Digital Supply Chains:
A FRONTSIDE FLIP

Building Competitive Advantage to Optimize Performance and Customer Demand

The Center for Global Enterprise

"In December, 2015 a group of leading CEOs from around the world met in Sanya, China, under the auspices of the Center for Global Enterprise to talk about major issues they see facing them in the global marketplace. This White Paper results from those discussions, namely research for a better understanding of the potential for the 'Digital Supply Chain' to fuel enterprise competitiveness and success. It speaks to the potential of platform business models to accelerate growth and market share while slashing costs dramatically. By employing new management practices, data science and analytics, automation and social media, companies — of all sizes and sectors — will be enabled to exceed customer expectations. This research and set of recommendations is unique, new and valuable for all CEOs and senior leaders looking to compete in today's global economy." www.thecge.net

Sam Palmisano, founder of the Center for Global Enterprise (CGE)

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The Digital Supply Chain Initiative (DSCi) is the first project launched under The Center for Global Enterprise's Academy for Platform Management. The Center wishes to especially recognize its project partners SAP and CREATe.org and thank SAP for the generous support that enabled the project to be launched. The Center also wishes to acknowledge the participation of the companies from around the world that were members of the Global Experts Group (GEG).

Digital Supply Chains: A Frontside Flip

Building Competitive Advantage to Optimize Performance and Customer Demand

Snowboarders understand the difference between frontside and backside. They know how to jump, flip the board and land rolling forward, toward the front of the body. Snowboarders can also flip the board and land backside, toward the back of the body. Once you know how, a frontside flip is actually much easier than a backside flip. Being able to execute these maneuvers gives great competitive advantage, as well as attention-grabbing respect for one's control and agility.

Table Of Contents

Moving to the Frontside

Companies around the world are re-thinking and transforming their supply chains as they see new digital technologies and organizational models coming to the forefront of business. At the same time, there is a lack of information available to business leaders about what it takes to have a true Digital Supply Chain (DSC) and how to operate one. Scholars and supply chain consultants are struggling with the topic and frequently revert to yesterday's supply chain principles. Yet it is clear that new approaches to business, such as platform business models, are having a profound impact on global commerce. And even if these new models are not yet fully understood by business leaders and others, their impact on traditional supply chains is already being felt. Successful companies will need to take advantage of new management practices, a continuously expanding data reservoir, and new technologies relevant to Digital Supply Chains, if they are to achieve future competitive advantage and delight their customers. The key element cited by all of the companies involved with this initiative is the frontside. Advanced snowboarders know how to do the "frontside flip." People running the global supply chain of the future will also have to perform a "frontside flip." That is, they will have to flip their focus to the customer-facing side — the frontside — of the business.

Bill McDermott, CEO, SAP (Germany)

"The customer and customer alone determines whether we win, or we lose. This is increasingly a customer to business global economy; the business to business to customer economy is going away. In this evolving economy, everything has to start with that ultimate empathy for the end user and the experience they're getting from business' products or services. Big data and analytics, the Internet of Things, social media all enable businesses in every sector to reach and thereby better know and fulfill their customers' needs and wants. The Digital Supply Chain holds the promise of real-time data to sense demand, drive innovation, reduce cost and deliver the customer the right product at the right time and price." go.sap.com/index.html

The Center for Global Enterprise (CGE) has set out to address the gaps in management knowledge by launching a Digital Supply Chain Initiative (DSCi). We have interviewed and surveyed hundreds of leading supply chain practitioners from around the world and these conversations have led us to conclude that the adoption of and improvements to digital supply chains can reduce procurement costs for all purchases of goods and services by 20%, and reduce supply chain process costs by 50%. In addition to decreased costs, improvements in the DSC have the ability to increase revenue by 10%. And perhaps even more importantly, dramatic improvements in customer satisfaction

Digital Supply Chains can reduce procurement costs for all purchases of goods and services by 20% ... reduce supply chain process costs by 50% ... and increase revenue by 10%.

are coming, and with them associated growth in market share. In addition to these dynamics, there are benefits such as enterprise agility, visibility, productivity and real-time awareness — all of which add up to an exciting "opportunity phase" ahead for senior management.

In this paper, we will bring clarity and provide practical recommendations to the much-discussed concept of a "Digital Supply Chain." Greater clarity will help CEOs and senior executives to better define the opportunities and challenges of this emerging management opportunity. It will enable more effective communication internally and with the suppliers, channel partners and customers that make up a company's end-to-end supply chain.

Jean-Pascal Tricoire, CEO, Schneider Electric (Hong Kong)

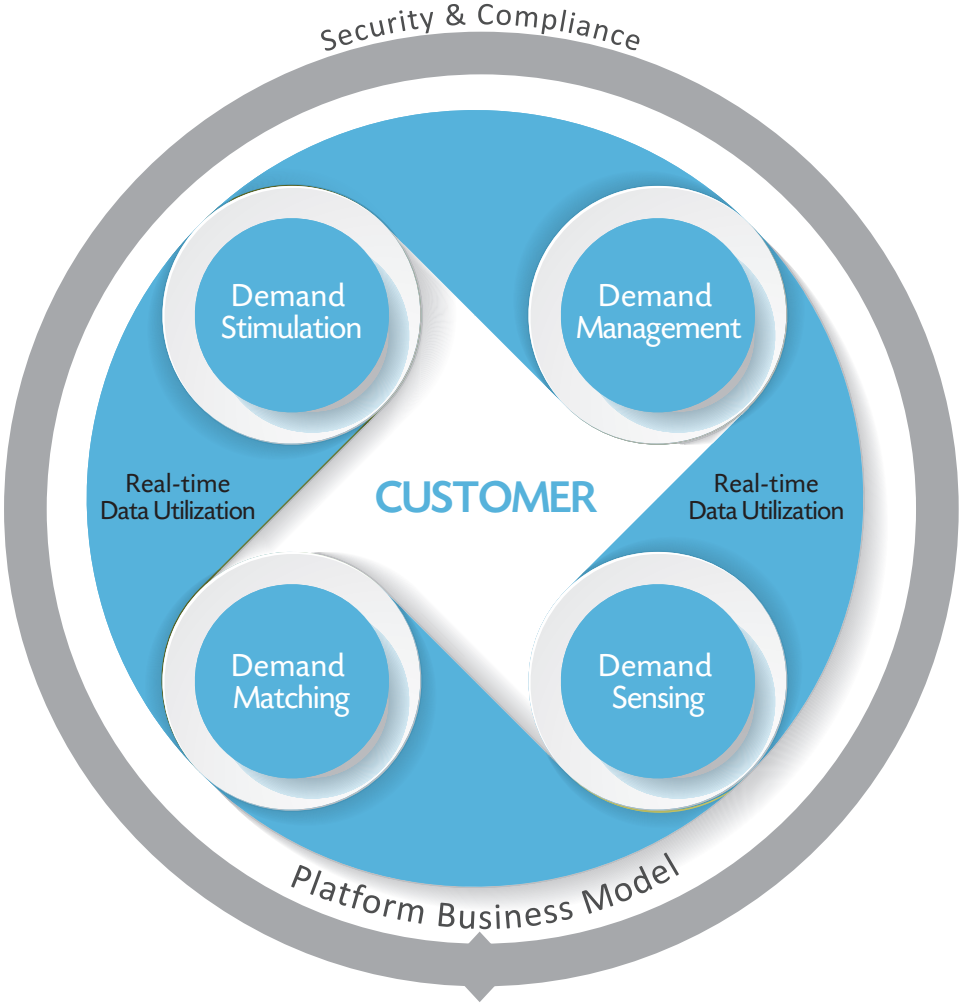
"As a company, we must differentiate ourselves to our customers in the market in all that we do. It's essential to have end-to-end visibility and capability in our supply chain. A Digital Supply Chain – including use of the internet, big data, analytics and other technologies – enables us to do so much more today than only a few years ago. This differentiation grows our revenue and market share while also cutting costs significantly. Two examples illustrate how our Digital Supply Chain differentiates us. It is about visibility and collaboration, and differentiated service for customers according to their specific needs. Our business customers expect to know at all times where their products are in our supply chain process, as they rely on us 100% to then deliver on their own projects, which digital enables now fully. The second involves sensing new business opportunity on social media and adapting accordingly our service offer." www.schneider-electric.com/ww/en/

Digital Supply Chain: What Is It?

A Digital Supply Chain (DSC) is a customer-centric platform model that captures and maximizes utilization of real-time data coming from a variety of sources. It enables demand stimulation, matching, sensing and management to optimize performance and minimize risk.

There are many companies that make and sell physical products. For example, Colgate-Palmolive makes 6 billion tubes of toothpaste every year.[i] There are other companies that manage, invest or loan money. American Express is this type of company. Other companies sell the skills and services of people (e.g., Aricent) and still others provide software or other digital solutions. Toth, a medical solutions provider based in Chile, is a good example of a platform-based company. One of the biggest trends in business today is companies moving towards being a "platform" company, where they provide a foundation for a variety of enterprises and individuals to conduct some type of business. Google is an example. Each and every one of these companies is moving toward the Digital Supply Chain. The Digital Supply Chain is not about whether the goods or services are digital or physical. It refers to the way that the supply chain process is managed. In some industries (e.g., financial services), the term "supply chain" is rarely if ever used; yet companies in those industries still manage a supply chain and are moving toward a Digital Supply Chain.

Digital Supply Chain



SUPPLIERS, CUSTOMERS, SENSOR/IoT DATA

The core benefit of the Digital Supply Chain is its capacity to enable extraordinary performance in delighting customers. The DSC allows for the creation of products and services that are designed with more acute knowledge of customer needs, built with efficiency, and in locations with rapid and easy customer access. Digital Supply Chains provide essential information that allow for goods to be shipped with the speed and quality needed to satisfy the customer and support the quick and easy return of these products at end-of-life. This is the promise and the rapidly emerging reality of DSCs. They are fundamentally different from traditional supply chains that focus on minimizing the cost of manufacturing, shipping and logistics. It's important to appreciate the DSC's connection to and focus on the customer, who is the frontside of all businesses. Companies that are now embracing Digital Supply Chain practices are working to flip their supply chain focus to the frontside, which is enabling a much closer and deeper relationship with customers.

