THE NEW ERA OF SUPPLY CHAIN VISIBILITY AND OPTIMIZATION

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IndustryWeek

WELCOME

Our global supply chain networks have never been more complex nor been asked to operate at such speed. We often hear about the influence of the empowered consumer on rising expectations and the explosive growth of data from smart phones, people, transactions and increasingly connected products. How in the world are supply chain leaders expected to keep up with these dynamics day to day – let alone become a strategic contributor to growth?

As more businesses are impacted by digital transformation, we need a new approach to how we acquire, amend, analyze, and act using supply chain data – in real-time – to proactively minimize disruptions while improving service levels.

A variety of research and editors are claiming that Industry 4.0 enables the digital transformation of supply chains, how organizations are working to transform their traditional supply chain functions into a holistic digital supply network (DSN) to better achieve their business objectives – both related to operational efficiency and enabling growth.

However, most organizations' supply chain systems and processes have grown up in a very linear way overtime and huge investments are in place to keep track of the thousands of geographic point-to-point relationships that cannot be easily pivoted to enable the DSN.

A strategic opportunity for organizations now is to understand how geographic information systems (GIS) and spatial analytics provide a natural layer of collaboration that bring together those necessary information sources and organizes them within the context of their location. GIS helps organizations visualize a holistic real-time global operating picture with the logical tracing connections between sources to understand the impact of current issues and how to engage alternative solutions before a disruption occurs.

This eBook provides expert accounts of how the global supply chain is shifting in our digital world and how organizations can best apply technology to rise above the noise to grow and differentiate their business through supply chain precision.

Cindy Elliott
Head of Global Market Strategy,
Manufacturing and Logistics, Esri

WHAT i4.0 MEANS FOR SUPPLY CHAINS

BY BRIAN HECKLER AND DOUG GATES, KPMG INDUSTRIAL MANUFACTURING

From boardrooms and shareholder meetings to conferences and collaboration circles, it seems everyone is talking about the fourth Industrial Revolution (i4.0). Manufacturing executives are increasingly challenged to evolve to remain competitive in this age of rapid technological disruption. Depending on whom you talk to, the disruption for value chains, employees and business models may be fundamental.

In this environment, it is critical for executives at manufacturing companies to separate hype from reality in order to effectively prioritize their business initiatives. They need a clear picture of the current risks and opportunities and they need to understand what their peers and competitors are doing to drive value and capture competitive advantage.

While most manufacturers are certainly investing into i4.0 capabilities and technologies, few have achieved the scale and integration required to drive

enterprise value from i4.0. There are many working towards creating the "factory of the future" or going beyond to evolve to a "digital enterprise," but none have yet to achieve consistent application of those capabilities across all of the corners of their operations. Most are still experimenting with discrete pilots or trialing point solutions. Some have yet to start developing their roadmap for integrating i4.0 into their business and operating models.

We believe that the time for small-scale i4.0 experimentation is coming to a close. Indeed, to win in tomorrow's competitive environment, we believe that manufacturers will need to start being bolder in their vision and faster in their scaling of strategies and actions for i4.0 in a more comprehensive way. Perhaps the best place for all manufacturers to begin with is their supply chain.

SUPPLY CHAIN: ENHANCING i4.0 VALUE

After years of struggling to improve integration and coordination across the value chain, many manufacturers clearly see i4.0 as a potential solution to some of their more persistent supply chain challenges. Indeed, a fully integrated i4.0 environment could help manufacturers to remove significant friction from their increasingly complex supply chains. It could unlock improved visibility across the network and down into lower tier suppliers to better reduce risk and improve flexibility. It could enhance coordination and innovation through better access to customer and product usage data and deliver scaled yet customized product solutions. And it could deliver improved working capital flexibility by helping to lower inventory levels and sharpen forecasting. The benefits of integration can be significant.

But the real value will come when the value chain becomes a value network—where data is shared fluidly between various nodes in the chain, decisions and demand signals are shared in real-time across the network, and data sources are integrated across systems. That will allow new opportunities to be uncovered and new performance improvements to be achieved.

