RIS News - RS&S
Advanced Planning and Optimization Series

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Introduction
Over the past several months, Terry Donofrio from Retail Systems and Services (RS&S), in conjunction with RIS News, has provided a series of articles addressing Advanced Merchandise Planning and Optimization. This 7 part series provided a comprehensive look at the planning environments of many successful retailers. The purpose of this series was to show how processes and methods should be applied to provide an efficient planning environment and improved profitability.

The first article considered an Overview of Advanced Planning including the major functions, processes, methods, automation and optimization tools that are applied. Subsequent articles explored each of the individual Advanced Planning functions in detail and described the processes, major tasks, roles/responsibilities and methodology as well as the automation and optimization techniques.

The articles are presented here as follows:
- Advanced Planning Part 1 - *Process, Methods and Automation Overview*
- Advanced Planning Part 2 - *Merchandise and Store Planning*
- Advanced Planning Part 3 - *Store Clustering*
- Advanced Planning Part 4 - *Assortment Planning*
- Advanced Planning Part 5 - *Space Planning*
- Advanced Planning Part 6 - *Allocation and Replenishment*
- Advanced Planning Part 7 - *Forecasting and Optimization*
Background
Today’s retailers face an economic climate unlike any in recent history. This difficult situation has led to a major cutback in consumer spending and overall demand. All indications are that this economic situation will continue for some time. Besides the reduction in spending, consumers are focusing on essential items only, lower pricepoints and less trips to stores. Successful retailers will need to understand the impact of these buying patterns and make the necessary changes to product strategy, assortments, pricing and margins.

Although retailers face a challenging outlook, they still consider the use of technology as a major factor in their success. This support from technology is especially true for Advanced Planning, where good processes and methods supported by automation is considered essential to a successful business strategy.

Need for Process Change
Before retailers can fully embrace the use of new methods and technology, they must consider the changes required to improve their processes and the resulting staffing requirements - namely the revised roles and responsibilities. Advanced Planning methods and automated tools offer many approaches and their application can be a daunting task. A defined and documented process ensures a correct approach and the right implementation strategy.

Currently, new technology improvements are being delayed to control expense levels and maintain profitability. However, to address the current retail environment, some retailers are streamlining their existing processes now. These changes will provide benefit by addressing current problems, getting the most out of existing technology and preparing for future technology investments.

Process and Methodology - Overview and Definitions
Advanced Planning considers various inputs integrated with the six major planning functions. These inputs, major functions and interaction are shown in the chart below.
Planning functions are defined below:

- **Merchandise Planning** – producing monthly (or weekly) merchandise/financial plans for all major parameters at all levels of the merchandise hierarchy down to Department, Class or even Subclass.
- **Store Planning** – developing financial plans by store and/or store cluster for all major planning parameters or a reduced set of parameters.
- **Store Clustering** – developing store groups based on various store performance parameters (usually sales) and non-performance based criteria (e.g. climate, space, ethnicity etc.).
- **Assortment Planning** – developing item quantities by store cluster as well as considering item lifecycle plans over time.
- **Space Planning** – developing space plans that consider both the store layout (visual space) and the unit assortment quantities coordinated with fixtures and product density (quantitative space).
- **Allocation/Replenishment**
  - **Allocation** – developing distribution quantities by store cluster and store.
  - **Replenishment** – developing store shipment quantities by SKU for warehoused merchandise.

For each Advanced Planning function defined above, the complete **process** must be defined including: tasks, roles/responsibilities, timing, inputs, outputs and systems support. The **methods** (methodology) applied to develop the plans must also be addressed (e.g. the algorithms, parameters, calculations and constraints applied to develop and maintain all types of plans). These processes and methods must be considered for both pre-season and in-season planning.

**Systems Approach/Automation/Optimization**

To support the planning processes and methods, requires a defined **systems approach** providing the guidelines for all automated support tools. The systems approach and resulting automation provides the capabilities to develop and maintain all plans. These **automation** capabilities include:

- Integrated Historical Information
- Business Analysis
- Plan Creation and Maintenance
- Integrated Advanced Planning Functions
- Integrated Legacy Systems
- Flexibility and Ease of Use

Various **optimization** tools are now being considered as well. These capabilities include: Business Analytics, Statistical/Causal Forecasting, Case Pack/Size Optimization, Advanced Clustering Capabilities, Assortment Optimization, Promotional Lift/Forecasts etc.

**Summary and Benefits**

Past history has shown that any successful planning system implementation must be preceded by good process definition along with the changes needed to methodology and systems approach. When retailers define and document their new approach they will achieve significant benefits including:

- elimination of problems and issues
- a more efficient organization with clearly defined roles/responsibilities.
- a solid framework to address automation and advanced tools so the full benefit may be realized.
- guidelines for the cultural change needed for all personnel to successfully grasp the new processes, methods and systems approach.
Advanced Planning Part 1: Process, Methods and Automation Overview

- a basis for the change management that must occur.
- smooth integration of legacy and new processes, methods and systems approach.
- a definition of the training that will be necessary for both processes as well as methods and systems.
- a logical and sequential approach for the changeover to new methods and techniques.

A summary of the Advanced Planning functions is given in the chart below.
Introduction
Advanced Planning addresses the major functions supporting retail merchandising activities. These six Advanced Planning functions were identified in our first article and are shown below with today's topics highlighted.

