Chapter 2
Supply Chain Planning Processes for Two Major Retailers

Narendra Agrawal and Stephen A. Smith

1 Introduction

This chapter provides descriptions of the supply chain structures and planning processes of two major retailers in the home furnishings sector. These descriptions are based on a series of interviews with senior executives at these two retailers. Our objective is not to provide a comprehensive survey of such retail firms, but rather to describe the structures and planning processes commonly found in this sector and the corresponding implications for supply chain management based on these two case studies.

Home furnishings is one of the most complex areas in retailing, because of the large number of stock-keeping-units (SKUs), the inter-relationships among the SKUs, as well as use of multiple brands and multiple marketing channels targeted to different customer segments. Due to its complexity, we believe that the assortment selection and supply chain management decisions for this sector pose many challenging problems, whose solutions extend beyond the current state of the art. Thus, we hope that documenting the practices for these supply chains will provide a foundation for future methodological research.

Since both companies requested that we not reveal their identities, we will refer to them as Companies A and B. A number of our observations about planning processes were similar at the two retailers. Also, as described later, Company A has a more complex supply chain because it is a multi-channel retailer. Thus, its structure and planning process are more general than Company B. Therefore, rather than presenting two separate case studies, we will discuss them simultaneously,

N. Agrawal (✉) • S.A. Smith
Department of Operations Management and Information Systems,
Leavey School of Business, Santa Clara University, Santa Clara, CA 95053, USA
e-mail: nagrawal@scu.edu

© Springer Science+Business Media New York 2015

N. Agrawal, S.A. Smith (eds.), *Retail Supply Chain Management*,
International Series in Operations Research & Management Science 223,
DOI 10.1007/978-1-4899-7562-1_2

focusing primarily on Company A, while highlighting the differences at Company B.

Company A, with revenues of about $3.5 Billion per year, consists of six different retail brands or "concepts," with a total of the nearly 600 stores in over 40 states in the US. Each brand sells products through its own distinct set of retail stores. For example, while one brand focuses on casual home furnishings, another focuses on cookware essentials, and a third focuses on children's furnishings. In addition, Company A also operates direct-to-consumer channels, with eight different brands of catalogs and six different web sites. A true multi-channel retailer, this firm generates nearly 40 % of its revenues from its direct-to-consumer marketing channels.

Company B has yearly revenues of approximately $1 Billion, and operates roughly 300 stores, selling products in the casual home furnishings, housewares, gifts, decorative accessories categories. In contrast to Company A, this retailer is primarily a single channel retailer, selling mostly through stores. Its Internet channel was initiated very recently, and it does not have a catalog channel. Also, the great majority of its products are branded merchandise. Therefore, its supply chain structure is much simpler than Company A's. However, Company B generates a significant fraction of its revenue from foods and beverages, which present special challenges due to the perishable nature of these products.

The number of different SKUs is quite large for both retailers. Within their largest brand, Company A offers roughly 70,000 different SKUs at a given point in time. Company B operates smaller stores (about 18,000 square feet), with approximately 36,000 SKUs at each store. The SKUs are partitioned into categories, such as furniture, home accessories, table top accessories, food and decorative accessories. Within a category, strong demand interactions across SKUs could be expected to occur, e.g., many SKUs may complement or substitute for each other. SKUs across different categories would have weaker and less specific demand interactions. The products vary significantly in their prices, physical characteristics, prices, perishability, seasonality, procurement lead times and country of origin.

The assortment must address two key marketing objectives (1) providing customers with as complete an assortment as possible and (2) providing an assortment that creates attractive **presentations**. Since stores carry manufacturers' name brands, it is important to provide a comprehensive selection of related items within a given brand, e.g., Sheffield cutlery. Both retailers emphasized that "presentation drives demand" in each of the channels. Therefore, products are often displayed as they might actually appear in a customer's home for maximum advertising impact. In fact, some customers will purchase an entire room as displayed in the store, or will purchase the complete set of items in a tabletop display. In addition, the best types of items to feature in the catalog or Internet presentations may differ from those in the ideal store presentation. For example, a completely furnished room works well in a store, but would be difficult to capture photographically for a catalog. A large assortment of wall hangings shows well in a catalog, but would require too much wall space in a store.

