Taking the 'spare' out of parts

Trying to anticipate the demand for aftermarket parts is a tricky business but thanks to some smart software OEMs are managing make forecasts that are financially sound. **Malcolm Wheatley** reports

By stamping a little of the owner's personality on the vehicle they have just bought, as well as fine-tuning it for his or her particular needs and intended use, aftermarket accessories offer the consumer an alluring way of distinctively personalising a vehicle. Buy a new Land Rover, for example, and it soon becomes clear that the basic as-specified vehicle is just the starting point for a whole host of bolt-on goodies, some of them highly functional, others very much more of a lifestyle statement.

But for the vehicle manufacturer, accessories often represent the tip of a particularly awkward iceberg. For if forecasting the precise mix and configurations of finished vehicles is challenging, then forecasting aftermarket parts demand is doubly difficult. And the further that demand is separated from the specifics of vehicle usage – as measured in kilometres, severity of driving conditions, or time – the greater the magnitude of the problem presented. Accessories, where demand often depends on little more than consumer whims, are an especially thorny problem.

Predicting the right parts

Managers at Toyota Motor Sales USA realised that spreadsheet-based forecasts of demand were proving unequal to the task. With more than 1,200 accessory part numbers to forecast, supply chain personnel were having to spend significant amounts of time manually entering data into unwieldy spreadsheets in order to be able to take a stab at which accessories buyers would take a shine to.

"Our parts and accessories range from something as simple as a cargo net that fits a series of vehicles to something as specific as a spoiler that fits a specific colour and model of vehicle," explains Accessory Supply Manager Joe Cammiso. "To predict future demand for accessories, we were having to look at a lot of data with regard to what vehicles had been built and wholesaled. [We needed] to tie those vehicles to the products that were applicable to them before looking at future vehicle build data to try to make a judgement as to what the future demand would be for that accessory."

The solution? A demand planning application from specialist supply chain planning and optimisation vendor i2, which offered a rich variety of statistical techniques, provided an unlimited number of causal factors to which specific accessory demand patterns could be linked, and allowed Toyota planners to 'see' predictions using multi-dimensional data representation and analysis tools.

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The transformation has been significant. Planners, says Cammiso, "can now spend more time analysing data, rather than gathering and key punching data." And the increased time that is available for analysis is enabling Toyota's forecasters to get to the heart of the issues that are driving demand for particular accessories. "It allows them to investigate issues during the ordering process that they previously might not have had sufficient time to look into," he adds. "They can contact the appropriate people and get more background as to what might be driving demand in a certain direction."

Demand for resources

Writ large, Toyota's aftermarket challenges typify the issues addressed right across the automotive industry, from global OEMs right through to niche parts manufacturers.

"Nailing down demand with any degree of precision is very, very difficult," says Rod Horrocks, a partner in specialist UK-based consulting firm Procertis, which recently carried out just such an engagement for Quinton Hazell, a leading manufacturer of automotive components with plants and distribution sites across Europe. "Different national markets have different characteristics, different buying processes, and experience demand in different ways."

Despite this diversity, he notes, one theme does unify the industry's approach to aftermarket forecasting: the paucity of the resources devoted to it. "Frankly, companies don't devote enough time to the issue, don't invest enough in the right systems, and don't employ enough people skilled in relevant disciplines such as statistics," he charges. And the legacy systems frequently found in the industry's aftermarket forecasting functions, he adds, only compound the problem; Quinton Hazell's core system, for example, was 20 years old.

If such problems are gradually easing, it's primarily because automotive businesses have woken up to the costs (and opportunity costs) of such attitudes. With automotive giants like GM and Ford bleeding red ink, carrying excess inventory ties up scarce capital that could be deployed more effectively elsewhere—not least in building more efficient plants or developing new models.

i2 reckons that 90 per cent of the sales of aftermarket parts comes from no more than 10 per cent of the investment in inventory. It is possible to reduce inventories by significant amounts, says Hans-Georg Kaltenbrunner, i2's Programme Director for the automotive and aerospace industries, but you need to avoid taking the axe to inventory levels in ways that reduce sales just as much as they lower inventory levels.

