SupplyVue By CONCENTRA

WMG THE UNIVERSITY OF WARWICK

Enhancing supply chain performance using data analytics

Five industrial case studies

SEPTEMBER 2018

Abstract

This joint study between WMG, University of Warwick and the management analytics firm Concentra set out to research the capacity of modern data analytics to optimise supply chain performance. The research base comprises five European manufacturing businesses, all of different sizes and operating in unrelated industries. Using SupplyVue, Concentra's supply chain analytics tool, the researchers were able to clearly demonstrate the ability of modern data analytics to create visibility across complex supply chains and to identify areas of sub-optimal performance. These insights informed improvements in the firms' supply chain management processes and policies, which led clear business benefits in every case. The study indicates that the potential for analytics in supply chain management is high, but largely untapped. Our findings suggest that the easiest wins centre around basic good management measures, such as demand profiling, forecasting and the systematisation of supply processes.

Content

Introduction

Between 60%-90% of company costs occur in the supply chain. As a consequence, even small efficiency improvements in supply chain management can result in major cost-saving gains. However, research indicates that the drive for cost cutting increases the risk of reduced service quality.

The guiding hypothesis of this paper is that data analytics helps break the management silos that commonly occur in modern supply chains and replace them with a more holistic approach to supply chain management.

This joint research project set out to analyse the capacity of modern data analytics to optimise supply chain performance. Adopting a case study approach, we tested a best practice supply chain analytics tool on five separate companies from a variety of different sectors and geographies.

The tool adheres to a consistent set of core management principles, which are systematically applied in the supply chain evaluation process. The tool contains a suite of data collection and analysis technologies through which this evaluation process is operationalised.

The primary goal of the research was to evaluate whether this generic tool could be employed to identify and consequently resolve the root causes of specific supply chain problems.

As well as testing our central hypothesis, this research exercise also sought to draw out practical observations concerning the application of data analytics in supply chain-related problem solving.

In this regard, our investigation centred on three principle questions:

- What types of data and information deliver the most value in supply chain optimisation processes?
- How can data analytics use performance data to best effect?
- And, how should data analytics be integrated into business decision-making so as to capture its fullest value?

Research design

A four-stage research design was deployed for this study.

Stage 1: Case study identification
Five companies were selected to cover a broad scope of supply chain activities (e.g. retail, manufacturing, distribution).

Stage 2: Scoping study
Through semi-structured interviews and site visits, the supply chain context, project scope, supply chain challenge and data requirements were defined.

Stage 3: Data download, analysis and review of current state
Data was extracted, cleaned and uploaded into SupplyVue for analysis and review of the current state supply chain with the case study partner.

Stage 4: Modelling and review of future state
Based on the analysis of the current state, an opportunity for supply chain improvement was modelled to demonstrate the potential benefits. This future state was then reviewed with each case study company.

Case study 1

Creating a stable plan by applying production wheel planning

Challenge

This case study concerns an industrial manufacturer. Despite having relatively predictable demand and high inventories, the company suffered occasional shortages of items. As a consequence, it had to constantly change production plans and schedules so as to maintain service levels. Operating costs in the supply chain were unnecessarily high, while the constant need to resolve day-to-day challenges absorbed a disproportionate amount of management time.

Approach

The SupplyVue analytics tool was employed to capture transactional and planning data from the firm's supply chain. This information was then used to better understand the firm's business context and to accurately evaluate performance levels within its supply chain.

Diagnostic summary

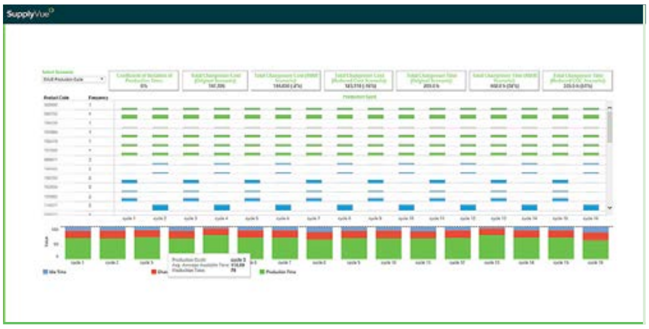
The diagnostic process revealed opportunities to stabilise demand on the firm's factory unit by making use of weekly demand data and synchronising the supply chain accordingly. Because demand patterns were not previously being managed, the factory was scheduling requirements as and when they occurred. This gave rise to inconsistent lead times of replenishment, which complicated inventory planning and management. In addition to constant short-term schedule changes, the firm's production system suffered continual peaks and troughs in demand.

Designing the future state

The *Segmentation analysis* undertaken by the tool classified the products in the firm's production wheel into runners, repeaters and stranger classes (1.a). The SupplyVue team reviewed the production sequence, using the line changeover matrix to identify the lowest-cost manufacturing sequence. Using this ideal sequence, SupplyVue used production wheel methodology to create an ideal 16-week production plan (1.b).

