Leveraging Downstream Data in the Footwear/Apparel Industry

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Abstract

Retailers collect information regarding consumer purchases on a transactional basis. This data is not completely being leveraged by manufacturers in the footwear and apparel industry to increase on-shelf availability. However, certain apparel and consumer products companies have developed *best-in-class* methods for collecting and utilizing data to enhance supply chain visibility and to drive increased sales. A description of these *best-in-class* practices is provided, strategies to use the data are presented, and the importance of collaboration among supply chain partners is discussed. Further, point of sale data from a footwear and apparel manufacturer is analyzed to illustrate how the data can be leveraged to predict subsequent season sales, to improve forecasting accuracy, and to allocate replenishment inventory more effectively.

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1 Introduction

As consumers purchase goods from retailers, records of the sale are kept by the retailer. These records are referred to as point-of-sale data (POS) and are often available to the manufacturer. POS data helps companies see which items are selling and provide a glimpse into real consumer demand.

Downstream data is any inventory or sales information collected after the product leaves the manufacturer. This thesis focuses on two types of downstream data, referred to as sell-in and sell-through. As illustrated in Figure 1, sell-in refers to the shipments from the manufacturer (ShoeCo) to its customers. This constitutes the inventory that is “sold in” to the customer’s supply chain. Sell-through data, also known as sell-out data, refers to consumer purchases at the retail stores. Sell-through, in the context of this thesis, is simply the point-of-sale data from the stores.

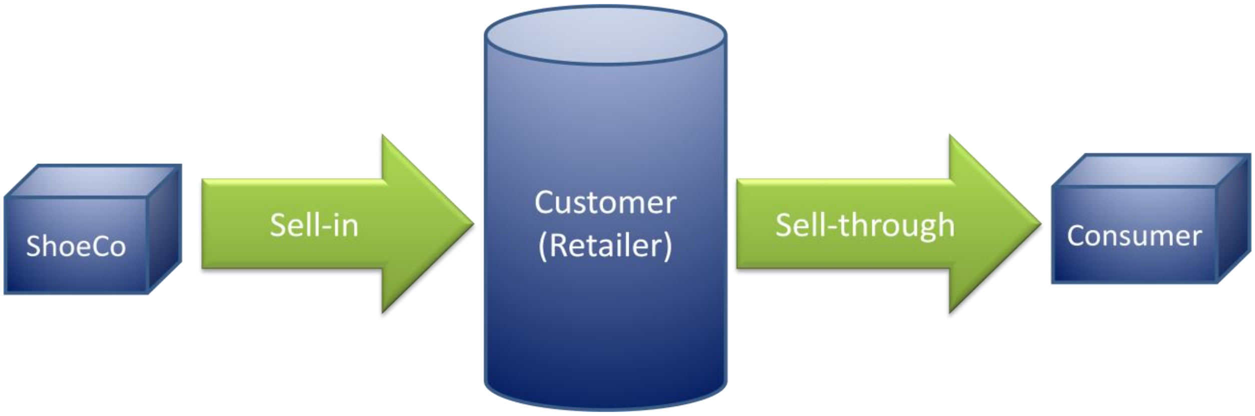

Figure 1: Downstream Data Illustration

1.1 Motivation

Downstream data is used in many parts of the supply chain. Although many companies have mastered the use of historical data in their forecasting processes, there are few that implement downstream data to sense and react to demand pattern changes. Sensing and understanding consumer demand in real-time will improve inventory and replenishment strategies and drive increased sales through fewer out-of-stock items.

1.2 Research Question

The thesis will focus on two main components: an exploration of industry downstream data processes and potential methods to analyze downstream data in the footwear and apparel supply chain. Chapter Four will analyze literature and industry practices answering the following question.

> *How is downstream/point-of-sale (POS) data being used and how can it be used to improve forecast and inventory planning ultimately driving sales through improved on shelf availability?*

Chapter Five focuses on actual point-of-sale data from a leading manufacturer of footwear and apparel items. It will examine uses and benefits of downstream data answering the second question.

> *What are possible ways for a footwear and apparel manufacturer to use downstream data?*

This section will evaluate the quantitative benefits for a footwear manufacturer using downstream data in its supply chain to find better methods to collect and analyze downstream data.

1.3 The Footwear and Apparel Industry

The footwear and apparel industry is challenged with forecasting in a world of long lead times and short product lifecycles. Since the majority of footwear and apparel production is outsourced and produced in Asia, it is common for order lead-times to be three to six months. When this is coupled with an industry that depends on current fashion trends, forecasting can be quite difficult.

For most in the apparel industry, replenishment is not an option. In an out-of-stock situation at the retail store, the company will attempt to replenish from its central distribution centers (DCs). Later in the season there may be no stock at the DC and typically there is not enough time for the manufacturer to execute another order before the selling season is complete. Some manufacturers have designed multiple supply chain and postponement strategies to be able to expedite replenishment of some items, but this carries an increased supply chain cost. Further, it is not possible to incorporate all products in this type of strategy.

1.4 Background

The data illustration portion of the thesis focuses on a specific footwear and apparel company. This company, which is referred to as "the manufacturer" or ShoeCo[1], designs, markets, and coordinates the production of footwear and apparel. Further, ShoeCo does not own its own manufacturing facilities. The company or group of companies contracted by ShoeCo to produce its products is referred to as the "contract manufacturer."

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[1] The actual partner company name has been disguised to protect confidentiality.

ShoeCo, the manufacturer, sells products to customers. The "customer" in this thesis refers to the customer of ShoeCo and is a retailer that sells footwear and apparel. These customers (retailers) in turn sell goods to "consumers" or end users. The consumer is the final link in the supply chain and is the person that will ultimately use the item. ShoeCo's current supply chain practices will be discussed in more detail in Chapter Three.

2 Literature and Industry Review

Recent literature discussing downstream data and its potential uses is explored and later applied specifically to the footwear and apparel industry. In addition, interviews with apparel, software, and consumer products companies are discussed detailing their current practices for using downstream data to transform supply chains and become more demand driven.

2.1 Literature Review

2.1.1 Types and Uses of Downstream Data

AMR Research provides an overview of downstream data in its report titled *A Handbook for Consumer Product Companies Using Downstream Data* (Cecere, Martin, & Bois, 2006). It details the most prevalent types of downstream data including:

1. Retail POS data and inventory movements – usually interchanged on a weekly basis from the retailer via electronic data interchange (EDI).

2. Vendor-managed inventory (VMI) data – data from customer/supplier VMI relationships.

3. Syndicated data – cleansed and harmonized data from third party such as ACNielsen.

4. Consumer Loyalty Data – not readily available to manufacturers today, but important in understanding demographic data and purchase activity providing insight into individual customer behavior.

According to Cecere et al (ibid) a company's strategy should include all four types of downstream data in conjunction. The data must be cleansed and harmonized in a demand signal repository (DSR) in order to efficiently yield demand insights. The authors then divide the data into two models, POS/channel replenishment data and demand insight data, each with a unique use. POS/channel replenishment data provides insight into what product was sold by location, while demand insight data attempts to illustrate what could have been sold in the channel location. It is important to distinguish that a DSR is not the same as an enterprise data warehouse and only contains a subset of the corporate data available. Figure 2 shows how the two systems interact with each other and the company's downstream data strategy.

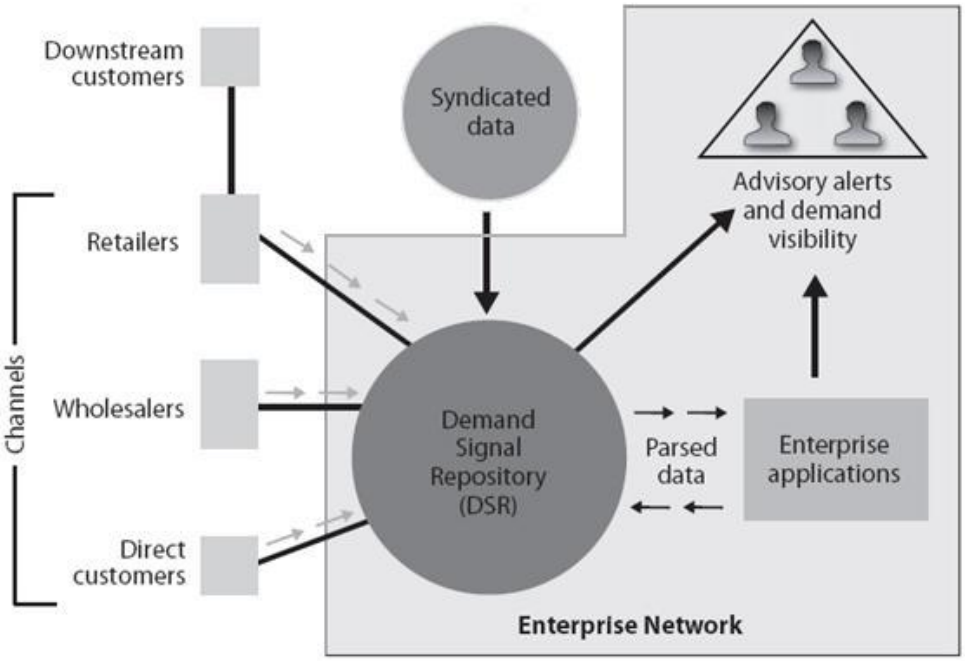
Downstream customers
Syndicated data
Advisory alerts and demand visibility
Retailers
Channels
Wholesalers
Demand Signal Repository (DSR)
Parsed data
Enterprise applications
Direct customers
Enterprise Network

Figure 2: Downstream Data System Structure (Cecere, Martin, & Bois, 2006).

A vital component of the ability to use any point-of-sale information in supply chain forecasting and replenishment is the integrity of the data in the DSR. Atkinson (2004) reinforces the prior source in a discussion of how raw POS data is typically dirty data and can require a lot of manual intervention to make it useful for forecasting purposes. He continues to explain that despite the labor-intensive effort required to manipulate and cleanse the data, many have found it a useful part of the company's supply chain strategy.

Regardless of the expected visibility benefits for using point of sale information, many companies have not been able to execute an effective strategy. Lapide (2005) states that in order to effectively use POS data and other downstream data companies need to forecast and plan on an account-level. Since most companies only have the necessary resources to plan at the account level for key customers, Lapide suggests that POS data can only provide improvement for a small part of the supply chain.

Direct store delivery consumer goods companies tend to be the most advanced in the use of downstream data today (Cecere & Masson, 2006). These companies, such as Anheuser-Busch, Coke, and PepsiCo, have easy access to the consumer demand because of the company presence in stocking the store shelf.