Purpose
Merchandise Planning establishes the pre-season approved plan that sets the direction for all merchandising activities. This plan provides the basis for inventory and Open-to-Buy (OTB) control. During the season, the plan is updated and serves as the basis for on-going tracking and control.

The Store Plans provide additional performance tracking and control as well as supporting Store Clustering and Allocation. Merchandise and Store Plans together provide the financial targets for the Assortment Plans.

Planning Process and Methods
An overview of the pre-season process is shown below.
As shown, the process considers top down and bottom-up merchandise planning, store planning, reconciliation and approval. The key functions include:

**Merchandise Planning:** merchandise plans consider all major financial parameters from an inventory and profitability perspective.

- **Goals and Objectives/Strategic Plans/Merchandise Strategy** – the pre-season process is driven by company management as they establish the objectives that set the direction for the merchandise division.
- **Business Analysis/Business Analytics** – historical store and merchandise performance reviews define the trends and forecasts that are utilized as plans are developed.
- **Top Down Planning** – Company and Division plans are prepared by management based on the established company goals and objectives. These plans are driven to Department level based on history, trends and/or forecasts.
- **Bottom-Up Planning** – Department Plans are driven by Class level units or dollars, store plans and/or unit assortment plans. These plans follow the Department merchandise strategy as well as recent trends and forecasts.
- **Plan Reconciliation and Approval** – The top down and bottom-up Department plans are reviewed and reconciled. Revisions to all plans are made and the final reconciled plans are then approved and become the Original Approved Plan as well as the Department Budget.

**Store Planning:** store plans consider all major financial parameters or a reduced subset (e.g. sales, inventory and receipts).

- **Store Level Review and Analysis** – the Store Planning process starts with a performance review and analysis. Trends and forecast are defined to support the store plan development.
- **Store Plan Creation** – Top down store plans are developed after the Merchandise Plans are complete based on store history or forecasts. A bottom-up approach is possible based on average store, store clusters and/or store forecasts. In some cases existing and new store plans can be applied as well.
- **Store and Merchandise Plan Reconciliation and Approval** – once the Merchandise and Store Plans are complete, they are reviewed, reconciled and approved. Resulting adjustments to both the store and merchandise plans may result.

Monthly **In-Season Planning** is performed resulting in a revised 3-6 month outlook. These on-going plans provide the basis for future decisions (e.g. markdowns, reorders etc.). The approved Merchandise and Store Plans are then inputs to the Store Clustering, Assortment Planning, Space Planning and Allocation/Replenishment functions.

**Organization Needs and Alternatives**

A critical element of the Merchandise and Store Planning process is the organization as well as the roles and responsibilities that support the process. Organizations have expanded to include and integrate both merchandise and store planning. One approach has senior planners developing the merchandise plans while planners develop the store plans. A second approach considers a separate store planning function defined based on existing and/or additional planners and allocators. Another approach has the store analyst function expanding to include a store planning capability.

For all approaches, the needed resources must be defined and applied. The team approach must be maintained with Planners, Buyers and Allocators working together.
Automated Support
Successful planning functions require new special purpose planning systems to support the processes, organization and methods defined. These available systems consider:

- creating store and merchandise plans
- maintaining history
- developing forecasts and trends
- seeding plans with history, trends and/or forecasts
- addressing hierarchies and other plan setup functions
- maintaining planning parameters
- building top down and bottom-up plans
- reconciling and approving plans
- allowing various approaches in a user friendly environment

Summary and Benefits
Merchandise and Store Planning provides the essential first step in the Advanced Planning process. The plans provide the basis for on-going tracking and control essential for a company to remain profitable and maximize potential. The figure below shows the interaction of Merchandise and Store Planning with the other Advanced Planning processes.
**Introduction**

Advanced Planning addresses the major functions supporting retail merchandising activities. An overview of these Advanced Planning functions was given in our first article in July and they are shown below with today’s topic highlighted.

**Definition and Purpose**

Store Clustering is the grouping of stores based on common store and demographic characteristics. There are two types of store clusters: performance and non-performance based. Performance based store clusters are grouped according to how they perform. For example, store locations with similar sales performance would be placed in the same store group. Non-performance based clusters consider store characteristics such as climate, store size and/or store type etc. Non-performance based clusters also consider customer demographics such as ethnicity, income level, age group, fashion preference etc.

Store clusters are usually developed at a Department and/or Class level. Store Clustering is very important as retail chains begin to consider customer-centric merchandising and tailor their assortments based on localized customer need. Assortment quantities and merchandise mix will be defined based on the characteristics of the various store clusters.

Effective store clustering often considers a combination of at least two types of clusters. For example, it is very common to consider both store size and sales volume together as a method of clustering. As shown in the chart below, this approach allows the planner to consider various combinations that will impact the assortments and products provided. A small store with high sales volume will be merchandised quite differently than a small store with low sales volume. The result of good clustering is an improved ability to provide a customer-centric merchandise environment.
**Store Clustering Process and Methods**

An overview of the pre-season Store Clustering process is shown in the chart below.

![Store Clustering Functions Diagram](image)

The key functions are described below.

- **Store Cluster Review and Analysis** – for both performance and non-performance based clusters, it is necessary to review the existing clusters to define any problems, issues and changes. For example, the analysis can consider parameters such as sales by volume group, climate zone, store size or other cluster grouping. Based on the analysis and changes, new clusters will be defined.

