

Analytics



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Analytics Optimizes Fractional Aircraft Assignments

The Business

Fractional-aircraft management companies (FMCs) sell shares in business aircraft. Their customers are typically corporations and wealthy individuals who don't want the expense and responsibility of owning their own aircraft, yet prefer the luxury and convenience of private aviation. FMCs also perform all necessary fleet maintenance, pilot management, and scheduling.

The Problem

FMCs must provide an aircraft with as little as four hours notice. If they can't, they will usually subcontract the flight to another carrier at very high cost. However, deciding which aircraft to assign to which flights to avoid this cost is a very complex undertaking. FMCs must balance many factors including pop-up demand, aircraft breakage, owners' schedules, and aviation rules regarding maintenance and crew duty cycles.

Many FMCs enlist some kind of scheduling software to help solve this puzzle; however, few have software that is up to the task. One such FMC called Analytics for help.

The Existing Solution

The client previously had contracted with university researchers to develop a schedule optimizer. The schedule optimizer had numerous limitations:

- It required several hours to produce a result
- It did not accurately model the intricacies of crew duty
- It did not honor maintenance constraints
- It made too many changes in the solution for the operator to execute
- It did not account for future demand
- It could only optimize one day at a time

Because it was so slow, the optimizer could only be run once to create an initial schedule. After that, a roomful of schedulers would manually adjust the schedule as new demands or aircraft breakages occurred. That meant that fewer than 15% of the schedule optimizer's assignments were implemented, resulting in significant extra costs in the scheduling process itself and also due to scheduling mistakes.

Analytics' Solution

Analytics re-designed and re-built the schedule optimizer to correct these faults. Analytics also helped the client change its scheduling processes so that the new optimizer could be used in real-time. Finally, Analytics transferred to the client the competency needed to maintain and further improve the optimizer and the scheduling process.

The Analytics Difference

Analytics is extremely knowledgeable in schedule optimization models and techniques. It also has the computer skills to deploy its optimized schedulers as easy-to-use software tools.

Business Impact

Saved over \$9m in annual operating costs

In addition to cost savings from improved resource utilization, benefits of Analytics' new schedule optimizer and recommended process improvements included:

- Improved customer service, such as faster response times to requests for new trips
- Shorter response times to changes in aircraft status
- Reduced demand on the scheduling department
- Less reliance on the "star" scheduler
- Systematic, controllable processes of making decisions
- A "what if" simulator that greatly leveraged strategic planning

"Analytics is the only consulting firm I am aware of that could meet our needs across a broad range of operations areas and issues. They quickly came up to speed on the important factors unique to our operations, worked well with our people, and were extremely responsive to our needs and feedback. They consistently delivered projects on-time and on-budget, and I highly recommend their services."

– CEO

Analytics



Analytics Realigns Luggage Company's Distribution Network

The Business

As result of a major acquisition and incremental changes over time, the U.S. warehousing and distribution network of a prominent luggage company had become a competitive liability.

The Problem

Analytics Operations Engineering, Inc. was asked to redesign the current network determining the number and location of warehouses that would best serve the company.

Analytics' Solution

Analytics performed a more comprehensive analysis, including the following cost components:

- Inbound and outbound freight
- Direct and indirect labor
- Warehousing and overhead
- Inventory-driven costs
- Capital equipment

Working with the company's internal transportation staff, the company's major carriers, and independent experts, Analytics determined transportation costs and verified that the results were robust across the feasible range of rates. Two strong network alternatives were identified:

- A lower-risk scenario with 21% ROI
- A higher-risk scenario with 29% ROI

Because of the low return of the former, the high risk of the later, and the high investment required for either, Analytics developed a hybrid approach – a pilot operation at a new hub location. Compared with the two initial solutions, this option offered two-thirds of the savings, a higher return on investment, and much lower risk – and required only about half of the capital investment.

This third option would also enable the gradual evolution to either of the two recommended end state solutions based on exhibited performance.

To capture real-world uncertainty, Analytics performed robustness analysis to investigate the effect of changes to various inputs. These studies tested assumptions about company growth, prepaid vs. collect business portion, product-sourcing locations, and LTL (less-than-truckload) discount percentages vs. location.

The Analytics Difference

Prior to actual implementation, Analytics was able to design and rigorously compare a number of robust distribution scenarios, allowing the client to make its best current investment decision without sacrificing the opportunity for additional ROI gains down the road.

