

The pragmatic futurist

Shekar Natarajan not only foresees the future of supply chain management, he is helping to shape it by finding new and revolutionary ways to apply technology to solve business challenges.



IF, IN THE FUTURE, a drone is taking inventory in your warehouse, autonomous robots are delivering groceries to your customers' kitchens, or you're delivering products to consumers before they even realize they need them, you might be taking advantage of innovations conceived and developed by Chandrashekar (Shekar) Natarajan and the teams of forward-thinking supply chain and engineering professionals he has led over the past 15 years.

From redesigning material handling systems and adapting autonomous vehicles for logistics applications to improving urban logistics and rethinking supply chain planning methodology (to name just a few examples), Natarajan can cite many achievements in his multifaceted career—and he's not even 40 years old yet. A protégé of the late Richard Muther, a pioneering industrial engineer known as "the Father of Systematic Planning," Natarajan has been a supply chain executive at some of the best-known companies on the planet. His name is on hundreds of patents, and he's authored or co-authored four books on systematic planning and network design. (He also wrote, with Richard Muther & Associates President H. Lee Hales, an article in this publication, "Six steps to effective network planning.")

Currently, Natarajan is focusing on finding new ways to apply technology to solve business challenges and revolutionize how supply chains serve con-

sumers. He recently spoke with CSCMP's *Supply Chain Quarterly* about the future of supply chain technology, and how supply chain professionals can prepare themselves and their companies to succeed in a constantly changing world.

You advocate encouraging "productivity of the mind" in supply chain organizations. What do you mean by that, and why is it important?

Productivity of thinking is something you can actually measure as the ability to have situational awareness and react very quickly. People often address problems with mundane solutions if they don't have a structured way of thinking about them. If you have a framework for thinking about problems it drives you to consider both the obvious and the non-obvious. This should increase situational awareness—anticipating what will happen before it happens and pre-positioning responses ahead of time.

Businesses today are evolving rapidly. The primary axes of change include time, networks, networks of networks, relationships with our customers, and the use of data in real time. And all of these are changing asynchronously. To take advantage of

these changes, navigate them, and deal with threats, the productivity of our thinking must increase dramatically. We need to incorporate and implement our people's ideas and realign ourselves very quickly.

One way to do that is to think through more than one solution to a problem. What was contextually right at one point in time may be completely wrong two years later. If you have "A to B" and "B to A" scenarios you will be better prepared for change. You will know how to respond because you have already thought through two opposite solutions for that scenario. When you have determined the right approach, you will have strategic options ready to execute. In this way you can accelerate organizational change.

Another is to have all employees see themselves as a potential provider of personalized service; when that happens, hyperlocal opportunities quickly emerge. For example, an employee might deliver a package for a customer on the way home; another might offer a painting service for a customer who is apprehensive about doing the painting.

When you were in the beverage industry, you were instrumental in improving product handling equipment and processes. Tell us about one solution that continues to have a significant impact.

At Coca-Cola Bottling Company we developed the Coolift beverage-delivery system, which is now a standard throughout the industry. The specially designed carts and pallets make the job of moving beverages from truck to store much quicker, safer, and more efficient. We developed the solution by looking for a merchandising delivery system that reduced the risk of injury and could be used easily by anyone. We analyzed the whole supply chain as a system, deconstructed it, and identified where and how we could improve it.

When I was with PepsiCo, the same "system" approach led to a host of other innovations, including geo-based delivery, automation of the manufacturing-to-merchandising processes, building orders like Lego bricks so they could be merchandised in minutes versus hours, centralizing and automating routing and dispatching, implementing reputational integrity systems to manage bad actors, and virtual

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control towers to handle the order flow on an exception basis. In this way, every one of our cumbersome processes got a facelift. As a result, we were able to launch several billion-dollar brands and simplify the work of thousands of field associates. I am grateful to the teams that enabled this and the executives who inspired us to think this way.

Your name is on some 300 patents. What are some of the areas you've focused on?