- **Performance Based Cluster Definition** – the parameters and algorithms that will be utilized to calculate the clusters are defined for each product area (e.g. department and/or class). The cluster criteria will be established such as the volume group breakpoints. History and/or store plan values will be selected.

- **Non-Performance Based Cluster Definition** – based on the analysis and the latest store demographics and characteristics, non-performance based clusters will be defined. Cluster groups such as store size, climate, ethnicity and/or various customer demographics will be selected. For each cluster group, the parameters associated with the group will be defined (e.g. small, medium, large and extra large store size). The criteria for each parameter also need to be considered (e.g. the size range that defines small, medium, large and extra large stores).
**Advanced Planning Part 3: Store Clustering**

- **Store Plans and Forecasts** – to develop the final performance based clusters, the latest store plans and/or store forecasts are needed. Store plans will be reviewed and necessary changes identified. The latest store forecasts, store trends as well as merchandise plan updates will be applied and new store plans will be developed.

- **Final Store Cluster Development** – for performance based clusters, the various algorithms will be run and the clusters calculated (e.g. sales volume). The clusters are then reviewed. As necessary, the parameters and/or algorithms may be changed and the clusters revised. For non-performance based clusters, the stores will be placed in the appropriate cluster group (e.g. store size/climate) based on the parameters and criteria established. The performance and non-performance based clusters will then be combined and the final store clusters are reviewed and modified as necessary.

**Timing and Organization Considerations**

Store Clustering is performed by department and/or class on a seasonal basis or more often. For assortment planning, the clusters may be defined for each buying season (e.g. back-to-school, holiday etc.). For allocation, the clusters may be updated each time a new allocation is performed (e.g. monthly).

Store Clusters are developed as part of the planning and allocation activity. In some cases, the allocators and/or store analysts will develop the clusters. Store planners may also have responsibility for cluster development. Allocators, store analysts and/or planners may perform the on-going maintenance and updating. The planners, analysts and allocators work as a team in the cluster development process.

**Automated Support and Interfaces**

Successful store clustering requires new systems to support the process and methods defined. The Store Clustering system considers:

- Maintaining history and plans
- Maintaining algorithms and parameters
- Creating and updating performance based clusters
- Developing non-performance based clusters
- Providing review and revision capabilities

Store Clustering systems are supported by Business Analysis, Merchandise Planning and Store Planning systems as well as Forecasting/Trending. Future automation will begin to consider Advanced Clustering approaches in which optimization and data mining will be utilized to define the most effective clusters.

**Summary and Benefits**

Store Clustering provides the basis to plan a diverse multi-location environment in an efficient and timely manner. Store Clustering provides grouping stores based on both performance (e.g. sales volume) and non-performance (e.g. store size) parameters. The store clusters support assortment planning and allocation as well as maintaining a customer-centric merchandise approach. The **chart below** shows the interaction of Store Clustering with the other Advanced Planning processes.
Advanced Planning Part 3: Store Clustering
**Introduction**
Advanced Planning addresses the major functions supporting retail merchandising activities. An overview of these Advanced Planning functions was given in our first article in July and they are shown below with today’s topic highlighted.

**Note:** the development of assortment plans is performed in conjunction with Space Planning. However, our next article in November will consider Space Planning. Also, early versions of assortment plans can support the product development process which we have not covered in this article.

**The Retail Environment Today**
Consumers and retailers alike are facing a severe economic downturn. This economic situation has forced consumers to change their buying habits. Customers are buying less, focusing on essential items, buying closer to need and emphasizing price. Localized assortments and customer-centric merchandising driven by good assortment plans, is seen as the way to address the problems being faced today.

Although retailers have begun to recognize the importance of Assortment Planning, the execution is hindered by various internal problems. There is often a lack of necessary support tools (e.g. Store Planning, Store Clustering etc.) and the key functions are often not integrated (e.g. financial plans, assortment plans etc.). Without good support tools labor intensive processes result and buying often takes place without a defined strategy or plan in place. Finally, there is often a lack of process definition as well as adequate resources to address the tasks at hand.

**Definition and Purpose**
Assortment Planning is the development of chain, store cluster and store level product attributes, styles, colors and SKUs that provide a basis for addressing localized customer preference, customer demand, store space as well as store characteristics.
The purpose of a good assortment plan is as follows:

- Enhance the company image while following and executing the merchandise strategy.
- Quickly and efficiently address the changes in customer demand and buying habits.
- Address competition and the specialization that has occurred in retailing.
- Manage inventory around customer need by considering the assortment breadth, depth, quantities and timing.

Assortment Planning Process and Methods
As we start to apply new methods and automation to Assortment Planning, we need a sound business process first. In considering the process, various different Assortment Planning approaches are possible based on company characteristics and requirements. These characteristics or requirements which need to be considered include:

- Types of Merchandise: e.g. fashion vs basic, imports and private label, seasonal items etc.
- Store Characteristics: e.g. large vs small, varying layouts; climate considerations etc.
- Purchasing Considerations: e.g. long vs. short lead times, early commitments etc.
- Customer Demographics: e.g. ethnicity; income level; fashion preference, customer type etc.
- Merchandise Strategy: e.g. look, variety, image to be maintained, approach to value and pricing, vendor programs, promotional philosophy etc.
- Merchandise Attributes: e.g. pattern, fabric, brand, price point, etc.
- Assortment Definition: e.g. breadth vs depth, no of styles/SKUs by store cluster etc.
- Key Timeframes/Seasons: e.g. mini-seasons such as back-to-school or holiday, catalogs; promo cycles etc.

