

# Supply Chain Management: Past, Present and Future

On our 20th anniversary, *SCMR* asked founding editor Frank Quinn and four industry experts to weigh in on the future of supply chain management.

## SCMR's first 20 years



1997-2017

BY FRANCIS J. QUINN

### *"You want to start a magazine on what?"*

That was the incredulous question we heard more than 20 years ago when *Supply Chain Management Review* was first proposed.

But a core of true believers in our publishing company were convinced that this emerging discipline called supply chain management would soon become a dominant force in business success. We argued that the publication that established itself as the "go-to" supply chain information resource—for the practitioners, service providers and educators who would make up that community—would enjoy a readership advantage for years to come.

Happily, we convinced our management of the importance of supply chain management and of the need to fill an emerging

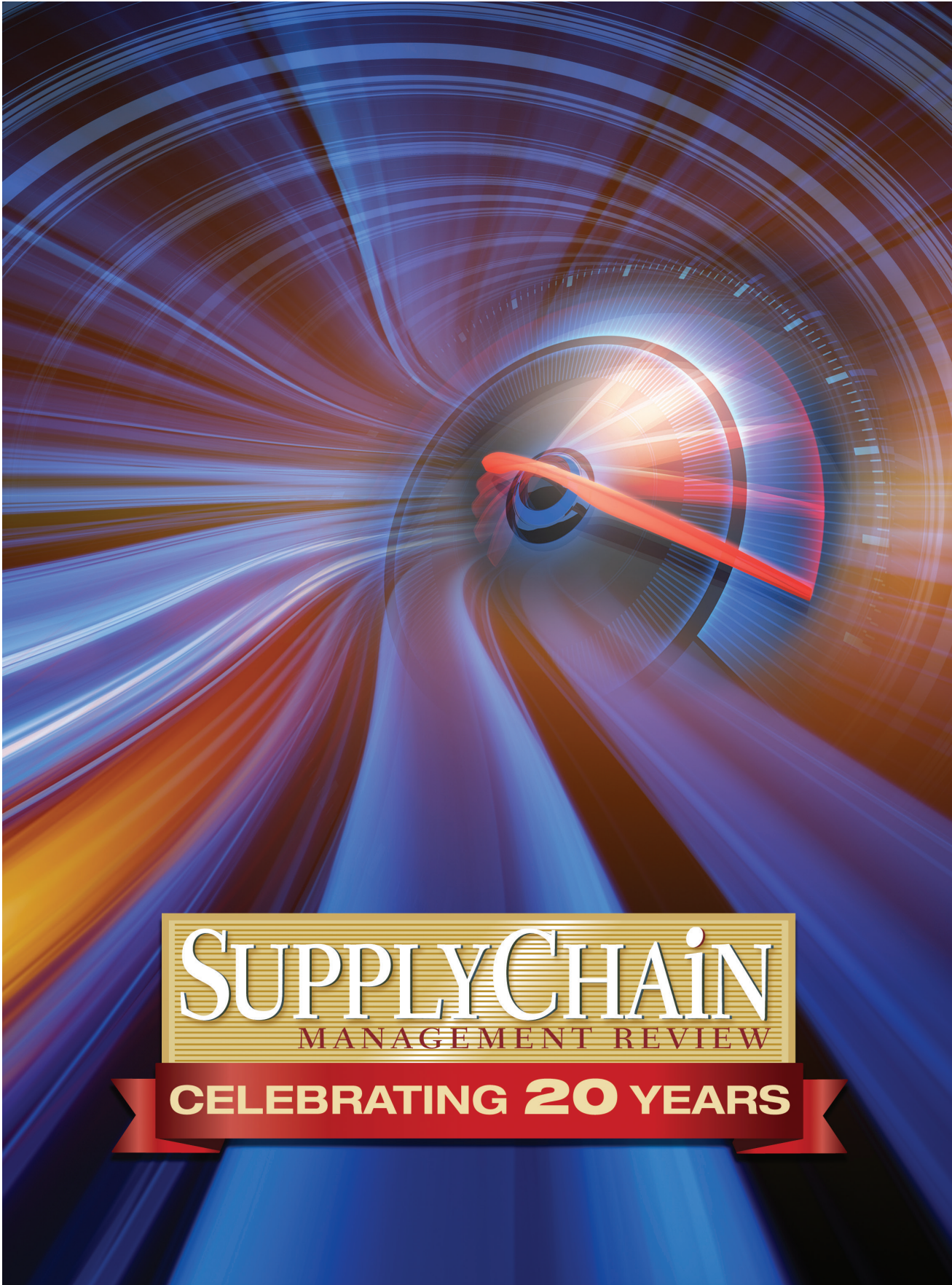
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*Editorial advisor Francis J. Quinn was the founding editor of Supply Chain Management Review.*