2.1.2 Leveraging the Organizational Structure

Organizational structure has an effect on a company's ability to sense consumer demand. Additionally, cross-functional participation in the supply chain organization is vital to success. An AMR Research study found that 59% of companies take more than two weeks to sense true channel demand. Contrarily, companies with sales and marketing groups that have a direct reporting relationship to the supply chain organization are closer to their consumer and are more likely to be leaders in demand sensing (Cecere, O'Brien, & Martin, 2006).

Building on the data proximity concept, Radjou et al (2003) discuss that demand signals are often diluted as they travel upstream within an organization. Downstream data and the demand signals that result usually originate in the sales and marketing organization. As this information is passed to the supply chain group, if passed at all, the data is often aggregated or diluted in some way resulting in a supply chain organization that struggles to make sense of the data. The discontinuous flow of information between organizations stems from limited communication due to rigid boundaries between customer-facing activities and supply chain operations. Furthermore, more meetings or software tools are not the answer. Leading companies will integrate the functional domains of sales and supply chain into a composite organizational process.

2.1.3 Downstream Data Technology

A discussion by Crawford et al (2003) illustrates how emerging technology will play into the downstream data strategy. The report details the impact of the RFID-enabled store shelf on the apparel industry. RFID provides unprecedented real-time visibility of a product as it travels throughout the supply chain. The final scan of the RFID replicates the POS information. This visibility allows a retailer to monitor inventory levels in real time and replenish fast-moving items proactively.

A case is developed by Crawford (ibid) that details the pilot of an RFID enabled store during a holiday season, which improved on-shelf availability to a level that translated into a 5% increase in sales. The downside to RFID is that the advanced technology is not yet mastered by most retailers. In addition, it also requires restructuring and possible replacement of infrastructure.

2.1.4 Apparel Industry Challenges

The challenges of managing demand uncertainty in the apparel industry are discussed by LeQuoc and Lawrie (2005b). Due to the abundance of apparel that is sourced from low-cost regions, the industry is plagued with long inflexible supply chains. The inflexibility reduces the capability of the industry to respond to shifts in consumer demand. This forces apparel companies to build large amounts of onshore inventory to attempt to counteract these effects and subsequently suffer from low stock turns and the risk of costly markdowns which often exceed 10% of revenues.

An argument is made by LeQuoc and Lawrie (ibid) that suggests apparel companies should focus efforts on increasing sales forecast accuracy and accelerating product development. They discuss the need for differentiated forecasts depending on the product category. POS and syndicated data will increase the transparency in the supply chain helping to improve the accuracy of the forecasts. LeQuoc and Lawrie recommend that companies must share forecasts with their suppliers and that web-based integration technology is making this easier than the traditional EDI system. An EDI system must be set up between two supply chain partners, where web-based technology can allow for real-time access and reporting of the supply chain's downstream data.

In another report, LeQuoc and Lawrie (2005a) observe more than half of apparel companies are not using any technology to help improve market responsiveness. Moreover, only 20% of companies have incorporated some type of third party technology into their systems. The industry's inability to accelerate new collection introductions is driven by low speed to market, which is illustrated by 40% of companies with replenishment cycles of more than one month. LeQuoc and Lawrie (ibid) give the following reasons from apparel company experts for not accelerating creation and introduction.

- Lack of resources
- Lack of responsiveness
- Not enough capacity
- Lack of market knowledge and visibility
- Too complicated

Finally, LeQuoc and Lawrie (ibid) explain that systems should be prioritized by the retail strategy of the product segment. They detail the following alternatives.

- High availability items – This category includes stable demand items such as a white dress shirt.
- Low-availability item with stable demand – Including occasional purchase items such as a ball gown.
- High-availability items with volatile demand – This category includes seasonal items that have demand based on a number of factors like beach wear. For this category, the strategy focus should be on the balance of optimum lead time, inventory holding, low cost production and lost sales due to out-of-stocks.

- High-fashion items with short product life – The main problem for fashion apparel is the lack of a framework for defining new items with attributes that are linked to expected consumer attitudes and future demand.

2.2 Industry Practices

Interviews were conducted with industry experts from the apparel and consumer packaged goods industries to determine *best in class* techniques for integrating downstream data into a company's supply chain strategy.

2.2.1 Industry Interview with an Apparel Company

ApparelCo[2] is a large, United States based, vertically integrated apparel retailer that collects point of sale data at the SKU level from its stores. ApparelCo has an advantage over ShoeCo when it comes to point-of-sale data collection since it owns and operates its retail stores, which allows unlimited access to any available downstream data. ShoeCo must negotiate agreements with each of its customers to obtain the same information. After POS data is collected by ApparelCo, the data is fed into a data warehouse where it can then be extracted, analyzed and summarized by various business units to meet individual needs.

ApparelCo uses several systems to capture, store and analyze its downstream data. The first collection method is a data warehouse, or repository, and it is a system provided by Teradata. A second, separate system by Micro Strategies, Inc. is used as a front-end reporting tool. Despite the numerous companies that provide analysis packages, ApparelCo chooses to do its analysis and optimization in-house.

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[2] The actual company name has been disguised to protect confidentiality.

One of the main uses of the data for ApparelCo is to perform size-curve analysis. In a size-curve analysis, ApparelCo examines how each size of a specific style item sold-through compared to the other sizes. This helps ApparelCo determine the styles and sizes that are selling most readily. Size-curve analysis information can then be used to improve forecasts for similar styles in a future season.

For example, a particular style dress in size 2 may have sold out at the suggested retail price. The same dress in size 14 may not have sold as well and had to be marked down to clear out the remaining inventory. These demand pattern characteristics are used to shape future forecasts of similar fashion items. Thus, in the subsequent selling season, the manufacturer will be notified, and a comparable product will have a smaller percentage of size 14 dresses produced, compared to the preceding period.

ApparelCo also uses point of sale data in its carryover product lines to determine which colors and sizes of apparel are considered the best sellers. A carryover product is one which is sold in multiple seasons with little or no style change. Based on POS data ApparelCo is able to investigate whether the traditional black, 34B is the most prolific selling bra size, or was it the special color marketed this season. Further, if it was a color that drove the sales, a comparison can be made whether the most common size 34B sold-through the most or another size. Most of the analysis is done after the selling season in attempt to make smarter decisions and improve its forecasting accuracy in future production planning and inventory management (out-of-stock and over-stock reduction). Due to the lead-times, ApparelCo has not been able to benefit current season decisions.

ApparelCo also uses POS data during new product introductions. Following a product launch, POS data is used to track the impact of the new item on the market. Product sales of the new item are compared to the sales in previous selling periods to ascertain whether the present demand has changed on a store level or by geographic region. Additionally, point of sale data is used to determine whether the expansion of an existing product style complemented the current products by expanding sales or supplemented the existing goods by taking away market share.

For instance, ApparelCo has a line of traditional woman's panties it sells season after season that are available in multiple colors and sizes. When ApparelCo introduces a new color with patterns or dots, they want to know how the line extension affected the sales of the existing colors. Did it complement the line to drive additional sales, or did the consumer switch to the new color from one of the existing colors?

Finally, ApparelCo uses point of sale data to make inferences about the selling patterns of its individual retail stores. ApparelCo is attempting to use POS data to determine whether certain stores show predictive characteristics for the remaining stores inventory sell-through. It is identifying whether a specific store is truly fast fashion, selling items quickly early in the season due to trends, or whether a store is simply an early season store, selling items because of its geographic location. For example, spring apparel will sell earlier in stores in a southern climate than in a place that still has snow on the ground, and these stores can give an early prediction of how the styles will eventually sell in other regions. On the other hand, stores located in Beverly Hills or New York City are probably fast fashion cities and may not predict the sell-through of a store in Topeka, Kansas.

Customer loyalty downstream data is also collected by ApparelCo, but it is not currently being utilized. However, ApparelCo is working to integrate loyalty data into its supply chain strategy. Loyalty data is collected from the following sources at ApparelCo.

- Direct mail – When consumers opt to receive mailers from ApparelCo, it tracks the purchases of the consumer when he or she uses the coupons included in the direct mailers.

- Catalogue customers – ApparelCo tracks the purchasing patterns of its catalogue and Internet customers for the brands that are sold through these channels.

- Phone capture information from POS – When a consumer gives his or her phone number at the register prior to a purchase, that information is stored with the POS record. Over time ApparelCo can track the purchasing patterns of consumers.

Currently, ApparelCo has built a separate database to store its loyalty data, but the strategy for potential uses for this data is still in its infancy. Additionally, ApparelCo analyzes and compares this customer loyalty data to other POS data manually.

2.2.2 Industry Expert Interview with a Software Analytics Company

An interview was conducted with an industry expert from a supply chain software provider to add an external perspective for using downstream data. Benefits and key strategies to using downstream data are: early sales predictions, ease of access, and level of granularity.

2.2.2.1 Point of Sale Data as an Early Predictor of Sell-through

Point of sale data can be useful for many types of analysis. It is vital for a company to gain access to POS data pertaining to its products, even if the data is for a subset of products. Without point-of-sale or other downstream data from customers, the manufacturer does not know what consumers are buying until the inventory is depleted at the retail stores. At this point, the manufacturer sees a spike in demand due to replenishment orders on the hot selling items. Early insight of consumer demand can give the manufacturer extra time to plan replenishments of fast selling items.

Another benefit of POS data is the ability to predict the future sales of a season based on test markets. If a company were to introduce a new product line in a small subset of “test stores” prior to the actual launch, it could use the POS information to predict the total sell-through for the complete season. The goal of executing this type of plan would be to gather the test data while there is time to impact production and make changes if necessary.

2.2.2.2 Access to Downstream Data

Companies have different access to downstream data depending on industry and organizational structure. The best case scenario is the vertically integrated corporation. It is not as important if the manufacturer uses contract manufacturing to produce its product, but more important that the retail stores are integrated into the corporation. In the latter situation, the company has full, unfiltered access to all downstream data and a signal of actual consumer demand.

Companies that are not vertically integrated tend to be at a disadvantage when it comes to point-of-sale data collection. However, companies that sell products through a major retailer, such as Wal-Mart, tend to have better access to downstream data. Wal-Mart provides all of its suppliers with access to most of its POS data, inventory records, receipts, and orders though its database, RetailLink. This data is provided with latency of no more than one day, and it gives the suppliers insight into sales by item, by day, by store, and other levels of aggregation. The burden for analysis and use of the data is on the supplier, but Wal-Mart represents the gold standard for making downstream data available.