The merchandise featured in each channel's presentation is, of course, only a small subset of the available merchandise. Store and catalog presentations are

modified as frequently as every 30 days depending on the seasons of the year. The products offered in the assortments change much less frequently than the presentations, with the majority of the SKUs continuing for at least 6 months or more. One rapidly changing type of SKU, known as "ornamentation," is seasonal and fashion driven, and thus the ornamentation assortment tends to change with the presentation. Also, some products may be discontinued in their original sales channel, but still continue to be offered through the outlet stores or Internet and catalog channels. Therefore, the presentation requirements lead to additional constraints on both the assortment planning process and the management of the supply chain.

Neither retailer optimizes supply chain costs as part of the product design and assortment selection process. Instead sourcing costs and financial outcomes are viewed as constraints, rather than primary objectives. Supply chain decisions are handled by a sourcing team, which is separate from the design and assortment selection team. In general, the sourcing team is responsible for managing the supply chain as effectively as possible for whatever assortment is chosen. If problems arise, the sourcing team does have some power to initiate assortment modifications later in the planning process, as we discuss in the next section. It is generally recognized that this partitioning of responsibilities is suboptimal, but the problem persists because of the complexity of the decisions.

We note that some of these characteristics of home furnishings supply chains are common to retailers in other areas, which indicates that the structures described here have broader significance. For example, The Gap, similar to Company A, sells its apparel and accessories through a number of different store concepts that include The Gap stores (including Gap Kids, Baby Gap, Gap Outlet and Gap Body), Old Navy, Banana Republic and Piper Lime. While The Gap focuses on casual and fashion apparel and accessories for men and women, Old Navy is positioned for the more value conscious consumer, and Banana Republic is positioned at price points that are higher than The Gap channel. Products are sold through retail stores and the Internet channel for each concept. Similarly, Target operates Target Stores, Mervyns and Dayton Hudson stores, which carry both private label brands and branded merchandise. Internet channels are also associated with each store concept at Target.

The objective of "presenting an attractive assortment" to the consumer is equally important to these retailers as well. For example, it is common practice to display complete apparel and accessory outfits from a given manufacturer, e.g., Ralph Lauren, both in stores and in the Internet channels. It is common knowledge across the retail industry that matching assortments that are displayed on the covers of catalogs, or displayed prominently in stores, generate a significantly larger level of sales than products stocked on shelves or racks. Thus the assortment selection and presentation design decisions are closely linked across many retail categories.

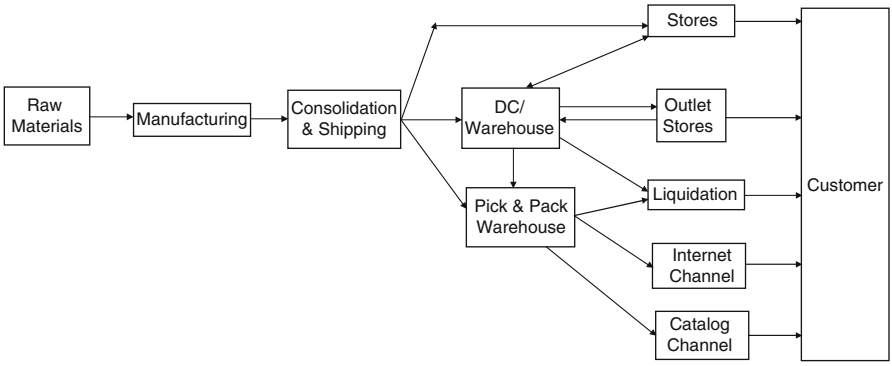

Fig. 2.1 Retail supply chain for Company A

2 Supply Chain Description

Company A's supply chain is illustrated in Fig. 2.1. While the supply chain varies somewhat across brands, this figure illustrates the most general case. The overlap across supply chains for the various brands is minimal and limited to sharing of warehouse space and merchandise handling capabilities at the distribution center (DC).