Sudhir Reddy, chief information officer, Aricent (USA)

"We've over 8,500 engineers with more than 800 projects underway at any given time. Winning bids requires speed and agility to define, select, cost out and deploy right-sized and skilled teams. This cuts costs, but more importantly, creates customer confidence that wins us more business. Our Digital Supply Chain capabilities will gain us market share as a preferred vendor and has the potential to grow our revenues by 10% to 15% due to ramp-up capability, skill alignment, quality of delivery and cost management." www.aricent.com/

The most pressing and dramatic factor enabling this ability to flip to the frontside is the enormous influx of new data, which is now a vital resource for businesses throughout the world. Business leaders must think about how, when and where their companies will draw upon this data to make decisions. These leaders can also leverage data

and the Digital Supply Chain to help determine who should be making what decision at what level in the company. Supply chain decision rights are important, but so is collaboration. And effective collaboration within the company, and with external stakeholders such as suppliers and customers, will be the differentiator of a company's success. Within the organization, functions such as product development, supply chain, marketing, IT, legal/compliance, HR and finance will all have a role in executing the frontside flip. Overcoming the natural boundaries between internal company units, and between suppliers and customers, will require companies to implement new management thinking and approaches.

For businesses of today and tomorrow, creating a truly Digital Supply Chain is a mission-critical challenge that will require a new supply chain strategy, new people and skills and new technologies. Companies also need to determine how to make step-by-step changes that can transform their existing supply chain.

Digital Supply Chains draw upon and accelerate the move toward platform business models, which are used to easily reach connected customers and efficiently match buyers and suppliers. Buyers can be a company's internal sourcing/procurement department… or its customer… or its customer's customer… or its supplier's supplier. Regardless, platform business models enable and also require management to provide a new and different kind of "umbrella of trust" so that agility, performance and compliance can be optimized. But how is this trust built and maintained? How does one trust, but verify? These are the management challenges and opportunities ahead, and they all exist in an environment marked by threats of hacking, IP loss and counterfeiting. These vulnerabilities present an even greater need for rigorous and transparent risk management.

This paper provides the management insights and the guidance to help CEOs and their senior leaders plan, direct and execute the new frontside Digital Supply Chain. Within that framework, it includes a discussion of many timely topics:

- The pressing issues real companies are working on today, as well as current best practices.
- The future of the DSC and what it will likely look like in 2020.
- Recommendations on the key next steps that CEOs and their teams should internalize and begin executing.

The Research Process

The CGE, and its board of directors comprised of leading management experts from around the world, chose to initiate this project because they realize how critical supply chains are to management excellence and enterprise success.

This initiative was launched by CGE in cooperation with CREATe.org to create management and operational value that can be applied to advance enterprise agility and productivity in an era of platform business models. It is also intended to be a catalyst for the development of management curriculum and learning that can better prepare the next generation of supply chain leaders worldwide.

Creating this white paper required several steps. First, CGE Chair Sam Palmisano invited CEOs of leading companies around the world to nominate one (and in some cases two) of their direct reports to represent their firms. These executives formed the Global Experts Group (GEG) and are, in most cases, those responsible for running the global supply chain: the CIO or other senior executives in charge of supply chain transformation. These executives, who worked with CGE over the span of seven months to develop the findings about the DSC, have a combined 400+ years of supply chain management experience. The supply chains managed by the GEG are among the world's largest and most innovative. The total market cap of the GEG companies exceeds $841 billion and total revenue exceeds $594 billion.

COMPANIES PARTICIPATING IN THE GLOBAL EXPERTS GROUP

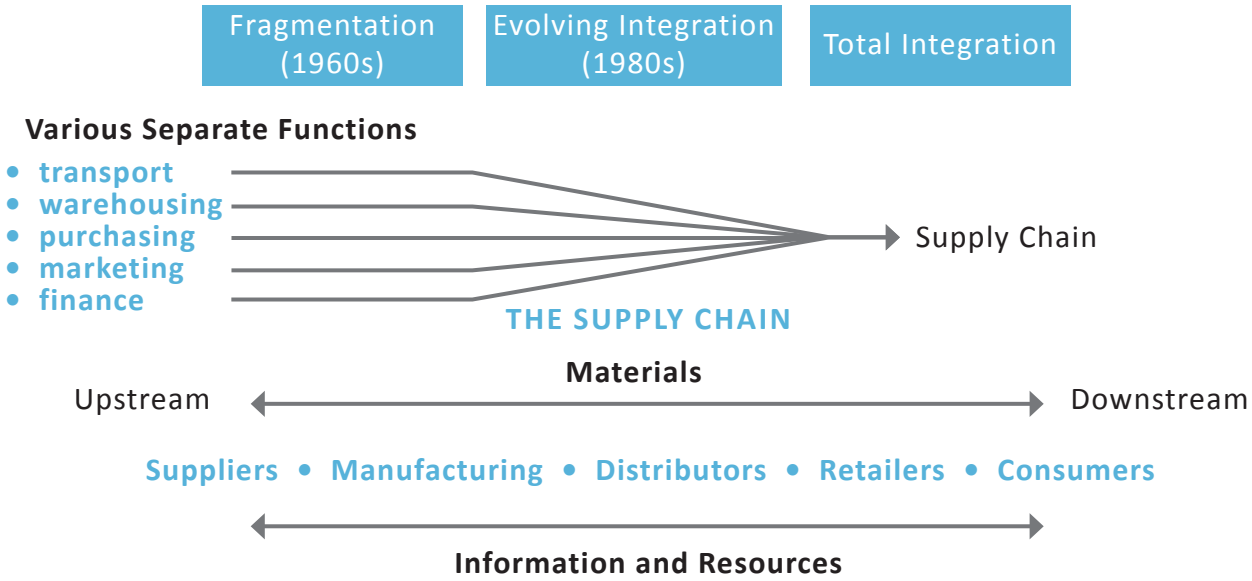
Company	CEO	Company	CEO
Acer	Jason Chen	Lockheed Martin	Marillyn A. Hewson
Alyx Technologies	Sudhakar Shenoy	SAP	Bill McDermott
American Express	Kenneth I. Chenault	Schneider Electric	Jean-Pascal Tricoire
Aricent	Frank Kern	Sodexo	Michel Landel
ChainIQ	Urs Dogwiler	Soft Bank Energy	Masayoshi Son
Colgate-Palmolive	Ian M. Cook	Symphony Technology Group	Romesh T. Wadhwani
Dell	Michael S. Dell	Tech Mahindra	C. P. Gurnani
DOW	Andrew N. Liveris	Toth	Andres Valdivieso
Edelweiss Finance	Rashesh Shah	Under Armour	Kevin Plank
Fujitsu	Masami Yamamoto	Western Digital	Stephen D. Milligan
Geely	Sheng Yue Gui	ZTE	Zhao Xianming
Goodyear	Richard J. Kramer		
Kanoria Chemicals	Rajyu Vardhan Kanoria		

The focus of the project and this white paper is future market dynamics, management actions and execution. The target readership is CEOs, their direct reports and anyone interested in leading-edge supply chain developments and operational improvement.

Today's Supply Chain

The traditional supply chain is a network purposely created among different companies for the production, handling and/or distribution of products or services. Specifically, the supply chain encompasses the steps it takes to get goods or services from the supplier to the customer. Supply chain management is a crucial process for many companies, and they strive to optimize their supply chain — a process that usually translates to lower costs for their enterprise and greater competitiveness.

FIGURE 1.1 EVOLUTION OF THE TRADITIONAL SUPPLY CHAIN OVER THE LAST HALF CENTURY

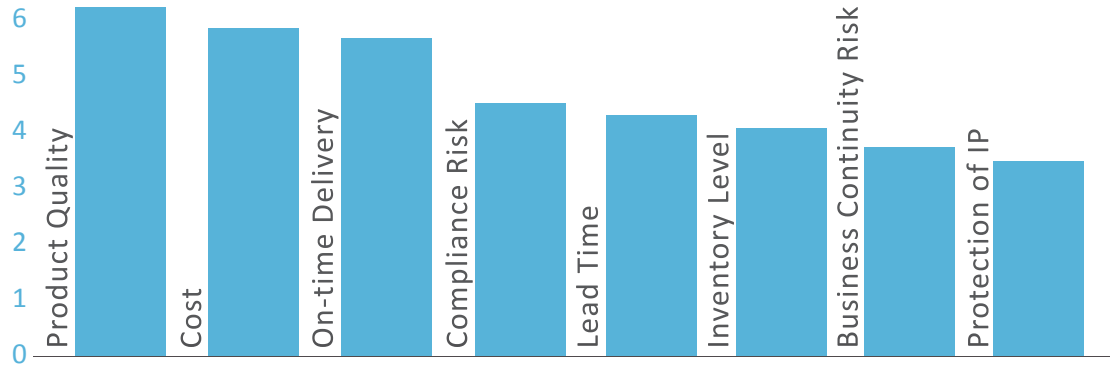


SOURCE: JOHN MANGAN, CHANDRA LALWANI, TIM BUTCHER

Companies have made many improvements during this period, and these improvements have contributed significantly to enterprise agility and productivity. For example, companies and supply chain leaders have reduced the number of suppliers they need to certify and manage. Information systems have been deployed to help track and manage the flow of goods and services. Corporate procurement policies have been strengthened and centralized, demand and supply matching algorithms have improved and many companies have located part of their supply chain in lower-cost jurisdictions. Tremendous gains have been made in traditional supply chains, but it is time for leaders to focus on transformation and not just further increases in efficiency.

In order to document current supply chain management priorities, this initiative surveyed leading companies and their supply chain leaders regarding the key performance indicators (KPIs) presently used to measure their supply chains. The figure below depicts the survey's key results.

Today's Supply Chain KPIs



Respondents were asked to rank the relative importance of eight supply chain KPIs from 1 to 8. Product quality and cost were designated as the two most important KPIs. On-time delivery followed closely.

