Desperately seeking shelf availability: an examination of the extent, the causes, and the efforts to address retail out-of-stocks

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Abstract

With all the hype around efficient consumer response (ECR) and the brave new world of technologies, one would believe that retail out-of-stocks have gone down over the last ten years. That is wrong. Retailers have been struggling with considerable out-of-stocks for decades – with little evidence of improvement. A similar wrong belief is that shoppers are also still unwilling to accept low service levels. In fact, increasingly, consumers switch brands when they do not find the brand they wanted. But retailers must be wary, because the results of our research show that increasingly shoppers switch stores quickly and may never come back. So, who is to blame? The supply chain. And where to tackle it? On the shop floor. Over the past two years, we have conducted a major, worldwide study of the extent, causes, and consumer responses to out-of-stocks in the fast-moving consumer goods industry. In this article, we report these findings and provide insight to solving this chronic industry problem.

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Introduction

In an era where retail competition is fiercer than ever, retailers continue to search for ways to enhance performance. In our view, not enough time is being spent looking right in their own back (and front) yard, where, according to our research, retailers can boost earnings per share up to 5 per cent by addressing their out-of-stock (OOS) issues. After all, where else can a retailer find so much potential revenue without spending to attract new customers? In the pages that follow, we summarize and elaborate on the findings of our OOS research project (Gruen *et al.*, 2002; described in Appendix 1), including recommendations on how to tackle the challenges of improved product availability. The battle can be won, but it is not easy.

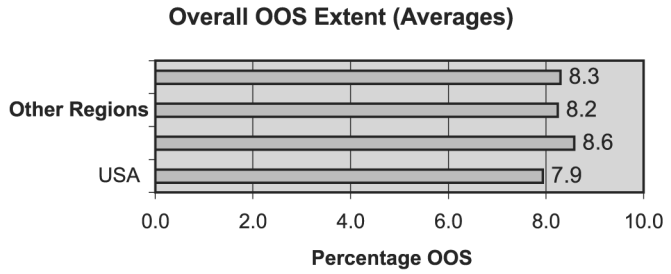
Several trade associations such as the Grocery Manufacturers of America and the Food Marketing Institute and joint trade-industry bodies such as ECR Europe or ECR Asia have sponsored and/or released major reports on out-of-stock in the past few years (ECR Australasia/PWC, 2001; GMA, 2002; ECR Europe, 2003).
All of this attention to OOS points to one thing: availability of products to the customer is the new battleground in the fast-moving consumer goods (FMCG) industry. However, while our research shows that 75 per cent of the responsibility for out-of-stock rests at the store level, our research also found that the solution will be found through retailers and suppliers together working for improved availability.

What is the extent of shelf out-of-stocks?

The average out-of-stock (OOS) rate for all 40 studies that reliably reported OOS extent was 8.3 per cent (see Figure 1 for OOS rates). The average of the reported highs in the studies was 12.3 per cent, and the average of the lows was 4.9 per cent. This is similar to, though slightly higher than, the primary US benchmark developed in the 1996 Coca-Cola Research Council sponsored study (Coca-Cola Research Council/Andersen Consulting, 1996). That figure was 8.2 per cent, and was calculated as the simple average rate of eight categories ranging from 3.9 per

International Journal of Retail & Distribution Management
Volume 31 · Number 12 · 2003 · 605-617

Figure 1 Out-of-stock (OOS) rates



cent to 11.1 per cent. However, it falls within the range of two other recent studies. A 2002 GMA study on direct-store-delivery in the USA reported an OOS rate of 7.4 per cent with categories ranging from 3.2 per cent to 11.2 per cent. ECR Europe's 2003 on-shelf-availability study reported an OOS rate of 7-10 per cent with categories ranging from 5 per cent for canned food to 18 per cent for fresh meals and even 32 per cent for ladies' stockings.

Keep in mind that the 40 studies examined here used slightly different measurement methods, different people, measured different categories, and examined different durations and different daily and weekly factors. All of these can affect the measurement of OOS rates (see Appendix 2 for discussion of what makes up an OOS). However, when all of these factors are considered together, the averages regress to an uncanny similarity. This provides a sense that the findings are reliable in the aggregate, and that differences can easily be explained by differing categories, methods, and regions.

When we split Europe into its northern and western region (Norway, Denmark, Sweden, France, Belgium, The Netherlands, Germany, Switzerland, Austria, UK, Finland) and into its southern and eastern region (Portugal, Spain, Greece, Poland, Hungary, Czech Republic, Slovakia) we found that countries within each of these two areas showed similarities in OOS rates, but differences between the two regions were substantial. Northwest Europe showed the lowest OOS rates of any region in the world, while Southeast Europe showed the highest.

OOS rates in "other regions" (South America and Asia) were lower on average although details varied. The small number of studies does not provide a complete representation of these regions.

Regarding promotional effects, the studies consistently show OOS rates to be higher on promoted items than on non-promoted items. In some cases the differences are minor, but in most the difference is substantial – even though promoted items should be receiving retail store managers' attention.

