

# SCROOGE LEARNED A LESSON, BUT CAN WE?

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## SUMMARY

If you are happy just having any business at all, then you should be thinking seriously about a new business model this year. As a country, our manufacturing operations must be the best in the world to capture a second chance. A country that no longer knows how to build cannot innovate. The stakes of getting it right this time are high.

Do you hear it anymore? The whoosh? It's the sound of jobs leaving, equipment leaving, factories leaving. That was the horrible ghost of Christmas past. Today, we don't hear the whoosh. A small number of us have figured out how to survive the cold economic winter in the U.S. Not only that, we think we might see something optimistic coming our way in 2012 and beyond, something warm in the fire place: onshoring.

Onshoring is the ghost of Christmas Present. As we stare into this optimistic warmth, what does the ghost of Christmas Present yet to come say about it? Like the Dickens tale, if we don't seriously change and

learn from our past, our second chance to do manufacturing right will disappear. Without changing, what we will see in our future is, "R.I.P. Innovation," along with "R.I.P. Workers, Engineers and Managers." Silicon Valley will return to orange groves. There will no longer be high-paying jobs. We will cut trees, grow crops and raise livestock. Wall Street will be tumbleweed. We have to change now. We must learn to love manufacturing and become extremely skilled at it.

I never thought I would see the day when the old moth-balled PCB plants would be started up again with millions of dollars in new capital and equipment, but it is happening. Onshoring is real. However, onshoring raises the serious question about why we offshored to begin with?

Offshoring in our PCB industry was based on several myths. The first myth was that what we did as PCB fabricators was just a commodity. Anyone can do it anywhere in the world. Making these complicated and complex PCBs was like making socks or flipping burgers or making shoes in a sweat shop. This thinking caused us to run our factories very badly. The second myth was that nothing much was going to change with regard to how we made our products. Everything was known, nothing was a surprise and nothing much will change about our fabrication processes, our material sets, our equipment sets, or our methods. We felt that the PCB industry will

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be slow to advance so it made sense to let factories leave and move offshore. The third myth was it didn't matter about the quality of labor; what mattered was just the price of labor and that price was the differentiator. Anyone could learn how to do a job in our plants. Experience, training, attitude and behavior didn't matter. The fourth myth was the non-importance of the location of plants. Costs associated with transportation didn't amount to much. This lack of need of manufacturing proximity leads to the fifth myth, which was manufacturing knowledge and experience is irrelevant to innovation and technological growth of electronic devices. These myths created a one-dimensional decision. Move your plant to where labor was cheapest. This myth is proving to be wrong!

Once we let our PCB manufacturing go, we've seen the talent going, too. If what we do is such a commodity, then why do we need our best and brightest people to spend multi-year assignments in Asia and other emerging countries? With this brain drain, we are not only losing our ability to build stuff, but we are also losing our ability to innovate. We are becoming more and more dependent on foreign innovation to create the electronic devices we crave. We may have developed the graphical user interface with our friendly mouse, but who developed and designed the capacitive touch screen used on the iPhone? Who makes the iPhone touch screen? How important is manufacturing to innovation? How we build stuff, how we come up with new designs and how we come up with new ideas, is all linked. In order for this linkage to occur everything has to be in close physical proximity. By allowing our PCB factories to leave, we broke this linkage. As a result, our ability to innovate has weakened.

Too many of us today are just happy we have business, while others are feeling jubilant that we have, in fact, a thriving business. What we should be doing, instead of just being happy, is thinking seriously what the new business model needs to be going forward. What do we need to do differently to make our manufacturing operations the best in the world so that we can capture this second

chance? The main challenge we face going forward isn't the technology, in terms of new materials and new equipment, it is in the technology and techniques and how fast we can reconfigure and optimize our businesses.