In the final scenario, companies have to request POS data from their individual customers. The amount of availability for each will depend on individual customers.

2.2.2.3 Aggregated Data Use

To best leverage downstream data, it should be available at a SKU level. At the SKU level, analysis for inventory planning and replenishment will yield the most insight. It is difficult, if not impossible, to base replenishment decisions on aggregated POS data.

Aggregated downstream data can be useful for intermediate and long-term planning. Since it is likely that longer term planning is not done at a SKU level, aggregated data will help to predict an entire season sales. Furthermore, aggregated data may also be useful in transportation decisions if all items are a similar size.

2.2.3 Industry Interview with a Consumer Packaged Goods Company

CPGCo[3] is a Fortune 500 consumer packaged goods company that markets its products through grocery and discount retailers throughout the world. In contrast to the apparel and footwear industry, CPGCo has broad access to downstream data from its largest customers. This section will focus on the ways that CPGCo leverages the data that it receives from its one of its major customers.

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[3] The actual name of the company has been disguised to protect confidentiality.

CPGCo is able to view POS data in near real-time via an online portal that the customer maintains. The data is updated on a daily basis and transactions from the previous night can be viewed the following day. CPGCo focuses its analysis on inventory at the customer warehouse, sales, and other specific product information that are available from the online portal. Within the system, the data can be filtered by store, warehouse, item, or groups of items. Additionally, aggregation bases can be built at any level depending on the type of analysis desired by CPGCo.

CPGCo uses several methods for reporting data on a regular basis. The methods are as follows:

- System reports from the online portal – Many reports are built in or can be built within the system to provide the insight needed for CPGCo.

- Automatically downloaded reports – CPGCo has a system in place which it can schedule reports to be automatically downloaded from the portal to a certain local location. These can be set up by a specific analyst to regularly provide desired information.

- Data dumps – CPGCo uses a 3rd party application tool for data mining. This tool provides the ability to receive data dumps from the customer portal at regular intervals, which data can later be analyzed using the application.

Ultimately, CPGCo expects the 3rd party data mining tool to integrate with its ERP system to further the analysis capability and integration of downstream and internal data.

From an execution standpoint, CPGCo works collaboratively with the customer's account managers to optimize its inventory and replenishment strategy. CPGCo benchmarks performance by using a scorecard that lists specific operating metrics. Each category is evaluated for the current period and then it is compared to a similar period of time during the previous week, month and year. Included in these metrics are warehouse inventories, store sales, store in stock, unit turns, and store weeks on hand.

Similar to ApparelCo, CPGCo uses downstream data to perform size curve analysis. Its products are sold in various sizes of packages, and it is important that it has the correct mix of pack sizes in the store. CPGCo uses size curve analysis to determine whether demand is shifting from one pack to another and adjust replenishment accordingly.

In addition to pack size, CPGCo analyzes whether demand is shifting from one product line to another. Some of the products that it manufactures have overlapping market segments. CPGCo uses the POS information to track consumer buying habits and plan production appropriately for each of the competing products.

3 Current ShoeCo Footwear Supply Chain

This chapter will outline the ShoeCo footwear supply chain. Additionally, it will describe the overall supply chain then outline forecasting processes and milestones.

3.1 Footwear Supply Chain

The supply chain for ShoeCo, a major footwear and apparel manufacturer, has many variations and complexities dependent on product line. This thesis will focus only on the supply chain organization for the footwear sector of the business. Footwear production is outsourced to contract manufacturers in Asia, and finished products are imported to the United States and sold through various channels. In Figure 3, the supply chain is illustrated in its most basic form.

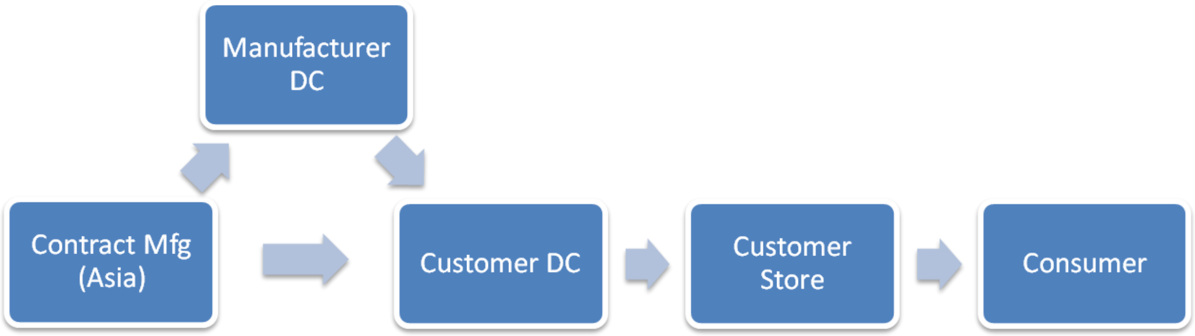

Figure 3: Footwear Supply Chain

ShoeCo outsources footwear production to contract manufacturing companies located primarily in Asia. The completed shoes typically travel by ship to the selling country, and occasionally shoes are expedited to the customer via air transport. For large customers, many goods are shipped directly to the customer's distribution center (DC). The remaining footwear is shipped to the manufacturer's (ShoeCo) central DC and is distributed per customer orders. The second half of the footwear supply chain lies outside the direct control of the manufacturer. Using inventory stored at its DC, the customer distributes the footwear among its network of stores to be sold to consumers. The customer, in this case, is a sports retailer or a department store. The consumer is defined as the end user of the footwear.

3.2 Supply Chain Inventory Movement

ShoeCo forecasts its footwear production mainly on pre-orders from customers. A pre-order is basically a reservation for inventory that the customer will order at a future point in time. It is important to note that the pre-order is nonbinding, and the customer has the ability to cancel part of the order later in the season based on individual contracts. ShoeCo's sales representatives share footwear samples with customers prior to mass production, and the customer pre-orders a certain amount of shoes based on the expected sales for the season. These pre-orders are used by ShoeCo to plan capacity at the contract manufacturer and to forecast the actual orders that will be placed for each style of shoe.

Based on forecasts and customer pre-orders, ShoeCo arranges for production at its contract manufacturers. Figure 4 illustrates the movement of inventory through the ShoeCo supply chain. Currently, 80% of ShoeCo's product lines move though this type of supply chain pipeline.

Completed footwear is shipped to a distribution center in the country that it will be sold. ShoeCo holds approximately 30 percent of the order quantities in its own distribution centers for replenishment. Even though the customer has not actually purchased the inventory that remains in the ShoeCo DC, footwear is reserved for specific customers based on the pre-orders. The remaining 70 percent of the inventory is shipped either to the customer's distribution center via the ShoeCo DC or directly to the customer's DC from the contract manufacturer. The channel used is dependent on the size and needs of the customer.

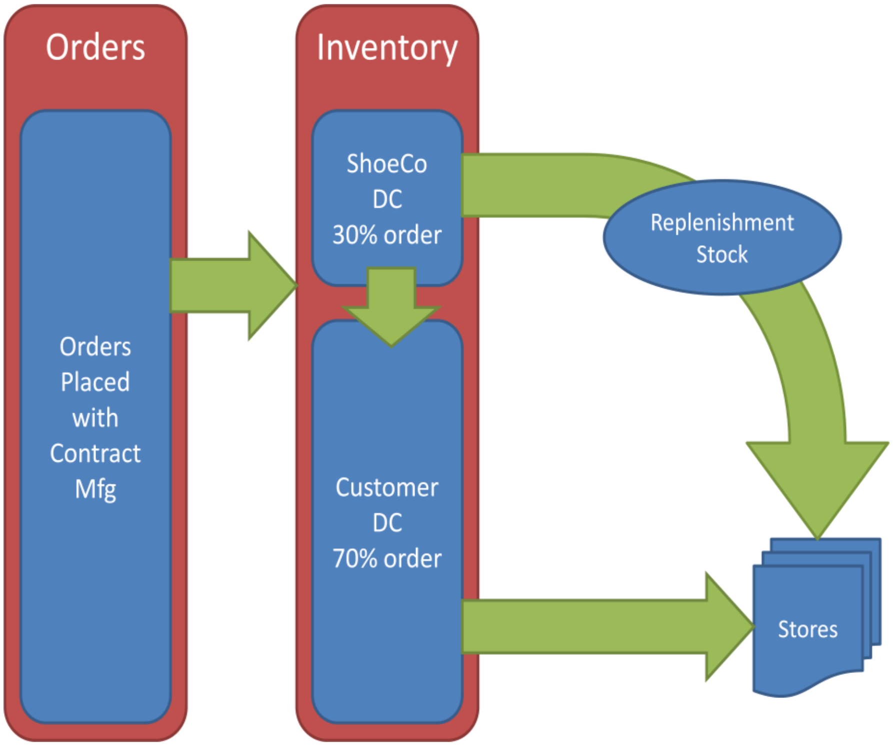
Orders
Orders Placed with Contract Mfg
Inventory
ShoeCo DC 30% order
Customer DC 70% order
Replenishment Stock
Stores

Figure 4: ShoeCo Inventory Movement

Once the footwear has arrived at the customer DC, inventory is deployed to the stores using the customer's specific supply chain. ShoeCo does not control inventory in the customer's supply chain.

Replenishment is triggered when inventory is needed to restock the customer stores. The replenishment inventory is shipped either to the customer distribution center or directly to the store. The risk that ShoeCo takes is an over production or under forecast of demand for a particular footwear line. An inaccurate forecast (and subsequent production) causes one of two issues.

1. Inadequate inventory at the ShoeCo distribution center to fill the customer's replenishment needs. Due to long lead times, ShoeCo typically cannot place a replenishment order with the contract manufacturer. This will be discussed further in later chapters.

2. Slow sell-through at the stores due to a smaller market for the product line than was initially forecast. Since the customer is not obligated to purchase the entire pre-order (based on individual contracts) ShoeCo carries the liability of the excess inventory. This excess inventory is liquidated through buyback contracts with customers or sold to discount retailers. Either situation yields decreased revenue on the over-produced items.

3.3 Product Aggregation

ShoeCo groups and forecasts its products at multiple levels of aggregation. The three levels that will be discussed in this chapter are Model, Article, and SKU. Figure 5 shows an example model of shoe called the Classic[4]. Within the Classic model line are two available colors, black and white. Each of these colors represents the article level in ShoeCo's product hierarchy. Each model-article comes in multiple sizes representing the SKU level of the product. For simplicity the figure shows only two sizes, but a typical shoe is available in the entire range. In summary, each SKU indicates a unique size, color, and model of ShoeCo footwear.