information void. We launched a prototype issue in 1996 that was warmly welcomed by focus groups and in industry surveys. We soon got the green light to begin regular publication and in the spring of 1997 launched the first edition of *Supply Chain Management Review*. It's been going strong—no, make that getting better—ever since.

The late 1990s was a period of transition in our world. Traffic and transportation management had given way to the concept of physical distribution management, which before long would be called logistics management. By the end of the '90s, the term supply chain management began popping up in academic papers and at industry events. SCM would be broadly defined as all of those activities involved in moving goods from the raw materials stage though to the end user. The momentum toward integrated supply chain management was building—although pockets of doubt still lingered.

A prescient column in our very first issue by legendary educator Bernard J. (Bud) LaLonde of The Ohio State University asked



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**CELEBRATING 20 YEARS**

whether supply chain management was a “myth or reality?” Bud argued convincingly that it was the latter—and that companies not embracing this new reality put at risk the value they provided to their customers.

A look at some of the feature articles in that first issue of *SCMR* show that many of the challenges supply chain

***Supply Chain Management Review* never would have gotten off the ground, let alone lasted 20-plus years, without you, our readers.**

professionals faced 20 years ago remain front and center today. Here are a few examples.

- The article: “How to Design an Optimum Supply Chain” written by management consultant Paul Bender speaks to a challenge that has only intensified as companies become more global and complex.
- As is the case today, readers 20 years ago were eager for insights and information on how the best companies run their supply chains. So I’m convinced that Professor Don Bowersox’s piece “Lessons Learned from the Supply Chain Leaders” would be as timely today as it was in our inaugural issue.
- A seminal article on the “Seven Principles of SCM” by Andersen Consulting (now Accenture) remains in high demand to this day. In fact, this has been the single most reprinted article in the history of our publication.

Now this is not to say that the art and science of supply chain management has remained static since 1997—far from it. New technologies in forecasting and demand planning, shipment visibility, automation and fulfillment have brought us to unprecedented levels of efficiency. Organizationally, leading companies have broken down the siloes inhibiting productivity, replacing them with integrated processes that enhance customer service and support profitability. In short, supply chain management is now widely regarded as a foundational element in overall business success.

On the education front, the progress has been similarly impressive. Twenty years ago, courses with “supply chain” in the title were just beginning to appear in business school curricula. Today, many excellent universities offer degrees in supply chain management ranging from certificates and bachelor’s degrees up to doctorates. Notably, many of these

programs are offered online as well as in traditional classroom settings. For practitioners—and for students contemplating potential career paths—supply chain education pays off. Educators at the major universities in our field will tell you that a supply chain concentration is among the most sought-after on their campuses. More importantly, the job market for young people with a degree in this field is robust and growing.

From a personal standpoint, I wish to acknowledge the educators that have helped usher in the supply chain era. They have advocated long and hard for supply chain management to “have a seat” at the education table along with finance, marketing, engineering and other more traditional disciplines. The great majority of supply chain educators that I have met over the years have a clear understanding of business realities and the related supply chain component—the term “ivory tower” does not apply here. And not insignificantly, these individuals were among the first and most enthusiastic supporters of *SCMR*. For that, I am truly grateful.

We’ve also seen the evolution of our professional associations over the past 20 years. The names have changed to reflect the new business reality (the Council of Logistics Management became the Council of Supply Chain Management Professionals, for instance, while the National Association of Purchasing Managers is now the Institute for Supply Chain Management), as has the scope of their offerings to members. These organizations provide a wonderful opportunity to network with fellow professionals, as they always have. They’re still doing this today—plus a lot more. Targeted online education programs, certifications, access to research and peer interaction has added a valuable dimension to membership. One of my soapbox platforms as editor of *SCMR* was encouraging readers to become *active* in organizations like CSCMP, ISM, APICS and the NITLeague. Membership has always been a social, educational and thoroughly enjoyable experience—and a tremendous complement to a supply chain career.

