Vendor-Managed Inventory Forecast Optimization and Integration

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Summary: This project developed a novel way of measuring and comparing account level Vendor-Managed Inventory forecasts with traditional high-level demand planning forecast. Insights were developed on how to integrate this valuable forecast and inventory information upstream into the demand planning process to effectively improve supply chain forecast accuracy.

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KEY INSIGHTS

1. Incorporated VMI information can drastically reduce forecast error.

2. Manufacturers need to develop the account level forecast.

3. Different forecast methods should be applied for different customer.
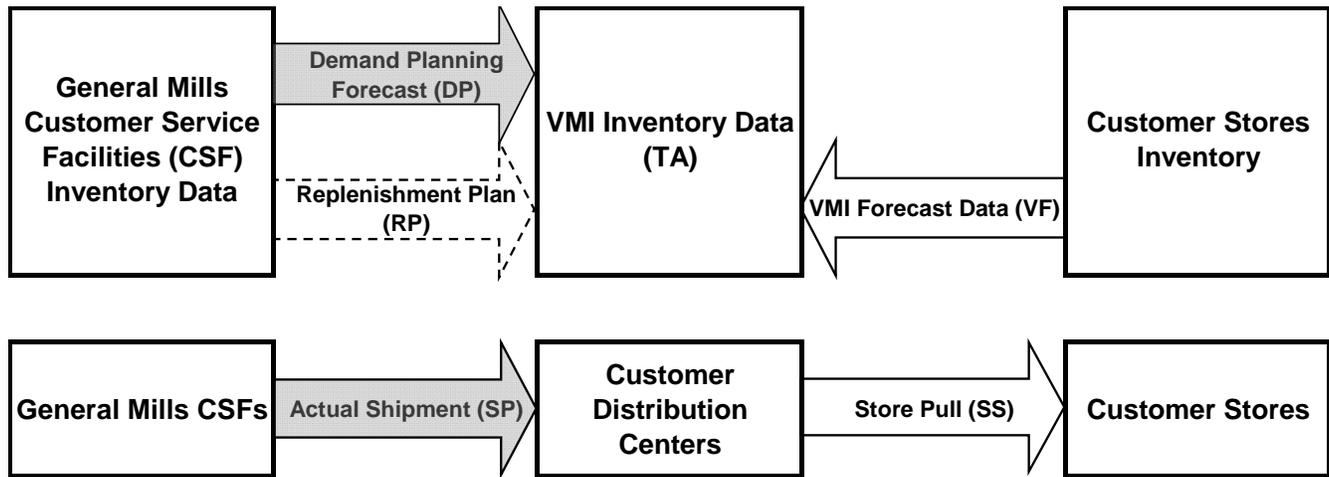
Introduction

In the retail industry, both consumer package goods (CPG) manufacturers and retailers invest heavily in new information technology systems such as electronic data interchange (EDI) to transmit data and vendor-managed inventory (VMI) to reduce total inventory.

The practice of VMI has been adopted by more and more consumer package goods manufacturer and retail chains, because it helps retailers to hand over the inventory management and purchase order issuing process to its suppliers. However, on the consumer package goods manufacturer side, the benefit of such a practice has not yet been fully realized. How to best utilize these ultimate tools and this source of retailer inventory information is becoming a critical question to most consumer package goods manufacturers. In the 1990s, some research focused on the application of "Collaborative Planning, Forecasting and Replenishment" (CPFR) (VICS, 2007). However, this theoretically suitable method was only partially successful, because both manufacturers and retailers were still reluctant to share information, which they considered to be sensitive.

Research Scope

This project intends to explore those opportunities where a consumer packaged goods company can benefit from a VMI practice with its retailers. Trying to provide key insight into how a consumer package goods manufacturer can best benefit from VMI, General Mills' VMI forecast practice with two of its retailers was analyzed and compared its current demand planning.

