Optimizing Fashion Retail Shelf Management for Enhanced Consumer Experience: A Literature Review

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ABSTRACT:
This study aims to optimize shelf display management in the fashion retail industry to cater to the evolving needs and desires of consumers for specific products. With the ever-expanding range of fashion items available in retail stores, the limited space on display shelves poses a significant challenge. Additionally, trendy, and high-demand fashion products often experience quick sell-outs, necessitating frequent restocking. Effective management of shelf displays is pivotal in enhancing consumer satisfaction and stimulating impulse purchases by maximizing product visibility and exposure. In the realm of fashion retail, shelf display management can be broadly categorized into macro and micro levels, encompassing strategic overall layout and precise product allocation within specific fashion categories. However, these approaches heavily rely on the availability of demand and transaction data, which can be challenging for small and medium-sized fashion enterprises with limited data resources. This literature review underscores the research opportunities for optimizing shelf display management, particularly in the context of fashion retail businesses facing data limitations. It recognizes that through thoughtful facility layout design, coupled with suitable adjustments and modifications, the challenges associated with shelf displays in fashion retail stores can be effectively addressed.

Keywords: Shelf Space Allocation Display, Shelf Management, Space Elasticity, Shelf Replenishment, Shelf Display Layout

I. INTRODUCTION

Although the popularity of online fashion stores and the rise of e-commerce have grown significantly, the significance of physical fashion retail stores that provide an immersive shopping experience cannot be overlooked. Physical stores allow consumers to interact with fashion products, feel the fabrics, evaluate the textures, and assess the overall quality firsthand. This tactile engagement plays a crucial role in influencing consumers' fashion purchasing decisions, as emotional connections, personal experiences, and psychological factors greatly impact their choices.

As consumer demand for a diverse range of fashion products continues to increase, fashion retail stores face the challenge of limited space to display their entire collection (Caro, Gallien, & Gallien, 2007; Wen, Choi, & Chung, 2019). Simply offering an extensive variety of products does not guarantee heightened consumer satisfaction. Furthermore, if fashion items are not adequately showcased and visible to shoppers, there is a high probability of disappointment, leading to lost potential customers and decreased repeat visits to the store (Ebster & Garaus, 2011; Mowrey, Parikh, & Gue, 2018). To overcome these obstacles, fashion retailers must prioritize designing captivating and memorable store layouts that leave a lasting impression on consumers. By achieving this, retailers can foster customer loyalty and increase their chances of repeat business.

Another crucial aspect is the effective management of popular and high-demand fashion items, as they tend to sell out quickly and have a short product life cycle (Jin, Chang, Matthews, & Gupta, 2012). A visually empty display rack not only disappoints customers but also creates a perception of limited stock availability. The ease of product accessibility and optimal product visibility significantly influence consumers' purchase decisions in the fashion industry. In the context of the fashion industry, it is worth noting that most businesses are micro, small, and medium-sized enterprises (MSMEs). These MSMEs play a vital role in promoting fashion products and contributing to the industry's growth. However, many fashion retailers face challenges in managing their store layouts due to limited space and a diverse range of fashion offerings. The lack of comprehensive data, including demand patterns and transaction records, further compounds these challenges. Consequently, conducting research on optimizing shelf display layouts in the fashion retail sector becomes imperative. This literature review critically examines existing research while exploring the potential for innovative approaches to address current store layout challenges and enhance the overall shopping experience for fashion consumers.

II. SHELF SPACE MANAGEMENT EFFECT IN CUSTOMER SATISFACTION

The shelf display layout in fashion retail stores can have a significant impact on consumer perception and satisfaction (Bianchi-Aguiar, Hübner, Carravilla, & Oliveira, 2021; Young et al., 2020). Studies have shown that consumers tend to scan from left to right within their desired category, and then look from top to bottom for specific brands and variants (Ebster & Garaus, 2011). This means that vertical categorization of products can enhance consumer satisfaction, as it makes it easier for consumers to find the products they are looking for. The height at which products are placed on the shelves also plays a role in consumer satisfaction. Products placed at eye level up to knee height tend to receive more attention from consumers, as this is the natural line of sight for most people (Mowrey, Parikh, & Gue, 2019a). As a result, some fashion stores position frequently purchased items at this height, such as accessories, jewelry, and handbags. By optimizing the shelf display layout, fashion retailers can create a more memorable and satisfying shopping experience for their customers (Saijo, Tosu, Morimura, Otake, & Namatame, 2018). A well-designed layout that makes it easy for customers to find the products they are looking for can lead to increased sales and customer loyalty.

