Global Review of Business and Economic Research, Vol. 14 No. 2, (2018) : 129-148

MARKETING DIFFERENTIATION SYNERGIES OF HIGH VELOCITY INVENTORY TURNS

Eisenhower C. Etienne
Florida A&M University, Florida

ABSTRACT

This paper builds on the proposition that inventory is a net destroyer of supply chain responsiveness and examines a related proposition that high velocity inventory turns facilitates the deployment of a successful marketing differentiation strategy. The paper provides much evidence that high velocity inventory turns that are the result of systematic inventory compression that culminate in economical small lot production, distribution and procurement allow a company to both enhance and leverage its marketing differentiation strategy. We demonstrate that high velocity inventory turns promote on several dimensions, high marketing differentiation at low cost. The implication is that far from being merely an operational supply chain management issue, inventory compression and the associated high inventory turns that result therefrom are important elements of a successful marketing differentiation strategy.

Keywords: *Supply Chain Responsiveness (M11), Marketing Synergies (M31), Differentiation Strategy(M30), Quality Feedforward (M11), Quality Feedback (M11), Lean Systems (M11), Aggregation Effect (M30), Sales Intensity (M31).*

INTRODUCTION

The supply chain responsiveness-cost efficient frontier posits that the relationship between supply chain cost and responsiveness is based on tradeoff between the two, where higher levels of responsiveness can only come at the expense of increasing cost (Chopra *et al.*, 2004). That position partly derives from the notion that increasing supply chain responsiveness requires higher levels of inventory to provide high levels of product availability when there are predictable and unpredictable changes in demand and lead time requirements.

More recently, however, it has been demonstrated that the relationship between inventory and supply chain responsiveness is much more complex than what is accepted in theory and practice and that, instead of being a contributor to or enhancer of supply chain responsiveness, inventory is a substantial net destroyer of it (Etienne, 2005, 2005). This latter position is based on the observation that inventory compression unleashes and exploits a number of areas of synergy between supply chain cost and responsiveness. The synergistic relationship between inventory compression and responsiveness improvement derives substantially from the fact that as a company significantly drives inventory levels down, it also compresses a large number of elements of supply chain performance (Stalk, 1990; Etienne, 2005, 2005).

Received: 30 July 2018; Accepted: 12 August 2018; Published: 5 December 2018

Mainly because of its role in increasing the probability that a company will make an immediate sale when demand unexpectedly increases, marketing has a tendency to view high levels of inventory as desirable. However, it has been shown elsewhere (Etienne, 2005) that inventory compression exploits synergy in most dimensions of supply chain responsiveness. In this paper we focus on the marketing differentiation synergies, the ability to deliver higher levels of differentiation at lower cost that result from high velocity inventory turns. A company is achieving High Velocity Inventory Turns if it is recognized to be deploying a best-in-class supply chain system and is realizing, on a sustainable basis, inventory turnover that is at least 50% higher than that achieved by the average company in its industry.

We investigate the synergistic relationship between high-velocity inventory turns and marketing differentiation through the mechanism of aggregation, of which we recognize two types. In simple aggregation, the type that has hitherto been explored in the literature, if a company doubles its number of SKUs by doubling its scale and thus doubling its fixed space costs and other operating level overhead, it will recoup lower operating costs because of economies of scale through aggregation, but will not increase sales per square foot. But if that same company doubles its number of SKU's by doubling its inventory turns, it achieves what we refer to as compound aggregation. That type of aggregation releases space and scale infrastructure that can be deployed to double the number of product offerings while keeping scale costs constant, thereby reducing scale costs per SKU by a factor of greater than two, broadening variety and differentiation and increasing sales per square foot because of the complementarity and substitution effects. We advance that aggregation is used here as a proxy that helps us keep track of ordering/setup cost compression and its impact on inventory turns. Whatever mechanism is used to drive ordering/setup cost down will produce the same inventory turns performance and differentiation impact identified here.

HYPOTHESIS AND METHODOLOGY

The central question to be investigated by this research can be framed in the form of the following hypothesis:

> Companies that achieve high-velocity inventory turns through inventory compression produced by systematic reduction in ordering/setup cost reap synergistic marketing differentiation effects in the form of higher product variety, higher product quality, greater quality responsiveness and greater product shelf-life preservation, all at lower cost.

We investigate this fundamental relationship by using a set of simulations that systematically reduce the ordering cost for a given product line and compute the impact of that reduction on inventory levels and inventory turns. We then evaluated the latter's impact on the potential level of differentiation, product variety, shelf-life preservation and the commensurate total inventory-related cost.

HIGH-VELOCITY INVENTORY TURNS AND MARKETING DIFFERENTIATION SYNERGY

Variety, Differentiation and Market Niche Synergy

Companies do not compete in markets but in market segments and this is a central thesis of the generic strategies framework (Porter, 1980; 1985; 1986). Highly successful companies are always astute at uncovering novel ways to segment their markets, to find segments within segments, what we refer to as interstices, and to dovetail product features to capitalize on the unique, and sometimes idiosyncratic, requirements of each segment thus identified. A successful differentiator must be able to deliver a highly differentiated product or service while keeping the cost of such differentiation below the marginal revenue that the customer is willing to pay for an additional unique aspect of the product/service offering (Porter, 1980).

There are two reasons why high levels of inventory and the commensurate low inventory turns destroy a company's ability to achieve low marginal cost of variety and differentiation. First, costs associated with technological obsolescence, shelf life expiration and the staleness of fashion sensitive items are now the major components of inventory holding cost. For example, while for many companies annual financing and shrinkage costs are of the order of 8% and 2%, respectively, of the unit variable cost of an item, inventory write-offs and markdowns in the range of 40% to 60% are the norm for many modern-day companies. For companies like Nike, Benetton, Doré-Doré, World.com and Swedish clothing manufacturer B&M which compete in fashion or model sensitive markets, annual financing costs are usually of the order of eight to ten percent of the unit cost of the item. For these same companies, obsolescence costs such as inventory mark downs or write-offs typically wipe out the entire gross margin on a product even before the other costs of holding inventory such as financing, warehousing, shrinkage, insurance and management are factored in. Thus, a company that has low inventory turns likely makes no margins on a significant proportion of the last replenishment batch of product. Therefore, low-velocity inventory turns destroy much of the margins generated by variety/differentiation and impose additional inventory costs as well.