An overview of the Assortment Planning process is shown in the chart below.

The key process functions are described below:

- **Business Review and Analysis** – the first step in process development is to review historical performance, define trends/forecasts and apply these results to future planning. Contribution analysis and mix management also serve as a basis for new assortments.

- **Merchandise Strategy** – the assortment plan is driven by the merchandise strategy that defines the look, variety, image, pricing philosophy and value proposition. The strategy should consider the type of items such as fashion, basic, replenishment, imports, private label, key items, seasonal
Advanced Planning Part 4: Assortment Planning

etc. Carryover, discontinued and new items will be defined along with the keep/add/drop criteria for basic merchandise.

- **Assortment Definition and Guidelines** – The assortment definition provides the number of styles/options/SKUs by store cluster as well as the breakdown by product attribute. The assortment financial targets based on the merchandise plan are then established. The numerical guidelines for the assortment plan are now set, such as merchandise mix %, number of required attributes, fashion vs basic %, number of key items, import vs domestic % etc.

- **Assortment Planning: Quantities and Flow** – the Style/SKU quantities (e.g. receipts) by cluster are defined including breakdowns by key attribute such as color/size. Item lifecycle plans over time are defined with special attention to key items. A reconciliation of the bottom-up assortment plan to the financial targets is performed. Plans are then reviewed and revised as necessary.

- **Assortment Planning: Item Information and Characteristics** – the assortment plan also includes item information (e.g. style no., style description, item no. etc.), vendor information (e.g. vendor no., vendor name, vendor characteristics etc.) and merchandise characteristics/attributes (e.g. color, size, pattern, fabric, model no., etc.).

- **Product Procurement/Buying** – the final step in the Assortment Planning process is the product procurement or buying. The output of the assortment plan (items, quantities and characteristics) becomes the shopping list and input to the purchase order. In addition the assortment plan supports other buying-vendor activities such as market trips, vendor catalogs, vendor visits etc.

In addition to the key process functions defined above, there are several support functions needed for assortment plan development including: Merchandise Planning, Store Planning and Store Clustering. These functions were discussed in previous articles. The assortment plan also serves as input to the Allocation function. The initial allocation quantities are based on the initial assortment plan for the season.

**Organization and Timing**

Assortment Planning requires a team approach with planners and merchants working together. In some cases, the Planners will develop the financial targets, assortment definition and the plan quantities while the Buyers will maintain responsibility for the product selection. Alternatively, the Planners may only develop the financial targets while the Buyers maintain responsibility for assortment definition, assortment quantities and product selection.

The timeframe for all activities must be defined. The plans can be developed on a seasonal, monthly or weekly basis and are often defined according to the assortment seasons referred to as mini-seasons (e.g. back-to-school, holiday etc.). Assortment plans are often driven by various events (such as Mothers Day, Fathers Day etc.) as well as promotional plans and schedules.

**Automated Support and Interfaces**

Assortment Planning requires new special purpose systems to support the process and methods defined. The system considers automation to address the following:

- Maintaining history to support review and analysis.
- Developing assortment definition and assortment strategy.
- Developing the unit assortment plans.
- Addressing the breakdown of the assortment plan by key attributes.
- Creating and updating plans with flexible seasons and timeframes.
- Reconciling assortment plans to financial targets.
- Providing review and revision capabilities.
Assortment Planning systems are supported by Business Analysis, Merchandise/Financial Planning, Store Planning and Store Clustering systems as well as Forecasting/Trending capabilities.

**Summary and Benefits**
Assortment Planning supports localized customer-centric merchandise assortments based on customer need and changing buying habits. Assortment Planning addresses the no. of styles/SKUs needed and then considers the unit assortment quantities by store cluster. The plans consider merchandise attributes as well as item and vendor product information. The plan also provides lifecycle item management over time. The *figure below* shows the interaction of Assortment Planning with the other Advanced Planning processes.
Introduction

Advanced Planning addresses the major functions supporting retail merchandising activities. An overview of these Advanced Planning functions was given in our first article in July and they are shown below with today’s topic highlighted. We have previously addressed Merchandise/Store Planning, Store Clustering as well as Assortment Planning. This article considers Space Planning.

Note: the development of space plans is performed in conjunction with Assortment Planning.

As discussed in previous articles, retailers today are beginning to consider Assortment Planning and Store Clustering to provide localized assortments. This approach helps provide a customer-centric merchandising environment to address customer need and still minimize unnecessary inventory investment.

Providing the right unit quantities, however, is only part of the merchandising process. Retailers must also consider the space available in the store, the most effective utilization of that space and the visual layout of the product. Space Planning provides the capability to develop plans that support the assortment plan and address the store and fixture layout.

Definition and Purpose

Available space is a resource that must be allocated based on the product assortment and the merchandising objectives. Space Planning considers both the quantitative product requirements (unit assortment plans) as well as the visual presentation (store and fixture layout).

There are two parts to the Space Planning effort. First the quantitative aspect considers the methods used to define how much space is needed, the type and number of fixtures required and the amount of product placed on each type of fixture. The quantitative methods are based on the item (product) quantities established in the unit assortment plan.

