nVentic

Bridging the gap between theory and practice

Inventory science is a field well represented in the academic world. From at least Harris (1913)[1] onwards, work has been done to explore how to calculate optimum inventory levels: more than a hundred years, therefore, of research.

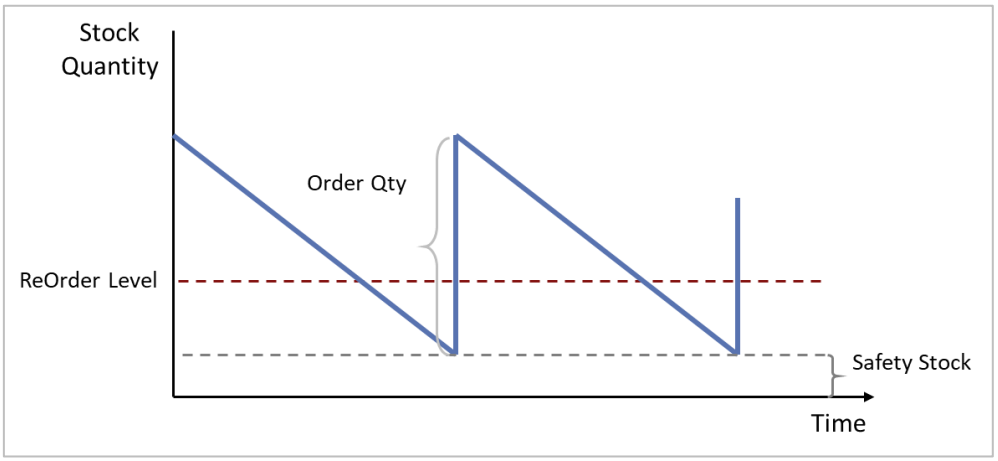
And yet if you look at what is going on in organizations today from a practical perspective, you will find surprisingly little of that research being applied. In this white paper we're going to explore why this is, what impact the failure to apply inventory optimization principles has, and finally what we're doing at nVentic to help bridge the gap.[2]

Mind the gap

So why is inventory science so popular with academics but under-developed in practice? In a word, complexity. Academics love a good challenge. And there is sufficient complexity in inventory to make it an attractive discipline.

Outside of academia, however, complexity is usually not so welcome. If something is difficult or onerous to do, and one can get by without doing it, there is a strong temptation to leave it alone. Let us have a look at why inventory science is so complex.

The image below is familiar to most students of supply chain:



On the basis of a few key parameters, we can determine how much should be ordered, and when, to maintain optimum inventory levels. We can also determine, based on a few other parameters, how much safety stock to keep.

This is a simple model, and not too difficult to follow, but in our experience, there are few organizations using it to any great extent, if at all. There are a number of barriers to using it in practice:

1. Some of the parameters are hard to quantify. To build the model above for any SKU we need to be able to quantify re-order costs, holding costs and shortage costs (the forth cost parameter, unit cost, is usually easier to quantify)

2. We need to layer variability into the model. Demand is not uniform or constant, and it may not even demonstrate normal distribution. The same may well be true of lead time. This demands some more advanced mathematics
3. Everything in this model needs to be done SKU by SKU. Organizations often have thousands of SKU's, so the data burden alone is often a roadblock
4. The mathematical model is too precise. The underlying equations will deliver results in fractions, but in reality, organizations need to deal with minimum order quantities, stock controls that aren't instant, and so on

We will come onto what nVentic does to counter these problems below, but first let's consider what impact a failure to apply inventory optimization principles will have.

Pile them high, sell them cheap

When Harris was writing, in the early 20th century, inventory was considered a good thing. But over the last 50 years in particular, leanness has come to be considered a virtue. In a world where customers expect greater choice, and constant product innovation, and are only a click away from finding it online, holding too much inventory can be very risky. Holding inventory costs money and ties up working capital.

Of course, you can improve your inventory situation without applying optimization techniques. Measures such as shortening lead times and using consignment stock will make it easier to operate with less inventory on your books. But you still have to make decisions in terms of how much stock to hold, how much to order and how often. If organizations are not using optimization models, how do they do this?

If an optimization model is not used at all, the alternative is often a simplified concept of how many days' or weeks' stock you need to hold. Some ready reckoning will factor in average demand, demand peaks, perishability if appropriate, lead times and convenient (for logistics, production or purchasing) lot quantities. Although even doing this requires quite a lot of manual effort and data manipulation which isn't always easy.

