

Yale Talk: Conversations with Peter Salovey

Episode 30: Repairing the global supply chain

Guest: Sang Kim, professor of Operations Management

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FULL TRANSCRIPT

Peter Salovey: Hello, everyone. I'm Peter Salovey, and welcome to Yale Talk. So in recent years, amid the COVID 19 pandemic, the global supply chain has been battered by an unprecedented wave of disruptions. We have seen surging demand for products, plant closures, port congestion and labor shortages. In 2021, more than 70% of Americans reported that they were either unable to obtain a product they wanted, or had experienced significant delays in receiving a product they had ordered. Of course, the crisis has persisted well into 2022, and many suspect it will continue through the next year. These are serious and troubling issues for the global economy, and to repair the supply chain as quickly as possible, we need to make decisions based on empirical evidence and the guidance of experts. So today, I'm pleased to have the opportunity to discuss these issues with one of those experts. Sang Kim is a professor of operations management at the Yale School of Management, and his research interests focus on managing low probability, high impact disruptions in supply chains, sustainable operations, and social responsibility in supply chain management. Sang, thank so much for joining me on Yale Talk.

Sang Kim: Thank you, President Salovey. It's a pleasure, real pleasure to be here.

Peter Salovey: Well, thank you. And before we get into it, for the listeners of this podcast who aren't quite sure they know what a supply chain is, we throw around these terms and certainly the crisis of the last couple of years, you hear it on the radio a little bit, much more than you would have in the past. But maybe you can tell us, what is a supply chain?

Sang Kim: Yeah, definitely. I mean, for those who probably started hearing about supply chains in the past couple of years, I mean, it's been there. It's been there for a long time, obviously. But it's just that the significance of managing supply chains has been really heightened in the past couple of years, starting with COVID. Now we're going through some major war in Europe, and all of those things really started a lot of pressure to global supply chains, to the extent that now a lot of us are experiencing shortages of some items. So, in some sense, many of us are somewhat spoiled. In the past decade or so, with the emergence of e-commerce, you click on a website on Amazon, you're expected to get something the next day or maybe within a day. So, somebody has to make these products, somebody has to move these products, and deliver that to your doorstep. And this complex process of enabling the delivery of the products is the supply chain management. Now, the practice of managing supply chains has really changed a lot in the past decades. This coincided with, in the eighties and nineties, a lot of movement toward globalization, and also the cost structure of managing supply chains changed dramatically. For example, one of the biggest innovations in the 20th century was the standardization of shipping

containers. You probably have seen these containers moving in highways. They're all exactly the same shape: 20 foot, eight by eight. And this standardization of the ship really changed the practice of shipping dramatically, it reduced the cost a lot. It improved the efficiency of moving things around so much that it actually became economical for many companies to set up a factory in China or other places in the world, because shipping costs have gone down dramatically. And another factor is that the companies are always looking for ways to cut cost. And back in the eighties and nineties, when they were moving the production facilities out of the United States, obviously it was a hard decision. But what really convinced them to do this was a huge labor cost differential compared to the U.S., despite moving away from where the consumption occurs. Instead of shipping things within a timeframe of a week, for example, if things were built in the U.S., now we're stretching that to weeks or months because we have to ship things from Asia and other countries. Now, out of that comes the problem of disruptions. There's a longer distance, there's less buffer in the system. If something happens, then things can go wrong. Occasionally, we see headlines that earthquake happened in some place in the world, there's a flood some other place, that has some consequences in terms of disruptions in supply chains. But nothing like what we've been witnessing in the past few years, ever since COVID happened.

Peter Salovey: So, we have COVID. We have US-China relations. Yes, catastrophic weather events due to climate change. And all of this is causing the big crunch that we're witnessing. So what's actually happening? So products are not being manufactured on schedule. They're not being delivered on schedule. Demand surges, COVID destabilization makes certain products in demand that weren't in demand in the past. Do we ever return to a pre-pandemic supply chain?

