White Paper

Trouble with the [Size] Curve: How Proportional Profile Planning Streamlines Apparel Supply Chain Planning

Executive Summary

The apparel industry uniquely combines characteristics of make-to-stock manufacturing with consumer-driven fashion volatility. While an apparel maker may have a base demand that is amenable to cost-saving lean manufacturing, its fashion-driven business requires enhanced agility to achieve needed service levels in the face of short life cycles, high volatility, low predictability and high impulse purchasing.

Proportional profiles [also called distributions or "size curves"] that parse an item's demand forecast by attributes such as color, size and more, are crucial to creating accurate demand plans at the SKU and sub-SKU level for new products, over the complete life cycle, and within different seasons.

Creating accurate distributions has traditionally been a cumbersome manual task, fraught with uncertainty and prone to human error. However, recent advances in demand planning technology allow planners to go far beyond manual generation of size curves based largely on intuition and incomplete data.

Planners can now automate the creation and management of proportional profiles spanning attributes such as gender, size, color, width, trim, fabric, channel, region, label/brand, and much more for entire collections of apparel items.

This paper presents a new approach to proportional profile planning that lets planners:

1. **Automatically generate accurate profiles using existing sales history data.**
2. **Go beyond the size curve to handle any number of product attributes and tiers.**
3. **Forecast by attribute earlier in the planning cycle to streamline new product introductions.**
4. **Adapt proportional profiles across seasons and life cycles to optimize overall profitability.**
5. **Streamline demand to supply translations to maximize your market-driven response.**

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Proportional profile planning solutions give demand planners the power to forecast more SKUs more accurately using multiple tiers of attributes, which also takes pressure off sourcing and supply teams.

Proportional Profiles Consider Crucial Factors

For sourcing and supply planning teams, proportional profiles provide specific guidance at the granular forecasting level, beyond style/color/size.

This is especially important for apparel supply chains, where life cycles are short, uncertainty is high, and stock-outs and obsolescence are simultaneous threats. Even apparel manufacturers who adopt a lean manufacturing approach upstream must have a responsive, agile strategy downstream in order to serve the unpredictable, fashion-driven segments of the marketplace.

Forecasting accurately down to the size/SKU level applies both upstream and downstream to basic and fashion-sensitive apparel products. In addition, although the low-level, granular demand pattern for staple goods may be predictable, seasonal products are influenced by factors such as time of year, holidays, academic cycles and others.

In all of these cases, translating the demand plan for an item into an accurate granular forecast can mean the difference between profit and loss.

"Supply chain planning technology is now the single leading area about which apparel companies are concerned."

— "7th Annual Top Technology Trends in the Apparel Market," Apparel Magazine/Gartner

Low-level Errors, High-level Impact

Like companies in other industries, apparel manufacturers use demand planning systems to adjust and maintain their statistical forecasts [unconstrained demand plans] at the item/style level. But for apparel makers, disaggregating the forecast for each item/style into colors, sizes, fabrics, sub-styles, etc., must also be a core competency. Style and color attributes are notoriously difficult to forecast, while size distributions are more stable and easier to quantify using historical sales data. Size requirements for customers remain fairly consistent over time and the size distribution of products sold during the past season usually serves well as an indication of future demand.

Still, it has been estimated that forecast error for the size attribute commonly ranges up to 40% for many items in the apparel industry. Even a forecast error of no more than 1—2% for each size in a curve from XS to XXL can cause 10% overall error—an inaccuracy that is then multiplied across all styles and colors of the item.[1] And size ranges can often be much larger: commonly used women's size ranges in clothing stores include misses [6 to 16], juniors [1 to 15], petites [1 to 13], women's [14 to 25], tall and maternity.

For apparel makers, forecast errors at the SKU/size level are a common, and costly, fact of life.

[1] "Impact of Size Distribution Forecast Error on Retail Performance," Hunter and King, 1996

No Place for Rules of Thumb

If disaggregating high-level demand plans into granular forecasts must be a core competency for apparel companies, they should be guided by scientific calculation, not rules of thumb.

Forecasting demand for fashion-sensitive, seasonal products is often based on, or influenced greatly by, the planner's experience, trend research, voice of the consumer or sales team, etc., and the largely non-empirical result consists of "rules of thumb" approximations.