Moreover, while large lot sizes have a built-in safety stock feature (Etienne; 1987) they may provide less service level protection than formerly thought. These large lot sizes are usually indicative of low supply responsiveness, so that although they ensure a lower probability that the system will not be able to cope with random demand fluctuations, low responsiveness also means that the magnitude and persistence of stockouts will be greater when they do occur. In contrast, the probability of stockouts is higher for smaller batch sizes but when these stockouts do occur, the high responsiveness of small-lot systems means that they can deliver an emergency-response batch much more quickly and thereby minimize the total service level, marketing and financial damage caused by a stock-out.

Second, because of the economics of shared facilities like plants, warehouses, transportation and point-of-sale physical assets, low inventory turns drastically reduce a company's ability to provide high levels of variety/differentiation at low cost. High variety in production, warehousing and transportation comes from quick setup, turnaround, scheduling and planning of facilities which result in their intensive use. High velocity inventory turns increase the intensity of use of facilities, drives facilities and overhead costs down and make it possible for a company to offer high variety at low cost. For example, the logic of the Toyota Production System says that if a company produces a product X for a broadly-defined market segment and that same company, through improvements in the supply and production processes, reduces the economical lot size of the product by a factor of four, then that company can define four narrower segments based on more unique customer requirements and produce unique product options for each segment, without sacrificing cost or increasing inventory. That means that higher differentiation is achieved at lower overall cost.

We use the basic lot sizing model to investigate the marketing synergies unleashed by high-velocity inventory turns. In the basic lot sizing model, the Economic Order Quantity is given by Q, where,

$$Q=\sqrt{\frac{2DS}{h}} \tag{1}$$

D = Annual demand

S = Ordering cost per order

h = Inventory holding cost per unit per year

As shown in Table 1, by increasing overall inventory turns, a retail company can increase the range of product offerings at the point of sale without increasing inventory, space, overhead and infrastructural costs. By quadrupling inventory turns, for example, as illustrated in Table 1, a retail company can quadruple the number of product options offered at the point of sale, decrease obsolescence, write-off and holding cost and avoid increasing overall space costs, since the space liberated by higher stock turns can be used to offer four different options of the same product. This means that, at the margin, each new product added actually decreases relative space costs. The same logic applies to the production and transportation system and warehousing operations upstream of the point of sale. The data in Table 1 show that high-velocity inventory turns create marketing synergy because they actually decrease the cost of achieving higher levels of variety and differentiation. This higher level of differentiation is achieved using the same level of physical facilities, which means that the relative facilities-related and overhead cost of the additional differentiation has actually decreased. Its driver is compound aggregation, as proposed previously.

Figures 1-A and 1-B show how high velocity inventory turns transform the aggregation effect from a driver of lower cost increases to one that actually decreases overall cost and increases profit margins. Figure 1-A shows the impact of compound aggregation. The strategic logic of Wal-Mart’s entry into the higher-end segment of the discount retail market demonstrates the competitive marketing differentiation power of economies of scale combined with high-velocity inventory turns (Barbaro, 2006). Moreover, increased product variety also has favorable internal marketing effects. Greater variety communicates an aura of broad choice and availability to the customer, and that, coupled with the positive symbiotic relationship among a large variety of different options of the same product, will likely cause overall sales for the entire family to increase, which will reduce costs per sales dollar even further. Thus, high-velocity inventory turns, because they increase the efficiency of deployment of supply chain capacity resources, increase market-niche synergy and allow a company to reap the marketing advantages of high variety and differentiation at low cost.

Economic Exploitation of Market Interstices

High velocity inventory turns fundamentally alter the economic attractiveness of hitherto unattractive interstices of the market. Regardless of the base that a company uses to segment its market, some segments will be deemed to be economically unattractive because they are too small to cover the costs associated with targeting a product offering to them. Clearly though, these costs are not cast in stone and their level, like every other costs in a company, must respond to management action to drive them down. When management of a company says that a segment of a market is too small to be economically exploited, what they are admitting is that the company's costs are too high. Consequently, as a company drives its costs down it will find that more and more of the small market segments that were hitherto uneconomical to serve in fact represent attractive opportunities to expand sales, further reduce fixed and some direct operating costs through the aggregation, substitution and complementarity effects and thereby improve both gross and net margins.

Table 1
High-Velocity Inventory Turns and Costs of Product Variety/Segment Differentiation

	Pre-Inventory Compression	*Post-Invent. Compression*	*Post-Inventory Compression; Four Options of Same Former Product A*				
Data	*Product A*	*Product A*	*Product A_1*	*Product A_2*	*Product A_3*	*Product A_4*	*Total*
Demand	12000	12000	3000	3000	3000	3000	12000
Annual Holding cost/unit	1	1	1	1	1	1	1
Ordering cost/order	160	10	10	10	10	10	40
Ordering cost, four SKUs/order			2.5	2.5	2.5	2.5	10
Required space/ unit; square feet	1	1	1	1	1	1	1
EOQ	1960	490	123	123	123	123	490
Ave. Inventory	980	245	62	62	62	62	245
Total Inventory Costs	1960.00	490.00	122.50	122.50	122.50	122.50	490.00
Inventory Turns/YR.	12.24	49	49	49	49	49	49
Required space	1960	490	123	123	123	123	490
% Space utilization	100	25	6.3	6.3	6.3	6.3	25.0

In addition to the complementarity and substitution effects explored previously, high velocity inventory turns also increase the potential market demand available to a company by increasing the attractiveness of hitherto unattractive, micro-segments. Table 2 investigates the impact of high velocity turns on interstice (micro-segment) attractiveness using four scenarios. In the first, the base case, there is no inventory compression that results in high-velocity inventory turns. In the second, there is inventory compression, inventory turns increase radically and total demand remains the same but the market is segmented into three dominant segments and one interstice. Where the supply chain system lacks the requisite level of responsiveness, it cannot exploit the interstice and total core demand would decrease. The third scenario assumes no change in total core demand which comes from the exploitation of four dominant market segments. However, there is also a peripheral, micro-segment that can be targeted if the supply chain has the requisite level of responsiveness. For ordering and inventory replenishment purposes, there is no order pooling of the demand from the micro-segment with that from the dominant segments. That is, the micro-segment is managed on a stand-alone basis, independent of demand of the company's dominant products. Economical exploitation of the micro-segment would result in a marginal expansion of demand. Finally, the fourth scenario repeats the third one but additionally assumes that for ordering and replenishment purposes, pooling of orders for the micro-segment demand with that of the dominant products is feasible.

