

Performance Measures, and Measurement in Supply Chains in the Food System

By

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Introduction

Companies in the food system, like all firms, are under relentless pressure from investors to continually produce increased earnings each quarter. This is difficult when a firm is in an industry such as food that has essentially stagnant sales. Real in-store food sales are rising about 1 percent per year. The growth in real sales in the meals-away-from-home market is doing slightly better, increasing 2-3 percent per year (Food Institute Report). To remain an attractive investment alternative, food firms must find ways other than increasing sales to enhance their profits. The three most popular alternatives are mergers and acquisitions, entering foreign markets, and lowering operating costs.

Mergers and Acquisitions. A recent Wall Street Journal article calls the merger and acquisitions activity in the industry a “food fight.” The conventional wisdom among food

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industry top management seems to be “bigger is better.” This process is also a way to remove excess capacity and lower overall operating costs. Despite all the enthusiasm, the evidence is that M&A activities rarely produce the desired results (Food Industry Report).

Entry into Foreign Markets The movement into foreign markets has brought growth in earnings for many food firms. Coca-Cola and McDonald’s, for example, have had great financial success with their efforts. In both cases, foreign sales contribute a substantial portion of their annual earning growth each year. As Cola-Cola found out last fall, foreign markets in “safe places” such as western Europe--can carry serious risks that are beyond their control (i.e., health, safety, currency, and political risks)..

Reducing Operating Costs Many food firms are directing their searches for greater profits toward finding ways to reduce their operating costs. The industry structure (many small, independent firms, operating in local markets, selling a perishable, bulky product) makes it a prime candidate for greater efficiency. The relentless growth of Wal-Mart as a food retailer is also spurring food companies to seek greater cost savings. Flinkinger attributed 50 percent of the growth in the retail food channels in the 1990s to them. One hallmark of Wal-Mart’s retail success has been their ability to operate with historically low levels of overhead, especially inventory and distribution costs.

To put Wal-Marts performance into perspective, the Wall Street Journal reports that they sell 63% of all their goods *before* they pay their suppliers. They cited the example of Crest Toothpaste. The typical tube spends eight hours in a Wal-Mart warehouse and is sold within 24 hours of being delivered to the store (Food Institute Report).

Firms spend 10-11% of their sales dollar on managing their supply chain activities (i.e., ordering, shipping, warehousing, etc.). Businesses that use best supply chain practices, such as Wal-Mart, can reduce this cost to 5-6% of sales. For a company with \$500 million sales per year (small to mid-sized food firm) this can bring a cost advantage of \$25-30 million per year. The benefits of a better managed supply chain can extend beyond the overhead cost savings to include improved customer service and increased sales. In fact, all these can occur

simultaneously. The result is a bigger bottom line. In addition, a proven record exists of the financial efficacy of better supply chain management in food.

The Evolutionary Path to Super Supply Chains

As the modern corporation emerged in the early days of the 20th century, most firms were organized primarily along functional lines (i.e., production, sales, warehousing, purchasing, and so on). As manufacturing grew more sophisticated, greater emphasis was placed on capturing the economies of large scale production, especially in food. Until the middle of the 20th century, the expected demand for food seemed nearly endless. We were feeding a hungry world. Besides, inventory, purchasing, and transportation management were merely ancillary activities to the “big show” of production. Around the middle of the century the relative relationship between food supply and demand changed. The supply of most food items began to exceed demand at prevailing prices. The transportation industry was deregulated. Access to media, and rising income and educational levels made America’s palates more sophisticated. The result was a new market climate for food marked by intense price competition. These trends are manifested in the growth of food sales by Wal-Mart, who is expected to emerge in a short time as the USA’s largest food retailer and the first national chain in many years (The Food Institute Report).

The Evolution of Supply Chain Management

In response to these pressures in food and other industries, managers began to link functional management areas to lower operating costs. The first marriage was the combination of inventory management and transportation management in the 1960s. This combination was called *physical distribution management*. Significant savings were found by coordinating these functions and using computer-assisted decision making (e.g., vehicle routing and scheduling algorithms, location models, and network analysis). Later these functions were augmented by including purchasing management and manufacturing management. The new subject was called logistics. *Logistics* integrated these management functions within a firm.