One more thought before I end: *Supply Chain Management Review* never would have gotten off the ground, let alone lasted 20-plus years, without you, our readers. I’m going to be presumptuous here and speak for myself and for Bob Trebilcock, my successor at the *SCMR* editorial helm: We are forever in your debt.



# A new score for supply chains

BY CHRIS CAPLICE

**A**dditive manufacturing, autonomous vehicles, blockchain technology, the Internet of Things and multi-channel retailing are some of the innovations that are driving tremendous change in supply chain management today. Yet the innovative trend that is of most interest to me is already several decades old—the growing importance of service over products.

Although this trend is not new, it is more relevant to the future of supply chain management than ever, and its impact is gaining momentum. I believe that the value of services has finally eclipsed the value of the underlying products, and that this portends tremendous changes to supply chains going forward.

## Back to the future

One way to understand what the future might hold for supply chains is to review how a different industry navigated a sea change in the past. Academics often look for these historical canaries in the coal mine.

One of my favorite industries to follow is the recorded music industry because it has an exceptionally fast clock-speed. That is a term coined by MIT professor Charlie Fine to identify industries with very fast reaction cycle times to change. Its performance over the last 40 years reveals some striking insights into how the supply chain industry could change in the future.

In the early 1970s, the pre-recorded music industry was flying high. There was significant consolidation amongst the manufacturers—the major labels—and the vinyl long playing (LP) record had been a relatively stable format for over a decade. That all began to change in the mid-to-late 1970s as the LP gave way to 8-tracks, cassette tapes and finally, nearly 20 years later, to compact discs (CDs). Yet, regardless of the format, total sales of physical product grew dramatically. In 1976, just fewer than 400 million units of pre-recorded music (mainly vinyl records but also cassettes and 8-tracks) were sold in the United States. By 2000, the number of units of pre-recorded music shipped exceeded 1 billion—the

vast majority of which was CDs.

Each new format change not only increased usability, but also represented a dramatic densification. In 1973, the weight of the product required to provide one hour of music was just over 8 ounces, or half a pound. By 2000, this had dropped to just over 2.5 ounces, a four-fold density increase from seven minutes to over 24 minutes of music per ounce. During that period, the number of units shipped doubled, and the amount of hours of music sold increased by fivefold even though the weight shipped only increased by a third. This value densification (minutes of music per pound of product) led to a 65% reduction in the ton-miles required to distribute the product over the 30-year period. Interestingly, other industries did not invest heavily in the densification of their products (reducing package size, removing water and miniaturizing components) to achieve the logistics benefits that the music industry enjoyed until decades later.

## Step change

That, of course, was not the end of the story. In the mid-2000s, the music industry was hit with digitization. Rather than buy CDs, music lovers downloaded their favorite songs and albums. By 2011, the total revenue from digital downloads surpassed that from physical products; by 2015, the number of physical units sold per year had shrunk from over 1 billion to just over 100 million.

Confronted with a shifting marketplace, the major labels fell prey to the innovators dilemma and are now a classic cautionary tale of what not to do under massive technological change. Rather than embrace digitization, they fought change through legal actions and other obstructionist means—and lost. In the end, outside players like Apple's iTunes store drove the innovations that transformed the way consumers buy and listen to recorded music today.

Yet, the transformation is not over. The new innovators are providers of streaming services, where the user rents music from a service such as Spotify, Pandora or AppleMusic rather than buy specific songs or albums. The service is either free to the user (with revenue coming from advertising sales) or requires a subscription fee. In 2015, total revenue from streaming outpaced the revenue from either physical sales or digital downloads.

This reflects a change that is unlike densification and digitization, where the innovation was in the production or manufacturing of the “product.” This time, the innovation is in the way music is consumed. As a life-long audiophile, I can attest to this. My collection of thousands of LPs, 8-tracks, cassettes and CDs is tucked away in an attic.