We recently spoke to some of the world's leading manufacturers, suppliers and innovators as part of a KPMG-developed framework and benchmarking exercise. What we found is even the leaders of this group demonstrated room for improvement in demand-driven supply chain maturity. However, a few of those investigated are already moving to work (in deep collaboration) with their suppliers and customers to embed value chain considerations into their transformation roadmaps.

What are the leaders in i4.0 supply chains doing?

- **They are focusing on integration.** A few leaders are moving quickly to integrate their suppliers and customers into a demand-driven supply chain. They aim to leverage an interconnected network as the key to future competitive advantage. And they are using the cloud to connect to their suppliers and externally to gain improvements in responsiveness, quality and cost.

- **They are creating the right environment.** The leaders are assessing both the opportunities and the risks of greater value chain integration. They are using sensors across all nodes of their operations in order to gather data to help model and predict various supply chain scenarios. And they are improving their controls to reflect the potential for increased cyber security and data privacy risks.

- **They are looking for new opportunities to drive performance.** Leaders are also rethinking their traditional supply chains and networks to streamline and eliminate unnecessary processes and remove waste by working collaboratively with their suppliers.

COLLABORATION FOR INTEGRATION

We believe that significant value can be unlocked by driving integration across the extended value chain and creating a platform for the network. This can only be achieved through both technological integration—of systems, platforms and data—but also closer integration around controls, governance and cyber security. Further, full cooperation and collaboration between manufacturers, their suppliers and (possibly) their suppliers' suppliers will drive more value from the platform, not only to improve the success of the partnership, but also to identify and monetize the value of the network. Adding the customer into the mix—in a truly interconnected network—will further improve the returns and benefits.

The question then becomes one of control. Leading-edge manufacturers are starting to adopt a "control tower" approach to managing their supply chain, bringing analytics, automation, augmented decision support, modeling and other capabilities together as a centralized function. Manufacturers can begin by focusing their attention on improving integration with a few select (top tier) suppliers. Once standards have been set, governance and controls have been defined, and protocols have been created, these tools can then be used to drive further integration deeper down into the supply chain.

SUPPLY CHAIN TECHNOLOGY BRINGS THE WORLD CLOSER TOGETHER

BY PAUL MYERSON

Having been in the supply chain and logistics management field my entire career, whenever I hear it mentioned on national TV (e.g., UPS' "I Love Logistics" commercials) or, as was recently mentioned by a sitting president ("Globalization is a fact, because of technology, because of an integrated global supply chain, because of changes in transportation"), I can't help but get excited about the future.

The latest quote from President Obama above ties nicely with my forthcoming book, "Lean and Technology: Working Hand in Hand to Enable and Energize Your Global Supply Chain" (Pearson), which I think is a timely and important topic now for the coming years.

Technology is pervasive in today's supply chains in every possible area, ranging from processing and tracking transactions to planning, scheduling and managing. It enables a truly integrated, visible and efficient supply chain that benefits from collaboration.

For example, software technology is used in areas of the supply chain such as:

- Transaction processing—resulting in a reduction of manual work and costs, improvement of information quality, speeding up of information transfer, and volume of transactions used to drive the use of IT for transaction processing.
- Supply chain planning and collaboration—information is used for running processes such as demand forecasting, production and distribution planning, procurement, sales & operations planning (S&OP), as well as VMI and CPFR initiatives that benefit both a company's internal and external supply chains.
- Order tracking and delivery coordination—for tracking the progress of orders or deliveries or in providing this information to interested parties.
- Supply chain analytics—provides supply chain members with improved data accuracy, clarity and insights, which can lead to more contextual intelligence to be shared across supply chains.

Hardware technology is used in areas such as:

- Distribution and fulfillment operations—automated equipment ranging from forklift trucks and carousels to Kiva robots move material quickly and efficiently through a facility, and other tools such as bar code scanning and RFID improve not only increase speed of processing but also accuracy.
- Transportation—GPS and telematics are used to improve the efficiency of delivery of product on traditional vehicles along with other potential forms of delivery, such as air and land-based drones.

Not to mention that there is also the emerging use of social media to interact with customers, respond to questions, report accidents or weather conditions that may impede delivery schedules, and create automated updates about your inventory, which is especially useful in today's omni-channel marketing and distribution environment.