Rule of thumb methodologies suffer from many inadequacies, promoting human error, often penalizing veteran planners as much as the less experienced. There is no scientific repeatability, whether from season to season, from color family to color family, style to style, or collection to collection. Usage of rules of thumb seems to go hand-in-hand with a limited or disorganized understanding of historical sales data and demand pattern analysis.

Rules of thumb come in three basic types:

- **Compensatory: based on importance weights and attribute ratings summed over all the attributes.**
- **Lexicographic: ranking attributes according to importance and selecting based on the most important attribute.**
- **Conjunctive: based on a minimum standard for each attribute.**

Many apparel companies attempt to use some form of sales history or future order targets as a basis for size forecasts. History can also be a crucial guide in other areas, for example, color forecasting. Colors for clothing products usually include trend colors and never-out-colors such as black and white, as well as "signature" colors of the brand or maker. Many clothing manufacturers use a six-month life cycle of trend colors and require at least that amount of lead time to initiate colors.

A proportional profile planning system can automate the gathering of hard data on multiple product attributes such as color, fabric, sub-style, and more, finally replacing rules of thumb and folklore with a scientifically generated granular forecast for sourcing, supply planning and production scheduling.

Takeaway: Rules of thumb must yield to scientifically-driven estimating techniques in order to minimize human error and provide repeatable forecasting improvements that become more accurate and more efficient over time.

When History Repeats Itself—Take Advantage!

Accurate predictive profiles for most upcoming products can be built based on existing sales histories of products with similar attributes, if the tools exist to leverage all available shipment history data and refine the planner's understanding of how individual attributes have contributed to overall demand patterns.

The key to better forecast accuracy, replenishment responsiveness and minimized obsolescence lies in automating the creation and management of a portfolio of relevant, history-based proportional profiles.

While demand planning at higher levels yields high overall forecast accuracy, the demand planner-to-supply team translation is crucial. In some organizations, planners forecast style/color/location, but leave it to those on the supply side to break that down into a size forecast. Smarter decisions come from closing the gap between high-level clothing line forecasting and granular supply-side plans for fabric/ materials sourcing, cutting/sewing, and production scheduling.

Using a proportional profile planning solution, apparel planners can apply custom profiles to an orders-of-magnitude greater number of products without overtaxing time and resources. They can also translate high-level forecasts into SKU-level replenishment plans far more accurately.

As good planners take every opportunity to migrate from a clerical to an analytical focus, a proportional profiling solution can deliver big benefits. It automates capturing and organizing sales history data, and applying profiles to item/style forecasts, eliminating time-consuming manual data collection and spreadsheet calculations. When planners are able to apply best-fit distribution curves and hand granular forecasts off to purchasing or supply planners, more time can be devoted to selecting and honing proportional profiles for best results, without bogging down in time-consuming data collection and spreadsheet analysis.

"New product failure rates, defined as a new product failing to achieve one or more target metrics set for it, hover[s] at 50 percent or greater across industries."

— "7th Annual Top Technology Trends in the Apparel Market," Apparel Magazine/Gartner

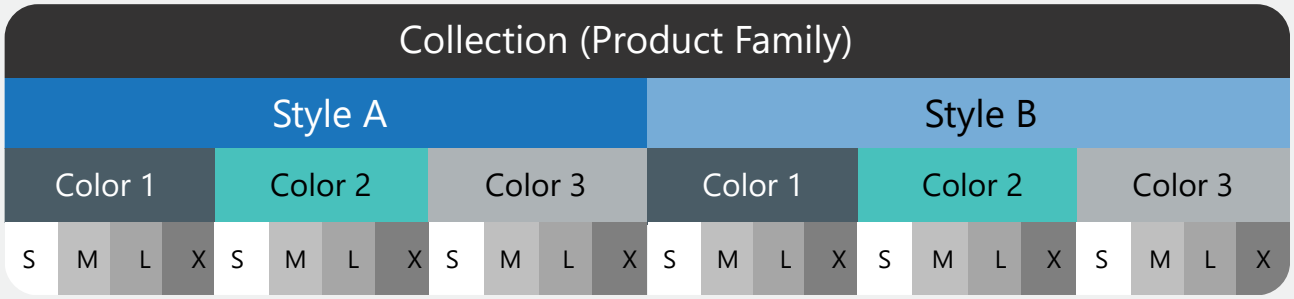
The apparel planners' library of profiles should contain named, relevant demand histories built from items with similar attributes from previous seasons, other clothing lines, etc. Rather than creating hundreds of item/style curves, usually the emphasis is on grouping and subsetting products to create a manageable number of predictive curves that apply key attributes like size, color, and style to new product introductions and changing market conditions.

