

Playing catch-up in advanced analytics

Luis Benavides, Rehana Khanam, Frédéric Lefort and Oscar Lovera-Perez

Among CPG companies' most underused assets are the vast quantities of data they generate. But there's still opportunity to invest in industry-beating analytic capabilities.

Consumer-packaged-goods (CPG) companies have increasingly gained access to unprecedented amounts of data, and we expect that this trend will intensify over time. However, most companies are generating very limited insight from these newly found sources, leaving a treasure chest of opportunities untapped. Companies that have already captured benefits from this trove of insight are reaching the next frontier of performance. For those companies that have yet to follow suit, it is imperative to take steps to catch up.

With all the attention given to advanced analytics, it may be tempting to assume that the benefits are overrated. But the value is real and significant. For example, by making a concerted effort to find correlations among more than 400 output and quality parameters, a paper company was able to reduce material cost by more than 10 percent and increase revenue per ton by more than 5 percent. To achieve its targets for quality at minimum cost, the company needed to optimize multiple consecutive process steps. Papermaking is a complex industrial process that combines interrelated chemical, thermal, and mechanical steps, but these interrelations and their impact on the product are often not well understood. The company had only a limited understanding of how control parameters influence product characteristics at each step of the value chain. Once the company understood the linkages among parameters, it used the latest machine learning and bespoke algorithms to optimize the paper mill for customer requirements. It also uses the model on a continuous basis to monitor and increase yield and improve performance.

Choose the right data and tools

Global companies should consider using both internal and external data, while addressing the challenge of accessing information in the most sensible way. Internal data sets must typically be cleaned and merged in order to glean insights. Depending on their source, data sets generated within a plant are often structured differently (for example, using different nomenclature or units of measure) and may contain statistical “noise” for a variety of reasons. External data can often provide CPG companies with much-needed insights related to consumers, customers, and competitors. However, the ability to use external data sources is highly dependent on the extent to which the provider has structured the data. Raw data may appear to be a random array of numbers and names. To make the data useful for analysis, the provider must, for example, clearly identify what is being measured and the units of measure. To generate insights from the data sources, companies must also understand the analytical tools and models available and select the right ones.

By choosing the right reliability-analytics approach, a heavy-equipment manufacturer reduced maintenance spending by about 5 percent, amounting to savings of tens of millions of dollars. The company applied a variety of advanced analytics to evaluate the performance of large motors used in production. These analytics included a Weibull analysis of component-failures data to determine the optimal maintenance strategy and logistic regression analysis to establish the relationship between alarms and failure events. Although these are not new analyses, the availability of real-time data, on-demand computing power, and machine-learning algorithms has enabled an entirely new level of proactive insight. The analyses revealed that high maintenance spending resulted from the need for a break-in period for new components. To prevent breakdowns, the manufacturer had been proactively replacing the components. In fact, the company’s overzealous approach to component replacement had actually been driving costs higher. By replacing the components less frequently, the company could improve their reliability and reduce maintenance costs.