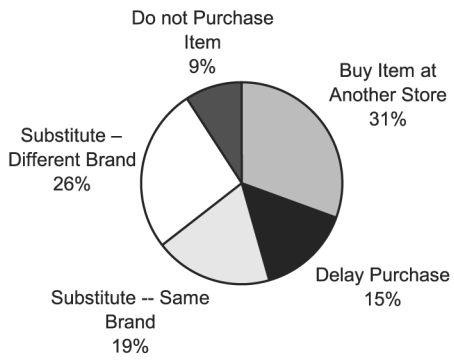
While our research did not specifically examine new products, in some of the studies we reviewed we did find challenges in keeping new products in stock as the case study in the [call-out box] indicates. Furthermore, while we assumed that more SKUs lead to higher out-of-stocks we found that the suppliers that suffer most from out-of-stocks are stuck-in-the-middle neither supplying many nor few SKU!

While the differences vary among studies, in general we found a 2 : 1 ratio of promoted vs non-promoted OOS rates. Second, OOS rates varied by day of the week with Sunday and Monday having the highest levels, and levels decreasing throughout the week. This pattern makes sense when one considers that shopping will be highest on the weekends, while retailer ordering, and delivery to stores do not occur until Monday and Tuesday.

What are the consumer reactions to shelf out-of-stocks?

We also looked at a worldwide study of more than 71,000 consumers that was conducted in a series of 29 studies across 20 countries across a variety of categories. The results of this analysis are presented in Figure 2. Academic research has identified and categorized up to 15 possible consumer responses to an OOS, though typically, managerial researchers measure five primary

Figure 2



International Journal of Retail & Distribution Management
Volume 31 · Number 12 · 2003 · 605-617

responses (see e.g. Campo *et al.*, 2000; Emmelhainz *et al.*, 1991; Fitzsimons, 2000; *Progressive Grocer*, 1968a, b; Schary and Christopher, 1979). All five responses result in direct and/or indirect losses to both retailers and manufacturers. These are:

(1) buy item at another store (store switch);
(2) delay purchase (buy later at the same store);
(3) substitute – same brand (for a different size or type);
(4) substitute – different brand (brand switch); and
(5) do not purchase the item (lost sale).

In the aggregate, delay of purchase and not purchasing at all are reasonably similar worldwide. The major overall difference between US and European consumers is the lower willingness of US consumers to switch brands. European consumers are almost 50 per cent more likely to switch to a competing brand when faced with an OOS on the desired item (see Figure 3). Alternatively, US consumers are more likely to substitute a different package size or variation within their preferred brand. Thus, in the aggregate, US consumers act in a more brand loyal manner than do consumers outside the USA. Store switching is greatest outside the USA and Europe. Europeans are the least likely to switch stores due to OOS.

Consumer responses vary considerably by category. Figure 4 shows the worldwide average for several of the categories examined in the study. Several factors impact the consumer response to OOS items. Traditionally these have been categorized based on the nature of the category, type of product, type of consumer, the immediacy of need, and the general brand loyalty. However, all of these factors interact, making it difficult to develop a generalized scheme to help determine the likelihood of a consumer's reaction.

Figure 3

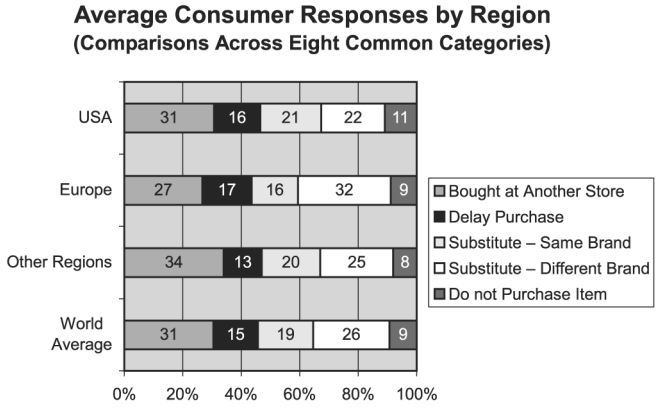
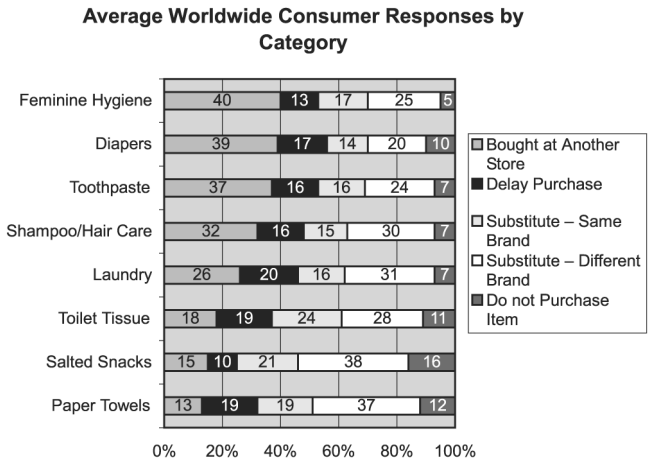


Figure 4



To present a generalized approach, we found that there are three primary drivers that interact and cause the consumer to take one action over another. Using economic theory, Campo *et al.* (2000) present the opportunity cost of not being able to consume the product immediately, the substitution cost of decreased utility of a less preferred alternative, and the transaction cost of the time and effort required to obtain the preferred item. Using this terminology, one can examine how the levels of each of the three cost components interact to explain a consumer's likely response to an OOS situation.