Profile contents can vary widely by organization. In some cases, for instance, color may be considered part of the style, rather than a separate attribute. Also depending on the manufacturer's business, specific profiles may be created for different times of year or for distributions across customer ages or body types.

"The demand plan is not a sales or marketing forecast, it's not orders, and it's not a budget either. It is a process by which organizations determine the most profitable mix of items that could be sold, balanced by constraints and demand risks."

— "Building an Effective Demand Planning Process," Gartner

A simple multi-tier proportional profile for an apparel item



Takeaway: New automation tools make it possible for demand planners to create attribute profiles from existing sales histories of similar products. High-value profiles can be named and organized into a catalog for reuse. Collecting similar SKUs into groups simplifies the work of creating and applying proportional profiles. Making extensive use of historically-based proportional profiles can mean the difference between launching a highly profitable apparel line and flooding the clearance bins with obsolete merchandise.

Beyond Size Curves

Automating a scientific methodology and taking the burden of granular forecasting off the shoulders of the supply team vastly improves procurement decisions, vendor negotiations, and managing against vendor minimums.

A good start for many teams is simply to automate the creation of accurate size curves for new products based on historical data, and scaling that process across all apparel lines. But proportional profiling can go further, extending vertically to manage multiple tiers of various attributes:

- style/color/size/width
- style/fabric/color/waist/inseam
- label/style/color/imprint/size
- style/attire/neck style/sleeve style

Production schedules and capacity planning can get underway with enough lead time to create smoother and more efficient production runs.

While most apparel attribute stacks will have few tiers, profile creation should be flexible enough to handle deeper hierarchical stacks of attributes.

Some organizations may find it useful to create profiles for retail-oriented stacks [channel/department/brand], or distribution-oriented stacks [region/retailer/store type]. With the power to gather, organize, and analyze sales data for a wide variety of attributes, advanced apparel makers can reduce discounting and obsolescence across many lines and collections.

Takeaway: Demand planning should be augmented with proportional profiles that extend through unlimited tiers of attributes and drive better demand-to-supply translations.

Early Prediction

Proportional profile planning can accelerate sourcing decisions and contribute to more successful new product launches by shortening the planning cycle.

Proportional profile planning helps translate demand plans into sourcing, supply, and production plans at a much earlier point in the process. By automatically modeling the historical demand patterns of items with similar attributes, initial profiles can be built early in the product development cycle—and important aspects can be in place before all product decisions have been made, vendors have been selected, or the forecast is complete. Production schedules and capacity planning can get underway with enough lead time to create smoother and more efficient production runs. Efficiency and profitability are improved by having a longer-term view of the capacity needed, purchasing mix, and production scheduling requirements.

Product assortments can be adjusted based on the life cycle stage, selling season, or replenishment period.

At each phase, the internal discussion between sales, marketing and operations proceeds with clarity and mutual understanding.

It no longer requires a veteran planner to create a solid SKU/size forecast even before the entire sales forecast is set, using a proportional profile based on relevant sales history.

Takeaway: Proportional profiling determines the best-fitting disaggregation profile for a new product, which in turn allows operations teams to start making confident supply planning decisions even before the entire product plan is complete.

