

Optimizing Store Assortment and Allocation for Short Lifecycle Products

Retailing Short Lifecycle products

Our lives are filled with products with short lifecycles. Examples include movie DVDs, music CDs, electronic items (such as digital cameras, laptops, TVs, etc), apparel, books, and toys. Products in these categories experience brisk sales in the first few days/weeks and then experience a rapid decline in sales as the fad or 'newness' wears out. Retailers from formats specializing in short lifecycle products face several issues in deciding store assortment¹ and allocation². These issues can be traced to the following reasons:

- **Lack of historical sales data** due to the 'incomparable' nature of hot new products in these categories e.g., a bestseller book, DVD release of a new action movie, a revolutionary new tablet PC with enhanced features
- **Significant variation in demand across stores** for products in some categories, due to:
 - *Climatic differences* e.g., demand for winter jackets in the North East US states is much higher than demand in the Southern states

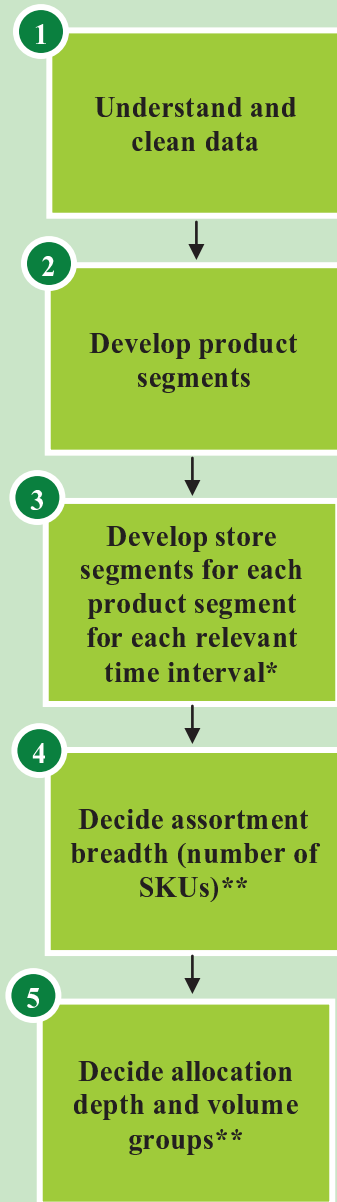
- *Demographic settings* e.g., Areas with higher proportion of Hispanics have different DVD demand patterns than the rest of the country
- *Urban vs. Rural settings* e.g., rural demand for GPS devices is higher than urban demand
- *Store format and location* e.g., bookstores in the airport have higher proportion of magazine sales compared to mall bookstores

These issues often lead to sub-optimal assortment and allocation in these categories, which causes stock-outs of popular items at some stores and excessive markdowns of slow moving items at some stores. It is usually not possible to correct mistakes made during assortment, allocation and planning because customers are often unwilling to take a rain-check for stocked-out items and because the cost of reverse logistics for excess inventory from the store-shelf is prohibitive. Our experience with an apparel retailer suggests that the *potential sales lost during stock-outs could be as high as 4 to 6% of total sales*, whereas the *total negative margin on markdowns could be as high as 3 to 5% of total sales*. Thus, optimizing assortment and allocation can improve the top and the bottom line significantly.

¹ which products to carry in each store

² how much of each product to carry

Approach for Store-level Assortment and Allocation



* Week, month, quarter or season

** For each Dept-Class-Section for each relevant time interval for each store group

Step 1: Understand and clean data

Assortment and allocation optimization primarily require the following types of data:

- Transaction and inventory data at SKU-store-week level
- Latest product and store master data

A detailed understanding of the current and past business practices is critical before any analysis. Some questions that need to be clarified include:

- How does the retailer currently segment Products? Stores?
- What has the historical assortment strategy been?
- What process and strategy does the retailer use for allocation and planning?

These questions can be answered by talking to team members in Allocation & Planning and Merchandising and/or by analyzing the data.