Sang Kim: Well, one would hope so. Previously, when a disruption occurred in supply chains, it tended to be contained. One of the most major disruptions that happened before COVID was back in 2011. There was a huge earthquake in Japan that had a huge impact on supply chains for cars, electronics, obviously, because Japan is a center of manufacturing the components of these products. It was huge, but at the same time it was contained in a sense that the effect of this was recovered in a relatively short period of time. So it took weeks, maybe months, to recover from that. And it was localized. It happened only in Japan. We know exactly what happened. We can try to come up with ways to remedy the problem. What was different about COVID-led disruptions is that unlike in those other instances, things keep happening. There were different waves of COVID, and whenever that happened, there was a plant closure in one part of the world, followed by another disruption. For example, workers not being able to come to work at ports because of the protocols. And it just kept continuing. And this prolonged phased process of closures in supply is something that I think for the first time we've experienced. Before this, I don't recall any example that the disruption happened in such a long period of time in a prolonged fashion. And another is exactly what you mention, is that usually the disruptions happen either on the supply side, or the demand side. But in the past couple of years, what we've been witnessing is that it actually happened simultaneously on the supply side and the demand side. Very interesting from a resources perspective, but at the same time, frustrating for a lot of other people. I remember about a year ago, the summer of 2021, I read some reports forecasting

that at that time we've been experiencing some shortages of semiconductors and other products, and things will get stabilized by end of the year. And I remember thinking that that was too optimistic because one of the things about supply chains is that things really don't move, you know, in a linear, predictable fashion. There's a theory that have been established in the literature of supply chain management, and is called the bullwhip effect. So bullwhip comes from the analogy of if you crack a whip, the part of the whip is close to your hand, you know, maybe there's a little fluctuation. But if you go toward the end of the whip, then it fluctuates wildly. So what happens in typical supply chains, especially the supply chain that's decentralized, meaning a lot of different entities compose the entire supply chain, is that little tiny disruption that might happen at the end of the supply chain, so downstream part of the supply chain, has a tendency to be amplified as you go to the upstream. So when I saw that report last year that well, we see the data point here that I think there's a hint that things are stabilizing and as a result, you know, a few months will be good, I was doubtful because they were not thinking about this bullwhip effect. And indeed, that's what's happening. We're still experiencing all these shortages. And one of the things that right now is happening is the supply constraints seems to be easing a little bit. But what that has led to is a lot of the retailers, they stocked up the inventories a lot. And I kind of suspect that maybe in the coming months, retailers would be in a position where they have to try to liquidate this inventory.

Peter Salovey: So that should push against inflation, in exactly the opposite direction, which would see supermarket prices dropping, at least on non-perishables.

Sang Kim: Yes, exactly. And this creates another fluctuation in the supply chains. And sometimes there is unpredictability of how we observe the behavior in the supply chains.

Peter Salovey: So with all this unpredictability and with the bullwhip effect, as you describe, where small perturbations get amplified, plus with how decentralized the supply chain is, I know you've called for some kind of coordinating mechanism to try to ease the strain on the system. I think you call it like a control tower, which might be a government entity to identify and address blindspots and weaknesses in the supply chain before major disruptions are experienced. Could you say a little more about how that would work?

Sang Kim: Yeah. So this is the commentary that I made back when COVID was relatively new. And if you sort of recall what happened at that time, the shortages that we experienced in the first phase of COVID were things like masks, ventilators, PPEs--the stuff that we really didn't think too much of. But then all of a sudden, the demand for these things really went up dramatically. It had huge consequences in terms of public health. For those type of products that are somewhat different from the products we typically get from Amazon and other places, the companies who sell these products in the U.S., these are not government entities. These are for-profit companies trying to find the demand. But if something like COVID happens, all of a sudden, the demand surges, and people are trying to find this product. Somewhere we experience shortages. And we have to think about the incentives of the companies, whether they have an incentive to hoard the inventory, really not knowing whether the COVID type of disruptions will