Despite the industry's long 'tail' of legacy vehicles—many backed by parts availability guarantees—he says, "it's important to make sure that the investment made in the 90 per cent of the inventory that contributes 10 per cent of the profits isn't at the expense of the investment in the inventory that contributes 90 per cent of the profits."

Aftermarket's goldmine

In terms of opportunity cost, poor forecasting can show up in lower profit margins and reduced revenues as sales go to competitors instead. Recent research from business advisory firm Deloitte showed that aftermarket sales and services are 75 per cent more profitable than global manufacturers' core operations, contributing 46 per cent of the overall profit, and in many cases significantly buoying up overall profitability.

But in seeking to wrest additional revenue and profit from their aftermarket inventories through better demand forecasting, there's no denying that automotive businesses face a significant challenge. At the heart of the matter lies a sober fact: no single approach will ever deliver a dependable forecast for every part that a business needs to forecast – the influences on demand are simply too variable.

"We have to forecast the demand for more than 200,000 active part numbers; everything from fast-moving filters to components in a powertrain that might fail only by accident," says Mike Rickett, North American Supply Chain Manager in Ford's global parts supply and logistics operation. No one forecasting algorithm, probability distribution or statistical technique can impose order on the sheer variety of demand patterns in question, he suggests.

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"Overlay the extremes of seasonality and the impact of geographic region – think about the demand for air conditioning components in Florida and Texas, for example – and it's clear that even if techniques such as seasonally-adjusted exponential smoothing can deliver accurate projections for high-volume items, they're going to struggle when predicting the demand for low-volume 'failure mode' items, especially in new vehicle niches, where there's limited demand history to make use of."

To make matters worse, he adds, parts usually follow a demand lifecycle where, not only is there a tendency to underestimate demand as the volume of vehicles on the road increases, but also an equivalent tendency to overestimate

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demand as the number of vehicles starts to decline. The demand history that a forecasting system is drawing on is based on a vehicle fleet larger than that which will generate parts consumption going forward. "Once a part's demand starts to decline, if you're not careful, you'll overshoot," he warns.

In dealing with such conundrums, a number of approaches are on offer. Rather than attempt to base demand forecasts on a single forecasting algorithm, probability distribution or statistical technique, a useful trick is to throw computer power at the problem instead.

