White Paper

Service Parts Management: The Linchpin to Successful Service Operations

Executive Summary

Aftermarket and service parts have profit margins as much as 10 times those for initial product sales. And post-sale service is key to securing customer loyalty, fostering the company brand and maintaining competitive differentiation. All told, aftermarket service and parts account for 20% to 30% of revenues and about 40% of total profits for most manufacturers.

There are multiple components to effective aftermarket service, including call centers, returns management operations, and promotions and marketing. However, the key driver of effective post-sale support is service parts management. Service parts management is the process of planning and alignment of service parts inventories, resources, and processes to ensure optimal customer service and response with minimal risks and costs, while being environmentally responsible at the same time.

Common goals for service parts management include increasing forecast accuracy for service parts; reducing excess spare parts inventory; reducing obsolete spare parts inventory; enhancing scrapping programs; and increasing service levels by increasing fill rates, increasing product availability or up time.

While there are many challenges in achieving the goals stated above, there is one area that stands above the others. How can we do a better job of planning for products that have intermittent demand?

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Unique Problem of Planning Products with Intermittent Demand

Supply chain professionals increasingly face challenges replenishing products with intermittent demand. Intermittent demand, also known as low and lumpy demand, typically contains a large percentage of zero values in a time series, with non-zero values randomly mixed in. It is a common phenomenon found in the service parts divisions in the automotive, industrial and consumer electronics industries. Interestingly, we also now see intermittent demand in branded "fast-moving" products from well-known manufacturing companies.

Some noticeable trends in the marketplace are driving more products [SKUs] into the lumpy demand category. Organizations are under growing market pressure to introduce more varieties of products to meet customer expectations. As a result, the demand variability at the individual SKU level increases as the number of SKUs in the product portfolio increases.

Another trend is more granular forecasting and more frequent replenishment cycles. While more frequent deliveries allow organizations to be more responsive and to react to demand changes more easily, this also means managing demand and inventory at a more granular level of precision. A demand viewed as "normal" and "smooth" in larger time buckets may look intermittent and lumpy in smaller time buckets.

Yet another prominent trend is the heightened focus on reverse logistics planning in the context of the circular economy. There is an increasing recognition of the significance of efficiently managing product returns, recycling, refurbishing, and remanufacturing processes as a means to reduce waste, cut production costs, and mitigate their environmental impact. Manufacturers are now integrating reverse logistics into their supply chain strategies, acknowledging that the recovery of valuable materials from discarded products is not just a responsible choice, but a cost-effective one.

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Conventional Approach

Conventional forecasting methods such as moving average and exponential smoothing work well when demand probability is normally distributed. However, organizations that rely on these traditional forecasting methods do not get satisfactory results when the underlying demand variability is very high and demand probability distributions are highly skewed. These methods do not work well because they ignore the special role of the zero values when analyzing demand.

When conventional methods fail, organizations often rely on expensive manual intervention to adjust the forecast, hoping to better predict future activity based on past business experiences. As a result, they tend to overreact to a demand spike and overstock the SKUs in order to maintain a desirable service level. This translates into a huge increase in inventory carrying costs and hurts overall supply chain performance.

Having recognized the difficulties with the conventional methods, many organizations rely on the forecasting method developed by statistician J. D. Croston. Croston's method and its variants extend the exponential smoothing methods so that forecasts on the demand quantity and forecasts on intervals between demands are calculated separately. While these methods are effective in forecasting the average demand per period, they do not provide guidance on how likely a demand will occur within a replenishment lead time, nor do they address the lead-time demand distribution, especially how much the demand volume is likely to be at a given customer service level.

U.S. businesses and consumers spend more than $700 billion each year on spare parts and services for previously purchased assets.