Figure 1: High Velocity Inventory Turns and the Aggregation Effect

A. Simple aggregation effect: Double number of SKUs from 16 to 32 with same inventory turns

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32

Operating and overhead costs increase at decreasing rate

B. Compound Aggregation effect with high velocity inventory turns: First double inventory turns, then double variety and differentiation

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32

Decreasing operating and scale costs due to both aggregation effects (substitution and complementarity)

Analysis of the results show the rather dramatic differentiation synergy potential unleashed by high-velocity inventory turns. Inventory compression even without order replenishment pooling and with the existence of a micro-segment cuts inventory costs and increases inventory turns by a factor of four, while broadening differentiation to provide four options of the same product. Moreover, space utilization, which is a proxy of the scale and overhead costs of the entire supply chain, has been reduced by 75%. Implementation of order/replenishment pooling further reduces inventory costs and space utilization and increases inventory turns from 49 to 53 even after the dampening effect of the micro-segment's low inventory turns.

Whereas in Table 2-A we investigated the impact of high-velocity inventory turns on the ability of a company to economically pursue differentiation where market segmentation includes one micro-segment that does not result in expansion of the market, Table 2-B investigates the impact of scenarios three and four where there is an additional micro-segment which results in both broader differentiation from four to five segments and an increase in overall demand. With inventory compression and the commensurate high-velocity inventory turns, but without order/replenishment pooling, one dimension of the aggregation effect, pursuit of maximum level of marketing differentiation by offering four options of the basic product A results in a substantial decrease in inventory costs from the base case of $1960/year to $980/year, a decrease in space utilization from 100% to 50.0%, and an increase in inventory turns from 12.24 to

24.4. Again, without order/replenishment aggregation, exploitation of the additional micro-segment that is as small as 2% of existing demand results in a decrease in inventory costs from \$1960.00/year to \$1106/year, a decrease in space utilization from 100% to 56.4% and an increase in inventory turns from 12.24 to 22.1. That is, high-velocity inventory turns allow the economical exploitation of the micro-segment.

Table 2-A
High-Velocity Inventory Turns, Costs of Product Variety/Segment Differentiation and the Economical Exploitation of Market Interstices

	Pre-Inventory Compression	*Post-Invent. Compression*	*Post-Inventory Compression; Four Options of Same Former Product A Including a Micro-segment*				
Data	*Product A*	*Product A*	*Product A_1*	*Product A_2*	*Product A_3*	*Product A_4*	*Total*
Demand	12000	12000	3940	3940	3940	180	12000
Annual Holding cost/unit	1	1	1	1	1	1	1
Ordering cost/ order	160	10	10	10	10	10	40
Ordering cost, four SKUs/order			2.5	2.5	2.5	2.5	10
Required space/ unit; square feet	1	1	1	1	1	1	1
EOQ	1960	490	140	140	140	30	490
Average Inventory	980	245	70	70	70	15	225
Total Inventory Costs	1960.00	490.00	140.00	140.00	140.00	30.00	450.00
Inventory Turns/YR.	12.24	49	56	56	56	12	53
Required space	1960	490	140	140	140	30	450
% Space utilization	100	25	7.1	7.1	7.1	1.5	23.0

Costs same, variety has quadrupled; Interstice in international foods at Wal-Mart, for example.

With the implementation of order/replenishment pooling, that is, exploiting the aggregation effect to replenish a number of SKUs, including the additional micro-segment, in a single order/replenishment cycle, high-velocity inventory turns allow the supply chain to economically target the micro-segment, broaden differentiation from four to five products, and drive inventory costs and space utilization down from the base case scenario. Compared to the base case scenario, inventory costs decrease from \$1960 to \$495, a slight deterioration from the case where there was only one product and no differentiation. Inventory turns increase from 12.24 to 49.6 and space utilization decreased from 100% to 25.3%. Both space utilization and costs deteriorate slightly from the case where there is no variety/differentiation, but this is a very small price to pay for a fivefold increase in differentiation and an expansion of demand. Without high velocity turns, increasing variety by a factor of four, from one product option to four, would double the total inventory costs, double the space requirements, and cut the inventory turns in half. This can be clearly seen from an analysis of the tradeoffs that are captured by the basic EOQ model given in equation 1. Increasing variety by a factor of four decreases demand per item (stock-keeping unit, SKU, product option) by a factor of four as well, but decreases the EOQ by a

Table 2-B
High-Velocity Inventory Turns and the Costs of Product Variety/Segment Differentiation

	Pre-Inventory Com-pression	*Post-Invent. Com-pression*	*Post-Inventory Compression: Four Options of Same Former Product A*					*Post-Inventory Compression: Four Options of Same Former Product A Plus Additional Micro-segment*		
Data	*Prod. A*	*Prod. A*	*Prod.* A_1	*Prod.* A_2	*Prod.* A_3	*Prod.* A_4	*Total*	*Prod. A*	*New Inter-stice*	*Total*
Demand	12000	12000	3000	3000	3000	3000	12000	12,000	240	12,240
Annual Holding cost/unit	1	1	1	1	1	1	1	1	1	1
Ordering cost/order	160	10	10	10	10	10	10	10	10	10
Ordering cost, one SKU/order	160	10	10	10	10	10	40	40	10	50
Required space/unit; square feet	1	1	1	1	1	1	1	1	1	1
EOQ	1960	490	245	245	245	245	980	980	70	1106
Average Inventory	980	245	123	123	123	123	490	490	35	553
Total Inventory Costs	1960.00	490.00	245	245	245	245	980	980	70	1106
Inventory Turns/YR.	12.24	49	24.4	24.4	24.4	24.4	24.4	24.4	6.9	22.1
Required space	1960	490	245	245	245	245	980	980	70	1106
% Space utilization	100	25	12.5	12.5	12.5	12.5	50	50	3.5	56.4
Ordering cost, all SKUs/order	160	10	2.5	2.5	2.5	2.5	10	10	2.0	10
EOQ	1960	490	123	123	123	123	490	490	31	495
Average Inventory	980	245	62	62	62	62	245	245	16	247
Total Inventory Costs	1960.00	490.00	123.00	123.00	123.00	123.00	490	490	31	495
Inventory Turns/YR.	12.24	49	48.4	48.4	48.4	48.4	49	49	15.0	49.6
Required space	1960	490	123	123	123	123	490	490	31	495
% Space utilization	100	25	6.3	6.3	6.3	6.3	25.0	25.0	1.5	25.3

factor of 2 =√4, that is, to ½ of its original level for each product option or SKU. However, since there was a fourfold increase in variety, there are now four products instead of one, which effectively increases the level of inventory, the associated costs and flow time by (½)(4) = 2, effectively doubling them, and reduces inventory turns by one half.