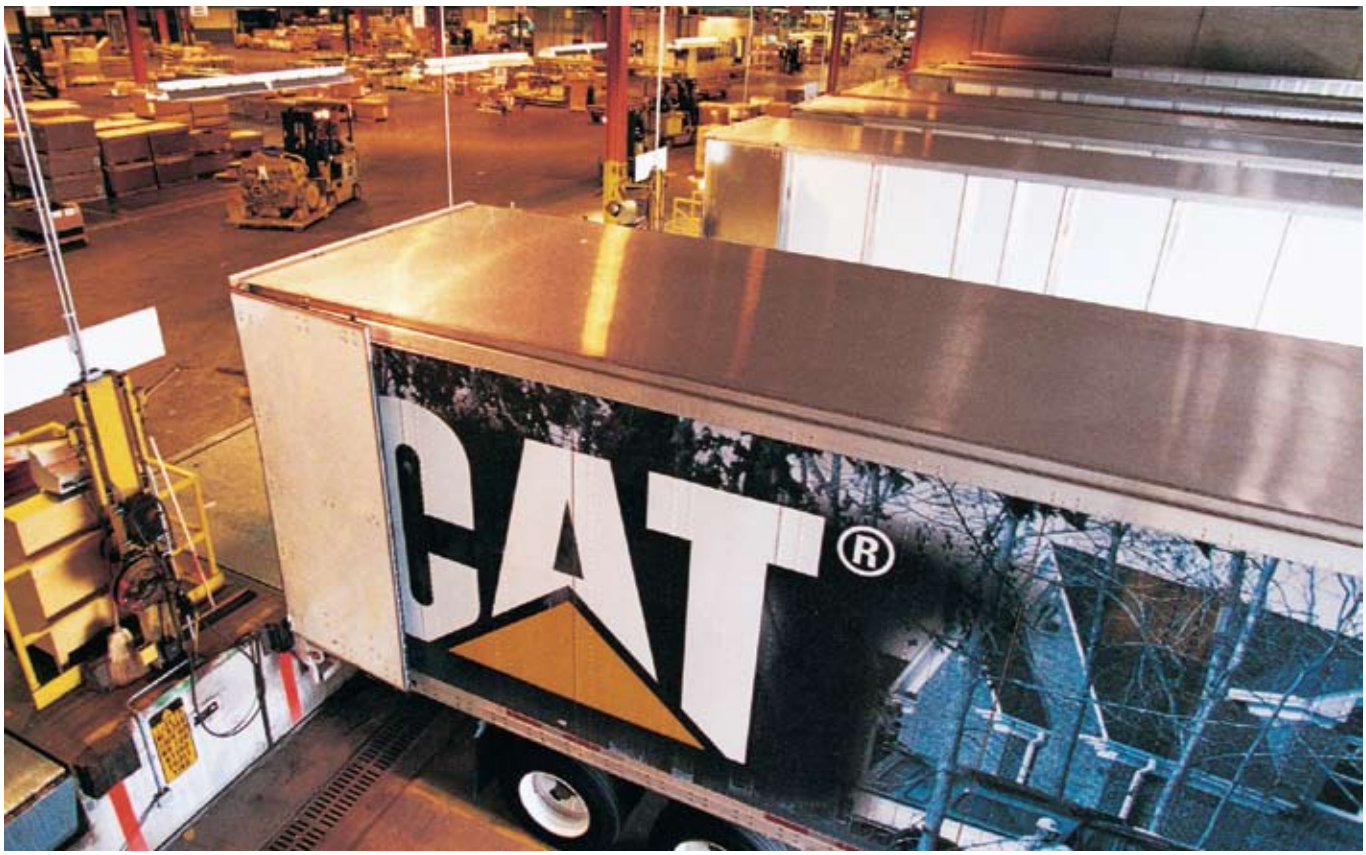
Best-fit forecasting

Servigistics, a UK-based aftermarket-forecasting specialist, offers a 'best-fit' capability, where different forecasting techniques are applied to a parts demand history until the technique that delivers the lowest forecast error is found. (i2, it should be noted, also offers best-fit forecasting.)

"Best-fit forecasting analyses the data, determines which forecasting approach would have produced the best result in the past, and makes a recommendation about future demand on the assumption that what worked in the past will carry on working in the future," says Gavin Hartland, Servigistics' Marketing And Alliances Director. He adds that the results achieved by Subaru of New England – a North American regional Subaru distributor – were in part due to best-fit forecasting: not only were inventory levels slashed by 40 per cent, but order fill rates climbed from 70 per cent to 98 per cent.

That said, best-fit forecasting won't effectively deal with items with a highly irregular demand pattern, especially at low volume levels. While it's possible to gauge demand for high-volume parts items with conventional techniques like exponential smoothing, and items with intermediate levels of demand with 'best fit' approaches, items with sporadically variable demand succumb to neither technique.

In most other industries, managements might just shrug and de-list the product in question, but in industries like aerospace and automotive, that isn't an option. And unfortunately, according to one estimate, as many as 70 per cent of the parts held by a typical automotive manufacturer fall into just that sporadically variable category.



Ford's aftermarket supply chain and forecasting processes are benefitting from specific forecasting skills from Caterpillar, which is well-used to dealing with parts running at much lower volume levels through its work with agricultural and heavy equipment manufacturers

Bootstrapping the business

Smart Software, co-founded by former university academic Charles Smart, is one software firm tackling the problem. Its flagship product, SmartForecasts, uses a patented empirical approach called 'bootstrapping' to rapidly generate tens of thousands of possible scenarios of future demand sequences, building up cumulative demand values over an item's lead time.

Typically, says Smart, businesses deploying the firm's software can expect to reduce inventory levels by as much as 15-20 per cent in the first year, increase parts availability 10-20 per cent and more, and reduce the need for (and costs) of emergency trans-shipments to close gaps in the supply chain.

