OPTIMIZING INVENTORY MANAGEMENT IN THAI PRODUCTS WAREHOUSE: SKU RATIONALIZATION GUIDELINES FROM A TRAVEL RETAILER PERSPECTIVE

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ABSTRACT

This study addresses inventory management challenges in a travel retail company, where a recently expanded warehouse reached full capacity within two years. The research investigates the root causes of the storage issue, identifying excess stock and ineffective SKU (Stock Keeping Unit) management as primary contributors. The paper proposes a systematic approach to SKU rationalization aimed at optimizing inventory, reducing costs, and improving turnover rates without negatively impacting customer satisfaction. The methodology integrates data-driven analysis of profitability, sales rates, and inventory turnover to guide decisions on retaining, discontinuing, or reassessing products.

The findings demonstrate that SKU rationalization can enhance inventory control, streamline product assortment, and align stock levels with consumer demand, thereby improving operational efficiency and profitability. While the study provides actionable insights for managing the Thai Products category in travel retail, its applicability to other product categories warrants further exploration. Recommendations are made for implementing targeted SKU reduction strategies to balance inventory optimization with customer service requirements, contributing to more effective supply chain management in retail contexts.

Key Words: *SKU rationalization, Inventory turn, Rate of Sale, Travel Retail, SKU reduction, Product portfolio management, SKU Rationalization Score*

บทคัดย่อ

งานวิจัยนี้มุ่งเน้นการจัดการสินค้าคงคลังในบริษัทค้าปลีกสำหรับนักท่องเที่ยว ซึ่งประสบปัญหาโกดังสินค้าที่เพิ่งสร้างเสร็จเก็บสินค้าเต็มความจุภายในสองปี งานวิจัยนี้สำรวจสาเหตุที่ทำให้เกิดปัญหาคลังสินค้าเต็ม และพบว่าปัญหาหลักคือการจัดการ SKU (Stock Keeping Unit) ที่มีจำนวนสินค้ามาก และหลักการจัดการที่มีอยู่ในปัจจุบันไม่อาจตอบสนองต่อความหลากหลายของสินค้า บทความนี้เสนอแนวทางการจัดการ SKU เพื่อให้การจัดการสินค้าคงคลัง มีประสิทธิภาพ ลดต้นทุน และเพิ่มอัตราการหมุนเวียน ตลอดจนไม่ส่งผลกระทบต่อความพึงพอใจของลูกค้า วิธีการที่ใช้ประกอบด้วยการวิเคราะห์ข้อมูลแบบเชิงปริมาณเกี่ยวกับความสามารถในการทำกำไร อัตราการขาย และการหมุนเวียนสินค้าคงคลัง เพื่อช่วยในการตัดสินใจเกี่ยวกับการเก็บรักษา ยกเลิก หรือประเมินใหม่ของสินค้า ผลการวิจัยแสดงให้เห็นว่าการปรับปรุง SKU สามารถเสริมประสิทธิภาพการควบคุมสินค้าคงคลัง ปรับปรุงความหลากหลายของผลิตภัณฑ์ และปรับระดับสินค้าคงคลังให้สอดคล้องกับความต้องการของผู้บริโภค ส่งผลให้การดำเนินงานมีประสิทธิภาพมากขึ้นและเพิ่มความสามารถในการทำ

Received October 30, 2024; Revised February 24, 2025; Accepted March 2, 2025
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กำไร แม้ว่าการศึกษาในครั้งนี้จะให้ข้อมูลเชิงลึกที่สามารถนำไปใช้ได้ในการจัดการสินค้าประเภทสินค้าไทยในห้างค้าปลีกสำหรับนักท่องเที่ยว แต่การนำผลลัพธ์ไปใช้กับประเภทสินค้าอื่นๆ ยังคงต้องมีการสำรวจและปรับปรุงปัจจัยเพิ่มเติม ทั้งนี้ข้อเสนอแนะจากการศึกษา แนะนำให้ดำเนินการลดจำนวน SKU อย่างมุ่งเป้าเพื่อปรับสมดุลการเพิ่มประสิทธิภาพสินค้าคงคลังกับความต้องการของบริการลูกค้า ซึ่งจะช่วยให้การจัดการซัพพลายเชนในบริบทค้าปลีกมีประสิทธิผลมากขึ้น

คำสำคัญ: การปรับปรุง SKU อัตราการหมุนเวียน อัตราการขาย ห้างค้าปลีกสำหรับนักท่องเที่ยว การลดจำนวน SKU การจัดการกลุ่มผลิตภัณฑ์ คะแนนการปรับปรุง SKU

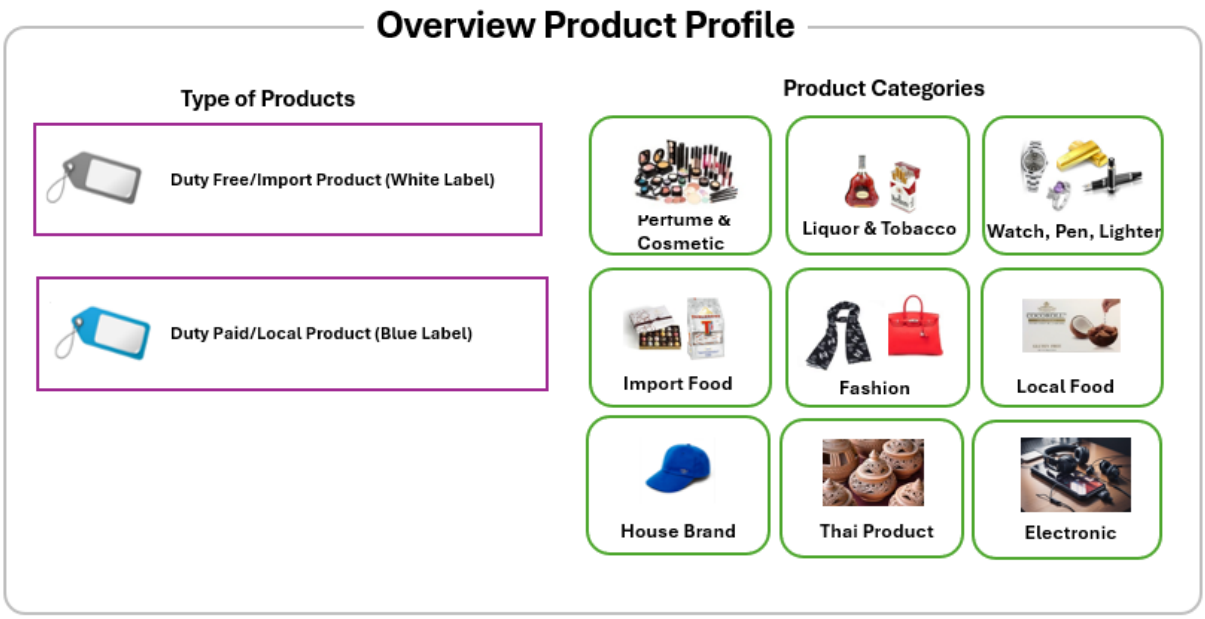
INTRODUCTION

This research aims to investigate and propose a solution to address the challenges encountered by a travel retail warehouse that reached its maximum capacity within two years of utilizing a second warehouse. This issue garnered the attention of executives and raised concerns regarding operational inefficiencies.

The company's initial investigation highlighted deficiencies in warehouse design and management. However, warehouse management alone does not encompass the entirety of the issue, as warehouses cannot independently control inbound and outbound logistics. Therefore, a comprehensive investigation of all supply chain activities, from sourcing to store operations, is necessary.

The company, referred to as TRS, categorizes its products into two main groups: (1) duty-free or imported products, which are marked with a white retail price tag, and (2) duty-paid or local products, which are marked with a blue retail price tag. There are nine main product categories, each comprising 27 subcategories, with a total of 300,000 SKUs (stock keeping units). TRS exhibits a diverse range of item counts across its categories. Specifically, there is one sub-category with over 100,000 items, six sub-categories with over 10,000 items, eleven sub-categories with over 1,000 items, and nine sub-categories with fewer than 1,000 items.

Figure 1: Travel Retailer Product Profile



In the profile analysis, the fashion category constitutes the highest proportion at 74%, while the import food category represents the lowest proportion at 0.20%. From a stock perspective, the Thai Products category holds the highest share at 35%, whereas the electronic category has the lowest share at 1%. However, in terms of total sales, the Thai Products category accounts for the highest percentage at 30%, with the electronic category contributing the least at 0.5%.