What am I talking about? We need to learn how to optimize our business because of the complex nature of the new, compact designs. We are forced to run very small lots, we are forced to go multiple times through the same operations, we are forced to mix together exotic materials that just weren't meant to be together, and this is just the start. Along with the challenges of trying to figure out how to make a product quickly and crashing entire lots of material at times, we don't know how to determine quickly the true cost of making a board. In my article, [\*Reject Cost Accounting's Answer and Build Jobs That Make the Most Money\*](#), I explain how using linear programming (LP) allows you to focus on the true cost of different jobs and how to maximize your product mix. However, this is just part of the answer. We also need to become skilled at understanding variation.

By variation, I am not talking about a control chart or a Six Sigma type of variation, but a much deeper and sophisticated understanding of how variation impacts our operations. Let me give you an example by way of a question. Which is worse, having more variation in your upstream processes or having more variation in your downstream processes? The answer is that variation in your downstream processes is much worse for you than upstream variation.

Let me give you another example. In order for many of us to get ahead it will be tempting to accept low-yielding jobs. I explained in my article [\*Are We Nothing More than a Pair of Socks at Walmart?\*](#) that scrap consumes your plant's capacity. But it does something else that is extremely damaging. It makes your business exponentially unpredictable. In a future column, I am going to take the example in the aforementioned, *Reject Cost Accounting's Answer...* and show you something called a discrete event model. If you don't know what this is, you need to learn about it fast, because it will be one of the tools we are going to rely

Job	Profit	Scrap
1	\$700	25%
2	\$450	10%
3	\$100	70%

**Table 1.**

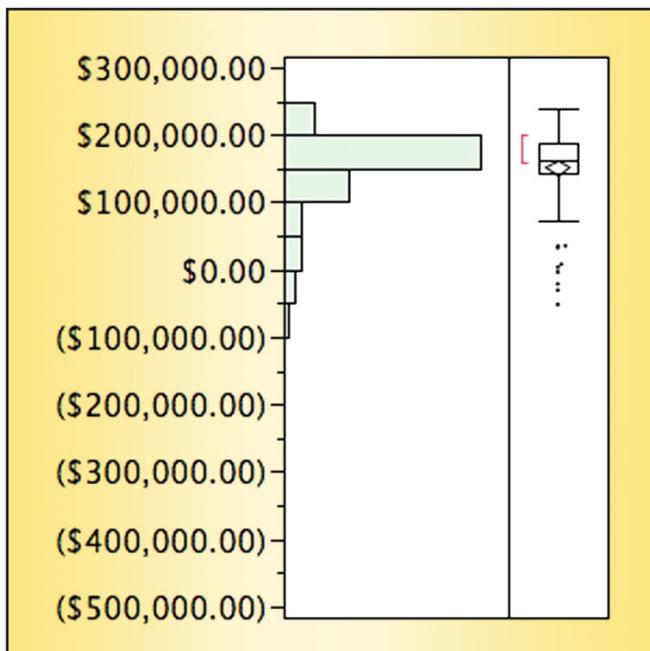
on in the future to figure out how to optimize our manufacturing operations. Consider jobs 1, 2 and 3 described in Table 1.

Now, take a look at Figures 1, 2, and 3 below. Figure 1 shows the results of the discrete event simulation done with 20% Job 1 and 80% Job 2. Figure 2 shows the results of 10% Job 1, 80% Job 2 and 10% Job 3. What is surprising is just a little bit of this problem job had a huge effect on the variation of the profitability results. It made the business much more unpredictable. It would be easy on paper to reject this job. However, suppose this job went to an assembly plant your company owns and it was vital for their customers' next-generation device. The PCB shop doesn't make money on the part, but the company as a whole does. The problem is that deliveries are unpredictable, because the board is next