So it is clear that technology can help the supply chain to bring companies and people closer together in today's global economy.

HALF OF SUPPLIERS DON'T COLLABORATE WITH PARTNERS

While it is an accepted supply chain business strategy that collaboration and sustainability can drive innovation and growth, most suppliers are not acting on this.

A new study from 3M shows that only 43% of suppliers feel fully empowered to collaborate with their partners.

In fact, half of all suppliers surveyed have held back from making strategic recommendations due to lack of incentive or customer openness. The reason for this is that 57% of suppliers don't feel encouraged or empowered to innovate and make suggestions for improvement for the customers they supply.

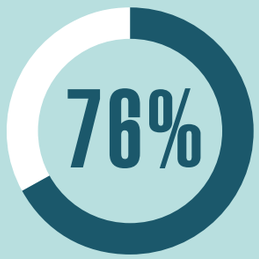
Furthermore, 70% of suppliers said at least half of the customers they supply do not have a strong system and process in place for buyer and supplier collaboration.

"This coordination gap is potentially costing customers millions in efficiency and development opportunities," the report concludes.

TECHNOLOGY

Change is in the air, however, as 60% of organizations are in the process of making major upgrades to their systems to become more connected to customers, according to the report. Currently, 58% of organizations already have fully modern systems in place. However, more work is needed since only 29% of organizations currently have a strong system in place for two-way demand planning.

THIS COORDINATION GAP IS POTENTIALLY COSTING CUSTOMERS MILLIONS IN EFFICIENCY AND DEVELOPMENT OPPORTUNITIES



SEVENTY-SIX PERCENT OF SUPPLIERS EQUATE OPERATING A SUSTAINABLE OPERATION TO POSITIVE BUSINESS OUTCOMES.

While most suppliers agree the newly digitized system is beneficial to their partner relationships, one-fourth of respondents said organizations they supply make them use technology or systems that negatively impact productivity and collaboration.

SUSTAINABILITY

Seventy-six percent of suppliers equate operating a sustainable operation to positive business outcomes. The next biggest drivers for sustainability and CSR: suppliers' desire to create a more socially responsible supply chain (69%), compliance (64%) and brand reputation (62%).

RISKS

3M's research also uncovered some interesting data as it pertains to current risks throughout the supply chain. According to the research, sixty-one percent of respondents identified volatile commodity and supply prices as their primary concern.

- Other top risks included:
- Uncertain policies of new U.S. administration (15%)
- Regulatory compliance (8%)
- The performance of tier two and tier three suppliers (7%)
- Natural disasters and supply disruptions (6%)
- Cybersecurity (3%)

WHY THE SUPPLY CHAIN IS A MANUFACTURER'S STRATEGIC NUCLEUS

BY DAVE BLANCHARD

Supply chain professionals come from all walks of life, with many of them taking a circuitous route to their careers. Many of the "30 Under 30 Supply Chain Stars," for instance, pursued degrees in such diverse fields as economics, engineering, finance, information management, operations management and public transportation.

It seems only natural, then, that the CEO of the Institute for Supply Management, one of the world's foremost trade groups for supply chain professionals and a sponsor of the "30 Under 30" program, got his degree at Georgetown in foreign relations.

Tom Derry has led ISM since 2012, after having spent the previous nine years as chief operating officer of another professional trade group, the Association for Financial Professionals (AFP). In both roles, he has worked closely with member companies to develop programs and resources with a global economic scope.

At the recent annual ISM Conference in Indianapolis, IW sat down with Derry to get his insights into where the global supply chain is headed in the coming years, and where procurement and supply management professionals fit into that world.

"CHIEF SUPPLY CHAIN OFFICERS AND CPOS—THERE'S A LOT OF CROSS-OVER NOW BETWEEN THOSE TITLES, AND PEOPLE NOW CARRY BOTH TITLES—ARE PARTICIPATING IN THE MOST STRATEGIC DECISIONS AT THEIR COMPANY BECAUSE THEY HAVE TO."

-Tom Derry, CEO, Institute for Supply Management

IndustryWeek: What do you see as the most pressing issues that your members have to deal with in their careers?

