves efficiency in parallel-aisle systems (Purwanto & Oktarina, 2024). At IKEA Fuzhou, it is applied to both internal operations and customer flow (showroom => warehouse => checkout => delivery), ensuring complete item coverage while enhancing both operational efficiency and customer experience.

6.5.2. Limitations

Although the traditional S-shaped picking strategy is widely used and simple to implement, the empirical results from the IKEA Fuzhou warehouse show that it may not be optimal in terms of travel distance and picking time, especially as order complexity increases.

The empirical findings from the IKEA Fuzhou case indicate that while the S-shaped routing strategy ensures operational simplicity, it does not achieve distance minimization under increasing order complexity. For a 50-item order, the average picking distance under the S-shaped strategy reached 927.56 m, compared to 389.56 m under a Genetic Algorithm (GA) optimized route, representing a 58% reduction. Similarly, total picking time decreased from 56.64 minutes to 44.09 minutes, corresponding to an improvement of approximately 22% (Zeng et al., 2024).

These results suggest that the performance gap widens as SKU dispersion increases, indicating scalability limitations of the S-shaped heuristic. Therefore, routing optimization represents a key area for operational enhancement, particularly in high-volume retail warehouses. Integrating algorithm-supported route planning could reduce non-value-added travel time, improve labor productivity, and enhance throughput capacity without requiring structural layout redesign.

Table 1: Comparison of picking distance and time between S-shaped and GA Routing at IKEA Fuzhou

Metric	**S-shaped Strategy**	**GA Optimization**	**Improvement**
Distance (50-item order)	927.56 m	389.56 m	–58 %
Time (50-item order)	56.64 min	44.09 min	–22 %
Distance trend	Increases sharply with order size	Scales more efficiently	Better scaling

Source: Zeng et al., 2024

6.6. Implications for Vietnam

The IKEA Fuzhou model demonstrates strong applicability to Vietnam’s retail context, particularly in sectors characterized by bulky products, high SKU diversity, and cost sensitivity.

First, Vietnam’s furniture retail sector is characterized by fragmented distribution networks, small-scale showrooms, and physically separated storage facilities, which collectively generate significant inefficiencies in handling bulky goods. Unlike standardized FMCG supply chains, furniture logistics involves low handling frequency but high volumetric complexity, making traditional multi-echelon warehousing systems suboptimal.

In this context, the IKEA Fuzhou model offers a structurally aligned solution. The integration of warehouse and retail functions directly addresses the double-handling problem, where goods are repeatedly moved between storage and display points. Moreover, the adoption of flat-pack design principles reduces cubic volume per SKU, which is particularly relevant in Vietnam where urban logistics costs and land prices—especially in cities such as Hanoi and Ho Chi Minh City—are rapidly increasing.

The urgency of adopting this model stems from the sector's ongoing transition toward organized retail formats and increasing demand for cost-efficient last-mile delivery. By implementing high-density storage and self-service retrieval systems, firms can significantly reduce labor intensity while improving inventory accessibility. Post-adoption, this would translate into lower operational costs, faster order fulfillment, and improved customer experience, particularly in urban consumption hubs.

Second, the electronics and home appliances sector in Vietnam is highly sensitive to demand volatility, rapid product obsolescence, and high unit value, which places considerable pressure on inventory accuracy and service reliability. Currently, many retailers operate under decentralized inventory systems, leading to stock imbalances, delayed replenishment, and increased markdown risks.

The IKEA Fuzhou model becomes particularly relevant in this context due to its emphasis on real-time inventory visibility and synchronized replenishment flows. In Vietnam, where consumer expectations for rapid fulfillment are rising—driven in part by the growth of e-commerce platforms—the inability to maintain accurate stock levels can directly erode competitiveness.

Adopting an integrated warehouse–retail model would allow firms to centralize inventory while maintaining front-end accessibility, thereby reducing safety stock requirements and improving turnover ratios. Furthermore, spatial integration facilitates shorter replenishment lead times, which is critical for high-value goods with fluctuating demand patterns.

Consequently, the model enables Vietnamese retailers to achieve higher service levels, reduced inventory holding costs, and improved responsiveness to market demand, strengthening their position in an increasingly competitive retail landscape.

Third, the DIY and construction materials sector in Vietnam presents a unique set of challenges, including extreme SKU diversity, irregular product dimensions, and high operational complexity in picking and handling processes. Many existing facilities rely on manual, unstructured picking systems, which lead to inefficiencies, errors, and low throughput rates.

The IKEA Fuzhou model provides a systematic approach to addressing these constraints through zoning strategies, structured picking routes, and optimized layout configurations. These features are particularly critical in Vietnam, where labor productivity in logistics remains relatively low compared to regional benchmarks.

The urgency for adoption is further reinforced by the rapid urbanization and construction growth across Vietnam, which is driving increased demand for construction materials and DIY products. Without operational optimization, existing warehouse systems will struggle to scale efficiently.

By implementing structured warehouse design and routing logic, firms can significantly reduce picking errors, minimize travel distance, and increase throughput capacity. Post-adoption, this would result in higher operational accuracy, improved labor productivity, and enhanced scalability, enabling firms to meet growing demand without proportional increases in labor or space.

Fourth, Vietnam’s retail sector is currently undergoing a structural transformation from traditional trade (wet markets, small independent stores) toward modern retail and wholesale formats. However, a key limitation in this transition is the continued reliance on segregated warehouse and retail systems, which creates redundant handling, limited inventory visibility, and inefficiencies in replenishment.

The IKEA Fuzhou model aligns closely with the needs of this transition by promoting spatial and functional integration. For wholesale and large-format retail operators, consolidating storage and retail operations enables real-time inventory synchronization, reducing discrepancies between recorded and actual stock levels.

The urgency of adopting such a model is amplified by increasing competition from both domestic and international retail chains, as well as the growing importance of omnichannel retailing. Without integrated systems, Vietnamese retailers may face structural disadvantages in terms of cost efficiency and service responsiveness.

Following adoption, firms can benefit from reduced internal logistics costs, enhanced inventory transparency, and improved coordination between supply chain functions. This not only supports operational efficiency but also facilitates the development of data-driven retail strategies, which are essential for long-term competitiveness.

7. Limitations

This study has several limitations. First, it relies primarily on secondary data and a single-case analysis of IKEA Fuzhou, which limits empirical validation and generalizability to other contexts. Second, the findings are context-specific, as IKEA operates with strong financial resources, standardized systems, and advanced logistics capabilities that may not be directly replicable in Vietnam. Third, the research focuses mainly on warehouse layout and operational processes, without extensive quantitative performance measurement or in-depth analysis of financial and sustainability outcomes.

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