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Jon Miller



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Six Sigma

The Necessity of Redundancy in Lean

Getting ready for fit manufacturing: a little bit of fat isn't bad.

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After every major natural disaster that disrupts global supply chains, there are voices that cry out “A-ha! I told you just-in-time inventory doesn’t work!” Recently the Icelandic volcano turned European skies airplane-free for a few days and news programs reported shortages of critical raw materials, such as

bananas in Germany. Although the sky is clearing of volcano ashes, if extended for weeks, such a situation could have threatened foundations of the industrialized West. If I had power to influence the future of aviation, [blimps would play a major role](#), their bulbous forms filling our skies, uninhibited by jet-engines that clog with volcanic debris.

Lean systems promote problem solving to drive out waste and rely on just-in-time flow, a process that is triggered by pull from the downstream (customer) process and that is paced by customer demand. Inventory is reduced not only because of the costs associated with owning and managing it, but because inventory acts to cover up weak spots in the supply chain. But once exposed, these weaknesses need to be either shored up or covered by redundant stock, systems, or resources. Unless we accept that our supply chains will run dry from time to time due to unexpected problems, redundancy is a necessary part of lean systems, though never value added or an end in itself.

This may be a counter-intuitive thought, but in fact lean systems demonstrate many examples of the necessity of redundancy. Lean requires buffer stock inventory, which is required to account for delivery lead time. It requires safety stock inventory, which is required to account for delivery failures and losses. Within standardized work, it requires recovery time to be built into a worker's cycle for repetitive operations to avoid fatigue. We could call this "necessary redundancy." Using a skill matrix and cross-training program to develop multiple people to perform the same task, even when most days these skills may be "idle" is yet another example of built-in redundancy, which adds no value but avoids the waste of system breakdown should there be an absence of a skilled person to perform the work. It was the designer who convinced me that the time he spent walking around the office thinking and being inspired was not motion waste, but a necessary secondary energy expenditure while his brain worked on the chief process of design that taught me about the necessity of redundancy.

Duplication of suppliers to ensure competition, part availability, or even multiple designs, is another redundancy. The lack of this last type of redundancy in part design may have been a factor in Toyota's recent and expensive quality problems. According to an *International Business Times* article titled "[Toyota stumbles but its 'kaizen' cult endures](#)," suggests that these problems "... highlight an often overlooked problem with its obsessive focus on hyper efficient supply chains."

Namely:

"Sure, fewer parts and fewer suppliers can drive down material costs and radically simplify operations. But when a strategic supplier of a critical part encounters a hiccup, it can have crippling and costly implications for the enterprise."

The article goes on to make a "Darwin vs. *kaizen*" analogy:

"Alex Blanton, an analyst at Ingalls and Snyder who has covered the U.S. industrial space for four decades, says that in this respect, companies that adopt Toyota's lean principles are ignoring the lessons of evolution. " 'One of the ways Toyota has reduced costs in their lean program was commonality of parts,' says Blanton. 'Well, if that part has a problem, then it affects many more models. If they'd been using a lot of different gas pedals for these models, and they had problems with one, they wouldn't have to shut down the company. That's why humans aren't lean. It's a Darwinian thing. The purpose of fat is to carry you over periods when you don't have food.'"

In designing our supply chains, we should perhaps learn from self-sustaining, low waste, renewable, solar-powered, green systems that have persisted and improved continuously throughout geologic time. Ecosystems don't suboptimize around the land, the organisms, or the food; they are inherently stable. Ecosystems aren't global; they are exceedingly local. Ecosystems aren't lean; they are fit. If we want to imagine the future of industry, instead of lean manufacturing—which may suggest in black and white the notion that fat is bad, regardless of the nature of the animal and its ecosystem—"fit manufacturing" is more appropriate. Just as there is no "best" or finish line in lean operations, we see no "perfect" creatures, only the "fittest" or most well-adapted to the particular environment.

Lean systems should not be implemented blindly or in ways that lack risk management. There are plenty of human, market, and environmental factors to consider. The failure mode and effects analysis (FMEA) is a wonderful tool but ironically it is seldom applied to the implementation of lean itself. Traditional change management attempts similar actions, but often without the rigor. Whether it is the steering committee that oversees and governs the implementation of major systems such as lean operations, or disaster management at a national level, adequate planning is a must. Perhaps this too must wait for lean thinkers to enter public service.

Being fit doesn't necessarily mean being lean. There is no way to be too lean and be fit. If we are emaciated, we are no longer fit. We also need a certain amount of fat within any system to survive those natural disasters that are survivable. This lesson should be learned and applied more widely. Placed in an FMEA, the volcanic eruption may not justify a back-up transport system from the point of view of frequency; however, from the point of view of severity of impact an alternate mode of transport may be justified. I have friends in Europe who didn't make it home during the days of the eruption. Some took ferries home because they were stranded in one part of the continent without clear air space. This would have been a good time for enterprising dirigible drivers to make quick money and get on the map as the redundant air travel channel of choice. We'll have to wait until next eruption.

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About The Author



Jon Miller

Jon Miller is co-founder of [Gemba Research LLC](#) where he leads development efforts including consulting solutions, training materials, and establishing internal consulting standards. Miller was born in Japan and lived there for 18 years. In 1993 Miller was fortunate to start his career working with consultants who were students of Taiichi Ohno. Since 1998 he has led dozens of lean transformation projects in a wide range of industries. Miller has taught kaizen in 15 countries for more than 15 years. He is a frequent contributor of articles to a variety of publications and written more than 800 articles on lean manufacturing, kaizen, and the Toyota Production System on [Gemba's blog](#) .

Comments

05/03/2010 - 13:30 pm — Tom Hopper

Products by Genetic Algorithm vs Lean

Though I enjoy and avidly read Mr. Miller's columns and blog, I find myself in disagreement with this and will offer a contrary argument.

Consider that each additional supplier requires management, which means additional resources and cost. If the parts need to be interchangeable, as we can assume if the alternative is a single part from a single supplier, then the opportunities for problems with the interface grow with each supplier (e.g. poor fit of linkages, or communications problems between software modules). This idea of using multiple suppliers to increase fitness to the competitive landscape focuses on a limited subset of that landscape, such as occasional supply chain disruption or cost of recall. Technical performance, cost and reliability are also part of that landscape.

In terms of the Toyota brake problem, there's no guarantee that the other suppliers wouldn't have problems,

too (the same? different?). We might expect problems from each of them, each problem affecting fewer customers but the same total number of customers affected. If Toyota did not also increase their supplier management resources to handle the extra suppliers, increasing overhead, then we could even expect more problems. Some of these problems would overlap in time, requiring additional engineering resources to diagnose and correct. Indeed, GM, Ford and Chrysler may provide a good set of test cases for the reduced quality and added costs of multi-sourcing.

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