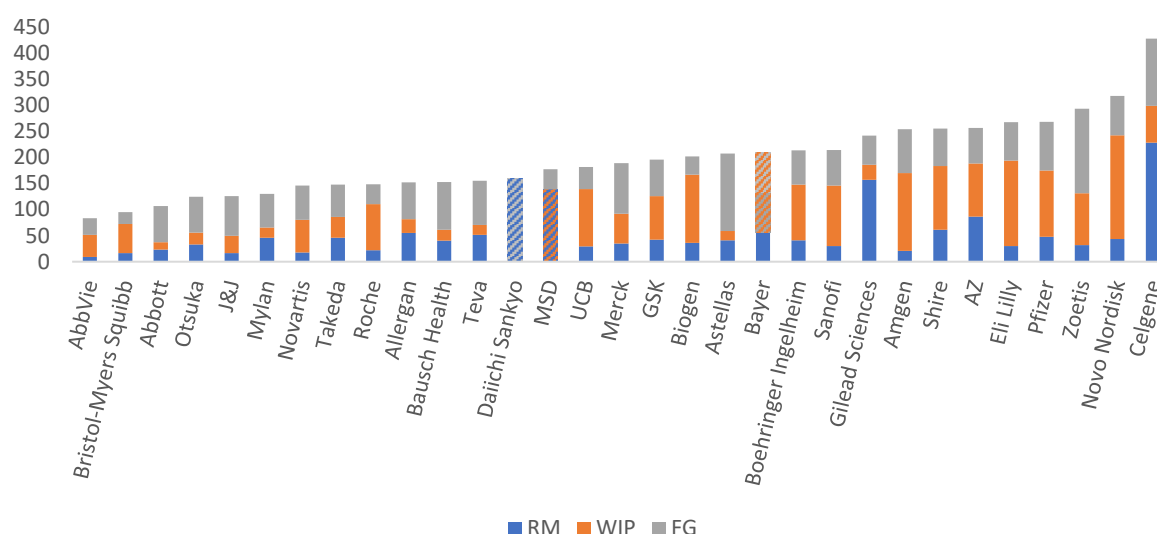


The inventory challenge for the pharmaceutical industry

A multi-billion-dollar opportunity

Lies, damn lies and statistics. The collection, presentation and interpretation of data is fraught with risks. But nevertheless, we are going to open with some analysis we have done of inventory performance (measured by Days Inventory Outstanding) amongst pharmaceutical companies.

DIO selected pharmaceutical companies 2017



Yes, this is a crude metric with all sorts of limitations (for a fuller discussion, see the note at the end of this white paper)¹. But as with most such approximations there is a grain of truth underlying the comparison. Companies don't normally report shortages, so it is a shame we can't overlay service level onto this chart, but we believe that two things are evident from these metrics:

1. Median inventory levels for the industry are high - ~180 days DIO represents 6 months' worth of stock on hand *on average*
2. There is a striking range of inventory levels between companies, even given the differences in their product mix, supply chains and reporting practices

Given that the companies in this list have, on average, more than €3bn in inventory each, even a 20% reduction in inventory would represent nearly €17.5bn in capital collectively freed up for better uses: further R&D, increases in inventories of medicines in short supply, and so on. This is therefore a big opportunity for the industry as a whole and especially for companies lagging on this measure.

In terms of benefits, inventory optimization is immediately compelling: reduce shortages, reduce waste, reduce costs, improve service levels and free up working capital! And yet a lot of organizations, not just pharmaceutical companies, find inventory optimization difficult. For one thing it is reliant on big data, for another the mathematical principles involved are a little more complex than the basic numeracy which will get you through most things in business. Furthermore, inventory optimization depends on strong coordination throughout the value chain, from demand forecasting through to third party supply. A concerted effort is required to deliver sustainable improvement.