Accordingly, some organizations help themselves by using planning software which will leverage at least some of the mathematics we describe above. However, as we have already noted, these models are very sensitive to the input data, so using tools can be prone to error. We have seen many instances of software being overwritten or ignored because early experience with it led to undesirable outcomes.

Our view is that most organizations are not doing much in terms of inventory optimization. The 2017 REL Europe Working Capital Survey suggests €350bn is tied up in excess inventory in the biggest 1000 companies in Europe alone. And what is harder to quantify because not publicly reported, but no doubt an even bigger concern to many organizations, are the sales lost due to shortages.

That £350bn of tied up working capital is a wasted opportunity, since it could be put to more interesting uses, such as acquisitions, paying down debt, or equity buy-backs.

Moreover, as the holding cost of inventory is typically in the region of 25%, that's also €87bn of unnecessary cost. And that's before factoring in the impact of lost sales. If companies haven't addressed this sooner it is surely not only because of the difficulty, but also because most of their competitors haven't either. Yet it represents a major, largely untapped, opportunity to gain competitive advantage.

Build a bridge and get over it

At nVentic, our mission is to close the gap between the academic theory and practical application of inventory science. So what do we do to enable this?

Firstly, we have built analytical tools which will do all of the calculations for you automatically based on historical data, so the opportunity for manual error is removed. Secondly, we work with clients to actually optimize their inventories. We believe that the tools in isolation have limited value but by working collaboratively with our clients we help them not just to realize the benefits identified, but also to build internal capability for sustainable improvement.

We come to inventory optimization with a strong command of the mathematics, which we have embedded in our own analytical tools, but moreover with many years of helping organizations make concrete improvements in inventory management.

In terms of dealing with the 4 barriers to applying the mathematical model in practice, we apply the following approach:

1. (Parameters which are hard to quantify.) Here the key is approximation. Sensitivity analysis shows that modest changes in these parameters will not make significant differences to the outcome. We can advise clients on what to use here based on experience
2. (Factoring in variability.) This is vital and we use advanced algorithms to deal with it. However, there are also practical ways to simplify it if necessary in the short term by looking at maximum values
3. (Dealing with large data sets.) We have developed tools which take raw data from your ERP system(s), and then automatically transform them and perform over 100 mathematical routines on them. The output is an overall quantification of potential, and the segmentation of your SKU's by value/volume and variability (ABCXYZ analysis). In addition, our tools allow you to drill down by SKU: historical stock evolution, key parameters and deltas (how much stock did you have compared to how much you optimally should have had?) We can perform this analysis in a matter of days even on very large data sets
4. (The mathematical model is too precise.) We deal with this in two ways. Firstly, we automatically round values up depending on known constraints such as packing sizes or minimum order quantities. Secondly, we recommend an incremental approach to making improvements. Rather than jumping straight to the calculated target, aim to

build in a little spare buffer in the first instance and work towards optimal levels incrementally, focusing on the most valuable SKU's

We find that even taking a conservative approach, significant double-digit improvements are possible for most organizations in the first year, with plenty more to come in subsequent years. The transparency that our tools provide typically enables a certain number of quick wins – identifying excess stock holdings which can safely be drained. And then we work with clients to interpret the data and implement the underlying changes which are necessary to embed optimized inventory management. In this way they build internal capability to make year on year improvements with an increasing command of the subject.

Bridging the gap between theory and practice in inventory management is something we believe in passionately. To truly optimize inventory takes time and effort, but significant improvements are possible quickly and, thanks to the technology we have developed, easily. If you would like to build a bridge in your organization, reach out to us for a conversation today.

For more information about nVentic, please see our website www.nventic.com or contact us for an initial discussion: information@nventic.com

Notes

1 Ford W. Harris, "How Many Parts to Make at Once." *Factory, The Magazine of Management* 10 (2), February 1913, 135-136, 152. And "How Much Stock to Keep on Hand." *Factory, The Magazine of Management* 10 (3), March 1913, 240-241, 281-284.

2 Another topic that we're not considering here is why Finance departments tend to abandon the topic of inventory management to Operations given how strategic working capital is. This in itself leads to inventory being neglected as a strategic asset, with more emphasis on the tactical topic of inventory control. See also Linda G. Sprague and Marc J. Sardy, "Inventory Management: Some Surprising news about classical views on inventory and some non-classical responses to traditional practice.", *Inventory Management – non-classical views*, ed. M.Y. Jaber, 2009, Chapter 2.