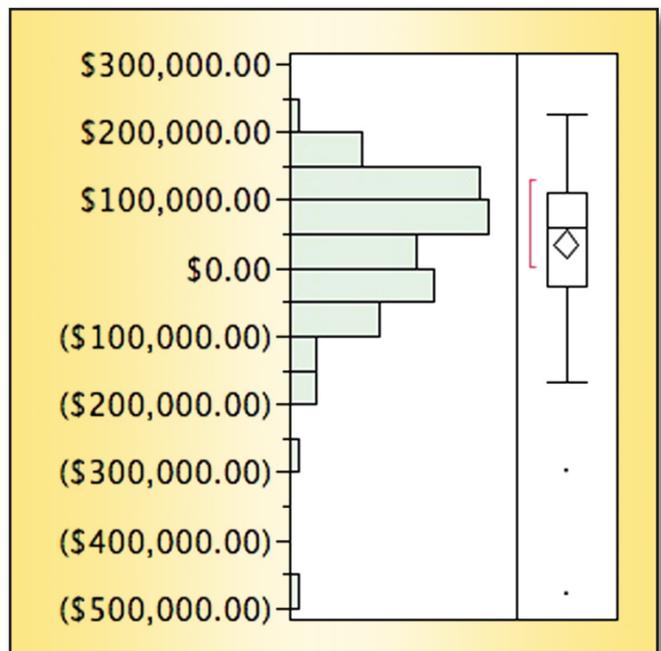
to impossible to build. What can you do to produce a certain quantity of this problem job each month and still make your PCB board shop profitable? In other words, how can you take out the variation and its cause?

The jobs coming into this shop that produced Figure 2 were random. What happens when you produce in a specified scheduling sequence? You get Figure 3! Granted, the result isn't profitable, but there is far less variation. There is an optimum sequence of running problematic jobs with jobs that run through your factory well! Upon reflection this may seem obvious, but it isn't something many of us have considered, done and optimized. Understanding variation is a core competency that we must develop in order to achieve our future vision of manufacturing excellence.

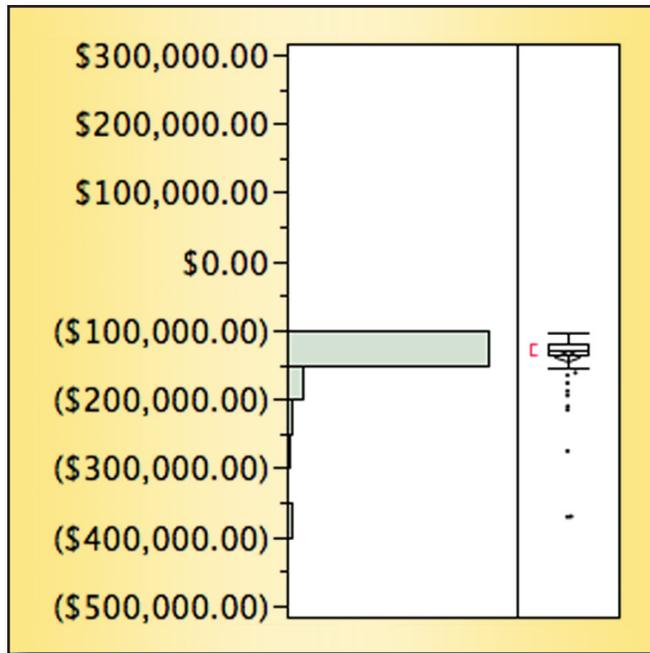
We aren't going to be able to figure out all of this stuff and meet manufacturing challenges if we don't change our attitude about people. If we don't learn how to value the human asset, we will fail again. In the future we must build collaborative work teams. These teams must be devoid of bad behaviors so that they thrive in a productive culture. As Louis V. Gerstner said, "I came to see, in my



**Figure 1.**



**Figure 2.**



**Figure 3.**

time at IBM, that culture isn't just one aspect of the game, it is the game."

In order to have an effective team culture we have to be productive, we have to communicate, and we have to make discoveries. In my book, [Change Your DAM Thinking](#), I talk about the five thinking DAMs, which block our progress and lead to an ineffective culture. These are listed in Table 2.

Going forward we must be able to observe, measure and hold our employees accountable for their behavior and we must observe, measure and provide feedback on behavior of those with whom we work. Our businesses in this industry must become serious about changing our DAM behavior, or we will fail.

Without this DAM behavior we can work collaboratively to solve our complex problems quickly.