When the opportunity cost of not being able to immediately consume the product is high (for example when one runs out of diapers) the consumer will either substitute or find the item at another store. Alternatively, a low opportunity cost will lead to either purchase delay or cancellation. When the substitution cost of using a less preferred brand is high (for example in the case of feminine hygiene and laundry), the consumer will take any action except to substitute another brand. When the transactions cost is high, i.e. involving time and effort to purchase later or elsewhere, the consumer will either substitute or cancel purchase. This perspective shows that consumers switch more in some categories than others. For example, we found that feminine hygiene has low substitution, since these are very personal products and there is a high substitution cost. However, when the

International Journal of Retail & Distribution Management
Volume 31 · Number 12 · 2003 · 605-617

brand is less personal, e.g. paper towels, more substitution between brands may occur.

What is the cost of shelf out-of-stocks to the retailer?

While most studies concentrate on the sales loss to the retailer created by OOS items, the total "cost" of OOS affects the entire supply chain and can be divided into four areas:

(1) *Retailer shopper loss risk.* When shoppers permanently switch stores due to OOS situations. Either the new preferred store has overall lower OOS levels, or it has lower OOS levels on items of greatest value to the consumer. In the aggregate, assuming heterogeneity in consumer value on items, the store with a lower overall OOS level will lose fewer customers and gain more customers from other stores.

(2) *Retailer sales loss risk.* This is from three components: consumers buying the OOS item at another store, consumers canceling their purchase of the item, and consumers substituting a smaller and/or lower priced item. Sales loss risk is calculated by combining the estimated lost sales percentage from these three components and multiplying this by the extent of OOS. The result provides an estimate of the percentage of the retailer's total gross sales that are lost due to items being OOS.

(3) *Manufacturer shopper loss risk.* When consumers switch to a competitor's brand within a category, not only for the immediate purchase but also ongoing purchases.

(4) *Manufacturer sales loss risk.* When consumers substitute a competitor's item or cancel a purchase.

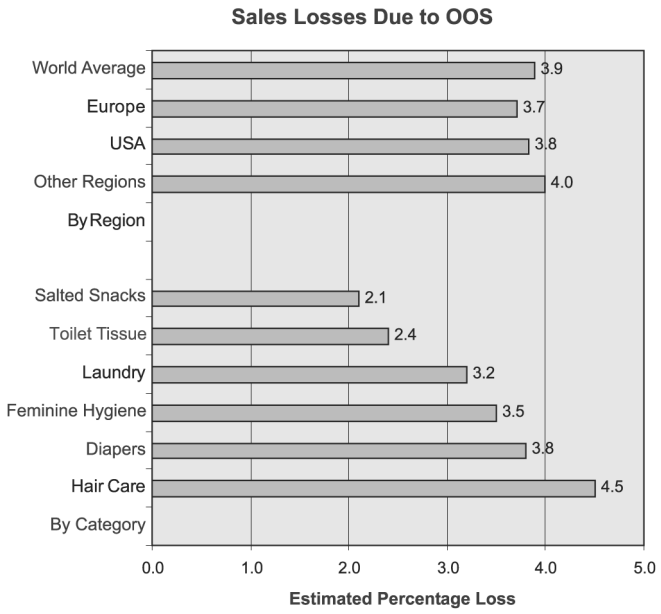
The key to understanding the implications of OOS (as well as the benefits of addressing OOS at the retailer) is that the areas of loss are interdependent. A reduction in the sales loss to the retailer also reduces the resulting shopper loss risk, the risk to the supplier, and the resulting supply-chain inefficiencies. Most of the attention in measurement has been in the area of retailer sales loss. This is typically estimated based on the following formula:

Percentage of consumer responses that negatively affect the retailer × OOS extent.

Figure 5 shows that the worldwide benchmark average is 3.9 per cent sales loss at retail due to OOS items. The regional averages as well as worldwide averages by category are also presented. The chart shows that overall sales losses are similar worldwide, with a narrow range from 3.7-4.0 per cent. However, category sales losses vary dramatically from 2.1 per cent to 4.5 per cent. Regardless of how the data are cut, the implication is still the same: both the manufacturer and the retailer have created value for the consumer, but nearly 4 per cent of this effort is wasted because the retailer cannot extract the value from the consumer due to OOS items.

Other implications of OOS include logistics and information inefficiencies in the supply chain. Irregular, fill-in, and "rush" orders due to OOS situations cause logistics-fulfillment inefficiencies. These are subject to "demand amplification" or the "bullwhip effect" where small shifts at the retail level become magnified further up the supply chain. Information inefficiencies are created when the ordering signals sent up the supply chain reflect a pattern other than true consumer demand. What is worse, out-of-stocks not only disappoint customers, but perpetuate themselves and drive up costs throughout the supply chain. Take, for example, a retailer that needs to reorder a product will typically examine the sales history of that product. When the item has been out of stock, the sales history data provide inaccurate information to

Figure 5 Sales losses due to OOS



International Journal of Retail & Distribution Management
Volume 31 · Number 12 · 2003 · 605-617

the buyer on what is the necessary purchase quantity to meet actual demand. If the out-of-stock has not been detected, then the buying decision will most likely be too low to meet the normal customer demand plus those who delayed purchase until the retailer received additional stock. Alternatively, if the buyer is aware of the OOS situation, the tendency may be to over order, because the buyer is unable to determine the permanent loss of customers caused by the OOS through brand substitution or to the store due to store switching. In sum, the OOS forces the buyer to work with a greater margin of error, and this increases the variability in the ordering, as summarized in Figure 6.

What are the root causes of shelf out-of-stocks?