The height at which products are displayed can also influence consumers' perception of the value and price of the items. Products placed at eye level are often perceived as being more valuable than products placed lower down on the shelves. This is because consumers associate eye level with quality and attention to detail (Lu & Seo, 2015). For example, products placed at lower levels, below knee height, are perceived to have lower value and cheaper prices

compared to items placed above. Hence, products displayed at higher levels often represent high-value or highly sought-after items, while those placed at lower levels are associated with lower value. Products placed on lower shelves should ideally be heavy or bulky items (Ebster & Garaus, 2011). Placing items above eye level can be dangerous and risky for consumers in case of misplacement or earthquakes when standing. However, many retail stores utilize the top shelves for storage, which reduces the available storage space in the store. In addition to shelf height, the placement of products in specific aisles or areas can also impact store revenue. Products located near the cashier counter receive higher exposure compared to those placed in corner or secluded areas, as consumers tend to avoid narrow and secluded spaces (Saijo et al., 2018). Therefore, effective management of the store's display layout is essential in maximizing consumer experiences.

Transaction of shopping carried out by consumers is divided into two categories: planned shopping transactions and unplanned or impulsive shopping transactions (Yapicioglu & Smith, 2012). In planned shopping transactions, consumers rely on their memory of the layout of product displays in the retail store, making it easier for them to find the products they intend to purchase. However, in unplanned shopping transactions, consumers usually buy products that can enhance their satisfaction, such as non-essential items. These products are also known as hedonistic products, such as candies or other items that fulfill personal desires or satisfaction (Mowrey, Parikh, & Gue, 2019b; Yapicioglu & Smith, 2012). Some researchers also assume that the level of impulsive transactions is likely to occur in areas with high customer density. Therefore, consumer decisions to make impulsive purchases are influenced by various stimuli in the store, such as product placement on available display space, pricing, promotions, product advertising, market segmentation characteristics, consumer habits in the store, and the effects of product display design and environmental conditions (Flamand, Ghoniem, & Maddah, 2016).

Each fashion store operates within a unique market segment and caters to specific target markets with distinct consumer behaviors. To enhance retail revenue, it is crucial for stores to collect and analyze transaction data and consumer profiles, enabling them to develop tailored strategies for each store. These strategies should consider factors such as transaction data, consumer profiles, shopping behaviors, and the arrangement of product display racks, as they influence the store's profits from impulsive shopping transactions (Flamand et al., 2016). Consequently, effective management of the product display rack layout becomes paramount in the fashion industry's inventory management context, aiming to maximize existing display space utilization based on consumer demand and ultimately increase revenue. The management of retail store layout should encompass considerations such as product types, the order of product categories, the positioning of products horizontally and vertically, allocation of products on display racks, and planning for rack replenishment (Peng, 2021).

III. SHELF SPACE MANAGEMENT IN FASHION RETAIL

Within the context of retail inventory management, shelf space management can be categorized into two levels: the macro or strategic level and the micro or tactical level (Hübner & Schaal, 2017; Karki, Guthrie, & Parikh, 2021). At the macro level, the focus lies on determining location space, arranging the order of product categories, and selecting suitable rack types. Conversely, the micro level involves tactical layout design, specifically allocating products

within each product category. Strategic-level management primarily addresses broader product display rack layout issues without delving into the intricate arrangement and allocation of individual products. Previous research has concentrated on identifying shopping patterns and behaviors, such as consumer line of sight, aisle and shelf congestion, distance travelled by consumers, and analyzing purchased products in each transaction. Through the analysis of such data, researchers can design layout orientations, determine spacing between racks, identify strategic locations, and arrange product categories to align with consumer patterns and behaviors during shopping. On the other hand, micro-level layout management focuses on optimizing the efficiency of available display space, considering factors like demand, product size, and retail store revenue, often referred to as shelf space planning.