actually happen. So that's the problem. The inventory is one of the most important elements that we look at in supply chain management. Basically, the goods that we store somewhere before the demand happens. If we have a lot of inventories stored somewhere, we may not experience the shortages that we've experienced at that time. It's easy to say that, but from the company's perspective, it's not easy because the inventories that are sitting in warehouses, they're extremely costly for them. These are the items that they already paid for sitting in the warehouse until the consumption occurs. So some money tied up. So oftentimes it is really difficult to convince them that you need this inventory because something like COVID happens--very unpredictable. So as a result, it is very difficult proposition for the companies themselves to decide that we have to hoard up this inventory. So this is the context in which I suggested maybe some action by the government could help. In a sense that this is a public good, to a certain degree, it has huge public health implications, and there's an incentive mismatch between the companies and what the public wants. And somehow, if the government has some incentives to companies to secure the inventory through these type of products, or it could be some sort of a regulation, or it could be government actually taking the steps of purchasing these products on behalf of the public. I'm not exactly convinced that the government should be present for other types of products, but at the same time for certain types of products, it might actually make sense that a little more involvement by the government entity could actually help a problem like this.

Peter Salovey: It's an interesting proposal that it kind of represents, in a way, a type of partnership.

Sang Kim: Exactly.

Peter Salovey: Now, a similar area, you are part of the Yale Center for Business and Environment, and this is a group from a lot of different disciplinary perspectives that talks about business solutions to systemic environmental problems. And maybe you could relate your work as a supply chain scholar with the attempt to bring business solutions to environmental problems. You were kind of going in that direction a minute ago.

Sang Kim: Yeah, certainly. Obviously, supply chain and the environment, there's a close linkage between the two. And these days, it's not hard to find startups, for example, that are really focusing exactly on this problem. How do we bring innovation to managing supply chains so that we reduce the carbon footprints? A lot of large companies are doing this. For example, Nike has been working on reducing their carbon footprint. So this is one area where the supply chain meets the environmental concerns. At the same time, we also have to think about how the supply chain could be changed as a result of changing environment, climate change, rising sea level, for example. I was actually talking with one of the executives about a lot of different things related to the supply chain disruptions. But one thing that he actually brought up was that he is making a huge decision of bringing some production capability from China to the U.S. And this is really started by all all these uncertainties that happen with COVID. But he was emphasizing that one key reason why he was doing it is because the environment is changing really rapidly. There is more uncertainty about supply chain that we built decades ago could be actually maintained. One

organization that is really concerned about climate change when it comes to supply chain is actually the U.S. Military. So if you think about U.S. Navy, most of their bases are at ocean front, so they're directly impacted by sea level rising. Think about the cost of having to move some of these facilities as a result of flooding, and not being able to launch ships or aircraft. So they're actually really making a lot of effort to make sure that they have adaptability when it comes to changing sea levels. I think we definitely have some room for innovation, for thinking about ways of adapting to the new environment when we're redesigning the supply chains.

Peter Salovey: And we have concrete examples that we can look at.

Sang Kim: Right now in Europe, you know, they're experiencing historical drought, which has a major impact on their supply chains because a lot of the transport of goods happen in waterways, canals, rivers, and the water is dried up. So it really impacts your ability to move things.

Peter Salovey: Yeah, of course. And war, unrest, conflict must be another issue, too.

Sang Kim: Exactly. Past two or three years, one thing after another. Started with COVID, and then we talked about the weather events. But one of the biggest factors in supply chain disruption has been the Ukraine war, which really dramatically changed the way that people thought about supply chains. A lot of uncertainty has been injected to global supply chains. And if one of those disruptions that happens for a certain period of time and we have time to recover, and then there's another disruption, then I would say that maybe what we had previously could be restored. But because things kept happening one after another, I think the mindset of the managers today is that this is a really new paradigm. There's just too much uncertainty for us not to make any action. You probably read also in the newspapers about how the U.S. Government is sort of aligning its allies for restructuring the supply chain for semiconductors and EV batteries, etc. And I think this is really changing our ideas completely. So it's a little bit frustrating, at least for me, and exciting at the same time as a researcher of supply chain. Because the theories, the practices that I taught in my classroom of supply chains has been established for many, many years. All of a sudden, I think I might have to revise my syllabus because things are dramatically different and going forward, I expect this to be very different.