To address the challenges faced by TRS, a comprehensive analysis and set of measures have been developed. However, this article will specifically review possible solutions beyond the existing Open-to-Buy and Aging inventory strategies. Additionally, explore more practical ways, using movement analysis to help TRS to manage stock and reduce the proliferation of the total number of SKUs.

Research Objectives

The objectives of this research were as follows:

1. To assess the current inventory control practices in TRS travel retail.
2. To develop a practical SKU rationalization guideline for product portfolio management to reduce SKUs in travel retailer strategies.
3. To explore and compare SKU rationalization using TRS Inventory Aging Policy, and Multiple Factors as the SKU Rationalization Score (SRS).

Scope of the Research

This study aims to enhance the practicality of work design and improvement by analyzing the current product portfolio management workflow. To optimize the process, it will identify the nature, sequence, volumes, and frequency of orders to improve resource allocation. Data will be gathered from warehouse records, processes, and sales orders to gain insights for improvement actions.

TRS manages 26 product categories encompassing over 305,000 SKUs, each possessing unique characteristics, which complicates the development of a universal solution. Furthermore, TRS has requested practical enhancements to the decision-making process for merchandisers. Consequently, the solution proposed in this study will serve as an illustrative framework and provide guidelines for incorporating additional factors into the existing decision-making processes of a sub-category within the Thai Products category. This sub-category accounts for 521 SKUs out of a total of 10,887 SKUs.

LITERATURE REVIEW

In the literature review, we will briefly examine topics related to TRS's existing approach and additional strategies, including Open-to-Buy, aging inventory management, and a summary of the advantages and challenges of push strategy, pull strategy, and planogram. Furthermore, we will review a supplementary concept: SKU rationalization.

Open-to-Buy

Open-to-Buy (OTB) represents a critical merchandise planning tool that determines the difference between planned purchases and actual inventory commitments over a specific period (Levy & Weitz, 2019). In today's dynamic retail environment, effective OTB management has become increasingly vital for maintaining competitive advantage and financial stability. Research has shown that proper inventory management systems significantly impact retail

performance (Mattila et al., 2002). As an essential financial instrument, Open-to-Buy (OTB) assists retailers in managing their inventory levels effectively, ensuring sufficient cash flow for future acquisitions, and preventing budget overruns or shortfalls.
The formula for OTB can be expressed as:

$$\text{OTB Budget} = (\text{Planned Sales} + \text{Planned Markdowns} + \text{Target Ending Inventory}) - (\text{Current On} - \text{Hand Inventory} + \text{Outstanding Purchase Orders})$$

- Planned Sales: Forecasted sales for the period.
- Planned Markdowns: Expected reductions in price.
- Planned Inventory: Desired inventory levels at the end of the period.
- Current On-hand Inventory: Current inventory levels.
- Outstanding Purchase Orders: Inventory that has been ordered but not yet received.

This calculation helps retailers control inventory investment while maintaining sufficient stock to meet customer demand. Studies by (Thomassey, 2010) demonstrate that successful implementation requires integration with forecasting systems and point-of-sale data.

Table 1: OTB Benefits and Challenges

Benefits	Challenge
Research in retail inventory management identifies several key advantages (Raman et al., 2001): - Improved cash flow management - Reduced excess inventory - Better alignment of stock with seasonal demands - Enhanced profit margins through optimal inventory levels	Key implementation challenges include: - Complexity in forecasting market demands - Need for accurate and timely data - Balance between stock availability and overstock risks

Aging Inventory

Aging inventory represents a significant challenge in supply chain management, potentially leading to increased holding costs, reduced product quality, and capital inefficiency. Van Donselaar et al. (2016) demonstrated in their empirical study how perishable inventory aging affects various retail operations and financial metrics. Aging inventory presents unique challenges in retail settings, where product lifecycles are increasingly shorter and consumer preferences rapidly evolve. As highlighted by Fisher et al. (2000), the cost of managing aging inventory in retail can account for up to 12% of total operational costs.

Further research by Diabat et al. (2012) quantified the cost implications of aging inventory in pharmaceutical supply chains, showing exponential increase in holding costs over time.

Broek meulen & van Donselaar (2019) demonstrated that dynamic replenishment policies can significantly reduce waste from aging inventory in retail environments. Their research showed:
- 15-25% reduction in waste through improved ordering policies
- Significant impact of shelf space allocation on product aging
- Importance of demand forecasting accuracy

SKU Rationalization

SKU rationalization in retail refers to the systematic process of evaluating and optimizing a retailer's product assortment by identifying and eliminating underperforming or redundant Stock Keeping Units (SKUs). The aim is to streamline inventory management, reduce costs, and improve profitability without negatively impacting customer satisfaction. This process is increasingly critical in modern retailing, where effective inventory control directly influences the financial health of businesses.

Figure 2: SKU Rationalization and Product Assortment Reduction

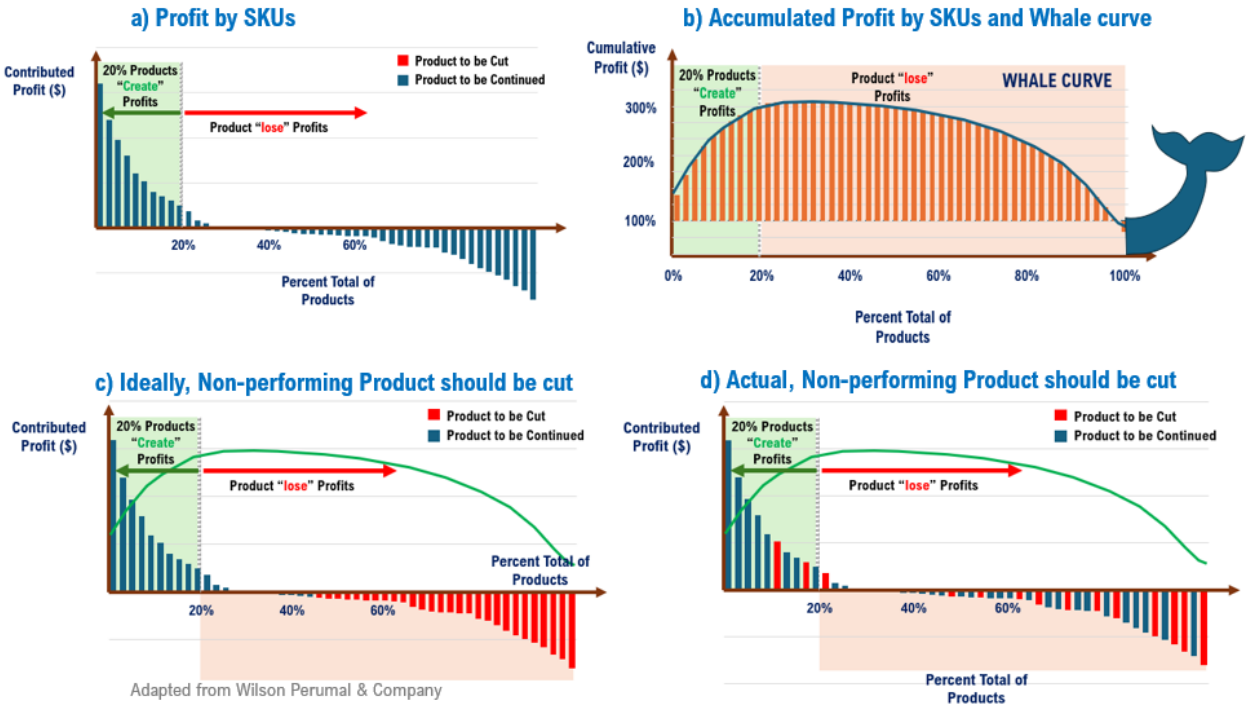


Figure 2 (a) illustrates the typical Whale Curve, where 20-30% of products typically generate 300% of profits, while the remaining 70-80% of products result in a 180% loss due to holding costs, defects, and pilferage. When plotting cumulative profit, the resulting curve resembles a whale, hence the term 'Whale Curve' as shown in Figure 2 (b).

Figure 2 (c) depicts the ideal scenario in which a retailer removes non-performing products from their portfolio. However, in practice, it is not feasible to eliminate all non-performing products, as some items may align with the retailer's target market and customer expectations. For instance, a sewing kit in a convenience store may not be a fast-moving item, but it is retained on shelves due to its classification as a convenience and emergency item. Therefore, retailers should carefully rationalize their assortment. To manage the total number of SKUs, retailers should consider removing some items from the top 20% and a greater number from the bottom 80% of the product list, as illustrated in **Figure 2** (d).