Since Company B is primarily a single channel retailer, its supply chain lacks the pick-&-pack warehouse, outlet stores, and the Internet and Catalog channels in the figure above.

Company A's products are sourced from both domestic and foreign suppliers. The foreign suppliers are located in 35 different countries, and are responsible for nearly two-thirds of the total merchandise purchased. A particular brand or concept that offers 60,000–70,000 stock-keeping-units SKUs may be sourced from as many as 1,000 different vendors. Nearly 60 % of the products are basics, which continue for at least two selling seasons. The planning calendar consists of four seasons, with the Fall season responsible for the majority of annual sales. Stores may carry both nationally known brands of products as well as private label products. Company B sources its products primarily from foreign vendors. It utilizes about 30 agents to obtain 36,000 SKUs from about 1,000 active vendors. 65–70 % of its furnishing products and almost 90 % of its food products are basic (its core products can have a selling season that is 2–10 years long). It too plans for four separate seasons over the year.

Shipping from foreign sources is primarily by boat, in large metal shipping containers. Containers destined for multiple stores need to be sent to a DC and unpacked. Company A, with the more complex supply chain, operates three such DCs. The largest facility, with nearly 6 million square feet of space, is located in Memphis. It provides replenishments for all the stores, as well the sourcing for the direct-to-consumer shipments for the Internet and catalog channels for all products other than furniture. Furniture, given its physical size, is distributed through two

separate distribution centers, one on the East coast and one on the West coast. Store-bound merchandise is then transferred to trucks for delivery. Direct-to-consumer shipments are handled by two independent shipping companies. Company B operates two DCs, one on each coast. Demand fulfillment for their Internet business, when it is ready, will occur from a separate, outsourced DC on the east coast.

Merchandise can also follow a variety of paths during the selling process. Store customers usually pick up items at the store. But bulky items such as furniture are displayed in the store, while deliveries take place directly from a DC/ warehouse to the customer. In order to combine customer orders and reduce trucking costs, customer delivery time may require a lead time of several weeks. Items that are direct shipped are handled by third party logistics (TPLs) companies and delivered to the customer. Similarly, non-conveyable items that are purchased through the Internet or Catalog channels may ship directly to the customer from the DC/ warehouse. Thus, multiple items that the customer purchases at the same time may be delivered in different ways and at different times. The same customer may also shop in different channels at various times. Thus, the customers' level of satisfaction with their overall shopping experience in one channel will influence their future purchases in other channels. This cross channel interaction is not currently considered in selecting inventory service levels.

Certain items in any channel may not sell as well as originally anticipated. Slow sellers or discontinued items in the stores are often sent to one of the retailer's outlet stores, and offered at a reduced price. The outlet channel may also be used for returned merchandise that the retailer does not wish to offer in the regular stores. Merchandise from the regular stores destined for the outlet stores is typically moved first to the DC, where it is consolidated and then allocated to the outlet stores based on their anticipated demands. In order to maintain an attractive presentation and selection in the outlets, about 30–40 % of the outlet merchandise for Company A is sourced specifically for outlets, and consists of items that are not offered in regular stores. Some items that are no longer carried in stores may continue to be offered through the Internet or Catalog channels. Since customers can retain catalogs for some time, orders will sometimes be filled for items that are no longer carried in the most recent catalog.

3 Supply Chain Planning Processes

Let us now turn our attention to the various planning processes in these supply chains. We begin by describing a typical planning calendar (Fig. 2.2), which can be 12–16 months long, and is implemented in a rolling horizon basis. Our description of this calendar is primarily based on our discussions with Company B, although the process is very similar at Company A.