VMI Forecast and Demand Planning Forecast

General Mills Customer Service Facilities (CSF) Inventory Data

Demand Planning Forecast (DP)

Replenishment Plan (RP)

VMI Inventory Data (TA)

VMI Forecast Data (VF)

Customer Stores Inventory

General Mills CSFs

Actual Shipment (SP)

Customer Distribution Centers

Store Pull (SS)

Customer Stores

Legend

Demand Planning Activities

VMI Activities
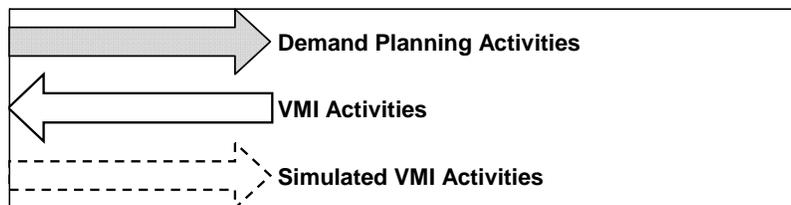
Simulated VMI Activities

Figure 1 General Mills Planning Process

By forging into EDI linkages with retailers, VMI benefits its users with following distinctive advantages:

1. It represents a high level of collaboration between the manufacturer and the customer. This high level of collaboration is based not only on the trust between customer and supplier, but also based on the trust of their information systems that report on customer demand and those replenishment orders generated to meet that demand. With this trust, CPG companies can develop strategic partnerships with the retailers and boost the sales of both sides.

2. VMI creates the opportunity for CPG manufacturers to develop account-level forecasts. In a VMI practice, the CPG manufacturer is responsible for the replenishment of a retailer's distribution center. Together with the traditional forecast information that the CPG manufacturer received from the retailer, the CPG company now has access to information closer to retailers' point-of-sales data. This enables the CPG company to develop a more real demand-based bottom-up forecast.

3. At last, VMI provides a CPG company with inventory visibility of the whole supply chain. As previously mentioned in point 2, with VMI, the CPG manufacturer has a clearer view of incoming demand. In addition, the CPG manufacturer also has complete control over the replenishment to retailers' distribution centers (DCs) and retailer DC inventory. Thus, a CPG manufacturer can keep the right levels of inventory at its own warehouse and customer DCs. Therefore, product supply lead times are also more predictable and controlled.

Forecast Method Analysis

In order to test these advantages against the traditional demand planning forecast, General Mills planning process has been mapped in Figure 1.

Then, a Replenishment Plan (RP) was developed by using VMI Forecast Data (VF), VMI Inventory Data (TA) and corresponding DC inventory policies.

The right forecast data aggregation level was also defined by taking reference to current important customer service challenges. So the forecast accuracy will be measured based on forecast "Week" – Time, "DC" – Ship-to Location and "Product" – Volume and Mix. Figure 2 depicts the defined Level 3 data aggregation

Aggregation Level	Data Aggregation	Service Requirement Low	→		Service Requirement High
Level 1	**Product**	Right Product			
Level 2	**CSF Product**	Right Product	Right Shipping Location		
Level 2	**DC Product**	Right Product	Right Ship to Location		
Level 2	**Week Product**	Right Product	Right Time		
Level 3	**Week CSF Product**	Right Product	Right Shipping Location	Right Time	
Level 3	**Week DC Product**	Right Product	Right Ship to Location	Right Time	
Level 4	**Week DC CSF Product**	Right Product	Right Shipping Location	Right Ship to Location	Right Time

Aggregation Level High ↑ Aggregation Level Low

Figure 2 Forecasts Data Aggregation Level

As the next step, the Demand Planning Forecast, Replenishment Plan and VMI Forecast were compared in a series of ways to evaluate their forecast accuracy as in Table 1.