Beginning with the evolution of information technology (IT) in the 1980s, it has become possible to extend the supply management system further to include the final consumer and the firm's suppliers. IT gives the manager the ability to collect, measure, and analyze all the data in the system in a timely, cost-effective, and transparent manner that is available on an equal basis to all its partners in the supply chain. Because everyone has accurate data, in the right form for decision-making, and in real time, avoiding what macro-economists called "unintended inventory accumulation" that lead to economic recessions. The result is a lowering of the inventory to sales ratio. Net working capital is reduced since fewer dollars are tied up in inventory. In this environment a business produces only the items it sells. The ultimate goal is to reach the Dell Computing model of "make one when you sell one."

Efficient Consumer Response (ECR) in the 1990s was the food industry's first coordinated response to these changes. ECR pointed the way and changed how managers viewed their suppliers and customers. They went from adversaries to partners whose cooperation could lead to better financial returns for all. The result is *supply chain management*.

The Super Supply Chain Management System

Because of the experience with ECR and greater advances in IT, operating a Super Supply Chain Management System is now possible. This super system can integrate: more powerful computers, greater bandwidth, the internet/intranet, advanced planning and scheduling (APS) software, comprehensive planning, forecasting, and replenishment (CPFR) software, and enterprise resource planning (ERP) software.

The result is the ability to coordinate consumer demand, purchasing, transportation, inventory, warehousing, and production planning not just within a single plant or firm, but to extend the coordination all the way back to the business's input suppliers and forward to the final consumers with "flawless execution" every time and every day -- anything less is unacceptable.

To make this process possible, groups such as the Voluntary Interindustry Commerce Committee (VICC) were set up to establish standard operating systems in the United States and internationally. While all producers are different, their supply chains contain many common

characteristics. They must operate flawlessly. They must be so fast that managers have the right information, in the right form at the right time to make decisions. They must provide the right information about forecasting, tracking, measurement, and support general management decision making. To do this requires a management philosophy that is based on collaboration and virtuallity, a full company commitment to its implementation (not just an initiative), and a commitment that supply chain management is a vital part of the firm's strategic competitive advantage.

Recent writers in this area talk of a customer centric web rather than a linear system. They feel this captures the interrelated nature of what is going on. This a better description since there are forward and backward flows. Other prefer to call this a "demand chain system" since the whole exercise is about efficiently and effectively filling customer needs (Robinson).

No matter what you call it, food firms can gain an added competitive edge in the market that they can find few other places. Through better coordination with suppliers and customers all parties in the system can obtain lower costs and greater profits. The evidence of the benefits is beginning to accumulate. Robinson found that firms employing best supply chain practices had higher economic value added (EVA) than those firms who did not. He went as far as to say that competition in the future will be dominated by competition between supply chains, not firms. Channel leaders will require their "partners" to join their supply system to obtain their business.

Elements of A Supply Chain System

A supply chain management system must capture three sets of flows: product, information, and money. All three must operate "flawlessly every day." The basic single stage supply chain is given in Exhibit 1.

The basic single stage supply chain can be expanded to a multistage system by extending the system upstream to suppliers and downstream to customers (Exhibit 2). Regardless of its length, the users of the system are still dependent upon everyone having the data they need at the

right time and in the right form to make decisions. The system must deliver its information in real time, be visible to all participants and be coordinated.

The Collaborative Planning, Forecasting and Replenishment (CPFR) Model

Voluntary Interindustry Commerce Standards Committee (VICS) established the general business protocols that helped the development of supply chains. As part of that effort the committee generated a general business model called the *Collaborative Planning, Forecasting and Replenishment* (CPFR) model (Exhibit 3). Joseph Andraski, who was the chair of this committee, described the model this way: “[The CPFR model] is a relatively straightforward planning model with a clearly defined collaborative business process at its core. CPFR brings partners together to share marketplace information to be used to create a market specific plan that includes--forecasts of purchases (and untimely sales), by SKUs, by week, and in specific quantities.” (Food Logistics Supply Chain Supplement).

The VICS saw this as a 9-stage process (Exhibit 3). Stage one is planning and involves steps 1 and 2. Stage two is forecasting and involves steps 3-8. Stage three is replenishment and consist of step 9. (Food Logistics Supply Chain Supplement).

The goal of supply chain management is to replace inventory with information. K-Mart is doing this with four of its food product categories. The only inventory they keep in those four categories is what you see on the shelf in the store. The rest is in transit or is yet to be produced. The premise behind this approach is that the better the forecast of future demand, the more likely the system can respond with the right good at the right time and place, and with minimized costs (Doherty).