While the details of these steps are presented subsequently, we note that the first key interaction between the merchandising team and supply chain planning team

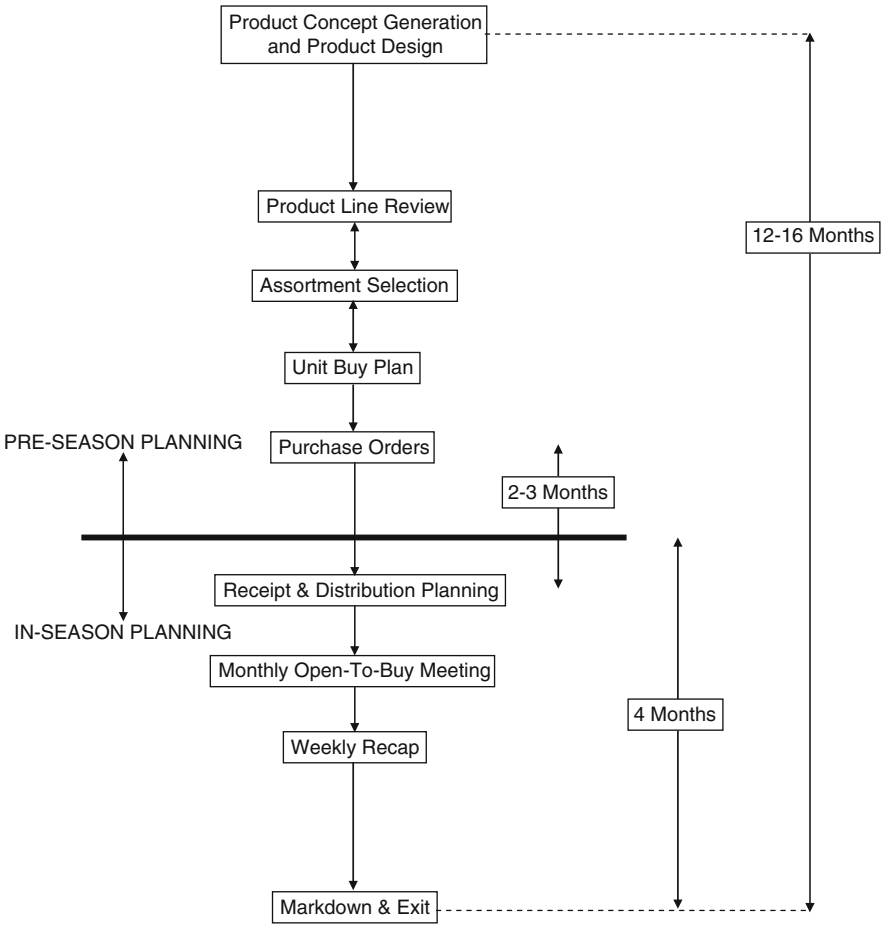

Fig. 2.2 Retail Master Calendar

occurs during the Assortment Selection step. As part of this step, not only do the teams formalize the assortment, they also perform financial analyses to determine whether the sales targets, specified in the company's financial plans, will be met. This is based on a top-down analysis of the sales forecasts. Following this, when the unit buy plans are created, the teams forecast unit sales at the different stores for given pricing policies. This is a bottom-up analysis. A very important step at this point is the reconciliation between the top-down and bottom-up predictions. This may lead to a revision of the company targets for sales and margins and/or modifications in the assortment. These targets are further reviewed at the monthly review meetings, and may be revised, along with targets for initial markup, inventory turns and markdowns.

Decision making in this process tends to consist of a series of "what if" analyses, with little reliance on analytical optimization. Moreover, the process of revising company targets involves addressing a number of tradeoffs, which is often done in a subjective manner. These decisions may be greatly influenced by personal incentives. For instance, if the unit buy plan turns out to exceed the financial targets, the teams would typically simply promise to meet the target, i.e., they would much rather perform better than predicted than to show a shortfall.