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[4] This example is for illustrative purposes and does not indicate an actual product. Actual products may come in more or less colors and sizes.

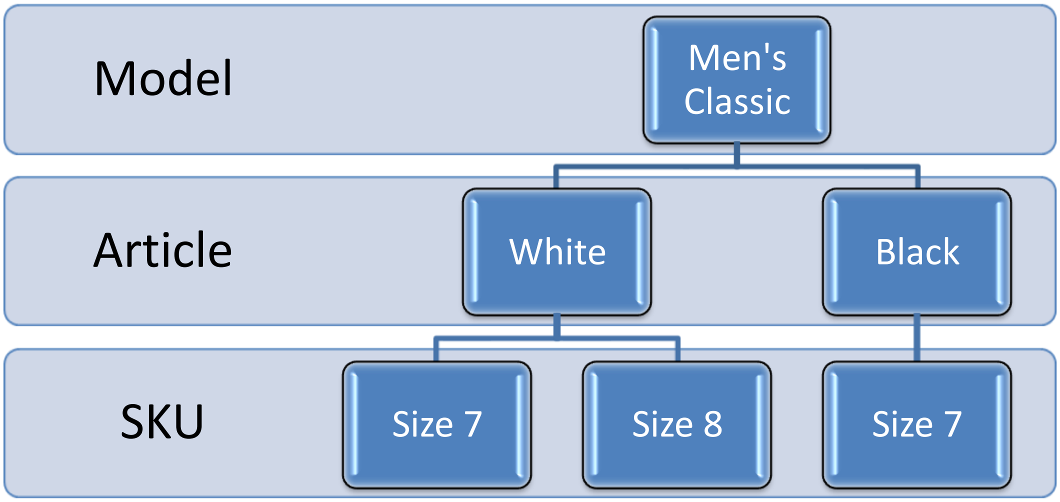
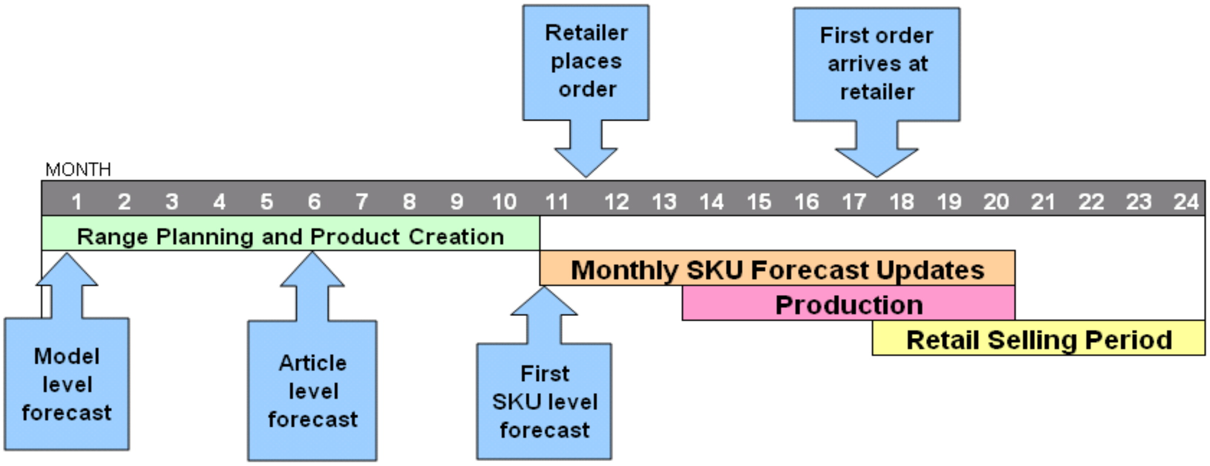

Model
Men's Classic
Article
White
Black
SKU
Size 7
Size 8
Size 7

Figure 5: Product Aggregation Level

3.4 *Footwear Product Lifecycle*

The footwear product lifecycle at ShoeCo spans twenty-four months, meaning that products for the spring/summer 2008 season began initial designs in mid-2006. Figure 6 shows an overview of a typical footwear product lifecycle.



Retailer places order
First order arrives at retailer
MONTH
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Range Planning and Product Creation
Monthly SKU Forecast Updates
Production
Retail Selling Period
Model level forecast
Article level forecast
First SKU level forecast

Figure 6: ShoeCo Product Lifecycle

The first ten months of the product lifecycle consist of range planning and product creation, which provide the first inputs to the tactical planning process, including forecasting and production panning. Range planning outlines the financial, regional and area targets, as well as finalizes the scope of products that will be offered from a global assortment. This process is done for each sales subsidiary and provides estimates on the total number of product models to be sold in the upcoming season. Additionally, range planning provides a total forecast across all customers, which includes detailed category and account plans with volume estimates.

After initial model level forecasts are complete for the season’s products, capacity planning and allocation begins, which is called product concept review. This time period is used to determine manufacturing bottlenecks and production capacity constraints. At approximately the same time, article level forecasts are being developed. These forecasts are continually refined until the end of the range planning period.

During month ten, the sales representatives begin to share product samples with customers at the same time gaining insight on sales volumes for the season. With this insight, the first SKU level forecast is prepared at the beginning of month eleven.

The SKU level forecast is updated on a monthly basis until production is completed as customers continue to place pre-orders. Production, starting in month 14, typically lasts six months, but it can be extended if capacity is available and if the product is needed.

The retail selling season, which also lasts for six months, overlaps the production period phase of the planning process. This overlap gives ShoeCo adequate lead-time to build product inventory and to distribute it to retail customers. At the end of the retail selling period, any unsold items are typically marked down to clear the shelves for the new season's styles. Unsold inventory at the ShoeCo warehouses is typically sold to discount retailers at a decreased profit margin, thus it is undesirable to over produce.

3.5 Current State of Point of Sale Data

In the supply chain organization, ShoeCo primarily uses point of sale data to provide a gut feeling of actual consumer demand. Most POS data is received from the ShoeCo sales representatives in Microsoft Excel format. Individual spreadsheets are created weekly by each sales representative and transmitted via email to the planners. The current spreadsheets are in several formats, varying by customer, and they do not provide a user friendly means for analysis.

Further, the POS data that was analyzed for this thesis was aggregated to the article level. ShoeCo receives data showing the sell-through in pairs of shoes per week, but there is no visibility into the size distribution, geographic region or store level inventory of products sold. Additionally, customers do not share SKU-level information with ShoeCo at the current time.

4 Downstream Data Process Benchmarking

This chapter discusses the uses of downstream data presented by the literature and industry experts. It will explore strategies and how they can be used to increase consumer demand visibility in the footwear and apparel industry.

4.1 Strategy for Using Downstream Data

Downstream data can be distracting and provide nominal value if it is in the wrong form. One of the most important factors in using the data is the cleanliness of the information. Point of sale information chronically contains errors, anomalies, missing data, and other problems. These issues must be cleaned up in a data repository before the data can be used for analysis.

Another important factor in using point of sale data is the level of aggregation. Various levels of aggregation are required in different parts of a company's organization. For supply chain and forecasting groups, the data must be available at the lowest level of aggregation possible, SKU level. Analysts can aggregate data to ascertain the required insights, but if SKU level data is not available analysis will be limited. This issue is illustrated further in Chapter Five.

4.1.1 Available Downstream Data

Adding to the summary in Chapter Two, the most prevalent downstream data consists of

- Point of sale data – The most prevalent and easily obtained downstream data. All companies discussed in this thesis, including ShoeCo, received some level of POS data. The level of aggregation is an important factor in determining how useful the data can be.

- Vendor managed inventory information – This thesis does not go into detailed uses of VMI data, but companies with VMI relationships have increased visibility of consumer demand and can react to shifts in demand.

- Syndicated data – Syndicated data is nice clean data to analyze. The issue with this type of data is that it takes a long time to obtain, which makes the analysis too slow to effectively increase visibility to drive current sales.

- Loyalty Data – Few companies have incorporated a strategy for loyalty data in their supply chain. This is potentially the most insightful data into consumer habits for predicting future demand patterns as discussed in the case of ApparelCo.

Some or all of this data is available in every industry, but some customers are more willing to share information.

For example, Wal-Mart makes all of its point of sale information available to its suppliers and expects them to use it. Subsequently, the consumer packaged goods companies and food industries are the most advanced in leveraging point of sale and downstream data. Despite the fast moving traits of these industries, some techniques can be applied in the footwear and apparel industry. The availability of one-day-old data through systems such as RetalLink enables a company to access, monitor, and utilize point of sale data. ShoeCo could benefit from an open relationship and information sharing with its retail partners.

4.1.2 Industry Channels

In the footwear and apparel industry, companies fit into three distinct selling channels which have a key impact on the ease of downstream data availability.

1. Manufacturer – Produces products and market through retail locations owned by another company. A manufacturer must depend on its retail customers to pass on downstream data through partnerships or other arrangements. Customer loyalty information is difficult to obtain.

2. Vertically Integrated Manufacturer/Retailer – Produces and markets own brands in company owned stores. Since a vertically integrated company does not have to depend on outside sources, it has open access to all data it collects at a store level. It also has increased availability of loyalty data from its stores, if it chooses to collect this type of data.

3. Catalog or Internet Catalog Manufacturer/Retailer – Produces and markets own brands on company operated websites or mail-order catalogs. Similar to vertically integrated companies, catalog retailers have open access to downstream data. Furthermore, since products are mailed to consumers directly, the company can easily track the buying patterns of individual consumers.

Some companies, like ShoeCo, sell through multiple channels, although one channel is usually primary. The second two channels in the list above benefit from the downstream data available directly since consumers buy directly from the manufacturer. They are also afforded a complete picture of actual consumer demand without having to collaborate with retail partners.

In the first channel, a manufacturer must depend on the retail store to pass on downstream data, and some retailers share more data than others. Additionally, a manufacturer is dependent on the retailer to provide data in a usable format, which is not always the case. Finally, customer loyalty data is rarely shared between companies.

4.1.3 Strategy Execution

Access to point of sale and other downstream data is the key to leveraging the information in planning and forecasting. Without the data or with only limited data, it is difficult to implement an effective consumer demand visibility strategy.

It is important that a company set up a data repository to collect all of its customer data. The literature suggests that a company should use one of the third party repository software packages rather than develop its own system (Cecere, Martin, & Bois, 2006). Once a company has its data repository implemented, it should partner with its retail customers to obtain as much information as possible. This data needs to be disaggregated so an SKU level analysis can be performed. Ideally, the data should be downloaded into a single data repository within the manufacturer.