With high velocity turns, a company can actually improve all these supply chain metrics and increase market expansion while increasing variety. Moreover, since the company has increased segment scope and variety, it has amplified the potential substitution and complementarity effects which together produce cost and profitability advantages from aggregation. When compared with the results for scenario three, which represents a dramatic improvement over the base case scenario, radical increase in differentiation that is driven by high-velocity inventory turns result in a small, marginal increase in space utilization and therefore produce no appreciable increase in overhead costs. However, a company substantially increases the level of differentiation at which diminishing returns will set in by driving inventory turns higher. In other words, every time a company succeeds in driving inventory turns higher, it increases the scale of differentiation at which diminishing returns will set in and start to wipe out the advantage of further differentiation.

Sales Intensity Synergy

Through related processes, high velocity inventory turns create and exploit synergy at the point of sale which results in higher sales intensity, measured as sales per square foot, per customer visit, per transaction or other similar metrics. The first way in which high velocity turns drive sales intensity is through the substitution effect, whereby a customer who comes to the point of sale to buy a particular product is more likely to find a good substitute if the exact product that he or she wanted to buy is momentarily out-of-stock. The greater the variety of the product offered, the more likely it is for a company to benefit from the substitution effect. In that case, variety means that the company makes a sale that it would otherwise have lost. Demand switching occurs on-the-spot, which reduces the demand variability experienced at the point of sale and maximizes the demand fill rate for a given level of safety stock or, alternatively, minimizes the level of stockouts for a given safety stock.

The second process contributing to point-of-sale sales intensity synergy of variety and differentiation impact of high velocity inventory turns is the complementarity effect, which expresses the frequently observed phenomenon whereby a customer who comes in to buy a given product is more likely to buy it plus another item that was not part of the original purchase intention. The complementarity effect means that the company sells two items instead of one, and the greater the variety and differentiation of products in the product offering, the more likely that it is to occur. The complementarity effect allows a company to leverage high-velocity inventory turns to increase sales and responsiveness, that is, the level of product availability perceived by customers, by reducing inventory and simultaneously reducing cost. Wal-Mart is the prototypical case of a company that has systematically used high-velocity inventory turns to amplify the fundamental aggregation effect and dramatically increase sales per square foot, drive down space requirements per Stock Keeping Unit (SKU), systematically broadened its product offering over the years and added food retailing, pharmaceuticals and toys to its core product offerings.

Quality Synergy: Improved Quality at Lower Cost

It is widely accepted that, for the modern enterprise, quality that meets or surpasses customer expectations is the primary driver of sustainable competitive performance (Hendricks et al., 1997). The achievement of near-zero defect rates as reflected in six-sigma quality levels is increasingly becoming a key requirement for success in most markets. Manufacturing, service delivery and supply systems that achieve high-velocity inventory turns are an indispensable complement to and enhancer of six-sigma processes. JIT/Pull and small lot production, purchasing, transportation and distribution systems operate to drive quality up by compressing inventory out of supply chain processes. By doing so, these processes create and exploit marketing synergy by achieving higher quality at lower cost thereby defying the widely accepted principle that higher quality can only be achieved at higher cost. Inventory substantially destroys quality because it is the key determinant of product obsolescence given the particular rate of technological innovation of an industry.

Companies that compress time to market reap first mover advantages in terms of larger market share, higher margins, earlier and more deeply entrenched brand positions and recognition, advanced progress on the learning and experience curves, all of which drive costs down and margins up (Stalk, 1990). The rather dramatic impact that high-velocity inventory turns have on a company's ability to take goods to market quickly has been largely overlooked. In point of fact, high inventories and the associated low-velocity inventory turns can nullify the time advantage generated by concurrent engineering and QFD. The critical point to be underscored is that instead of being quality-performance neutral as is often supposed, the Supply Chain System, if it is not managed to achieve high-velocity inventory turns systematically and consistently, is a net destroyer of quality. Market response time is crucial for quality performance and improvement because no matter how vigorous and calculating a company is in anticipating customer requirements and in deploying internal processes for assuring and controlling quality, very few products will be taken to market completely fault-free (Heskett et al., 1990; Nelson, 1970; Darby *et al.*, 1973; Etienne, 2005). Speed of feedback from the market and its complement, speed of feedforward to the market, are crucially dependent on the velocity of inventory turns.

Supply chain quality responsiveness is of two broad types. The first is quality feed-forward to market, or the speed with which improved products or parts are delivered to real customers so that experience quality can start to be evaluated. The second is quality feedback-from-market, which measures how fast experience quality data flow back to the company or its suppliers. Additionally, to be strategically meaningful, supply chain responsiveness must include quality responsiveness as a critical dimension of supply chain performance, both at the level of supply/sourcing and at the level of market/demand. Figure 2 shows the four types of supply chain quality responsiveness and how high-velocity inventory turns drive their performance.

Feed-forward to Market/Source Quality Responsiveness

In a modern competitive arena, the capability to take products to market fast has significant strategic impact. One dimension of that competence is feed-forward quality responsiveness which is of two types. The first has to do with the speed with which a company can take new products or services to market, and thereby signal to customers and consumers that quality has improved. If the improved quality pushes the company's quality performance beyond the strategic breakpoint (Haas, 1987) then the result will be a dramatic shift of customers towards the company's product and away from those of competitors. The second aspect of feed-forward quality responsiveness is the speed with which suppliers can signal to a company that it has improved quality, so that the company can move to integrate the improved components and parts in its own products and services and thereby capitalize on a supplier source of competitive advantage (Etienne, 2005).

For pharmaceutical compounds, storage time decreases product potency and efficacy, and regulatory authorities mandate that expiration dates be clearly indicated on these products and that they be destroyed upon reaching these expiration dates. Moreover, high levels of inventory and the associated low inventory turns expose a product to defects introduced by the warehousing and inventorying processes themselves, because these processes are not quality-neutral, contrary to what many companies believe. Products deteriorate in storage which is also a quality impacting process whose operations cause defects.