3.1 Product Design and Assortment Planning

Retailer A has a highly "vertical structure" with respect to its planning processes. The planners assigned to the various processes tend to be specific to each brand, with minimal overlapping responsibilities across brands. The percentage of private label merchandise is small in the retailer's flagship brand, while it is quite high in its other brands. Each brand has its own product design team. As a specific example, in one brand, 40 *product designers* search the world for new product designs and material concepts. Merchandise is divided into a number of different categories, each with its own design team and buyers. The designers present their ideas to the *merchants* and *sourcing* specialists during a product line review process, where they evaluate sketches and samples of products, and consider pricing decisions. Upon approval, these specs are then given to independent *sourcing agents*, spread across the world, who seek out the appropriate *vendors* for product prototypes.

Upon receipt of these prototypes, the merchants consider how the assortment as a whole will be presented to the consumer, and suggest appropriate modifications. This is a very important step in the process, since individual product decisions must be made subject to the constraints and limitations imposed by the assortment presentation. The assortment is also reviewed by the *visual and marketing* group, which specializes in creating store presentations. Finally, the products are adopted and handed over to the sourcing and *inventory teams*. The inventory team is responsible for producing high level forecasts, and determining if the product line can deliver its sales and revenue targets. Typically, the elapsed lead time from a new product's concept stage to delivery into the stores is about 12 months.

In this planning process, the central role in assortment decisions is played by merchants. The process architecture is illustrated in Fig. 2.3 below, where the merchants are at the hub. Product design groups within a brand tend to work all year round, since about a third of the SKUs tend to be new at Company A each year. The in-store presentation changes frequently, giving consumers the impression of a rapidly changing assortment. Catalogs are also shipped to consumers frequently with different assortments of featured merchandise, corresponding to the season of the year. As noted previously, the total assortment of products in each of these channels turns over much less frequently than the presentations. Finally, the product lines in the three marketing channels overlap somewhat, but each line also contains many unique products.

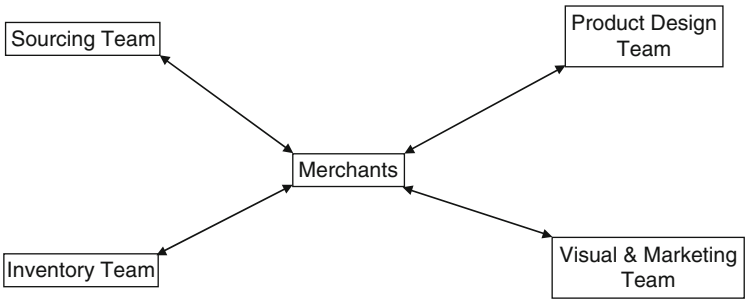

Fig. 2.3 Product design process architecture

3.2 Sourcing and Vendor Selection

As mentioned earlier, due to the retailer's vertical structure, each brand tends to have its own sourcing teams. This is a recognized weakness with regard to sourcing, since it does not exploit the potential synergies due to consolidation of buying across brands. As is typical of most retailers, Company A does not manufacture its own products. In fact, Company A manages most of its vendor interactions through independent agents, who are domain experts. These agents identify the vendors, ensure the ability of these vendors to execute purchase orders in a timely and financially sound manner, implement quality protocols in-line and for final goods, verify packaging, and determine the vendors' social compliance. Ensuring social compliance by vendors is becoming increasingly important for US based retailers, and continues to be a very difficult challenge.

The retailer evaluates the vendors primarily based on their past performance. Vendor evaluation score cards are selected for ongoing vendors, but no such metric is used to evaluate new vendors during the selection process. This retailer's sourcing organizations are generally not involved in the vendors' actual production planning process beyond shared forecasts and receiving purchase orders. This is in contrast to what we have observed at some other retailers who actively engage in the vendor's capacity planning (Agrawal et al. 2002) Also, because of capacity limitations, multiple vendors may sometimes be used for the same product.