Business Impact

A \$25 million better network design decision

Analytics' hybrid network design approach offered:

- 65% of the savings
- 55% of the investment
- 35% ROI

and much lower risk than traditional network alternatives. The result was over \$25 million in additional value creation.

"The team from Analytics certainly lived up to the company's name – they were some of the most technically-capable people I've encountered, but also very easy to work with. In addition, they navigated a challenging political environment, were responsive to shifting objectives from the project sponsors, and provided recommendations on an aggressive timeline. Analytics' analysis of cost-savings opportunities in each operating scenario revealed differences in value creation between scenarios of over \$25 million over 5 years."

– VP, Operations and Logistics

Analytics



Analytics' Scheduling Helps Polymer Producer Minimize Inventory and Costs

The Business

A leading polymer producer makes saturated and unsaturated polymer products for use in a wide variety of products, from footwear to roads to roofing. The polymers are produced in a batch polymerization process (a “campaign”) that imposes several constraints on production:

- Only one product type can be made on any of the four production units at a time
- There are significant costs to switching between grades of polymer
- Adequate raw material must be available at the start of a production run to complete it
- Minimum run-size constraints dictate the smallest quantity that can be economically made in a production run

The ability to determine a robust schedule as well as to rapidly reschedule the units whenever conditions change is critical to the operational success of the company.

The Problem

The scheduling of each production unit involves two decisions: 1) In what order should products be produced, and 2) How much of each product should be produced. Creating a schedule involves tradeoffs among numerous competing objectives:

- Reducing cycle stock and safety stock
- Minimizing type-change costs
- Maximizing customer-service levels
- Respecting monomer and other raw-material constraints
- Maintaining smooth production levels throughout the year

Before consulting Analytics, there was no way of knowing if a production schedule was optimal or the cost of deviating from an optimal schedule.

Analytics' Solution

Analytics analyzed the prior year's schedule and inventory profile and compared these to an optimized schedule that minimized total costs (including inventory-holding and type-change costs), subject to meeting stringent customer-service levels.

Armed with this information and with further assistance from Analytics, the producer implemented an optimization-based campaign-planning process, improved its process for setting safety-stock levels, and deployed a more robust demand-planning process.

The Analytics Difference

Analytics' robust modeling techniques enable producers to evaluate alternative production scenarios before committing resources, to achieve the best overall result.

Business Impact

Campaign optimization cut inventories 19% and saved \$2.5 million in warehousing costs

Analytics identified opportunities for significant inventory and cost reductions:

- Inventory reductions of 18 million pounds (19%) to meet the prior year's production levels
- Warehousing cost savings of \$2.5 million annually

“Analytics was extremely helpful in their work on safety stock planning, aging inventory, and setting key performance indicators. The bottom-line impact of Analytics' work will far exceed their fees just in the first year, and we look forward to working with them on other opportunities.”

– Global Procurement Director

Analytics



Analytics Finds the Source of Weld Quality Problems in Aluminum Tanks

The Business

The client is a major producer of aluminum tanks for the freight transportation industry. The tanks are assembled using a GMAW (gas metal arc welding) process.

Welding is obviously critical to the final quality of a product. It often is a major cause of product malfunctions as well as customer complaints when a weld has defects or fails under stress. Unfortunately, producing high-quality welds consistently can be very difficult – especially since welds are highly sensitive to small changes in a large number of factors including incoming materials, operating conditions, and operators.

The Problem

When the tank manufacturer began to experience an unsatisfactorily levels of weld defects on one of its products, it immediately started searching for answers. The defect rate in the welds was significant enough to require rework on almost all of the tanks. This rework was not only time consuming – it also put customer relations at risk. Fundamentally, what the client needed to know was whether to make process improvements or redesign the product. Many process factors were believed to be contributing to the quality issues and therefore many quality improvement projects were identified.

Analytics' Solution

The first step was to analyze the historical data on defects, their locations, and the operational conditions. By teasing apart the data, Analytics was able to assign a portion of the total defect rate to each contributing factor. These included:

Geometry: The tank had both straight sections and curved sections. The curved sections had a higher defect rate.

Machine: One welder had a higher defect rate than the other.

Tank size: The large tanks had a higher defect rate.

Day-to-day variation: A combination of incoming materials, process settings, and operating conditions meant that quality levels varied from day to day.