My purpose in filing patents has been to support and protect my employer's business with respect to the future of logistics and commerce. Some of the subject areas that emerged in the past few years include autonomous vehicles—air, ground, on the road, and in the home; the last 100 feet into a consumer's home and in the kitchen; cognitive commerce, where data collection and analysis allows me to know you so well that even before you need something I will get it to you, which leapfrogs search altogether; just-in-time replenishment to the home according to values, affinities, and preferences held

in the cloud, which obviates the need for ordering or in-home inventory; and hyperspectral imaging, which gauges a food product's internal qualities, and blockchains to ensure food safety and freshness.

Some others include temperature control and Internet of Things (IoT) systems that enable virtual control towers; engaging customers with virtual reality and augmented reality; virtual malls and the monetization of virtual space; moving "digital duplex" conversations with inanimate objects that are coded with information from the point of purchase to engage the consumer at the point of consumption; personalized business-to-person products, services, and communications; emotive and psychological measurement systems that can adapt the selling process to each customer in real time; algorithms that power gamified virtual planning towers; and continuous dynamic reconfiguration of the supply chain so that it is always optimized.

All of these have an underlying systemic implication for the supply chain's architecture and for the dynamic response networks that need to be created to enable them.

How do you go about determining which technologies are important and where to apply them?

The jobs that must be done in commerce and logistics don't fundamentally change. Customers will always want to buy clothes, and we will always have to complete a financial transaction and provide the goods, for instance. But evolving technologies can overcome resource constraints, provide step-change cost advantages, and give us new opportunities to delight the customer. So, I look at the jobs we need to do and map to them the relevant technologies to create a framework of opportunities. As an example, if a package of pretzels can "talk" digitally to the customer and engage in the process of cooking, suddenly the concept of food logistics and brand packaging looks very different. New value gets unlocked for customers and brand companies.

Here's another example: When they are choosing clothes, customers are regularly at the mercy of the sizes and colors that are already available. The technology exists that would allow a customer to choose the style, fabric, size, color, and other options for the garment to be made to order and shipped out overnight. Then the customer could have exactly what he or she wanted each time without the risk of the size or preferred color being out of stock.

Any predictions about what will be the hot areas for supply chain in the next 5 to 10 years?

Yes, I think the following areas will be most important:

- The Internet of Things will enable full visibility of the supply chain from factory to customer.
- Blockchains will enable track and trace and will limit the influence of bad actors.
- Logistics services will become available as Logistics as a Service (LaaS), where a third party provides platform-based turnkey solutions for end-to-end processes.
- "Frenemy networks" will include competitors in a service offering.
- Every supply chain job will change due to digitization, through such means as apps, advanced analytics, and cloud computing power.
- "Networks of networks" will develop through the constant realignment of networks with new partners to enable value delivery.
- We will see highly personalized business-to-individual (B2i) communications and commerce.
- Robots and autonomous vehicles will play an increasingly significant role.

Why is know-how about emerging sciences critical to businesses in general, and supply chain organizations in particular? How will the roles of supply chain professionals evolve?

I firmly believe that a company must grow as fast as its market to survive in the long term. Since the rate of change in the markets is going up continuously, innovation and growth must be everyone's job, not just that of a select few.

Let me address this using an example. Today a transportation leader is rewarded for securing the right contractual rates, managing drivers for safety and compliance, and executing on time and within budget. In a world of autonomous vehicles, there is no driver to manage, and the job of the transport leader is to ensure and build the right algorithms, manage the integrity of assets, and ensure good customer interactions. Because so much must change, being ahead of it is critical.

My experience has made me a firm believer in the ability of logistics to drive revenue and create new business models. Logistics can drive customer intimacy, operational excellence, and product leadership. Autonomous vehicles, for instance, will improve efficiency, but there are numerous ways they can be a source of revenue. Those that carry passengers can be mobile kiosks, making sales to passengers. And while they are carrying passengers, the trunks can be carrying packages for delivery.

Supply chain leaders need to be alert to these opportunities and be able to capitalize upon them. To do that, they must think as businesspeople—more like a general manager and less like a transaction-focused logistics manager. △