Probabilistic, Adaptive Approach

A better alternative to managing intermittent demand is to adopt a probabilistic, adaptive approach. Rather than deterministically forecasting the demand average, a probabilistic forecasting strategy focuses on three key elements:

1. **Generate a good estimate of the probability of a demand occurrence within the replenishment lead time**
2. **Obtain a probabilistic view of lead-time demand distribution for the service-level inventory requirement**
3. **Analyze the under stocking and overstocking risks to make an accurate replenishment decision based on the probability of a demand occurrence and the probabilistic model of demand distribution**

Leveraging a sound probabilistic planning technology, you can better control and manage intermittent demand in a supply chain network and derive a forecast and replenishment plan that is more adaptive to demand change, lead-time variation and customer service level requirements.

Demand Occurrence within Lead Time

To have a better understanding of the probability of a demand occurrence within a lead time, start with evaluating the historical demand data. The history for a SKU with intermittent demand reveals statistical insights on the frequency pattern of demand occurrences. A sound probability formulation for the problem should be adaptive to the inter-arrival variation in demand, known as the coefficient of variation in statistics. You need to consider not only the average periods between demands, but also how long ago the last demand occurrence was.

It is also important to filter out the "noise" that can distort the true inter-arrival pattern. A careful probabilistic analysis includes examining the correlation between the factors that influence demand fluctuation. In many situations, a simulation method is a valuable tool to allow supply management professionals to better understand the intricacies of the inter-arrival pattern.

Lead-time Demand Distribution

In contrast to exponential smoothing methods, a probabilistic forecasting method provides a full-spectrum view of the lead-time demand distribution. Poisson distribution, discovered by French mathematician Simeon-Denis Poisson, describes the probability of several events occurring in a fixed period of time when an average rate of occurrence is known. In a typical spare parts business, if more than 40 percent of the periods have no demand, and if the demand follows a Poisson distribution, there is an average of 0.9 line-orders [or less] per time bucket.

To figure out lead-time demand distribution and derive an appropriate inventory policy, you must consider not only customer demand variability, but also the lead-time variability of suppliers.

However, the real question is: How much inventory an organization should carry during a replenishment lead time to meet a desirable customer service level?

To figure out lead-time demand distribution and derive an appropriate inventory policy, you must consider not only customer demand variability, but also the lead-time variability of suppliers. A statistical simulation method is a valuable tool to estimate the lead-time distribution, and to provide guidance to set service-level inventory policies, such as safety stock and reorder point.

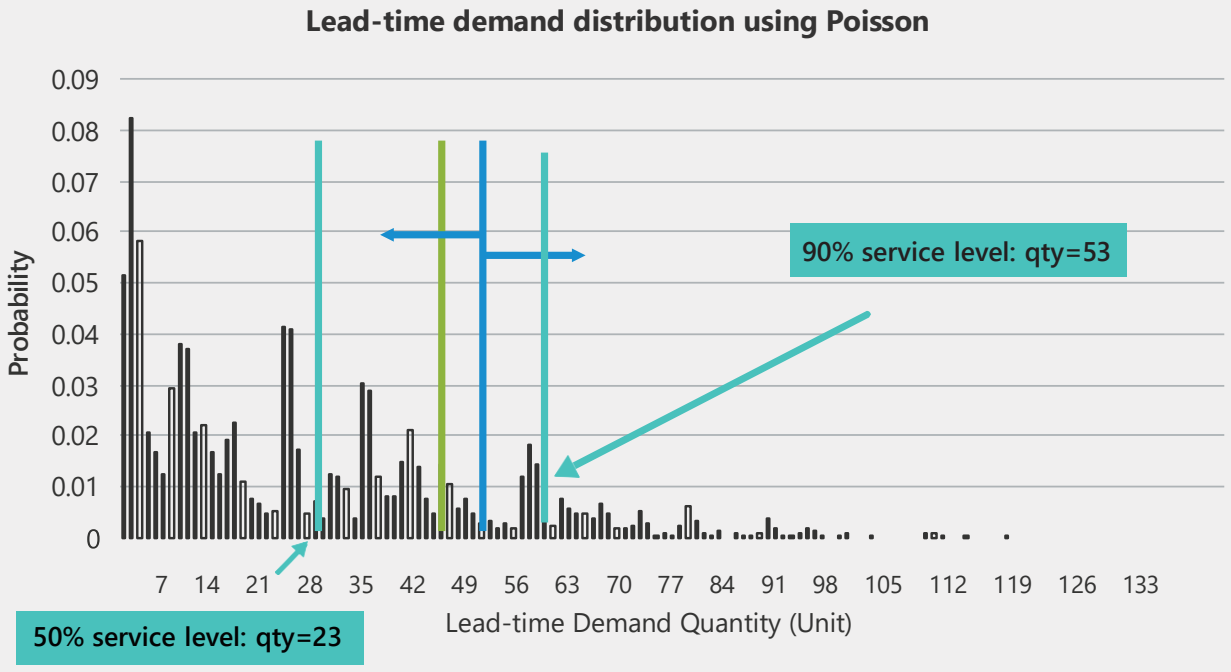
Probabilistic Replenishment Decision and Risk Analysis