Previous studies have placed most of the responsibility for OOS on retailer store ordering and forecasting practices. Our research confirms this, as Figure 7 shows. Between two-thirds and three-fourths of OOS are caused in the store, while one-fourth to one-third are due to upstream causes.

Figure 6

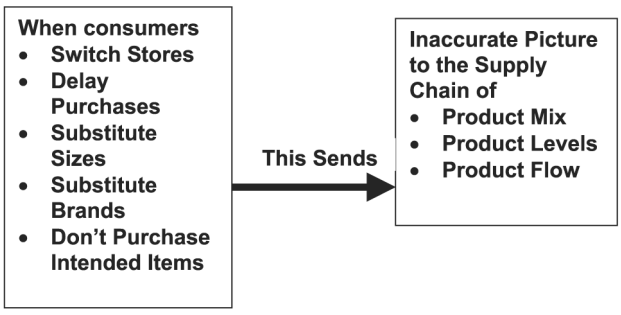
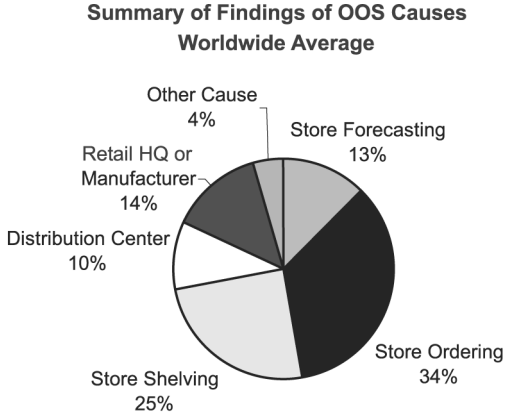


Figure 7



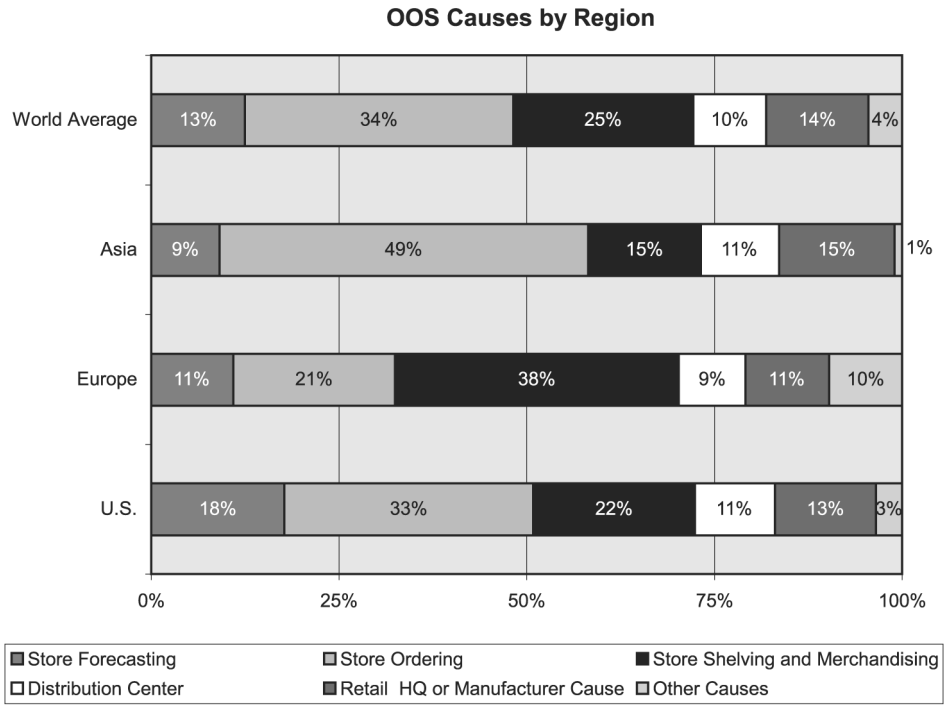
Worldwide, the two greatest causes are inaccurate forecasting (34 per cent), an indicator of increasing demand volatility, and shelf-replenishment (25 per cent). The latter is particularly surprising when compared to the much-cited 1996 Coca-Cola Research Council study. That study attributed a higher percentage to ordering (19 per cent) and forecasting (54 per cent) and it traced an average of only 8 per cent of the OOS situation to product being available in the back room but not on the shelf.

Figure 8 shows how OOS causes vary by region. We were surprised to find that, in the USA, significantly more causes of out-of-stocks are attributed to ordering practices (51 per cent) than in Europe (32 per cent). On the other hand, in Europe there seem to be more problems with regards to replenishment (47 per cent) than in the USA (32 per cent), particularly shelf-replenishment (i.e. when the product is already in the store). This is counterintuitive, as one would have guessed that smaller back rooms and efficient transport networks in Europe would alleviate this cause. Asia seems to be slightly worse with regards to ordering, however, the Asian sample is very limited. Somewhat striking, 72 per cent of all OOS across the world are caused in the store, by bad store practices, by late and insufficient ordering, wrong forecasts, or shelf-restocking problems. Retailer store managers must simultaneously manage thousands of stock-keeping units and work with hundreds (often thousands) of simultaneously promoted items (which cause demand to fluctuate), while keeping personnel costs in reason (Dubelaar *et al.*, 2001). Furthermore, retailers face complementary issues such as shrinkage that becomes more difficult to control as inventories increase. Thus it is not surprising to see a strong linkage of out-of-stocks with store ordering practices.