Using a single repository and obtaining SKU level data allows appropriate parties within the company to access any needed data. For example, supply chain organizations will use the data differently than sales organizations. By using a single repository with data at an SKU level, each organization can build the reports it needs by filtering and aggregating data to meet individual requirements. At the same time, no potential visibility is lost to any organization within the business.

4.2 Driving Sales with Downstream Data

Based on the literature and industry review, this section introduces multiple methods for using downstream data to drive increased sales. Some of the methods will be examined further and illustrated in Chapter Five.

4.2.1 Size-curve Analysis

ShoeCo currently knows the distribution sent to the retailers in its shipment data, but it has limited visibility into what drove the sale. ShoeCo may see an ending season inventory of zero, but this could be due to retailer promotions and mark-downs on less desired styles. Utilizing size-curve analysis prior to the mark down point would allow forecast updates, potential current season inventory adjustments, and a vital impact for the following seasons.

The distribution of shoe sizes sold will provide insight into a customer's preference. For example, a certain shoe may have sold well only in sizes 12 and 13, but it may have experienced poor sales in other sizes. Having this knowledge would help to improve the forecasting process for the subsequent year's styles and models of a similar shoe.

Size distribution is likely to vary based on the style and targeted consumer of each shoe. After a few seasons of analysis and adjustment, ShoeCo will be able to better predict the sell-through for a shoe targeted at a particular consumer. Depending on the desired level of granularity, analysis could be segmented by retail customer, geographic region, consumer demographic, or not segmented, for a view of the entire market.

Currently, the point-of-sale data is aggregated to the article level by the retailers, and only the total number of units sold is divulged to ShoeCo. There is no visibility into which sizes sold and which were sold due to mark-downs at the end of the season. SKU level data allows a manufacturer to examine whether sizes are selling through as expected or if adjustments to forecasts are necessary. Chapter Five examines this concept similarly by analyzing the sell-through of a mix of colors for a specific style of shoe.

4.2.2 Geographic and Demographic Uses

The geographic region that a retail store is located in could provide insight into why certain types of shoes are selling. For example, in the winter months a retailer in the northeastern United States will probably sell fewer running shoes than the same store located in a warmer southwest climate. Knowing the buying patterns of consumers in different geographic regions early in the selling season could allow ShoeCo to redistribute remaining inventory in its distribution centers to the stores that are selling more units. Similarly, if a popular professional athlete was traded from one sports team to another, this may shift the buying patterns (demand) of sports-shoe consumers. Based on geographic store locations, reallocation of inventory may be possible to increase on-shelf availability.

In the interview with ApparelCo, a discussion arose on how to group stores and identify store locations that serve as early predictors. In the case of ShoeCo, it can potentially use southern stores (warmer locations) during the Spring/Summer season as an early predictor of sell-through for its northern stores (colder climates). ShoeCo could possibly delay launch of Spring/Summer merchandise, giving it extra time to confirm forecast predictions from the early season sales in its southern stores.

4.2.3 Reducing Out-of-Stocks

SKU-level data can increase visibility at the retailers so ShoeCo can track fast selling sizes and anticipate a replenishment order from the retailer. As Chapter Five will illustrate, aggregated point of sale data makes it almost impossible to determine actual out of stock situations for a particular SKU within a customer's supply chain. With SKU level data ShoeCo will only know the entire customer chain is out of stock of a specific SKU. While this is beneficial information, it is possible that a large portion of the retailer's individual stores will stock out before the entire retailer's inventory is zero. Thus, it is necessary to obtain store level data.

Tracking store level POS for large customers can be a daunting task. Therefore, CPG companies typically employ dedicated teams to their largest customers. Despite the complexity, the potential to react to stock outs at individual stores could drive increased sales for a product.

For example, ShoeCo could hold more of the pre-ordered inventory at its own warehouses rather than the customer distribution center. When a stock out situation is on the near horizon based on POS data analysis, ShoeCo could ship additional inventory directly to the store that needs it. Used in combination with other lifecycle prediction techniques and size/color distribution analysis, ShoeCo could decide whether to replenish or not. In some cases ShoeCo may feel, based on analysis, that additional inventory will not completely sell-through and have to be marked down. Since the amount of inventory available is likely finite, due to short lifecycle products, ShoeCo can manage its own inventory and deploy it to the customer and stores that are most likely to sell it without markdown.

4.2.4 Collaboration among Supply Chain Partners

The previous section discussed methods that require open communication of sell-through data and inventory information between the customer and manufacturer. A collaborative relationship is a vital part in the effective use of downstream data. Additionally, both the customer and the manufacturer can realize potential gains by reducing out of stocks and markdowns. Each party holds information that can help the other make better replenishment decisions.

Collaborative Planning, Forecasting and Replenishment (CPFR) is an activity between the buyer (retailer) and seller (manufacturer) to work together to satisfy the demands of the end consumer. The entire process requires collaboration on parts of the supply chain from strategy to analysis, but a subset of the activities will prove useful to leverage downstream data (VICS, 2004).

The VICS standards (2004) discuss that trading partners collaborate at multiple levels depending on the size of the account. Some customers may require DC replenishment collaboration while for others it is better to collaborate at the store level. In DC replenishment collaboration, partners seek to increase the efficiency of the flow between the separate supply chain organizations. Store replenishment collaboration focuses more effort on store POS forecasts. At the store level, trading partners can expect a much greater visibility with benefits including:

- Improved replenishment accuracy
- Improved in-stocks
- Overstock reduction
- Improved promotional execution

In turn, the relationship allows trading partners a direct view of how consumers are responding to products. Manufacturers can then leverage this information to improve their supply chain execution (VICS, 2004).

5 Illustrative Use of Downstream Data at ShoeCo

The following chapter will outline potential ways that ShoeCo can analyze its downstream data, and the potential benefits that can be realized.

5.1 Stock-out Analysis of ShoeCo's POS Data

ShoeCo currently receives POS data from its customers (retailers) on a weekly basis. Included in this data set is the number of units sold and inventory that remains on hand at the retail chain for a particular shoe. Figure 7 illustrates an example of the point-of-sale data that was collected for ShoeCo by one of its retailers for a women's white leather shoe.

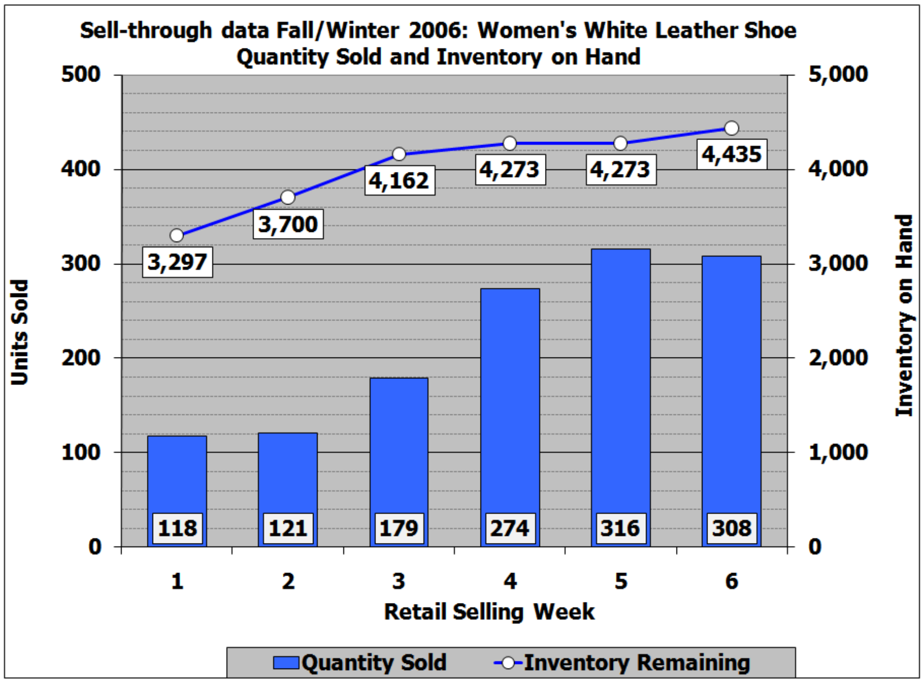


Figure 7: Point-of-sale data from a ShoeCo retailer

The vertical bars in Figure 7 represent the quantity of shoes that were sold while the positively sloped line corresponds to the inventory of shoes that remain at the retailer's stores. Data is shown for a six-week period of the Fall/Winter 2006 selling season. While the number of units sold between week 2 and week 3 increases by 50%, the reason for the boost in sales is difficult to quantify. A decrease in the sales price may have precipitated the increase in units sold, but without additional data the reason is unclear. Similarly, the inventory on hand at the retailer increases every week except for week number 4. An increase in inventory illustrates that units are being replenished at the retail store; however, it is not possible to determine either what stores are being replenished or the distribution of shoe sizes that are being restocked. Current POS information is only provided on an aggregate level, and it is difficult to deduce meaningful results about the distribution of shoe size, geographic store location, or selling price of the shoe.

Using aggregated data creates uncertainty in the POS data analysis. For example, in week 1 there were 118 units of a white women's shoe sold and approximately 3,300 units remaining in inventory. Although 3,300 units of inventory may seem like a large number, this figure is misleading because this data represents the total number shoes in all store locations and warehouses. If a retailer has 330 stores, then on average it has only 10 pairs of shoes in stock per location. Without knowing the distribution of shoe sizes sold and in-stock at each store location, it is difficult to improve forecast accuracy for future orders.

As illustrated previously in Figure 7, the sales increase observed between week 2 and week 3 is difficult to justify without additional information. By knowing whether the sales price was retail or discounted, ShoeCo would understand the reason a certain number of units were sold. This type of POS data would benefit the planning department of ShoeCo by allowing it to adjust product forecasts for similar SKUs in the next selling season.

5.2 Color-style Analysis of ShoeCo's POS Data

Based on the current point of sale data that ShoeCo receives, it is possible to perform a color-style analysis for a particular style of shoe and retailer. Figure 8 shows a color-style analysis for a men's shoe at all stores of a single retailer.