The manufacturing process itself may take as long as 3–5 months to complete. But the manufacturing lead time can be as short as 30 days for products that consist primarily of upholstery or fabrics. The total order quantity for the merchandise is manufactured over a period of time and the goods are typically flowed to the retailer in multiple lots. For core products that are carried over multiple seasons, contracts often allow for modifications in order quantities within certain ranges, depending on the observed demand for the product.

3.3 Logistics Planning

As mentioned earlier, shipments from foreign sources are primarily in large metal shipping containers. The shipping time for a container, including delivery to the DC or directly to a store, is from 30 to 40 days, depending on the final destination. Ideally, a shipment to the retailer fills one or more containers exactly. This objective may influence lot size selection for both shipping and manufacturing. The allocation of merchandise across shipping containers can be quite complex. For example, it is highly desirable to have a dedicated shipping container that can be transported directly to a store. At the same time, stores have limited space and holding too much merchandise in the store at one time is not acceptable.

Planning the shipping needs for retailers is a complex but critical activity. For example, at Company B, logistics planning begins right after the merchandising plans are set for the following year. Unfortunately, merchandising plans do not specify how the percentage of imports relative to total purchases will change in the upcoming year. Nor do they specify how product inflows from particular countries may change. This information is important for logistics planning since securing shipping container capacity on specific freight lanes in a timely manner is critical to ensuring delivery reliability. This decision problem is dimensionally complex—Company B utilizes five different steamship lines and fills about 7,000 40-ft containers annually. In the absence of the detailed capacity requirements, retailers use rudimentary forecasting methods for planning purposes.

Based on these rough forecasts, retailers negotiate rates for shipments with shipping companies. Rate negotiations typically happen in February and March for shipments starting in May through the following April. Contracts typically specify the total number of containers that will be used, with guaranteed minimums, but not the actual timing of the shipments. Rates have been hard to predict in the recent past due to significant uncertainty in the cost of fuel. The average cost of shipping a full container to the US is $3,200, and partial container shipments incur roughly a 33 % cost premium.

Containers destined for multiple stores need to be sent to the DCs to be unpacked. The merchandise is then transferred to trucks for delivery to the stores, which also adds to the shipping time. Retailers typically set aggressive targets for transfer time in the DC, e.g., less than 24 h turnaround time. Depending on their country of origin and the quantity of items, some merchandise shipments do not fill a whole shipping container. In this case, the shipment is handled by local freight consolidators who pool shipments from multiple retailers. For these items, the retailer also needs to make arrangements for where the container will be unpacked and how the merchandise will be transported to its final destination. In order to facilitate shipping, the container requirements could thus potentially influence the retailer's choice of sourcing location or manufacturer. While the sourcing team at this retailer tries to deal with this problem subjectively, they do not consider the joint optimization of shipping and sourcing decisions in a systematic way.

The retailer also operates a "Pick and Pack" warehouse, where merchandise is "direct shipped" to customers from the Internet and Catalog channels. This requires special packaging that can be done at the manufacturing site. In some cases, the direct ship merchandise comes in larger packages that require additional set up for the automated pick and pack process at the warehouse. An important distinction is made between items that are "conveyable," i.e., can be put on a conveyer belt. Those that are not conveyable (items with very large dimensions or irregular shapes) cannot be handled by automated pick and pack equipment. Again, items shipped from the vendor to the pick and pack facility may not always fill a whole shipping container. In this case, they are combined with other retailers' merchandise by a consolidator, and later separated and trucked to the pick and pack warehouse.

Shipments from the DCs to stores are primarily by truck. This shipping time was as high as 10 days, but has now shrunk to 2–3 days because of the use of TPLs like UPS. Oversized packages that are not handled by UPS are sent via other independent shippers.

