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The Impact of Planogram-Based Shelf Space Allocation on Retail Store Performance: A Balanced Scorecard Approach

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Abstract

This study investigates the impact of shelf space allocation planning strategies (planogram implementation) on store performance at PT. XY, a retail company operating 36 branches across Indonesia. Using a quantitative descriptive approach, the research analyzes sales volume, customer acquisition, internal business processes, and organizational learning and growth, based on the Balanced Scorecard framework. Comparative analysis was conducted between 12 stores that applied planogram-based shelf space planning and 24 stores that did not. The findings reveal that the implementation of planograms significantly enhances store performance, evidenced by increases in sales volume, unit sales, SKU sales, new customer registrations, transaction volume and the unsold products decreased. However, the number of out-of-stock items slightly increased, indicating the need for improved inventory replenishment systems. A simulation of shelf space planning was also conducted on stores without planogram usage, demonstrating potential performance improvements through more structured product displays. This study contributes to retail operations management by emphasizing the strategic role of optimized shelf space planning in improving both financial and non-financial aspects of store performance.

Keywords: Retail management, shelf space allocation, planogram, store performance, balanced scorecard, inventory management

1. INTRODUCTION

The retail industry remains one of the most crucial sectors globally, contributing significantly to national economies. In Indonesia, the retail and wholesale sector accounted for 12.94% of the national GDP in 2023, with the modern trade segment growing by 6.2% during the same year, driven by an increase in sales volume (Nielsen Report, 2024). Despite the expansion of e-commerce, physical retail stores continue to serve as the primary distribution channels for final consumers, emphasizing the strategic importance of the physical store environment in achieving competitive advantage (Turley & Chebat, 2002). Furthermore, studies have shown that store atmosphere has a positive and significant influence on customer loyalty (Purnamasari & Hidayat, 2016).

Retail operations involve complex activities such as product selection, sales strategy development, promotional planning, inventory management, and optimizing store layout to enhance customer satisfaction (Aktas & Meng, 2017). As competition intensifies, efficient shelf space allocation has emerged as a critical factor for retail success. The increasing variety of products and the limited shelf



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space available make optimal product placement a major challenge for retailers. Efficient shelf space planning not only enhances inventory return on investment but also improves customer satisfaction by minimizing out-of-stock situations (Lim et al., 2004). A well-optimized layout ensures smooth inventory turnover, facilitates efficient employee workflows, and enhances the shopping experience for customers (Putri & Yunani, 2024).

A well-managed shelf space allocation strategy, commonly operationalized using planograms, plays a fundamental role in retail category management (Lim et al., 2004). Previous research highlights that optimal shelf space planning significantly boosts store profitability (Gajjar & Adil, 2010) and market share (Suarez, 2005) and aligns shelf space allocation with inventory management practices (Urban, 2001).

PT. XY, a major retail company in Indonesia, has recognized the need for a more strategic approach to shelf space planning to sustain growth and maximize profitability. The company initiated the implementation of shelf space planning in new stores at the end of 2022 and expanded it to several product categories across multiple branches throughout 2023. This strategic initiative aims to improve product assortment control, inventory management, and overall store performance through the establishment of a dedicated planogram team.

The shelf space planning model adopted by PT. XY is based on the optimization framework proposed by (Dusterhoft, 2020), which emphasizes six key elements: accurate space allocation, product clustering calculations, shelf space redesign, allocation concept determination, demand impact exploration, and stakeholder interest considerations.

Despite the growing body of research on shelf space optimization, there remains a gap in understanding its comprehensive impact on overall store performance. Therefore, this study aims to analyse the performance differences between stores that have implemented shelf space planning and those that have not. Additionally, the research explores the potential performance improvements for stores that have yet to adopt such strategies, offering insights into the broader implications of shelf space optimization in the retail sector.

2. THEORETICAL BACKGROUND

2.1 Retail management

Retailing represents a significant form of commercial business, involving the purchase of goods from other organizations with the intention of reselling them to end consumers without substantial transformation (Zentes et al., 2017). Key activities in retail management include selecting the types of products to be sold, formulating sales strategies, designing promotional activities, managing inventory to avoid stockouts and overstock situations, ensuring optimal product availability on display shelves, and configuring store layouts to maximize customer satisfaction (Aktas & Meng, 2017). Inventory management bridges operational success and financial stability, making it a vital tool for enhancing business performance (Yunani & Firmialy, 2025).