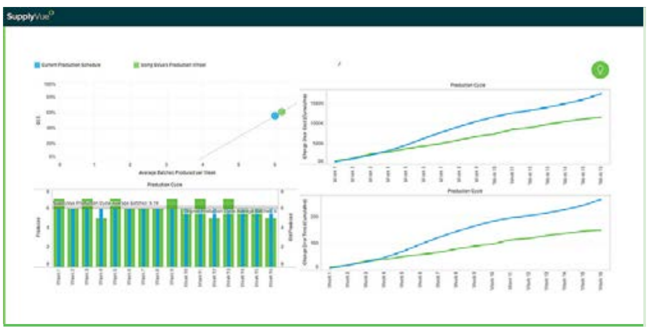
1.a Segmentation analysis

1.b Production wheel definition

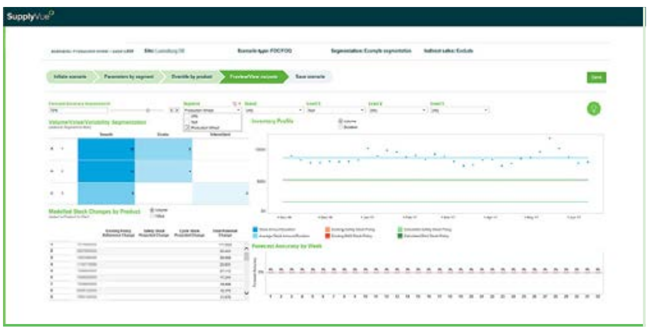


Production plan scenarios were generated and evaluated using the *Capacity and cost comparison* (1.c) and *Inventory impact analysis* (1.d) dashboards. The trade-offs between manufacturing cost and inventory levels were analysed, as were those between levelling capacity and inventory levels. This enabled the management team to decide on the production policies that most aligned to their business objectives.

1.c Capacity and cost comparison



1.d Inventory impact analysis



Analytics in action

Demand profile

The *Sales profile - daily buckets* dashboard (1.c) reveals that the demand was variable and that the coefficient of variation was high relative to other businesses studied. This supported the feeling of volatility by the business, which arose the frequency of short-term scheduling changes taking place.

However, the *Sales profile - weekly buckets* dashboard (1.d) indicates that weekly demand patterns were significantly less variable than daily patterns. This suggests that the supply process would be more suited to a weekly drumbeat.

By setting the firm's supply chain processes onto a weekly profile, the cadence became stable and reliable. In this way, customers' demand profiles stopped causing short-term schedule changes and other disruptions in the supply chain. Although daily demand remained inconsistent, inventory was able to absorb this variability.

Inventory levels

The *Stock against sales* dashboard (1.e) puts the average finished goods inventory level at 23 days. The analytics showed that this was providing a 97% stock availability at a one-day inventory level threshold. As a result, the business was experiencing occasional inventory shortages.

The *Replenishment policy assessment* dashboard (1.f) shows that the demand being placed on the factory exhibited a serious lack of cadence and predictability. High levels of variability characterised both time interval between orders and the order quantity for each order.

The tool revealed that one of the major causes of the unpredictable demand being placed on the factory was the use of a re-order point control mechanism for managing the finished goods replenishment system. The level of unpredictability in demand patterns made it highly unlikely for the firm to provide a reliable service.

Factory capacity

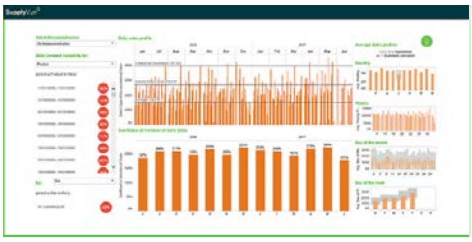
The *Weekly capacity requirement* dashboard (1.g) shows the capacity requirement from week to week. The data revealed the requirement patterns to be highly variable, with significant peaks and troughs clearly in evidence. These patterns were shown to be significantly more variable than the weekly demand profile.

The *Conformance to schedule* dashboard (1.h) shows that the resulting output and conformance to plan was low. When the conformance to the order trigger points from finished goods is poor, this usually leads to intermittent, stock shortages on each stock-keeping unit (SKU). The tool examined individual SKUs that had shortages and confirmed this to be true for the case company. It was due to late replenishments.