Interestingly, we learned at Company B that domestic shipping can be more onerous than international shipping because the trucking industry capacity in the US is unpredictable. We were told that from the retailers' perspective, the performance of the trucking industry seems to be negatively correlated with the state of the construction industry, because the better the construction industry does, the fewer drivers are available for the trucking industry. Reliability of truck drivers and availability of equipment (trucks) capacity is a constant challenge. Finally, since shipments by trucks often require multiple handoffs due to the hub-and-spoke system used by shippers, numerous errors in shipping information and damages to products are often introduced.

Appropriate packaging design is a very important issue for two reasons. First, it affects the probability of damage, which continues to present a significant challenge, especially for bulky items. For some items, the probability of damage was reported to be as high as 1/3 for each loading and unloading cycle. Packaging also affects the handling time and storage space required per item, and the need for repackaging at the DC. In order to minimize the complexity and cost associated with different packaging requirements across the channels, packaging tends to be designed for the most demanding channel (often the catalog/Internet channel). This can increase the product costs in other channels. Some retailers, such as Walmart, have achieved significant cost savings by redesigning their product packaging to facilitate shipping (Plambeck and Denend 2007).

3.4 Distribution Planning and Inventory Management

Company A operates in a centralized planning environment. Store managers do not place merchandise orders, but rely instead on decisions made by central planners. Nearly 50 % of goods are on auto-replenishment programs, where replenishments

come from the DC/ warehouse. Some branded merchandise can be replenished directly from the vendor. The systems in place for communication between stores and DCs are viewed as satisfactory, but they are still in the process of rolling out EDI linkages with vendors.

The frequency of shipping to stores presents an interesting challenge. Shipping less frequently reduces shipping costs, but increases the size of the shipments. Large shipments can generally be received by stores only before they open for business, which presents considerable staffing challenges. Consequently, smaller and more frequent shipments tend to be preferred, since they can be received by the store during normal working hours. Stores generally maintain only small back-rooms for stocking inventory, and may occasionally also rent off-site lockers for additional storage needs.

Scientific inventory management and demand forecasting is an acknowledged shortcoming of the present system at both of these retailers. Inventory management decisions are often made in an ad hoc manner, using rule of thumb weeks-of-supply (WOS) targets for merchandise at stores and in the DC/ warehouse, without a clear understanding the cost implications of over- or under-stocking. The result tends to be higher than optimal levels of inventory and an annual inventory turnover of less than 2.0 for Company A, which is well below that of some other home furnishings retailers. However, this retailer's strategy focuses on carrying the latest trends in home furnishings together with a fairly high markup. This has produced satisfactory results from a profitability standpoint, but the logistics planners believe that there are significant opportunities for cost reductions.

3.5 Clearance and Markdown Optimization

As mentioned earlier, unsold or slow-moving items are sent to one of the retailer's outlet stores, or sold through the Internet channel. It is important at some point to clear the discontinued items to make room for new merchandise. One option is to take markdowns at stores, but deeper price markdowns generally occur in outlet stores or on the Internet. A second liquidation option is to sell discontinued merchandise to a discounter, after removing labels that identify its origin. Some items may be donated to charitable organizations, which creates a tax deduction. Still others may simply be discarded.

The logistics planners that we spoke with felt that markdown planning and pricing decisions are not made in a scientific manner by this retailer. Often, the merchandise planners wait too long before implementing markdowns or liquidating products. This is also recognized as an opportunity for improving profits (see Chaps. 13–15 for further discussion of pricing and markdown issues).

3.6 Cross-Channel Optimization

While Company A has done little to integrate many of the supply chain processes across the various brands, they do make use of cross-channel marketing (Kalyanam and Achabal 2005). For instance, their advertising expense in the traditional print and mass media is minimal. In fact, their catalogs are used as the primary advertising mechanism, with about 400 million catalogs shipped annually. Many of their catalogs are shipped to areas where stores already exist, and this serves as an instrument to drive store traffic. To compensate the catalog channel for this service, which is significantly cheaper than actual advertising, they receive a fixed percentage of store revenue as a fee. Aggregate information about consumers and their buying behavior in the catalog channel is also used in making decisions about store location and for assessing the market potential of new products. This could likely produce additional benefits if cross channel supply chain interactions were included in the decision making process.

