

# The Negative Consequences of a Conventional Supply Chain

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*"We can't solve problems by using the same kind of thinking we used when we created them."*  
- Albert Einstein

## Introduction

This paper explores the cause and effect relationship between problems that exist in modern supply chains. More than that, the fact that these negatives actually spring from a single misunderstanding in our thinking is revealed. Then, to provide focus and shed light on the relative importance of these issues, an example is given that quantifies their financial impact. Knowing the central cause and having a strong incentive does not yet guarantee that we are on a path out of the woods. Since most people follow "the rules" without seriously questioning them, we must think deeply about how to gain buy-in in order to permanently change for the better.

## A list of Evils

If you ask people in lots of companies, your ears will tune into a perpetual refrain. Different people in diverse industries use various words but, conceptually, the meaning is consistent. The following list is comprised of some of the most common.

- *Not Enough Profits*
- *Not Enough Time in the Day*
- *Disposals*
- *Carrying Costs*
- *Shortages*
- *Costs Too High*
- *Inventory Promotion Sales*
- *Plant Rescheduling*
- *Returns*
- *Too Little Cash*
- *Operations Disrupted*
- *Surpluses*
- *Sales Too Low*
- *Expediting*
- *Limited Options*
- *Lost Sales/Clients*

It is easy to see that some are connected. For example, *Shortages* are a cause of *Expediting*. If a company wanted to reduce stubborn *Surpluses*, one of the consequences might be *Inventory Promotion Sales*.

The cause and effect of other connections are a little more complex. For example, *Expediting* could cause more than one effect. If it is frequent, it could be a contributor to *Not Enough Time in the Day*. Since there are costs associated with *Expediting* it can result in *Costs Too High* and also *Plant Rescheduling*. If you play the game of figuring out the connections, the diagram in Figure 1 will be the result.



Figure 1

I have excluded other elements which would be necessary to make the cause and effects rigorously logical. It is enough to present a conceptual framework that someone familiar with their own company's situation would recognize.

### The Underlying Needs

Holding the wrong inventory is obviously the cause of *Shortages* and *Surpluses*. We know people are doing this, because, if they weren't, the list of undesirable effects would vanish with the root cause, and nobody would be grumbling about them. What isn't so obvious are the reasons why most companies hold the wrong amounts. People are neither stupid nor crazy. There have to be good reasons for holding too much or too little. If there weren't, people wouldn't be doing it.

A hypothesis is that people in companies are being pulled in opposing directions simultaneously. They feel compelled to reduce inventories for obvious reasons: if they do so, the ills caused by *Surpluses* disappear. Just as obviously, the evils caused by *Shortages* will go away if there are none. Decision makers know what to do but not when to stop doing it. It takes time to get inventory in – the lead time. After making a decision to order or not to, the situation can change, making *Surpluses* into *Shortages* or vice versa. Wait. Doesn't your forecast solve that problem? It would if it were always right. Unfortunately, the opposite is true; the forecast is always wrong.

In general, the damage done by too little inventory is worse than the damage done by holding too much. Therefore, we can predict that average inventories will be too high, because managers err on the side of holding too much and placing orders less often. Still, there is a need to compromise to avoid the pain caused by *Surpluses*. This leads us to predict that, at least for some of the items held in stock, there will be *Shortages*.

## An Example, Please

Here are financials for a manufacturer called XYZ Company. This company manufactures products which they hold in inventory until their customers place orders. XYZ is in a competitive industry. Other manufacturers make similar products, which they also sell from stock. There is heavy pressure on XYZ to lower prices. Over the years, XYZ's sales have grown but their profitability, as a percentage of sales, has fallen. Figure 2 shows a summary of XYZ's current income statement.

(millions)	Annual
Sales	\$100
COGS	50
Margin	50
Op. Exp.	48
Net Profit	\$2

Figure 2

When the current shareholders of XYZ bought the company, times were better. Since then, they have struggled to hold enough inventory to be competitive and to make the needed improvements to the plant. Much less has been available to pay off debt. Their balance sheet is summarized in figure 3 below.

(millions)	Assets	(millions)	Liab.
Cash	\$0	A/P	\$10
A/R	12	Debt	58
Inventory	20		Equity
Plant	48	Worth	12
Total	\$80	Total	\$80

Figure 3

XYZ needs cash and is already heavily leveraged. Their debt to equity ratio is almost 5 to 1. It is unlikely that they can borrow more money given their current profitability. They owe their suppliers for 73 days worth of the raw materials. Producing cash by paying suppliers more slowly is risky. Any further delay in payments and the suppliers might refuse to ship more raw materials, which would cause massive *Shortages*, enough to drive *Sale Too Low* to meet the company's breakeven point. They can't offer their customers a discount to encourage them to pay faster. Just a 1% discount would eat up half of current profits. The shareholders are reluctant to sell more shares, because of *Not Enough Profits* the price will be low, if they can find a buyer at all.

Their best short term source of cash is to reduce their inventories. They hold almost 5 months worth, while their industry keeps more like 4 months worth in inventory. Still, they worry that lower inventories will mean more *Shortages*. For XYZ, the drives to both increase inventory and reduce it are strong. By how much is this dragging down their financial performance? It is impossible to calculate precisely but relatively easy to arrive at a conservative number – one that we agree is too low.