Peter Salovey: I was going to ask, what you think the next supply chain crisis is going to be?

Sang Kim: Yeah, well, it's obviously very hard to predict what the next crisis might be, but what's certain is that things are not as stable as it used to be. And what that means is that what we need to think about is what kind of measures do we have to put in place in order to cope with this uncertainty? For example, onshoring has been an idea, so bring some manufacturing back into the U.S. or maybe neighboring countries. I grew up in the eighties, and I feel like we're sort of going back to that era where things were very different. This push for globalization is what have been driving in the past few decades, but now we're sort of more regionalized. And we have to think about the impact of what that regionalized supply chains might implicate. At least in the short term, I think what might actually happen is that the selection of the goods, and the price of

the goods, may actually go against what the consumers would like. Things probably will be more expensive, things will be more scarce. But once this idea of a globalized supply chain is established now, I don't know exactly when that will happen, I'm hoping that some innovations will come along and make things a little bit more like what we are accustomed to. But again, I think there's a lot of uncertainty. It's a little hard to predict what the new normal of supply chain might look like. So for me, again, it's really exciting that we can find some new ways of research and teaching. But at the same time, for average consumers, there's a lot of uncertainties.

Peter Salovey: Do you think the kinds of protective mechanisms you've been proposing will be in place by the time the next crisis happens, or?

Sang Kim: That's a good question. I was actually thinking about this congestion issue at the L.A. port, which is the biggest port that we have in the U.S. It's been so congested and there has been some threats of union strike in the past couple of weeks. As a result, a lot of the companies redirected their ships to the ports in the East Coast, and it is kind of very haphazard. Companies are finding out that there's some availability at the port in Houston or in New Jersey, so they send their ship. Maybe there could be a role for the government in this particular case of coordinating across different ports, of gathering information, of where the availability is and informing the companies that there are some more capacity in certain ports. Because, again, we're living in a very decentralized world of supply chains. Not everything should be centralized, obviously, but there could be a role for some centralized entity that could be beneficial to everyone involved.

Peter Salovey: That sounds fantastic. Could we conclude with just a word about your teaching? So you teach in the Yale School of Management. Tell us a little bit about the courses that come out of your expertise on supply chain management.

Sang Kim: At Yale School of Management, I've been teaching core operations management. So in business they're different fields and operations management deals with the execution of business ideas. So it's about the process, but we talk a lot about bottleneck. So if I think about the supply chains, the reason that we have all these disruptions is because we're experiencing different bottlenecks at a certain point in time. It's not just within our company or organization, but encompassing different organizations. How do we coordinate? So coordination actually is a very big theme in supply chain management.

Peter Salovey: You're often modeling this quantitatively, right?

Sang Kim: Exactly. Yes, I'm a modeler. I try to come up with a theoretical model with different combinations of different techniques, of mathematical modeling, economic ideas, and some computational techniques to come up with a sort of an integrative framework of how to think about the phenomena that we're witnessing. And the ultimate goal is to come up with some ideas about how we can change certain policies, where what is the more efficient way of managing supply chains, for example? And obviously, all of these modeling ideas is much better if these are empirically tested and people actually adapted in practice. But that's what I do.

Peter Salovey: Fantastic. Fantastic. Sang, I want to thank you for joining me today and spending some time describing your work and how it addresses an incredible problem that we're facing in the world today. We appreciate your insights, and the fact that you are part of the national dialogue on these pressing issues. Thank you for representing Yale so well, and for educating our students, and all who are listening.

To friends and members of the community, thank you for joining me for Yale Talk. And until our next conversation, best wishes and take care.

The theme music Butterflies and Bees is composed by Yale Professor of music and director of university bands Thomas C. Duffy and is performed by the Yale Concert Band.