Along with being able to work with each other much more productively we also need to be able to take a different approach on how we think of problems. Our work is going to be so challenging going forward, that we must change our notion of problems. We must view problems as good and describe them as opportunities for discovery. If we encounter a quality problem we should ask, "What was the source of the problem?" Then, "When is this problem going to happen again?" And finally, "What are we doing to prevent it from happening?" What we need to do is have models that contain our understanding and assumptions, which then can be used to predict outcomes. At that point we can judge if the event was entirely unexpected or not. In both cases we need to figure out what we need to do to be better. This type of an approach goes far beyond the standard FMEA of Six Sigma. Are there companies doing this? Yes, but none that I know of in our industry. We not only need to become the best at building PCBs in the world, but our industry has to be known for its manufacturing excellence. We should be so good at manufacturing that Toyota wants to learn from us, because of our ability to perform, create and adapt. We need to understand and take lessons from the likes of Proctor & Gamble and other great companies that love and advance their manufacturing operations.

Finally, what we need to do in the future is become a real partner to our customers. Let me explain what this really means. It doesn't

Question	Dam	What it Blocks
Fail to ask for help?	Ego DAM	Productivity
Manage people's feelings?	Feelings DAM	The Business Purpose
Afraid to speak up?	Trust DAM	Communication
Won't let go?	My Precious DAM	Growth
Know it all?	Learning DAM	Discovery

**Table 2.**

mean the customer is king. It doesn't mean the customer is always right. It doesn't even mean you always have to be nice. It means you have a relationship. It means if you have a problematic job, you don't merely accept it, you work with the customer to make it better. And you do this with powerful ideas and flexibility. There are always options. There is never one perfect way. The future isn't going to be about individual achievement. The future is going to be about our ability to work collaboratively to find solutions to very complex problems. Our customer needs to be a collaborating partner in what we do and we need to be a collaborating partner in what they do. In so doing, we will both grow on many levels. We will set new standards of excellence, but not standards imposed upon us by our customers. They will be standards we set for ourselves because we want to be leaders. We want this second chance to work. We want to be the best manufacturers on the planet.

Finally, everything comes full circle — back to innovation. The manufacturing side is as important as the design side for an electronic device. In order for this to work there has to be localized manufacturing close to companies that are coming up with the ideas and doing the design. There are so many different ways to combine materials and components and so many different ways of packaging these components onto a board

that the best combinations of things can't be understood when the manufacturing operation is thousands of miles away, with cultural and language differences. You can't innovate over Skype no matter how hard you try! The myth that offshoring has no impact on our ability to innovate is proving to be very wrong. We need to get our manufacturing operations to be the best in the world. We need to become collaborative partners with our customers. And we need to be able to figure out alternatives and solutions to complex problems, fast. If we do this while always operating our plants profitably then we will have a bright future. The easy days are over. Now it is time to show the world what we are made of. **PCB**



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## PRINTED CIRCUITS, INC. EXPANDS CAPACITY, LOWERS COST

Printed Circuits, Inc. (PCI) has expanded their manufacturing facility. Through the acquisition of new equipment, PCI has increased inner layer capacity and improved manufacturing yields resulting in a cost reduction on their rigid-flex products, and the additional service offering of higher volume production to their customers.

Among the new capital equipment investments undertaken, PCI has installed and qualified new conveyORIZED wet processing equipment from Chemcut, USA, including a chemical clean line, cupric chloride etcher, and resist stripper. The added capacity and equipment has positioned PCI's cost structure

for higher volume rigid-flex manufacturing, while improving repeatability, manufacturing yield, and process capability on trace technology below 75 $\mu$ /75 $\mu$ .

"In the last 12 to 18 months, we have been taking larger orders and higher volume, lower cost rigid flex" said Ken Tannehill, President and CEO of Printed Circuits. "This new equipment gives us the capacity to handle the higher volume projects at a lower cost, and a much higher yield. We have been pleased to see the improved yields since qualifying the process lines for production earlier this year."

To learn more, call or e-mail [Bob Burns](mailto:Bob.Burns@pci.com) at (952) 886-9307.