Business impact

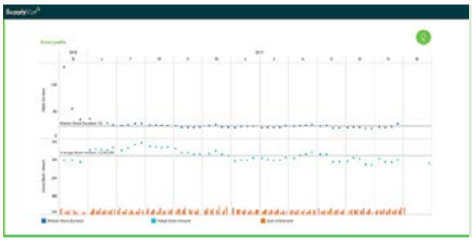
The application of the tool led to the scheduling of an optimised production wheel, which saw changeover time and cost reduced by 15%. In addition, demand was levelled over time to prevent overtime and variable shift patterns. Another notable benefit was a reduction in inventory levels due to reduced cycle times and increased conformance to plan. Scheduling changes also fell dramatically.

1.c Sales profile – daily buckets



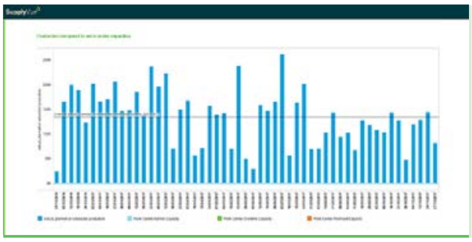
1.d Sales profile – weekly buckets

1.e Stock against sales



1.f Replenishment policy assessment

1.g Weekly capacity requirement



1.h Conformance to schedule

Case study 2

Eliminating unnecessary air-freight for an international retailer

Challenge

The case company in this instance was an international retailer. The firm was struggling with high levels of inventory in stores and central depots. To complicate matters further, this inventory was the incorrect mix for the rate of sales. The firm's inability to coordinate the flow of goods from suppliers with long lead times to its respective stores led to shortages. To cover these shortages, the retailer frequently fell back on air-freighting product. Yet working capital was above target.

Approach

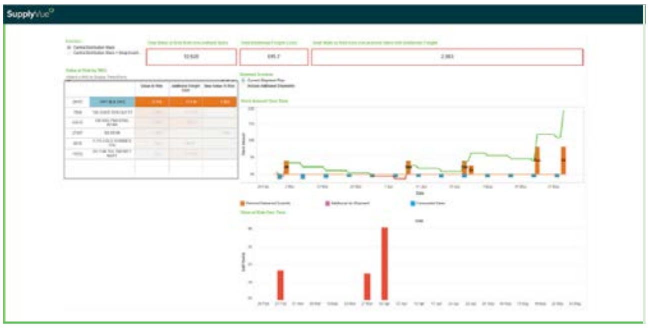
The SupplyVue analytics tool was used to capture transactional demand and inventory data. This information was than extracted to analyse the demand profiles of the firm's product portfolio. A separate examination was carried out of base demand and promotional demand, respectively. Finally, the researchers undertook a segmentation analysis of the performance, processes and parameter settings by segment of the firm's supply chain in order to pin down the most likely root cause of the air-freight requirement.

Diagnostic summary

The tool identified the firm's inventory management approach as the crux of the problem. This approach was pushing inventory forward into the stores, instead of formally planning an inventory holding at the regional warehouse. As a consequence, the business was having to air-freight in supply from off-shore.

As is common to many supply chains in which information is incorrect or incomplete, the firm has sufficient inventory across its network, only it was not in the right location. Inventory planning at the regional level can address this failing. However, this requires the prior ability to forecast regional demand accurately.

2.a Air-freight management dashboard



Designing the future state

Using SupplyVue, the researchers segmented the demand between basic and promotional products. They employed a modelled forecast, generating accuracy via a statistical algorithm for basic items. The tool calculated the required inventory policies at the firm's central warehouse and recalculated the corresponding inventory levels at store (based on a Kanban pull mechanism from the central inventory).

For these items, the demand profile proved to be sufficiently stable and predictable to provide enough cover at the central warehouse to eliminate air-freight caused by inventory shortages. The tool's modelling demonstrated this would remain the case even with an overall reduction in the total inventory in the network. Analysis of the collected data suggested that promotional items should continue to be managed separately, as previously.

Even though the safety cover at the central warehouse was set at a high level (99%), the likelihood of stock-outs could still not be ruled out. Such scenarios therefore need to be predicted and managed. This can be achieved by taking the latest forecasts and then using the tool's planning and analysis capabilities to predict the products with a high probability of stock shortages. It is then possible to evaluate the margin that is likely to be lost before the next planned replenishment and compare this to the cost of air-freight. With this calculation to hand, managers were able to take a more informed decision about whether to air-freight or not.

Business impact

The tool enabled this international retailer to adopt a more regional approach to its inventory management. This rebalancing resulted in a 20% reduction in the company's overall inventory, coupled with significantly improved inventory availability. In addition, the retailer was able to almost completely eliminate the use of air-freight due to inventory shortages. At the same time, the ability of the firm's management to decide if air-freighting was required or could be avoided was greatly improved.

Analytics in action

Demand profile

The *Sales profile – daily buckets* dashboard (2.b) shows that daily demand pattern was predictable, with peaks centred around known public holidays and other calendar events.