Most importantly, 53% of respondents said they expect moderate-to-extreme change to their supply chain KPIs over the next five years. Only 2% expect there will be no change to their KPIs between now and 2020.[ii]

But how will past improvements and metrics serve companies in the future? The linear nature of the traditional supply chain is increasingly misaligned with the more networked and distributed nature of global commerce and society. Supply chain leaders are feeling the pressures of this new environment, and while it is clear that product quality and cost will remain important, these leaders will be evaluated against the impact Digital Supply Chains will now bring to a company's needs and objectives. Indicators tell us today's leading KPIs will likely be joined by product design, demand stimulation and real-time customization.[iii]

Companies have yet to fully comprehend the structural changes being driven by pervasive connectivity and digitalization. Game-changing technologies and products are beginning to have fundamental impacts on the design and operations of supply chains. Building on past progress seen in supply chains will depend on the ability of companies to incorporate these technologies into both management and their existing supply chain practices

The Game Changers

The world is in the midst of a substantial number of major changes that will force companies to change the way they lead, manage and operate their supply chains. Taking advantage of these changes will lead to great success. Continuing with current practice will result in revenue loss and cost increases. The game-changer list includes:

Jim Hardy, EVP global operations, Under Armour (USA)

"We acquired three digital fitness companies and they form our 'Connected Fitness Platform.' Our 175 million, and growing, user community, coupled with retail data, will be the backbone of our 'big data' strategy. Sensors in our shoes, garments and other devices will provide us data in near real-time about use and wear, and will allow us to better predict, shape, manage and respond to new customers' needs and wants. With these new valuable insights and information, we expect to significantly accelerate our revenue growth." www.underarmour.com

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Real-time Big Data and Analytics

The sheer amount of data being created throughout the world is unprecedented: 2.5 quintillion bytes every day. And 90% of existing data is less than two years old.[iv] This means that there will be 5,200 gigabytes of data for every person on this planet by 2020.[v] The game changer is the massive amounts of data that will be at our disposal, along with systems and tools to collect, analyze and use it. Most important, the data will be available in real time, which will enable companies to use it to make decisions on product design, features, price, manufacturing, distribution and sales. But real-time big data must be analyzed before they can be applied to the needs of the business. Thus a key question going forward is, what rapidly expanding sources will companies use to acquire and utilize this data to drive their supply chains to better meet customer needs?

Mobile

While many corporate and consumer users operate desktop computing devices, most are also active users of smartphones and laptops. The workforce increasingly expects the ability to conduct company business from their smartphones, including those who actively manage supply chains.

In addition, it is predicted there will be an influx of data from individual mobile users. This includes mobile use, searches and mobile orders. Estimates suggest global monthly mobile data traffic will grow from 3.7 exabytes in 2015 to 30.6 exabytes by 2020.[vi] How will mobile sources of data be integrated with other sources to improve supply chain effectiveness?

Sensors

The number of sensors is rapidly growing. In 2015, $101.9 billion worth of sensors reached the market, and a compound annual growth rate of 10.1% is projected until 2021.[vii] There are at least 14 different types of sensors that can be found in the average smartphone, ranging from light sensors to thermometers and fingerprint sensors.[viii] Given rapidly decreasing costs to create sensors, they are likely to be incorporated into more and more products. For example, the automotive industry alone will be using 22 billion sensors by 2020.[ix] According to the DSCi survey, 79% of people agree that data from sensors and the Internet of Things will have a dramatic impact on how their company manages all aspects of their supply chain over the next five years; 34% of those people strongly agree.[x] What sensor-based information should companies collect in order to best design, innovate, produce, plan and deliver their goods and services?

Tiffany Huang, president of corporate marketing, business planning & operations, Acer (Taiwan)

"Our channels are rapidly changing from distribution and partnering offline to engaging end customers and businesses online. In this evolution, our timeline from order to end customer delivery is being continuously compressed. On-time delivery is key – it's our capability to deliver products more quickly and on time to our customers worldwide that differentiates us in the marketplace. Our collection and use of data and our digital supply chain's visibility to our suppliers, partners and end customers make this possible. The visibility through big data with data analytics gives us the capability to better predict supply vs. demand, also gives us the chance to shape future orders and service better with customers."www.acer.com

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Internet of Things

The Internet of Things is already creating a wealth of information about customer usage patterns. In 2015, there were 13.4 billion connected devices, ranging from rice cookers to refrigerators to cars to oil and gas wellheads. It's projected that by 2020, there will be 38.5 billion connected devices — an increase of 285% in a five-year period.[xi] How can companies use this data to better understand their customers and meet their needs?

Mitch King, director, extended global supply chain operations, Dow Chemical Company (USA)

"In our production, distribution and delivery, we're continuing to expand our digital footprint, with deployment of sensors, machine learning and cognitive software in manufacturing, in transportation RFID and real-time GPS visibility into our thousands of railroad and marine carriers. Linking this all together – we've a ways to go, but for us, the forward-leaning Digital Supply Chain is not an option, it is a 'must have' competitive advantage for the future." www.dow.com

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Social Media

More than 1.71 billion people use Facebook on a monthly basis, 2.5 billion use Google+ and over 667 million active users searched Baidu from their mobile phones in June 2016.[xii] To increase connectivity, Google has plans to launch balloons and space-based antennae to reach remote areas of the world. By 2020, estimates suggest that around 7.6 billion people will be accessing the internet using more than 34 billion internet-compatible devices.[xiii] Social media companies are collecting information about people's buying patterns and geographic locale. How can companies collect and utilize this valuable information to inform their supply chains?

Digital Impact on Manufacturing and Delivery

Several key manufacturing and delivery technologies are experiencing breakthroughs that will be commonplace by the year 2020. These breakthroughs are exemplified by robotics, 3D printing, drones and driverless vehicles. Furthermore, the shift toward digital manufacturing and delivery is accelerated by the increase in available information. In 2020, a company executive will be able to view customer requirements and delivery plans on a real-time basis through a mobile platform. How do business models leverage these technologies?

Robotics

Robots are not new, but they are currently being deployed in manufacturing and delivery at an unprecedented rate — delivering immense benefits in the process. In 2013, the market value for industrial robotics stood at $28.9 billion. Estimates suggest that the industrial robotics industry will grow at a CAGR of about 6.2% and represent a market value of about $44.4 billion by 2020.[xiv] The increased prevalence of robotics is visible in employment forecasts for 2020.[xv] The World Economic Forum predicts that robotics will claim 7.1 million jobs, while only 2 million will be created.[xvi]

Gaurav S. Saxena, VP procurement operations, American Express (USA)

"The financial services industry in general is challenged by many incompatible platforms and processes. We're now highly engaged in integrating the data from these silos and employing AI and robotics – not the mechanical robots, but rather software 'robots' that are able to grab data from one system, 'clean it up,' then deploy it to others in a way that is usable going forward across our systems. What we've seen is incredible productivity, quality and efficiency gains in our supply chain organization." www.americanexpress.com

DSC Process Automation through machine learning, cognitive computing and predictive/ decision analytics is becoming a game changer. It will speed and improve the quality of processes , and at the same time, enable knowledge workers and executives to focus on exceptions that computers can't solve — whether these exceptions are customer opportunities or supply chain risks. Akin to what robotics and AI have been doing in manufacturing and delivery, in DSC operations — where there are many handoffs between people and groups, intervention by customers or employees and many decision-makers involved — this digital enablement promises great opportunity to improve variability, reduce rework and cycle times and deliver much greater customer responsiveness. How can robotics reduce cost, improve quality and speed delivery to the customer?

Drones and Driverless Vehicles

Drones and driverless vehicles are transforming and will continue to transform corporate infrastructure maintenance and security, assets monitoring (e.g., oil and gas pipelines) and goods delivery in the last mile. Laws are being enacted around the world to regulate drone activity, and the science behind monitoring and controlling drones is improving. In June 2016, the United States Federal Aviation Administration (FAA) published a series of regulatory requirements for the use of the devices. Our Digital Supply Chain initiative Global Experts Group (GEG) participants expect drones will have a big impact on their business, but have not made plans for big investments in supply chain drones at this time. Nevertheless, the FAA predicts the sale of commercial drones to jump from 600,000 in 2016 to 2.7 million by 2020.[xvii]

Driverless vehicles are also under development and could be used for logistics and delivery. Some can imagine a scenario where virtually all shipping and logistics are carried out by driverless vehicles. While many GEG companies are not investigating driverless vehicles, it is a clear focus of research for McKinsey & Company. Alexander Niemeyer says, "The Digital Supply Chain will deliver value in multiple different flavors… One is that we'll see functional enhancements to single elements of the value chain. A great example is warehouse AGVs (autonomously guided vehicles, e.g., Amazon's Kiva), which leverage Moore's law and advances in computing algorithms (e.g., deep learning based vision systems) to replace warehouse workers at much lower cost. At a more advanced level, the 'Uberization' of transport will, in select industries, reduce transportation cost quite substantially."[xviii]

While relatively few companies foresee widespread adoption of drones and driverless vehicles between now and 2020, it's expected that these innovations will eventually have a big impact. How can emerging technology like drones and driverless vehicles reduce costs, improve customer service and increase efficiency, safety and productivity?

3D Printing

3D printing is an emerging technology that's being used in a growing number of industries, from medical devices to footwear to automotive to retail. It has the potential to be an extremely disruptive technology that permanently alters the supply chain in some industries. Today, companies use 3D printing to reduce the cost and time of product development and increase speed-to-market and order fulfillment. Low-cost product customization is one of the most intriguing capabilities of 3D printing and in many industries, licensing will play a key role in creating customized products on-demand. 3D printing has the added benefit of being price-competitive in markets with high labor costs. The industry grew 25% from 2014 to 2015 and it is expected to grow 230% by 2020[xix], when 3D printers are expected to be 10 times faster than today. Advances in material sciences, organic chemistry and other scientific disciplines will be the key to unlocking even more rapid growth and unleashing more disruptive power in industry after industry. Where should companies deploy 3D printing to better meet customer needs and gain market share?

Mike Corbo, chief supply chain officer, Colgate-Palmolive (USA)

"In the near future, as we develop more 3D printing capability and knowledge, we will be able to accelerate our innovation and new product development process greatly. Where it takes a week or more today, we'll be able to create a new product mold and cap in just a day for quick prototyping. Coupled with sensors, social media, retailer and big data analytics, we'll be able to both shape, predict and quickly respond to new customer demands and grow market share."

www.colgate.com

Kevin Plank, CEO, Under Armour (USA)

"3D printing is radically changing how we use digital technology to create and produce products that you simply can't do with traditional methods. For example, we recently launched our first footwear that was digitally 3D fabricated and manufactured – the UA Architech – offering athletes a "super-hybrid" trainer that solved an unmet need through a proprietary 3D printing process. This digital technology, coupled with others like sensors, robotics, big data and analytics, will enable us to engage with new customers, cut costs and transform how we plan, shape, predict and deliver to athletes around the world." www.underarmour.com

Collaboration with a Purpose

Strong collaboration between sales and supply chain, between suppliers and a company, and between customers and a company is critically important. However, today's world requires effective operating collaboration — collaboration with an accountable purpose. But from the time of the very first supply chain, collaboration has been difficult, if not impossible, to achieve. Why? Because the goals and the objectives of different players can vary. The sales team wants unlimited product so that sales can be highest. The supply chain group is more interested in inventory turns and does not get measured on sales. Suppliers (first tier, second tier, all tiers) want to maximize their prices while minimizing their inventory costs. The buying company wants short lead times and rock-bottom prices. Digital transparency does not resolve these issues of embedded conflict. The CEO edict to work together to create shareholder value does not necessarily change behavior. What does change behavior are new metrics. The Digital Supply Chain drives the necessity of collaboration with a purpose to a higher level. Correspondingly, it is imperative to develop contemporary business metrics that drive operational performance and measure collaboration. How can we dramatically increase the level of effective collaboration both inside and outside of the company?