Integrative Decision-Support Frameworks in Retail Operations

Recent integrative decision-support frameworks have begun to link assortment planning with other aspects of retail operations. Studies on product variety in retail environments indicate that

high demand variability can be mitigated by carefully managing the assortment, thereby reducing excess inventory and stockouts (K. Sweeney, J. Riley and Y. Duan, 2022). More comprehensive models, such as those addressing shelf space and replenishment constraints, incorporate movement rates and aging inventory as inputs. These models suggest that a quantitative assessment of turnover (movement analysis) coupled with measures of inventory aging can drive decisions that lead to:

- Improved fill rates and reduced stockout incidences.
- More efficient use of limited shelf space.
- Lowered operational costs due to reduced need for frequent, ad-hoc replenishment. (A. Hübner and H. Kuhn, 2024)

Thus, integrating these factors into assortment optimization not only streamlines the product portfolio but also supports broader supply chain efficiencies. M. Gilliland (2011) argues that maintaining a large number of low-volume SKUs can impair revenue, profit, and service levels. The paper emphasizes that pruning such items simplifies forecasting, reduces handling costs, and allows a company to focus its resources on high-performing products.

Benefits of SKU Rationalization

Stock Keeping Unit (SKU) rationalization has emerged as a critical strategy in modern retail management, focusing on optimizing product assortments while maximizing profitability and operational efficiency. Through analysis of peer-reviewed literature, we explore the impact of SKU rationalization on retail performance, customer satisfaction, and supply chain efficiency. Research demonstrates that consumer perception of variety can be maintained despite significant SKU reduction. Broniarczyk et al. (1998) found that retailers could eliminate 25-50% of SKUs without negative impact, provided three critical conditions were met: retention of favorite items, maintenance of category space, proper shelf organization.

Attribute-Based Reduction Strategy and Consumer Response

Building on these foundations, Boatwright and Nunes (2001) advanced our understanding by introducing an attribute-based approach to SKU rationalization. Their research revealed that systematic reduction based on product attributes could actually lead to sales increases in 75% of studied categories. This counterintuitive finding suggested that reducing choice complexity through careful attribute-based elimination of redundant variations could enhance rather than detract from category performance. Their work also introduced the important distinction between "deep" and "shallow" cuts in assortment reduction, with deeper cuts often producing better results.

Long-term Effects and Customer Retention

The temporal dimension of SKU rationalization was extensively explored by Borle et al. (2005), who examined the long-term effects on customer retention. Their research revealed complex patterns in how assortment changes influence shopping frequency and purchase behavior across different customer segments. These findings were further elaborated by Sloot, Fok, and Verhoef (2006), who documented distinct patterns in short-term versus long-term category sales impacts. Their work highlighted the importance of considering both immediate and extended temporal effects when planning assortment reductions.

Consumer Processing and Variety Perception

Van Herpen and Pieters (2002) provided valuable insights into how consumers perceive and evaluate assortment variety. Their research expanded the attribute-based approach by exploring

how consumers cognitively process assortment information, highlighting the importance of organization and attribute structure in variety perception. This understanding clarifies why effective SKU rationalization can maintain perceived variety even with significant reductions in actual SKU count. A well-curated assortment reduces decision fatigue for shoppers, making it easier for them to find desired products. Additionally, Sloot, Fok, and Verhoef (2006) stated that focusing on fewer, high-demand SKUs can improve stock availability and service levels, thereby enhancing customer satisfaction and loyalty.

In summary, SKU rationalization is a strategic tool for retail inventory management, offering significant benefits in terms of cost reduction, inventory optimization, and profitability enhancement. However, it requires careful planning and execution to avoid negative impacts on customer satisfaction and supplier relationships.

Inventory Management Strategies Conclusion

The open-to-buy strategy is an essential tool for merchandisers, enabling them to manage inventory levels effectively and optimize financial resources. By carefully planning and controlling inventory purchases, retailers can enhance their ability to meet customer demand, improve cash flow, and increase profitability.

Table 2: Comparison of Inventory Management Strategies relates to TRS

	Strategies	Advantages	Disadvantages
TRS Inventory Management and Control Strategies (Existing)	Open-to-Buy (OTB)	- Controls over-purchasing - Improved cash flow management - Reduced excess inventory - Aligns inventory levels with sales trends or seasonal demands	- Requires accurate sales forecasting - Can limit flexibility in responding to market changes - May lead to stockouts if not managed properly
	Inventory Turn	- Indicates efficiency in inventory management - Helps identify slow-moving items - Encourages better purchasing decisions	- High turnover may lead to frequent stockouts - Low turnover can indicate overstocking or poor sales - Requires continuous monitoring and adjustment
	Pull Strategy	- Reduced Overstocking: Aligns inventory with actual customer demand, minimizing excess stock. - Lower Holding Costs: Decreases costs related to storing inventory, as products are ordered as needed. - Demand Responsiveness: More adaptable to changes in customer preferences, leading to better customer satisfaction.	- Stockout Risk: Higher potential for stockouts if demand spikes unexpectedly, potentially losing sales. - Supply Chain Dependence: Requires a highly reliable and flexible supply chain to respond quickly to demand changes. - Higher Ordering Costs: Frequent replenishment can lead to increased ordering and administrative costs.

Table 3: Comparison of Inventory Management Strategies relates to TRS (Cont.)

	Strategies	Advantages	Disadvantages
TRS Inventory Management and Control Strategies (Existing)	Push Strategy	- Steady Supply: Ensures shelves are always stocked, reducing the risk of stockouts. - Economies of Scale: Bulk purchasing can lead to cost savings through discounts and reduced shipping costs. - Reduced Lead Times: Products are readily available for customers, enhancing shopping experience. - Applied when there is promotion (push to store)	- Overstocking Risk: High risk of excess inventory, leading to markdowns and obsolescence. - Demand Forecasting: Requires accurate demand predictions to avoid overproduction. - Holding Costs: Increased costs for storing large quantities of inventory, including warehousing and insurance.
	Planogram	- Optimized Shelf Space: Planograms help in efficiently utilizing shelf space, ensuring that high-demand products are prominently displayed. - Improved Sales: By strategically placing products, planograms can enhance product visibility and boost sales. - Consistency Across Stores: Ensures uniformity in product placement across multiple store locations, providing a consistent shopping experience. - Inventory Control: Helps in maintaining optimal inventory levels by clearly defining product placement and stock quantities.	- Implementation Cost: requiring specialized software and training - Inflexibility: Planograms can be rigid, making it difficult to quickly adapt to changes in consumer demand or new product introductions. - Limited Customization: May not account for local preferences or store-specific factors, potentially leading to suboptimal product placement - Complexity: Managing and updating planograms for large product assortments can be complex and labor-intensive. - Dependency on Accurate Data: Effectiveness of planograms relies on accurate sales and inventory data, which can be challenging to maintain
TRS Enhanced Solutions (Additional)	Rate of Sales and Movement Analysis	- Provides insight into product performance - Helps in demand forecasting - Assists in optimizing inventory levels	- Can be influenced by seasonal variations - May not account for external factors affecting sales - Requires accurate and timely sales data
	SKU Rationalization	- Reduces complexity and costs in inventory management - Improves focus on high-performing product and reduce assortments - Enhances operational efficiency	- Risk of eliminating products that have niche but loyal customer bases - Can lead to reduced variety for customers- Requires thorough analysis and understanding of product performance