Let's start with the assumption that XYZ can reduce their inventory holdings by half<sup>1</sup>. This is a gain of \$10 million in cash from inventory. Once done, *Carrying Costs* will decline by 5% of \$10 million, or \$500,000 per year, if the cash is used to pay down debt. If we assume a reduction in *Surpluses* obviates the need for *Inventory Promotion Sales* amounting to 2½% of XYZ's sales at a 20% discount, then the impact is another \$500,000 per year. Likewise, annual *Disposals* might be reduced by 1% of the current average inventory held. Fewer *Surpluses* mean less exposure to *Disposals* – \$200,000 in additional savings. It isn't hard to imagine that a \$100 million company spends \$200,000 per year due to *Disrupted Operations* and \$100,000/yr on *Expediting*. With so many *Expedited* orders, there is *Not Enough Time in the Day* to Negotiate. In a company that has used layoffs to protect profitability, the capacity is just not available. I estimate that this factor results in costs of goods sold that are 2% high. The company buys \$50 million/yr in raw materials and 2% of that is a cool million lost from profits. The biggest impact is *Lost Sales and Clients*. If XYZ is missing just 5% of their current sales, the bottom line impact is the gross margin on \$5 million of sales, which amounts to \$2.5 million/yr. The table in figure 4 below summarizes the potential gain in annual net profits.

(millions)	Δ Net Profit
Carrying Cost	+ \$0.5
Invt. Promo. Sales	+ 0.5
Disposals	+ 0.2
Disrupted Ops.	+ 0.2
Expediting	+ 0.1
No Time to Negotiate	+ 1.0
Lost Sales/Clients	+ 2.5
<b>Net Profit Boost</b>	<b>+ \$5.0</b>

Figure 4.

This would mean a dramatic change in fortunes. Profits increase to 350% of their current level, plus a one-time cash influx of \$10 million. The total one year cash flow is equal to 7½ years' profits. And, this is a conservative assessment. Do other opportunities have this kind of potential? This should be the only priority for XYZ Company.

### No More Compromises

We want an approach that calms fears by virtually eliminating *Shortages* while, at the same time, allowing a company to hold much less inventory. Hold on. Don't mutter "impossible", shake your head and stop reading. Not only is it possible, it is easy. What's hard is shaking the erroneous assumption that has led businesses away from the proper path which has been right in front of them for years, the assumption that holding more inventory offers better protection from *Shortages*. The opposite is true.

There are many interrelated reasons why holding more inventory actually makes it more likely that *Shortages* will exist.

<sup>1</sup> Demory, Erin F. and Camp, Henry F., *The Benefits of Moving from a Push to a Pull System* explains why it is reasonable to expect a 50% or greater reduction in inventory. The paper can be found at [www.IDEAllc.com](http://www.IDEAllc.com).

Storage areas may be full, leaving no room for more product. If so, orders are delayed, driving increased *Shortages*.

In some industries like retail, there is an open-to-buy amount which is reduced if inventories are high in dollar terms. No open-to-buy dollars, no orders. Unfortunately, that makes *Sales Too Low* because the highest movers are most likely to suffer *Shortages*.

*Surpluses* of an obsolete product typically delay orders for a new and improved replacement. Hot new products remain in *Shortages*.

Ordering an item does not happen in a vacuum. For instance, orders to a supplier are seldom for a single item. Usually, suppliers provide more than one product to their customers. Some items are fast movers while others move more slowly. Here is a common scenario. An order for multiple items has recently been received. Since the order was placed, a slower mover has caught on, its demand is increasing. The recently received order did not include enough of this newly popular item; inventory quickly gets low. Here is the rub. There is no need for more of any of the other products the supplier offers. Those items are only part way to their reorder points. Ordering the new average mover alone may mean a higher price and freight charges. On the other hand, reordering a full complement of items from the supplier, to avoid making *Costs Too High*, amounts to consciously creating *Surpluses*. Waiting means taking even greater risks of *Shortages*.

A similar but even worse situation results when a fast mover's demand falls off. In such a case, before it is appropriate to reorder, many other products experience the risk of *Shortages*.

The fact that orders for many products are interrelated explains only one of the three serious flaws in F. W. Harris' 1913 formula for an "Economic Order Quantity" – the basis for max/min and reorder point systems. The other two erroneous assumptions are that the rate of demand is constant (which hasn't happened yet) and the ludicrous notion that a fixed cost is expended with every order<sup>2</sup>.

The correct approach has three main parts:

1. Reduce replenishment time<sup>3</sup>, as long as too much additional cost is not added. An easy way of doing this is to order smaller quantities more frequently.
2. For each item, establish an inventory buffer based on the most consumption expected before more can be procured, then add more based on how late replenishment might be. Learn to stop ordering when the quantity on-hand plus

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<sup>2</sup> To pop this balloon, it is only necessary to ask yourself if the cost of placing an order disappears if purchasing decides not to place it. Does payroll decline? Alternatively, if an order is split into two parts, does that mean costs to place the orders doubled? Balderdash! The cost of placing orders, over an enormous range, is largely fixed by the number of people in the department. Placing twice as many purchase orders or half as many can be easily done with the same staff, overhead and similar expenses.