Analytics determined that if all changes were made to reduce the defects on the curved portions, make all machines identical, produce the larger tanks at the same quality level as the smaller, and remove all day-to-day variation, the remaining defect rate would *still* be too high. Instead, Analytics helped the client focus on design changes that could deliver a 98% reduction in manufacturing defects.

The Analytics Difference

Analytics enables clients to gauge the impact on quality of each improvement as well as the likely impact if *all* proposed quality improvements were made.

Business Impact

Manufacturing defects reduced 98%

Analytics helped the client understand that the quality issues were fundamental to the existing design.

As a result, the client was able to confidently make the needed significant investment in redesign rather than waste resources trying to improve the manufacturing process.

"Analytics' analysis of quality defects on a key component identified that the existing product design made reliable production virtually impossible. By suggesting design changes to the component to enable consistent, high-quality welds, Analytics helped us reduce defects by 98%."

Overall, Analytics' deep understanding of manufacturing system dynamics and the interplay of production cells has provided our organization the horsepower to meet our future production goals."

– Plant Manager

Analytics



Analytics Delivers Needed Inkjet Production for Hewlett Packard

The Business

Hewlett Packard has been the world's leading brand in inkjet printers since the company introduced the first DeskJet product over a decade ago. However, by the mid-1990s inkjet printers had become so successful that HP and its competitors combined could not satisfy worldwide demand.

The Problem

Scaling up the existing, largely manual, production method was not HP's first choice:

- Pushing existing workers to produce more might lower quality and erode margins
- Hiring more workers would mean layoffs in the future as the inkjet market matured and demand leveled off – a violation of HP's stable workforce policy

HP chose to invest \$25 million in an automated system it expected would raise production to meet demand. But as the system came online, early tests showed that production would actually *fall* by almost half unless there was also a big increase in labor costs – the very outcome HP wanted to avoid.

The Existing Solution

The system HP was implementing consisted of stations and cells spaced at intervals along a conveyor loop. Cells build subassemblies and feed the conveyor. Once on the conveyor, the subassemblies go from station to station and are integrated with subassemblies built in other cells. The solution assumed 99% machine efficiencies and constant station cycle times.

Early data indicated machine efficiencies were closer to 97% than the needed 99%. In addition, station cycle times varied much more than expected. Another complication: the solution was already under construction. HP could not change individual machines, or any system component, without disrupting the system's development.

Analytics' Solution

Analytics' solution was to deploy buffers of in-process inventory at strategic points along the conveyor and within cells feeding the conveyor. Properly-sized buffers at these locations mitigated the effects of machine failures, yet did not expand inventory excessively. To identify buffer sizes and locations, Analytics adapted quantitative models from the "flow-line" research literature. By installing subassembly buffers that could hold 30 minutes of inventory, any disruptions in the cells were isolated from the main line. Another recommendation: to deploy buffers of about 12 units each one-quarter, one-half, and three-quarters around the loop.

The Analytics Difference

As an expert in the most advanced quantitative models, Analytics could selectively and appropriately modify and apply the models ideally suited to solving HP's problem.

Business Impact

Productivity increased \$280m

Analytics' recommendations cost HP \$1.4 million to implement. In return, HP realized an incremental revenue increase of \$280 million.

In addition, HP found itself well prepared for the day when inkjet prices were to drop and the focus would shift from revenue to cost control.

"Analytics' techniques helped HP achieve its production and revenue goals rapidly and cost effectively. In addition, the 50% increase in productivity we achieved through Analytics' work made HP's printers cost competitive far into the future."

–Supply Chain
Engineering Manager

Analytics



Analytics' Forecasting Boosts Value of Medical Device Manufacturer

The Business

This client is a leading medical device manufacturer. The company produces both the devices themselves as well as the instruments and associated materials and accessories used by doctors. The company produces 2,200 different products. Domestically, it sells its products directly to individual doctors and practices; internationally, the company sends its products to distributors, subsidiaries, and affiliates. Orders placed at headquarters by subsidiaries and affiliates generate the company's international demand data.

In 1994, the company brought in a private equity firm to provide capital in exchange for a small percentage of the company. This gave the company the operating capital it needed to begin a rapid expansion program. Since then, company revenues increased steadily at approximately 20% per year.