Segmentation analysis

The *Segmentation analysis* dashboard (2.c) reveals that two clear product segments exist within the demand profile; (1) basic products that were not promoted, and (2) basic products that were promoted.

Forecasting basic items at regional level

The retailer in question did not produce forecasts as management correctly concluded that demand could not be predicted at store level. What they had not appreciated was the predictability of regional demand. Contrary to expectations, however, the tool's *Forecast accuracy analysis* dashboard (2.d) below shows that regional-level demand signals aggregate to produce predictable demand profiles. In the case of basic product items, simple forecasting algorithms produce forecast accuracy of between 60% and 80% (at product item level). This level of detail is more than adequate for managing a central inventory holding.

Inventory levels by network tier

The *Inventory profile over time* dashboard (2.e) demonstrates that there were 120 days of inventory in the network for the basic items. However, it also reveals that the majority of this inventory was pushed forward to the stores, with only about 20 days of inventory held back in the central regional store. The stores consequently faced regular shortages, which they sought to overcome by air-freighting in inventory from oversees. Occasionally, stores would face the opposite problem, with too much inventory being pushed forward. In such circumstance, they resorted to discounting products in order reduce the stock

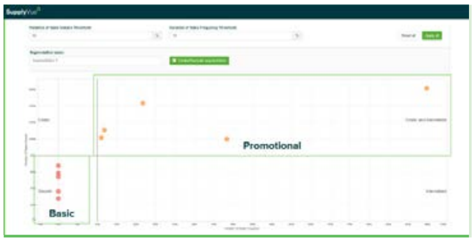
Promotional items

The *Demand profile* dashboard (2.f) below highlights the high intermittency of demand for the firm's promotional items. This variability was too great to be calculated accurately by an algorithm. This was despite accurate planning by the firm of its promotional activities.

Equally, the *Inventory profile over time* dashboard (2.g) reveals that the inventory policy and the planning for the promotional items were more coherent than the basic items. As a consequence of the insights provided by the tool, the firm's management decided to hold back nearly one third (30%) of the ordered products in a central location. The products were then fed through to stores as the stores sold them. This process worked successfully.

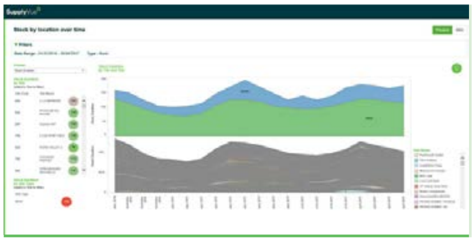
2.b Sales profile – daily buckets

2.c Segmentation analysis

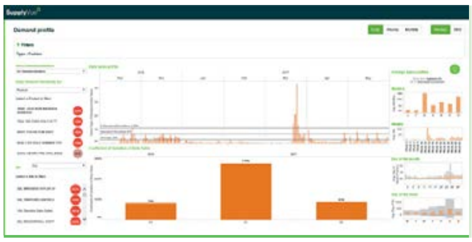


2.d Forecast accuracy analysis

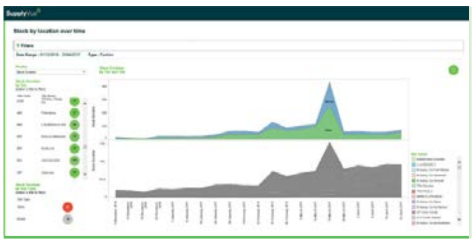
2.e Inventory profile over time



2.f Demand profile



2.g Inventory profile over time



Case study 3

Applying segmentation methodology to spare parts supply management

Challenge

In this case study, the tool was rolled out in an engineering business that manufactured spare parts. The firm found itself juggling the supply of parts for first-time construction projects, on the one hand, and the provision of spare parts for repairs and refurbishments, on the other. High levels of service were vital to the business's success, yet the demand profiles for all the separate items were very different. As a result, the firm was struggling to keep inventory levels under control. This was despite the company's ability to achieve inventory availability. The challenge, therefore, was to find opportunities to reduce inventory levels.

Approach

As a first step, the research team used SupplyVue to segment the demand for parts into 36 granular boxes. Each box corresponded to parts with similar demand profiles. The tool was then used to examine the flow of parts through the supply chain for each of the respective segments. Finally, the firm's replenishment policies and parameters were analysed, as were the resulting levels and availability of its inventory.

Diagnostic summary

The diagnostic revealed several positives. The firm's weekly demand levels were relatively stable and consistent, while its lead times were relatively short and reliable. All the same, its inventory was very high. In addition, when its supply chain was divided up into demand segments, inventory policies were shown to be inconsistent and lacking in coherence. This led the team to conclude that a comprehensive review of the firm's inventory holding policies could serve to significantly reduce its overall inventory.