4 Conclusion

These discussions of the supply chain operations at two home furnishings retailers highlight a wide variety of unsolved analytical problems. One specific problem that is analytically challenging is the optimal use of containers to transport the flow of various quantities of merchandise from different supplier locations to the retailer's DC and stores, subject to delivery scheduling constraints. While some models exist in the literature for optimal container packing (Martello et al. 2000), the more general problem of optimally using of an integer number of containers to deliver a flow of merchandise over time appears to be unsolved. For example, it may be advantageous, based on inventory versus shipping cost tradeoffs, to deliver some merchandise ahead of schedule and store it, in order to achieve the objective of exactly filling a container. A complete container that can be shipped to the retailer's DC avoids the additional expense of consolidation with another retailer's merchandise. A further objective is to ship a complete container directly to a store, if possible.

Chapter 8 in this volume discusses a number of papers that deal with the combined problems of assortment selection and inventory management. But modeling the life cycle costs associated with flowing the merchandise in the assortment through the retailer's complete supply chain is beyond the scope of the currently available methods. For example, how does the assortment selection affect the shipping container and inventory cost tradeoffs discussed above?

Additional aspects of assortment planning and inventory management are the presentation requirements for merchandise in stores and catalogs. Chapter 14 in this volume discusses several papers that have studied the impacts of inventory level on sales. But these models do not address the requirement to feature a combination of

items that creates an attractive display. That is, assortment optimization models should somehow include these presentation effects.

The sequential nature of the retailer's decision making process is also an interesting variation on what existing supply chain models tend to assume. That is, assortment decisions are made first, followed by sourcing decisions, inventory ordering decisions, and finally shipping decisions. The timing for these retailer decisions is largely determined by the different lead times associated with each decision. That is, the two retailers described here have elected to postpone each separate decision as long as possible, rather than making them jointly. Conceptually, the overall problem could be modeled as one gigantic dynamic programming problem, but it would clearly be completely intractable. Models that capture the timing of these decisions in a way that includes sequentially updated states of information about demand could potentially be quite useful.

Finally, cross channel optimization clearly offers a number of opportunities for improving supply chain performance at both of these retailers. There are economies of scale across the channels in sourcing, in optimizing shipping containers, and in the use of trucks to deliver shipments to stores, which are currently not being exploited. In many cases, this is because retailers do not have methodologies that can capture these tradeoffs. Cross channel pricing tradeoffs are also important, in particular when a different channel is used to clear the excess merchandise from the original sales channel. There are also cross channel impacts of promotions, some of which are discussed in Kalyanam and Achabal 2005.

In summary, these two case studies illustrate the complexity of retailers' supply chain decisions in practice, and the gaps that exist between the currently available methodologies and the actual decision making environment. We hope that these discussions, as well as the methods and empirical studies presented in this volume, will provide the foundation for future research that will advance the state of the art in retail supply chain management and provide significant additional value for retailers' supply chain operations.

References

Agrawal, N., Smith, S. A., & Tsay, A. A. (2002). Multi-vendor sourcing in a retail supply chain. *Production and Operations Management, 11*(2), 157–182.

Kalyanam, K., Achabal, D.D. (2005). Cross-channel optimization: a strategic roadmap for multichannel retailers. Working paper, Retail Management Institute, Santa Clara University, CA.

Martello, S., Pisinger, D., & Vigo, D. (2000). The three dimensional bin packing problem. *Operations Research, 48*(2), 256–267.

Plambeck, E., Denend, L. (2007). Walmart's sustainability strategy. Stanford Graduate School of Business Case, OIT-71.