The sweetest pleasure arises from difficulties overcome

Pharmaceutical companies are faced with a number of particular challenges when it comes to inventory optimization:

- the need to maintain availability of products which are frequently essential to health or life itself
- an imperative to maximize sales during patent lifecycles
- strict regulation of their whole value chain, from R&D through to marketing
- perishable raw materials, intermediates and finished goods
- long manufacturing lead times
- a fragile production process
- reliance at times on a very small number of supply options

For these reasons, optimizing inventory is more difficult for pharmaceutical companies than, say, the average industrial manufacturing company. To take one example: batch size is a key lever in optimizing inventory. Calculating how much of something to produce and how often is an important step in optimizing inventories. But for a pharmaceutical company this is not so easy to change. For one thing the production process is highly reliant on very precise quantities and scaling up or down is not certain to deliver the desired results. And for this reason, a manufacturing facility's regulatory approval to produce a given drug is limited to pre-determined batch sizes. Changing a batch size can therefore be a lengthy and expensive process.

Besides the difficulty involved, there has perhaps been a tendency to overlook inventory optimization due to the financial structure of pharmaceutical companies' operations. Cost of sales as a percentage of revenue is low compared to almost all other industries. This is no doubt why pharmaceutical companies seem happy to write down or write off eye-wateringly large amounts of obsolete inventory, sometimes several hundred million dollars' worth a year. Who cares, if you're still making a healthy margin overall? Indeed, the priority for many pharmaceutical companies is to reduce shortages, not to reduce excess or obsolete inventory. In this sense the overall market is well aligned – making sure drugs are available is good for patients as well as sales. But where a class of drugs, such as antibiotics, ceases to be a strong generator of profit, shortages are increasingly a risk.

There is a difference between having very high inventories because you're consciously trying to deliver very high defined service levels and having very high inventories because you haven't optimized your inventory management. The difference between the two is often measurable in shortages. If your balance sheet shows you have months' worth of inventory on average but you seem to spend all your time dealing with shortages then you're in the latter camp. Producing too much of one product not only leads to waste in that product, but it means time, resources and capacity have been misallocated. Shortages may indirectly have been caused in other products and more money could and probably should have been spent on other things.

The tide is now changing for pharmaceutical firms due to a number of macro-trends affecting the industry. Payer pricing pressure, patent cliffs, and competition from generics and biosimilars are all putting much more pressure on margins than has historically been the case. The relative decline of blockbuster drugs in favour of genomics and orphan drugs, as well as a shift in business model towards healthcare, implies greater SKU proliferation and therefore complexity. The importance of supply chain efficiency is therefore growing, and pharmaceutical companies have a great opportunity to develop competitive advantage using this lever.

Physician, heal thyself

A report by the Access to Medicine Foundation from May 2018² lists a step change in inventory management as number one in its list of what pharmaceutical companies can do to improve their supply chain performance. It acknowledges that great progress has already been made in improving forecast accuracy, sharing data across the supply chain, and visibility of where inventories are held. But inventory management needs to go much further than this. This is a useful distinction, but based on our experience of talking to a large variety of companies, both within the pharmaceutical sector and further afield, not one that is always fully appreciated.

Real time, or close to real time visibility of inventories is very useful for the tactical, day to day management of inventories. Similarly, sharing data and making improvements in forecast accuracy should help to reduce the bullwhip effect and facilitate stable planning and scheduling. But inventory optimization can go further than this. It can provide organizations with a much better basis for understanding what inventory levels to target depending on the variability and sporadicity of demand as well as other key areas of variability in the supply chain. When looking at the supply chain as a whole, it can also help determine the best stocking locations for different types of products.

Moreover, inventory optimization is not totally dependent on real time inventory visibility or even forecast accuracy, although it is sometimes treated as if it were. As long as you have historical data of actual consumption you can carry out a highly valuable evaluation of how well you're performing product by product and where you need to take action to prevent shortages or overstock situations. At nVentic we have automated this evaluation, which is otherwise labour-intensive and error prone, through a series of algorithms which can be applied to very large data sets. This gives companies quick visibility of target inventory levels SKU by SKU, along with actuals. Our customers are typically able to deliver significant double-digit reductions in excess inventory while improving or maintaining service levels.

This kind of improvement can make all the difference for stretched supply chains such as that for antibiotics where the need is most acute, but it also represents a huge potential for the pharmaceutical industry as a whole. Many pharmaceutical companies have already made great improvements in how they manage inventory, but to return once more to our opening benchmark – we believe the potential for further improvement is very significant across the industry.