Second, the qualitative or visual considerations address the store layout as well as the fixture layout within the available space. The store layout addresses the physical characteristics including how the fixtures are arranged and the different types of fixtures necessary. The visual considerations also address
the assignment of departments to the available space and the changes made as various seasons and events take place.

Both the quantitative and visual aspects need to be addressed together in developing the final space plan. The number of fixtures and fixture layout combines the store aesthetics (visual look) with the quantitative fixture requirements. Different approaches need to be tried and evaluated. The space plan validates the assortment plan, and likewise the assortment plan validates the space plan.

**Space Planning Process and Methods**

An overview of the Space Planning Process is shown in the chart below.

![Space Planning Functions Diagram](image)

The key process functions are described below:

- **Space Analysis and Preparation** – the first step is a review and evaluation of the existing space utilization. The analysis considers a review of fixtures utilized by product type, the fixture capacity, the product density and the existing store layout. The space utilization (e.g. sales per sq ft etc.) and the various differences across store clusters and individual stores is also considered. As a result of the analysis, possible revisions to the space plan may be needed.

- **Unit Assortment (Inventory) Plans** – the assortment plan provides the unit inventory levels as the basis for the fixture requirements and fixture layout. From the assortment plan definition, the numbers of styles or SKUs are considered to define the product/fixture requirements. The inventory requirements and product density are also reviewed and adjusted based on the unit assortment plan.

- **Product/Fixture Requirements** – the type and number of fixtures must be established based on the unit assortment plans. The products in the assortment, the fixture types required for display, the product density and the fixture capacity are all inputs to the product/fixture requirements. Initial consideration is given to the number of items per fixture and the number of fixtures required.

- **Store Layout** – the physical characteristics of the store and the optimum physical layout drives the store layout. Based on the store design, the use of open space and wall areas is considered along with the optimum fixture layout. Department space allocation and initial fixture layout are defined. Permanent and seasonal department requirements are also considered.

- **Fixture Layout** – based on the product/fixture requirements and the store layout, the fixture layout within each department is defined. The quantity and product placement on the fixtures is
adjusted as necessary to meet the unit assortment plan requirements. The store layout and the unit assortment plan may also be adjusted as the final fixture layout is completed.

- **Space Plan and Assortment Plan Reconciliation** – when the product(fixture requirements and the fixture layout are defined, the space plan is complete. Both the quantitative and visual aspects are now defined. At this point reconciliation is performed between the final space plan and the assortment plan. Adjustments to fixture type, fixture quantities, fixture layout as well as store layout can be considered. Likewise, possible adjustments can also be made to the unit assortment plan as well as the financial plan.

- **Final Planograms (as required)** – once the space plan and the assortment plan reconciliation is complete, Planograms can be considered. Planograms provide the visual documentation of the space plan including the final fixture layout and the exact product layout on the fixtures. The Planograms provide the store by store documentation that considers the overall space plan and the individual store characteristics. The Planograms guide the implementation of the space plan at store level. Creating Planograms with actual store level considerations may require minor adjustments to the space plan as well as the assortment plan.

**Organization and Timing**

Effective Space Planning requires a team approach with planners, merchants and visual (store) specialists often working together. Planners and merchants will collaborate in developing the quantitative part of the space plan. Visual specialists may become part of the team effort as the visual store layout and fixture layout are considered. The visual specialists are also responsible for the Planograms.

The timeframe for all the activities must be defined. Since the space plan is done in conjunction with the assortment plan, the two activities follow the same overall timing. As the assortment plans are being developed on a seasonal, monthly or weekly basis the space plans will also be considered. While the initial store and fixture layout may be established as a seasonal activity, adjustments will be made as the assortment plans are completed.

**Automated Support and Interfaces**

Successful Space Planning requires special purpose systems to support the process and methods defined. The Space Planning system addresses the following:

- Maintaining history to support the analysis of both the quantitative and visual space plans
- Providing integration with Assortment Planning to obtain the latest assortment strategy, assortment definition (no of Styles/SKUs) and the unit assortment plans.
- Providing quantitative parameters and calculations to develop the number of fixtures, type of fixtures, and product assignment.
- Providing the visual representation and manipulation of store layout, fixtures, products on fixtures etc.
- Providing the ability to switch between tabular (quantitative) and visual representations of the space plan.
- Providing review and revision capabilities as well as reconciling assortment plans and space plans.

**Summary and Benefits**

Space Planning addresses the store and fixture layout based on the unit assortment plan and ensures that available space is utilized efficiently. Space Planning complements the Assortment Planning activity
and provides a validation of the assortment plan. Space Planning addresses both the quantitative and visual aspects of merchandise presentation. Together Assortment and Space Planning provide the basis for a localized customer-centric merchandising environment based on varying customer needs and changing buying habits.

The **figure below** shows the interaction of Space Planning with the other Advanced Planning processes.
**Introduction**

Advanced Planning addresses the major functions supporting retail merchandising activities. An overview of these Advanced Planning functions was given in our first article in July and they are shown below with today’s topic highlighted. We have previously addressed Merchandise/Store Planning, Store Clustering, Assortment Planning as well as Space Planning. This article considers Allocation and Replenishment.

Retailers today are beginning to consider advanced planning in developing localized assortments and maintaining a customer-centric merchandising environment. Advanced planning functions all work together to provide the necessary product to address the individual customer need and store characteristics.