Life Cycle Planning

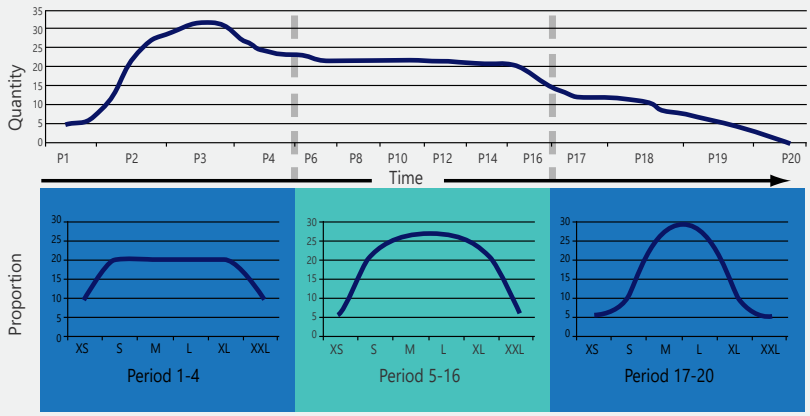
From introduction to retirement, full-price demand to close-out demand, the ideal replenishment plan should take into account the changing patterns of phases of the life cycle—and respond to market feedback as it becomes available.

Proportional profiling allows for quick adjustment of product assortments based on the stage, selling season or replenishment period. Changing profiles over time [time-phased distributions] allow planners to change replenishment patterns both in-season and at end-of-season. A good profiling solution allows organizations to switch to better-fitting profiles in response to actual sales data.

During early stages of the product life cycle or season, planners want "lots of everything:" all styles, colors, and sizes available to all regions, channels, and customers. During the mid-life stage, the percentage of each product variant may be adjusted in response to actual demand data or booked sales orders. In later stages, the emphasis is on restricting replenishment to selected sizes, never-out colors, etc. in order to reduce discounting and obsolescence.

Demand plans can be synchronized with on-hand inventory and customer orders for various product attributes. At each phase, an internal discussion that is traditionally dominated by intuition and emotion can now be supported by facts, helping planners reach consensus more easily.

Proportional profile planning throughout a clothing product's life cycle



Examples of challenges posed by in-season demand patterns, regional differences, and life cycle stages:

- Color popularity may differ across geographical regions.
- Fabric preferences may differ between warm/cold climates.
- Pricier fashion items may sell better at affluent retail boutiques.

Takeaway: Proportional profiles can refine forecasts across every phase of the apparel life cycle. Multiple profiles can be used to adjust granular forecasts and inventory to optimize sales and minimize obsolescence and discounting.

Conclusion

Proportional profiles allow apparel manufacturing planners to forecast at a level of aggregation that is more predictable and matches their business requirements, while allocating the forecast accurately across important product attributes at lower levels of aggregation, such as size, color, and many others.

Proportional profile planning solutions give demand planners the power to forecast more SKUs more accurately using multiple tiers of attributes, which also takes pressure off sourcing and supply teams.

Most companies using automated proportional profile planning report their biggest benefits are time savings/productivity and reduced human error.

Developing proportional profile planning as a core competency requires:

- **Easy and automatic profile generation**
  Increase new product forecast accuracy by building proportional profiles based on existing demand data drawn from any product line with similar attributes. Adopt a technology platform that augments traditional demand planning by automating the process of creating, organizing, and re-using profiles.

- **Scalable, multi-level demand profiles**
  Create profiles that parse demand forecasting down through many tiers of product attributes [style, color, label, fabric, region, and so on.]

- **Profiling early in the product development process**
  Use proportional profiles to forecast by attribute early in the planning cycle, giving the supply-side team more lead-time to procure materials and plan production.

- **Adjusting profiles across seasons and the product life cycle**
  Match inventory to business goals from launch to end-of-life using best-fit proportional profiles at each stage of the life cycle.

Now there is a new weapon in the battle to forecast more accurately, roll lines out faster, respond to market changes quicker, raise customer satisfaction, and maximize lifetime profitability of every item in every collection.

Proportional profile planning helps apparel manufacturers stay ahead of the curve.

About Logility

Accelerating the sustainable digital supply chain, Logility helps companies seize new opportunities, sense and respond to changing market dynamics and more profitably manage their complex global businesses. The Logility® Digital Supply Chain Platform leverages an innovative blend of artificial intelligence [AI] and advanced analytics to automate planning, accelerate cycle times, increase precision, improve operating performance, break down business silos and deliver greater visibility. Logility is a wholly owned subsidiary of American Software, Inc. [NASDAQ: AMSWA].

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