



## DAEDUCK ELECTRONICS

### Challenge

Management tasked engineers with reducing the scrap budget, shortening experimentation times and extending the way they work across the company with integrated analytics and automation.

## Innovation in manufacturing starts with the right tools

Daeduck Electronics elevates its analytical capabilities to reduce costs and streamline production.

It's no secret that the future looks bright for the printed circuit board (PCB) industry. According to a June Research and Markets report, business opportunities for PCB manufacturers abound in the computer, communications, consumer electronics, automotive and aerospace industries. In fact, the report projects the PCB market will be valued at \$90 billion by 2024.

Accelerating this growth is an increasing demand for PCB miniaturization, high-speed data, signal transmission and green solutions. Who will succeed in this rapidly changing marketplace, however, depends largely on companies' ability to innovate – not only in R&D, but also in how new PCB offerings are manufactured.

Ansan, Korea-based Daeduck Electronics is rising to this challenge with an executive commitment to the principles of smart manufacturing and the engineering talent to roll out the company's ambitious plan for analytics integration. SungSoo Lee, an Innovation Group Manager at Daeduck's PKG plant, is spearheading the automation and data centralization initiative. An engineer who earned his chops in the company's technology quality group, Lee spent more than a decade working with Daeduck's employees to apply cutting-edge analytical methods for manufacturing improvement. Now, he's tasked with scaling up those methods with the help of automation and emerging technologies.

Lee's gained his expertise in analytics almost exclusively on the job. With a keen mind for it – and an appreciation for how analytics would transform the industry – Lee has put years of effort into testing the very best data methods and tools for Daeduck's manufacturing operations. Some years ago, he discovered a statistical software package that has been invaluable at Daeduck ever since he proved to management that it was exactly what its engineers needed.

That tool was JMP®. And since switching from Minitab, Lee says, "There are analysis tasks I can now perform in 90% less time, which means that I can do so much more in the same workday. In other words, JMP's cost-benefit ratio is very high."

### Moving beyond Minitab

Lee first encountered statistical software in the form of Minitab while studying for a degree in materials engineering. But while working as an intern during his senior year, he was introduced to JMP. What Lee saw was a far more versatile software package – one that he eventually brought with him to Daeduck.

At the time Lee received his Six Sigma Black Belt certification, Daeduck was still using Minitab exclusively. Aware that JMP might be a more accessible, interactive option, and frustrated by some of the limitations of the existing software, he proceeded with an evaluation. "The [Six Sigma] trainer didn't know JMP, and at first he objected to my using it," Lee recalls. "But toward the end of the training, he asked me why I insisted upon using JMP."

"I think the more deeply you come to know JMP, the more likely you are to select it," Lee explains. So he asked his colleagues in the Six Sigma program to give it a try.

"When I first started using JMP, I found it was more powerful [than Minitab] because it was designed from an engineer's perspective," Lee says, adding that Minitab is strongest from the perspective of the trainer, not necessarily the end user. "JMP belongs to a higher class than other programs because it is designed to solve all kinds of problems experienced by engineers – it's really convenient for engineers to use."

In addition to its engineering focus, Lee says his colleagues soon saw that JMP offered superior visualization capabilities for data exploration and communications with management and customers. Especially important is Graph Builder, which allows engineers to explore multidimensional relationships easily and flexibly using line charts, bar charts, histograms,

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SungSoo Lee, Materials Engineer



contour plots – the list goes on – and switch to a different graph type with the click of a button. “Graph Builder’s a great entry point for new users to explore their data,” Lee adds.

A third reason JMP succeeds, he says, is that applications in JMP are interconnected. “What I’ve learned from using JMP,” he continues, “is that the connectivity of analysis is completely different from Minitab. While Minitab has independent menus to be operated when changing between analyses, JMP itself can easily change a distribution analysis into that of process capability.

“JMP is a one-stop shop.”

## A systematic approach to reducing waste

With more of his colleagues at Daeduck adopting JMP and JMP Pro, Lee says the company is starting to see quantifiable evidence of its impact. The introduction of new statistical techniques played an especially important role in reducing the site’s loss ratio. “Management was telling us, ‘We need to lower the scrap budget,’ so we had to come up with a solution,” Lee recalls.

The amount of scrap the company produces in relation to the amount of quality product output is a critical index in Daeduck’s cost-efficiency and a measure of particular interest at the executive level. “If you want to produce 100 of a particular item, it is important to predict the exact loss and put in only the amount you need,” Lee explains.

Daeduck has traditionally used the overall average loss ratio as its input, but Lee was convinced there was a better way. He first used applications for data preprocessing in JMP Pro to bring better order to his data set prior to analysis. Then, he and his team were able to select those specifications that affect quality and use them to build a variety of predictive models to more accurately anticipate the ratio and develop a deeper understanding of the specifications affecting their scrap budget.

“I can use modeling functions in JMP to predict how the yield rate changes according to the specification,” Lee explains. “If the yield and specification are put in as Y and X, respectively, you can better predict the yield. The establishment of a formula can be used to analyze all combina-

tions. It can be modeled more accurately [and faster] in JMP than in Excel or any other software.”

## Common software deepens Daeduck’s connection with its customers

The next phase in Daeduck’s analytics integration, Lee says, is expanding the company’s use of design of experiments (DOE) to optimize testing and reduce the number of runs necessary for any experiment. “DOE offers a great deal for our engineers,” he says. “It’s a way for us to utilize our engineering resources and time more efficiently.” The JMP Custom Design platform in particular allows engineers to set constraints on the design space and identify which effects are necessary to estimate and which are desirable to estimate, if possible, given the number of runs.

By using statistical analyses to be more precise and proactive, Lee says, Daeduck will be able to reduce the time and costs associated with on-site experimentation and other processes. Even given the quantitative evidence, though, the single most important advantage of JMP is that Daeduck’s customers also use the software. “Our leading customers often designate JMP for analysis,” Lee explains. “So even if neither I nor my colleagues had made a quantitative case for using JMP to our management, we would still have been persuaded by our customers ... The ability to share our data helps improve our relationships.”

## Learning from what others are doing with JMP®

Lee’s quest for improvement opportunities – and the methods to systematize them – will continue, he says. One way he has found to get new ideas is to read more about how other JMP users around the world are using the software’s capabilities in their organizations. In fact, as his interest grew, Lee began translating previously unavailable JMP documentation from English to Korean, learning as he translated.

Through this experience, he says, “I gained valuable knowledge of the theoretical elements of statistics.” Lee now shares this translated documentation with his colleagues, and in so doing has helped them likewise gain confidence in their knowledge of statistics and its applications. “JMP has certainly made me more confident,” Lee reflects. “I think that is the best advantage of all.”

## Solution

Adopt JMP® so that engineers across the organization can take advantage of capabilities that drive improvement. Invest time in learning more about the software to expand its utility.

## Results

JMP now plays a key role in tasks such as waste reduction, yield improvement and process optimization. “There are tasks that I can now perform in 90% less analysis time using JMP, which means that I can do so much more in the same workday than before,” says Manager SungSoo Lee.

To contact your local JMP office, please visit: [jmp.com/offices](http://jmp.com/offices)



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