Designing the future state

Based on the demand segmentation of the firm's product portfolio, the researchers used the tool to model a number of replenishment scenarios. Each scenario had a different replenishment cycle time and different rules for regulating order quantities.

As might be imagined, the results varied significantly. In Scenario 3, for example, the inventory covered 27 days. This scenario was based on replenishing faster moving items on a fixed order cycle, while replenishing slower moving items by fixed order quantity. Scenario 5, in contrast, took as its parameters a fixed order quantity for SKUs based on minimum order quantities. This resulted in a modelled holding of 36 days.

In addition to the inventory reduction, both scenarios modelled at 99% availability for all SKUs. They also showed a pattern of demand on the manufacturing department and suppliers that was significantly more stable and predictable. This revised demand pattern held out the prospect of numerous knock-on benefits.

Scenario	FOC/FOQ	Cycle length or batch size logic	SL	Lead time
1	FOC	1 week	0.99	N/A
2	FOC	Cycle length based on MOQ and weekly demand; max length 16	0.99	N/A
3	FOC	Where cycle length <=16	0.99	N/A
	FOQ	Batch size = MOQ		Master data
4	FOQ	Batch size = weekly demand	0.99	Master data
5	FOQ	Batch size = MOQ (max 26 weeks)	0.99	Master data

Business impact

The tool's analytical analysis revealed numerous pockets of excess inventory. Resolving these mismatches had the potential to reduce the firm's total inventory of spares by 70%. In addition, the decision by management to introduce more repetition-based replenishment methods and parameters created a more predictable demand plan for both the firm and its suppliers.

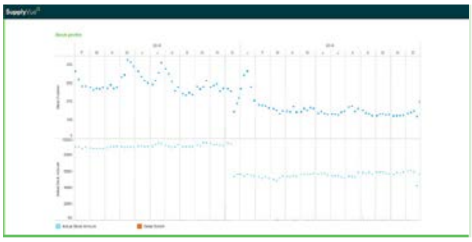
Analytics in action

Inventory levels and replenishment process

The *Inventory levels versus daily usage* dashboard (3.a) shows the level of inventory held in the business. The overall inventory coverage average for the period being analysed was 127 days.

The *Replenishment lead-time analysis* dashboard (3.b) puts the replenishment lead-time for the majority of SKUs at 4 weeks or less. It also confirms that delivery conformance was good.

3.a Inventory level versus daily usage



3.b Replenishment lead-time analysis

Demand profiles

The *Sales profile - daily buckets* dashboard (3.c) clearly demonstrates that the demand profiles were very variable. Indeed, the variability index was calculated at 173%. When looking at the sales profile in weekly buckets (3.d), however, the demand profile exhibits far greater stability and predictability. Over the same period, for instance, the variability index stood at 64%. Considering the comparative regularity of the weekly demand profile, a 127-day level of inventory cover appears very high. The fact that the replenishment lead times were also relatively short and reliable further strengthens this conclusion. As a next step, the researchers used the tool to examine the levels of inventory cover by demand segment. This enabled them to identify which segment(s) presented the highest potential for reductions in the firm's primary inventory.

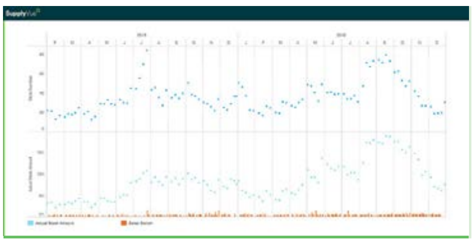
3.c Sales profile - daily buckets

3.d Sales profile - weekly buckets

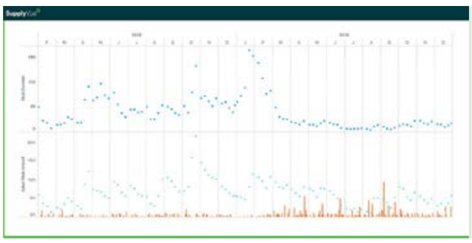
Inventory cover and policies

The analysis of the inventory levels by demand segment revealed a mismatch with inventory policies. This is clear from the data. The A line erratic segment, for instance, is shown to have a lower level of cover than the A line smooth segment. Similar evidence of inconsistency between the demand profile and inventory policies is provided by the slower moving B2 Erratic and Intermittent segment, which only had a small increase in inventory cover above the A line smooth segment. The C line smooth segment, meanwhile, had 512 days of cover, which was clearly unnecessarily high. These observations are illustrated in the charts below.