However, planning the product assortments and space utilization is only the first step in the process. Each retailer must then address the execution of the plans and the movement of actual product to the store locations in the right quantities and at the right time. Allocation and Replenishment are the functions that address moving product to the stores.

**Definition and Purpose**

Allocation considers distribution quantities by item and store that will guide the movement of merchandise from the Distribution Center (DC) to the stores. The process addresses flow-thru merchandise (non-basic fashion and fashion basic items) that is usually received, packed and shipped to stores at the start of an assortment season (e.g. floorsets, back-to-school, holiday etc.) or after an initial distribution has been completed. Allocation may also consider warehoused items that are being “pushed” to the stores. There are two main types of allocation: pre-distribution and post distribution. For pre-distribution, the stores and quantities are determined at the time the PO is generated, while post-distribution considers quantities that are defined at the time the merchandise is received.

Replenishment considers the distribution quantities by item and store for warehoused merchandise that is put away upon receipt for later shipment. The process also considers vendor to store (drop ship) and vendor to warehouse (reorder) situations. Replenishment is an on-going activity for basic merchandise that is sold year round (e.g. socks, underwear. tools, hardware etc.). Shipments to the stores are...
generated on a scheduled basis or vendor orders are created as needed to re-stock the warehouse.

Both and Allocation and Replenishment take into account various constraints such as end-of-season, ad merchandise, key items, coordinate groups etc. Also, the processes may be combined with an item initially pushed to the stores via Allocation and then put on Replenishment for on-going store distribution.

**Allocation and Replenishment Process and Methods**

An overview of the allocation and replenishment process is shown in the chart below.

The key Allocation process functions are described below:

- **Merchandise Available** – the process starts with receipt of flow-thru merchandise in the distribution center. Based on POs, Automated Ship Notices and/or actual receipts, the merchandise allocations are scheduled (“merchandise available for allocation”). The merchandise available can also consider fill-ins from the warehouse that are being “pushed” to the stores, follow-up to initial allocations as well as promos; events and ad merchandise. Various review meetings take place between planning, merchandising and allocation to provide input for the allocation process.

- **Parameters and Methods** – the basis for developing the allocation quantities is reviewed and defined: store plans and store clusters are updated; data requirements and timeframes are defined; parameters and algorithms are updated; store locations are selected; special store situations are included; merchandise characteristics are considered; special buys and ad-hoc allocations are addressed. In some cases, initial allocations will be run and reviewed with revisions to parameters, algorithms etc. as needed.

- **Allocation Quantities** – the algorithms defined (e.g. open-to-ship etc.) are run and the allocation quantities by store are determined. For initial allocations, the latest assortment plan will be considered. Store forecasts are run to update the store plans. Various factors such as hold back, new/like items, coordinate groups, seasonal items, ad items etc. are addressed. Allocation quantities are reviewed and revised as necessary. Note: in some cases the allocation parameters and algorithms may be modified and the allocations are re-run.

- **Review, Modify and Execute** – a final review of all allocations by class or department is performed to define the impact at store level and consider the overall assortment plan. As necessary, quantities may be adjusted and/or revised parameters and algorithms may be used to
generate new allocations. The allocations are then executed and merchandise is shipped to the stores. Periodically the effectiveness of the allocations process is reviewed and future adjustments are suggested to the allocation setup and execution.

The key Replenishment process functions are described below:

- **Review and Analysis** – the first step considers a review and analysis of both the warehouse and store results. Historical sales, receipts, shipments and inventory level by SKU/week are considered as well as the effectiveness of the present assortment. Problems and issues are defined including: over-stocks; out-of-stock; the lack of ad/promo support; vendor performance etc.. The items presently being replenished are reviewed and changes are defined.

- **Parameters and Methods** – the various parameters utilized in the development of order quantities are reviewed and modified as needed including: lead times; review times; order cycles; customer service levels; safety stock; forecast error etc. The various methods utilized are considered including: order point; order-up-to; min-max and forecast. Based on the latest assortment plan (basics and seasonal items), the items defined for replenishment are adjusted. In defining replenishment methods, consideration is also given to item importance including never outs, core and fringe (nice to have).

- **Order Quantity Development** - Replenishment is performed on a scheduled basis utilizing the parameters and methods defined above to develop both store and vendor order quantities. Other factors such as seasonality, end-of-season, promotions, ad items and product characteristics can impact the replenishment approach.

- **Replenishment Execution** – once the order quantities are determined, the execution phase begins. For store replenishment, the order quantities are the basis for shipments to the stores. For warehouse replenishment, the order quantities define the vendor orders with appropriate input concerning vendor minimums, quantity discounts, shipping requirements etc.

**Other Considerations: Store Pull De-Centralized Environment**
The Allocation and Replenishment processes described above considered a store “push” or centralized approach. In some cases, a de-centralized store environment is possible where the stores “pull” merchandise from the warehouse, DC or vendor based on a combination of central and store input. For store replenishment, a warehouse or vendor order is created for the store and the Store Manager has input to order or not order selected items. Likewise, for allocation, a suggested “push” to the stores is created and the Store Manager has input on the overall assortment selected.