However, the real story is more complex. Broadly speaking, causes of out-of-stocks tend to be assigned to one of the following three general processes: ordering, replenishing and planning, detailed in Figure 9 and described below:

(1) *Ordering practices.* This covers two general categories. First, the retail store may have ordered too little or too late so that the warehouse could not deliver before the retailer ran out of the item. Second, the retailer forecast may have misjudged

Figure 8



demand for an item and ordered an insufficient supply. Often when an item is promoted, inadequate supply is ordered to meet demand. Other ordering practices also play their part: for example, insufficient ordering by the warehouse, such as when a major promotion by the chain causes demand to exceed supply.

(2) *Replenishment practices.* In this case the product is in the store (often in the back room, but also sometimes in another area of the store) but it is not on the shelf when the consumer comes to buy the product. This can be caused by inadequate shelf space allocated to the item so that it runs out before regular restocking occurs, lack of an adequate signal to retail management that the product is not on the shelf, or poor back-room inventory handling procedures that impede the ability of store personnel to get product from the back room inventory onto the shelf. Replenishment issues also occur upstream from the retail store. On the warehouse level the warehouse may have insufficient inventory to meet demand and "scratches" the retailer's order.

(3) *Planning practices.* This category covers several possible causes. The item may have been discontinued but not communicated to the retailer, the manufacturer may not have shipped adequate inventory, or there may be a product "drought" where the manufacturer is unable to produce enough to meet demand.

It is important to note that in OOS studies, the root causes are estimated or calculated rather than directly measured. For example, if an item is OOS and was ordered at the most recent opportunity, the assumption is that the retailer ordered too little to meet demand, and thus the cause would be assigned to retailer forecasting. Alternatively, if the item was not ordered at the most recent opportunity, then the assumption is that the store ordered an insufficient quantity. This is why the assigned causes may not be true "root causes" but simply the most plausible place to assign responsibility. In some cases this may reflect the symptom rather than the cause.

How can on-shelf availability be improved?

The previous discussion showed that the majority of the root causes are in the store, however, that is not the place to start for finding a solution. Ideally, a sustainable on-shelf availability management process consists of a set of linked decisions on category tactics and shelf-space allocation, as

Figure 9

Root Cause		
Planning	**Ordering**	**Replenishing**
Store		
• Incongruence between shelf capacity and replenishment frequency. • Product purchasing frequencies. • Large number of SKUs in assortment.	• Data (bad POS data, inaccurate records). • Forecasting (inaccurate forecast, long cycles). • Inventory (inaccurate inventory or book-stocks). • Ordering (no order, late order, wrong order, backorders).	• Staffing (insufficient or busy staff). • Backroom (congested). • Receiving (receiving errors, inaccurate records). • Shelf replenishment (infrequent, late or no shelf filling). • Planogram (bad execution and compliance). • Shrinkage (damage, theft).
Distribution Center		
	• Data (bad data, inaccurate records). • Forecasting (inaccurate forecast). • Inventory (inaccurate inventory or book-stocks). • Ordering (no order, late order, wrong order, backorders).	• Transportation (shipping, loading). • Receiving (loading errors, inaccurate records). • Storage (put away/ break pack). • Replenishment (infrequent, late or no store replenishment). • Lead times (long and infrequent). • Shrinkage.
Wholesaler/Retail Headquarter		
• Assortment (new or discontinued item). • Data and communication (master data). • Planogram design and implementation (shelf allocation). • Promotions and pricing decisions. • Advertising and display planning. • Store layout and service levels.	• Data (bad data, inaccurate records). • Forecasting (inaccurate forecast). • Inventory (inaccurate inventory or book-stocks). • Ordering (no order, late order, wrong order, backorders).	• Availability (shortage).
Supplier		
• Assortment (new or discontinued item). • Data and communication (master data). • Promotions and pricing decisions. • Advertising and display planning.	• Data (bad data, inaccurate records). • Forecasting (inaccurate forecast). • Inventory (inaccurate inventory or book-stocks). • Ordering (no order, late order, wrong order, backorders).	• Availability (packaging, raw materials and ingredients).

well as the mode, frequency and quantity of ordering and replenishment. An integrated process must address the three supporting pillars of process responsiveness, operational accuracy, and incentive alignment in order to effectively address the root causes of out-of-stocks.

Remedy 1: process improvements

Assortment planning and space allocation

Given continuously changing and growing assortments, most stores end up in the dilemma where they allocate relatively too little shelf space for fast movers and too much shelf space for slow movers (Corstjens and Doyle, 1981). Fast movers are particularly susceptible to out-of-stocks and, counter-intuitively, we found that fast movers often get less than their fair allocation of shelf space given their sales potential. While in some cases the retailer wanted to promote/ "accelerate" slow movers (his own private labels) in most cases they simply lost/succumbed space to newly introduced products (or slow movers that were allocated more space than they deserve due to minimum order quantity and case pack requirements). Clearly, a fast mover or a promoted item with high demand volatility needs more rather than less shelf space to

International Journal of Retail & Distribution Management
Volume 31 · Number 12 · 2003 · 605-617

fulfill consumer demand at any given moment or run the risk of being out-of-stock.