3.e A1 Smooth - 34 days

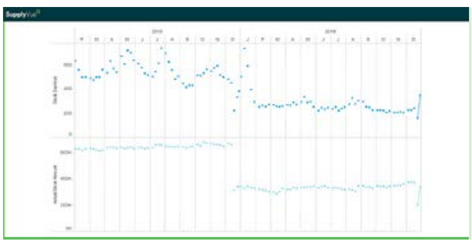


3.f A1 Erratic - 25 days



3.g B2 Erratic & intermittent - 44 days

3.h C3 Smooth - 512 days



Case study 4

Investigating and identifying the cause of poor inventory availability for a European tyre company

Challenge

In this case, the tool was applied to the supply chain system of a European automotive tyre manufacturer. The company was struggling with inventory availability issues in one of its key markets. Despite intermediate spikes in demand from original equipment manufacturer (OEM) customers, the firm's demand profile was generally steady and predictable. Lead-times were also short. Somewhat surprisingly, however, the company was facing serious issues regarding inventory availability. The challenge was to identify the root cause of this problem and propose a lasting corrective solution.

Approach

The tool was used to capture the transactional data for the full forecast to inventory process. The inventory process was then analysed and diagnosed step-by-step in order to identify the failings in the supply system that lay behind the inventory availability problem.

Diagnostic summary

The diagnostic process revealed that the lack of segmented approach in the demand planning process was key to the problem at hand. This was leading to forecasts that were inaccurate, unreliable and regularly under-weighted. The combination of these factors meant that the supply chain was constantly under pressure from inventory shortages. This, in turn, led to unpredictable and unstable demand being placed on the supplying factory. The consequent lack of cadence and predictability in the signal onto the factory introduced excess costs within the manufacturing unit and in the wider supply chain.

Designing the future state

Based on insights gleaned from the tool, the research team recommended that customers be divided into OEM and non-OEM segments. For the OEM customers, the supply chain should be run on a Make-to-Order basis. By following the OEMs' rate of product usage, supply should become more frequent. The best way to determine the rate of usage is through improved customer engagement.

The remaining business has a stable and predictable demand profile, meaning it could be run on a forecast basis. In addition, the two demand streams onto the factory could be merged to create fixed order cycle patterns. This would synchronise supply with demand, thus creating a predictable and metronomic cadence.

Business impact

Insights derived from the tool's use of analytics permitted a correction of the demand planning process and an improvement in forecast accuracy. It also served to eliminate the systemic problem of under-forecasting.

As a result, the research team were well-placed to create a stable and predictable production plan for the supplying factory. This led to supply efficiency gains, as well as correcting the issue with low inventory levels and associated customer service problems.

Analytics in action

Demand profile and stock cover versus sales

The *Stock against daily sales* dashboards (4.a and 4.b) bring to light the demand pattern in the tyre manufacturer. It is clear from this data that two separate demand components exist in the business. These comprise base sales to a large number of companies, in the one case, and infrequent large orders for OEM customers, in the other. The spikes in demand will be impacting the entire forecast to stock process and will consume the inventory when they occur. As the data reveals, the underlying demand is stable and predictable, excepting the intermittent spikes.

4.a Stock against sales - smooth products

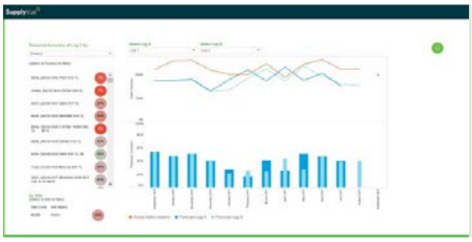
4.b Stock against sales - erratic products

Demand forecasting

Despite being driven by a statistical algorithm, the demand forecasting process used by the tyre manufacturer was not as accurate as might be expected. This was because the process worked off a disaggregated, total demand figure. A more nuanced picture is revealed when orders for OEM customers are separated from overall demand. It is important to note, however, that the size and timing of the OEM demand is not possible to forecast via a statistical algorithm alone. Instead, accurate forecasting needs to be managed through a collaborative process.

The statistical algorithm is inaccurate, as shown in the *Forecast accuracy analysis* chart (4.c). This is the result of the algorithm failing to forecast the sales spikes. Because these spikes are not excluded from the base data, the algorithm concludes that a similar uplift in sales will occur in the following period as well. If no changes are made to the data entering the algorithm, the forecast will continue to predict excessive demand after a spike. This incorrect timing of demand will mean the system is consistently under-forecasting total demand. This bias of under forecasting demand is shown in the *Forecast bias analysis* dashboard (4.d).

4.c Forecast accuracy analysis



4.d Forecast bias analysis

The *Forecast value add analysis* dashboard (4.e) shows that the firm's existing forecasting process produces less accurate results than a process that is smoothed and less reactive. The tool reveals evidence of an underlying smooth rate of sales. This can be used to set the cadence for the supply chain. The OEM demand profile, on the other hand, is unpredictable. As the *Forecast accuracy histogram* (4.f) shows, there is a high volume of SKUs. These representing about 25% of the volume with less than 10% forecast accuracy. The source of this inaccuracy is driven by the OEM business. It was recommended that OEM demand be managed on a collaborative basis.

