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Rutgers Supply Chain Management Thought Leaders



Combining multiple initiatives in supply chain resilience: Layered defense or false redundancies?

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The recent massive chemical explosion in Tianjin reminded us of how vulnerable human life and material supply chains can be to these unfortunate events. Just over a month ago, the two massive blasts at a chemical storage facility killed at least 150 people and injured hundreds. Over eight thousand new Hyundai, Kia, Volkswagen, Renault, and Toyota cars stored at the Tianjin port were completely burnt. Caterpillar, Deere and many other companies were impacted.

GlaxoSmithKline lost its production site near the Tianjin blast zone and lost all production capacity for making the drug Tenozet, used for hepatitis B treatment.

Companies like GSK, Caterpillar and John Deere have great depth of talent to adequately reflect and consider the ramifications of not being prepared for such potential disruptions. They hire and train many supply chain and risk management professionals to think through ways to lead the company through such crises. Nevertheless, some companies “weather the storm” better than others. What do the companies that are successful in minimizing the effects of a disruption do? These days the simple answer is: “They have a resilient supply chain” or one that has enhanced redundancies (such as buffer inventory, multiple suppliers, etc.) and flexibilities (adjustable contracts with suppliers, postponement strategies. etc.). But perhaps there is more to supply chain resilience!

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Previously, in the Center for Supply Chain Management Thought Leader Quarterly (Vol 1, Issue 3), I argued that latent resilience, just like fat in the body, is only beneficial if it can be useful when facing disruptions. Here, I extend the argument to dive into how resilient companies make sure that their resiliency initiatives are complementary to one another. Resilient elements, such as inventory, can be complementary (value enhancing) or supplementary (useless; or of limited use). Let us explore two ways: (1) Our supplier carries finished goods inventory that is near-identical to our own raw material inventory (2) Our supplier’s inventory is of the type that the manufacturer doesn’t keep as raw material. The first is supplementary, while the second type is complementary. With the second form of inventory, the supply chain is better prepared to face more types of disruptions. The notion of complementary and supplementary resilience goes beyond just inventories. For instance, building resilience by going from one supplier to two helps in the face of a supply issues (earthquake, supplier strike, etc.). Going from one to two transportation firms helps in the face of a logistics issues (e.g. port closure, etc.). These two types of resilience (supply and logistics) are complementary.

Now, let us say that instead of two suppliers and two transportation companies, we decide to improve resilience with the same total number of supply chain companies (4 companies). But this time, we stay with one supplier and contract with

three transportation companies. The usefulness of a third transportation company is limited because the probability of two transportation companies is quite low. So, carrying a third transportation company is a “supplementary” form of resilience. We may call it a false redundancy because it may never be used, and falsely suggests that we are more resilient than we really are. Finally, let us take another situation. Let us say that a downstream manufacturer is investing massive sums of money on an elaborate control tower to help with supply chain visibility. Would it be right for its tightly linked Tier 1 suppliers to also invest in similar information gathering capabilities? Probably not. Instead, to complement the supply chain visibility it may be best for them to invest in upstream supplier audits, or conducting “what-if” analyses to be better prepared when disaster strikes.

Complementary elements of a supply chain resilience help compensate for weaknesses in other elements weakness. In industrial safety literature this is known as the Swiss cheese model of safety (yes, the ones with large holes!). The Swiss cheese model likens human systems to multiple slices of cheese with holes, stacked side by side. The risk of a threat becoming a reality is mitigated by the differing layers and types of defenses which are “layered” next to each other. In information technology, the concept is known as layered defense. Layered defense is why we have an antivirus application, a firewall application, an anti-spam application and personalized privacy controls in our computers. Combined they make sure cyber-attacks are less effective.

Good layering of supply chain resilience comes from recognizing how resilience elements complement one another. One way to gain complementarities is to make sure some elements are focused on the structure of the supply chain, while others are focused on the process. For instance, supply chains can be structurally designed to avoid single points of failure through multiple sourcing. Another way to structurally enhance supply chain resilience is through postponement policies; moving customization of the final product to downstream points in the chain. Process based forms of resilience are rooted in leaving flexibility in how the supply chain operates. For instance, Intel enhances its resilience by making sure that all its manufacturing sites use the same steps in the process; what Intel calls “copy exactly”. Southwest airlines tries to stay with the same type airplanes as much as possible. These standardization processes help face uncertainties easier.

Supply Chain Disruption research laboratory (SCDrl) at Rutgers Business School is focused on research that can help validate and extend this and similar conceptual arguments.





Making Game Theory Work for You

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Does Trust Win?

Often, supply chains involve relationships. But that's not always true. Suppose you are engaged in a spot transaction with another company you have no reason to expect you will ever do business with again. In this situation—what economists call a one-shot game—does it pay for you to do what's best for both companies together and to trust the other company to do the same?

It's reasonable to suspect that in a one-time situation with no ongoing relationship it pays not to trust. That's indeed true in the famous Prisoner's Dilemma game. In the Dilemma, if both of you trust, you both do better—but if you trust and the other player doesn't, you get clobbered.

But the Prisoner's Dilemma turns out to be a very unrepresentative game. More typical are games like the Stag Hunt, shown below alongside the Dilemma, in which trust wins out.