A replenishment decision is made from the likelihood of demand occurrence estimates, and the lead-time demand distribution. This decision involves whether or not replenishment is necessary, and when the answer is yes, the amount of inventory needed.

Probability modeling applies not only to finished good products, but also component-level replenishment planning.

A recommended probability threshold as a replenishment trigger should be established on an individual SKU basis by evaluating the business attributes. The threshold value reflects the out-of-stock [OOS] tolerance level for an individual SKU. A replenishment decision is made when the calculated demand occurrence probability exceeds the threshold, subject to the relative inventory position in relation to the reorder point. This probability modeling applies not only to finished good products, but also component-level replenishment planning.

A probability analysis on risks of both under stocking and overstocking is valuable and important when choosing the appropriate threshold value. From the same probability model, you should be able to calculate the risk of an OOS in the lead time if a replenishment order is not placed, and the risk of over stocking if you decide to place an order. An optimization effort can follow to balance the two types of risks and minimize the overall cost. This process should be done on an ongoing basis to achieve sustainable benefits.



Case Study:

How a Large Consumer Electronics Company Used Improved Forecast Accuracy to Reduce Inventory Investment

Recognized as an innovative leader in consumer electronics, this company is faced with the challenges associated with a fast paced industry which changes dramatically every three-six months as new products roll out. With new innovations in flat panel technology occurring every three-four months, there are no guarantees that if a television fails, the customer will get it fixed versus buying a new one. Add to this the increasing costs of the technology built into the end product and the cost of holding that inventory increases dramatically along with the risk of obsolescence.

Logility delivers a statistical-based forecast that provides the required forecast accuracy to enable the inventory parameters the group needs.

The company has a large and complex supply chain with hundreds of thousands of parts and long lead times. It has multiple locations focused solely on specific distribution center planning and procurement. These disparate groups located in South, Central and North America did not communicate regularly to optimize investments in service parts inventories across the network. Recently, this company focused on the objective of consolidating its organization to more efficiently and cost-effectively service each region. Through this initiative, enabled by Logility, the procurement group is now centralized and able to manage all procurement orders and planning across the Americas network. “Logility does the hard work and allows us to focus on the strategic business objectives,” says the company’s global inventory supervisor.

The initiative has led to a more focused, efficient department. With Logility, the planning team has made the conscious decision to focus less on the data and more on executing key decisions through enhanced business processes and exception resolution.

Logility delivers a probabilistic forecast that provides the required forecast accuracy to enable the inventory parameters the group needs to factor the specific types of product and part categories. Since forecast accuracy is such a key component to inventory planning, the team can now more accurately plan inventory investments for product lines that are high value and have high visibility.

To help facilitate the improvement in service parts planning, the company focused on two key corporate objectives. First, improve asset life and keep inventory investment as low as possible. Second, maintain high customer satisfaction by meeting target fill rate goals. A key process change was the use and reliance on software to handle the data crunching. The planning group made the shift to rely on Logility to help focus on the business objectives and manage exceptions as they arise. According to the group leader, “We have seen that when the planning part is done correctly, purchasing becomes very simple.”