Forecast Comparison	Demand Planning Forecast	Replenishment Plan	VMI Forecast
Forecast Level	Shipping Locations	Customer DC	Account
Account Level Forecast Accuracy	Low	Mid - High	High
Account Level Forecast Bias	High	Low	Low
Data Source	Shipment History & Marketing Plan	Customer DC Inventory Target, VMI Forecast	Store Pull History & Customer Promotion Plan
Inventory Data Used	Not Applied	Customer DC Inventory	Customer DC Inventory
Promotion Forecast Method	Combined Forecast with Turn	Independent Forecast	Independent Forecast
Planning Horizon	4 Months	2 Weeks	Weekly

Table 1 Three Forecast Comparisons

As shown from Table 1, even though those three forecasts are projecting demand at different levels, the Replenishment Plan has a lower forecast error compared with the Demand Planning Forecast. In addition, Replenishment Plan and VMI forecast also have significant low forecast volume bias in comparison with the Demand Planning Forecast.

An error causal diagram was developed as shown in Figure 3 to identify five key drivers for Demand Planning Forecast errors. They are:

1. Product Category Mix Variance

2. Volume Variance

3. Pipeline Inventory Data Accuracy
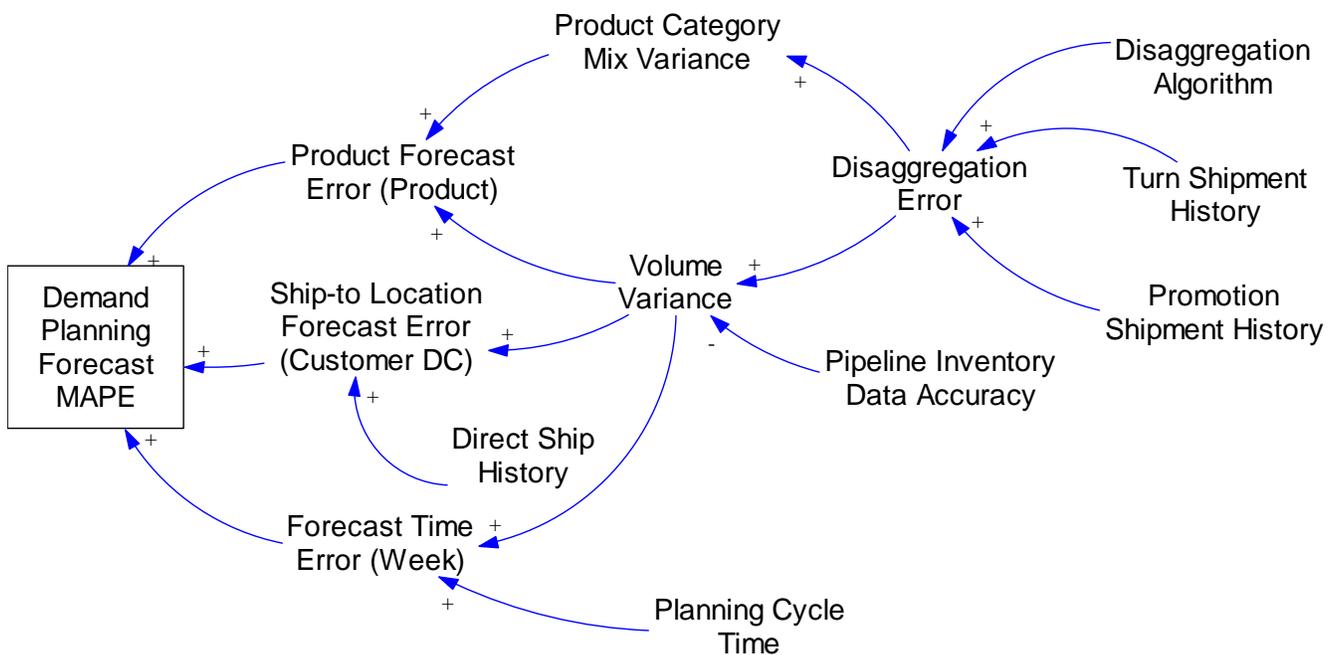
4. Planning Cycle Time

5. Direct Ship History

Figure 3 Demand Planning Forecast Error Causal Model

Conclusion

The overall strategy of a CPG company should be at developing an account-based forecast (Lapide, 2001) in which customer demand drives the whole planning process. VMI and EDI provide some ground for such strategy being implemented. In order to integrate the VMI forecast into the supply planning process, companies first need to segment their customers by planning methods as shown in Figure 4