Step 2: Develop product segments

Segmenting products is an important step in developing an assortment strategy. This can be done on the basis of the following information (if available):

- Underlying attributes of the products
- Seasonality of Sales
- Pattern of sales in the past few years
- Price range of the products

In electronic products, one may need to create a segmenting variable that changes over time, to capture the dynamic nature of the product. E.g., the RAM, hard disk capacity and processor speed of an 'Entry' level laptop have increased over time. Product trends need to be studied over time to develop segments in these categories.

Category	Illustrative product segments
DVDs	Action, Comedy, Family-Drama, Horror, TV Series; New Release, Classic; Blue Ray, SD; Box office revenue (<\$50 MM, \$50-100 MM, >\$100 MM)
TVs	3D, LED, LCD, Plasma; <26 inches, 26-40 inches, >40 inches; < 3 HDMI inputs, 3-4 HDMI inputs; HD/ HD-Ready
Women's Apparel	Missy/Women/Petite; Sweaters/Pants/Knits/Woven/Jackets; Casual/ Work wear/ Party wear; Fashion, Basic

Step 3: Develop store segments for each product segment for each time interval

After segmenting products, we segment stores for each product segment for each relevant time interval. Store segmentation is usually done using a combination of the following performance metrics:

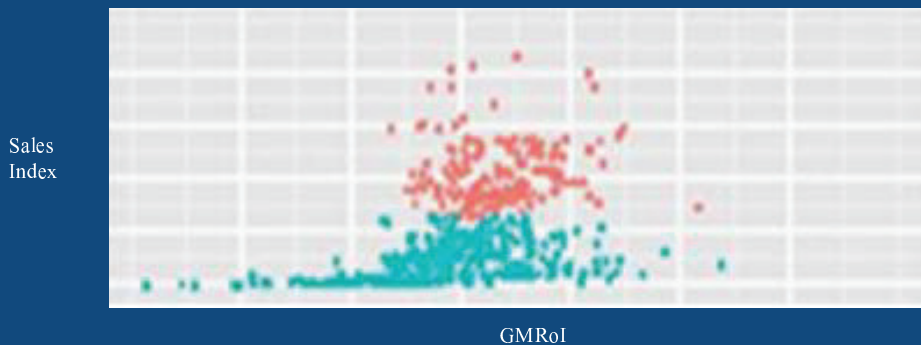
- Gross margin return on inventory (GMROI)
- Sales Index (store sales for a product segment, indexed to average store sales)

- Inventory turnover
- Full-price sell-through

Statistical analysis (decision trees, clustering), data mining, and business judgment are used to select the store segments and the combination of metrics.

Finally, each store segment is profiled on demographics, location type, climate of the location, area, performance metrics, etc, to understand the nature of the segments.

An illustration of a solution with two store segments for an apparel product segment is shown below. Each dot represents a store and the color represents the segment.



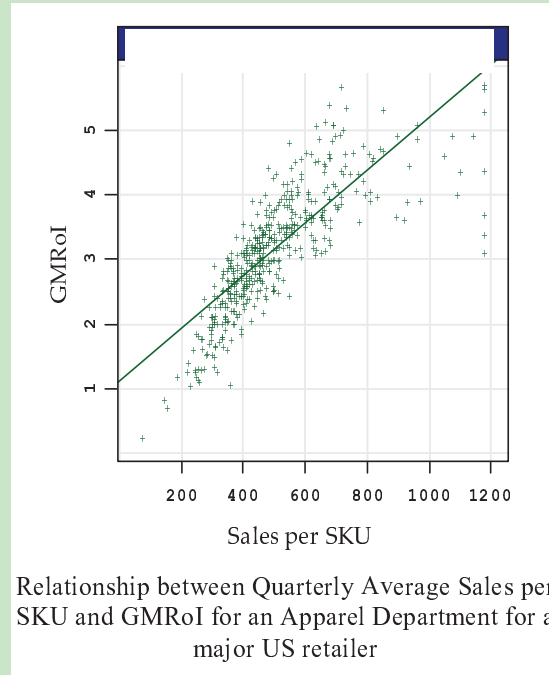
Step 4: Decide Assortment breadth

Firstly, we adjust historical gross sales data for negative margin sales and stock-outs to obtain the 'True Demand' for each product at each store. Negative margin sales adjustments are required to avoid over-allocation to stores that sell merchandise at a loss at the end of the lifecycle.