### The idea of capturing the “voice of the machine” to make predictive analytics is starting to happen today.

While I downloaded several mortgage payments worth of songs from iTunes between 2008 and 2014, I now stream my music. Essentially, for me, as with a growing number of consumers, recorded music has changed from being a product to buy to a service to rent.

The rise in streaming is also changing the way that musicians release their music. Rather than large-scale launches of an album every two years, musicians stay in the forefront of the listener’s attention by releasing individual songs or small batches continuously. So, in a sense, this change in consumption is changing the production or at least the timing of release.

### Far-reaching implications

Many industries today are facing this transformational challenge of shifting from making a product to providing a service. The auto industry is a strong example. A larger segment of consumers is becoming more interested in the idea of *mobility* than car *ownership*. The rise of pooled car sharing services (Zipcar etc.) and non-traditional taxi services (Uber, Lyft) is having a dramatic impact on the demand for cars. It has been estimated that every car introduced into a car pool replaces five vehicles.

The same general trend is occurring in other large asset industries, such as aeronautics, where Lockheed Martin famously shifted its sales from engines to hours of uptime for the military.

Once we recognize this shift from product to service, we can start thinking of the implications to supply chains, which I believe will be dramatic. The most obvious is a reduction in the number of physical units produced. With fewer units, the utilization of each unit will have to increase in order to handle the underlying demand for the core service being provided. This could drive higher qual-

ity or more resilient products that can sustain increased use for extended periods of time. That leads to easier cost justification for investments in more sensors to track how these items perform as well as the creation of real-time simulations and monitoring of these products. This is sometimes called digital twinning and is already becoming widespread in locomotive engines. The idea of capturing the “voice of the machine” to make predictive analytics is starting to happen today.

Of course, these are just conjectures. It could be that some of these industries become totally fragmented and operate as a marketplace of independent players. Just as most supply chains have embraced densification and been faced with digitalization challenges as has the music industry, so will they encounter the transformational shift from products to services. This will require each company to reassess and reevaluate exactly what their firm provides to consumers—not the product, but the underlying need that their products can satisfy.

I am excited to see how this trend toward service-centered products spreads and grows. It will fundamentally change supply chains—exactly how is anyone’s guess.

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*Chris Caplice is the executive director of the MIT Center for Transportation & Logistics.*

## Interesting times ahead for SCM

BY SEAN MONAHAN

**I**n the ever-evolving world of supply chain management, the expression “may you live in interesting times” is viewed by many as a curse. For me, I look forward with anticipation to a supply chain that thrives on a future with heightened expectations, new capabilities, unavoidable challenges and yes, even unknowns.

### Heightened expectations are the new normal

The importance and stature of supply chain management within organizations has risen dramatically over the past decade—and we can expect that trend to continue. Gone

are the days of supply chain as a necessary evil with its primary mission being to not fail. Certainly, not failing is still an expectation, and as the steward of most of the costs and assets of many organizations, continuous productivity improvement will remain table stakes. But increasingly, the discussion focuses on how the supply chain can be leveraged as a competitive differentiator providing enhanced capabilities to our customers such as personalized products and “instantaneous” delivery and fulfillment. The expectation will be that the supply chain contributes

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directly to the top line on par with more traditional commercial functions. As such, supply chain leaders must play a larger role in the C-suite and in boardrooms. On a national scale, countries are leveraging supply chains as a primary vehicle to drive economic development. Government leaders are making industrial policy a centerpiece of their agendas, including: “Make in India;” Germany’s Industrie 4.0; Made in China 2025; Ethiopia’s Industrial Development Strategic Plan; and the Trump Administration’s Manufacturing Council.

#### **New capabilities**

We are at the beginning of the 4th Industrial Revolution driven by emerging technologies. While much of the discussion focuses on the “Fab Five” technologies—Internet of Things (IoT), Artificial Intelligence, Augmented/Virtual Reality, Robotics and 3D Printing—through recent work in collaboration with the World Economic Forum, we have identified over 50 technological advances that will shape the future of supply chains. Individually, and as they converge, these technologies will transform how we design (e.g., unconstrained), how we manufacture (e.g., batch size of one), where we produce (e.g., localized to consumption), how we skill, how we partner and how we sell. These technologies will support new levels of productivity, new levels of sustainability and new business models that help supply chain managers deliver on the heightened expectations noted above.