Michael Crowe, CIO, Colgate-Palmolive (USA)

"Measuring and improving performance of the overall supply chain takes real collaboration between many functions, from sales to development. We're working to integrate the entire planning process with fast and user-friendly systems, but success will depend as much on the process and mindset to reach a consensus number that will drive the entire chain. We've established a monthly, cross-functional process to review the perspectives of Supply Chain, Sales and Finance. Each participant shares what is being put in as goals and forecasts, and discusses them with the others. A series of working meetings and leadership alignment result in consensus. The upfront disclosure, discussion and disciplined consensus is gaining traction with all. Collaboration is improving team communication, trust and confidence. It's a good example of collaboration driven for a needed outcome."

www.colgatepalmolive.com/

Internal Collaboration

Companies that are moving toward a Digital Supply Chain strive to achieve the level of collaboration that is needed to be effective. Some companies are aligning goals and rewards to drive collaboration. In these companies, the sales team gets measured on forecast accuracy. If the team underestimates demand, they run out of inventory. If they overestimate sales, then the forecast accuracy metric would provide negative feedback to the team. This method of measurement is also tied directly to performance pay, bonuses and the like. Other companies give the sales team the same key measurement as the Digital Supply Chain team, although the weighting of the measures might vary. There is also some basic work that these companies are doing to set up regular meetings and "off-sites," where people from different internal organizations can work through problems. When measures are aligned and the right cadence of regular meetings is structured, the outcome will be collaboration with a purpose.

External Collaboration

We have been told that it is difficult to overcome the pressure endemic in supplier relationships. Suppliers, and their suppliers, have a different set of goals to meet. Some of these goals are strongly misaligned and, in fact, can never be reconciled. For example, the suppliers want to maximize margin and gain predictable demand, while the company wants to minimize cost, and may prefer multiple suppliers in order to control price. Suppliers feel that many companies are trying to grind all the profit out of them and, in some cases, they are right! As a result, collaboration with suppliers often means keeping them on the supplier list while others are taken off. Then, the supplier gains revenue, albeit at a lower margin. Collaboration with customers can also be very fruitful within the context of a Digital Supply Chain. New ideas for new products and services or new feature packages can be designed when collaborating with customers.

Cyber Risks, IP Theft, Compliance and Data Mining Business Contracts

The Digital Supply Chain enhances the capacity to see and address risks, but it requires a proactive approach. Technology will provide a company with more visibility. There will be greater visibility around compliance-related data, such as requirements to retain confidential information, which can improve a company's ability to predict risks and incidents. Yet the transition to a more Digital Supply Chain is clearly going to increase risks related to cybersecurity and protecting intellectual property (IP), including confidential information, trade secrets and personally identifiable information.

However, it would be very short-sighted to put on blinders and ignore the many other compliance and regulatory issues. Laws and voluntary industry standards that impact the supply chain are all increasing; export restrictions, corruption, labor, environment, conflict minerals and more. In many countries, a company assumes liability for the actions of its suppliers and business partners. Governments and companies are making compliance a condition of doing business. Social media and the 24/7 global news industry make every compliance issue a potential time-bomb waiting to explode, having the potential to damage a company's reputation and cause financial harm.

Cyber Risks

The number of cybersecurity breaches is growing by nearly 40% every year. While cyber threats come from a wide variety of sources (including nation-states, competitors and organized crime), 80% of cyber breaches are linked to current and former employees, contractors, service providers, suppliers and business partners — in other words, people within the company and supply chain.[xx] In the Digital Supply Chain of 2020, companies will be collecting and storing more and more data. They will be sharing more and more high-value confidential business information with other companies. The survey conducted by the DSCi team found that 95% of people surveyed agree that the digitization and sharing of company information with third parties (suppliers, customers, business partners, etc.) increases the importance of cybersecurity measures.[xxi] Governments are imposing new and tighter laws and regulations are requiring companies to implement cybersecurity controls. One of the major unknowns for companies is whether they can embrace one overall information security framework, or if they will face a splintered environment with an unmanageable number of different corporate, industry and government standards. How can companies get the right mix of "people, process and technology" to reduce cyber risk internally and in their supply chain?

IP Theft

Although intellectual property (IP) is central to the success of most companies, many do not assess the risks of IP theft and infringement. Companies increasingly spend huge resources developing IP, and its loss will result in significant corporate damage, ranging from diminished competitiveness to reputational damage to financial loss. Confidential information and trade secrets are routinely shared with suppliers and customers as an essential part of doing business. Yet IP protection is often relegated to the legal or IT department and not integrated into supply chain risk programs. A supplier may over-produce a product and sell the excess out the back door. A customer may use a company's trade secrets to create a competing product. As collaboration

with suppliers and customers increases, effective IP protection will need to go beyond contracts and IT security. Today, many companies fail to consider how to manage IP-related risks in their supply chain, waiting to react to an incident. Are companies aware of what IP is shared in their supply chain and the related risks?

Kurt Ravenfeld, director of global supply chain operations, Lockheed Martin (USA)

"As the leading global security company, we are facing increased security challenges and regulatory scrutiny from the marketplace. Today's business climate includes growing cybersecurity concerns, increased international sourcing requirements, and domestic policies encouraging small business supplier participation.The Digital Supply Chain is critical to future business success. As the new, challenging marketplace presents global opportunities for Digital Supply Chain execution, the increased network footprint exposes the enterprise to heightened risks of data breaches, Intellectual Property theft and operational disruption. Through ongoing vigilance, we can mitigate global digital risks while embracing mission success for our customers." www.lockheedmartin.com/

Compliance

Governments around the world are becoming more active in defining new requirements for issues ranging from conflict minerals to corruption to information security. They are passing new legislation, adopting new regulations and tightening government procurement requirements. As noted above, many of these regulations make a company liable for the actions of suppliers and business partners. Voluntary industry and corporate standards continue to proliferate, and companies continue to expand the compliance expectations they put on suppliers. Today's instantaneous global communications allow stakeholders to be aware of corporate behavior, leading stakeholders to demand greater transparency from companies. Corporate awareness of these growing regulations is reflected in the fact that 95% of people surveyed by the DSCi group responded that compliance-related regulations and standards play an important role in the management of their company's supply chain, with 52% saying they play an extremely important role.[xxii] How can companies use data to gain better supply chain visibility and integrate compliance into core supply chain business performance issues?

Data Mining Business Contracts

Leading companies are starting to explore the tremendous potential to be realized by mining data from their own business contracts. For large companies with thousands of active contracts, being able to turn pre-contract negotiations, the contracts themselves, and post-contract performances into searchable, structured data can be a game changer. The ability to analyze contractual information focused on payment terms, delivery times and compliance obligations can provide tremendous insight. A company could quickly examine and analyze its historical relationship with one supplier or view aggregated data on supplier risk and performance. Suddenly, the analyses of business and compliance risks, and performance versus contractual terms, would be possible throughout the enterprise. It could allow streamlined negotiations with a specific supplier or a look at aggregated data to spot trends and predict problem areas. A number of key issues could be addressed: What happens to order fulfillment and on-time delivery rates after negotiating extended payment terms with a supplier? And do costs from suppliers go up when more contractual compliance requirements are added? The data could help ensure contractual provisions better align with business realities. Ultimately, the knowledge gained could provide a company with a competitive advantage. What could be learned about business performance and compliance risks from the details contained in a company's contract lifecycle?

A Wild Card: Blockchain

A key challenge today for global companies is to manage and integrate database silos and to securely handle enormous numbers of transactions across a company, its supply chain, its partners and customers. Business performance opportunities — and risks — are clearly front and center for those transforming their supply chains into Digital Supply Chain platforms.

Blockchain, a "distributed data base/ledger technology," is a new form of database architecture that allows two or more parties, operating through an open, trusted cryptographic network, to increase the speed, security and accuracy of settlements on financial and commercial transactions. It is an open global infrastructure on which other technologies and applications may be built. According to former IBM executive Irving Wladawksy-Berger, it "holds the promise to revolutionize the finance industry and other aspects of the digital economy by bringing … the ledger to the internet age. As a major technology, it has … the ability to handle trustless transactions where no parties need to know or trust each other for transactions to complete."[xxiii]

Financial: Speed, Accuracy and Cost

Databases generally are centralized by someone with unilateral control and editorial rights. Today, when many parties interact on a common transaction, every party keeps their own separate record or "ledger" of their piece of that transaction. Blockchain would allow rapid and nearly immediate closure on all transactions throughout a Digital Supply Chain of the future. For that reason, it may be ideal for multi-party processes where shared information is necessary to close transactions, to coordinate activity and to exchange value. Significant cost savings would come from time-to-close financial transactions, thus avoiding intermediary institutions (such as banks, insurance companies, etc.), especially across national boundaries. For example, "In banking, SAP, Canadian Bank ATB Financial and fintech startup Ripple Labs transferred 1,000 Canadian dollars ($760) to a German bank in 20 seconds instead of the usual several days."[xxiv]

Management: Product Integrity

Blockchain could enable a company to track the lifecycle of any component, assembly or product with a single unique number — efficiently and effectively managing the entire chain while ensuring product integrity along the way.

Security: Protecting Data

Based on a cryptographic technology and process, another critical element for the supply chain is Blockchain technology's ability to provide security for the millions of daily transactions moving through the Digital Supply Chain. This is absolutely crucial for the vast majority of companies that face a legal obligation to secure personal and proprietary data, intellectual property, financial information and other sensitive data sent within and outside the supply chain. Blockchain's ability to secure data takes on heightened importance given the inadequacy of methods used by companies throughout the world. "Over the past two decades … information of all kinds is increasingly digital … where transactions are now between people, institutions and things. Our current methods for securely managing … information … are proving inadequate … as evidenced by the all-too-common data breaches, identity theft and large-scale fraud around the world." [xxv]

Managers who are exploring potential use of Blockchain need to determine whether they are doing so for purposes of product tracking or integrity? Faster financial transactions? More security?