2.2 Store layout

Store layout planning is a complex task aimed at maximizing sales while ensuring customer satisfaction and minimizing overall operational costs. Several factors influence store layout planning, including customer arrival patterns, building design, desired service levels, merchandise assortment, and other operational considerations.

Store layout plays a crucial role in shaping consumer perceptions of a retail store. It helps identify bottlenecks, optimize resource allocation, and reduce delays (Martha et al., 2024). Therefore, creating a



compelling customer experience has become one of the primary objectives in the modern retail industry. Customer experience encompasses all stages of the shopping journey, including product search, purchase, and post-transaction engagement (Singh et al., 2014).

The amount of time a customer spends inside a store is significantly influenced by the store's layout. Retail environments typically feature various types of store layouts, including linear, loop (racetrack), and free-form layouts. Furthermore, not only the general store layout but also the specific product layout within the store critically affects consumer perceptions and the overall shopping experience (Van Praag, 2013).

2.3 Merchandise display

Studies conducted by (Dhamerin, 2014), (Han and Stobart, 2015), and (Rahmadana, 2016) have demonstrated that customers tend to prefer stores with neatly arranged merchandise. The ease of finding products and the visibility of price labels also significantly enhance the consumer shopping experience. An attractive and orderly merchandise display can effectively stimulate consumer buying interest.

Merchandise display is defined as the practice of arranging and placing products on available media such as shelves, showcases, or other display units in a manner that is both visually appealing and functionally convenient for customers seeking products to purchase. To facilitate customer navigation and optimize shopping efficiency, products are typically grouped according to their functions — for instance, cooking oil should be displayed near other kitchen necessities.

2.4 Shelf space allocation planning

One of the critical strategic decisions that retail managers must make is selecting the products to offer and allocating appropriate shelf space for their display. Retail managers must match consumer demand with available shelf supply, balancing the assortment variety and shelf availability. However, the increasing number of products contrasts with the limited and fixed storage space, making shelf space allocation a significant challenge in retail management.

Shelf management models must balance the impact of supply and demand dynamics. Decisions regarding shelf space allocation directly influence consumer demand, which is sensitive to the amount of space given to each product and the frequency of stock replenishment. Empirical studies have shown that shelf space has a stronger influence on sales than product positioning or pricing strategies. Moreover, limiting product variety, when managed correctly, can positively affect sales outcomes.

(Boatwright and Nunes, 2001) found that a significant reduction in the number of items (up to 54%) led to an average increase in sales of 11% across 42 product categories. Other studies have similarly demonstrated that effective shelf management initiatives reflect relevant consumer demand patterns and positively impact overall sales performance.

2.5 Planogram

A planogram is a visual representation of product placement within a store, designed to enhance operational efficiency, capture customer attention, and optimize both sales and profits (Levy & Weitz, 2014). It provides detailed information for each product, including product codes, average sales, product category addresses, and the quantity of product displays.

Planograms are developed using various data sources, such as historical sales data, retail area size, product dimensions, and the size of display media like shelves, shelving units, pallets, or showcases.

2.6 Organizational performance indicators based on the balanced scorecard

Performance can be defined as actions and the success of outcomes compared to certain standards throughout the process that leads to a series of potential impacts and future results (Lebas & Euske, 2022). Performance measurement refers to the process or method of evaluating the extent to which an



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organization, individual, or system has achieved its established goals and objectives. This measurement involves assessing and analysing various relevant indicators or metrics to understand how effectively and optimally an organization or entity is accomplishing specific objectives.

Performance measurement is a process of assessing progress toward goals and objectives in managing human resources to produce goods and services, including information on the efficiency and effectiveness of actions in achieving organizational goals. Performance measurement is highly dependent on the performance indicators used. Performance indicators are quantitative and qualitative measures that have been agreed upon and established to reflect the level of achievement of a set goal (Moeheriono, 2012).