Automatic ordering systems
Traditionally, store managers evaluate inventory by walking through the store and order products based on intuition rather than on accurate forecasts. This, of course, leads to lost sales, because near and complete out-of-stocks are spotted too late. While shelf-replenishment remains, even today, a predominantly manual process, automatic or computer-assisted store ordering has emerged as a key lever for better on-shelf availability. Ahold Spain, for instance, has improved availability by more than 66 per cent (i.e. from 13-15 per cent OOS to 5 per cent), in test stores that moved from manual ordering to computer-assisted store ordering.

EDI, Internet and real-time ordering
Batching orders disrupts the product flow to the shelf and causes the well-known "bullwhip effect" throughout the supply chain (Lee, 2002). To address this, many retailers have already increased their ordering frequency, implemented EDI and Internet ordering, introduced mixed truckloads, adapted minimum pack sizes, reworked delivery schedules and automated ordering to break batches. Tesco has gone even further, by exploring how its systems can pass orders continuously to its suppliers, rather than once a night.

Inventory control
Retailers and suppliers can and should work together to reduce total supply chain inventory. While intuitively most would think that supply-chain inventory levels positively correlate with on-shelf availability, we found the contrary to be true. Higher supply-chain inventory actually correlates with higher out-of-stock rates! This apparent paradox can be explained by the fact that retailers with lower inventory levels tend to manage their supply chains better and have their inventories in the appropriate places. For example, one major US retailer we examined in our study has between 66 and 117 days of supply in the stores, much of which is simply excess inventory in the back room. This situation makes it difficult for store personnel to locate the product they know they have at the store, which leads to reordering of additional product, thus creating a vicious cycle. In a test of multiple stores in a metropolitan area, the retailer focused simply on reducing excess back-room inventory.

Supply networks/store flow replenishment
Unexpectedly, we found that it makes no difference in out-of-stocks if merchandise is delivered directly from the supplier to the store or via a retailer distribution center. However, the overall design of the supply and distribution network does make a big difference. Tesco, for example, has streamlined incoming receiving and inspection in the distribution centers to let fast-moving products flow straight through to sort and dispatch, thus only storing the surplus from the full truckload. At the same time continuous replenishment of store orders together with multiple deliveries, rather than batch processing overnight, improved the speed and accuracy in the store.

Remedy 2: improve operational accuracy
Automatic availability measurement
Advanced technology-based solutions have emerged that automate out-of-stock measurement and detection. For example, Sainsbury's has introduced an automatic "shelf availability monitor" (SAM). This system tracks the sales transaction data (rather than the inventory) for a store's top 2,000 products and can be used to flag items that may be out of stock. It is in use at most stores, with regular reports highlighting where sales have been missed, how long items have been unavailable and converting these numbers into a cash figure of lost sales. Furthermore, it tracks a store's sales in 15-minute blocks and stores can plan their activities to ensure products are available when there is likely to be shopper demand. Since the introduction of SAM in early 2001, there has been an improvement across the company of 1 per cent on-shelf availability.

Another solution has been developed by Data Ventures and Procter & Gamble. The "item velocity monitor" predicts with 90 per cent accuracy the out-of-stock status for items that move four or more times per day. This can provide a real-time signal to store managers and does not depend on store inventory records. Similarly, Delhaize has instituted an "alert system" that uses historical point-of-sale data to help store

International Journal of Retail & Distribution Management
Volume 31 · Number 12 · 2003 · 605-617

managers identify out-of-stocks. An "alert" is received when the product does not pass through the point of sale as expected on a given day. Store managers then check the shelf to verify that the product is actually out-of-stock and take the appropriate action to replenish. These new solutions all share the ability to utilize technology (as opposed to inventory or manpower) to address out-of-stocks items in a rapid basis. This provides the potential benefits of reduced out-of-stocks levels without committing high cost labor to address the problem. Furthermore, they provide the ability of linking the shelf out-of-stocks information to supply chain partners.

Inventory record accuracy

Inventory inaccuracy presents a major obstacle to on-shelf availability and needs to be addressed. This is crucial since ordering and inventory models assume that inventory records are accurate. However, recent research indicates that inaccurate inventory levels and misplaced stock-keeping units are both significant and expensive, contributing to a profit reduction of more than 10 per cent (Raman *et al.*, 2001). Due to data inaccuracy, retailers have to hold larger safety stocks, which increase the inventory costs. In addition, when inventory records (that are based on point-of-sales data) differ significantly from physical inventory levels, retailers cannot effectively use point-of-sales data for inventory management purposes. Many retailers have addressed one cause of inventory record inaccuracy which is improper scanning. Checkout personnel are trained in the importance of proper scanning and are shown the costs that get generated when an item is scanned incorrectly at the point of sale.

Automatic identification

One exciting technological advancement that provides great hope for improving on-shelf availability is based on the emerging technologies of intelligent tags or smart chips such as those promoted by the Massachusetts Institute for Technology's Auto-Identification center. Recently, Procter & Gamble and SAP announced that they are jointly trialing the use of radio-frequency identification (RFID) transponders. In this trial "intelligent tags" will be attached to each stock-keeping unit, providing truly accurate inventory control.

Remedy 3: improve incentive alignment

Ordering incentives

Store managers are faced with a confusing array of incentives. We found that many retailers penalize their store managers for out-of-stocks instead of encouraging them to improve on-shelf availability. Simultaneously, store managers are generally liable for stolen merchandise and other sources of shrinkage. This encourages managers to purposely keep shelves "empty" or lock up merchandise behind the counter. Furthermore, when store managers are penalized for high inventory they will reduce stocks despite the risk of out-of-stocks. For example, at a store in Poland we found statements such as "inventory is the key driver of costs." At the same time the store manager grumbled:

> I have to keep shelves fully in stock. That is my responsibility. If a buyer notices out-of-stocks, I can get fired.