Tom Derry: There are a couple. One is this accelerating evolution that's happening, as companies have fundamentally changed their basic strategies. About 80% of a firm's cost structure on average is spent outside their four walls. And CAPS Research's data shows that about 80% of that 80% is directly managed by a company's chief procurement officer. So 64% of a company's total spend is managed by the CPO and their team, which represents a massive shift in responsibility from the way things had been since 1970.

At the same time, while the focus for the last decade or more has been on reducing costs—that's what going to China was all about—people now realize that the remit of the CPO and the procurement organization has broadened. When you talk about sustainability issues, there are numerous examples of forced labor in the supply chains, and questions about the sustainable harvest of certain commodities like palm oils. These are important things to be dealt with just because as global citizens we ought to do the right thing, but the risks to a company is that consumers will take their business elsewhere. CEOs know this, and boards of directors know this, and they're looking to the CPO to make sure that their house is in order so that these things don't flare up.

IW: How closely do CPOs or anybody on the procurement team work with product development and the core supply chain team? Do companies have a good structure in place to get everybody on the same team?

Derry: That pendulum swings back and forth all the time, but it seems to me the best organizations are on the front end of all product development decisions, whether it's sourcing for spec, or sourcing for innovation. You hear frequently about engineers that build the best damn widget possible, but you don't really need to build a nuclear bomb-proof widget. Maybe a pretty robust widget will work just fine, and you can get that for one-third of the cost. So great organizations recognize that procurement has a big role to play, and actually has broader market knowledge than other groups.

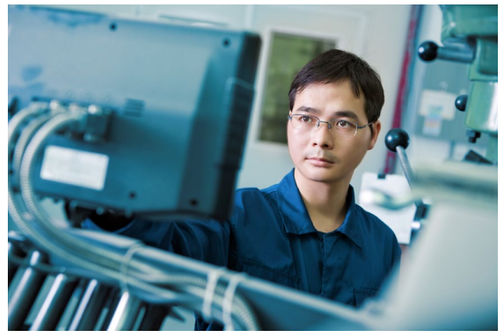
Chief supply chain officers and CPOs—there's a lot of cross-over now between those titles, and people now carry both titles—are participating in the most strategic decisions at their company because they have to.

IW: For the U.S. manufacturing industry, how much influence does the ISM's Purchasing Managers Index (PMI) have on how they conduct their business? From your perspective, what do manufacturing and chief executives do with that information?

Derry: For any given firm, the PMI for any given month may not be reflective of the conditions that they're observing, but taken broadly, across

the whole sector and across the U.S. economy and certainly over time, there's no better indicator to where the U.S. economy is headed. And we've got 60+ years worth of data to prove it.

People make business decisions about, say, key commodities, and depending on the nature of their work, it certainly could affect employment, about whether to add workers or reduce the size of their staff. If you see trends in certain industries that you're either upstream or downstream from, that matters a great deal to you, so that's early intelligence.



We essentially collect the data in the last 10 days of a month and then publish it almost immediately, so one of the reasons the PMI is so valuable is there's nothing more real-time that's published. So it gives you that finger on the pulse. You can get an early warning signal that a key supplier or the industry that supplies you might be having difficulty, or maybe a key customer might be having difficulty. And then that could help you to get a jump-start on the competition.

"LABOR COSTS AREN'T GOING TO BE THE SAME FACTOR THAT THEY WERE—TECHNOLOGY WILL DRIVE IT, AND SO FRANKLY, YOU CAN ARGUE: MORE INTERESTING JOBS, BETTER JOBS, HIGHER PAYING JOBS THAN THE ONES THAT LEFT WHEN THEY WENT OVERSEAS"

IW: What's the mission of your organization?

Derry: Our mission is very simple and straightforward: It's to advance the practice of supply management, and that has at least two components: one is for individuals, and the other is for companies. Everything we do ultimately traces back to that fundamental mission.

For individuals, whether they're interested in the CPSM (Certified Professionals in Supply Management) certification program, for instance, or our Mastery Model program, our members can sit down with their manager and have a conversation about career development. Maybe they want to be prepared for the next promotion opportunity that comes along. We hear from a lot of companies that even the best and brightest students coming out of great schools with degrees in the field aren't quite ready to hit the ground running as practitioners, and CPSM plays a critical role in getting them up the learning curve much faster, into the practical realities of being a professional as opposed to the theoretical foundations of the field.