Feedback-from-Market Quality Responsiveness

The vast array of tools which are deployed by modern-day companies to speed the introduction of goods and services to market drive search or credence quality which is paramount in allowing a company to make the first sale. Subsequent repeat purchases of the product come from experience quality which, if negative, will completely destroy the initial confidence that the customer demonstrated by making the initial purchase and thereafter abandon the company or, if positive, will reinforce the customer's confidence and produce repeat purchases and high levels of customer retention. In the modern-day competitive environments, marketplace success depends rather crucially on experience quality. No matter how robust a company's quality system is and regardless of how deep and broad it reaches into all organizational and supply chain processes, there will always be cases where the product or service delivered to market will either have design flaws or defects introduced by weaknesses in the manufacturing process, and the only way to recoup lost customer goodwill as a result of these quality deficiencies is to discover them fast based on customer experiences with the product.

Experience quality operates at two levels. First, it provides the basis for signaling to the market that the product/service indeed is a significant improvement over existing product/ service offerings and is worthy of adoption by others. Second, it provides the quick feedback that the company can use to identify, analyze and eliminate the defects in the product that have escaped identification at the design and process planning phases. For the vast majority of products, experience quality is the key to building and exploiting first-mover advantages from innovation. When a company takes new products to market, it needs to quickly demonstrate that the new product is, in fact, an improvement and worthy of the user's switching efforts and costs. No matter what a company promises prior to and during new product launching and ramp-up to market demand, there is no innovation until the customer/consumer experiences the quality and that information diffuses rapidly through the market. In nearly all cases, the new product will have bugs that were not identified during product testing and which become manifest when customers/consumers start to use the product. In the final analysis, the only true, final and conclusive product test occurs when real customers use the product in real consumption/ use situations, as was so dramatically demonstrated in the Black and Decker SpacemakerPlus Coffee case (Smith, 1990). Consequently, rapid quality feedback from the market is key to isolating design defects, new process weaknesses and production quality control system inadequacies that cause defective new products to be taken to market. Anything that slows down quality feedback from the market also destroys a company's responsiveness advantage and seriously blunts its innovation efforts, and low velocity inventory turns is one of these destructive factors.

Figure 2
High-Velocity Inventory Turns and Quality Responsiveness

ReSponsIveness Type		Quality Responsiveness Target/Source and Impact: Market/customer/consumer	Source/supplier
	Feedforward	Speed with which company takes improved quality to market, thus signaling to customers that quality has changed and increasing their expectations; Drives Strategic Breakpoint (17, 1987; 7, 2005)	Speed with which suppliers bring new and improved components and parts to market allowing a supplier's customers (manufacturers) to quickly deploy these to improve their products: Gives customers potential to leverage supplier innovations and improvement (7, 2005)
	High-velocity Turns Impact	Adds to first-mover advantages that are R&D based; Enhances/protects first-mover advantages produced by time compression in product/process R&D; Compressed time to deplete inventory of old end product prior to launch of new; Compressed cost of old end product inventory write-offs, obsolescence costs (7, 2005)	Compressed time to deplete inventory of old parts and subassemblies which are replaced by new design; New parts design available in new or existing product faster Cultivate advantage in taking supplier-generated innovations to market Compressed cost of write-offs of obsolete parts inventory (7, 2005)
	Feedback	Speed with which company receives feedback from customers as to true quality performance of product based on experience of use; Builds experience quality and cultivates and protects first-mover advantages (16,1990; 7, 2005)	Speed with which company can signal back to suppliers true quality of parts, components based on experience in production/after-sales support of product, as basis for improving them: Stimulates supplier innovation and improvement (7, 2005)
	High-velocity Turns Impact	New product subject to customers' experience more quickly. Accelerated availability of experience quality on which to base improvement of new product, ramp up product proliferation and drive learning curve cost and quality effects Maintains or increases innovation advantage (7, 2005)	More rapid availability of information on impact of new part on quality of product in field; Part goes through real field test earlier and more quickly; Provides market/customer driven information on performance of supplier parts and subassemblies; Helps company contribute to supplier's quality/innovation effort, building goodwill that can be leveraged for cost, delivery concessions

Shelf-Life Margin

We use the concept of shelf-life margin to refer to the difference between the absolute shelf-life of a product when it is placed at the point of sale and the time that it takes to sell it. At any point in time, the shelf-life margin is the time that remains for the product to arrive at its expiry, best-before or sell-by date. All products are subject to deterioration or degradation, which means that their attractiveness to customers at the point of sale, the price and margin that can be recouped upon sale and the cost of holding the item in inventory are influenced by shelf-life margin, even if for some products the measurable impact is not captured by the supply chain control processes of most companies. For consumer perishables pharmaceutical compounds, health, beauty and personal hygiene items shelf-life margin is a powerful driver of sales, customer satisfaction, quality improvement and cost reduction and they also have very severe shelf-life constraints that, in some cases, have life and death consequences for consumers, and shelf life margin has dramatic consequences for a company's customer attraction and retention and financial performance. For these products, the management of shelf-life is a critical quality, marketing, legal and product liability concern and supply chain decisions must focus vigorously on the preservation of shelf life. Beyond the maintenance of storage conditions that slow down product deterioration, the preservation of shelf life and the assurance of a healthy shelf-life margin both before and after the product is sold is largely a matter of deploying supply chain policies that systematically decrease flow time, particularly those that achieve high-velocity inventory turns. The absolute shelf life of a product is largely fixed and is determined by the nature of the product, the type of preservation technology that is used in its design or transformation and the type of packaging that embodies it. How much of that fixed shelf life will remain when the product is sold to the customer is thus entirely determined by how fast products move off the shelf, that is, the flow time. Inventory destroys shelf life.

The supply chain systems in many companies are operated on the practice-derived premise that the volume of sales of a product is the major factor that drives shelf-life margin, with high volume items having large shelf-life margins while low volume items tend to have smaller shelf-life margins. On that basis, when the sales volume of a product declines, managers expect shelf-life margin to deteriorate and, conversely, to significantly increase when sales volume increases. Using a basic simulation model, we evaluated the validity of that practice-derived premise and investigated the impact on shelf-life margin of both the variation in sales and the velocity of inventory turns that is the result of systematic, economical small lot replenishment. We considered the impact of economical small lot replenishment that comes from either continuous improvement in the fixed order replenishment cost or discontinuous, stepwise reduction in that cost that is the result of order-replenishment aggregation. The simulation investigated the impact of eight (8) scenarios; four (4) related to changes in order replenishment cost, two (2) related to demand variation and two (2) based on order replenishment aggregation. We assumed annual inventory holding cost of $2.00 per unit and an instantaneous delivery inventory model. Based on that model referred to earlier, we can compute the replenishment order quantity, Q.