It is still early days, but Blockchain may soon become a game changer for the Digital Supply Chain, helping it to become more secure and more widely used. That's one of many reasons why companies need to be developing a better understanding of Blockchain's potential and be prepared to deploy it in the near future.

We believe that companies cannot ignore Blockchain and must begin to study and understand how they might deploy it — even though it may not yet be ready today for the Digital Supply Chain of tomorrow.

CEO Mandate

Executing the Digital Supply Chain Framework

Of the 24 Global Experts Group companies with whom we have worked to develop this white paper, 20 are planning how to significantly transform their supply chain, while the other four are in the early stages of such an effort. All the companies understand and believe in the value of migrating to a true Digital Supply Chain. In addition, our survey of 30 global companies, in industries spanning from software manufacturing to clothing production and transport, shows that 88% have already incorporated some elements of the Digital Supply Chain into their business model, and that 100% are working on some or all of the game changers mentioned in the previous section of this paper.

As much progress as companies make in developing a Digital Supply Chain, the truth is that no company will ever reach a state where it can rest. New sources of data will always emerge. New types of analytics will always be developed. And new software, new robotics and new customer demands will come to the fore. Most companies today fail to maximize the opportunities presented by the data, systems and people. As important as it is to remedy these shortcomings, market leaders also need to focus on the customer (or their customer's customer) and provide high-quality goods or services in the most timely and efficient way.

Building and evolving a more traditional supply chain into a Digital Supply Chain is critical but not without significant challenges. Every member of our GEG has expressed that major change must occur in their companies and supply chains in order to fully realize the potential of their Digital Supply Chains. This kind of transformational change has many issues. We have identified an execution framework with four management imperatives that require the attention and support of the CEO and the company's senior leadership. These imperatives are managing demand, managing people, managing technology and managing risk. They should be the cornerstones of a company's strategic direction, as they can become a key differentiator for a company's Digital Supply Chain success and market leadership.

Pallab Chatterjee, general partner, Symphony Technology Group (USA)

"Now we are at a critical pivot point in supply chain technology and software. There was a time not so long ago when companies were thrilled with technology allowing supply-demand conversion once a month. But the question now is 'what can you do close to, or in, real time' with multiple data sources to bring customer sentiment and behavior into the demand forecast cycle." www.symphonytg.com

Managing Demand

Executing the frontside flip is difficult for supply chain organizations that have focused exclusively on procurement, manufacturing, shipping and logistics. Yet our GEG leaders feel that focusing on the frontside (customers and growth) is the right approach for the DSC. The CEO of SAP, Bill McDermott, says, "Know thy customer's customer." McDermott is working to ensure that his team knows the true source demand and can design the right set of product solutions to meet that demand. One of our GEG members already has revenue growth in their objectives for the global supply chain leader. This member has found that the DSC is a prime driver of growth for several business lines across many geographies.

DSC Execution Framework

Demand forecasting will improve as people manage new sources of data to create and make better DSC decisions. In many companies, the demand forecast is developed by the sales team based on existing data and intuition. In the near future, winning companies will use artificial intelligence (AI) to match demand and supply. Inventory will be reduced by as much as 30% as companies build algorithms that automatically replenish based on observable demand signals.

Jim Hardy, EVP global operations,
Under Armour (USA)

"Time is money, and speed wins. Through investments in AI and robotics in the shipping and distribution channels, we expect to cut our distribution and end customer sales costs significantly over the next year or two. Greater efficiency, speed, quality control and customer satisfaction are essential to the bottom line and will grow our market share."
www.underarmour.com

Several companies (about 20% of our sample) indicated that the DSC would change the way they go to market. One such company is opening up an online presence that will eventually be larger than the distribution channel it is managing right now. Companies are cautious about broadcasting this effort, fearing retaliation from distributors. Many of the companies with whom we interacted reported that they would keep their current distributors and also manage a direct channel. One company that is doing just that and actually leveraging its current distribution in building out the direct channel is Goodyear.

Scott Rogers, Goodyear's chief marketing officer responsible for North America, describes how his company has begun taking steps to digitize its supply chain. He emphasizes that this new approach gives the company a competitive advantage by creating a direct relationship with its customers.

"Our CEO has challenged the organization to make the consumer buying process easier … which if you've ever bought tires you realize this industry has opportunities. To accomplish this, I've been working with our supply chain team on an initiative to increase our responsiveness to get the right tire to the end consumer to drive more sales for Goodyear and our customers. Last year, we were the first tire manufacturer to launch online direct sales via goodyear.com. The process is simple and convenient for the consumer — they select their tires, local installer and appointment time, completing the entire purchase process in one simple online transaction at goodyear.com and then just show up for their appointment at the installer. The hard part is that we now have to determine if that inventory exists and where it is throughout the supply chain (which extends beyond Goodyear to our distributors and retailers) so we can confidently show the consumer tires online that are actually available to purchase … then we need to be able to get the four tires that they do purchase (out of 2,500 unique SKU's) to the installer before they show up, often the next day. This is very different than the current model where Goodyear sells tires to distributors and loses all visibility as to where they are. We are embarking on this journey to meet consumer needs and have the right tire available at the right time, place and price. This has been a challenge for us and our partner distributors and installers. Meanwhile, online sales are growing and we intend to take advantage of this to grow our sales and share. The more we learn, the more opportunities we see to digitalize our supply chain.

It's work well in progress. We're running projects using real-time search trends, website analytics, big data and POS information to know more about expected needs of our customers and consumers. We're doing digitally enabled collaborative planning with channel partners. We're putting in new shared performance measures and real-time reporting around our delivery of the right tire at the right time to the right place. All of this is enabling improvements in our online direct sales as well as benefiting our entire customer base and the end consumer, regardless of how they purchase."

Annette Clayton, chief supply chain officer and president & CEO of North America, Schneider Electric (USA)

"Digitizing the supply chain is revolutionary and innovative for companies to undertake and the focus we place on it at Schneider Electric allows us to improve supply chain efficiency and enhance our customers' experience. Through digitization, the insights our supply chain teams gather from the data we collect are critical, so we can plan for what we know so we have some capacity to react to what we don't know. Working collaboratively across the supply chain and having intimate knowledge of our customers' needs puts us in a much better position to achieve mutual success." www.schneider-electric.com

The key element is using the Digital Supply Chain to generate or stimulate demand. It can do this by capturing the data that will deepen knowledge of the customer — an outcome that's enabled by Digital Supply Chain processes touching the customer continuously and delivering real-time data. For example, many companies are discovering the tremendous value to be had from feeding social media information into the Digital Supply Chain. Information gathered from Facebook can influence everything from product design to delivery to end of life. A new generation of analytics will translate this new knowledge into company actions. And some of the new technologies, like Blockchain and 3D printing, will make real-time, continuous engagement with customers easier.

For example, one large consumer electronics company had more than 30 different power cords. Each cord was a different length, had a slightly different design and was incompatible with all of the other cords. The company's product engineers were convinced that they had designed the perfect product and they refused to standardize the cord. The Digital Supply Chain leader stepped in, presented information based on daily customer interactions and succeeded in reducing the number of cords to 12.

One of the important elements of managing a Digital Supply Chain that stimulates demand is for all aspects of the supply chain's contact with the customer to be aligned in a consistently positive way. This is often referred to as a key aspect "omnichannel" marketing, meaning that all customer experience, across all touch points and through all channels, provides a uniform and customer-pleasing experience. For example, if part of the product appeal is about quality and speed, then the supply chain must deliver high-quality products, and do so quickly, through all channels.

By executing a frontside flip and using the supply chain to stimulate demand, companies can boost their agility and enhance their long-term competitiveness.

Managing People

All organizational change is derived from people willing and capable of moving to the future. This is certainly true for the journey to a digital supply chain, which will require education, communication, organizational redesign, process redesign and bringing in new personnel.

Most of the companies with whom we worked have a formal supply chain management structure. Increasingly, these companies are naming one person to manage their supply chain who reports to the CEO and has broad decision-making authority. These positions are potentially a new route to the top, because of the breadth and depth of authority and the potential to manage companywide cost and revenue. In almost all cases, companies have developed a decision-authority matrix that clearly

spells out who can make what decision under what conditions.

The crucial change for the supply chain division is to shift from being exclusively a support organization and instead realize decision-making rights, similar to the line leaders that are running P&Ls. Supply chain leadership also has an important support role. This is significant because there will always be conflict in organizations between managers about priorities. For example: Who decides what supplier to use for indirect materials? And who decides what factory to build or use when external suppliers are available? Finally, does engineering or procurement decide what components to build into a new device?

There is always a risk that CEOs will not see their supply chain executives as prepared to create a new demand-focused Digital Supply Chain. In several companies, a non-supply chain person (from, for example, marketing or operations) has been put in charge of transformation. In one major global company, the supply chain role was diminished and a new value chain role was created. In this scenario, the supply chain leadership role is clearly not a route to the top.

It is important to assess the skills of the existing supply chain workforce. Are technical skills sufficient? Are data mining and analytical skills present? Every company we talked to mentioned that new workers would be hired who are "data scientists" — people who know how to collect and make sense out of new data. Several companies spoke of needing "data stewards" who can manage the collection, compilation and distribution of data between departments. Additionally, 78% of those who took the DSCi survey agree that they must hire new people with new skills in order to take advantage of the digital supply; 33% of those people strongly agree.[xxvi]

The enormous influx of new data from the Digital Supply Chain will fundamentally change how, when and where companies make decisions. One of the most strategic issues for senior management will be to determine who should be making what decision at what level in the company — and what data is needed to make those decisions. Complicating the "decision-making" process will be the heightened collaboration. Internal cross-functional collaboration will be a requirement for successfully transitioning to a more Digital Supply Chain.

It is very important to define and enforce the decision rights of each player and grade level. Then management can monitor compliance against the formal policies and hold everyone accountable.

In fact, what must happen when you change so many elements of the people dimension, including organization, is that you change culture. The ways that people are operating and using the supply chain must change.