Several prominent performance measurements from previous literature and research relate to financial indicators such as profitability, sales volume, and assets. Among various organizational performance measures, the balanced scorecard (BSC) proposed by Kaplan and Norton (1992) is most relevant to this study. The balanced scorecard emerged from the need to enhance the functions of planning, control, and performance measurement in managerial accounting and has proven to be a vital tool for measuring corporate performance (Atkinson et al., 2015).

Kaplan and Norton (1992) suggest that within the BSC, the mission and strategy are translated into goals and metrics organized from four distinct perspectives: financial, customer, internal processes, and learning and growth. The balanced scorecard creates a framework for communicating the mission and strategy using the established indicators to inform employees about current and future success factors.

From the financial perspective, performance measures indicate whether the company's strategy, implementation, and execution contribute to improved financial outcomes. Financial objectives are typically associated with profitability, revenue, return on investment (ROI), or economic value. Alternative financial objectives might include rapid sales growth or cash flow generation. The customer perspective typically includes several basic or common measures of the success of a strategy. Key metrics include customer satisfaction, customer retention, and participation levels within targeted segments. The balanced scorecard approach often results in identifying entirely new processes where the company must achieve excellence to meet financial and customer goals. The fourth perspective is learning and growth, which identifies the infrastructure that the company must build to generate long-term growth and improvement. Organizational learning and growth stem from three main sources: human resources, systems, and organizational procedures (Kaplan & Norton, 2006).

3. METHOD

3.1 Design and Participants

This study was conducted using a descriptive quantitative method, observing data from company reports and utilizing statistical analysis to test specific sample groups to draw conclusions. The research aims to compare the performance of retail stores with and without the implementation of planogram allocation strategies. The object of this study is a multinational retail company operating in Indonesia, with a total of 36 wholesale format stores and 12 hypermarket format stores. This research focuses specifically on the 36 wholesale format stores. The stores are divided into two groups: 12 stores that have implemented planogram allocation strategies and 24 stores that have not.

The participants in the study were store managers, selected for their knowledge of store performance and their direct involvement with the implementation of planogram strategies. They are able to provide accurate insights into the operational variables being measured. Data was collected through reports from the company and is based on the performance of these stores, with an emphasis on comparing the two



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groups. The research involves data analysis of store performance, focusing on metrics such as sales volume, inventory turnover, customer satisfaction, and operational efficiency. Statistical tools were applied to assess the impact of planogram implementation on the performance of wholesale format stores. **3.2 Measures**

Operational variables are essential for defining the types and indicators of the variables related to the study. The purpose of operational variables is to establish the measurement scales for each variable, enabling accurate hypothesis testing. This study aims to determine whether the use of planograms has been optimal by analysing the significance of differences in sales, forecast accuracy, inventory, and inventory costs between stores that use planograms and those that do not.

The research measures performance across five key areas: Sales, Customers, Business Processes, and Learning & Growth, using specific indicators to assess each dimension. The performance of the stores is compared by evaluating the operational variables of the two groups (planogram and non-planogram stores). The following table outlines the operational variables, dimensions, and corresponding indicators used as benchmarks for assessing store performance according to the balanced scorecard methodology.

Variable	Dimension	Indicator
Sales	Sales Volume	Total sales value
	Units Sold	Quantity of products sold
	SKUs Sold	Number of SKUs sold
Customers	New Customers	Number of new customer registrations
	Number of Invoices	Number of customer transactions
Business Processes	Unsold Products	Number of products not sold within a given period
	Out of Stock	Percentage of out-of-stock products
Learning & Growth	Planogram	Compliance of product display to category
	Implementation	

3.3 Data collection and analysis

This study employs a documentation-based data collection method, which involves gathering quantitative data from existing documents or records, such as financial reports, attendance records, and organizational archives. This method is particularly useful for obtaining historical data or data that is difficult to acquire through surveys or interviews.

Data processing begins once the necessary data has been collected. Subsequently, the data from the two groups of stores (those using planograms and those not using planograms) will be compared. The differences between the two groups will be analysed using an Independent Sample T-Test.

Data analysis in this study is based on the balanced scorecard model, which examines conditions across four perspectives: financial, customer, internal business processes, and learning and growth. After performing the Independent Sample T-Test, the results will be analysed to determine the extent of performance differences between the two store groups.

