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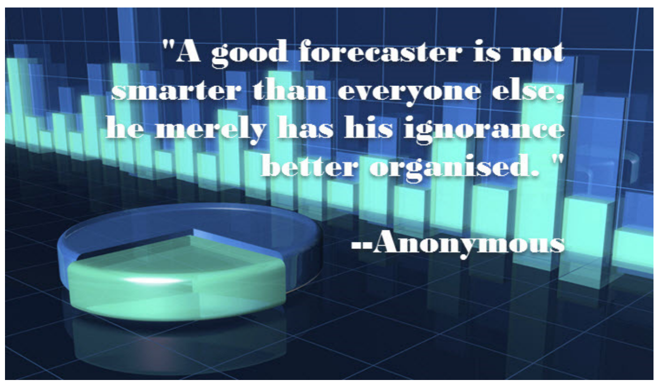
Creating a Data Framework for Agile Forecasting and Demand Management



This chapter describes (1) the role of the demand management process in a consumer-demand driven supply chain, (2) why a cloud-based, database framework for demand forecasting is essential to its success, (3) how to identify the essential components of a forecast decision support platform (FDSP), and (4) when and how automatic forecasting should be used.

Demand Management in the Supply Chain

Successful demand management organizations are those that have discovered how to apply effective data management practices with **agile forecasting** and planning processes to what is essentially a nontraditional supply chain discipline. In the demand forecasting discipline, we do not have the power to *change* future demand, only to become **agile** by quickly and skillfully influencing the sales target or demand plan to better align it with expected future demand.

The manufacturing/distribution/retail pipeline starts with raw materials and purchased parts required by the manufacturing plant. At the manufacturing level, the fabricated components are added, subassemblies, and assemblies are used to produce the finished-goods inventory. At the distribution level, we generally have finished goods.

In a modern consumer-demand driven supply chain, which evolved over decades, consumer-demand information also flows back in the opposite direction, so that all operations have complete visibility to the whole supply and demand process (Figure 13.1). Instead of being driven or supplied by the manufacturer, consumers are the drivers of demand, demanding cheaper, faster and higher quality products and services. A firm's success is a combination of a balanced supply chain, a sound infrastructure, and a focus on consumers.

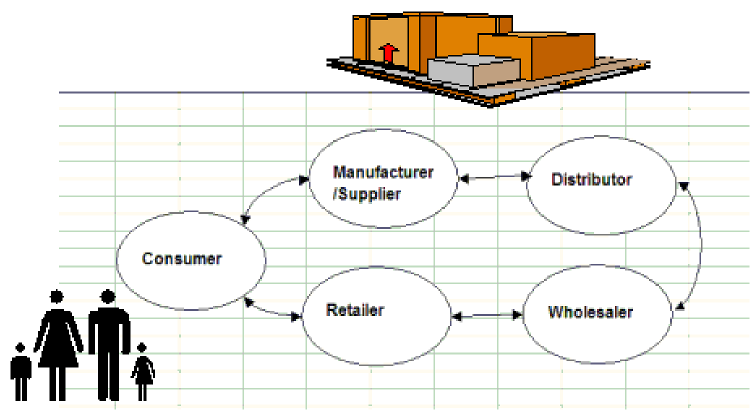


Figure 13.1 A consumer-demand driven supply chain. (*Source*: L. Lapide, MIT, 2006)

Demand planning systems have a similar underlying logic, but different factors/parameters affect the inventory plan at each point in this pipeline (Figure 13.1):

- **Manufacturing resource planning** (MRP) plans the raw materials, purchased parts, and components.
- **Master production scheduling (MPS)** plans the finished goods.
- **Distribution resource planning (DRP)** plans the finished goods at the distribution centers.

Material flow is from suppliers to the manufacturer through the distribution channel to the consumer. Demand information flow is in the reverse direction, from the consumer to the suppliers.

Although the analogy of a chain is useful in visualizing the "Sell What You Can Make" process (Figure 13.2), it is far too simplistic to describe what really happens with demand forecasting. Within the supplier/manufacturer, the supply chain includes forecasts of multiple sources of supply at every stage. In the distribution channel, multiple centers can supply multiple factories and provide service to multiple retail outlets.

The supply chain model includes a number of highly complex processes for sourcing/suppliers (production, scheduling, and supply sourcing), distribution (channel management, transportation, and warehouse operations), and customer interface/point-of-sale (demand management, order management, inventory management, and store operations).