RESEARCH METHODOLOGY

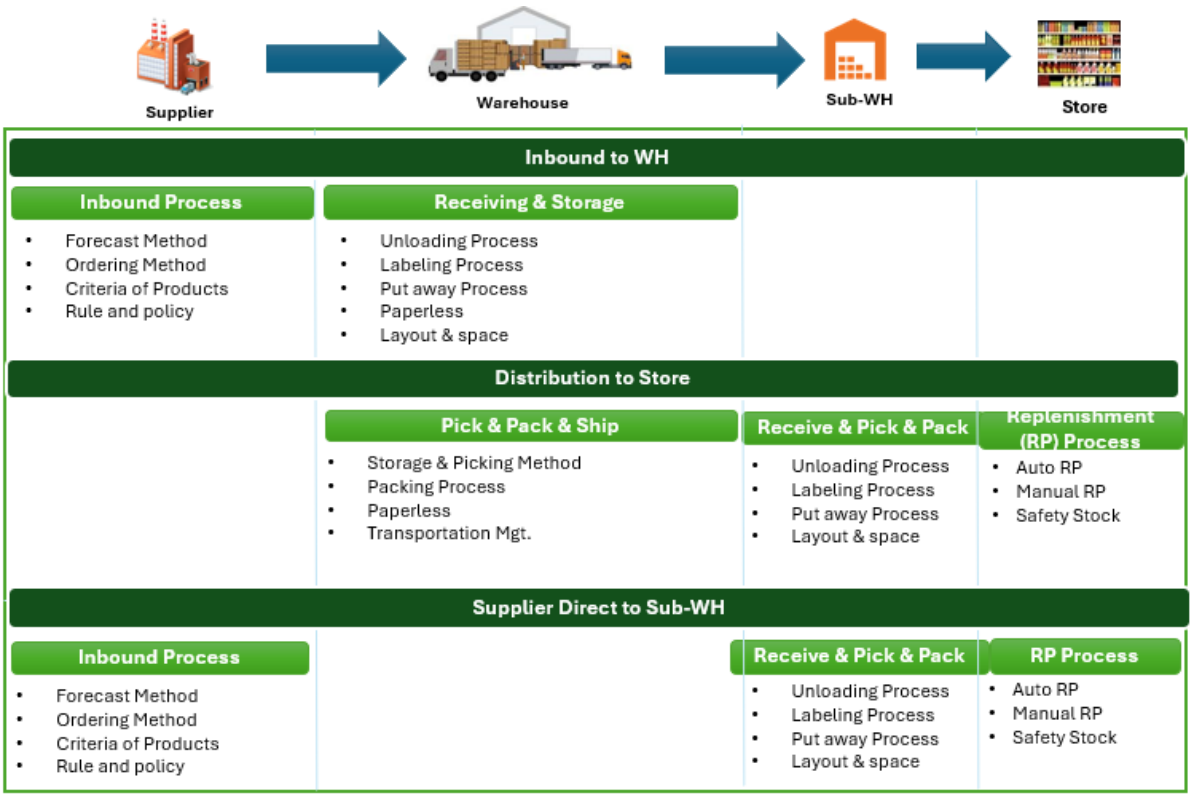
The research methodology employed in this study was designed to comprehensively assess the overall workflow of a travel retailer and to develop effective solutions aimed at reducing or limiting the proliferation of SKUs, which contribute to excessive stock levels. This study utilized qualitative and quantitative analyses to ensure a thorough understanding of the underlying issues, in addition to the existing inventory strategies, as found in Table 2.

Data and Workflow Collection

Upon reviewing the high-level operational assessment of TRS (**Error! Not a valid bookmark self-reference.**) and the product portfolio (

Figure **1**), it is apparent that TRS manages an extensive range of products, totaling 305,000 SKUs. Despite the company's efforts to control SKUs through the open-to-buy method and an ageing policy aimed at limiting inventory turnover to 2.75 turn per year, these strategies are not uncommon in the retail sector. However, their effectiveness in addressing the specific challenges faced by TRS warrants further examination.

Figure 3: As-is TRS Operational Assessment

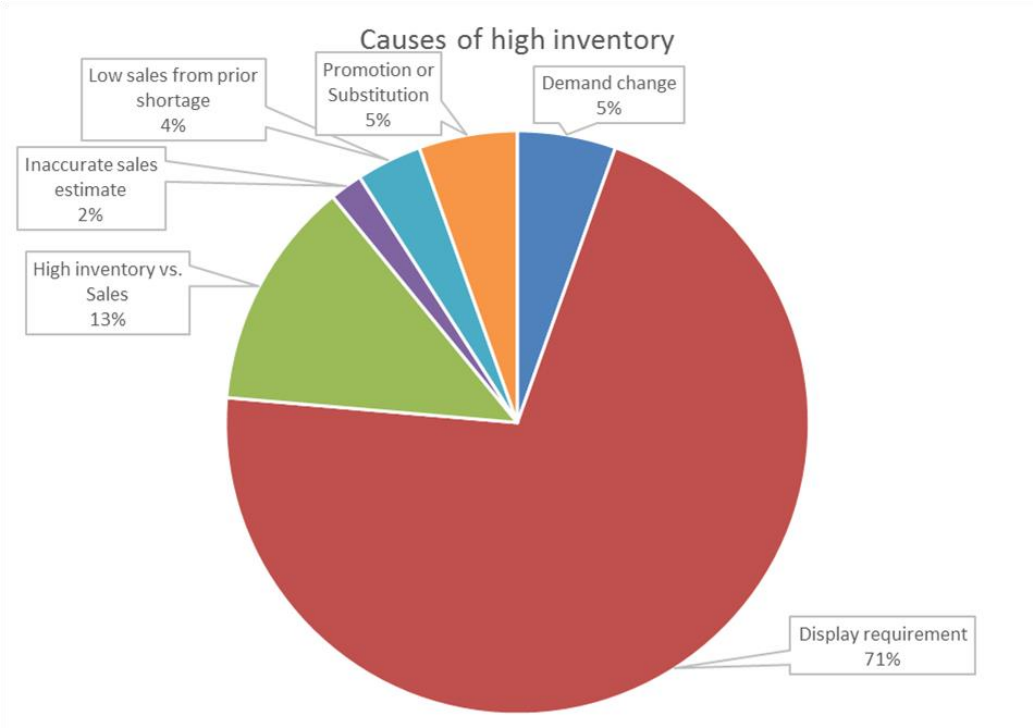


Business Analysis

From **Figure 4**, The majority of items with high inventory levels are those that require display. This issue is particularly pronounced at the Store location, where numerous shops each maintain their own inventory to meet minimum display requirements. There are opportunities to consolidate the inventory of these shops to optimize stock levels. Additionally, another significant contributor to high inventory levels is the practice of maintaining more stock than necessary relative to sales. This indicates potential opportunities to reduce inventory levels through more precise inventory management practices.

The high number of SKUs is primarily driven by merchandisers' efforts to enhance the attractiveness of their shops by offering a wide variety of products. Despite the already extensive range of products/SKUs, merchandisers have reported a persistent need for even greater diversity. This need is underscored by customer feedback, which frequently highlights a perceived lack of desired products.

Figure 4: Causes of High Inventory



Assess Inventory Control Strategy

Table 4 demonstrates that TRS travel retailers have already implemented inventory management and control strategies categorized. For inbound inventory management, the primary strategy employed is Open-to-Buy (OTB). The OTB strategy allows retailers to plan and control their purchasing activities within a specified budget, ensuring optimal stock levels and minimizing excess inventory. As, OTB strategy limits merchandiser to buy new products, they are required to eliminate some of the existing products in their portfolio. Conversely, the inventory turn and aging strategy is also employed to manage stock within the warehouse. This strategy emphasizes the monitoring and management of older inventory items to mitigate obsolescence and enhance turnover rates.

Following an analysis of the current inventory management strategy and associated data, SKU rationalization has been identified as additional strategy for TRS. This study will focus on SKU rationalization as the primary issue (Table 4).

SKU Rationalization Analysis

SKU (Stock Keeping Unit) rationalization entails a systematic evaluation of a product assortment to ascertain which items should be retained or discontinued. The primary objective is to generate a preliminary list of potential discontinued products, which will subsequently be evaluated and adjusted manually by a Thai Products merchandising team. This process aims to reduce inventory levels, lower costs, and create opportunities for new product introductions,

thereby enhancing overall portfolio control and profitability. The following section provides a step-by-step example of how to calculate a potential discontinued product shortlist.

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Table 4: TRS To-be Inventory Management and Control Strategies (Thai Products)

	Inbound
Existing Approaches	- Open-to-Buy (OTB) - Ageing performance review for each SKU is markedly across sub-categories, from 3 months, 6 months or more - Inventory turn is set at 2.75 turn per year - SKU performance is based on 80%/20% sales contribution rule
Additional Approach	- SKU Rationalization (Assortment Optimization) [Focused Improvement]

Step 1: Gather Data

Collect data for each SKU (**Table 5**), including:

- Sales volume (units sold)
- Selling price per unit
- Sales Revenue
- Cost of Goods Sold
- Unit Cost
- Inventory of Product Item (number of unit)
- Units Received
- Average Inventory Cost (Value)
- Inventory Turnover Ratio
- Unsold Inventory (beyond 6 months, if any)
- Days in Period
- Sales Velocity (Units/day)

Step 2: Calculate Product Performance Measures on Each SKU

The following are the detailed formulas and explanations:

1. GMROI (Gross Margin Return on Investment)

GMROI indicates how much profit is generated for every dollar invested in inventory.

$$GMROI = \frac{Gross\ Profit}{Average\ Inventory\ Cost}$$

Where:

- Gross Profit = Sales Revenue – Cost of Goods Sold (COGS)
- Average Inventory Cost = $\frac{Beginning\ Inventory + Ending\ Inventory}{2}$

