Statistical Discovery.™ From SAS.

Whirlpool spins a culture of analytics

JMP® helps analysts improve processes and products companywide

What does a high-quality refrigerator sound like? Does the compressor buzz or whir? Does the water dispenser whoosh? Does the ice maker rattle or crunch? Though most people visit their refrigerator several times a day, such questions rarely come to mind when they open the door. But for Aaron Youngstedt, Master Black Belt and Operation Excellence program deployment lead at Whirlpool, such questions are essential for improving business processes and providing customers with the best products possible.

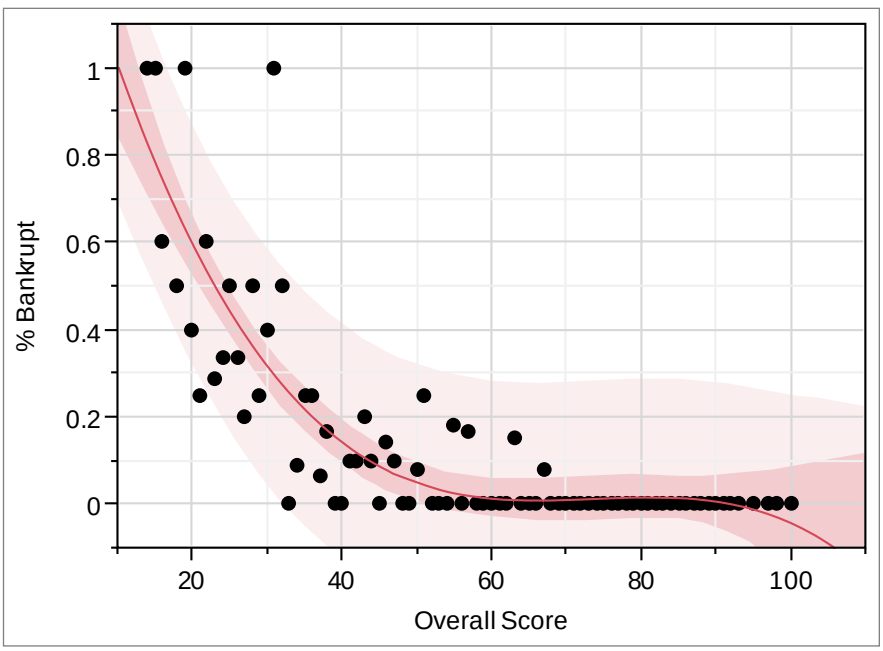
The Operation Excellence program, known internally as OpEx, was founded in 1996 to encourage data discovery through Six Sigma methods and to apply the resulting knowledge to enhance quality, reduce costs and improve customer satisfaction. From the start, OpEx has helped Whirlpool boost income and efficiency, improve the quality of products, reduce warranty costs, minimize damage during shipping and transit, and gather more accurate customer requirements to inform the design process.

And also from the start, JMP® statistical discovery software from SAS has been instrumental to the team's successes.

"For the OpEx program," Youngstedt explains, "JMP has been a secret weapon."

OpEx encourages critical thinking with an ultimate goal of "embedding a culture of data-driven learning." As part of this effort, Whirlpool has trained approximately 3,000 Black Belt candidates. Typically, Youngstedt explains, the program trains 150 Black Belts and 250 Green Belts every year across all business functions. Participants return to their jobs sharing a problem-solving language that is driven by questions, theories, predictions, and data analysis. OpEx is not designed to promote the use of any one specific tool, but rather focuses on allowing good critical thinking to guide people to the right tool, enabling knowledge discovery. Still, JMP is incorporated into all aspects of the training program. "JMP is such a great tool for exploring data quickly," Youngstedt says.

The interactive nature of the program, he explains, encourages the discovery of knowledge through data analysis and allows participants to quickly and compellingly prove or disprove assumptions. JMP is so useful in this



This risk curve represents a compilation of financial information from each of Whirlpool's suppliers. The graph presents a benchmark for high-risk suppliers; it also shows exactly which components need to be sourced from multiple suppliers and which suppliers need to be dropped altogether.

> "JMP enables knowledge discovery across our entire business. …The applications are endless."
>
> **Aaron Youngstedt**
> Whirlpool

capacity that all Black Belt candidates receive a software license prior to their first week of training, accompanied by an invitation to a custom "Welcome to JMP" WebEx. During the initial week, instructors lead "JMP Labs" each evening.

"Whirlpool's 17-year-old Operational Excellence program continues to lead the industry in its data acquisition and analysis capability, which improves decision making throughout the company," explains Ken Kleinhample, Whirlpool's Vice President of Global Quality. "Our partnership with JMP has been in place the entire journey. The software continues to be intuitive for our Black Belts in both planning and analyzing experiments."