#### **The challenge of sustained employment with transformative technology**

Just as power brings responsibility, capabilities and opportunities are frequently accompanied by challenges. While the technologies of the 4th IR will bring new capabilities, much of the popular discussion focuses on how these technologies will result in the loss of jobs. Or, as the Guardian opined this past January: “Robots will destroy our jobs—and we’re not ready for it.” The impact of technology on jobs has been a challenge since the creation of the first machine, but the historical impact has generally been additive with new job classifications and employment exceeding prior levels. However, while past industrial revolutions have been inter-generational, allowing the next generation to build the skills to prosper as new technology proliferates, current and future revolutions will be intra-generational requiring workers—blue- and white-collar alike—to retool and retrain multiple times over the course of their careers. How can public and private organizations work to support workers during these transitions to ensure that displaced workers are enabled to bridge the transition, and that employers have access to the appropriately skilled labor pool required to take advantage of these new technologies?

#### **Unknowns create uncertainty as well as opportunity**

While the timing, scope and scale of the expectations, capabilities and challenges outlined above cannot be predicted with any precision, I am confident that the trajectory is clear. However, there are a variety of other factors that are much less clear. Chief among these “known unknowns” is the nature of global interaction. As my colleague Paul Laudicina recently noted: “After a 25-year period of supercharged globalization, we have now arrived at an inflection point at which the entire future of the dominant post-war paradigm is in jeopardy.” For at least the near term, we can readily anticipate a step back from globalization and multi-lateral trade agreements, and we can already see the impact rippling through supply chains as decisions to offshore, on-shore and select suppliers are paused or reconsidered. How this “inflection point” plays out will shape supply chains for decades to come. And, certainly there are “unknown unknowns” we cannot even begin to speculate on.

As I look to the future, I am reminded of the questions I addressed with clients in 1997: Could changes over the past two decades provide any guidance on what lies ahead? What I find is familiar. Many of today's questions have not changed in the last 20 years: post-merger supply chain integration, working capital improvement, differentiated customer service strategy, plant productivity (Lean, 6 sigma), complexity management, material sourcing, organization design and talent development, distribution network strategy, new market entry, outsourcing and off-shoring. However, what have changed are the expectations of performance, the tools available and the clockspeed of change.

What excites me about supply chain management in the years ahead? The expectation that supply chain management can be leveraged as a competitive differentiator and fully deserves an important role in company strategy. New and exciting capabilities will enable us to create more value for our customers, shareholders and communities. Challenges and unknowns will arise to stimulate our thinking and creativity, inspiring supply chain management to deliver robust, agile solutions. And there is comfort in knowing that in the interesting times to come, there are foundational tenets and issues that we'll continue to pursue in search of better outcomes.

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## The new rules of LIVING supply chains

BY TOM LINTON AND ROBERT HANDFIELD

**F**lextronics, which recently changed its name to Flex, could be one of the biggest companies you have never heard of. With over 200,000 employees and over 1000 customers, Flex produces more than \$12 billion in revenue across at least 12 industry verticals. While we once focused on PCs, today we make everything from footwear for Nike to speakers for Bose to floor care products for Dyson and Bissell. While you won't ever see our name or our brand on these products, they represent billion dollar businesses in each of

these sectors. Yet, Flex's primary business is not manufacturing. Rather, it is supply chain management, on steroids, with a focus on continuously improving the end-to-end supply chain. Our new book, *The LIVING Supply Chain*, documents the changes going on at Flex in the context of the massive evolution in today's supply chain world. These changes will occur sometimes quickly, sometimes slowly, but will undoubtedly come into being in the next decade. The changes are not just about technology—they are about true evolution—in a biological sense—of the relationships, infrastructure and jobs in the supply chain.

Many of the changes we are seeing at Flex have been captured in a set of insights we call the "New Rules for LIVING Supply Chains." These new rules are aligned with many of the rules that dictate how species, human beings and genetics have evolved, and represent a natural, rather than a radical, evolution to change. They are occurring because the world of global trade is re-shaping the way we operate. In a sense, this world has reached the limits of growth; the new rules will require a new set of management approaches as the traditional approaches will no longer apply.