Table 5: Data-Driven SKU Analysis on Thai Products

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
SKU	Category	Units Sold	Selling Price per Unit	Sales Revenue	COGS	Unit Cost	Inventory	Units Received	Avg. Inventory Cost (Value)	Inventory Turnover Ratio	Unsold Inv. (>6 month)	Days in Period	Days of Supply	Is Dead Stock	SKU Rationalization Metrics				
															SKU Contribution to Total Sales (%)	GMROI	Sales Velocity (Units/Day)	Sell-Through Rate (%)	Dead Stock (%)
LF015	PC	650	62.00	40,000	22,000	33.85	700	1350	7,054	3.1	-	50	54	0	9.07	2.55	13	48.15	-
LF013	PC	550	53.00	29,000	16,000	29.09	500	1050	3,923	4.1	-	50	45	0	6.58	3.31	11	52.38	-
LF020	PC	520	56.00	29,000	16,000	30.77	600	1120	3,556	4.5	-	50	58	0	6.58	3.66	10.4	46.43	-
LF006	PC	450	56.00	25,000	14,000	31.11	500	950	3,275	4.3	-	50	56	0	5.67	3.36	9	47.37	-
LF011	PC	400	55.00	22,000	12,000	30.00	450	850	3,973	3.0	-	50	56	0	4.99	2.52	8	47.06	-
LF012	PC	320	59.00	19,000	11,000	34.38	500	820	2,386	4.6	-	50	78	0	4.31	3.35	6.4	39.02	-
LF018	PC	200	75.00	15,000	8,000	40.00	300	500	1,814	4.4	-	50	75	0	3.40	3.86	4	40.00	-
LF003	PC	200	75.00	15,000	8,000	40.00	400	600	1,743	4.6	-	50	100	0	3.40	4.02	4	33.33	-
LF016	PC	300	57.00	17,000	10,000	33.33	600	900	3,993	2.5	-	50	100	0	3.85	1.75	6	33.33	-
LF008	PC	250	60.00	15,000	9,000	36.00	600	850	2,285	3.9	-	50	120	0	3.40	2.63	5	29.41	-
LF019	PC	100	85.00	8,500	5,000	50.00	500	600	909	5.5	-	50	250	0	1.93	3.85	2	16.67	-
LF014	PC	80	88.00	7,000	4,000	50.00	400	480	736	5.4	-	50	250	0	1.59	4.08	1.6	16.67	-
LF005	PC	100	85.00	8,500	5,000	50.00	300	400	1,498	3.3	-	50	150	0	1.93	2.34	2	25.00	-
LF001	PC	500	56.00	28,000	15,000	30.00	600	1100	8,463	1.8	600	301	361	1	6.35	1.54	1.7	45.45	54.55
LF002	PC	300	70.00	21,000	12,000	40.00	500	800	56,445	0.2	500	301	502	1	4.76	0.16	1.0	37.50	62.50
LF004	PC	600	55.00	33,000	18,000	30.00	400	1000	6,621	2.7	400	301	201	1	7.48	2.27	2.0	60.00	40.00
LF007	PC	350	51.00	18,000	10,000	28.57	5000	800	10,915	0.9	5,000	301	4300	1	4.08	0.73	1.2	6.54	93.46
LF009	PC	700	51.00	36,000	20,000	28.57	800	1500	9,382	2.1	800	301	344	1	8.16	1.71	2.3	46.67	53.33
LF010	PC	150	67.00	10,000	6,000	40.00	350	500	2,109	2.8	350	301	702	1	2.27	1.90	0.5	30.00	70.00
LF017	PC	400	58.00	23,000	13,000	32.50	400	800	51,102	0.3	400	301	301	1	5.22	0.20	1.3	50.00	50.00
LF05010	PC	350	51.00	18,000	12,000	34.29	5000	800	10,915	1.1	5,000	301	4300	1	4.08	0.55	1.2	6.54	93.46
LF08010	PC	80	50.00	4,000	2,500	31.25	400	480	736	3.4	400	301	1505	1	0.91	2.04	0.3	16.67	83.33

Example:

- Gross Profit = 10,000 Baht
- COGS = 6,000 Baht
- Avg. Inventory Cost = 2,000 Baht

$$GMROI = \frac{10{,}000-6{,}000}{2{,}000} = \frac{4{,}000}{2{,}000} = 2.0$$

Interpretation (GMROI):

A GMROI of 2.0 means that for every 1 Baht spent on inventory, TRS make 2 Baht in gross profit.

2. Sell-Through Rate (STR)

The Sell-Through Rate helps assess how effectively inventory is managed relative to demand by measuring the proportion of stock sold to the total available inventory (both sold and unsold units). This results in a percentage that reflects inventory turnover efficiency.

$$STR = \left(\frac{Units\ Sold}{Units\ Sold + Ending\ Inventory}\right) \times 100$$

Example:

- If we have 200 units kept in the warehouse and sold 150 units

$$STR = \left(\frac{150}{150 + 200}\right) \times 100 = 42.85\%$$

Benchmark:

- A high STR (above 70-80%) indicates strong sales, but it could mean you need to restock quickly. In terms of inventory replenishment, if an item consistently sells through quickly, the merchandiser can increase reorder quantities or frequency.

- A low STR (below 40%) suggests slow-moving inventory, potential overstock, or the need for discounts. In terms of inventory replenishment, if an item lags in sales, the merchandiser should reduce future orders, run promotions, or bundle items to clear stock.

3. Days of Supply (DOS)

Days of supply estimates how many days current inventory will last based on sales trends. Days of supply is a metric used in inventory management to estimate how long current inventory will last based on the average daily usage or sales rate. It helps businesses understand how many days they can continue to meet customer demand without restocking. This metric is crucial for maintaining optimal inventory levels, avoiding stockouts, and minimizing holding costs.

$$DOS = \frac{Current\ Inventory}{Sales\ Velocity}$$

Example:

- Current Inventory: 500 units
- Sales Velocity: 10 units/day

$$DOS = \left(\frac{500}{10}\right) = 50\ days$$

Note: if DOS is too high, we might have overstock issues. SKUs with very high Days of Supply may indicate slow-moving or dead stock.

4. Inventory Turnover Ratio

It calculates how often inventory is sold and replaced over a period. High-turnover SKUs are generally more desirable.

$$Inventory\ Turnover = \frac{COGS}{Average\ Inventory\ Value}$$

Example:

- COGS: 50,000 Baht
- Average Inventory Cost (Value): 10,000 Baht

$$Inventory\ Turnover = \left(\frac{50{,}000}{10{,}000}\right) = 5$$

Benchmark:

- High (above 5) indicates Fast-moving inventory
- Low (below 2) indicates Overstock risk

5. Sales Velocity

Sales velocity measures how quickly each SKU sells over a specific period (e.g., monthly or quarterly). It also identifies high-performing SKUs (fast movers), moderate performers, and slow movers. It focuses solely on the pace of sales (units per day) without directly considering the amount of inventory on hand. Sales Velocity is useful for understanding demand trends over time.

$$SV = \frac{Total\ Units\ Sold}{Number\ of\ Days\ in\ Period}$$

Example:

- If you sold 300 units of a product in 30 days:

$$SV = \left(\frac{300}{30}\right) = 10\ units/day$$

6. Dead Stock Percentage

It measures how much inventory hasn't sold in a given period.

$$Dead\ Stock\ (\%) = \frac{Unsold\ Inventory\ (for\ x\ months)}{Total\ Inventory} \times 100$$

Example:

- Unsold inventory after 6 months = 1,000 units
- Total inventory = 5,000 units

$$Dead\ Stock\ (\%) = \left(\frac{1{,}000}{5{,}000}\right) \times 100 = 20\%$$

Note: If Dead Stock (Yes/No) > 20%, consider markdowns or clearance sales.

7. Average Age of Inventory

Inventory aging helps businesses understand how long inventory has been in stock, which is crucial for managing stock rotation, reducing obsolescence, and improving cash flow.

$$Average\ Age\ of\ Inventory = \frac{365}{Inventory\ Turnover\ Ratio}$$

Where: $Inventory\ Turnover = \frac{COGS}{Average\ Inventory\ Value}$

To create an inventory aging report, classify inventory based on age:

0-105 days indicates "Fresh stock"

106-150 days indicates "Moderate age"

151-180 days indicates "Older stock"

180+ days indicates "Excess or obsolete stock"

and Seasonal SKUs

For TRS, an inventory aging policy of three months is implemented for Thai Products.