We're the professional society for our field, so people expect to be able to turn to us and learn what standards are. What are standard models of procurement organizations? What are model job descriptions? What are the competencies and skills that are fundamental to various levels of progression in a career? What are ethical standards? What are the principles of corporate social responsibility? So we publish those standards that companies can use as a reference point.

IW: Is there a noticeable trend right now in U.S. companies to bring work back from China to the U.S. or nearby countries? What's your perspective on the prevalence of reshoring or nearshoring?

Derry: There was the classic era of the 1980s / early '90s of labor arbitrage in China, and then as cost pressures began to mount in China, other local economies that were adequately developed with lower labor costs began to be taken advantage of. So U.S. companies would move production to Malaysia or Vietnam, for instance. Most people figured out that that strategy has a very limited shelf life. It might work for a decade, or a decade and a half, but you get to cost parity fairly quickly in most economies.

Mexico is benefiting right now because they have a fairly well educated workforce that is comparatively much cheaper than in China, and so there's some nearshoring happening. But it's also happening because companies are much more focused on total cost of ownership. People had not factored in the cost of transportation, or dealing with reverse logistics which involves warranties and the end of product lifecycles. And so these distributed networks became harder to manage when you begin to look at all of those factors. So companies have figured out that being closer to the customer is a good thing.

Where that's evolving, however, is not so much nearshoring or reshoring. I think nearshoring is definitely happening. I don't think reshoring will happen in the sense that we're not going to see the jobs that left come back. Today we have highly automated, highly robotic manufacturing facilities where the handful of employees compared to the large number of employees that might have been involved in a similar project in the past will have totally different skills. They'll be akin to software and engineering type skills, managing production processes via human-machine interface rather than on a production line. You're not going to have tens of thousands of manufacturing jobs come back but you might have a few thousand higher-skilled, higher-paying jobs.

And frankly, there's a scarcity of those skills right now in the workforce. So if I were interested in pursuing a career in manufacturing or I had children at that age, I'd be looking at an opportunity to become stronger in my STEM education. Historically labor costs were the major component of manufacturing costs. Well, in this new world we're moving into, there will be higher wages but a lower employment base. So labor costs aren't going to be the same factor that they were—technology will drive it, and so frankly, you can argue: more interesting jobs, better jobs, higher paying jobs than the ones that left when they went overseas.

GLOBAL SUPPLY CHAIN RISK INCREASING

There is general unease about the state of the global economy with its increase in operational risk and the Chinese slowdown highlighting emerging market vulnerabilities.

This is according to the latest Chartered Institute of Procurement & Supply (CIPS) Risk Index, powered by Dun & Bradstreet, which found global supply chain risk increased in the fourth quarter of 2015, resuming the worsening trend in global operational risk.

"The fourth quarter of 2015 was dominated by non-economic news, such as the Paris terror attacks and the continued refugee inflows into Europe, combined with the increased political resistance and sometimes controversial measures aimed at curtailing these inflows," explained Oana Aristide, acting global leader at Dun & Bradstreet.

"While both of these have a limited impact in terms of disrupting business activity, they do affect investor and consumer confidence," Aristide added. "Meanwhile, the Federal Reserve lift-off and growth deceleration in China raised concerns about emerging markets' vulnerabilities. The business uncertainty – a feature of the global economy since the end of the recession – continues to stifle consumer confidence, which is necessary for a robust global recovery."

To determine the CIPS Risk Index,132 countries across nine risk and opportunity categories were analyzed. The index score worsened slightly in the last quarter of 2015 to 79.3 from 79.1 in the third quarter of 2015. While some regions, including the EU, have improved since mid-2015, emerging markets now demonstrate more vulnerability.

Key highlights from the index include:

- Supply chain risk in Asia Pacific continued to rise due to worsening economic conditions in New Zealand,Australia and China.
- Sub-Saharan Africa's supply chain risks fell slightly, though underlying risk trend continues to deteriorate.
- Though Iran's re-entry into global supply chains encourages optimism, supply chain risk in the Middle Eastand North Africa (MENA) remains in the high risk category.