The stock-out adjustments need to factor in rain-checks at the store or through a direct phone line. We also need to estimate the probability of a customer substituting a stocked-out item by a similar item. In the case of bestseller books, DVDs or toys, a stock-out usually leads to rain-checks or lost sales. In the case of apparel, customers may choose an item with the same style but a slightly different color. Stock-out adjustments require deep understanding of category consumer behavior.

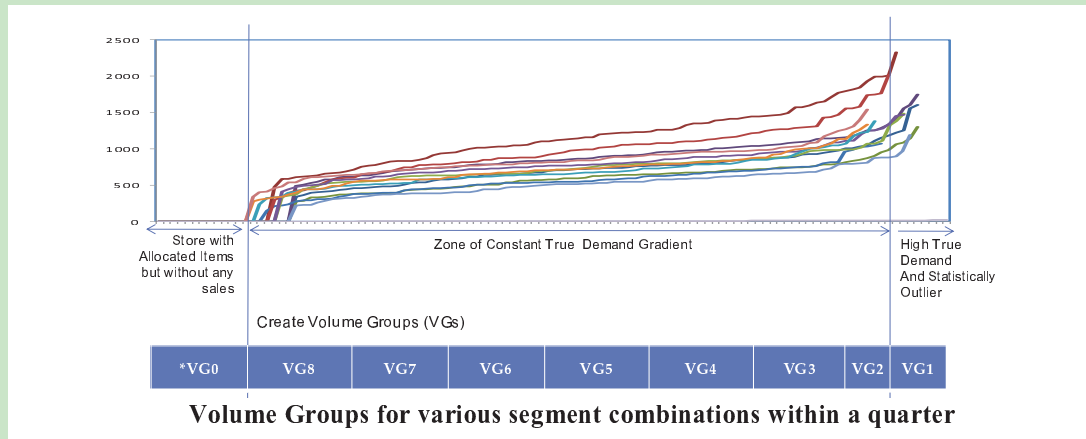
The assortment breadth for each store segment (for each Department-Class-Section, for each time interval) is then decided using the following activities:

- Calculate the average true demand per SKU displayed in each store. Usually the average true demand per SKU correlates highly with GMROI.
- Compare quarterly average true demand per SKU to minimum pack size requirements.



- Analyze the differences across stores in each store segment in the historical assortment breadth of the Department-Class-Section in that time interval
- Decide assortment breadth for each store segment and Department-Class-Section for each period such that there is no significant change in assortment of historically high breadth stores, and such that historically low breadth stores are able to sell at least one pack per SKU. This may require making exceptions for some stores.

Once the assortment breadth is decided, the Merchandizing team and the Planning team need to decide which SKUs need to be sent to each store segment.



Step 5: Decide Allocation depth and Volume Groups

An 'allocation curve' is developed for each product segment for each store segment for each time interval using the 'True Demand'. The stores in each store segment are grouped into desired number of 'Volume Groups' on the basis of 'True Demand', using statistical techniques and business rules.

The new allocation curves are compared with the historical allocation scheme and a suitable explanation is developed for any significant changes at the store level.

The allocation is then translated into unit shipments for each allocated SKU, after adjusting for pack sizes. Unit allocations at a Department-Class level for each store are checked against historical allocation to explain significant changes.

The VMI Caveat

The methodology suggested above cannot be used in categories where manufacturers/ vendors manage shelf inventory or in categories where the retailer can return unsold product back to the manufacturer/ vendor. In these cases, the retailer needs to optimize the shelf

space allocated to each manufacturer/ vendor.

The Way Forward

Today, only a few retailers selling short lifecycle products use sophisticated techniques in assortment and allocation, probably because it requires a diverse range of skills:

- **Data mining skills:** Analyzing millions of rows of retail data requires database skills as well as skills in advanced analytics software.
- **Domain knowledge:** Segmenting products and stores, and calculating the 'true' demand require deep understanding of the business.
- **Statistical expertise:** Skills in clustering, decision trees and regression are required for segmentation, and for understanding relationships between performance metrics and controllable levers

However, increased competitive pressure has made assortment and allocation optimization a necessity today.

To know more about assortment and allocation optimization, please write to us at knowledge@knowledgefoundry.net