8. Gross Profit Margin

Gross profit margin provides a more accurate picture of profitability, especially in retail where inventory holding costs can be significant. This helps in making better-informed decisions about pricing, promotions, and inventory management.

$$Gross\ Profit\ Margin = \frac{Revenue - (COGS + Average\ Inventory\ Cost)}{Revenue} \times 100$$

Step 3: Analyze Product Performance

3.1 Analysis of SKU performance

To determine which SKUs to retain or discontinue, this study will compare two methods, i.e., 1) Average Inventory Aging (AIA) and 2) SKU Rationalization Score (SRS).

3.1.1 Average Inventory Aging

For the Thai Products category managed by TRS, the average inventory aging is calculated based on a three-month aging policy, using the data presented in Column O of Table 9.

While Average Inventory Aging is a useful metric for managing SKUs and controlling overall stock levels by alerting merchandisers to avoid overstocking, relying solely on this metric may not provide sufficient information to determine which SKUs to retain or discontinue. Therefore, TRS employs average inventory aging in conjunction with other metrics, which are as follows:

3.1.1.1 Calculate Average Inventory Aging: data presented in Column O of **Table 9**.

3.1.1.2 Identify Slow-Moving SKUs: Use the aging data to spot SKUs that take longer to sell. These items might need to be promoted, discounted, or bundled to increase turnover.

3.1.1.3 Combine with Sales Data: Look at sales velocity and gross profit margins. High aging with low sales velocity and margins might indicate products to phase out or discontinue.

3.1.1.4 Customer Demand Insights: Analyze customer demand trends. If certain SKUs consistently show high aging, it might reflect a lack of demand.

3.1.1.5 Inventory Turnover Ratio: Use this ratio to understand how often inventory is sold and replaced over a period. A low turnover ratio combined with high aging suggests overstocking or low demand.

3.1.1.6 Product Performance Evaluation:
TRS currently utilizes Average Inventory Aging by implementing a three-month policy. The general guidelines and potential actions associated with this policy are illustrated in **Table 6**.

Table 6: TRS Average Inventory Aging SKU Rationalizations

SKU Classifications	Avg. Inventory Aging (Months)	Gross Profit Margin (GP>40%, High)	Sales Velocity (<50 = Low)	Possible Actions
Keep	**≤3 (90 days)**	**High**	**High**	**Keep**: Continue stocking this SKU as it is performing well.
				Optimize Inventory Levels: Ensure you have enough stock to meet demand without overstocking.
Promote	**> 3.5 (105 days)**	**High**	**Low**	**Promotion**: Since the SKU is profitable but slow-moving, consider running a promotion to boost sales. This could include discounts, special offers, change location, .
				Marketing Campaign: Increase visibility through targeted marketing campaigns to attract more customers.
Phase Out	**> 5 (150 days)**	**Low**	**Low**	**Phase Out**: Gradually reduce the stock of this SKU by offering clearance sales or discounts.
				Analyze Demand: Investigate why the SKU is underperforming. It could be due to changing customer preferences or market trends.
Discontinuing	**> 6 (180 days)**	**Low or Negative**	**Very Low**	**Discontinue**: Stop ordering this SKU and sell off remaining inventory at a discount to free up storage space and reduce holding costs.
				Supplier Negotiation: If the SKU is essential but unprofitable, negotiate better terms with suppliers or look for alternative products.
Seasonal SKUs	**Specific Time of the Year**	**Positive**	**High**	**Seasonal Stocking**: Adjust inventory levels based on seasonal demand. Stock up before the peak season and reduce inventory after the season ends.
				Promotional Timing: Plan promotions around the peak season to maximize sales.

Based on Table 6, the critical algorithm classifies all SKUs into four categories: Keeping, Promoting, Phasing Out, and Discontinuing. Each SKU is then calculated and classified according to specific criteria, such as a Gross Profit Margin categorized as "High" and a Sales Velocity of less than 50 units per day categorized as "Low." The results of this classification are presented in Table 7.

Table 7: SKU Rationalization Summary based on Average Inventory Aging

SKU Category	No. SKUs	Revenues (Baht)	COGS (Baht)	Avg. Inventory Cost (Baht)
Keep	254	236,920,225.00	99,506,494.50	23,588,054.13
Promotion	171	348,353,015.00	146,308,266.30	48,632,282.38
Phasing	71	159,494,570.00	66,987,719.40	29,949,773.74
Discount	25	74,254,700.00	31,186,974.00	17,117,677.76
	521	819,022,510.00	343,989,454.20	119,287,788.00

3.1.2 SKU Rationalization Using SKU Rationalization Score (SRS):

This method evaluates each SKU based on sales volume, revenue contribution, gross margin, and profitability to identify top-performing SKUs that drive the majority of profits.

3.1.2.1 Product Performance Evaluation:

To evaluate product performance (as illustrated in Table 4), several factors are considered for a pool of 10,788 SKUs. These factors include Sales Velocity, GMROI (Gross Margin Return on Investment), Sell-through Rate, Days of Supply, Dead Stock, SKU Contribution to Total Sales, and Cumulative Sales.

Summary Key Metrics and Their Role in SKU Rationalization

SKU Contribution to Total Sales:

- Measures the percentage of total sales revenue contributed by a specific SKU.
- High contribution SKUs are critical to overall business performance and should be prioritized.

GMROI (Gross Margin Return on Investment):

- Evaluates the profitability of inventory investment for a SKU.
- A higher GMROI indicates better efficiency in generating profit from inventory.

Sales Velocity:

- Tracks how quickly a SKU sells over a given period and helps businesses forecast future sales and plan inventory replenishment.
- High velocity SKUs indicate strong demand and efficient inventory turnover
- Low sales velocity suggests weak demand or potential issues like poor marketing, pricing, or product-market fit.

Sell-through Rate:

- Measures the percentage of inventory sold compared to the amount received from suppliers.
- A high sell-through rate suggests good alignment between supply and demand.
- A low sell-through rate suggests overstocking, poor demand forecasting, or slow-moving inventory.

Dead Stock:
- Represents inventory that has not sold over a long period.
- Dead stock ties up capital and storage space, negatively impacting profitability.

Note: SKU Contribution to Total Sales: Assess the percentage of total revenue contributed by each SKU. Focus on SKUs that drive significant sales.

3.1.2.2 Assign Weights to Factors:

Not all factors are equally important. Assign weights to each factor based on business priorities as shown below.

Factors	Weight (%)
SKU Contribution to Total Sales (W_c)	30%
GMROI (W_g)	20%
Sales Velocity (W_v)	20%
Sell-through Rate (W_s)	30%

3.1.2.3 Data Normalization:

Given that the factors are measured in different units (e.g., percentages, ratios, days), it is essential to normalize the data to a common scale (e.g., 0 to 1 or 0 to 100) and ensures that the weights sum to 1 or $W_c + W_g + W_v + W_s = 1$. This normalization process ensures fair and accurate comparisons across different metrics.

Formula for Positive metrics like Contribution to Sales, GMROI, Sales Velocity, and Sell-through rate, use:

$$Normalized\ Value = \frac{Value - Minimum\ Value}{Maximum\ Value - Minimum\ Value}$$

For example:

If GMROI range from 1.0 to 3.0:

$$SKU\ A\ (GMROI = 2.5) = \frac{2.5 - 1.0}{3.0 - 1.0} = 0.75$$

$$SKU\ B\ (GMROI = 1.2) = \frac{1.2 - 1.0}{3.0 - 1.0} = 0.1$$

3.1.2.4 SKU Rationalization Score (SRS) and Ranked SKUs:

Rank SKUs based on their weighted scores. Higher scores indicate better-performing SKUs that align with your business objectives.

SKU ID	SKU Contribution to Total Sales	GMROI	Sales Velocity	Sell-through Rate	SRS
SKU A	0.8 x 0.3 = 0.24	0.75 x0.2 = 0.15	0.8 x 0.2 = 0.16	0.9 x 0.3 = 0.27	0.82
SKU B	0.2 x 0.3 = 0.06	0.1 x 0.2 = 0.02	0.2 x 0.2 = 0.04	0.3 x 0.3 = 0.09	0.21

$$SRS = \sum_{i=1}^{5} (W_i \times Normalized\ Metric_i)$$

$$SRS = (C \times W_c) + (G \times W_g) + (V \times W_v) + (S \times W_s)$$

Where:

C (SKU Contribution to Total Sales)	SKU Contribution to Total Sales Weight (W_c)
G (GMROI)	GMROI Weight (W_g)
V (Sales Velocity)	Sales Velocity Weight (W_v)
S (Sell-through Rate)	Sell-through Rate Weight (W_s)

3.1.2.5 Categorize SKUs and Eliminate Underperforming SKUs:

In this step, the process of regrouping products is informed by normalized rankings, with Pareto Analysis serving as a valuable methodological framework. Pareto Analysis, commonly referred to as the 80/20 Rule, is a strategic analytical tool employed to classify products based on their normalized priorities by determining whether a small subset of SKUs—typically 20%—is responsible for generating a disproportionately large share of revenue, often around 80%. This approach is particularly significant in inventory management, as it enables the identification of high-performing SKUs that contribute substantially to overall revenue generation. By directing attention toward these top-performing products, organizations can enhance inventory optimization, improve sales efficiency, and achieve greater profitability. As a guiding principle, Pareto Analysis facilitates the prioritization of resources and efforts toward the most impactful items within the product assortment, thereby supporting data-driven decision-making and ensuring the maximization of financial returns.