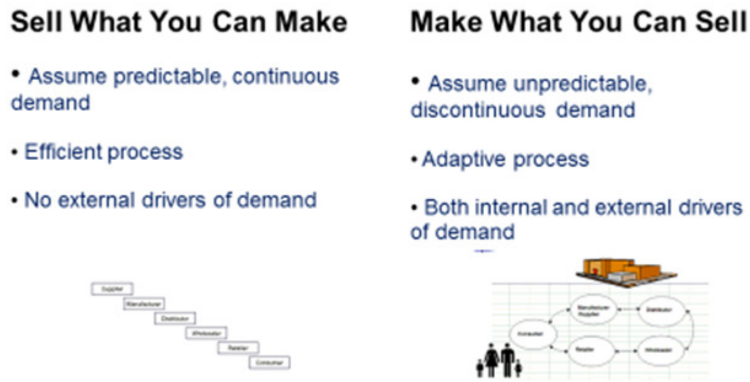


Figure 13.2 Traditional vs a consumer demand-driven supply chains: “Make What You Can Sell” versus “Sell What You Can Make.” (*Source*: Figure 1.3)

Data-Driven Demand Management Initiatives

There are a number of initiatives in the supply chain used to describe material flow from suppliers to the manufacturer through the distribution channel to the consumer. On the other hand, demand information flows in the reverse direction, from consumers to suppliers. **Quick Response** (QR), **Efficient Consumer Response** (ECR), and **Vendor Managed Inventory** (VMI) are all terms used in the trade for strategies for making manufacturers responsible for keeping the retailer in stock.

These acronyms represent industry initiatives to facilitate the flow of goods information in a timely manner. By implementing these management strategies, companies have reduced costs, increased sales, gained competitive advantage, and taken market share away from laggards.

The material flowing through a supply chain can be viewed from any one of three perspectives: the product view (SKUs), the customer view, the distribution view, or the supplier/manufacturer sourcing view. The product view defines the individual SKU, its contents including documentation and accessories, and its packaging and labeling. The customer view defines how the end customer (e.g., retailers and e-consumers) uses product descriptions, product numbers (SKUs), and product options to uniquely identify a complete product configuration. The supplier manufacturer view, like an engineering parts list, tends to consider a product or assembly to be complete without regard for the packaging documentation, software, or accessories that will make it a SKU. A complete customer configuration may require a shipment of many different SKUs.

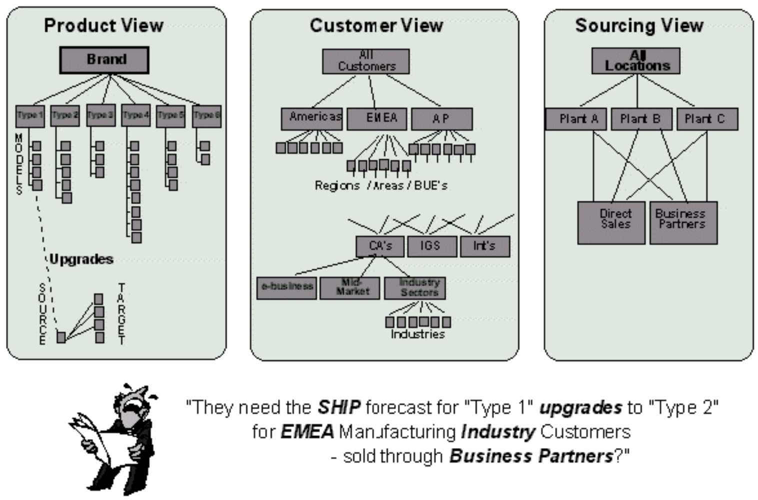


Figure 13.3 A product, customer, and sourcing view of the supply chain.

Figure 13.3 shows how a high-tech company looked at its business and realized how an overuse of demand hierarchies can add ineffective complexity to the demand forecasting process.

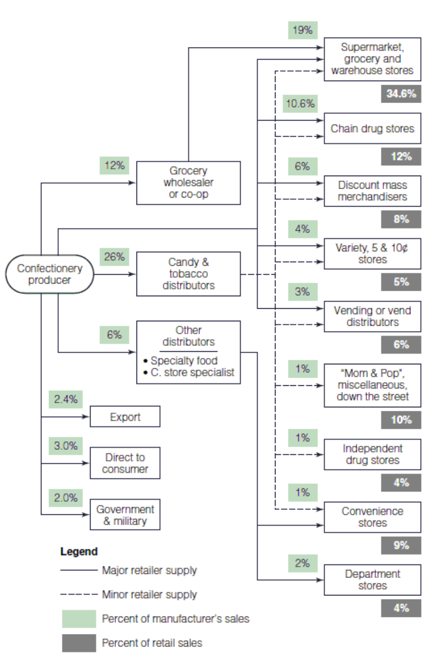
A traditional supply chain is any sequential set of business operations leading from raw material through conversion processes, storage, distribution, and delivery to an end customer. In the integrated consumer-demand driven supply chain, demand management's responsibility assures that demand information flows in the reverse direction as well.

