Perfecting Visibility with Retailer Data

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Summary: Designing optimized operations is essential for companies in competitive business landscapes, but unexpected or inconsistent customer demand can significantly reduce the effectiveness of the supply chain. This project creates a framework to use retailer point of sale (POS) data to adjust a consumer-packaged-goods (CPG) manufacturer’s production plan to not only improve the CPG company’s supply chain but also to enhance collaboration between the CPG company and its retail customer.

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KEY INSIGHTS
1. Using POS data to refine customer orders forecast creates value but does not reduce the bullwhip effect. To reduce the bullwhip and realize the full benefits of POS, customer orders must mimic POS.
2. The extent of POS integration into production planning correlates directly with the potential improvements in the supply chain.
3. POS data enables and enhances collaboration between customer and supplier.

Introduction
Companies have always been interested in the theoretical benefits POS data to their supply chains but due to the amount of time, effort, and cross-team collaboration, its actual implementation is not nearly as commonplace. This project uses retailer POS data to adjust production planning to reduce production and inventory costs but maintaining high service levels.

Products in Question
The four different SKUs analyzed in this project were produced in the same manufacturing process and sold to the same retail customer. The time frame expands 26 weeks. SKU 2 (Figure 1) & SKU 4 customer’s inventory position remained at a consistent ratio to POS volume.

Figure 1: POS Data SKU2
This results in the customer orders volume tracking to that of the POS but with a time shift delay and an amplification of its magnitude. The time shift delay is due to the retailer collecting the data, aggregating it, and then placing the order. The amplification is primarily due to an overreaction to the actual sales. This amplification is the Bullwhip Effect. SKUs 1 & 3 in comparison do not exhibit a consistent inventory policy, which conversely resulted in an order pattern that does not correlate to POS data. SKU1’s inventory to POS ratio varied from week to week unexpectedly without a sensible pattern. The retailer’s inventory to POS ratio of SKU3 declined by 50% from week 12 to week 26. The inventory policy of SKU1 and SKU3 necessitates open communications between the retailer and the manufacturer because quantitative analysis is no sufficient to effectively plan production.

Analysis
The focus of the analysis was to develop a model to investigate the benefit of incorporating POS data into production planning. Inventory holding cost and equipment changeover/setup cost were the optimization goals of the model while production capacity and item fill rate were its constraints. Due to the production planning freeze period of 3 weeks, the model used POS from week 1 through 4 to make the first production adjustment for week 8 through 11. The results were then used to adjust the subsequent weeks of production through week 26. Three models were developed: (1) Using only historical customer orders data; this most closely represented the existing forecast and production plan, (2) Using POS to forecast orders and adjust production to fulfill customer orders, (3) using POS data to adjust production to fulfill future POS, thereby eliminating customer orders altogether.

Results
The three models produced consistent results regarding the effectiveness of integrating POS data into production planning. The base model (1) provided the baseline and it was also the most costly model. Although model (2) improves over model (1), it only does so slightly on average of 5% primarily because model (2) still aims to fulfill to customer orders, which does not reduce the bullwhip effect. Model (3) resulted in the most cost savings because in addition to using POS to produce a better forecast, it also aims to fulfill future POS, thereby removing the extra layer of inefficiency of customer orders and the associated bullwhip. Figure 2 shows the inventory comparison between model (1) and model (3) for SKU 2.

![Figure 2: Inventory Comparison SKU 2](image)
Conclusions

The practical application of POS data can create substantial improvements in the supply chain. Figure 3 shown in below provides a framework on how to leverage POS data. If the bullwhip is minimal, then using POS data to improve customer orders forecast produces the most benefit to the cost. On the other hand the higher the bullwhip, generally the higher the inventory volume and stress on production and thus the more significant the potential to reduce inventory and production related costs if POS data is used effectively. So in this case, it is best to persuade the retailer to place orders that more closely resemble the POS. In the case that the average customer orders do not align to the volume of POS, regardless of the bullwhip effect, the manufacturer must engage the retailer to discuss the misalignment. The misalignment can be caused by a change in the retailer’s inventory policy that could create critical longer term consequences to the manufacturer if discovered too late. POS provides an early warning to decreases or increases in customer order volume with respect to actual sales. As the research in this project illustrates, POS data can be used “passively” to be analyzed and improve forecasts but to maximize the potential of POS, action must be taken to engage with retail customers. Not only can POS data impact immediate and tangible financial aspects of the manufacturer’s supply chain, but the real value of POS is to encourage and enhance communications between the retailer and the manufacturer. The overall supply chain is made more efficient creating a win-win situation. This also strengthens the long term relationship between customer and supplier thereby giving the supplier an added advantage over the competition.

Figure 3: POS Framework