A quantitative data analysis technique is employed, using statistical or mathematical methods to analyse numerical data and understand the phenomena under investigation. This approach involves collecting numerical data, which is then analysed using statistical tools to identify patterns, relationships, and trends within the data.



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Hypothesis testing is conducted to evaluate the optimization of planogram usage in the stores under study. This is done using an Independent Sample t-Test, a statistical method used to compare the means of two independent groups. The t-test assesses whether there is a significant difference between the means of the two populations by comparing the means of the two samples.

4. RESULTS AND ANALYSIS

This study aimed to analyze the impact of shelf space planning implementation on branch store performance at PT. XY, evaluated through the Balanced Scorecard framework. The discussion integrates empirical findings with existing literature to offer a comprehensive understanding of the effects observed across financial, customer, internal business process, and learning and growth perspectives.

From the financial perspective, the implementation of shelf space planning positively influenced both sales volume and the number of units sold. Data show that the average sales volume increased from IDR4,313,382 to IDR4,999,193, reflecting a growth of 15.90%, while the average number of units sold rose from 681 to 827 units, representing a 21.30% growth following the planogram implementation. This suggests that a more optimal allocation of shelf space made it easier for customers to find the products they needed, thus increasing sales.

These findings align with the study by Gelici (2020), titled Joint Shelf Design and Shelf Space Allocation Problem for Retailers, which demonstrated that improvements in planogram design using a Joint Shelf Design and Shelf Space Allocation model positively impacted revenue. Optimizing product placement through planograms was shown to enhance both space efficiency and product exposure, directly contributing to increased sales and overall store revenue.

However, a slight decrease was observed in the number of SKUs sold, with the average dropping from 120 to 118 SKUs. This may have resulted from a remerchandising strategy that prioritized high-performing products, causing lower-demand SKUs to become less visible, especially when not positioned at eye level.

From the customer perspective, the number of new customers experienced a significant increase following the planogram implementation, rising from an average of 1,701 customers to 2,263 customers, a growth of 33.05%. Research by Webber Cleber, Sausen Jorge, et al. (2018), titled Remodeling the Retail Store for Better Sales Performance, analyzed customer behavior, in-store movement patterns, and purchasing trends, leading to a store redesign aimed at enhancing the shopping experience. The results showed that redesigned stores saw increases in customer visits, visit duration, and sales volume. Nevertheless, there is still limited research that specifically explores the direct impact of planogram implementation on customer numbers.

Despite the growth in customer numbers, fluctuations were observed in transaction volume. The median number of transactions slightly decreased from 3,809 to 3,525, while the average number of transactions increased marginally from 4,384 to 4,542. The decline in the median suggests that while some stores experienced fewer transactions, the overall trend still indicated growth.

In terms of internal business processes, shelf space planning positively impacted store operational efficiency. The number of unsold products decreased from an average of 32 to 23, indicating that the new layout facilitated a more effective distribution of products and increased the likelihood of sales. Aligning product placement with consumer purchasing behavior helped minimize unsold inventory (Isa et al., 2024).

However, the number of out-of-stock products rose from an average of 17 to 30. This increase may have



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been driven by higher sales without a sufficiently rapid replenishment system to meet the heightened demand. Although planogram optimization improved sales efficiency, it highlighted the need for better stock management to prevent excessive stockouts. Adjustments to staff restocking schedules are also required, as shelf space planning based on sales data leads to dynamic changes in product facings.

From the learning and growth perspective, the implementation of shelf space planning significantly contributed to staff knowledge and development, particularly in understanding proper product display techniques. Initially, 6 out of 12 stores were still combining products from different categories, such as biscuits and chocolates, within the candy section. The new planning approach improved not only the separation of major product categories but also enhanced understanding of subcategories, thereby supporting more strategic product organization to facilitate consumer decision-making.

The planogram implementation improved both the consumer shopping experience (Silverio et al., 2025) and staff comprehension of product allocation. With clearer and more systematic visual mappings, store staff found it easier to understand product relationships and shelf allocations, making restocking and display inspections more efficient (Hubner & Kuhn, 2023). Additionally, Silva et al. (2009) emphasized that random product placement without appropriate grouping significantly reduces profitability.