Demand Information Flows

Depending on the industry and business model, companies use forecasting systems in a variety of ways. For instance, distribution-oriented companies are likely to use systems to help organize the replenishment and flow of goods into distribution centers (Figure 13.5). These companies are also likely to send the output of forecasting systems to transportation management or other order-fulfillment systems.

Manufacturing companies generally use forecasting systems to help synchronize production schedules and finished-goods inventory with actual customer/consumer sales. Therefore, they are more likely to feed forecast information to the **Materials Resource Planning** (MRP) module of an **Enterprise Resource Planning** (ERP) system or even to an **Advanced Planning System** (APS). In addition, demand forecast data have become part of the **Sales and Operations Planning** (S&OP) process, which brings people from different functional areas together to collaborate on a "final forecast" that drives the activities of the entire enterprise.

In Figure 13.4, the distinction between **customer** (light boxes) and **consumer** (dark boxes) is important in order to depict a comprehensive view of a supply chain for a packaged goods producer. The manufacturer produces a product for export, direct sales to consumers, the government, and the military; the product is sold to an extensive network of retailers. A grocery wholesaler or co-op retailer might distribute the product to supermarkets, grocery, and warehouse stores. Other distributors sell the product to chain drug stores, discount mass merchandisers, and variety stores.



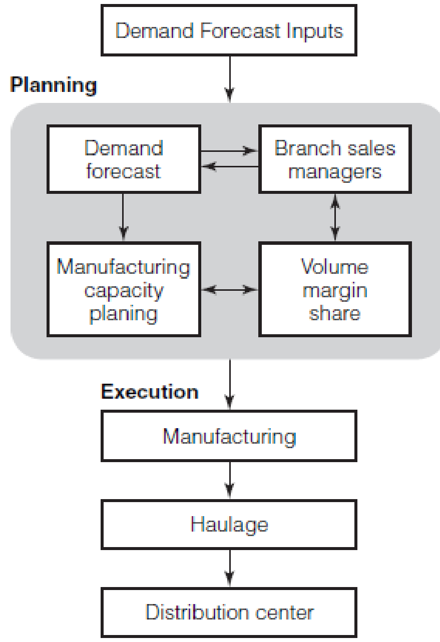


Figure 13.4 (*left*) A comprehensive view of a packaged goods producer: U.S. confectionary, shown previously in Chapter 1 (Figure 1.8).

Figure 13.5 (*right*) Demand forecasting drives crucial links in the supply chain. (*Source*: L. Lapide, MIT, 2006)

The sales and operations planning (S&OP) process brings people from different functional areas in the organization together to collaborate on a single '"final forecast' and demand plan.

Each industry has its own production and distribution needs. Information systems designed to manage the supply chain are focused on vertical markets in process manufacturing or discrete/repetitive/to-order manufacturing. Process manufacturers, which are predominantly batch-processing operations, include companies in the energy/petrochemical, chemical, and pharmaceutical industries. Electronics, fabricated metals, and automotive supplies are examples of discrete manufacturing markets.

In today's global market place, companies must achieve both in-stock levels and high *inventory turns*. In addition to competitive pressures, many companies have found it necessary to share demand information and forecasts with their business partners. Retailers, in particular, frequently share forecasting information with their supply chain partners.

Manufacturers have also recognized the importance of data-based demand forecasting and top-down planning along with joint collaborations in forecasting with suppliers and customers. Because of the high volume of items involved and the uncertain nature in variability (see Chapter 5), data-driven analytics (see Chapter 2) and statistical forecasting techniques (see Chapter 3) are increasingly being adopted by demand planners and managers.

Creating Planning Hierarchies for Demand Forecasting

Demand planners frequently discuss dependent and **independent demand** forecasts. Independent (unconstrained, unbiased) demand, which must be forecasted, comes from the customer/consumer and includes the demand for finished goods as well as service parts. In contrast, **dependent demand** applies to raw materials and other components that are used in production. The dependent demand for items need not be forecasted; it is calculated from the schedules of the item required for production and distribution.

At its core, demand planners establish a set of processes that produce plans or sets of time-phased numbers (e.g., forecasted orders) representing the best estimate of what demand is expected at a given time. For instance, a forecast for an item at a distribution center shows the expected demand over time, by the week or by the month, going forward. An order needs to be placed with the manufacturer or supplier against these requirements so that the requested item can arrive at the distribution center in time for shipment to the retailer or consumer. The timing of these orders is a function of the lead times of the items and the safety stock that assures adequate supply.

Demand management is the process of managing all independent demands for a company's product line and effectively communicating these demands to the master planner and top management production function.

The complete chapter can be found in

Change & Chance Embraced

ACHIEVING AGILITY WITH DEMAND FORECASTING IN THE SUPPLY CHAIN

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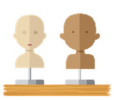

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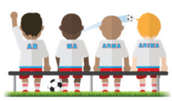

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