The strategic level of fashion shelf display inventory management involves two key approaches: the retail rack layout problem and Market Basket Analysis. The retail rack layout problem focuses on optimizing the arrangement of shelves based on consumer behavior, considering factors such as line of sight and the distance travelled during shopping. Previous research has examined the best orientation of racks to maximize product exposure and the proximity of related product categories(Flamand, Ghoniem, & Maddah, 2016; Mowrey et al., 2019b; Yapicioglu & Smith, 2012). This approach ensures that closely related products are placed together to enhance the shopping experience. Market Basket Analysis, on the other hand, utilizes transaction data to identify frequently purchased product combinations. In the fashion industry, this analysis helps create bundled promotional packages and strategically arrange the layout of these products (Hirpara & Parikh, 2021). By leveraging the insights from Market Basket Analysis, retail stores can enhance impulse purchases and customer satisfaction. However, solely focusing on the macro-level shelf display layout may overlook the specific allocation of individual products. All product demands are treated equally, disregarding their actual variations. This approach does not account for filling empty spaces on the shelves with alternative products or planning for the introduction of new product variations. To address these issues, tactical planning at the micro-level becomes crucial.

Micro-level shelf layout management aims to maximize the use of available display space by strategically allocating each product based on factors such as horizontal and vertical visibility. As the number of product variations increases, the available stock on the shelves decreases, requiring more frequent restocking. Products with high variability pose a risk of reducing product exposure and increasing the likelihood of out-of-stock situations. Studies have also highlighted the stimulating effect of the number of products allocated on the shelf display on product demand (Bianchi-Aguiar et al., 2021). Additionally, empirical research has identified two types of demand stimulation effects: demand influenced by the available shelf space and demand influenced by the product's position on the shelf (Irion, Lu, Al-Khayyal, & Tsao, 2012a; Russell & Urban, 2010).

Previous studies have explored the elasticity of shelf space and utilized product hierarchy decomposition to determine optimal space allocation on display shelves (Irion et al., 2012; Russell & Urban, 2010). However, these studies did not account for the impact of price on demand, as observed in another research (Murray, Talukdar, & Gosavi, 2010). Additionally, the existence of substitute products during stock-out situations, as addressed in separate studies, was not considered (Hübner & Schaal, 2017; Irion, Lu, Al-Khayyal, & Tsao, 2012). Similarly, specific studies have focused on scheduling product replenishment on display shelves based on consumer demand (Düsterhöft, Hübner, & Schaal, 2020). One study considered replenishing products based on existing inventory, while another incorporated the elasticity

function of display space to determine the optimal frequency of product replenishment and specific allocation on available shelves.

In the fashion industry, effectively managing both the strategic and tactical aspects of shelf display layout is essential for optimizing product exposure, meeting customer demands, and enhancing overall inventory management. Managing the shelf layout at the micro level involves addressing the challenges of product allocation on display shelves based on capacity, dimensions, and shape of the available space. Factors such as product availability, supplier regulations or agreements, and retail store merchandising rules that prioritize brand over category allocation also need to be considered. Although various approaches and models have been developed, comprehensive research that considers all the effects of layout on demand while incorporating all the constraints is still lacking.

IV. RETAIL SHELF DISPLAY LAYOUT MANAGEMENT

Research on the issue of industrial layout in general has been studied for a long time, even since the mid-1950s (Heragu, 2018). However, at that time, layout research focused only on the layout problems of manufacturing industries to minimize the distance of material travel from one machine to another in accordance with the production process sequence. On the other hand, the issue of display shelf layout in retail stores was only discovered in the 1960s, where empirical studies on the layout problems of display space were conducted to understand the impact of demand on the layout of retail store displays (Bianchi-Aguiar et al., 2021). From a qualitative analysis perspective, these two layout problems have similarities if the departments and/or facilities in the manufacturing industry are categories of products sold in retail stores, as there will be input data on proximity relationships that can be solved using systematic layout planning. However, from a quantitative analysis perspective, these two problems have different objective functions. In the case of manufacturing industry problems, the objective function is to minimize travel distance to reduce the cost of material movement. On the other hand, in the case of display shelf layout in retail stores, the objective function is to maximize revenue and increase impulse buying transactions (Yapicioglu & Smith, 2012).