Further, the inventory turns, IT, flow time, FT, total annual inventory cost, TC, and shelf-life margin, SLM, are given by the following expressions;

$$IT = D/(Q/2) \tag{2}$$

$$FT = 365/IT \tag{3}$$

$$TC = (Q/2)h + (D/Q)S \tag{4}$$

$$SLM = SL-FT \tag{5}$$

where,

SL = Shelf life of product as delivered by suppliers

365 = days per year

For our purposes, we assumed a maximum product shelf life (SL) of 100 days, although the fundamental insights developed from the results of the simulation are unaffected by the maximum shelf life of the product.

The results of the simulation are shown in Tables 3-A and 3-B. Table 3-A presents the basic results while Table 3-B shows these as percentage changes from the base case scenario. The results uncover some key relationships that should be of interest to supply chain managers, and we discuss the most interesting. First, the practice-derived observation that sales volume exerts some influence on inventory turns and, by implication, shelf-life margin, finds much support from the simulation. Regardless of the magnitude of the order-replenishment cost, increases in demand also increase inventory turns, decrease flow time and increase shelf-life margin, while decreases in demand have the opposite effect. All other things held equal, a 20% increase in demand increases the Economic Order Quantity by 9.55%, increases inventory turns by 9.59% and decreases flow time by 8.76% and increases shelf-life margin by 1.75%. A 20% decrease in demand, on the other hand, decreases the EOQ and inventory turns by 10.56% and10.5%, respectively, increases flow time by 11.70% and decreases shelf-life margin by 2.34%.

However, it must be noted that although increases in demand do improve inventory turns, flow time and shelf-life margin, these increases come at the expense of higher total inventory-related costs. A company that depends merely on higher demand volumes to increase inventory turns has not gained any net competitive advantage from the supply chain system, since it has simply traded off higher inventory turns for higher cost, thus changing its position on the current responsiveness-cost efficient frontier instead of moving the frontier itself outward.

Second, systematic reduction in the order-replenishment cost through continuous improvement is a substantial driver of inventory turns, flow time and shelf-life margin. As we decrease the order-replenishment cost by 20%, 30% and 40% from the base level, inventory turns increase by 11.83%, 19.59% and 29.13%, while flow time decreased by 10.62%, 16.38% and 22.56%, respectively. These improvements in inventory turns and flow time have a dramatic impact on shelf-life margin, the latter increasing by 2.12%, 3.28% and 4.52% over the base case scenario. We also note that while the improvements in inventory turns and shelf-life margin that are the result of increased demand come at higher total inventory costs, corresponding increases in these supply chain responsiveness factors that come from systematic improvements in order-replenishment cost actually result in dramatically lower total inventory related costs. This means that in the terminology of the responsiveness cost efficient frontier, the latter has been shifted up and to the right to represent a superior competitive position for the company achieving these improvements in order-replenishment cost.

Third, even more dramatic than the impact of continuous improvement in order-replenishment cost is the impact of order replenishment aggregation. As revealed by the results of our simulation, even when demand decreases by 20% compared with the base case scenario, a moderate level of order aggregation of just two SKUs per order more than wipes out the negative impact of decreased demand on inventory turns, flow time and shelf life margin, increasing inventory turns and shelf-life margin by 4.20% and 26.53%, and decreasing flow time and total inventory related costs by 21.00% and 36.75%, respectively. This clearly supports the theory that aggregation is the major factor that confers an overpowering competitive supply chain advantage on large retailers like Walmart. As shown in Table 2-B, the synergistic effect of continuous improvement in order replenishment cost and aggregation is overwhelming, generating a 131% increase in inventory turns, a 56.75% decrease in flow time, an 11.35% increase in shelf-life margin and a 65.36% decrease in total inventory related costs.

Table 3-A
Sensitivity of Shelf-Life Margin and Total Inventory Cost to Demand Variability and Economical Small-Lot Production/Distribution

Demand, EOQ, IT, Flow Time, Shelf-life Margin	*Base Replenishment Cost ($/order)*	*Replenishment Cost($/order): 20% Decrease*	*Replenishment Cost($/order): 30% Decrease*	*Replenishment Cost($/order): 40% Decrease*
Base demand: 120,000	1,000.00	800.00	700.00	600.00
EOQ	10,954.45	9797.96	9165.15	8485.28
Inventory turns[1]	21.91	24.49	26.19	28.28
Flow time[2]	16.67	14.90	13.94	12.91
Shelf-life margin[3]	83.33	85.10	86.06	87.09
Change in SLM(days)	-	1.77	2.73	3.76
Total Cost[4]	21,908.90	19,595.92	18,330.30	16,970.56
20% Demand decrease: 96,000				
EOQ	9797.96	8763.56	8197.56	7589.47
Inventory turns	19.60	21.91	23.42	25.30
Flow time	18.62	21.91	15.58	14.43
Shelf-life margin	81.38	83.35	84.42	85.57
Change in SLM(days)	-1.95	-	1.09	2.24
Total Cost	19,595.92	17,527.12	16,395.12	15,178.94
20% Demand increase: 144,000				
EOQ	12,000.00	10733.13	10039.92	9295.16
Inventory turns	24.00	26.83	28.69	30.98
Flow time	15.21	13.60	12.72	11.78
Shelf-life margin	84.79	86.40	87.28	88.22
Change in SLM(days)	1.46	3.07	3.95	4.89
Total Cost	24,000	21,466.26	20,079.84	18,590.32
Aggregation (2 SKU's/order)				
20%Demand decrease: 96,000				
EOQ	6928.20	6196.77	5796.55	5366.56
Inventory turns	27.71	30.98	33.12	35.78
Flow time	13.17	11.78	11.02	10.20
Shelf-life margin	86.83	88.22	88.98	89.80
Change in SLM(days)	3.50	4.89	5.65	6.47
Total Cost	13,856.40	12,393.54	11,593.10	10,773.12
Aggregation (4 SKU's/order)				
20%Demand decrease: 96,000				
EOQ	4898.98	4381.78	4098.78	3794.73
Inventory turns	39.19	43.82	46.84	50.60
Flow time	9.31	8.33	7.79	7.21
Shelf-life margin	90.69	91.67	92.21	92.79
Change in SLM(days)	7.36	8.34	8.88	9.46
Total Cost	9797.96	8763.56	9197.56	7589.46

1. Inventory Turns = Demand/Average inventory
2. Flow Time = 365/Inventory Turns
3. Shelf-life Margin = Shelf Life - Flow Time = 100-Flow Time
4. TC = (Q/2)h + (D/Q)S