Collaboration between engineering and production, geographical groups and head office, line managers and supply chain executives is crucial and must be improved. Information must be shared and decisions made according to the decision-authority tables. Often, companies

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Keith Miears, VP global supply chain, Dell (USA)

"The ability to collect and make effective use of big data is essential to the success of our business and its supply chain. One of the key challenges today is finding the right people and skills to realize this potential. We need different skills sets – more data scientists and IT professionals conversant with big data, analytics and tools to interface with data available from the web. We need to train key employees who know the company's infrastructure to team with fresh university and college graduates and data scientists. And we need people who understand the opportunities and risks our business faces and can figure out what data we need. These are the people who can ask the right business questions and communicate with the data scientists." www.dell.com

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report that they have to align their incentives with overall organizational goals. For some companies, all line executives are measured based on inventory levels. Their supply chain counterparts are measured the same way. At Schneider, the supply chain leader has a measure based on revenue growth. Steps to improve the measurement of collaboration can be seen at many companies. Acer, for example, has created back-to-back KPIs (key performance indicators), which encourage different departments to work toward a common goal. ZTE is working to establish common KPIs across the business as a whole so that everyone is working toward a common goal. Collaboration must be measured to encourage people to work together toward a common end.

Finally, collaboration must occur between the company and its suppliers, even the tier 3 or 4 suppliers. It will be important to focus on internal cross-functional collaboration and new ways of collaboration with third parties. The challenge for senior management will be creating and empowering the cross-functional teams and establishing clear decision-making authority. Collaboration in the supply chain requires increased visibility and transparency. But this transparency is inextricably linked to each company establishing trust.

A major execution risk for most companies is the gap between what executives say and what workers believe. On the one hand, respondents indicated how important the supply chain was in the eyes of the CEO. On the other hand, we noted a difference of opinion between executives and other employees in the majority of the survey questions.[xxvii] This phenomenon we call the "CEO Lament"; the feeling that all CEOs get when they communicate their vision and don't see the workers respond. While there can be a variety of factors contributing to this disconnect, it reinforces the importance of a clear, common understanding of what the Digital Supply Chain is all about, and how all parts of the organization will need to adjust to take advantage of it.

One of the keys to managing people is managing culture. Successful CEOs frequently have introduced culture change as one way to achieve improved performance. This is critically important for a truly global, frontside-focused, data-driven supply chain organization. And the culture change must be embedded across the organization.

Andres Valdivieso, CEO and founder, Toth (Chile)

"Our digital supply chain is our business. Our mantra and goal is "providing patients early access and low-cost health services via the use of technology" through extremely low-cost, secure online matching of health care providers with people on the 'very bottom of the social pyramid,' especially in economies where public health service is lacking. We've designed our 'digital supply platform' around low-cost infrastructure: open source software development for minimal cost and highly secure data protection, mobile apps to connect anywhere and low-cost social media marketing strategies and machine learning for data analysis. Digitally enabling all elements of our supply chain is the only way to grow our business and realize our dream." www.toth.life/en/

A good way for a CEO to signal the direction of the change for the Digital Supply Chain is to designate the role and reach of the Digital Supply Chain organization and each of its key players. The CEO must define the Digital Supply Chain "sandbox" — the areas that it controls or influences. And the CEO must ensure that the Digital Supply Chain executive team has the skills needed for the required frontside flip. Often this means that new people are needed — some of whom may not have a supply chain background. Of course, the CEO must define the new performance metrics that take into account the new business model.

Managing Technology

As mentioned in the game-changers section, data is growing at an unprecedented rate. There will be 5,200 gigabytes of data for every person on the planet by 2020! To better understand the significance of this, a gigabyte is the equivalent of 500 average e-books. That means every person will have 2,600,000 e-books worth of data. Much of this data will contribute to the DSC and help with everything from product design to shipping and delivery to sales and distribution. The sub story is that organizations today already have too much data and can't readily integrate and use it to support management decisions. In addition, many companies reported that they have data that's known as "ROT": redundant, obsolete and trivial. Almost all of the companies we worked with reported that they have trouble getting clean data today that is reliable for future Digital Supply Chain management and decisions. This has to be quickly fixed because it is the basis upon which the new sources of data will sit.

Outlining some of the very real challenges managing technology involves, Dell's vice president of worldwide procurement, Keith Miears, suggests deciding which data to interpret is one problem, and figuring how to use the data to make better business decisions is another.

Zahid Hai, SVP service operations deployment and planning, Sodexo (France)

"We have, over the past few years, gone through a transformation to build a truly global organization to better support our clients wherever they are, both locally and internationally, and define an organizational, operational and managerial model to enhance and make our value proposition around Quality of Life more compelling.

A key aspect of our transformation has been the creation of "service operations" – where we have fully integrated our Food and FM expertise together with HSE, Supply Management and IC&T into a single organization that delivers integrated processes to our sites. Supply Management is no longer a "support function" but integral to the delivery of a solution through our process to our clients. The focus on the integrated process as opposed to the function has broken silos and allowed a more client-focused approach, created more opportunities and we are beginning to see the impact on efficiency gains. Fully understanding what solution the client needs and designing and delivering that solution in a fully integrated way allows us to avoid waste and is a key initial step in digitalizing our supply chain. "www.sodexo.com/

"For a CEO or a supply chain executive there are two key challenges to address in deciding to invest in data and analytic capabilities. The first is the amount of data being generated and available — we may not really know what data we need, and that data may not be complete or clean, and we typically don't have trained and capable data stewards and resources. The project timeline to develop good data assets can be very long, while short-term performance commands more attention and resources. The second challenge is to ensure value is derived from the investment in data and it is employed to make better business decisions. It is easy to generate many charts and dashboards, but it can be difficult to demonstrate specific gains, or a specific problem to be solved. Very focused problem statements will help in assessing and gaining approval for specific data management capabilities. Within Dell we ran a project to measure the ROI around the problem of many order changes by the customer or Dell employees. Our analytics showed fewer touches meant cleaner orders resulting in ROI in several areas. We're now measuring and reporting around clean orders. We've built several internal and external projects along these lines and demonstrated value to the company. This is a rather simple, albeit telling example. We are building and linking our data and analytical capabilities across the supply chain."

As Keith Miears suggests, deciding which data to use is key. Companies have to prioritize new data sources and decide how much to invest in data acquisition. Seventy-five percent are experimenting or using social media based data from DSC decision-making. Seventy-nine percent are planning to use new sources of data derived from sensors and the Internet of Things.[xxviii] Building the information systems to capture and digest all this new data is a significant challenge.

Companies are also selling and distributing using their own websites and platforms such as Ariba to match buyers and sellers. Increasingly, companies are moving more of their IT infrastructure for the DSC to the cloud. Strangely enough, almost all small companies operate in a cloud-based architecture, but almost all large companies hesitate to move DSC to the cloud because of security risks. Does having a cloud-based architecture, especially one run by another company, mean that a company has lost control?

Without analytical tools to analyze the new data, and without decision-making tools that will compel action, technology is useless. But the power of new technology, new data and new decision-making tools is changing industry.

Here are the technology guidelines that we offer to companies moving toward the digital supply chain. First, prioritize technology that allows visibility of your whole supply chain, all the way to the customer. Second, invest in technology that enables future agility. Your company should be agile enough to respond to customer demand and demand changes. This means that many companies should consider cloud services for part of, or all of, their supply chain processes. Production technology that enables quick response to customer needs should be sought. Many companies can use more 3D printing and robotics than they currently deploy. Yet many of these companies are still in a "wait and see" mode. Mobile technology that the customer and your employees can use is important. Delivery technology will change dramatically in many industries as drones and driverless vehicles are deployed. Don't wait until a competitor has started to use this. Invest what is needed in order to obtain clean, structured data. Finally, consider Blockchain technology. There is a good chance that the Blockchain approach will change the way that the Digital Supply Chain will work in the future.

Kyle Hamm, VP global supply chain, Schneider Electric (USA)

"Cloud computing, while not a game changer itself, does enable easier and less costly digitalization of supply chains. It is now allowing us to reduce and integrate a large number of legacy and acquisition systems – we're aiming to halve that number by 2020. At the same time, the 'Cloud' is enabling smaller companies to develop their own digital supply chain capability since it reduces development and management costs significantly." www.schneider-electric.com

There are always more exciting new technologies than any one company can invest in. Prioritize your investments so that your technology will support a frontside flip.

Managing Risk

The Digital Supply Chain will provide new, more sophisticated ways to identify risks. Big data will create early warning systems allowing companies to become more proactive and preventative. Companies will be able to mitigate risks more effectively. Companies will also be able to go beyond risk mitigation and compliance to turn a risk into a competitive advantage by outperforming other companies in a targeted area. Think about an outdoor apparel company known for exceptional environmental practices in manufacturing and

shipping. Think about a cloud-services provider known for exceptional cybersecurity. Think about a buyer-supplier platform company known for creating trust through exceptional governance. Companies will be able to gain a competitive advantage through excellence in meeting certain compliance standards, just as they could in the past by excelling at meeting quality standards. The management challenge is determining where to mitigate risks and where to excel and turn a risk into a competitive advantage.

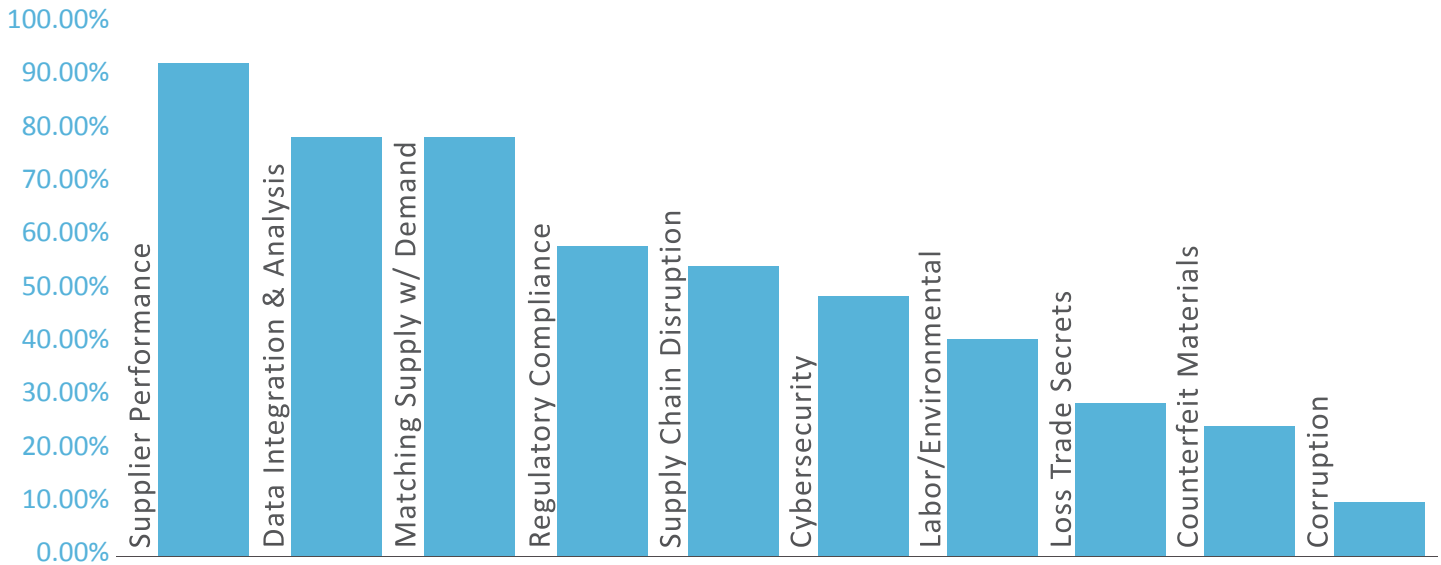
At the most fundamental level, supply chain risk falls into two categories: business performance risk and compliance/regulatory risk. The Digital Supply Chain will have a significant impact on both. The DSCi survey asked people to select the top five risks facing their supply chain today from a list of 10 options. Three answers stood out: 90% chose supplier performance; 76% chose effective integration and analysis of data; and 76% chose matching supply with demand.

