



SEAGATE

Challenge

A global survey of 1,500 enterprise leaders in 2020 found that though enterprise data is projected to grow at more than 42% annually over the next two years, 68% of available data currently goes unused. Companies need to prioritize the deployment of accessible, organizationwide analytics and close the gap between data and business insight.

From the datasphere to decision

How Seagate built a deeply knowledgeable organization by democratizing analytics

It should come as no surprise that Seagate, architect of the modern datasphere, is an organization with a deeply data-centric culture. At Seagate, a dedication to evidence-based decision making runs through every corner of operations, from engineering to marketing to partnerships with giants of industry around the world. The company's leaders, most of them former engineers and scientists, have worked to cultivate a very knowledgeable organization by deepening employee engagement with data.

Though with its sophisticated data infrastructure, Seagate is well-positioned for the transition to an AI-powered future, no organization is without its data challenges. An independent global survey commissioned by Seagate and conducted by IDC in 2020 found that though enterprise data is projected to grow at more than 42% annually, 68% of available data currently goes unused.

The report, *Rethink Data*, identifies several points of failure where the majority of data value is lost: First, there are missed opportunities in metrology. Organizations often fail to ensure both that needed data is collected and that collected data is needed. Second, the mismanagement of data storage and security immediately diminish the value extracted from enterprise data. And lastly, many organizations unwittingly silo data streams, creating internal blind spots for those seeking to optimize global operations.

One solution to these points of failure is the emerging discipline of DataOps, which connects data creators with data consumers - a philosophy very much in place at Seagate where the engineers who learned these lessons many years ago are now directors and VPs. Data communications link technology and human resources, and a robust data classification policy at the enterprise level sorts through what is asked of different data types and ensures that data delivers on those goals.

But it's not sufficient to simply build a foundation of knowledge for how to analyze data; you have to analyze it well, and for that, you need the right tools. That's why all engineers at Seagate have access to JMP® statistical discovery software and a select few have JMP Pro.

"If you're a construction company and you're building houses, do your workers get hammers? Yes," says Ted Ellefson, Managing Principal Engineer in Mechanical R&D at Seagate. "Our engineers, if they analyze data, then yes, they typically use JMP."

Smart manufacturing has fundamentally changed the data landscape

A Six Sigma Master Black Belt and 25-year veteran of Seagate's R&D operations, Ellefson is now part of a team responsible for the design and development organization at Seagate's Minneapolis facility, including support of data analysis instruction and consulting, experimental designs, business process management and identifying improvement opportunities across business processes. Though he may wear the proverbial process improvement hat, Ellefson stresses that he is embedded in the head R&D organization; analytics expertise at Seagate is integrated, not siloed into different departments or geographies.

"The amount of data we're producing is growing at a very, very fast rate," Ellefson says. "But we might only be using a third of that data. So just think of the opportunity even if you were able to explore and understand the other two-thirds of the data that's available to you, how many more things you could do for your company - for society."

Ellefson is now working with R&D engineers across Seagate to capitalize on that opportunity and tap yet unutilized or underutilized data. Institutional knowledge from subject matter experts and technology teams plays a critical role in helping them understand what data is available and which databases must be queried to find it. This synergy between domain and engineering expertise is key to the success of analytics integration.

Domain expertise complemented by AI, not replaced

Two decades ago, Six Sigma helped to institutionalize data-based culture. Today, automation and machine learning take center stage. But human interaction is still critical in creating validated models. Domain experts at Seagate understand the science necessary to produce a robust model that will become the basis for factory control, design decisions, product features and product design, among others.

The role of manufacturing engineers is to draw on their deep process knowledge and intuition to identify the vital process input and output variables and build a model showing the parameters that need to be monitored. "We can then set up an automated information system to monitor it in real time," Ellefson explains. "That AI in our factory can monitor those factors that we think are important from a multidimensional standpoint, and alert us when things are different than we expected. And then we can investigate and determine what to do."

Ellefson shares a useful analogy: Data automation systems work much like the rumble strips on the side of the highway. If you begin to drift out of your lane, you feel the thump-thump-thump indicating that you need to make an adjustment so you don't go into a ditch. These gentle alerts allow you to make a correction long before hitting the guardrail.

The same is true of Seagate's AI systems architecture. Seagate facilities around the world are now equipped with robust manufacturing execution systems (MES), which give engineers the ability to apply multidimensional statistical process control (SPC). Automated SPC charts allow the manufacturing staff to maintain a dashboard that runs continuous 24-hour monitoring on production operations and equipment. These dashboards can then alert domain experts, whether by text or email, to potential irregularities in the data.

"The role that JMP plays is to really help us explore that data in the beginning... to determine which parameters and interactions are the most important," Ellefson explains. "And then explore which types of SPC monitoring tools might be really effective... Once you determine that, now you can deploy a specific technique with an automated information system or MES system, and then that can run real-time all the time."



Going from low knowledge to high knowledge – that is what design engineering and process engineering are all about! You're continuously delivering knowledge to the company. That's what data analysis in JMP can do.