4.e Forecast value add analysis

4.f Forecast accuracy histogram

The *Plan policy analysis* dashboard (4.g) shows that the replenishment signal back to the supplying factory generally lacked clear, predictable policy or pattern. The replenishment orders on the factory varied in terms of the quantities requested. The time intervals between orders was also inconsistent. As the *Synchronisation analysis* dashboard (4.h) demonstrates, the order batch sizes were large. This caused high peaks in inventory, as well as occasional shortages. There is no obvious synchronisation between the rate of supply and the rate of sales.

4.g Plan policy analysis

4.h Synchronisation analysis

Case study 5

Right-sizing inventory levels of inbound materials for a complex job shop manufacturing process

Challenge

A mid-sized European manufacturer was suffering with a high investment in inbound materials. The manufacturing process was a complex job shop environment in which the material requirements were perceived not to follow clear patterns or trends. The situation was complicated by the high number of materials in the manufacturing process. Adding to this complication was the fact that some of these materials were reworked to become intermediate components and then stored as inventory. Finally, the length of lead times for the inbound materials varied across a wide range. The key research challenge was to see if the tool could identify opportunities for reducing inventory.

Approach

The tool was used to map the complex flows of information and data across the supply chain. Once completed, the demand profiles for the inbound and component materials were then analysed and divided into a 36-segment model. Each segment was isolated along with the respective information flow to suppliers. The resulting supply and inventory were then examined in unison. This helped identify the causes behind the high inventory levels. Armed with these insights, the research team were able to determine appropriate supply processes and parameters for each segment.

Diagnostic summary

The inventory levels for the inbound materials were extremely high. This was curious as the weekly demand profiles for the main throughput products were extremely stable and predictable. In addition, the lead times and the minimum order quantities for all products were three weeks or less and could be relied upon. The tool was used to recalculate the firm's inventory holding policies based on the demand profiles of its products. This resulted in a potential inventory reduction of around 80% for the A1 smooth segment. This dramatic reduction is achievable simply by altering the parameters of the company's Material requirements planning (MRP) and those for its MRP system's inventory holding policy.

Business impact

The tool identified opportunities for making an 80% reduction in the firm's A1 smooth segment inventory levels.

Analytics in action

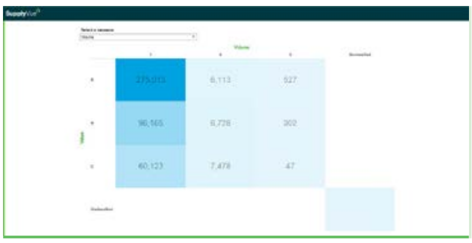
Segmentation

As a first step, the research team used the tool to group products into segments. Each segment included products with similar demand profiles, in terms of volume, value, variability of demand quantity, and variability of demand frequency. The dashboards (5.a, 5.b and 5.c) illustrate the results of this segmentation exercise.

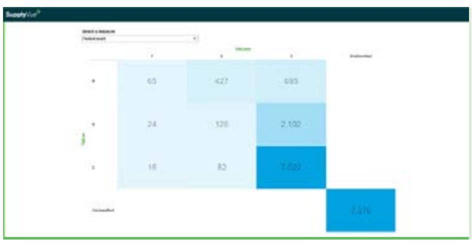
The A1 Smooth segment is the most significant in terms of throughput value and volume. Despite its importance to the overall performance of the supply chain, this segment contains a mere 65 products.

5.a Throughput value by segment

5.b Volume by segment



5.c Products in each segment



Inventory levels

The *Stock against sales* dashboard (5.d) for the total business puts the average inventory holding in the period under consideration at 100 days cover.

5.d Stock against sales - total business

The same *Stock against sales* dashboard (5.e) filtered for the A1 smooth segment reveals that the A1 smooth segment itself has 100 days of inventory.

5.e Stock against sales - A1 smooth segment

Based on this data, the A1 smooth segment was modelled in detail to identify opportunities for inventory reduction.

Examining inventory levels by segment

When inventory was analysed by segment it was noted that not only the A1 smooth segment but other smooth segments were holding significant amounts of inventory. These present obvious sources of additional inventory reduction.

5.f Stock distribution by segment by volume

5.g Stock distribution by segment by value

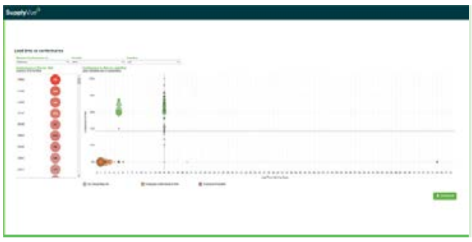
Examining the A1 smooth segment

The *Sales profile analysis* dashboard (5.h) shows that the weekly demand usage pattern for the A1 Smooth segment is very smooth and predictable.