That was certainly the experience of Elgin, Illinois-based SKF-VSM, the aftermarket parts division of $6.3 billion Swedish multinational SKF, and a manufacturer and distributor of bearings, seals, U-joints, and other automotive aftermarket products. Around 70 per cent of the 60,000 unique parts SKF-VSM sells to distributors and retailers through its six North American distribution centres exhibit either intermittent or slow-moving demand, or both, says Matthew Schiele, Vehicle Service Market Supply Chain Manager at SKF-VSM.

When Schiele took over the aftermarket supply chain role in 2003, the company's home-grown forecasting system, in use for some years, was clearly struggling to cope. Not only were the exponential smoothing algorithms on which it was based inappropriate for items with intermittent demand, but it also responded poorly in terms of the seasonal variations that were overlaid on the demand profile. "The reaction time was very poor," he recalls. "With an upturn or downturn, it took the system some time to recognise that demand had changed."

Implementing the Smart software had an immediate impact. Historically, to maintain the company's target service level of 95 per cent, inventory levels had generally risen in lockstep with sales levels: during the previous year, for example, inventories had risen 6 per cent. The new software effectively broke the linkage, with inventory levels falling by 3 per cent.

While at first glance that wasn't much, it did in fact represent a considered response to an 'over stock' position caused by the use of exponential smoothing, which had resulted in some parts having inventory balances far than that warranted by true demand. "We were using the Smart system to 'run lean', re-ordering less, and running down inventory levels," says Schiele. As demand was irregular, running down stocks took time, as items could only move from inventory if they were sold. The real benefit, he adds, came the following year: with service levels still being maintained at a consistent 95 per cent, SKF-VSM was able to reduce inventory holdings by 16 per cent.

Ford gets consistent

Ford, too, is tackling its tail of slow-moving and irregular items. Under a far-reaching three-way agreement with German IT giant SAP and Caterpillar's logistics arm, CAT Logistics, Ford is rolling out an entirely new global inventory management system, explains Anu Goel, Director of Ford's global parts supply and logistics operation.

The move, he adds, was prompted by the growing cost of Ford's existing systems: "The maintenance costs of our existing approach was huge: we had 45 legacy systems in North America, and 130 in Europe, all handling aftermarket parts supply and all requiring maintenance and upkeep."

Caterpillar, too, had similar issues, hence the tripartite agreement.

"We wanted to get out of software development, which wasn't our core competence, and leave that to SAP, for whom it is a very clear competence," he says. "It's been a big investment for us." At one point, over 100 Ford personnel were gathered together to define and describe the business processes that would underpin the system.

And five years in development, he relates, the system has been built from the ground up to be consistent, not just consistent across Ford's brands and geographic regions, but also consistent with global industry practice. As the SAP-built framework will be available for sale right across the service parts industry, he explains, "we've had to convince SAP that any tweaks we've wanted to make reflect just that, service parts industry practice and not just Ford practice."

Ford needs global supply chain and forecasting processes rather than purely regional ones and has implemented a new system to achieve this

Rolled out operationally for the first time in Europe in November, the new system also brings to Ford's aftermarket supply chain and forecasting processes some specific forecasting skills from Caterpillar, which is well-used to dealing with parts running at much lower volume levels. In particular, says Goel, Caterpillar has had considerable success applying a compounded extension of the Poisson probability distribution (which is specifically designed to handle low-frequency events), as opposed to the normal (or bell-shaped curve) distribution commonly used in inventory management.

Working with SAP and Caterpillar in this way has some restrictions, acknowledges Goel. "If there's a problem, you can't just holler down the hall and get a software developer in to apply a fix. But on the other hand, there are huge benefits if we get it right," he says. And get it right they must: with vehicles and parts sourced from a given geographic region increasingly being sold worldwide, Ford needs truly global supply chain and forecasting processes rather than purely regional ones, with all the differences and inconsistencies that implies. And by early 2008, says Goel, Ford should at last be able to see if it's going to get that.