Limitless applications

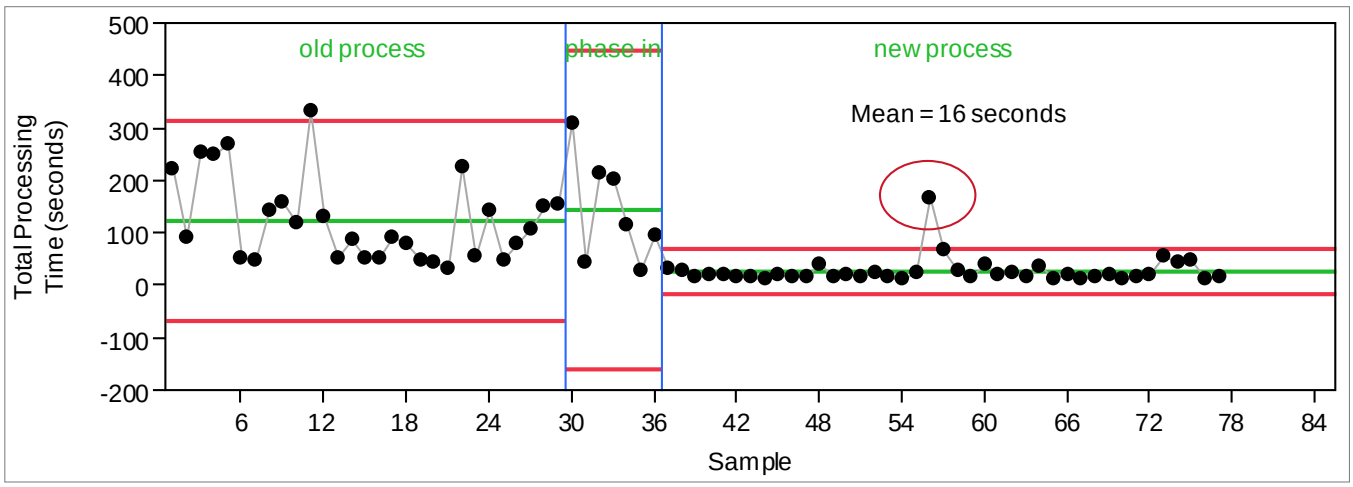
Working to improve quality in every aspect of a large business can lead to some unexpected applications of analytics. The case of a refrigerator's sound profile, for example, has more to do with perception than raw data. "People might not realize it's because of the sound of their ice dropping out of the icemaker at just the right angle," Youngstedt says, "but over time they develop this idea that their refrigerator is very well made."

This is a conclusion Whirlpool works hard to reinforce – and analytics is helping. Youngstedt explains that a team of Black Belts created a sound jury study using a paired comparison test to isolate the sounds customers associate with a cheaply made refrigerator and those they associate with a high-quality design. The results help engineers design a product that is not just well built, but one that subtly communicates this superior quality to consumers.

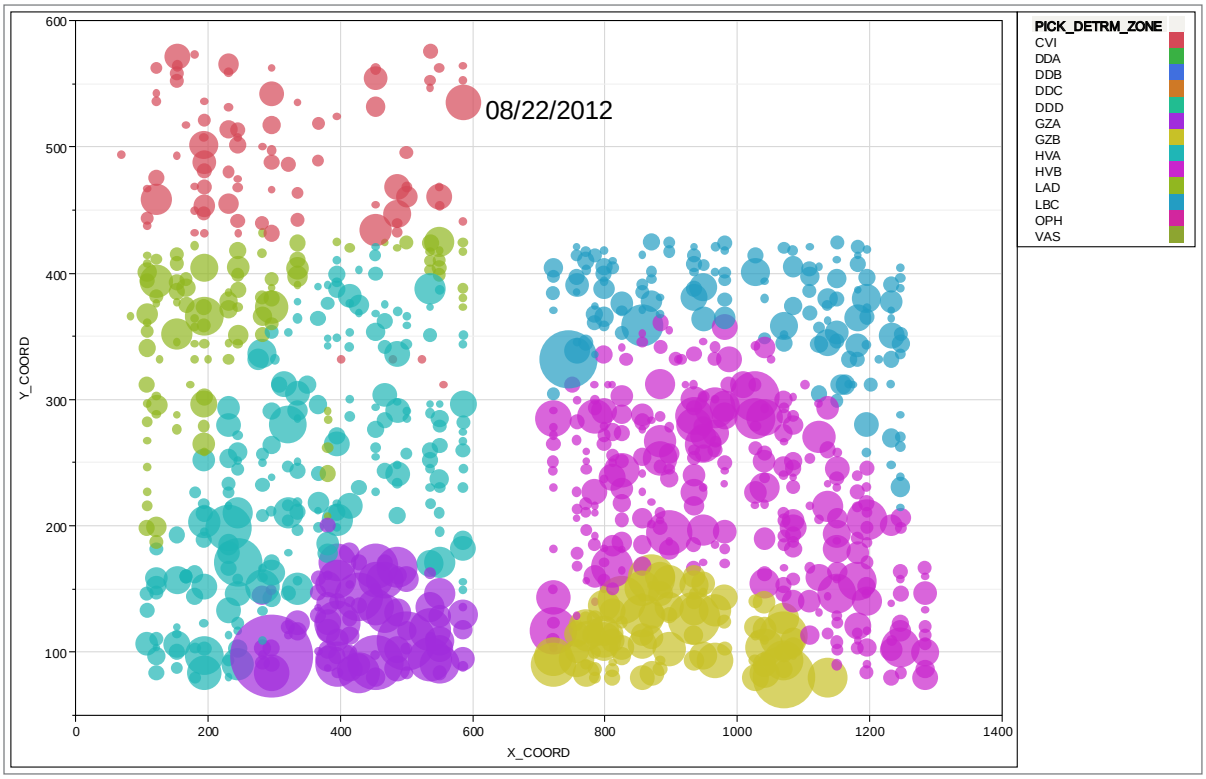
Indeed, the OpEx methodology has helped Whirlpool solve a wide range of problems. Building a product like a freestanding range, for example, requires components produced by a broad supply base of companies that each inject an additional element of risk in the supply chain.