The Problem

As time passed, however, the equity firm grew nervous. It had been in the investment almost six years and it would soon be time to exit. Two disturbing trends were developing: inventories were down to 3 turns and back orders exceeded \$1 million. In other words, costs were increasing while customer satisfaction was decreasing. The equity firm realized an improvement in financial performance would be required if investors were to achieve their goals.

Analytics was asked to identify causes. Among them:

- Individual forecasting of 1,600 SKUs using homegrown, oversensitive algorithms
- Poor scheduling and lot sizing leading to large swings in production and lead times
- Arbitrary assignment of safety stock

Analytics' Solution

Analytics rebuilt the company's forecasting system by using exponential smoothing techniques, and by aggregating products into product families. In addition, Analytics also determined appropriate safety stocks based on a quantitative analysis of system variability.

The Analytics Difference

Analytics was fully knowledgeable in, and could appropriately apply, the advanced quantitative techniques that were best suited to solving the manufacturer's problem. As a result of Analytics' intervention, the manufacturer's financial performance significantly improved and the private equity firm achieved its investment goals.

Business Impact

Backorders cut 95% and inventory reduced 25%

As a result of Analytics' intervention, the private equity firm achieved its investment goals. Operational improvements included a \$5 million reduction in finished goods inventory and a 95% reduction in backorders.

"I have worked with a huge number of consultants, and Analytics has been by far the best. Not only did the cost reductions pay for Analytics' fees in a matter of months, but our operations are running more smoothly than ever before."

– VP Manufacturing

"These improvements increased the value of our investment by at least 10 times Analytics' fees. In addition, the company's improved performance made it easier to sell. It was a real pleasure to work with a firm that consistently delivered on its promises, and did not make waves with portfolio company management."

– Private Equity
Managing Director

Analytics



Analytics Shrinks Soft Goods Inventory Costs and Improves Fill Rates

The Business

When a prominent private equity firm purchased a major national soft goods distributor, it knew that rapid reductions in inventory and required working capital would be needed to make the highly leveraged deal a success.

With annual sales of approximately \$500 million, the distributor maintains a hub and spoke network emanating from a centralized distribution center. However, despite the centralized design, its inventory of 15,000 SKUs was turning only a few times per year. As part of their strategic goals, management and the investors wanted to increase inventory turns in order to lower their investment in working capital and pay down the debt.

The Problem

The company suspected that it was carrying excess inventory of many unprofitable items, but with just two months before production of next year's catalog, it needed an accelerated method of focusing its product lines.

The Existing Solution

In the past, the company had replenished branch inventories without regard for sales variability, thus maintaining a fixed number of weeks of supply for each item. This resulted in excessive inventories for products with high, steady demand and inadequate inventories for products with low, variable demand. The result was a combination of excess costs and unfilled orders.

Analytics' Solution

By accounting for demand variability, inventory holding costs, product profitability, and product substitutability, Analytics developed a new min/max ordering policy.

At the same time, despite improvements in branch operations, fill rates weren't meeting objectives due to shortages from vendor mills. In response, Analytics built another model to adjust purchasing and inventory policies at the distribution center to account for supplier variability. This approach dealt with problems with vendor-managed inventory systems, backorder management, and vendor delivery variability.

A final key to improved performance involved rating each supplier's profitability. Analytics developed methods for analyzing over 30 suppliers in terms of inventory turns, backlogs, delivery times and lost sales due to stock outs.

The Analytics Difference

Analytics has the advanced quantitative modeling expertise needed to evaluate and appropriately balance a large number of factors that impact inventory levels simultaneously.

Business Impact

Cut inventory over \$25 million in 2 months

"The goal in our engagement [with Analytics] was to substantially reduce our inventories while improving our inventory turns and service levels. The results from Analytics' efforts have exceeded our expectations: inventories have been reduced by over \$25 million (25%), while improving service levels. As part of the inventory reduction, Analytics conducted a category management analysis that helped us to identify and eliminate unprofitable SKUs. This project was completed in less than two months, even though competing consultants had quoted up to one year."

– CEO

"The Analytics team offers a truly unique skill base, and delivers services that are not available elsewhere. They quickly grasp the "big picture" economics of business problems and rapidly develop fact-based solutions. Their expertise and thoroughness give us confidence for initiatives such as inventory reduction, which allows us to decrease debt and thereby increase equity value. In terms of cost, their fees are "darn cheap" compared to the value added we get from their work."

– Private Equity Executive VP