5.h Sales profile analysis - weekly buckets

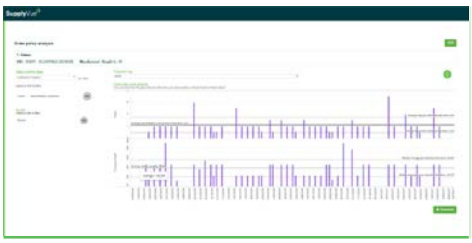
The *Lead-time analysis* dashboard (5.i) for the A1 Smooth segment indicates puts the supply lead times at a maximum of three weeks. It also reveals that the lead times were highly reliable.

5.i Lead-time analysis



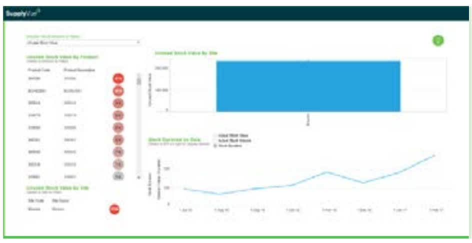
The *Replenishment policy analysis* dashboard (5.j) shows orders placed on suppliers were more variable and unstable than the consumption patterns, so the supply chain process was adding variability and volatility into the process.

5.j Replenishment policy analysis



Based on the demand profile, the reliable lead-times and respective minimum order quantities. The analysis (5.k) showed there was an 80% inventory reduction opportunity for the A1 segment.

5.k Inventory reduction opportunity



Key findings

Close attention to detail

Acquiring granular data from across the supply chain is vital to visualising a company's complete systems and identifying sources of detrimental variability.

Information visibility

Data analytics provides a hitherto unparalleled overview of a company's entire supply chain, improving opportunities to identify efficiencies and service improvements.

Parameter settings

Setting clear rules on how and when orders are generated is essential to governing demand and better regulating production processes.

Supply chain replenishment

The most significant impact of data analytics on decision-making relates to the design of supply chain replenishment mechanisms on a product-by-product basis.

Consistency and synchronicity

Data analytics enables supply chain managers to establish well-evidenced rules for managing demand, thus bringing greater predictability to production and reducing the need for costly buffers such as spare capacity and inventory.

Conclusion

This study confirmed that data analytics has the potential to deliver a number of performance-enhancing benefits in company supply chains.

Information availability and data quality were shown to be essential factors in delivering results. The more robust and copious a company's data points, the more insights and value the data analytics approach was able to generate. Although the case study companies exhibited differing levels of management capacity, all the firms analysed had the requisite level of data available.

The five firms in our study demonstrated considerable ease in capturing the requisite data from existing data management systems and uploading them into the generic analysis tool. Once the data was uploaded, the process of analysis proved quick and easy to apply.

A consistent finding across all the case studies was the critical role demand profiling plays. If a company's supply chain replenishment and inventory policies are not set correctly or are not being adhered to, companies will inevitably incur avoidable inefficiencies.

Demand patterns can be analysed at aggregated levels of the business as well as on a segmented (i.e. product-by-product) basis. Ideally, this should be done every three to six months, depending on the volatility of the business.

Regular demand profiling provides companies with a much more accurate picture of demand cycles. Such information permits improvements in sales forecasting, which in turn reduces costly mismatches with inventory and production.

None of the businesses in the study had a coherent or consistent policy setting process for managing demand. As a consequence, their processes for managing the parameter settings for each of the products in their supply chain lacked robust systematisation, detail and predictability.

In each case, applying a generic approach to demand profiling and segmentation analysis emerged as a prerequisite for effective data analytics. Once in place, the tool proved remarkably deft at identifying inconsistencies in the company's systems.

By drilling into the data behind these inconsistencies, the tool was then able to pinpoint the root causes of the supply chain inefficiencies for each of the case study firms. The tool's suite of analytic technologies proved adept at this regardless of the problem context, which was different each time.

Presenting simple time series charts was shown to be effective in helping operations managers understand the nature of the problems in their supply chains. Supply chain managers consistently reported the importance of the tool's ability to bring to light previously hidden data or to reveal where existing data was incorrect.

The evidence from the case companies indicated that time limitations and operational pressures prevents managers from analysing systems data for themselves. In the case of the companies under investigation, this led to poorly set systems and easily avoidable mistakes that the application of analytics could quickly identify and resolve.

The capacity of the tool to inform decision-making processes and policy solutions was widely noted by the study's participants. Holistic supply chain considerations and supply chain design were identified as the decision-making areas where the tool provided greatest value.

Given the changing nature of business, the case companies observed the need to update the analysis of their supply chains periodically.

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info@supplyvue.com
+44 (0)20 7099 6910

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