The evolution to a Digital Supply Chain changes the dynamics between these business performance risks and compliance risks. As you shift to the Digital Supply Chain and do the frontside flip, you will need to be aware of how your company's risk landscape changes. For example, the business performance risk of unmatched supply and demand will dramatically decline with the use

Urs Dogwiler, CEO, ChainIQ (Switzerland)

"As CEO of a global supply chain service provider, we clearly see the ROI from a Digital Supply Chain. It's no longer just about matching supply to meet customer demand. New risks and opportunities are arising for the supply chain organization. New government and non-government compliance rules are increasing that require businesses to ensure that their vendors and suppliers are also complying. Effectively this requires more data collaboration with your vendor and supplier base. Compliance and leverage for positive brand impact is an opportunity. Loss of business and potential brand damage is the risk. A secure Digital Supply Chain platform provides a way forward." www.chainiq.com

Percentage of People Who Chose Each Supply Chain Risk in Their Top Five



of real-time big data. Big data and predictive analytics will help companies better mitigate business continuity risks associated with natural disasters or political disruptions. Conversely, the risk of losing confidential information and trade secrets will continue to explode. While corruption was cited the least frequently by the supply chain executives as a top-five risk, compliance officers and sales executives frequently cite it as a top-five risk. So while big data will reduce the risks of "effective data integration and analysis" and "matching supply with demand," you will need to drive cross-functional collaboration internally to build awareness of corruption risk and address the rapidly growing risks of cybersecurity and IP theft.

Kenji Mizuno, deputy head, corporate supply chain management unit, Fujitsu (Japan)

"One of the challenges we face today is how we collaborate and deal with a fairly large number of suppliers in China and other countries in Asia. The level of IT sophistication is very mixed, with large ODMs and customers able to manage most anything we want or require of them. The smaller suppliers may have more limited IT capabilities, and so we both face decisions about whether we can build a business relationship and whether this may require new investments in IT training and capability. These are very real opportunities and risks we must weigh." www.fujitsu.com

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New ways of managing cyber and IP risk are required for two reasons. First, the Digital Supply Chain links all activity inside your company and it expands the flow of data with suppliers, customers and even customers of customers and suppliers of suppliers. These reservoirs of data get compromised when there are the kind of massive data breaches that are becoming commonplace. According to the 2016 PwC Global State of Information Security Survey, 79% of the companies surveyed reported a cyber incident in the previous 12 months, with 10% saying the loss from the incident exceeded $10M.[xxix]

Every company is a potential target for hackers — whether criminals, nation-states or unethical competitors. But every company is also at risk for losing confidential information from current and former employees or contractors — and those that work with every company in your supply chain. Successful risk mitigation requires people, process and technology to work together.

Beyond cyber risk, there are increasing regulations and industry standards. In response to the growing cyber threat, more than 240 bills, amendments and other legislative proposals have been introduced in U.S. Congress in the past three years.[xxx] As cybersecurity concerns grow, many countries are taking a more nationalistic approach. China recently passed a law requiring foreign companies to host data, including confidential information, used to conduct business in China on servers located in China. There are also multiple regulations linked to a company's supply chain, such as labor laws, environmental regulations, corruption laws, and export restrictions. Increasingly, a company is liable for the actions of third parties. Companies that can use data to stay ahead of the myriad of shifting regulations have a clear business advantage.

At many large companies today, the compliance and risk management functions are in separate silos, and there may be little coordination with the supply chain group. Similarly, the brand protection group may have little or no interaction with the responsible supply chain group, which may have no idea what the ethics and anti-corruption group is doing. And they all may be in the dark about what is happening with protecting confidential information and cybersecurity. This will need to change.

But because supply chain groups are always working closely with suppliers on business performance issues (possibly even sending quality control employees into the supplier on a weekly, or even daily, basis), a company's supply chain employees should be trained to identify

key red flags for compliance risks. Clearly, senior management needs to break down silos and drive cross-functional collaboration within the compliance areas and with the supply chain function. It is also senior management's job to make sure there is collaboration with a purpose.

The findings in the DSCi survey highlighted the importance of collaboration. The survey results showed that 95% of people agree and 67% strongly agree that "cross-functional collaboration will become more important to our supply chain performance over the next five years."[xxxi] Collaboration with suppliers, channel partners and customers will also accelerate as more and more data is shared. Balancing leverage and control in these relationships will be a critical success factor. Within the overall relationship with the supplier or business partner, trust is an essential element of a successful, sustainable relationship. But just as you verify their business performance, you will need to develop a scalable way to verify compliance performance.

Suresh Shenoy, EVP, Alyx Technologies (USA)

"Two examples of the potential for big data and analytics. One client was ready to award a contract to a local cabinet company. We analyzed public databases, social media and similar big data sources to verify this contractor's bonafides and credentials, and found the owner was a convicted pedophile who had changed names a couple of times before starting his current venture. Another client needed to assess potential supply chain risks and compliance by mining big data from social media and other data sources. These are just two examples of what can be discovered and gleaned in nearly real time from analytics of big data from multiple sources". www.alyxtech.com/

Execution Roadmap

While the game changers and possibly the wild card of Blockchain are setting the future direction for supply chains generally, and for the emergence of Digital Supply Chains in particular, CEOs and their senior leaders will need recommendations on how to move to position their companies to seize these opportunities. The following four execution roadmaps for managing Demand, People, Technology and Risk give guidance on where and how they can begin.

Each bear down on executing the new DSC Framework and offer different companies different starting points to suit their particular conditions. They are intended to help managers bring direction, measurement and accountability to the DSC journey.

Digital Supply Chain Execution Roadmap

QUESTIONS FOR CEO

DEMAND

1. Can you currently capture real time data you need to do the "frontside flip?"
2. Can you utilize and apply real-time data to determine customer demand?
3. Currently, do your supply chain people have a direct role in creating and capturing demand?
4. Do your current metrics support a customer centric Digital Supply Chain?

PEOPLE

1. Are you prepared to define the organizational boundaries of the supply chain?
2. Do the skills needed for a frontside flip exist in your organization?
3. Do you have a person capable of leading a frontside flip?
4. Do your current performance metrics encourage collaboration with a purpose?

CUSTOMER

TECHNOLOGY

1. Do you rely on current technology to enable enterprise agility and demand visibility?
2. Are you currently using new technology to enhance manufacturing and delivery in the Digital Supply Chain? 3D, Drones, Blockchain, Social media, etc.
3. Are you capable of integrating new technology into your existing business model?
4. How do you measure your technology return on investment for your enterprise? Are the metrics applicable to the new value of the Digital Supply Chain?

RISK

1. Are you aware of how the Digital Supply Chain can reduce your business performance and compliance risks?
2. From where do you think your greatest business performance or compliance risks will come?
3. Are you able to protect yourself against the escalating threat from cyber crime IP theft?
4. Can you measure the integrity and "authenticity" of your supply chain?

Company CEOs should recognize that the Digital Supply Chain is a strategic priority and then pursue the following actions:

1) Appoint someone to recruit a small team focused on rapidly developing a DSC creation plan. This person can be the current supply chain head or it could be someone entirely different. For example, Goodyear asked both marketing and supply chain leaders to collaborate to meet customers' needs vs. any one function's individual goals. This executive understands what it takes to do a frontside flip and is working hard to transform the supply chain along customer lines. The Supply Chain leader responsible for transforming operations into a truly digital supply chain should report to the CEO. This will signal the right level of importance and allow the CEO to monitor and manage progress.

2) The team's first step is to perform a diagnostic on the current supply chain and assess progress against a mature Digital Supply Chain. The results of this analysis should include a set of specific action items, estimated investments and expected outcomes over the next three years. The appointed team leader should understand that an aggressive plan is required with stretch objectives for results and timing. Outcomes should include an estimate of customer growth and benefit.

The plan should describe how the company will take advantage of the game changers, manage the five dimensions of the DSC and address each of the execution issues. The diagnostic and DSC plan should be prepared and presented within 12 weeks of the CEO giving the mandate. One critical element is to specify precisely where the company will emphasize improvement. The decision should be based on the current survey's diagnostic, and what it shows to have the most potential. Another contributor to success is to be very specific about which change management levers will be used to spark the supply chain transformation. Possibilities include changing the organizational structure, hiring new talent and training.

3) The CEO should assess the team's results and set goals for customer improvement, cost reduction and competitive advantage. The right scorecard and clear goals for improvement will propel the company forward. The goals should include a specific allocation of investment dollars against a prioritized list of actions. The CEO should require a monthly reporting cadence to the Executive Committee. In addition, the Board should be advised of the Digital Supply Chain transformation plan twice yearly.

Demand: Real-Time Continuous Engagement with Customers

The most fundamental and important feature of the Digital Supply Chain is its ability to enable real-time continuous engagement with customers. Many companies are already building in metrics for revenue and margin growth for the supply chain organization because the real-time engagement allows for demand stimulation and management. In order to achieve this, there are several things that the CEO must do.

First, the CEO must ensure that the organization is capturing the real-time data that is necessary for an effective Digital Supply Chain. This data can be collected from a wide range of sources: social media, Internet of Things and sensor, supplier and customer data. Much of this data is real time, or fresh. Useful, clean data is a requirement for the frontside flip.

