Forecasting Energy Consumption for a Global Consumer Goods Manufacturer

At large companies across the globe, the Big Data era has ushered in a new series of initiatives aimed at reducing the inefficiencies that Digital Transformation and Analytics programs have helped to identify.

When decision-makers at one global consumer goods manufacturer pinpointed energy consumption as one facet of its operations where there were significant gains to be made, they turned to Thorogood to help them build a reporting tool that uses company data to set benchmarks and monitor its progress in its quest to become a more efficient business and a more responsible corporate citizen. By utilizing software that was already familiar to the company's end users and integrating it with powerful statistical analysis, the new solution has become a pivotal tool in one of the manufacturing giant's most important organizational schemes.

Tackling energy usage

Regardless of industry, one thing all enterprise firms have in common is a reliance on energy. The benefits of reducing consumption are substantial, from the elimination of unnecessary spending to the minimization of impact on the environment. These concerns were particularly acute on the part of Thorogood's client, which had long stood as one of the world's leading consumer packaged goods companies. When the firm launched an initiative to reduce its energy usage, it began by targeting resource consumption at its manufacturing facilities. Given the supply and demand realities of its industry and the variable nature of production cycles, the company's decision-makers realized that it would be unreasonable to ask its factory managers for a flat, across-the-board reduction. Each factory needed its own like-for-like benchmarks based on a variety of factors. To accomplish this, it needed a tool with two primary features: user-friendly reports that allowed managers to quickly evaluate their energy consumption, and analytic capabilities that allowed the company to set the most appropriate benchmarks for each location.

These two factors led this particular company to enlist the help of Thorogood to draw upon its consultants' combined statistical expertise with their intimate

knowledge of technology and business operations. Previously, our client's analysts had produced energy consumption forecasts by processing yearly production figures in Excel and then using linear regression to produce a machine learning model for each factory. Given the manual nature of the process, they would spend roughly three weeks to produce forecasts for each factory. The time involved in producing the reports meant that they could only be produced twice per year, a significant drawback given that production schedules change far more frequently.

Making use of monthly data already available in different-purposed systems developed on Qlikview, the company had the ability to create a model that was more accurate and more applicable. And with the right development expertise, also a solution that cut the time it took to run a report from three weeks to under a minute.

A better model for more accurate forecasts

The first step was improving the mathematical model by switching the granularity of data to monthly. The model was based on two different assumptions, which were surfaced by Thorogood via constant communication and co-building with factory managers and business analysts. The first assumption held that all factories would have a baseline level of energy usage stemming from administrative consumption (staff facilities, offices, etc.). Second, that the energy used in the manufacturing process would be proportional to the output level of each product produced the facility in question, provided the products are manufactured using the same processes.

By factoring in variables that allowed for situational differences such as machine types and environmental conditions, Thorogood's consultants helped our client create a linear regression model that estimated each factory's expected energy consumption at a given point in time with far more certainty than the previous approach.

Making math easy to read

In order to integrate the new tool with our client's existing reporting, the Thorogood team set out to develop an application that could incorporate R's

statistical computing capabilities with QlikView, the reporting software that was most widely used within the company. They designed an architecture that, with the push of a button, would run the statistical algorithm and present the users with an up-to-date view of the forecast, alongside historical data.

The resulting dashboard suite allowed factory managers to evaluate actual against forecast energy consumption and quickly see visualizations of past usage and projected future usage. Because the dashboards were integrated with a long-standing tool, the company benefited from the familiarization its users had with its interface and the fact that the energy consumption data could be easily integrated with other reports the company was running. Altogether, the tool allowed for 'one version of the truth' across applications. It also enabled the user to write back data to files to perform 'what-if' analysis by adjusting volume plan data and re-running energy forecasts through R.

Moving forward, the application and its underlying data model will allow our client to take further steps to finetune its forecasts. The company is already considering the integration additional variables into the data model, including weather patterns and promotional cycles. Eventually, the model could be expanded to forecast energy usage for aspects of the supply chain outside of manufacturing, moving our client another step closer to its goal of optimal energy consumption.

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