Many of the service parts for its products are used across several business lines. The planning structure aligns each planner with specific product types. This ensures planners build expertise around specific lines of business. The shift in strategy, combined with the use of advanced software, gives each group visibility of the activities of other groups. For example, if a part is used in televisions and game consoles, the television department now has visibility into the game console group. And, if the game console group has excess inventory, the television group can source from there instead of procuring from a supplier at a higher cost. With Logility, the company has been able to greatly reduce safety stock investment while providing great service availability.

How did the team lower investments in safety stocks? It moved towards an approach that relies on the Logility to do the math, using techniques such as stochastic planning that help identify trends and alert the users to exceptions that require their expertise. An unexpected benefit has been how much easier it now is to resolve the exceptions when the planning has been done well. Efficiency and product availability have increased dramatically.

Since its refocus and adoption of software solutions to reduce inventory investments while supporting impressive service goals, the group has been able to improve its customer service more than 40%. In addition, the department's inventory investments have dropped significantly even though the cost/value of parts has risen. Inventory turns have increased by 350%, representing a significant reduction and realignment in inventory.

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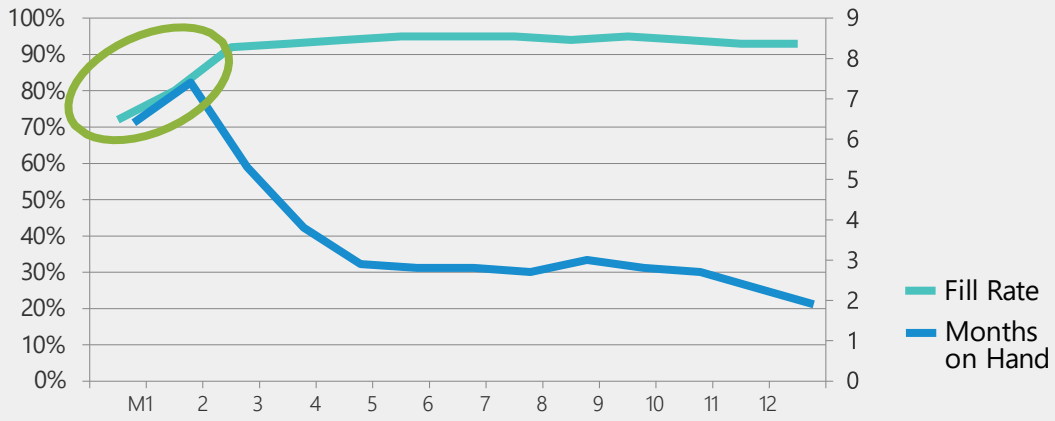
Inventory reduction after implementing Logility



Conclusion

Globalization, cost pressures and the demand for advanced technology solutions are compelling businesses to differentiate themselves on the distinctiveness of their offerings and the excellence of their service operations. More and more, revenue, profitability and customer loyalty are being influenced not merely by initial product sales, but by the quality of post-sale service and support.

Overcoming these challenges will require companies to achieve the following:

- Coordinate service parts planning and execution activities across the extended service network
- Cleanse and classify service parts data
- Leverage a variety of deterministic and probabilistic planning techniques to optimize inventory investments aligned with customer service goals
- Make requisite investment in service parts management automation

Investing in improving your service parts operations, with sophisticated capabilities such as probabilistic planning, can help drive customer loyalty, profitability, and competitive advantage.

Effectively managing intermittent demand presents a challenge to supply management professionals. By deploying a probabilistic, adaptive strategy, you can achieve substantial inventory cost reduction while maintaining a higher customer service level.

About Logility

Logility's Digital Supply Chain Platform delivers optimized demand, inventory, manufacturing, and supply plans – helping to provide executives the confidence and control to increase margins and service levels, while delivering sustainable supply chains. Designed for speed and agility, Logility's (SaaS) cloud-based platform provides an innovative blend of artificial intelligence (AI) and predictive analytics to help deliver integrated planning and operations across the end-to-end supply chain. Our prescriptive approach drives team alignment for over 800 customers in 80 countries with prioritized outcomes that assure demonstrable value. Logility is a wholly-owned subsidiary of American Software, Inc. (NASDAQ: AMSWA). Learn more at logility.com.

To learn how Logility can help you make smarter decisions faster, visit www.logility.com.