However, since inventory was more visible than out-of-stocks and the cost of lost sales unknown, hiding out-of-stocks in his store solved his dilemma. Hence, rather than penalizing inventory, stores should focus on on-shelf availability.

Incentive system

An even larger problem than the mixed incentives to managers, is the disconnect between buyers and store managers. Buyers determine which products should be held by the stores, but often they do not base their decisions on store sales information, nor do they account for the store managers' understanding of their shoppers' behavior. Rather, the buyers' decisions are governed by a range of functional factors, including purchasing term negotiations, margin, and volume-based performance incentives. To compensate for this, many stores deviate from the list of products prescribed by the buyers at the headquarter. They do not reorder listed items after they have sold out, and they order additional unlisted products. To avoid such costly practices, category management teams operating at retail headquarters need to have a way to incorporate the local store needs.

Roles and responsibilities

To make everyone responsible for on-shelf availability is to make no one responsible. There is immense benefit in dividing the responsibility for inventory control and

International Journal of Retail & Distribution Management
Volume 31 · Number 12 · 2003 · 605-617

customer service. Additionally, retailers must communicate that the introduction of new store technologies does not threaten jobs. One common occurrence with the introduction of new technologies is that many store managers are afraid that sophisticated computer software not only replaces some of the workload previously carried by store personnel, but also diminishes control by store management. In actuality, these systems put more power into the store managers' hands as they now deal with key trading issues at a local level. Most importantly, these systems will support stores in delivering a better customer service.

Flexible staffing

Retailers also need to reconsider their staffing rules since inflexible scheduling can increase out-of-stocks. At stores such as Safeway and K-Mart, for example, staffing budgets and schedules were based on sales projection rather than the requirements of store operations. In retailing, however, shelf-replenishment staffing needs to precede and/or coincide with customer arrivals. Hence, when shelves sold their entire inventory during peak sales times, there were people to serve customers, but nobody was there afterwards to replenish the shelves. In response, K-Mart and Safeway now align staff scheduling to replenishment peaks, as well as to shopper peaks.

Change culture

And finally, to motivate associates to have a real passion for availability, retailers such as Delhaize or Safeway have begun to create a culture with a passion for availability. They have launched comprehensive initiatives involving supply chain and store associates, internal competitions and awards. By setting tough targets, aligning incentives and controlling the process, they have achieved step change in employee attitudes to availability.

Conclusions

What does one conclude from all of this? There are many possible lessons:

- First, all of the studies we examined point to a common concern: OOS has been, is, and will continue to be a problem. The aggregate extent we found of 8.3 per cent (and the similar results found through other industry studies) continue to (and should) raise alarms throughout the FMCG industry.
- Second, OOS is costly. While the total costs to the supply chain have not been investigated, we found that worldwide, average sales loss due to OOS is 3.9 per cent.
- Third, not all OOS are the same. A slow-moving item that is OOS will be less costly to the store than a fast-moving item. Similarly, consumer substitution varies extensively among categories, affecting the retailer and manufacturer to different degrees.
- Fourth, duration of OOS is important. While techniques for measuring the duration of OOS are fairly new, the impact of long-term OOS problems impacts not only the sales of the item, but also the likely potential of a consumer to switch stores.
- Fifth, most of the responsibility for lowering OOS rests in the retail store. Unfortunately, manufacturers have placed their resources towards lowering OOS on solving supply-chain problems. This focus will need to shift if the problem of OOS is to be effectively addressed.
- Sixth, it is important to understand the limits of projections based on the findings of this research. The data were not collected in such a way that macroeconomic projections of the total cost to the industry can be confidently projected from these findings. However, any retailer can utilize the findings here to use as a benchmark comparison when addressing OOS items. For example, if the retailer estimates sales losses as greater than our estimated average of 3.9 per cent due to OOS items, they will likely have a large payoff from addressing the issues. Alternatively, if the retailer estimates sales losses as much less than 3.9 per cent (for example if the losses are about 2.1 per cent), then the payoff may be much lower.
- Seventh, as we examined consumers across the world, we found that consumers are indeed localized in their choices. However, when their choice is taken away through a item being out-of-stock, consumers behave in a similar manner globally. In the end, the

International Journal of Retail & Distribution Management
Volume 31 · Number 12 · 2003 · 605-617

retailers (and their supply chains) that satisfy customers on this issue will be those more likely to succeed.

In summary, improving availability is imperative but it comes at a price. Reducing out-of-stock requires initiatives that cut across functional boundaries which can require a fundamental rethinking of retailer processes. Thus, we were not surprised that some of the retailers and suppliers did not follow through with actions after having measured the extent of out-of-stock. We believe most retailers have not yet reached the threshold where it will cost them more not to reduce the incidence than it will cost them to invest in solutions. Clearly, there is a minimum out-of-stock rate where cost to reduce further is more than the benefit. In fact, in some categories occasional out-of-stocks can be even beneficial as certain availability may eventually increase price competition. In these instances a retailer can gain more by stocking less. Regardless, out-of-stock (or its counterpart, availability) remains a major issue for not only the retailers, but also for all parties in the supply chain. As many retailers begin to address out-of-stock with the newer, technologically sophisticated solutions, they are setting new standards. Consumers will soon expect these standards to be met as the level required to earn their business.