Table 3-B
Sensitivity of Shelf-Life Margin and Total Inventory Cost to Demand Variability and Economical Small-Lot Production/Distribution

Demand, EOQ, IT, Flow Time, Shelf-life Margin	*Base Replenishment Cost ($/order)*	*Replenishment Cost($/order): 20% Decrease*	*Replenishment Cost($/order): 30% Decrease*	*Replenishment Cost($/order): 40% Decrease*
Base demand: 120,000	1,000.00	800.00	700.00	600.00
Percentage change in:				
EOQ	-	-10.56	-16.33	-22.54
Inventory turns[1]	-	11.83	19.59	29.13
Flow time[2]	-	-10.62	-16.38	-22.56
% change in SLM	-	2.12	3.28	4.52
Total Cost	-	-10.56	-16.33	-22.54
20%Demand decrease: 96,000				
Percentage change in:				
EOQ	-10.56	-20.00	25.17	- 30.72
Inventory turns	-10.50	-	6.94	15.53
Flow time	11.70	-	- 6.54	-13.44
% change in SLM	-2.34	-	1.31	2.69
Total Cost	-10.56	-20.00	-25.17	-30.72
20%Demand increase: 144,000				
Percentage change in:				
EOQ	9.55	-2.02	-8.35	-15.15
Inventory turns	9.59	22.51	31.00	41.46
Flow time	-8.76	-18.42	-23.70	-29.33
% change in SLM	1.75	3.68	4.74	5.87
Total Cost	9.55	-2.02	-8.34	-15.15
Aggregation (2 SKU's/order)				
20%Demand decrease: 96,000				
Percentage change in:				
EOQ	-36.75	-43.43	-47.09	-51.01
Inventory turns	26.53	41.46	51.23	63.38
Flow time	-21.00	-29.33	-33.89	-38.81
% change in SLM	4.20	5.87	6.78	7.76
Total Cost	-36.75	-43.43	-47.09	-51.01
Aggregation (4 SKU's/order)				
20%Demand decrease: 96,000				
Percentage change in:				
EOQ	-55.28	-60.00	-62.58	-65.36
Inventory turns	78.95	100.09	113.88	131.05
Flow time	-44.15	-50.03	-53.27	-56.75
% change in SLM	8.83	10.01	10.65	11.35
Total Cost	-55.28	-60.00	-62.58	-65.36

1. Inventory Turns= Demand/Average inventory
2. Flow Time=365/Inventory Turns
2. Shelf-life Margin= Shelf Life – Flow Time=100-Flow Time
4. TC=(Q/2)h+(D/Q)S

The data in Table 2-A and 2-B show improvements in inventory turns have a clear and significant impact on shelf-life margin. High-velocity inventory turns result in substantial amelioration of shelf-life margin, and thus product quality after delivery from suppliers and prior to sale to customers. As we increase inventory turns from the base case of 21.91 to the high-velocity range of 39.19 by way of aggregation and even with no continuous improvement in the order replenishment cost of $1000.00 per order, shelf life margin improves from 83.33 days to 90.69 days, or 8.83%. That is to say, as the supply chain system achieves high-velocity inventory turns, the shelf-life margin approaches the maximum shelf-life of the product and shelf product quality delivered to customers approaches the actual quality delivered by suppliers. This is a competitively most desirable outcome since it means that the supply chain system is a net conserver, and not destroyer, of quality delivered to customers. It is also interesting to note that achieving high-velocity inventory turns through continuous improvement in the order replenishment cost is much slower than through the effect of aggregation.

In fact, for the range of continuous improvement explored by our simulation, the supply chain system does not achieve high-velocity inventory turns, even if the marginal improvement in shelf-life margin is still present and significant. But the data do show that continuous improvement in combination with aggregation move the supply chain system into the range of high-velocity turns more quickly, the latter being achieved with only a first level aggregation of two SKUs per order instead of four SKUs per order without continuous improvement. The combination of the maximum levels of continuous improvement and aggregation considered by the simulation model results in a rather dramatic improvement in inventory turns of 131.05% and shelf life margin of 11.35%. At that level, the shelf-life margin is 92.79 days, which is very close to the maximum shelf life of 100 days assumed to be delivered by suppliers in the present case. The supply chain system is succeeding in conserving and delivering to customers nearly all the shelf life delivered by suppliers. The supply chain system becomes an instrument for maintaining and enhancing quality differentiation. The dramatic impact of high velocity inventory turns on the conservation of shelf-life margin and on the other quality-differentiation factors identified above means that the achievement of high-velocity inventory turns is a strategic necessity for any supply chain system.

CONCLUSION AND IMPLICATIONS FOR MANAGEMENT

The results provide strong support for the central hypothesis of this research. High-velocity inventory turns, far from being merely of operational interest, have significant strategic impact in that they are key drivers of a company's capability to achieve high levels of differentiation at low cost. For the vast majority of supply chain managers, inventory is a resource, an asset that enhances a company's responsiveness. This view of inventory is well-entrenched in practice and in theory where inventory is viewed, modeled and managed as a driver of supply chain responsiveness. However, our results add to the mounting evidence that that view is dysfunctional and probably moribund.

More recently (Etienne, 2005), it has been demonstrated that, instead of enhancing a company's ability to respond quickly to customer requirements and competitive market events, inventory represents deadweight that destroys a company's supply chain responsiveness. The results presented here add further support to that underlying thesis. Management of the level and flow of inventory through the supply chain to achieve high-velocity inventory turns is largely an operations strategy issue, but it is one with very broad and profound corporate and marketing strategy ramifications. High-velocity inventory turns that are achieved, not by managerial diktat, but rather through systematic continuous improvement and, most importantly, by way of leveraging of economies of scale through aggregation, drive a company's marketing differentiation potential and enhance its differentiation strategy in a powerful way. A company's basic marketing differentiation potential is determined by strategic decisions that create R&D, marketing, operations, procurement and after-sales service capabilities that build and exploit core differentiation competence. But, the results presented and discussed here show that a company's marketing differentiation capability is partly created by supply chain processes that systematically compress inventory and achieve high-velocity turns. Our results argue for the position that the capability to design, operate and leverage the supply chain system to achieve high-velocity inventory turns through systematic pursuit of small lot production, procurement and distribution contribute much to the enhancement of that differentiation potential. In point of fact, the results argue for and reinforce the recent thesis that inventory is a net destroyer of supply chain responsiveness and, more specifically in the present case, those aspects of responsiveness that relate to the company's market differentiation potential.