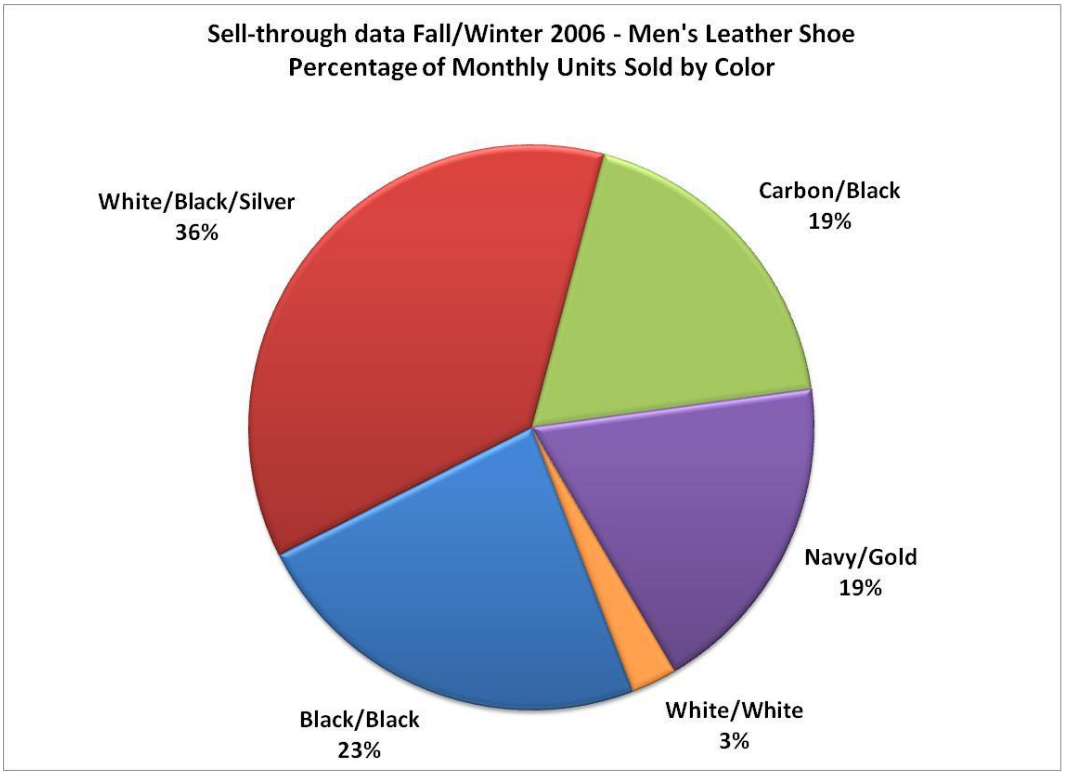


Figure 8: Color-style analysis based on POS data from a single ShoeCo retailer

Each segment of the pie in Figure 8 represents the percentage of total monthly sales for a specific style of shoe in each available color combination. In a given month, the White/Black/Silver colored shoe accounted for approximately 36% of the total sales volume while the White/White shoe only contributed 3% of total sales. Knowing the color distribution of a certain style of shoe provides the planning group with the insight to improve forecasting for the next model's selling season by adjusting to changes in demand. In the case of a carryover product, a shoe that is continuously sold from one season to the next, knowledge of the color distribution could improve ongoing production planning and inventory management.

5.2.1 Color-style Analysis as an Early Indicator of Sales

Additionally, ShoeCo can use the color-style analysis to forecast the amount of shoes required for the current selling season. ShoeCo can develop an early indicator of seasonal sales by comparing point of sale data from the start of a selling season (month 1) to the average sales for the entire season (6 months). Figure 9 illustrates a color-style analysis for a women's shoe at all of the stores (single retailer) during the *first month* of the Fall/Winter 2006 selling season. Similarly, Figure 10 shows the same analysis for the entire *six month* period of the Fall/Winter season.

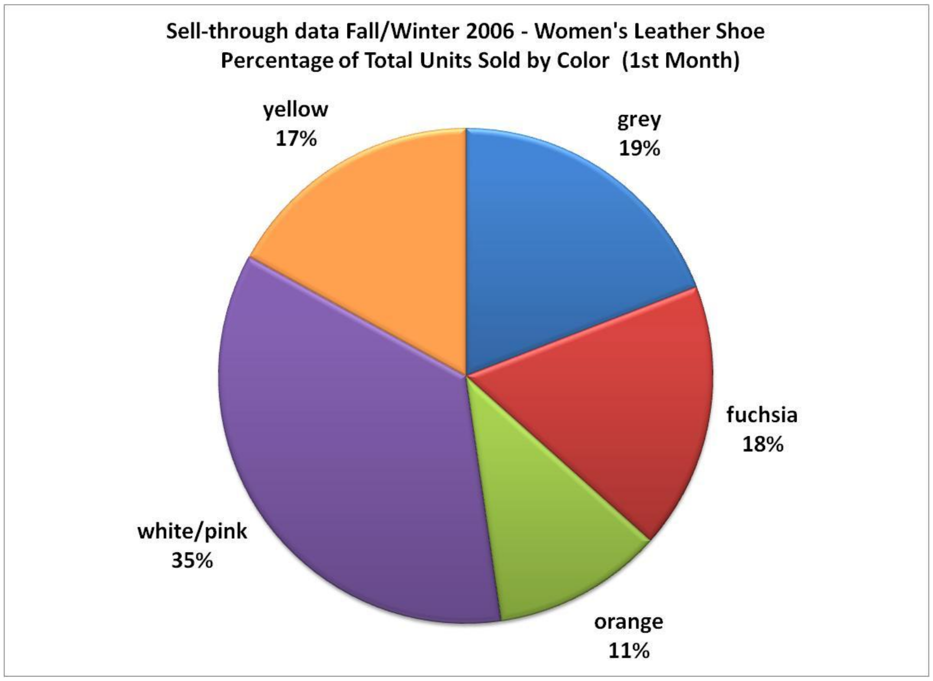


Figure 9: Color-style analysis for the 1st month of the selling season

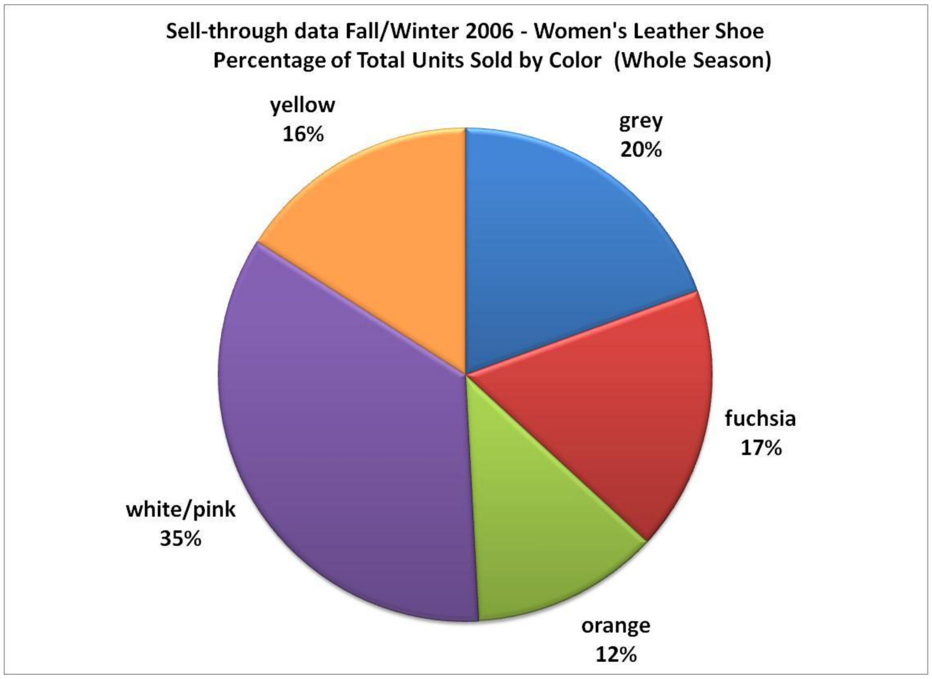


Figure 10: Color-style analysis for all 6 months of the selling season

Each segment of the pie represents the percentage of total volume sold for a specific style of shoe in each available color combination. Table 1 provides a comparison between the percentage of sales volume in the first month of the selling season and the percentage of shoes sold during the entire Fall/Winter 2006 period.

	Percentage of Total Volume Sold	
Color	**1st Month**	**6 Month Average**
Yellow	17%	16%
Grey	19%	20%
Fuchsia	18%	17%
Orange	11%	12%
White/Pink	35%	35%

Table 1: Color-style comparison for different time periods (1st month vs. season)

Table 1 shows the average sales for the Fall/Winter 2006 selling season are approximately equal to the sales after the first month. In other words, initial sales of the shoe are very similar to the color-style distribution for this style of shoe over the selling season. As a result, the proportion of shoes sold in month 1 can be used as a predictor of the total distribution of shoes sold throughout the entire selling season.

The color distribution forecast for the Fall/Winter 2007 selling season should be similar to the average sales for the previous season, Fall/Winter 2006. Therefore, whatever was sold during the last season will provide a starting point for the planning group to refine forecasts for the next selling season. Once the Fall/Winter 2007 retail selling season begins ShoeCo can collect point-of-sale data to compare the color distribution of early sales to that of the total season forecast for 2007. Table 2 illustrates this concept using the Fall/Winter 2007 forecast (based on the average 2006 values from Table 1) and hypothetical point-of-sale data collected by ShoeCo after the first month of the 2007 selling season.

Color	**Percentage of Total Volume Sold**	
	2007 Forecast	**Hypothetical Results After Month 1**
Yellow	16%	26%
Grey	20%	10%
Fuchsia	17%	17%
Orange	12%	12%
White/Pink	35%	35%

Table 2: Using POS data as an early season indicator of future sales

From the concept illustrated in Table 1, the proportion of sales from the first month should be indicative of the selling characteristics for the entire season. Therefore, if there is any discrepancy between the percentage of colors sold in the first month of 2007 and the forecast for 2007, then ShoeCo should consider reallocating production accordingly. In the hypothetical case in Table 2, the yellow shoe has outperformed the forecast by 10% while the grey shoe has underperformed its target by 10%. Observing the differences between the forecast and the first month results, ShoeCo can adjust its production orders to realign with this early season indicator. If analysis shows that only Retailer A is underselling certain colors, inventory reallocation can also be considered. More yellow shoes can now be shipped to the Retailer A stores while ShoeCo's inventory of grey shoes, which was designated for Retailer A, can be assigned to another retailer. By doing so, ShoeCo can increase it sales of yellow shoes and prevent markdowns of grey shoes at the end of the selling season.

5.2.2 Color-style Analysis to Predict Subsequent Seasons

By looking at the color-style distribution based on POS data for a single retailer, ShoeCo can predict which color-style combinations will have the greatest amount of sales throughout the retail season. Figure 10, from the previous section, showed the percentage of each color shoe that was sold during the Fall/Winter 2006 selling season.