Ted Ellefson, Managing Principal Engineer in Mechanical R&D



JMP® provides engineers a starting point, even if they don't yet know what they're looking for

Early-stage data challenges are often the most difficult to overcome in research, design, development and process engineering, when experts may not yet know what to look for. Though scientific judgment may guide them to the appropriate databases, Ellefson explains, a key barrier is knowing where to begin data exploration and queries.

"As a development engineering team, sometimes we don't know which design is going to work better or which factor is truly going to be important. We might know from our physics classes what we think should be important... but once you start interacting with real life and Murphy's law and the factory, you may not be sure what's going to happen," Ellefson says, noting that the ability to rapidly screen a multitude of parameters, drill down to the vital few and conduct an experiment with them is where the development engineering world truly resides.

"JMP plays a key role in that exploration by helping you explore and understand your data in a quick, efficient manner... It gives you the ability to not know what you want to do. JMP is a great tool - you can explore your data to really understand what works and what doesn't."

Ellefson calls this "going from low knowledge to high knowledge"; optimizing machines for the best possible performance, and taking the basics and extrapolating out into the new design space. JMP, he adds, promotes the building of knowledge. "And that is what design engineering and process engineering are all about! You're continuously delivering knowledge to the company. That's what data analysis in JMP can do."

Training brings everyone on board with Seagate's data-centric culture – solving business challenges, not just doing statistics

While JMP may lower the barrier to begin exploring, Seagate's culture of continuing education especially in the analytics area is what really drives the success of the company's analytics integration engine. Six Sigma training is offered across Seagate to anyone who wants it, and Ellefson may be involved in supporting Six Sigma trainees for as long as 12 months.

"A lot of people get trained in statistics [at university], but it's the applied use of statistics that is oftentimes a little light," he says. "That's one of the reasons we have our internal training program. It's not a statistics course; it's an applied engineering course." In the past, Ellefson says he has seen even statistics PhDs benefit from applications training. After all, that is the engineering group's key focus: couching the mathematics in a business problem or business improvement opportunity.

"Our engineers and scientists don't get paid to do statistics. We get paid to make recommendations and decisions. So the ability to teach them how to use the data to get there is really what we do internally to establish that foundation."

Democratizing analytics to domain experts

Though many Seagate employees are leaders in their fields – physics, chemistry, magnetics – Ellefson explains, they still benefit from access to analytical tools like JMP

that have been designed especially for industrial applications. That's why Seagate's leadership has made JMP accessible to anyone who touches data. With JMP, they can interpret results more effectively and efficiently, design experiments more strategically and exploit the full scope of applied statistical methods available today.

"One little button in JMP can create a graph based on millions of lines of codes, 40 or 50 files of data – it's just amazing. With a click of your JMP script you can produce results and graphs that help you make a decision... Whereas 20 years ago it would just never happen."

The efficacy of the loop connecting data creators and data consumers at Seagate also depends on communications. While downstream experts make sense of the noise in the data as it rolls out from the factory's systems architecture, they must also translate any insights they find into more easily consumable information. The key here, Ellefson says, is data visualization; "If you can deliver a picture that clearly shows the direction you should be moving, that is the conversation for you."

Ellefson cites an example in which he brought an analysis in JMP to one of Seagate's vice presidents. He quickly consumed the data, agreed with Ellefson's interpretation, and the two had an action plan before the end of the meeting. The vice president then brought those graphics further up the chain of command to secure the resources needed to move forward.

"An effective graph drives the right decisions. An effective visualization informs the viewer and helps them make the right recommendation and decision for the organization. You've got to put things together visually to really deliver [meaning] to your data consumer."

A like-minded community seeds new ideas

While the standard JMP package has more features than most average users could possibly exploit, Seagate provides a handful of strategic users access to JMP Pro. "We've taken the knowledge that we have and the analysis that we've done in standard JMP and we've applied some of the more advanced analytical techniques that JMP Pro has, like functional component analysis and generalized regression," Ellefson explains. While standard licenses are a core resource of the organization's democratization of analytics, JMP Pro enables advanced analysis in strategic business areas.

Irrespective of experience level, JMP and JMP Pro users meet on a monthly basis as part of an internal user group at Seagate. The goal is to communicate collaboratively and learn from other domain experts, with individuals from different corners of the company sharing how they are using JMP to overcome new challenges. "We can learn from each other that way," Ellefson explains, noting that he is also an active member of an external JMP user group for the region. "Again, this creates a community of practitioners in JMP who can come together and share best practices and ideas."

Seagate's prioritization of statistical learning and discovery – a core value shared also by JMP – has no doubt played an outside role in its ongoing industry leadership and will continue to do so for years to come.

Solution

Leaders at the data storage solutions provider Seagate Technology encourage any employee who deals with data to use tools that enable robust analysis and exploration. JMP is a primary tool among those they recommend. JMP and JMP Pro are now an integral part of wide-ranging data analysis techniques, statistical process control, reliability analysis, experimental design and modeling.

Results

In the hands of engineers across the organization, JMP is helping Seagate to extract business insights from unutilized and underutilized data streams. The software empowers engineers to explore data – even when they don't yet know what they're looking for – ultimately deepening the company's product and process knowledge in a strategic way.

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