So what should pharmaceutical companies do to take advantage of this opportunity? The first step is to quantify and target the improvement potential based on real data. This can be a daunting first step since the transactional data necessary to do this, whilst in principle available in ERP systems, is large and needs quite some manipulation to assess for inventory optimization. But this is a vital prerequisite to enable organizations to ensure they are focussing on the right things. There are many likely root causes of under- or overstock situations, and a data-driven approach allows companies to devote their attention to the most important.

It is also important to understand the role of segmentation in inventory optimization. Each SKU will require different treatment depending on its importance (both medicinal and commercial) and its demand characteristics (stable, variable, sporadic, growing, declining, new, etc.). Here again, a data-driven approach is essential to ensure best outcomes.

Once the total potential has been quantified, a deep analysis of the data will allow improvement levers to be prioritized based on ease and impact. The particular constraints of the pharmaceutical supply chain will play a key role here, and it is useful to separate quick wins (such as draining

overstock situations) from longer-term initiatives (which might involve trying to reduce lead times by moving production sites, for example). New performance metrics, to track adherence to new inventory targets, are usually required to ensure the proper focus on optimized inventories across the organization.

Finally, it is important to understand that inventory optimization is not a one-off exercise. A one-off focus on inventory can indeed deliver improvements, in the same way that significant focus on any element of a business will tend to deliver improvement, but unless backed up with sustainable changes to ways of working, reversion to previous levels and problems is all too rapid. Inventory optimization programmes can normally deliver a significant improvement in the short term (say 6-12 months) but year on year improvements require investment in capability in this area.

The pharmaceutical supply chain is complex, but its products are vital. Life expectancy and health outcomes have seen tremendous improvements in the last 100 years. Population aging, pricing pressures and greater expectations from more people are putting current models under significant pressure. For the positive trends to continue we need to devote ourselves to the application of best practice across the board. Inventory management has a key role to play in those efforts, and to develop leadership in this area pharmaceutical companies need to go beyond the tactical management of inventories. Their very survival – and therefore ours – depends on it.

If you would like to discuss how to take your inventory optimization capabilities to the next level, contact us: information@nventic.com

Notes:

1. The DIO chart. Source: published company accounts for 2017 (in some cases FY 2017 which is the year from 1 April 2016 to 31 March 2017). Not all companies split raw materials, work in progress and finished goods in the same way, so some approximations/estimates have been used.

Days Inventory Outstanding = $\text{total inventory value} / (\text{cost of sales} / 365)$.

The problems with using DIO as a strict comparator are numerous. The two main issues are the following:

- a) Each company's ideal DIO will differ based on their product mix and supply chains. If you predominantly manufacture and sell products with very low demand variability and short lead times your optimized inventory will be much lower than that for a company with very volatile demand and very long lead times.
- b) The metric is highly susceptible to how companies choose to manage their balance sheet. Most pharmaceutical companies choose to write down the value of inventory to mitigate risk of obsolescence. For instance, if you have produced large quantities of a drug before it has received full regulatory approval it is common to write down the full value of the inventory and then reverse the write down once (/if) approval is given. Each company takes its own approach to how much inventory value they write down in this way and as to how

transparently they do it. The table presented above reflects the net inventory value each company has decided to show on its balance sheet at the end of the year.

And yet we still believe that DIO is useful as a metric, not least because of how capital markets operate. The value of inventory affects a number of key financial metrics, including solvency, return on capital employed, return on assets, return on equity and earnings per share. At the risk of being overly simplistic, having too much capital tied up in inventory will make your investors unhappy. CEO's and CFO's should seek to keep inventory to the minimum possible while maintaining enough to support sales and stable operations.

2. "Shortages, stockouts and scarcity: the issues facing the security of antibiotic supply and the role for pharmaceutical companies", Access to Medicine Foundation, 31 May 2018. This paper is available online at https://accesstomedicinefoundation.org/media/atmf/Antibiotic-Shortages-Stockouts-and-Scarcity_Access-to-Medicine-Foundation_31-May-2018.pdf