Fortunately, this is a danger that data analysis can help mitigate. By compiling an extensive database of financial information for each supplier, Whirlpool is able to create robust prediction models describing the financial health of each supplier within the chain. Using JMP, OpEx practitioners create a risk curve utilizing z-scores and perform nominal logistic regression based on historical data. The resulting graph presents a benchmark for high-risk suppliers and shows exactly which components need to be sourced from multiple suppliers and which suppliers need to be dropped altogether.

In addition to this risk curve, a contingency table is also built. This allows for a more granular comparison, adding depth to the initial analysis. The ease of building models in JMP, Youngstedt explains, is a huge benefit because it allows the Black Belts to compare



This control chart shows spikes in processing time that required further investigation. Whirlpool used this information to refine its strategies, and mean processing time decreased from 124 seconds to just 16 seconds – saving almost eight weeks per year.



The bubbles on this graph represent products on the warehouse floor, providing a quick snapshot of the status of the warehouse. And with bubble plot animation, managers can monitor performance over an entire quarter.

several approaches before choosing the best one. Or, he says, team members can use multiple models to refine their results.

And refining results has led to some major improvements in business processes. One experiment, for example, compared responses to prerecorded support calls. An analysis of the transcripts using Cohen's kappa coefficient in JMP allowed OpEx practitioners to graph the call-taker reactions and quickly identify the scenarios that evoked the most inconsistent responses. This analysis revealed roadblocks, incidents and performance outliers, which could then be addressed through new strategies, ultimately leading to more consistent service.

In another example, the team charted invoice processing times in an attempt to identify process roadblocks. Spikes in processing time outside control limits made it easy to identify incidents requiring further investigation. After several rounds of such investigations, the strategies were refined and mean processing time decreased from 124 seconds to just 16 seconds, saving the company almost eight weeks per year in processing time. Though the method used was simple, the results show how analytics combined with good critical thought can lead to real transactional process improvements.

CHALLENGE

To improve Whirlpool business processes, services and products by spreading the use of analytics across the company.

SOLUTION

Whirlpool uses JMP in Six Sigma Black Belt and Green Belt training that supports its Operation Excellence program.

RESULTS

JMP helps analysts communicate data-driven ideas and concepts, and spread a culture of continuous improvement.

The ease of building models and graphs in JMP is not the software's only advantage – there's its versatility, too. Mapping the activity in a busy warehouse, for instance, requires the processing of large data sets. For analysis to be useful, it needs to respond to this quickly changing environment. To solve this problem, OpEx practitioners used JMP bubble plots to monitor movement within the warehouse over time.

In this system, the product type and warehouse location are recorded in a database every time an item's barcode is scanned. This creates a massive data table that was previously too unwieldy to be useful. JMP, however, is able to analyze the more than 108,000 rows of data in seconds, creating a bubble chart. Bubbles are color-coded by item type, and their sizes vary according to how frequently an item is scanned. By plotting the bubbles on a graph representing the warehouse floor, managers create a map that gives them a quick snapshot of the status of the warehouse.

Moreover, these maps are animated, showing performance over an entire quarter. This has helped managers optimize warehouse movement patterns by organizing items to minimize travel distances. The maps also reveal mistakes – either in item coding or placement – making it easy to keep large warehouses organized and free of errors.

"JMP enables knowledge discovery across our entire business and allows Whirlpool to analyze data that would not have been possible otherwise," Youngstedt says. "The applications are limitless."

A culture of learning

For the OpEx group, success is defined as a minimum 25x1 return on investment – in other words, for every dollar invested, the program generates a minimum of 25 times that in value for Whirlpool. From factories to call centers, warehouses to customers' kitchens, data and analytics have helped improve Whirlpool's processes, services and products. More importantly, the OpEx program has helped grow a culture of data-driven learning at Whirlpool, and has spread analytics across the company. JMP has proven to be an essential tool in this development. "As you can see, there is tremendous value driven by the program," Youngstedt says. "It's been an incredible journey – and it's been fun."

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