In the apparel industry, inventory is typically sold at the end of the season, even if it means large markdowns. Due to this liquidation of merchandise at the end of the season, the amount of product that was sold over the season will be approximately equal to the shipments from ShoeCo to the retailer. If ShoeCo uses total sell through from the store (that is equal to shipments) to predict future sales, they are not accounting for the adjustments needed to eliminate late season markdowns and early out of stocks. Analyzing late season POS data will help ShoeCo make informed forecast adjustments for future seasons. Figure 11 illustrates the color-style distribution for a week at the end of the season.

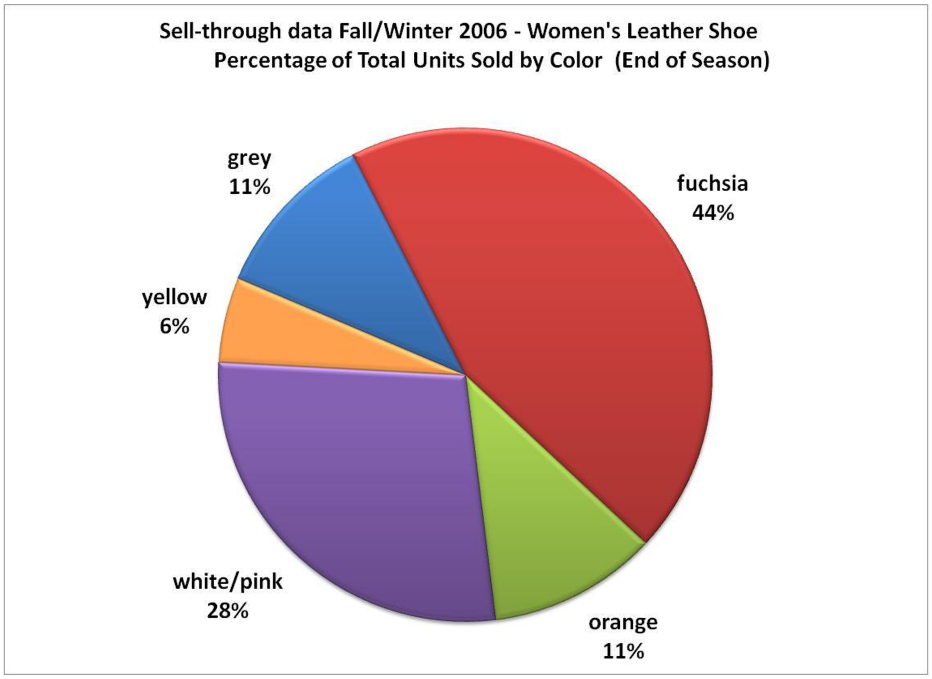


Figure 11: Color-style analysis for the end of the selling season

The proportion of shoes selling at the end of the season differs greatly from the average number of shoes shown in Figure 10. Since the total season sell-through is usually equal to the early season data, this violates what is expected and implies that items are marked down and selection is limited. The difference between the average sales and the end of season sales are given in Table 3.

Color	Percentage of Total Volume Sold	
	6 Month Average	End of Season
Yellow	16%	6%
Grey	20%	11%
Fuchsia	17%	44%
Orange	12%	11%
White/Pink	35%	28%

Table 3: Comparison over different time periods (6 months vs. end of season)

The fuchsia colored shoe, which averages 17% of style sales, accounted for 44% of sales during one of the last weeks in the selling season. The change in color distribution sell-through could represent a markdown in price due to low demand and increased inventory of the style at the retailer. The consumer may have been forced to buy the fuchsia colored shoes because other more favorable colored shoes were out-of-stock. Conversely, the yellow colored shoe represented only 6% of sales volume at the end of the selling season compared to 16% average sales. A lack of inventory selection (out-of-stock at the retailer) at the end of the selling season is likely to have caused the lost sales of the yellow shoe. By knowing the season sales at full retail price, ShoeCo will be able to improve forecast accuracy for the upcoming season.

5.3 Bullwhip Effect

The bullwhip effect is a distortion in the demand signal as information travels from the retailer (point-of-sale) to the producer (ShoeCo). By comparing the units sold from the POS data (sell-out) to the inventory that ShoeCo shipped to a retailer (sell-in) it is possible to observe the bullwhip effect in practice. Figure 12 displays the number of units sold on a weekly basis for a women's leather shoe. The data provided is from a single retailer, and it was collected during the Fall/Winter 2006 selling season.

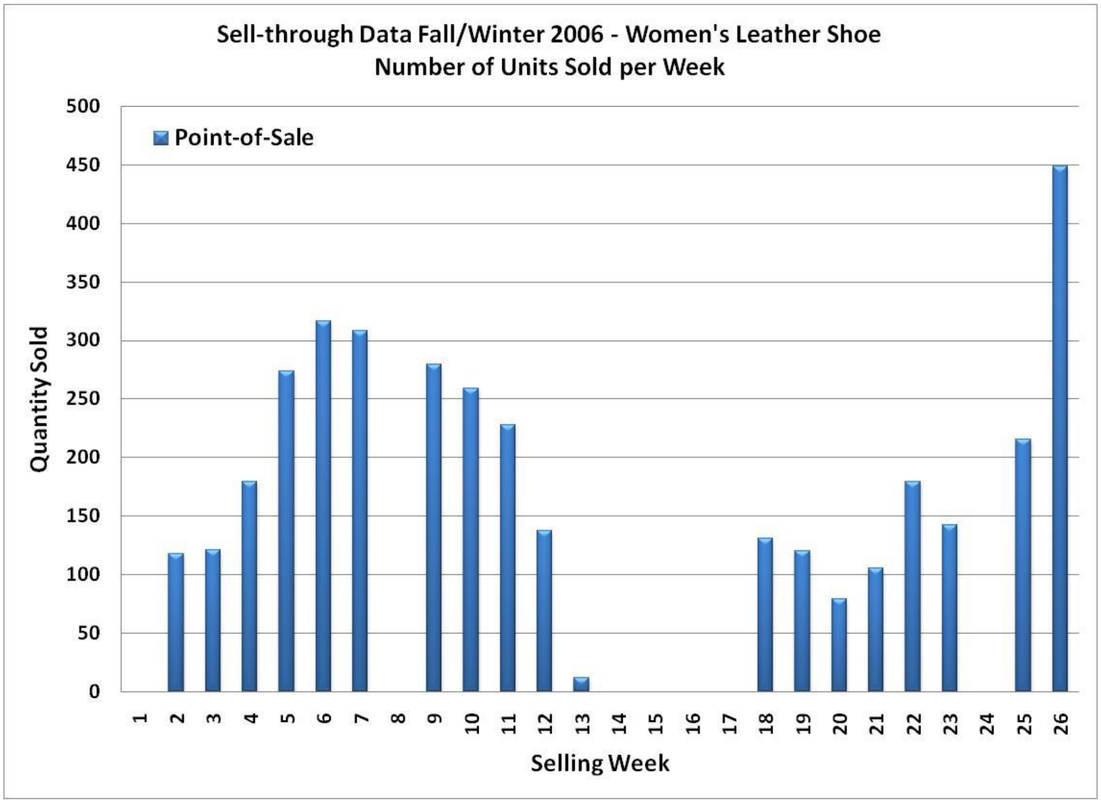


Figure 12: Units sold from a ShoeCo retailer (POS data)

The vertical bars in the figure represent the number of units sold for a particular week during the selling season. Weeks in which gaps exist in the data (1, 8, 14-17 & 24) do not correspond to zero sales but are a result of missing data reported by the sales representative to ShoeCo. A moving average of the point-of-sale data was taken to fill in the gaps between missing weeks. The data was averaged over two overlapping three week periods and has been re-plotted in Figure 13.

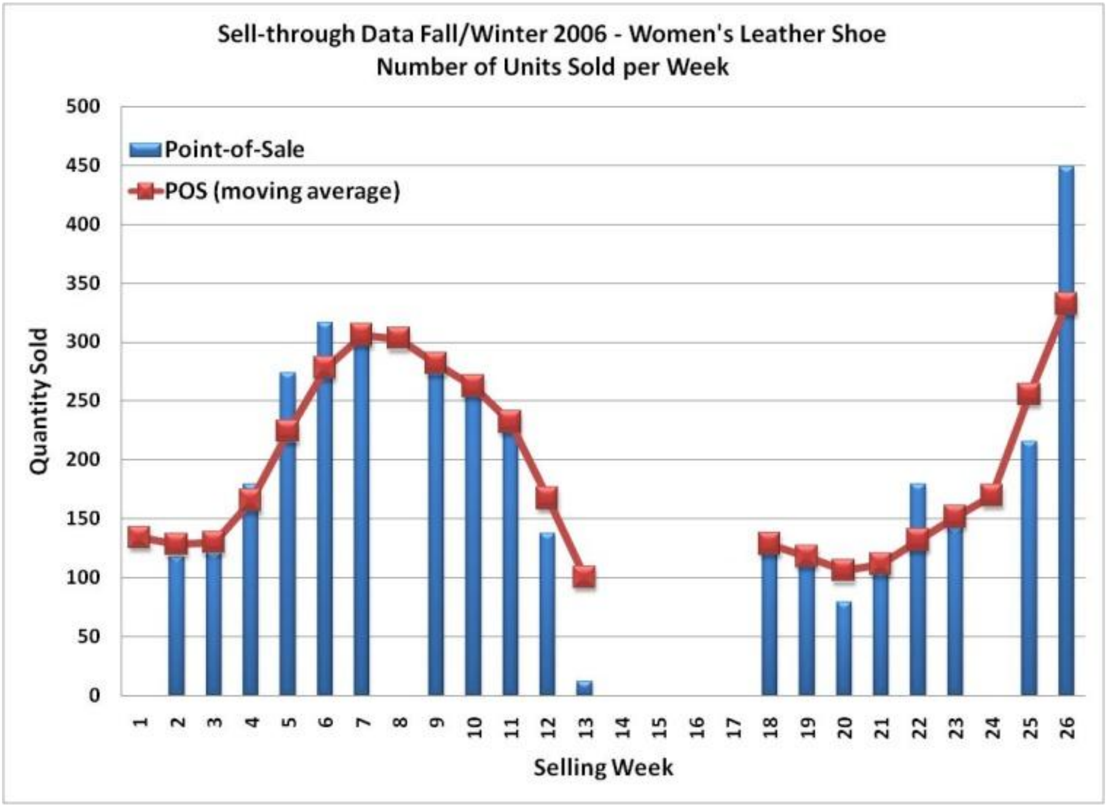


Figure 13: POS data (moving average) from a ShoeCo retailer

Since the sell-in data from ShoeCo to the retailer is reported on a monthly basis it is necessary to aggregate the weekly POS data into a monthly format for the purpose of comparison. Figure 14 shows the monthly aggregated POS data and the monthly sell-in data from ShoeCo.