Running the numbers: Out of 144 possible one-shot two player games, 15 are Dilemmas in which distrust prevails. On the other side of the ledger, 34 are Stag Hunts, Battles of the Sexes, and Chicken games in which trust is the more profitable play overall.

Prisoner's Dilemma

		Player A	
		Cooperate	Defect
Player B	Cooperate	3, 3	0, 5
	Defect	5, 0	1, 1

Trust doesn't pay here...

Stag Hunt

		Player A	
		Stag	Hare
Player B	Stag	5, 5	0, 2
	Hare	2, 0	2, 2

Trust does pay here...

The bottom line from my research: A strategy of trust narrowly beats a strategy of distrust in all one-shot games taken together. If you happen to know the situation you're in with the other company has the payoffs of a Prisoner's Dilemma, it pays to distrust—but in the much more common situation in which you and the other company aren't sure what game you're in (or if you know you're not in a Dilemma), trust is the best policy. In a given case, you may get burned—but there's a good logic of self-interest, not just a desire to be good, that supports trust.

Emotional Leaders, Calculating Followers

Effectiveness as a supply chain manager sometimes involves a calm, dispassionate calculation of the costs and benefits of alternative strategies. But compared to more emotional managers who can make what game theorists call credible commitments, the calm, cool manager can be at a disadvantage.

In surveys I've conducted of executives and students, those who identify with a "phlegmatic," calm approach to management are more common than any other type. But they are more likely to follow those who identify with a "sanguine," happy, challenge-loving approach, a "melancholy," accepting, forgiving approach, or a "choleric," get-even, "don't take advantage of me" approach than the other way around. Calm calculation is a highly useful skill in supply chain management—but to rise to the top, you can benefit from commanding strong emotions.

Game Theory on the Bright Side

Suppose you have a close relationship with a supplier that you realize is not doing a good job in responding to disruptive competition. You're both doing okay for now—but soon enough, you won't be.

This situation—and many others in supply chain management—can be analyzed pessimistically: You and the supplier would both be better off if you could only both avoid slacking and work together on the problem, but you both have an incentive to slack.

The very same situation can also be analyzed more optimistically: Both you and the supplier care about one another. You're in a pickle, all right—but the underlying problem in the bright-side story is not laziness. It's your deference to one another and your shared reluctance to shake up your established relationship.

The optimistic story has one very important advantage over the pessimistic one: It's possible for you to discuss it openly with your supplier in a way that doesn't work for the laziness story, and then to reason together about how to do better.

The Bottom Line

Game theory in its classical form is associated with the famous Prisoner's Dilemma, in which distrust pays. But the Dilemma is only one story, and not a representative one. In its modern, evolutionary form, game theory offers the following takeaways for supply chain managers: 1) Trust (usually) pays; 2) Leadership is connected to emotions more than to calculation; and 3) Difficult business situations can be more readily discussed and reasoned through by assuming positive motives than by assuming negative ones.

MBA Student Internships

100% of RBS Supply Chain Management MBA students completed a summer internship in 2015.

Students are gaining valuable business skills beyond the classroom, further developing their analytical, leadership, teamwork, communication, and project management skills.

Student 1

When Vandana Sharma set out to look for summer internships, there was no way she could have anticipated getting such a significant project with her employer, but Pfizer had other plans in mind! As a first year MBA, Vandana had taken a cross-section of supply chain courses, including Global Procurement. So when Pfizer assigned her a project to drive organizational flexibility, she dove right in, creating a tool that enables Pfizer managers to assess the qualitative, financial and risk elements to assist their sourcing decisions for new resources. While this project was going on, Vandana managed to complete three other procurement projects, leading Pfizer to offer her full time employment as she was leaving to go back to RBS for her final year.



Student 2

Luis Portal also had a significant internship experience working at Dell Computer on their global packaging team. He was tasked with developing an alternate sourcing strategy for their PC packaging, working in conjunction with both Procurement and Engineering. In addition to spanning two functional teams, the role cut across three regions, and a process governance council; which enabled him to truly understand the nuances of working with cross-functional teams and stakeholders. His project, which included aspects of pricing analytics, demand analysis, supplier evaluations, supply chain optimization, waste reduction, and negotiation, was estimated to have saved Dell 7% on their future packaging costs and has changed the way the company looks at this area for future bidding. According to Luis, "The Rutgers supply chain management program, along with the excellent professors and staff, prepared me to succeed in my internship, which led to a full-time offer." We couldn't have said it any better!



Student 3

With over 8 years of Project Management under her belt, Pamela Soffer decided to go back to get her MBA at Rutgers to embark in a new career in Corporate Strategy. Over the summer, she was fortunate to be a PLDP Intern at Johnson & Johnson, where she was placed in the Strategy & Execution area of the Procurement Department to take full advantage of her passion for cost-cutting efforts and long term planning. She was assigned to several projects involving change management, business planning, and mapping out processes to facilitate better cross-functional communication. She fell in love with not only the company culture, but the tremendous volunteer opportunities offered, and the breadth of roles in Procurement, such as Sourcing Manager, Program Manager, and Partner Development Manager. The combination of these great prospects made it an easy decision for Pamela to accept a full time off at Johnson & Johnson, where she is excited to show the company the truly amazing Supply Chain knowledge she gained at Rutgers during the past 2 years.