The following is a closer look at each region.

Asia-Pacific's Risk Increases Slightly Amid Negative External Impact From Shift In China's Economic Outlook And Falling Commodity Prices

As Australia's main trading partner, the slowdown in the Chinese economy and the resulting decline in demand for commodities has negatively impacted Australian suppliers.

In China, risk is related to regions where industry has considerable over-capacity and local governments have propped up employment

through their influence over local banks, raising both the risk of corporate defaults in the longer term, and higher credit risk.

Supply chain risk was also increased in New Zealand, where Dun & Bradstreet downgraded the country risk outlook for the second time in 2015, driven by a 40% fall in global dairy prices (resulting in dairy prices reaching their lowest level since 2008). A too-slow recovery of prices in 2016 could result in a further decline in land prices (up to 10%) and an 8% rise in non-performing loans.

Sub-Saharan Africa Bucks Trend of Increased Risk, But Falling Global Commodity Prices Impact Region

Unlike many other regions, Sub-Saharan Africa saw a slight improvement in its score according to the CIPS Risk Index, powered by Dun & Bradstreet, as a result of improvements in Cote D'Ivoire, Namibia and Senegal. These countries saw their Dun and Bradstreet country risk ratings upgraded due to diversification of their economies, commitments to invest in transportation and energy infrastructure and declining budget deficits. Conversely, Malawi and Zambia's country risk ratings were downgraded. Key challenges to Malawi include continued suspension of donor budgetary support due to a corruption scandal and weather-related challenges in the region. Zambia's economy and risk have been negatively impacted by lower global commodity prices, particularly related to copper, and power shortages.

MENA Supply Chain Risk Remains High; Re-Introduction of Iran to Global Supply Chain Encourages Optimism

Supply chain risk in MENA improved marginally in fourth quarter of 2015, but remained elevated by historical standards. The lifting of the sanctions on Iran should see the region benefit from new opportunities and assist regional and global supply chains in the medium term.

The increase in oil supply should keep energy prices low and in the short term negatively impact risk in oil exporting countries as government expenditure is cut. These governments will need to create opportunities for cross-border trade and investment to see improvements in the medium term. Egypt's country risk rating was downgraded in the wake of the downing of a Russian airliner in Sinai which is having an impact on the tourism sector, an important source of employment and foreign exchange earnings. Throughout the region, the security situation is expected to keep risk at high levels through 2016 and into 2017. ●

RESOURCES

- Esri WhereNext Magazine (online)
- What is GIS?
- Manufacturing Supply Chain

GIS: AN EXECUTIVE SUMMARY

WHAT

A geographic information system (GIS) delivers real-time, location-based insight. GIS can capture and analyze any data with a spatial context, from the location of a company's trucks and drivers, to the spending habits of people on a particular block, to the effects of weather patterns moving across the country.

WHY

Because location information is key to market intelligence, operational intelligence, real-time awareness, and more. As companies strive to answer customer needs, boost revenue, and set strategic direction, GIS provides insight on fundamental questions like: Where are sales trending upward? Where are we missing opportunities? What threats are on the horizon?

WHO

GIS delivers insight to the field and to the corner office. Leading companies have recognized its crucial role as a business intelligence tool and are using GIS to optimize the work streams of service technicians, risk analysts, business planners, and executives.

esri THE SCIENCE OF WHERE

Esri, the global market leader in geographic information system (GIS) software, offers the most powerful mapping and spatial analytics technology available. Since 1969, Esri has helped customers unlock the full potential of data to improve operational and business results. Today, Esri software is deployed in more than 350,000 organizations including the world's largest cities, most national governments, 75 percent of Fortune 500 companies, and more than 7,000 colleges and universities. Esri engineers the most advanced solutions for digital transformation, the Internet of Things (IoT), and location analytics to inform the most authoritative maps in the world.

Esri supports manufacturing and supply chain performance and visibility with skills, knowledge, and resources in the following:

- Mapping
- Spatial analytics
- Data-driven insights
- Real-time situational awareness and alerts
- Visualization

For more information, please contact manufacturing@esri.com.