**A Note about Data Integrity, Data Accuracy and Data Cleansing**
All Advanced Planning functions used to create plans and assortments are dependent on the accuracy and timelines of the information utilized. This fact is especially true in Allocation and Replenishment, where parameters, algorithms and various data sources are combined to automatically generate store shipments, warehouse orders etc. Bad data, incorrect data and/or missing data can cause very inaccurate results that will impact the critical outputs generated by these processes. Data integrity within support systems and data cleansing to alleviate bad or missing data is essential to ensure the accuracy and usefulness of the results.

**Organization and Timing**
Effective Allocation requires a team approach with planners, merchants and allocators often working together to complete the process. While the allocators are responsible for the allocation quantities, the planners and merchants are responsible for the review process and allocation effectiveness. With automated allocation having a major role in store assortments, the role of a store analyst is often needed to determine the effectiveness of the overall allocation process and address all store assortment issues.
Replenishment is often supported by a re-buying or inventory control activity to address both store and warehouse functions. For store replenishment the support function will address the smooth operation of the ordering function as well as the parameters and methods utilized. For warehouse replenishment, much the same tasks are necessary with the addition of the support for the vendor ordering process.

Replenishment is an on-going activity with a review and processing schedule defined based on various lead-time and other parameters. Allocation considers the start of an “assortment season” with an initial allocation followed by on-going allocations defined on a periodic basis, usually monthly. The Allocation timeframes are also impacted by receipt timing.

### Automated Support and Interfaces

Successful Allocation and Replenishment require new special purpose systems to support the process and methods defined.

The **Allocation system** considers automation to address the following:

- Maintain history to support review and analysis
- Provide the capability to manage the selection of merchandise
- Maintain the parameters and methods required
- Maintain and utilize algorithms to develop allocations
- Provide the ability to address various factors and special conditions
- Provide integration with the latest Assortment Plan
- Provide for manual review and revision of store level allocation quantities
- Pass information to support the picking and shipping process in the Distribution Center

The **Replenishment system** considers automation to address the following:

- Maintain history to support review and analysis
- Support the replenishment forecasts, methods and calculations
- Interface to the latest assortment plan defining the replenishment item assortment
- Utilize forecasts and replenishment algorithms to develop order quantities
- Pass information to support the picking and shipping process in the Warehouse

### Summary and Benefits

Allocation provides the capability to address the movement of non-basic flow-thru type merchandise from the distribution center to the stores based on various criteria and algorithms. Replenishment provides the capability to address movement of basic merchandise from the warehouse to the stores as well as from the vendor to the warehouse based on various parameters and methods.

The **figure below** shows the interaction of Allocation/Replenishment with the other Advanced Planning processes.
Advanced Planning and Optimization Part 6 – Allocation/Replenishment

Relationship to Advanced Planning

- Analysis/Forecasts
- Merchandise/Financial Planning
- Merch Plans
- Space Plans
- Merch Plans
- Allocation/Replenishment
- Assortment Planning
- Store Clusters
- Store Groups/Clusters
- Store Clusters
- Store Plans
- Space Planning
- Space Plans
- Merch Plans
Introduction
Advanced Planning addresses the major functions supporting all retail merchandising activities. An overview of these Advanced Planning functions was given in our first article in July and they are shown below with today’s topic highlighted. We have previously addressed Merchandise/Store Planning, Store Clustering, Assortment Planning, Space Panning and Allocation/Replenishment. This article considers the application of Forecasting and Optimization tools to all Advanced Planning functions.

Advanced Planning Functions

Corp Goals & Objectives
Strategic Plans
Merchandise Strategy

Merchandise Planning
Store Planning
Store Clustering

Allocation
Replenishment

Space Planning
Assortment Planning

= Advanced Planning Functions

Forecasting & Optimization

As we have discussed throughout our previous articles, retailers today are utilizing advanced planning to develop localized assortments and maintain a customer-centric merchandising environment. Advanced Planning functions all work together to help provide the necessary product to address individual customer need and varying store characteristics.

However, system science can also be applied to expand the capabilities of the advanced planning functions and enhance their ability to support the retail environment. Various mathematical, statistical, simulation and modeling tools can be utilized to develop these enhanced methods. The balance of this article considers these Forecasting and Optimization techniques (tools) and their application to support the Advanced Planning functions and the retail environment.

Definitions and Purpose
Forecasting considers the use of various statistical and modeling techniques to develop predictions of future events e.g. sales forecasts. There are two main types of forecasting methods: causal and non-causal. Non-causal based forecasting applies statistical techniques to past history to develop future predictions. For example, predicting future sales based on past sales history (a time series). Causal based forecasting considers future predictions based on the development of mathematical models that utilize various external factors such as pricing, promotions, events, weather problems etc.

Optimization considers the use of various mathematical, statistical, simulation and modeling techniques applied to define the best result (most optimum) when considering a series of possibilities. For example, optimization can be applied to determine the best combination of planning parameters to maximize gross
margin, the best clustering criteria, the right number of styles/SKUs in an assortment, etc. Some of the key optimization functions (methods) include: Business Analytics/Business Intelligence, Advanced/Intelligent Clustering, Assortment Optimization, SKU Rationalization, Case Pack/Size Optimization, Parameter Optimization, and Weather Analysis/Intelligence. A description of these tools and their application to Advanced Planning is given below.

**Applying Forecasting and Optimization to Advanced Planning Functions**

The Forecasting and Optimization techniques applied are dependent on the Advanced Planning functions being addressed. The application of Forecasting and Optimization tools to the various Advanced Planning functions are discussed below.