Table 8: Illustrates SKU Rationalization Metrics, Normalization, and SKU Rationalization Score

A	B	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
		SKU Rationalization Metrics					30%	20%	20%	30%				
SKU	Category	SKU Contribution to Total Sales (%)	GMROI	Sales Velocity (Units/Day)	Sell-Through Rate (%)	Dead Stock (%)	SKU Contribution to Total Sales (%)	GMROI	Sales Velocity (Units/Day)	Sell-Through Rate (%)	SKU Rationalization Score (SRS)	Cumm.SKU Contribution to Total Sales (%)	Movement Analysis	Decision
LF015	PC	9.07	2.55	13	48.15	-	1.00	0.61	1.00	0.78	0.8556	9.07	Fast	Keep
LF013	PC	6.58	3.31	11	52.38	-	0.69	0.81	0.84	0.86	0.7952	15.65	Fast	Keep
LF020	PC	6.58	3.66	10.4	46.43	-	0.69	0.89	0.80	0.75	0.7699	22.22	Fast	Keep
LF006	PC	5.67	3.36	9	47.37	-	0.58	0.82	0.69	0.76	0.7047	27.89	Fast	Keep
LF011	PC	4.99	2.52	8	47.06	-	0.50	0.60	0.61	0.76	0.6192	32.88	Medium	Keep
LF012	PC	4.31	3.35	6.4	39.02	-	0.42	0.82	0.48	0.61	0.5667	37.19	Medium	Keep
LF018	PC	3.40	3.86	4	40.00	-	0.31	0.94	0.29	0.63	0.5270	40.59	Slow	Discontinue
LF003	PC	3.40	4.02	4	33.33	-	0.31	0.98	0.29	0.50	0.4976	43.99	Slow	Keep
LF016	PC	3.85	1.75	6	33.33	-	0.36	0.41	0.45	0.50	0.4301	47.85	Medium	Keep
LF008	PC	3.40	2.63	5	29.41	-	0.31	0.63	0.37	0.43	0.4203	51.25	Medium	Keep
LF019	PC	1.93	3.85	2	16.67	-	0.13	0.94	0.14	0.19	0.3100	53.17	Slow	Discontinue
LF014	PC	1.59	4.08	1.6	16.67	-	0.08	1.00	0.10	0.19	0.3028	54.76	Slow	Keep
LF005	PC	1.93	2.34	2	25.00	-	0.13	0.56	0.14	0.35	0.2795	56.69	Slow	Discontinue
LF001	PC	6.35	1.54	1.7	45.45	54.55	0.67	0.35	0.11	0.73	0.5106			Discontinue
LF002	PC	4.76	0.16	1.0	37.50	62.50	0.47	0.00	0.06	0.58	0.3269			Discontinue
LF004	PC	7.48	2.27	2.0	60.00	40.00	0.81	0.54	0.14	1.00	0.6763			Discontinue
LF007	PC	4.08	0.73	1.2	6.54	93.46	0.39	0.15	0.07	0.00	0.1600			Discontinue
LF009	PC	8.16	1.71	2.3	46.67	53.33	0.89	0.39	0.16	0.75	0.6031			Discontinue
LF010	PC	2.27	1.90	0.5	30.00	70.00	0.17	0.44	0.02	0.44	0.2740			Discontinue
LF017	PC	5.22	0.20	1.3	50.00	50.00	0.53	0.01	0.08	0.81	0.4208			Discontinue
LF05010	PC	4.08	0.55	1.2	6.54	93.46	0.39	0.10	0.07	0.00	0.1507			Discontinue
LF08010	PC	0.91	2.04	0.3	16.67	83.33	0.00	0.48	0.00	0.19	0.1527			Discontinue

Based on the rankings and individual factor performance, categorize SKUs into action groups as Keep, Promote, Phase Out, and Discontinue.

- **Retain**: High scores across most factors (e.g., high GMROI, high sell-through rate, low days of supply).
- **Promote**: Good scores but could benefit from additional marketing or promotions to boost sales.
- **Phase Out**: Moderate scores but showing signs of decline or underperforming SKUs (e.g., aging inventory, low sell-through rate).
- **Discontinue**: Low scores across most factors (e.g., dead stock, low contribution to sales).

3.1.2.6 Implement Actions

Effective inventory management is a multi-faceted process crucial for optimizing sales and maintaining efficient operations. This study categorizes Stock Keeping Units (SKUs) into action groups based on their performance metrics and outlines specific strategies for each category.

Action Categories and Strategies

- **Retain:**
  Objective: Maintain optimal inventory levels and promote these SKUs.
  Actions: Focus on inventory control and marketing efforts to sustain sales.
- **Promote:**
  Objective: Increase sales through targeted efforts.
  Actions: Implement campaigns, discounts, or bundling strategies.
- **Phase Out:**
  Objective: Gradually reduce inventory levels.
  Actions: Stop reordering and decrease stock levels over time.
- **Discontinue:**
  Objective: Eliminate dead stock to free up space.
  Actions: Liquidate or write off obsolete inventory.

3.1.2.7 Monitor and Iterate

SKU rationalization is an ongoing process that requires continuous monitoring and strategic adjustments. To ensure optimal performance, it is essential to:

- ***Track changes*** in sales velocity, GMROI, and other metrics.
- ***Reassess SKUs periodically*** (e.g., quarterly or annually).
- ***Incorporate feedback*** from customers, sales teams, and market trends.

By maintaining a dynamic approach to SKU rationalization, businesses can adapt to evolving market conditions and sustain profitability.

Table 9: Exhibits an Example of SKU Rationalization Analysis

SKU ID	Sales Velocity	GMROI	Sell-through Rate (%)	Days of Supply	Dead Stock (Y/N)	Contribution to Total Sales (%)	Cummulative Sales (Baht)
SKU A	50 units/day	2.5	80%	30 days	No	15%	500,000
SKU B	10 units/day	1.2	30%	120 days	Yes	2%	50,000

SKU-A exhibits a high sales velocity, elevated Gross Margin Return on Investment (GMROI), substantial sell-through rate, minimal days of supply, absence of dead stock, and a significant contribution to overall sales. *Recommended Action: Retain and promote*.

SKU-B demonstrates a low sales velocity, diminished GMROI, poor sell-through rate, extensive days of supply, presence of dead stock, and minimal contribution to overall sales. *Recommended Action: Discontinue*.

Regular monitoring and iterative processes assist the merchandising team in refining product analysis within a dynamic environment.

3.1.3 Total Opportunity Lost Cost Evaluation

To finalize the discontinuation of SKUs, the Total Opportunity Lost Cost should be calculated and used as an input for the purchasing budget during the Open-to-Buy (OTB) process.

Carrying Cost: This cost is associated with holding inventory over a specified period. It is calculated as 28% of the units unsold over 6 months, multiplied by the unit cost.

$$\text{Carring Cost} = 0.28 \times (\textit{Units Unsold Over 6 Months}) \times (\textit{Unit Cost})$$

Opportunity Lost Cost: This represents the potential profit lost due to unsold inventory. It is calculated as the difference between the revenue that could have been earned and the cost of goods sold (COGS).

$$\text{Opportunity Lost Cost} = \text{Revenue} - \text{COGS}$$

Discounts/Write-offs: This cost accounts for the value of discounts or write-offs applied to the remaining unsold inventory. It is calculated as 25% of the remaining product in stock.

$$\text{Discounts/Write} - \text{offs} = 0.25 \times (\textit{Remaining Product in Stock})$$

The Total Opportunity Lost Cost is then determined by summing the above components:

$$\text{Total Opportunity Lost Cost} = (\text{Carrying Cost} + \text{Lost Sales Potential} + \text{Discounts\_or\_Write\_Offs}$$

Table 10: Comparison of Total Opportunity Lost Cost from Average Inventory Aging and SKU Rationalization Score (SRS)

	Avg. Inventory Aging Method (Baht)	SKU Rationalization Score (SRS) (Baht)
Total Opportunity Lost Cost	**206,007,964.0**	**490,368,489.2**

As demonstrated in Table 10, the current method employed by TRS, which utilizes Average Inventory Aging, has resulted in a lower Total Opportunity Lost Cost compared to the proposed method using the SKU Rationalization Score (SRS). By implementing SRS, TRS can identify more SKUs for discontinuation. With the Open-to-Buy (OTB) budget, merchandisers can

create opportunities for the merchandising team to purchase new products. This approach allows for effective inventory management, avoiding overstocking or understocking, and ensuring the availability of the right products to meet customer demand.