Second, the CEO must ensure that the data is analyzed and utilized to determine customer demand. Many companies report that they have collected huge volumes of data but lack the capacity to analyze it and make decisions. Almost all companies will need to bring in new analytical tools and new data scientists to make use of the data.

Third, the CEO must ensure that select Digital Supply Chain positions have a clear mandate for working the "demand stack," which includes supply and demand matching (a traditional supply chain responsibility). One part of the stack — demand management — calls for the supply chain team to move inventory that is in stock and available (some organizations already use this). Demand stimulation is also critically important. For some companies, customers work only with their supply chain counterparts after the sale is done. These companies can grow sales by giving their supply chain staff direction on what can and should be sold. In addition, these staff can sense demand and direct more customers into buying. Amazon uses the "customers who bought this item also ..." feature to encourage more sales through its online platform. Demand stimulation is an exciting add to a traditional supply chain process. The CEO should carefully consider what the Digital Supply Chain team should do to stimulate new market demand.

Fourth, the best way for CEOs to signal their intent on the execution of the Digital Supply Chain is to develop a new, demand-focused scorecard for the Digital Supply Chain. Companies should consider adding metrics for revenue and market share growth. The CEO must encourage the supply chain team to develop "rules of thumb" based on experience and data. Both data from machine learning and traditional management experience will contribute to new "rules of thumb" that CEOs

can use to make decisions better aligned with this new operating environment. One example of a potential metric is "cash to cash," which is the length of time it takes a company to use cash to fund an operation, compared with receiving the cash payment from a customer. By aligning compensation with the outcomes achieved on these metrics, companies will see a rapid shift towards the Digital Supply Chain.

People: Cultural and Organizational Shift

The CEO must define the boundaries of the (new) Supply Chain organization within the corporate organization, including new and/or strengthened authority to achieve its revised customer-focused revenue-generating and cost-cutting goals.

CEOs should identify and appoint a new senior executive, who will be a direct report, with the experience, knowledge and leadership skills to lead the organization in its frontside flip. This person should have the experience and knowledge needed to move ahead with the new technologies critical to the Digital Supply Chain, in particular the use of big data and analytics and other digital technology game changers in demand sensing, shaping as well as in production and engineering. This person should also be empowered with technology, budget and decision-making authority to drive that change through new people, new skills and new individual and group performance metrics.
The CEO must oversee the creation of a Digital Supply Chain demand roadmap. This roadmap should clearly show how the Digital Supply Chain will impact the demand stack, including demand matching, demand management and demand stimulation.

In training, hiring, assigning and managing supply chain people to these cross-functional teams, this new executive needs to assign his or her direct reports to team with their cross-functional and engaged peers. The focus should be developing and implementing agreed, mutual, joint and/or shared performance metrics that show how these collaborative efforts help to meet, sense and shape customer demand. This will be a game changer — collaboration with a purpose.

People and teams within this new Digital Supply Chain must be capable and effective working cross-functionally with their counterparts in other organizations, such as sales, manufacturing, IT and R&D. Most important, as part of a customer-centric organization, the DSC's people and teams must have the skills and management support to team and work directly with the customer on both pre-sales and post-sales demand shaping. This will include both cross training and new training in skills, as well as effective use of technologies that enable a Digital Supply Chain to meet its promise of a true frontside flip.

Technology: Enterprise/Platform Agility

The CEO must understand and support investment in supply chain technology that spans the entire company and enables real-time visibility. This visibility should encompass your customers as well as all internal groups that contribute to the predicting, planning, management and delivery of the customer products or solutions. Internal organization data silos — legacy systems, acquisition or other — should be integrated and linked. Data captured from external sources should be analyzed either internally or via outsourced contract. Taking these steps will feed the Digital Supply Chain with the predictive and demand-sensing

information needed to draw insights about current and potential customers. Investment in technology and resources to "clean" unstructured and unreliable data to share across systems will extend effective visibility. Finally, whatever data management system is implemented, it must enable all key Digital Supply Chain executives and managers to make necessary and informed real-time decisions. Together, these investments in data integration, capture, cleaning and use will greatly enhance your visibility and response to your customers.

The CEO also must support investment in a Digital Supply Chain platform technology that will enable greater business and corporate agility. Cloud technology is helping to make this possible. It is enabling smaller businesses to gain a secure, more affordable and flexible data platform capability, which allows for easier and more effective supply chain visibility extension and collaboration with customers, partners and suppliers — all without the enormous investment in one or several proprietary systems. There is some question about data security in a cloud environment. Some companies believe that a larger organization should self-manage its systems in order to secure data and provide a more efficient solution that does not require a profit premium to be paid to the cloud provider. Other people believe that the cloud providers are better able to meet security requirements and the sheer size of cloud providers delivers more efficiency. The CEO must listen to this discussion and decide the most prudent way of proceeding. Production technologies, including robotics, AI and 3D printing will contribute to your ability to speed, adjust and win new business and respond to new demands and new markets. Overall progress in areas like cognitive computing should be assessed to see where they apply to the specific company. Similarly, new delivery systems and capabilities found in driverless distribution and delivery vehicles may provide entirely new opportunities to cut costs and grow revenue. Finally, Blockchain technology has the potential to protect and sustain the integrity, performance and agility of the company.

Risk: Enhance Risk Management Capability

The advance of the Digital Supply Chain will enable you to scale your supply chain risk management program. Supply chain visibility will be easier through new data and technology. But technology should not drive the strategic risk decisions — the decisions should shape the technology. Your strategic decisions must shape the technology and data you need. The focus should be to shift from reactive to proactive, using data to better predict risks and incidents.

Leading companies are pushing to find ways to integrate compliance measurements into their core business performance measurements. Evolving technology and new data sources will help, but it is senior management's job to understand how to strategically allocate resources. The ultimate goal is to identify the compliance areas where a company will excel and develop a competitive advantage — while also identifying the compliance areas that will be the focus of risk mitigation.

The relative ease of getting information on third parties brings challenges and potential liabilities. Being able to say "we didn't know" is going to be less of an option. One of the challenges for senior management is how to balance depth and breadth in obtaining information on suppliers and business partners. Technology enables you to establish a broad program that gets information on the compliance programs of third parties. But it will be important to find a scalable way to determine the authenticity of the information. Based on a risk assessment, where are you comfortable with breadth and less information on a specific third party? Where do you really need a deeper understanding of their compliance program and the risk they pose? Knowing and doing something to

drive improvement is the best approach, but this may not be possible for all third parties — especially across all the many compliance risks. Companies will also need to find ways to integrate business performance and compliance measurements into a more holistic assessment of a supplier, with a focus on finding scalable ways to verify the integrity of a supplier and to determine its "authenticity."

Every company also needs to take a careful look at cybersecurity and IP protection. Internally, senior management needs to set the right balance between tight cyber controls and the ability for people to efficiently do their jobs and collaborate. IP security procedures that are too stringent and cumbersome have the unintended consequence of driving people to create "work-arounds." This is another example of why cross-functional collaboration is needed in developing practical policies and procedures.

Senior management will need to use the available data to shift from dealing with negative events reactively in separate silos to taking a more preventative approach. This is true for both business performance and compliance risks. By taking a holistic approach using management systems and business processes, companies can deal with a wide range of different risks in an organized and integrated way. Shifting from a reactive approach to this more proactive, preventative approach requires collaboration with a purpose. That means internal cross-functional collaboration, collaboration with suppliers and customers and, in some cases, collaboration with other companies facing the same risks.

Ultimately, to truly take advantage of the Digital Supply Chain you must determine which risks to mitigate and where you can turn a risk into a competitive advantage.

Summary

The competitive landscape will be reshaped by companies that drive down costs and drive up market share through their Digital Supply Chain strategy. The so-called "20-10 rule" will likely apply, with 20% lower costs and 10% higher revenue all driven by the Digital Supply Chain. Companies that successfully execute this strategy will collaborate with their suppliers in a new way, and at the same time, let their collaboration with customers drive innovative products and services. By the year 2020, some entirely new companies will be utilizing, and in some cases mastering, how to operate a Digital Supply Chain globally. And some current powerful companies will also make the transformation to a Digital Supply Chain platform.

Supply chain leaders have done a good job of optimizing results by managing suppliers, moving manufacturing to low-cost locations and increasing the efficiency of logistics. But these steps are insufficient in the world that is being reshaped by big data and analytics, new technology, new people skills and an increasingly risky operating environment. A frontside flip is a required move. It is the only way to ensure company success and Digital Supply Chain effectiveness.

Leadership Insights on the Digital Supply Chain

Rubik Babakanian, SVP and chief procurement officer, Western Digital (USA)

"A best-in-class Digital Supply Chain platform in the year 2020 will have mobile apps that will inform and enable global supply chain team members to make decisions they need to make at the right time and for the right reasons. They should be able to do this wherever they might be at the time. The business and its customers would expect no less." www.wdc.com

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Sudheer Paminghantam, global head of supply chain and logistics practice, Tech Mahindra (India)

"Connected vending machines are a good example of how a business can not only control inventory and supply but can also shape and create demand. This can bring insight and drive the entire Digital Supply Chain in real time on what is being sold, which products are in most demand and when and from where the product needs to be replenished. It's a simple yet perfect example of the value in knowing your customer's customer and making supply chain work toward it." www.techmahindra.com

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Rajya Vardhan Kanoria, CEO, Kanoria Chemicals (India)

"We see great opportunity in the near future to bring the full benefits of the Digital Supply Chain to our business. We've made our initial inroad in the production area, where with automation and robotics we've been able to increase quality and reduce production costs significantly. We intend to work toward building this Digital Supply Chain capability – backward to our suppliers and forward to our end customers." www.kanoriachem.com

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Kurt Ravenfeld, director of global supply chain operations, Lockheed Martin (USA)

"Digitally harvesting the 'jewels' associated with contractual relationships is a key enabler of supply chain predictive analytics, supplier risk mitigation, and strategic negotiation leverage and will be a value driver." www.lockheedmartin.com

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Hans Thalbauer, SVP extended supply chain and IoT, SAP (Germany)

"To win in the digital economy, we have to reimagine how we design, plan, make, deliver and operate our products and assets." Today's customer can buy through numerous channels, at any time, on any device. This drives the need for business process change across logistics functions. The store, warehouse and distribution center are all becoming fulfillment hubs to minimize inventory and maximize customer service." go.sap.com/index.html

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Links

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The Digital Supply Chain Initiative

Digital Supply Chain:

A Frontside Flip

The Center for Global Enterprise

www.thecge.net