1. **Merchandise/Financial Planning**
   - **Sales Forecasting** is applied to support both pre-season and in-season planning.
   - **Business Analytics/Intelligence** supports setting planning goals and company direction by defining trends, % contribution as well as potential growth opportunities.
   - **Parameter Optimization** is utilized to estimate gross margin based on sales, mark-up and markdown tradeoffs.
   - **Weather Analysis/Intelligence** determines the impact of weather on historical plan information, forecasts and initial plans (seeding).

2. **Store Planning**
   - **Sales Forecasting** is applied to store planning to develop sales contribution ratios for top down store planning; enhance bottom-up store-by-store planning; improve comp, new and like store estimates.
   - **Business Analytics/Intelligence** provides analysis and trends at store level to determine problems and issues that need to be addressed in planning.
   - **Weather Analysis/Intelligence** determines impact of weather on all historical store data and forecasts.

3. **Store Clustering**
   - **Sales Forecasting** provides in-season store sales projections to update store plans and support the on-going development of performance based store clusters.
   - **Business Analytics/Intelligence** provides cluster analysis input to define cluster problems and exceptions as well as determine the final cluster definition.
   - **Advanced/Intelligent Clustering** defines the criteria, parameters and final store clusters based on a statistical analysis and data mining approach without pre-selected store groups.
   - **Weather Analysis/Intelligence** defines the impact of weather on the store clustering parameters and also adjusts climate based store clusters for weather considerations.

4. **Assortment Planning**
   - **Sales Forecasting** provides item level sales projections to develop lifecycle product flow over time and also determine the starting inventory for the assortment.
   - **Business Analytics/Intelligence** considers assortment performance, trends and pricing parameters to define the new assortment product strategy and definition.
   - **Assortment Optimization** defines the number of styles/SKUs in the assortment based on contribution, cluster deviation and key performance parameters (e.g. sales, margin etc.). Also, considers the price performance mix to build an effective assortment.
• **SKU Rationalization** provides the SKU level “Keep or Drop” criteria by store cluster to build an on-going assortment and help define the potential for new SKUs.

• **Case Pack/Size Optimization** provides the correct size profiles and determines the existing case pack combinations for an assortment. Also considers the “best” case pack/size definition to fit new assortments.

• **Weather Analysis/Intelligence** determines the impact of weather on assortment quantities and product timing (introduction).

5. **Space Planning**

• **Sales Forecasting** provides item movement estimates from the unit assortment plan as a driver to space needs.

• **Business Analytics/Intelligence** provides analysis and defines changes needed to the overall space utilization.

• **Parameter Optimization** determines the optimum use of space based on available space, type of product, density, fixture characteristics and store layout.

6a. **Allocation**

• **Sales Forecasting** provides on-going store sales projections to derive the latest store plans as input to allocation.

• **Business Analytics/Intelligence** provides a review of the allocation process and the ability to meet the objectives of the assortment plan.

• **Case Pack/Size Optimization** provides the correct size profiles and determines the existing case pack combinations for an assortment. Also considers the “best” case pack/size definition to fit new assortments (in conjunction with Assortment Planning).

• **Parameter Optimization** defines the optimum allocation quantities and reserve stock to maximize performance and minimize overstock as well as markdowns.

• **Weather Analysis/Intelligence** determines the impact of weather on allocation quantities and product timing.

6b. **Replenishment**

• **Sales Forecasting** provides the latest item store sales forecasts by week to drive the auto-replenishment function

• **Business Analytics/Intelligence** provides analysis of the replenishment function and suggests changes to key parameters (e.g. safety stock, lead time, order cycles etc.)

• **Parameter Optimization** provides simulation and modeling tools to analyze and set the “best” replenishment parameters.

• **Weather Analysis/Intelligence** determines the impact of weather on replenishment quantities and product timing.

**Organization/Resources/Pre-Requisites**

As shown in the previous section, Forecasting and Optimization tools enhance the functions within Advanced Planning. The tools are utilized by planners, buyers and other staff members who support and complete the Advanced Planning functions e.g. planners using the Merchandise/Financial Planning function will utilize forecasting tools to develop monthly sales estimates.

However, in many cases, Forecasting and Optimization tools require specific resources to manage the
functionality provided. Separate analysts or an analysis group may be necessary to set parameters, provide the input data needed, perform preliminary tests, analyze results and interact with users as necessary to review results or support the tools.

In some cases a separate analyst may not be necessary, but key users are designated as “super users.” The “super users” understand the techniques and are able to perform the administration tasks necessary such as maintaining the inputs, setting parameters and addressing functionality etc.

**Note:** The application of Forecasting and Optimization Tools considers the following *pre-requisites*:
- Sound business processes must be in place for the Advanced Planning functions considered, including all tasks, timing, roles and responsibilities, inputs and outputs etc.
- The Advanced Planning function must be fully implemented to consider the enhancements based on the Forecasting and Optimization techniques.

**Summary and Benefits**
Forecasting and Optimization techniques provide features and functionality that expand and enhance (support) the Advanced Planning functions. Decision-making, plan review and parameter definition can all be improved and often automated when Forecasting and Optimization tools are applied. By applying these techniques, the retailer’s ability to manage a localized customer centric retail environment is improved.

The **figure below** shows the interaction of the Forecasting and Optimization techniques within the Advanced Planning processes.