The results show that the differentiation enhancement potential of high-velocity inventory turns exploit synergy between low levels of inventory and the economical expansion of product offering variety, giving a company the ability to provide greater variety at lower cost by reducing the cost of greater product line variety. High-velocity inventory turns also give the company the capability to economically exploit or serve market interstices that were previously deemed to be too small to be served economically, thus enabling a company to systematically broaden its product offering. This broadening of variety exploits sales intensity synergy through the complementarity effect and the substitution effect, as outlined previously. In turn, the exploitation of sales intensity synergy, in combination with the aggregation effect, helps a company leverage economies of scale and drive down overall costs. Thus, differentiation is achieved at lower cost, effectively pushing the responsiveness cost efficient frontier outward, creating real competitive advantage for a company through its supply chain systems and processes. Moreover, while continuous improvement in supply chain replenishment processes does have the predicted impact on the attainment of high-velocity inventory turns, more significant is the systematic compression of lot sizes by leveraging of economies of scale through order replenishment aggregation. Even low levels of aggregation have much higher impact on lot size compression and inventory turns velocity than very high levels of continuous improvement in order replenishment processes. This effect observed here provides the clear strategic rationale for the relentless pursuit of aggregation by large retailers like Walmart, Kmart and Costco.

By way of their impact on flow time, high-velocity inventory give the supply chain system a mechanism to systematically enhance quality. This is done through three related processes; quick quality feedback from the market, rapid quality feedforward to market and, critically, the extension of what we refer to here as shelf-life margin. Through its positive impact on shelf-life margin, high-velocity inventory turns enable the supply chain to conserve the quality delivered by suppliers and by the company's own manufacturing or assembly processes. As a company increases its velocity of inventory turns, it decreases flow time and increases the amount of its own manufacturing process or supplier quality that it effectively delivers to customers at the time of sale. The more a company increases its inventory turns, the closer its flow time approaches zero and the more closely it comes to conserving 100% of the quality delivered by its own manufacturing process or by its suppliers. In effect, a company that is not achieving high-velocity inventory turns is destroying through its supply chain processes a large part of the quality either created by its own production or assembly process or that delivered by suppliers.

Because of their impact on a company's marketing differentiation potential, the achievement of high-velocity inventory turns is a strategic marketing and competitive strategy priority. The design, selection and deployment of supply chain systems that specifically seek to achieve high-velocity inventory turns have profound competitive strategy and strategic marketing ramifications and must involve both top marketing management and top management. Viewed against the background of the results obtained and analyzed here, the legendary Toyota Production System with its emphasis on the achievement of high-velocity inventory turns, and its imitation in computer manufacturing, the Dell System, are much more than systems for attaining superior manufacturing capability to deliver greater customer value, that is, higher or equal quality at equal or lower cost with unmatched levels of responsiveness and flexibility. They are also competitive strategy and strategic marketing systems for achieving and enhancing marketing differentiation advantage with lower overall cost. The results also argue for the fact that the competitive superiority of the Walmart system is based on far more than the ability to deliver low overall cost. It is also a competitive marketing system that is managed for maximum synergy with operations to deliver unprecedented levels of differentiation and responsiveness potential, and Walmart is now beginning to leverage that potential to broaden its level of strategic marketing differentiation. The symbiotic relationship between marketing and manufacturing or operations in building a company's competitive capability on cost, quality and differentiation is made glaringly evident by our data and analyses. Strategic marketing differentiation depends on and is enhanced by operating supply chain decisions, particularly those decisions that pursue and achieve high-velocity inventory turns. High levels of inventory are bad for operating and cost reasons. The results show that they are also bad for strategic and marketing differentiation reasons. Inventory is deadweight and blunts a company's marketing differentiation strategy. Its systematic reduction through lean and agile supply chain systems must be viewed and managed as a mechanism of strategy and strategic marketing differentiation.

References

Barbaro, Michael (2006), New York Times, Friday, March 31, page C2).

Chopra, Sunil and Peter Meindl (2004), Supply Chain Management. (Upper Saddle River, New Jersey: Prentice Hall), pp. 35, 57.

Darby, M., R. and E. Karni (1973), Free Competition and the Optimal Amount of Fraud, *Journal of Law and Economics*, April, pp. 67-86.

Etienne, Eisenhower, C. (1985), "The Choice of Optimal Buffering Strategies for Dealing with Uncertainty in MRP." Administrative Sciences Association of Canada Annual Conference Proceedings.

——(2005), "Supply Chain Responsiveness and the Inventory Illusion". *Supply Chain Forum*, Vol. 6, No. 1.

——(2005), "Synergy, Tradeoff and the Dimensions of Supply Chain Responsiveness". *International Journal of Applied Operations Management*, Vol. 1, No. 1.

——(2005), "The Implementation Challenges of Six-Sigma in Service Businesses". *International Journal of Applied Quality Management*, Vol. 2, No. 1.

——(2005), "Dimensions of Global Operations Strategy in Service Businesses: A Value-Chain Based Analysis". *International Journal of Applied Operations Management*, Vol. 1, No. 1.

——(1987), "A Simple and Robust Model for Computing the Service Level Impact of Lot Sizes in Dependent and Independent Demand Contexts." *Journal of Operations and Production Management* (JOPM), Vol. 7, No. 2.

Haas, Elizabeth, A. (1987), Breakthrough Manufacturing, Harvard Business Review, March-April.

Hendricks, Kevin, B., and Vinod R. Singhal (1997), "Does Implementing an Effective TQM Program Actually Improve Operating Performance?: Empirical Evidence from Firms That Have Won Quality Awards," Management Science 43, 9 (September), 1258-1274.

Heskett, James, L., W. Earl Sasser and Christopher Hart (1990), Service Breakthroughs: Changing the Rules of the Game (New York, NY: The Free Press,) p. 37.

Nelson, Philip (1970), Advertising as Information, Journal of Political Information, July-August.

Porter, Michael (1980), Competitive Strategy. (New York, NY: The Free Press).

——(1985), Competitive Advantage. (New York, NY: The Free Press)

——(1986), Competition in Global Industries. (Boston, MA: Harvard Business School Press).

Smith, Craig, N. (1990), Black & Decker Corporation: Spacemaker Plus Coffeemaker (A). (9-590-099). Boston, MA, Harvard Business School, Publishing Division.

Stalk George, Competing Against Time (1990), (New York, NY: The Free Press).