3.1.3 Setting an Open-to-Buy (OTB) Budget

Setting an Open-to-Buy (OTB) Budget: A Six-Step Process
Step 1: Establish the Sales Budget Begin by setting a sales budget for the upcoming period. This should be based on historical sales data, market trends, and sales forecasts.

Step 2: Define SKU Margins. Determine the desired profit margins for each product. This helps merchandisers understand how much can be spent on inventory while maintaining profitability.

Step 3: Determine Inventory Turnover. Calculate the targeted inventory turnover rate, which indicates how often each SKU's inventory is sold and replaced over a specific period. A higher turnover rate generally signifies better inventory management.

Step 4: Calculate Opening Stock at Cost. Assess the value of the current inventory at cost, including all products currently in stock and their associated costs.

Step 5: Calculate the OTB Budget Use the following formula to calculate the OTB budget:

$$\text{OTB Budget} = (\text{Planned Sales} + \text{Planned Markdowns} + \text{Target Ending Inventory}) - (\text{Current On\_Hand Inventory} + \text{Outstanding Purchase Orders})$$

Where:

- Planned Sales: The expected sales for the period.
- Planned Markdowns: Any discounts or promotions planned for the period.
- Target Ending Inventory: The desired inventory level at the end of the period.
- Current On-hand Inventory: Current inventory levels.
- Outstanding Purchase Orders: Inventory that has been ordered but not yet received.

Step 6: Allocate the Budget Distribute the OTB budget across different product categories based on their contribution to total sales and strategic importance. This ensures investment in the right products to meet customer demand.

Finding and Recommendations
The goal of TRS merchandisers is to optimize the product portfolio by maximizing profits while managing stock levels. SKUs are categorized into four groups: Keep, Promotion, Phasing Out, and Discontinue, as illustrated in **Table 11**.

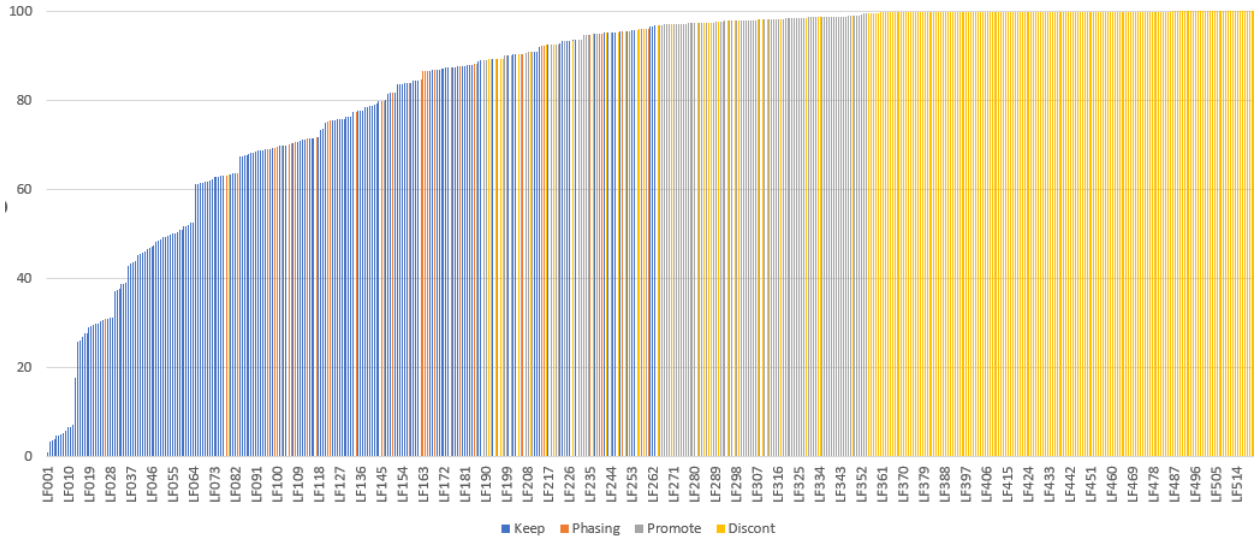
Table 11: Comparison of the Number of SKUs in Average Inventory Aging and SKU Rationalization Score (SRS)

		SKU Rationalization Score (SRS)				
		Discontinue	**Keep**	**Phasing out**	**Promotion**	**Total**
Average Inventory Aging (AIA)	**Discontinue**	14	1	10		25
	Keep	83	105		66	254
	Phasing out	46	8	17		71
	Promotion	60	71	8	32	171
	Total	203	185	35	98	521

According to **Table 11**, the SKU Rationalization Score (SRS) identified a higher number of Discontinued SKUs (203) compared to the Average Inventory Aging (AIA), which identified 25 SKUs. This discrepancy arises because merchandisers often prefer to retain products, hoping they will eventually sell, leading to an accumulation of slow-moving or dead stock (stock older than six months).

Regarding promotions, AIA inaccurately suggests promoting 60 SKUs, whereas SRS does not recommend this.

Figure 5: SKUs Rationalization Score with Movement Analysis



Comparing to Average Inventory Aging method that emphasize on movement analysis. However SRS provide more practicality in advises discontinuing SKUs across all movement categories—Very fast, fast, medium, and slow, super slow (see **Figure 5**) —resulting in a pattern similar to **Figure 2** (d) by discontinue SKUs more on the slow side but still delete some SKUs even in the fast move areas due to multiple factors in SRS.

SKU rationalization is not about indiscriminately cutting SKUs; it involves making smarter, data-driven decisions to optimize the product portfolio for sustained profitability and growth. However, SKU rationalization serves as a guideline for merchandisers, as there may be other factors to consider in practice. For example, local food items have short shelf lives, garment categories may require purchasing entire collections each season, luxury items like the Hermès Constance Bag may have very slow sales rates, and cosmetics may need to include all color shades even if some have not sold in the past six months. Managing SKUs requires innovative and strategic approaches to balance profit, reduce inventory costs, improve product performance, and ensure that retained SKUs meet customer needs and preferences.

CONCLUTIONS AND RECOMMENDATIONS

Historically, TRS has relied on inventory turnover to manage stock levels. However, this metric alone may not provide a comprehensive analysis, as it primarily reflects the volume of orders relative to demand. By incorporating the rate of sales, a clearer understanding of market demand is achieved, facilitating more informed decisions regarding which products to retain,

discontinue, or optimize. This approach enhances the balance between inventory efficiency, profitability, and customer satisfaction.

To further elaborate, inventory turnover measures how often inventory is sold and replaced over a period, which can indicate how well a company is managing its stock. However, it does not account for the nuances of market demand fluctuations. By integrating the rate of sales, which measures the speed at which products are sold, TRS can gain a more nuanced view of market dynamics. This dual-metric approach allows for a more strategic inventory management process, ensuring that stock levels are aligned with actual market demand. Consequently, this method supports better decision-making regarding inventory adjustments, ultimately leading to improved operational efficiency, enhanced profitability, and higher levels of customer satisfaction.

Additionally, by implementing the SKU rationalization concept, TRS will be able to reduce and better control product assortment. SKU rationalization involves analyzing the performance of each SKU to determine its contribution to overall profitability and customer satisfaction. This process helps identify underperforming or redundant SKUs that can be eliminated, thereby streamlining the product range. As a result, TRS can focus on high-performing products, reduce carrying costs, and improve inventory turnover. This targeted approach not only enhances operational efficiency but also ensures that the product assortment is closely aligned with market demand and customer preferences, further driving profitability and customer satisfaction.

Limitations and Recommendations for Future Research

While this research paper provides valuable insights, it is important to acknowledge its limitations. The study focuses on a single sub-category within the Thai Products category, which accounts for only 5 percent of the group. This narrow scope limits the generalizability of the findings to other categories. Therefore, caution is advised when applying these results to different categories or organizational contexts.

Given these limitations, organizations must carefully evaluate and adapt the proposed solutions to suit their specific applications and contexts. Additionally, it is essential to proactively identify and address potential challenges during the implementation phase to ensure the successful achievement of desired outcomes.

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