To understand this new world, a brief history lesson in supply chain management is in order. SCM developed as a field as large organizations saw the need for dedicated functions responsible for the management of materials, which included purchasing raw materials, managing manufacturing processes and moving materials (logistics). The overall objective of materials management was to solve materials problems from a total system cost perspective rather than from the viewpoint of individual functions or activities. The late 1990s saw the introduction of a set of principles known as "World Class Procurement." The idea, promulgated at universities like Michigan State University, where co-author Rob Handfield was a young assistant professor, was that procurement needed to establish a position not just as a "buyer of stuff," but as a centralized function that tabulated spending across both direct and indirect categories of spending, leveraged this volume through purchase power and sought to achieve significant cost improvement.

Driving cost out of the system was also a theme in logistics, where enterprises centralized their distribution centers and warehouses to drive optimization in transportation routing and reduce inventory across the system. Manufacturing, meanwhile, saw the introduction of Lean and just-in-time manufacturing based on the thinking pioneered by the

likes of Toyota. Just-in-time and Lean focused on standardizing products, improving coordination between different enterprises to reduce inventory and only delivering the exact amount needed, in quantities that could be immediately consumed by the follow-on operation.

### **Speed drives business value and inventory turns, reduces working capital, produces cash, (monetizes) assets and makes customers happy.**

Still later came the “Logistics Renaissance,” which proclaimed that the role of logistics was to add value and drive market penetration through technology integration. The concept was encapsulated in a “maturity model” that identified how organizations could develop capabilities over time toward a truly “world class supply chain” organization.

However, “world class” still emphasized distinctions in the field. Purchasing, operations and logistics were lumped together as “supply chain” functions, but they never stopped working independently of one another. Professional disputes emerged over which function was really in control of the supply chain. All the while, each claimed to be driving world class practices—implying that they are the best of the best.

In the end, there are some real problems with the world-class view of the supply chain. Although transactional excellence and efficiency is certainly an operative element that forms the basis for excellence, there is a shift away from the idea that world class applies to every situation.

So if world-class supply chain management is no longer the objective, what is the next generation of supply chains going to look like? To answer this, it is important to emphasize that managing supply chains is no longer just about driving cost out of the system, but about a deep understanding of the components of customer value and making decisions quickly in response to sudden shifts in customer requirements.

While cost optimization may well be one element of this equation, value has many contexts and meanings. Managing the supply chain first and foremost requires that managers act as internal consultants who listen closely, not just to the explicit needs of internal customers for materials, information, services, knowledge and capability, but also to the intangible elements of value customers are unable to articulate. In a sense, real-time supply chains involve understanding and predicting what internal users and

customers will need next month and next year, even before they themselves recognize that they need it. And velocity and speed is an integral capability that enables quick response to customer needs that produces the right outcome.

Attention to speed and velocity is also an idea promulgated by evolutionary economics and biologists, who emphasize that the organisms and creatures that are quick to respond will evolve more quickly—and will survive. Those that don’t? They will die out. In his book: “The Serengeti Rules,” biologist Sean Carroll explains why entire ecosystems can get “sick” when the populations of certain members are too low or too high. In fact, these rules provide an excellent set of guidelines for thinking about how supply chains operate as an ecosystem. In this manner, we propose the idea of a “LIVING” supply chain as one of a set of networked enterprises that are subject to biological rules related to the ability to respond—and evolve—quickly.

Why is velocity and real-time transparency so important in the supply chain? An anecdote used by Linton at Flex makes it clear: Think about driving in traffic and suddenly it occurs to you to use the Waze app. This app provides you with real-time data, collecting information from millions of other Waze drivers to give you instructions on how to get to your destination faster, using alternative routes. What if you had Waze for your supply chain? You could move more quickly, get real-time information and updates and provide better service and value.

This analogy points out a simple concept, which is not far from the truth: In the new global era, speed and velocity are more important than everything else. Speed drives business value and inventory turns, reduces working capital, produces cash, (monetizes) assets and makes customers happy. That, in turn, further drives top line revenue. The creation of real-time supply chains provides a means for creating value that the customer cares about, and in today’s rapid environment, velocity has customer value. Late deliveries, substandard quality, safety incidents and damaged shipments do not alleviate the benefits offered to a customer for lower prices, as many logisticians and planners will tell you. In many cases, speed not only reduces costs—it also creates customer value. ☺☺

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