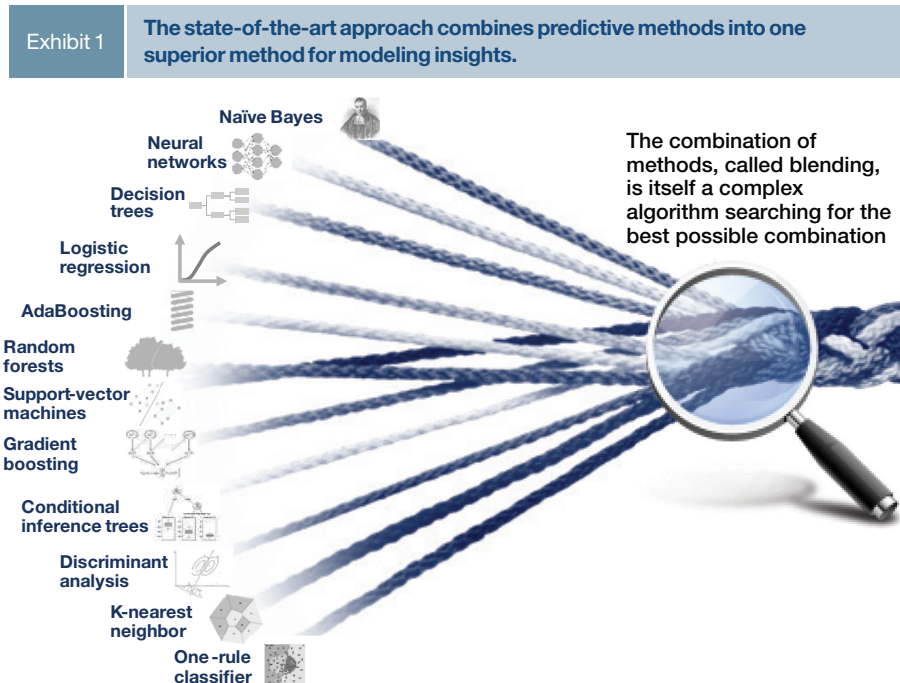
Take a comprehensive approach

Manufacturers must apply a robust advanced-analytics approach that includes statistical analysis, modeling, and optimization of processes and products, and then take action based on the insights:

- **Collect data** through sensors along the entire manufacturing process at critical points.
- **Record, archive, and analyze large volumes of big data** using statistical analyses.

- **Model, using logic and algorithms**, to calculate optimal settings or modes of operation. The state-of-the-art approach is to combine predictive methods into one superior method to model insights. The combination of methods, called blending, is itself a complex algorithm searching for the best possible solution (exhibit). The predictive methods blended in this approach are often not new. However, the availability of vast amounts of additional data and tremendous processing power has created new opportunities for companies to combine these analyses to predict performance and determine the optimum answers to business problems.
- **Act on the optimization and continually monitor** the impact to ensure decisions in plants are consistent with the design.
- **Set up and/or adjust the process or equipment** with continuous improvement.

Across CPG industries, companies are capturing significant value by deploying an analytics approach based on these steps. Two examples illustrate the potential:



Improving vaccine yield. A biopharma company increased its processing yield by 50 percent by building artificial neural networks to identify optimal machine parameters. Manufacturing was the bottleneck in the company's value stream. Yield was declining and highly variable, and regulatory bodies had raised concerns about process instability. The company's existing approach to improve yield was unstructured and showed limited success. The company adopted a new approach that began with thoroughly understanding its manufacturing process. It gathered all available historical process data sets and used advanced analytics to identify the most influential parameters. It applied the insights to identify linkages between critical parameters and operations, define the main levers for reaching the optimum process conditions, and develop an action plan for implementing the levers. Without the need for capital expenditures, the company succeeded in de-bottlenecking its production facility. The yield improvement helped to reduce costs by \$5 million to \$10 million and increase sales by \$20 million. The improvement also led to a resolution of the regulatory issues.

Accurately predicting spiciness. A food manufacturer was able to raise quality and reduce complaints by 90 percent by using infrared (IR) technology to continually monitor quality and optimize parameters to improve flavor characteristics. The perceived "hotness" of the company's products is a critical parameter, but could only be determined by human testers—a process that is both unreliable and expensive. The company sought to use the latest IR technology to capture data, and then use data analytics to develop a model to evaluate hotness. The company developed a fully automated model in a neural-network tool to correlate key IR measurements to hotness. It validated the model through production runs and a comparison with human flavor-tester results. Once data capturing and modeling was validated, key-input-controlling parameters were connected through a process loop, enabling the manufacturer to change inputs to meet hotness targets. The manufacturer now continuously monitors quality prior to packaging. Total testing costs have been reduced, while the sampling size has increased and variations in product characteristics have declined.



Efforts to adopt advanced analytics are typically initiated by teams in the industrial-engineering or continuous-improvement functions. While the value captured is often significant, these efforts are typically isolated and uncoordinated. Embedding such approaches more systematically requires coordination by the COO, working with other members of the C-suite to ensure that adequate energy, resources, and

attention are brought to bear. Most manufacturers will find that the data they need in order to derive valuable insights is already at their fingertips. Applying the right approach to advanced analytics is the crucial step to catching up to competitors that have already reached the next frontier of improvement.

***Luis Benavides** is a partner in McKinsey's Miami office; **Rehana Khanam** and **Oscar Lovera-Perez** are both associate partners in the London office; and **Frédéric Lefort** is a partner in the Gothenburg office.*

Copyright © 2016 McKinsey & Company. All rights reserved.