



## Address backorders before they impact your customers



### Background/Overview:

In recent years, increased computing power and unprecedented access to data has helped the field of *predictive analytics* become one of the fastest-growing and most influential new concepts in the technology sector. Predictive analytics, which includes both sophisticated predictive modeling and machine learning, sorts through extraordinary volumes of data and complex variables to anticipate and predict outcomes based on multiple factors. Even in cases where there are simply too many variables and too much data for the human brain to assimilate and comprehend, predictive analytics can identify hidden connections, reveal subtle patterns, untangle complex relationships and yield powerful new insights.

In this exciting and fast-growing field, a new generation of off-the shelf models, often referred to as “machine learning tools,” are being developed that can assist all companies in their work. At BMK Solutions, our experience with predictive analytics and machine learning shows us that to increase precision and accuracy, one must not only search for and discover the right variables, but also understand when and how to discard “weak” variables. With a firm understanding of both the tools *and* the data, we can apply predictive analytics and machine learning to a wide range of real-world problems. This allows us to gain powerful insights into the future and craft informed and effective solutions for our clients.

### Project Details:

Backorders are a common and often costly problem faced by many suppliers. They represent a disappointed customer at best, and often lead to lost sales. The burden of dealing with backorders becomes particularly challenging when you have a large



number of stock keeping units (SKUs). For example, one of our clients had over 200,000 SKUs. These SKUs ranged from high turning to very low turning products. During a single week, it was not uncommon to have more than 1,000 SKUs go on backorder. Frustrated by the size of the problem, the costs associated with backorders, and the seemingly impossible complexity involved in resolving the issue, the Supply Chain leadership looked to BMK Solutions to provide a solution.

The primary issue was that the volume of information was so large, the inventory so varied, and the factors that could prompt a run on any given item were unknown. If the weather forecast calls for rain, a store that sells umbrellas can reasonably predict they will have a run on that product. But with a diverse inventory of 200,000+ SKUs and a seemingly endless range of complex and interrelated variables that could impact demand on a daily and weekly basis, engaging in the same kind of predictive logic is simply impossible.

What was needed was a powerful tool – a machine learning solution that would use predictive analytics techniques to do what even the most experienced supply chain professional could not. And that is exactly what BMK Solutions set out to provide.

Our team made a goal to “predict” which parts out of all the currently available parts would go on backorder within the next few weeks. We began by collecting information from client systems regarding part details, warehousing inventory levels and supplier performance data.

Our early attempts to enter this data into learning models provided less than satisfactory results. The brute force method predicted that 110 parts would go on backorder. Out of the 100 parts, only 10 parts went on backorder (true positive) while 100 did not go on backorder (false positive).

Our subsequent attempts were focused on analyzing the performance of different machine learning models. After experimenting with several of the models, we began to focus in on a select group of supervised learning models. While these models did not initially increase our accuracy or precision, they *were* predicting a different set of SKUs. In other words, the new models increased our coverage.

Once we were confident that we had selected the best blend of different models, we focused on refining the variables we were inputting into the models. We were able to leverage our industry experience, down-selecting our chosen variables from 75 to 40 over the course of several iterations. In the process of refining our selections, we greatly improved the predictive accuracy of each model. Below is a sample of the results our final models would consistently produce:

- Total backorders for the week: 1,254
- Models predicted: 155 – of which 96 went on backorder. Overall accuracy of our predictions was 62% (96 / 155)
- Coverage: 13% of all backorders were identified (155 / 1,154)



### **Customer benefits:**

On the surface, a 13% percent coverage rate or 62% percent precision may not seem particularly impressive. But those numbers need to be placed into perspective to truly appreciate the impact. Consider that, prior to this knowledge, there was *no* direction, and all parts were treated with equal importance. For manufacturing and supply chain professionals, those numbers represent significant cost and efficiency savings, entirely apart from additional customer service and satisfaction benefits: over a four-week period, the 213 SKUs that went on backorder accounted for approximately 3,000 orders and 7,000 units.

With results generated from the finished model, our customer can now focus on anticipating and resolving potential back orders and inventory inefficiencies *before* they happen. The issues facing these SKUs and suppliers are far more complex than a simple “bad supplier” or “not enough” inventory issue. These issues seem to arise instead from a combination of complex events not easily seen when looking at one, two or three variables. These circumstances were an ideal fit for the specialized capabilities afforded by predictive analytics and machine learning technology.

### **Conclusion:**

The professional environment in which we operate today is highly competitive and complex. Even the smallest edge can make a dramatic difference. Going forward, businesses are increasingly likely to find that edge and translate it into lasting strategic business gains. At the intersection of industry experts and technology experts, both professionals can work collaboratively to solve business problems by deploying technology solutions that embody the right environmental variables. To have a successful team, industry experts and technology experts need to have a growth mindset, an understanding of how the business works *and* how the technology works. That synergistic approach will realize the greatest benefit from both perspectives, and will ensure that businesses will be able to use these exciting new tools to break from their current improvement plateau and start climbing again.

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