Specifically, in the candy category, subcategories such as fun reward, indulgence, refreshment, and small treat were previously displayed without grouping. After the implementation of shelf space planning, products were systematically organized according to their respective subcategories.

Overall, the findings confirm that structured shelf space planning significantly enhances store performance across multiple dimensions. However, the results also highlight the need for complementary improvements, particularly in inventory replenishment systems and staff training, to fully capitalize on the benefits of optimized shelf layouts. Future research could explore longer-term impacts and customer satisfaction metrics to further validate and refine shelf space planning strategies.

4.1 Simulation of shelf space allocation planning

In this study, a simulation of shelf space allocation planning, or planogramming, was conducted using Spaceman software at a branch store that does not currently implement a shelf space allocation strategy or planogram. This simulation aims to identify aspects that can be improved through the application of structured shelf space planning.





An analysis was conducted on the display layout of the candy category at a branch store that has not yet implemented shelf space allocation planning. Based on visual observation of the display rack conducted on June 14, 2024, it was found that out of a total of 105 SKUs recorded in the inventory system as of that



date, only 75 candy SKUs were displayed on the shelf. This indicates that 30 SKUs were not allocated any display space despite being available in the store's inventory. Additionally, there were 4 SKUs unrelated to the candy category that were placed in the candy display area, highlighting a mismatch in product category allocation.

To support the analysis, a display heatmap visualization was utilized, segmented according to category vision, which classifies products into subcategories such as Fruity / Small Treat, Fun Reward, Indulgence / Sharing Family, and Refreshment. The heatmap visualization illustrated the distribution and proportion of product display on the shelf. The visualization revealed that products were still scattered and not arranged according to their respective subcategories, indicating an imbalance between actual display capacity and the number of SKUs that should ideally be presented.



Figure 2. Simulation of shelf space allocation planning

The simulation of shelf space allocation planning (planogram) was conducted in response to the identified discrepancies in the actual display conditions of the candy category as of June 14, 2024. In this simulation, a reorganization of the shelf layout was carried out using a planogram-based approach that considered subcategory segmentation and optimized display space capacity based on available inventory data (Dusterhoft, 2020).

The simulation results demonstrated a significant improvement in terms of product arrangement and display efficiency. All 105 SKUs with available stock in the system were successfully displayed on the shelf, eliminating the issue of unrepresented SKUs observed in the actual display condition. Moreover, there were no products from unrelated categories placed within the candy section, indicating a more structured and category-aligned space allocation in the planogram design.

The visual display from the simulation also showed that products were arranged following a logical flow based on subcategories, including Fruity / Small Treat, Fun Reward, Indulgence / Sharing Family, and Refreshment. This not only facilitated customer navigation and product discovery but also supported a more effective merchandising strategy aimed at enhancing the shopping experience and sales potential.

The implementation of this planogram simulation highlights the importance of data-driven and structured shelf space planning. In addition to improving product visibility, this approach minimizes category misplacements and ensures that every actively stocked SKU receives appropriate exposure in the retail space (Chaniago, 2021).

4.2 Final Remarks

This study demonstrates that implementing shelf space allocation planning (planogram) significantly



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improves store performance at PT. XY, as measured through the Balanced Scorecard framework. The planogram strategy led to increased sales volume, higher product unit sales, and growth in new customer acquisition. It also enhanced staff understanding of product arrangement, contributing to operational efficiency and an improved shopping experience. However, a rise in out-of-stock items suggests that replenishment systems must be aligned more closely with display planning.

The independent sample t-test confirmed that stores applying planogram strategies performed significantly better than those without, particularly in sales, customer metrics, and product display effectiveness. Moreover, stores not yet adopting planograms still hold substantial potential, especially in increasing SKU visibility and reducing unsold inventory. Ensuring that all actively stocked products are displayed can minimize lost sales opportunities due to poor shelf management.

To sustain these benefits, PT. XY is encouraged to expand planogram implementation across its branches, improve stock replenishment systems, provide ongoing staff training, and regularly update planograms based on sales data and market trends. Strategically, planogram adoption supports data-driven decision-making, optimizes inventory control, enhances customer experience, and improves cross-department coordination, reinforcing its value as a key retail management tool.

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