<sup>3</sup> Replenishment time, as IDEA defines it, is the average time between deliveries (not lead time – the time it takes to get an item after placing an order). Placing orders more frequently means deliveries occur more frequently reducing replenishment time automatically. Average On-hand inventory is proportional to replenishment time.

the quantity inbound exceed the buffer size. Order quickly when the quantity on-hand plus the inbound are less than the buffer target.

3. Adjust buffers periodically as reality changes. Increase buffer sizes by one third, if the on-hand amount is only 25% of the target. Decrease the buffer by a third if inventory remains in the top third of the buffer for a full replenishment time.

Since the mechanism is covered in detail in the previously mentioned paper, *The Benefits of Moving from a Push to a Pull System*, we will not delve more deeply into the concepts behind the solution and why it works.

## Putting Theory into Practice

Any initiative that mitigates so many problems for so many different people in a company should be easy to implement. *Wrong*. The move represents a significant departure from the current mode of operation. No company starts from a blank slate. The inertia built up over years of using your current approach must be overcome. Some familiar habits, which hard work has ingrained, must be left behind. Therefore, it is important to fuel the change process with positive results quickly. Substantial early improvements make a compelling case for buy-in across an organization. Likewise, it is important to “get it right” the first time, as failures or misfires will increase resistance to the change and delay results.

Once there is buy-in to proceed, there are three necessary components to a quick and effective implementation:

- **Software**
- **Training**
- **Leadership**

### Software

Unless you only have to manage inventory buffers for a few products, managing the buffers requires software. Certain capabilities needed to make the model work are not present in commercially available or in-house IT systems. Precise explanations of how to properly set and manage inventory buffers is available in the public domain.<sup>4</sup>

Fortunately, quickly and easily interfaced software to bridge this gap is commercially available.<sup>5</sup> The benefits of using commercially available software are substantial:

- The elimination of the obstacle (the cost and delay) of creating, testing and implementing the necessary software functionality
- The comfort of leaving existing processes and software unchanged
- The ability to simulate the benefits of supply chain modifications before committing money and resources to such initiatives.
- A scalable replenishment solution that doesn't rely on spreadsheets (which are hard to share and subject to transcription errors).

### Training

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<sup>4</sup> Burch, David J., *How IDEA Buffer Management Works*, which can be found at [www.IDEAllc.com](http://www.IDEAllc.com), explains the mechanism. It is also fully detailed in *TOC Insights into Distribution* which can be purchased for a nominal fee at [www.TOC-Goldratt.com](http://www.TOC-Goldratt.com).

<sup>5</sup> Potential providers are IDEA, LLC. in the US, Vivacadena in Holland and Inherent Simplicity in Israel.



A critical element is the design and delivery of a training program, the goal of which is to help people understand the need for and to adopt the necessary paradigm shift. It is important to create a sense of ownership in the new paradigm. By leading managers through a process of self-discovery, they decide on their own the virtues of the new way, creating the confidence and motivation to change.

### Leadership

The third major deliverable is expertise. Someone internally must gain the knowledge of how to synchronize the supply chain to actual demand. This person must lead the implementation around the many pitfalls which can temporarily, or even permanently, derail any change process. Experience shows that results are much better, are achieved much faster and are much more sustainable when people have the support and guidance of a true expert.

### Summary

In the case of XYZ Company, an estimate of the damage done to net profits by an unsynchronized supply chain is over 5% of sales. Your business will be different but similar. The investment necessary to accomplish this dramatic result is actually a negative amount – the inventory recovered is far more than the cost of the initiative to cause the change. That is your motivation. Archimedes said, “Give me a long enough lever and a place to stand a fulcrum and I will move the world.” This paper reveals the Archimedes Point: the unnecessary conflict between trying to hold more inventory and less inventory at the same time. That is the *place to stand the fulcrum*. I hope the ideas presented in this paper and the others referenced, herein, provide you a *long enough lever*. All that is needed now is *the world* – starting with your company.

IDEA’S WAY OF THINKING	IDEA’S METHOD
<ul style="list-style-type: none"> <li>• Neither an accurate forecast nor changing vendors is required for success</li> <li>• There is a way to both increase sales and reduce inventory</li> <li>• Supply chains sell less when clogged with inventory</li> <li>• In the long term, unless the supply chain sells more no link can sell more</li> <li>• We must help clients gain buy-in internally and with supply chain partners</li> <li>• The majority of our fees are based on improved return on inventory</li> </ul>	<ul style="list-style-type: none"> <li>• Verify the existence of inventory imbalances and the benefits of moving from a “Push” to a “Pull” system</li> <li>• Gain top management buy-in to the assessment and support of the approach</li> <li>• Build knowledge and understanding across the supply chain, at all levels</li> <li>• Utilize systems that deliver actionable information, integrated with existing software</li> <li>• Work with you until expected results are achieved</li> <li>• Share the tools and know-how to continually improve results</li> </ul>
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