Measuring Supply Chain Performance

The old adage that what gets done is what gets measured is true for supply chains. Since this whole area of supply chain metrics is new there is little empirical work on this topic, and little agreement on what should be measured and what constitutes good performance. This is why the work presented in this paper is exploratory in nature and will be theory building rather

than theory testing. The research is viewed as a first step that should shed light on the following fundamental research questions about supply chain performance:

- What constitutes superior supply chain performance? ,
- how do you measure that performance, and
- what are the characteristics of superior supply chain design?

Efforts in this area are usually separated into two general categories: direct physical measures and qualitative measures. Direct physical measures are the easiest to understand and measure. They have the appeal that most of them deal with physical outcomes rather than process. The most obvious direct measures of performance include the cost of logistics in dollars per unit or as a percentage of sales, the number of stock-outs, back orders, inventory turnover rates and so on.

Logistics Management and Distribution Magazine conducts an annual survey of shippers to measure carrier performance using direct physical measures. Using a mail survey, it asks its subscribers to rate carrier performance in five areas: on-time performance, value, information technology, customer service, and equipment and operations. The results are grouped according to transport mode ~ less than truckload, truckload, ocean freight, etc. They found that greater satisfaction comes with longer term relationships and that on-time performance was the most desired trait across all modes.

The true measure of performance of a system rests with more qualitative measures of performance. The most elusive of these is customer satisfaction. Any definition of performance must begin with a customer-based definition of what is value and performance. Whicker likened the process of defining customer value by shippers to a portfolio selection problem. “A preferred investment is one that adds value to the organization and delivers a reasonable return on the resources invested. If the investment does not performed and improvement efforts have failed, the shipper will likely seek to downsize or remove that carrier from its portfolio.” He separated the attributes that would go into that decision into four areas: performance management, information availability, order tendering, and communication practices.

Supply Chain Metrics

The evolution of logistics toward a cross-functional and cross-organizational focus has prompted the need for more integrative and boundary spanning metrics. In 1994, a multi-industry consortium reported the results of their efforts at deriving an integrated supply chain metric framework (Pittiglio, Rabin, Todd, and McGrath). The consortium derived an extensive set of metrics that spanned the total supply chain and focused on four general metric types: 1) customer satisfaction/quality, 2) time, 3) costs, and 4) assets.

The multi-industry consortium mentioned above, evolved into the Supply-Chain Council (SCC). The SCC developed and endorsed the Supply Chain Operations Reference Model (SCOR)(Exhibit 4). This robust model included standard descriptions of management processes, developed a framework of relationships among standard processes, developed standard metrics to measure process performance, defined management practices that produce best-in-class performance, and set up alignments with software. The advantage of this model was that it integrated business process re-engineering, benchmarking, and best practices.

Using the Case Study Method of Research

Yin defined four basic types of designs for research where using case studies is the most appropriate methodology. The one that best fits this situation is the single-case study design with embedded multiple units of analysis. Yin states that a single-case study may be utilized as a prelude to further research when used as an exploratory device or the pilot case for a future multiple case study. The work underway here fits both criteria. The embedded, multiple units of analysis in the case design would be each of the firms identified as “the supplier,” “the focal company,” “the company,” and “the transport provider.” Two of Yin’s four dominant analytical techniques are employed for this research, pattern matching and explanation building. Pattern matching, which compares empirical-based patterns with predicted ones, will be used to strengthen the internal validity of the work. Explanation building, which is a special case of pattern matching, involves developing an explanation about is happening in the case.

The appropriateness of a firm to be a case study will be evaluated using a four-quadrant model developed by Neely et al. The two dimensions include: 1) the formality of their performance measurement design process, and 2) their boundary spanning perspective. Firms that have an inter-organizational boundary spanning perspective and utilize a formal performance measurement system are the ones most suitable for participation. From this analysis the super supply chain management system of a major regional supermarket and a major food firm supply was selected to be the case study.

Summary

This paper summarizes the exploratory working being done at our institution of supply chain performance metrics using Yin's case study method of research. The combination of the right market environment, and the evolution of information technology provide us the chance to gain greater efficiencies in our food system. The pace of change has quicken and the story gets more exciting everyday.

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