The design analysis of industrial layout and fashion retail store layout has similarities and is divided into two design stages: macro and micro. In industrial layout problems, the macro design stage involves determining the factory location, while the micro-level design stage involves designing the layout of machines and/or facilities within the factory (Heragu, 2018). In the case of fashion retail display shelf layout in fashion retail stores, the macro level involves planning the layout based on strategic level or product category, and the micro level involves planning the specific display shelf layout based on the allocation of products for each available shelf.

In each stage of designing the fashion retail shelf layout in retail stores, the effects of layout on satisfaction and perception should also be considered. Thus, customer satisfaction can be increased, and the retail store can maximize its revenue. One of the limitations of existing research is that it focuses only on maximizing the available space without considering the effects of layout on consumer perception and satisfaction. Additionally, current research heavily relies on demand and/or transaction data available from the retail store. However, the reality in today's retail stores is that data availability is very limited, especially if the store does not keep transaction data or has just opened, resulting in a lack of transaction data. Therefore,

research on display shelf layout problems in retail stores has not yet been able to solve the existing issues.

When a retail store lacks transaction data and/or consumer demand data for the products being sold, the models and/or algorithms from existing research cannot address the current reality of retail store problems. Thus, further research is needed to solve this issue. One approach to solving the display shelf layout problem in retail stores is by modifying systematic layout planning according to the needs and/or objective functions of the display shelf layout problem in fashion retail stores. Additionally, even with limited available data, retail stores can still design the most optimal layout to maximize the available space and consider the effects of layout on customer satisfaction during shopping. Thus, the fashion retail can develop a comprehensive design for its shelf space management.

V. CONCLUSIONS

The retail store layout plays a crucial role in the micro, small, and medium-sized enterprises (MSMEs) operating in the fashion industry. Retail stores have the potential to assist MSMEs in marketing their fashion products. Moreover, in meeting consumer demand, retail stores also need to enhance the range of products they offer. However, this poses a challenge for fashion retail stores in arranging their products due to the limited available space. As more products are sold, the stock quantity on display shelves becomes limited. Therefore, effective management of the store's display layout becomes paramount.

One of the current realities in Indonesia's MSME fashion retail is that many stores do not store or lack the necessary data, such as demand and transaction data, which can be used for inventory and layout management. Hence, this literature study aims to critically examine existing research and explore opportunities for inventory and display layout research in fashion retail stores to address these current challenges.

Previous studies have shown that the layout of fashion retail stores can also influence consumer perception and satisfaction while shopping. This is because consumers have specific patterns and behaviors when shopping, and the location and arrangement of products on display shelves can impact their impressions and satisfaction. However, the layout's effects on perception and satisfaction do not directly influence consumers' purchasing decisions. Several factors, including brand, price, promotions, visibility, and product exposure, play a significant role in consumers' purchasing decisions.

One of the objectives of managing the display layout in fashion retail stores is to increase revenue by optimizing the available display space, enhancing product exposure, placing related products near each other, and improving the accessibility of the items for sale. By increasing visibility and product exposure, consumers can easily find the products they intend to purchase. The management of the display layout in fashion retail stores generally involves two levels: macro and micro. The macro-level management, or strategic level, focuses on determining the location of display shelves. On the other hand, the micro-level management, or tactical level, involves allocating products for each product category. However, there is still a lack of comprehensive research that investigates the inventory and display layout management in fashion retail stores from macro to micro levels.

Furthermore, previous studies on fashion retail store layout management heavily relied on trend seasonal purchase demand and transaction data, which may not fully address the current inventory challenges. Therefore, there is an opportunity for research to comprehensively address the inventory and display layout problems in the fashion retail

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industry. For example, a comprehensive design of fashion retail store display layout can be achieved by combining systematic layout planning approaches with mathematical models using heuristic and/or optimal algorithm construction. These models can be adapted and modified to consider the effects of layout on consumer satisfaction while shopping in the fashion industry.

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