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Appendix 1. The research study description

This paper is based on a report entitled, *Retail Out-of-Stocks: A Worldwide Examination of Extent, Causes, and Consumer Responses* (Gruen *et al.*, 2002). This report presents what is believed to be the largest and most current single compilation of findings regarding the extent, causes, and consumer responses to retail out-of-stock (OOS) situations in the fast-moving consumer goods (FMCG) industry. This is also the first study that enumerates OOS on a worldwide basis. Funded by a grant from the Procter & Gamble Corporation, the study was conduted in 2001-2002.

The inputs for this report come from 52 studies that examine OOS. This includes previously published results of 16 industry and academic studies as well as the results from an additional 36 studies proprietary to this report. To provide a sense of the extensiveness of the studies that were used to develop this report, consider the following:

- Number of retail outlets examined: 661.
- Number of FMCG categories included: 32.
- Number of consumers surveyed worldwide: 71,000.
- Number of countries represented: 29.

International Journal of Retail & Distribution Management
Volume 31 · Number 12 · 2003 · 605-617

- Studies addressing extent of OOS: 40 (of 52 total studies).
- Studies addressing the root causes of OOS: 20 (of 52 total studies).
- Studies addressing the consumer responses to OOS: 15 (of 52 total studies).

The basic process used in the research followed five general steps:

(1) Collect and review published and unpublished OOS studies worldwide.
(2) Collect and review related research on OOS from academic and applied sources.
(3) Delineate findings from research.
(4) Isolate limiting factors.
(5) Synthesize findings and determine areas of consensus, trends, key findings.

More specifically, to develop this report, information was collected and synthesized from the following general sources:

- Previously published industry reports and studies of out-of-stocks.
- New data provided from two large-scale consumer studies conducted in 1999-2000 (one in the USA and a second identical study conducted in 19 countries outside of North America).
- New data provided from studies of three retailers' scanner and inventory data conducted in 1999-2001.
- New data provided from a series of traditional store audit studies conducted in 1998-2000.
- Various academic articles published from 1962-2001 on out-of-stock studies.
- Industry press and articles that addressed and/or reported on other out-of-stock studies.

The academic and industry studies provided background and theory regarding the way out-of-stocks has been measured, the likely consumer responses to out-of-stocks, and the value of addressing the issue at the retail level. The majority of the academic studies focused on consumer responses and provided important theoretical and categorical approaches to examining consumer response data. The industry studies were examined to provide baselines for evaluating the information we would then examine from the new studies. The review of the industry studies led us to systematically arrange the information contained in all studies into the following categories:

- Methodology.
- Categories examined.
- Extent of out-of-stocks found.
- Consumer responses.
- Root causes identified and assigned.
- Efforts examined/suggested to address out-of-stocks, the costs and returns.

The logic of the arrangement is straightforward. First, the methodology was reviewed to determine any likely limitations or concerns faced when examining the data from the study. This methodology also provided a way to categorize the studies. Second, the categories examined were listed in order to make comparisons among the studies that examined the same or similar categories. Consumer responses to OOS situations tended to vary widely among categories, thus category identification is a key variable.

Following general categorization, examination of the extent of out-of-stocks in the report was the logical place to begin, since it answers the question: "Is there a problem?" After identifying the extent, the logical next question is: "Does the OOS matter?" This is answered by examining the consumers' responses to OOS situations. The search for the cause to the problem leads to the next question: "Who is responsible for causing the problem?" This leads to the final questions: "Can and should it be fixed? If so, how?"

Appendix 2. Measuring out-of-stocks

The definition of what makes an OOS affects the extent that it gets reported in studies. While many variations exist, recent studies tend to settle on a consumer-based definition. Two general alternative definitions emerge based on the method of measurement. As the first and most accepted approach, the OOS rate is measured as a percentage of SKUs that are out-of-stock on the retail store shelf at a particular moment in time; i.e. the consumer expects to find an item that the store usually carries but it is not available. Normally, the OOS rate is reported for each category individually and then the categories are averaged (normally unweighted average) to create and report an overall rate for the study. Due to the number of studies that have used this approach, a major advantage of using this method is the availability of excellent baselines. The limitations to this type of

International Journal of Retail & Distribution Management
Volume 31 · Number 12 · 2003 · 605-617

measurement include the arbitrary nature of selection of the categories, frequency and timing of the audits, duration of the study and human error that can and does enter from many sources. In addition, differences in sales volume are not taken into consideration hence this definition does not indicate lost sales.

A second definition of an OOS is the number of times a consumer actually looks for the SKU and does not find it. The percentage rate is calculated as the number of times the consumer does not find the SKU divided into the sum of the times the consumer does find the SKU plus the number of times the consumer does not find it. Instead of relying on physical audits, the second approach is measured through the use of models that determine OOS rates from store scanner and inventory data. This view provides the advantage of determining the extent of out-of-stocks that actually matter to the retailer and the upstream supply-chain members. The major limitation of this method is that the OOS rates are estimates based on historical sales patterns, and thus can only be calculated for SKUs that sell with a minimum frequency (thus cannot detect OOS for very slow-moving products). Few studies have used this method, and therefore baselines do not readily exist.