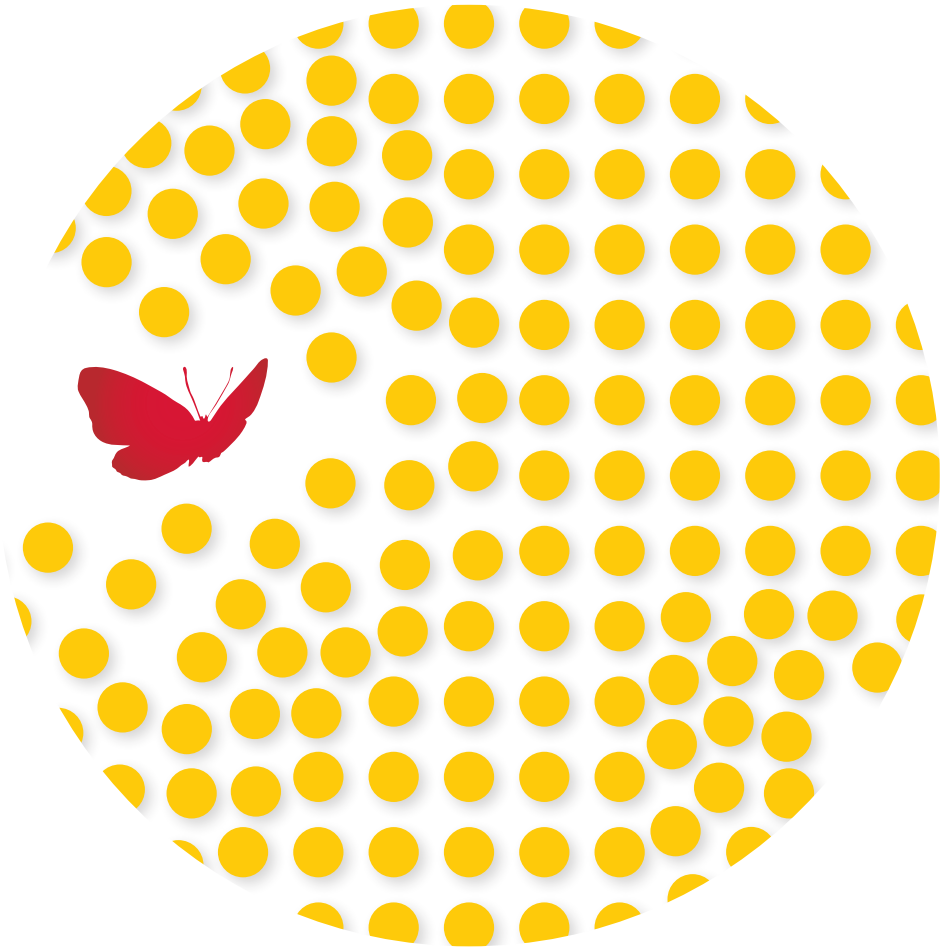

LEAN AND AGILE:

THE RESILIENT TECH SECTOR SUPPLY CHAIN

February 2015

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Volatility permeates every aspect of the high tech industry. Products, competition, consumer behavior, innovation, price and product lifespan all change with breathtaking speed. "While companies in most industries operate in *uncertain* environments," writes Accenture in a recent study, "…technology companies operate in *ambiguous* environments."[1] This distinction is important, and it both underpins and shapes the dynamics of the industry and its supply chains.

"When a company faces uncertainty, the past can be a reasonable predictor of the future with the right analysis," Accenture says. "In ambiguous environments, however, the past can be a poor predictor because major disruptions in the present can often change the parameters that shape the future."[2]

Consider the following:

- Today's smartphones have more computer power than all of NASA back in 1969, when it placed two astronauts on the moon[3]
- More than 3.5 billion citizens in developing economies will have access to the internet in 2025, more than 2 billion of them via mobile internet services[4]
- Mobile internet usage could generate global economic impact of as much as $10.8 trillion per year by 2025[5]
- The Internet of Things (IoT) is poised for explosive growth, with the installed base climbing to more than 30 billion "connected, autonomous things" by 2020.[6]

[1] Accenture, "Harnessing Disruption: How Science and Technology Companies Endure," 2013, p. 3.
[2] Ibid.
[3] http://www.phonearena.com/news/A-modern-smartphone-or-a-vintage-supercomputer-which-is-more-powerful_id57149.
[4] McKinsey Global Institute, "Disruptive technologies: Advances that will transform life, business, and the global economy," 2013, vi, vii, p. 33-34.
[5] Ibid.
[6] Ibid.

But trends like these are not the only sources of instability for this sector. "The technology industry is highly susceptible to economic variances because so much of technology spending today is discretionary, versus in the past when enterprise spending dominated," observes Eric Openshaw, Vice Chairman and U.S. Technology, Media & Telecommunications Leader, Deloitte LLP. "With tech now heavily skewed toward consumer demand, local economies largely drive how much is purchased. Consumers worldwide seem to have an insatiable appetite for the latest and greatest [gadgets]. However, demand going forward will be determined by constantly changing local conditions, evolving views on perceived value and mercurial consumer tastes."