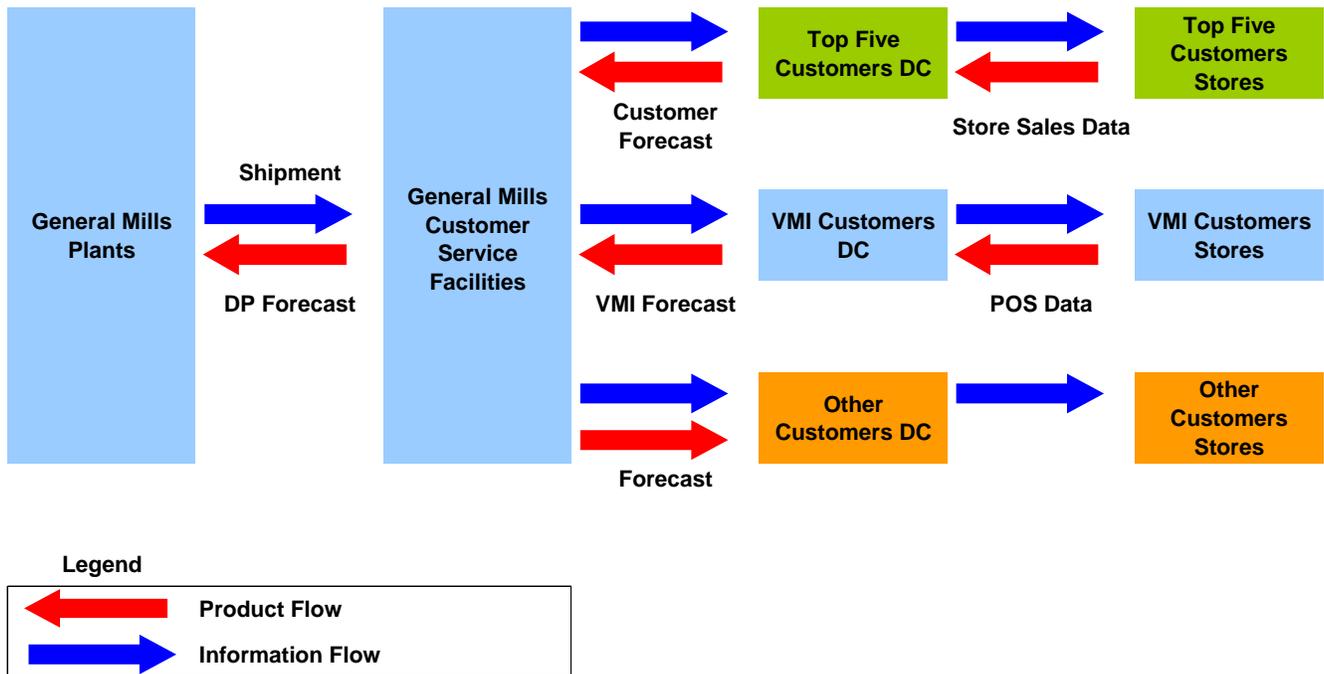
Figure 4 Recommended Planning Process

The implementation of such strategy usually involves the following steps. First, customers need to be segmented to apply appropriate forecast methods. For instance, **Error! Reference source not found.**, there are top five customers, VMI customers and other customers. Second, a CPG company should separate turn and promotional forecasts in its demand planning process. Different forecast methods can be used to forecast turn and promotional volume separately. By applying this change, promotional volume shipment history will not have any impact on future turn sales forecasts during disaggregation. In addition, because a VMI forecast is more accurate on promotional forecasts, the VMI promotional forecast data can be used to compare against the marketing projection of the promotional forecast. Third, pipeline inventory data should be included into the demand planning process. Visibility of pipeline inventory will help the demand planning process understand the real demand. Fourth, the demand planning forecast should incorporate:

- forecast information from marketing for the high level volume forecast
- the VMI forecast for customer pipeline inventory
- the VMI forecast plus promotional and turn shipment history to define the baseline forecast