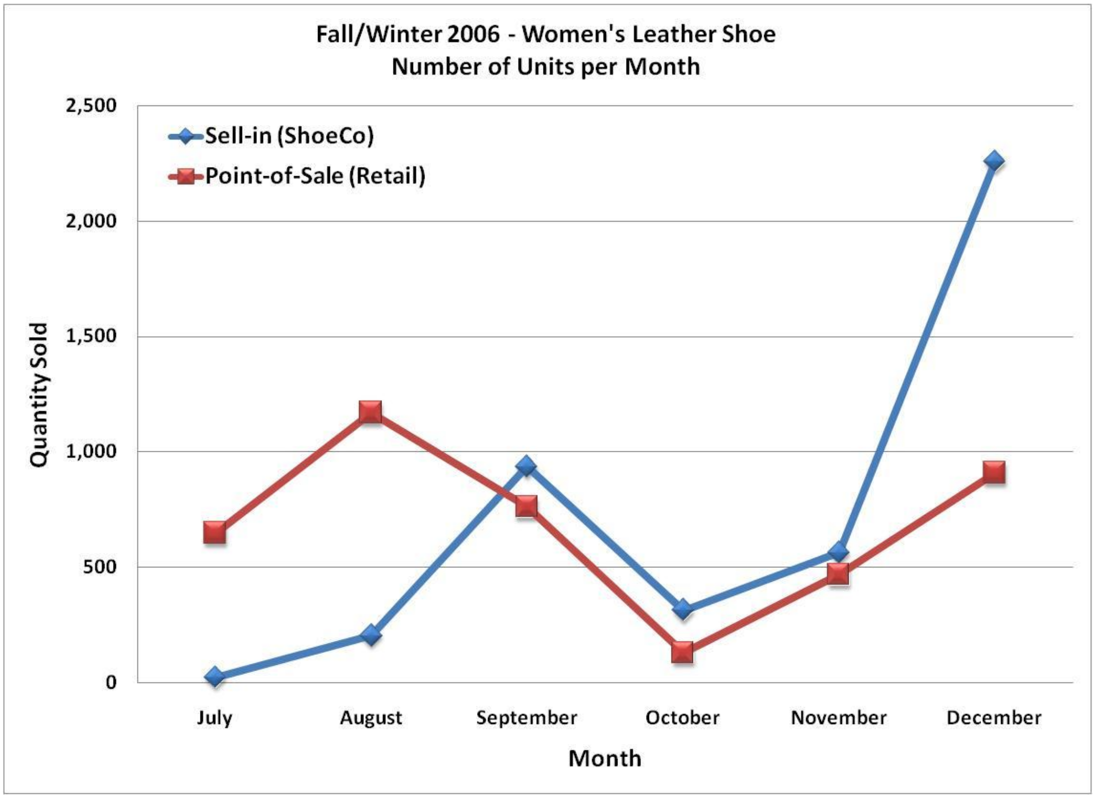


Figure 14: POS vs. sell-in data for a ShoeCo retailer

The bullwhip effect is noticed in the months of August and September. In August, the retailers sold about 1,200 shoes while ShoeCo only shipped about 200. In September, ShoeCo reacted by shipping about 1,000 shoes to the retailer. If ShoeCo had a better signal of demand, it would have been able to react to the changing consumer demand in the month of August. ShoeCo is trying to catch up to restore inventory levels at the retailer by shipping product to match items sold last month, rather than anticipating consumer demand.

5.4 Comparing Multiple Customers' POS Data

By comparing point-of-sale data from multiple retailers ShoeCo can make inferences about potential inventory replenishment benefits. Two retailers, which have roughly the same number of stores, were used for comparison. Retailer #1 has approximately 600 stores in the US while Retailer #2 has 650 stores. Figure 15 shows point-of-sale data for the two separate retailers during a 14 week period of the Fall/Winter 2006 selling season.

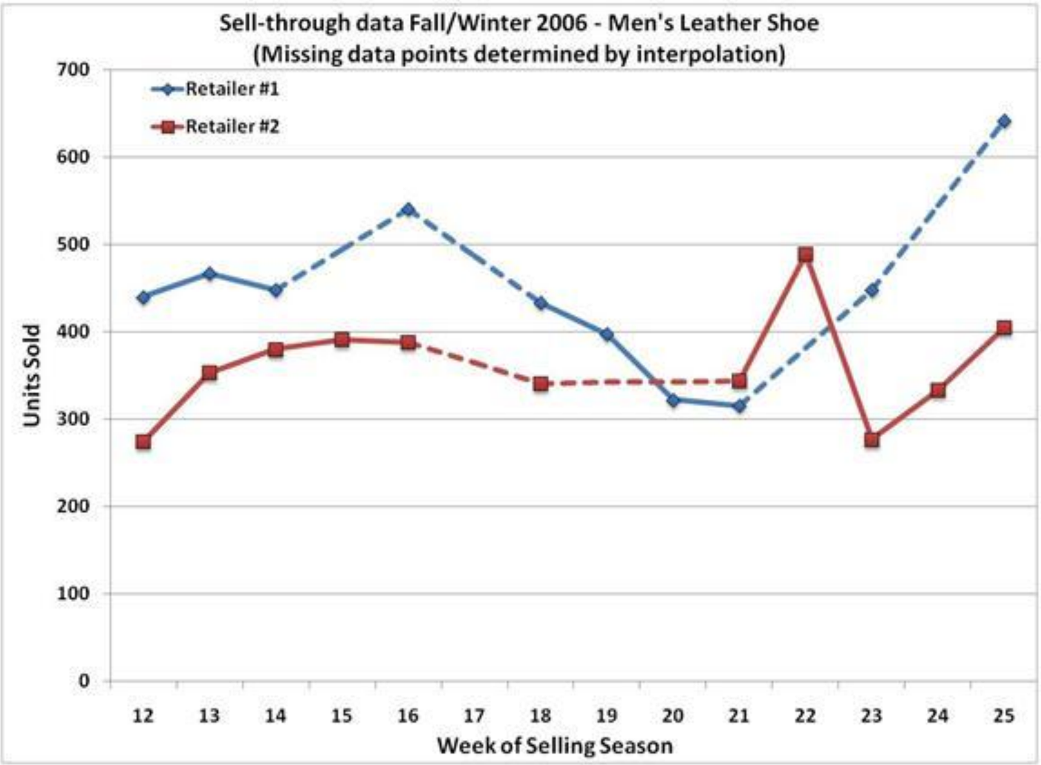


Figure 15: POS data for two separate retailers

The solid lines in Figure 15 correspond to actual reported sales data from the retailer while the dashed lines represent weeks where point-of-sale data was missing. The units sold have been determined through interpolation. It can be seen from Figure 15 that Retailer #1 experiences a 42% decrease in sales between week 16 and week 21. However, between week 21 and week 25 it observes an increase in sales of 100%. Retailer #2 on the other hand, has constant sales of 350 units per week except for the upward spike in sales during week 22.

An increase in stock-outs of popular sizes may have created lost sales for Retailer #1 after week 16 and contributed to the decline in sales. Or, a liquidation of merchandise at the end of the season may have caused Retailer #1 to markdown the price and resulted in an increase in sales. If ShoeCo were to use point-of-sale data to signal real consumer demand, it will foresee the declining sales after week 16 and react accordingly. Additional shoes, in the appropriate sizes, could be expedited to the stores to enable increased sales.

The reason for the fluctuation in units sold by Retailer #1, or the steady sales of Retailer #2, is unknown without additional information about the unit selling price, the geographic region of the store, the size of shoe, or stock-out information. Availability of this data would allow further analysis to provide insight into individual store selling patterns and consumer behavior.

6 Conclusions and Future Research

When it comes to leveraging downstream data, the footwear and apparel industry is behind many other industries in the United States. In order to fully utilize downstream data and move the supply chain to the next level, these manufacturers (such as ShoeCo) must focus their efforts on three key attributes.

1. Availability – Without available data, there is no information to analyze or to leverage. Manufacturers must form collaborative partnerships with retail customers to formally obtain the necessary consumer demand data. It is important that the data is complete and consistent over time. Gaps in the data force forecasters to guess, reducing the depth of the analysis.

2. Accessibility – The data, in its original form, must be accessible to all business units within the company. A single data repository is recommended to provide an essential level of visibility required to meet each organization's specific goals.

3. Aggregation – Detailed SKU level, and possibly store level, data is crucial for effective analysis. If data is aggregated before being deposited into the repository, some visibility will be lost. Furthermore, if the entire retail chain's data is lumped together (not store level), geographic and demographic analysis cannot be performed.

Once a repository has been built and detailed data is available, ShoeCo should explore the feasibility of implementing downstream data into its business model to drive increased sales. The methods that have been presented throughout the thesis provide a framework for future analysis once disaggregated data has been collected. Combining point of sale data with current forecasting and inventory planning practices will enable ShoeCo's supply chain to be more demand driven and realize the benefits of being closer to the end consumer.

Furthermore, customer loyalty data coupled with other downstream data promises to provide unique visibility and insight into individualized consumer buying patterns. Leveraging the customer loyalty data in a non-vertically integrated manufacturer presents a challenge since retailers tend not to share loyalty data with manufacturers and suppliers. This thesis focused on leveraging point of sale data, but additional study needs to be done on how manufacturers can form partnerships to fully benefit from consumer loyalty data.

ShoeCo should immediately begin to capture the downstream data from its company owned stores and put it into a data repository. While company owned stores are only a small part of the business, these stores would give ShoeCo complete access to all POS and loyalty data since relationships with other retailers will take time to build. With the POS data that is collected from the company owned stores, ShoeCo can begin to determine which analyses are the most appropriate for its supply chain. Further, ShoeCo will be able to document the cost versus the benefits of utilizing downstream data from all retail customers or from a subset of customers.

In conclusion, this thesis focused on current industry practices for downstream data and how ShoeCo can implement these methodologies into its supply chain strategy. Once ShoeCo has a repository full of detailed data, these strategies can be tested with ShoeCo's specific data to discover and prove techniques that enrich the planner's forecasting ability and truly drive sales.

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