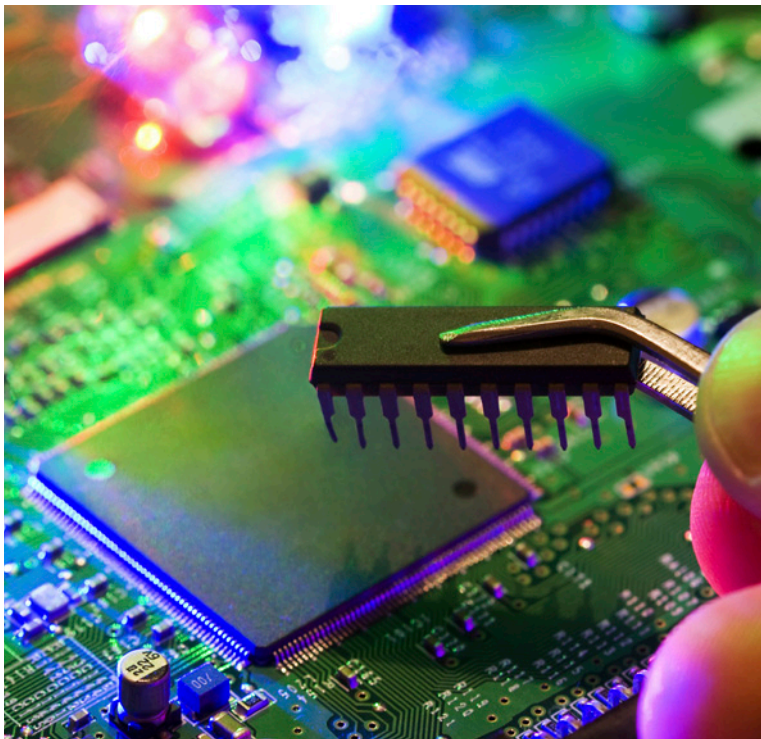
The simple fact that supply chains in the tech industry are significantly more global than in many other industries – and as a result often more complex or fragile – increases the industry's exposure to risk.

This uncertainty, resulting from constant changes in consumer preferences, further complicates supply chains that must deal with other more traditional and ongoing risk issues such as theft, product damage, natural disasters, geographic dispersion and product recalls. "Demand uncertainty is one of the most difficult supply chain problems to solve in the high tech sector," says Dr. Jan Thido Karlshaus, Chief Customer Officer, Technology Sector, DHL Supply Chain. "Uneven demand patterns caused by new product introduction, seasonality, emerging market growth and a number of other factors can quickly push supply chain costs through the ceiling. Add to this the fact that the tech sector is doing business in and expanding into regions of the globe that other industries may not be exploring, and you get a very high volatility quotient for the entire industry."

By way of example, consider the tech sector's exposure to natural disasters. Most of the industry's production capacity remains located in Asia, which is prone to floods and earthquakes. In 2011, for example, the floods in Thailand wiped out nearly 40 percent of the world's hard-disk drives, meaning the tech sector suffered a major blow.

The simple fact that supply chains in the tech industry are significantly more global than in many other industries – and as a result often more complex or fragile – increases the industry's exposure to risk. Also, the tech industry's aggressive expansion into emerging markets poses equally challenging supply chain risks. Lack of demand history in these new markets makes planning difficult; lack of adequate logistics infrastructure injects high levels of variability into the normally fast-flowing supply chains.

This white paper looks at the dynamics of uncertainty and ambiguity in the tech sector, and how companies can use supply chain innovation not just to gain the agility and speed required to compete, but to do so with ever improving efficiency and cost control.



Part 1: Current state and driving trends

While there are a number of issues that cause uncertainty and ambiguity in the tech sector, three in particular stand out as having significant supply chain implications:

- Shrinking lifecycles and warp speed
- Emerging markets and the rise of consumption
- Supply chain visibility gaps.

Shrinking lifecycles and warp speed

Product lifecycles in the tech sector are short and getting shorter. In the past, conventional business wisdom held that new product introductions followed a bell curve, which included moving from early adopters to mainstream users – but only after crossing a marketing 'chasm' in which the sell message changes from the new and exciting to the familiar and incremental.[7]

In high tech, that paradigm is dead. Consumers are hyper-tuned to expect the next new thing. This means that product lifecycles, once measured in years, have contracted to mere months. Thus, with every new product introduction, the value of existing products drops like a stone.

Take the example of Microsoft's Kinect gaming controller, as recalled by Larry Downes and Paul Nunes. "Kinect was an enormous hit, selling eight million units in just the first 60 days. Within six months, the pace of Kinect sales dropped precipitously. Though stragglers continued to buy Kinect in peaks and valleys over the next year, the product had largely fulfilled its mission in its first 10 months…"[8]

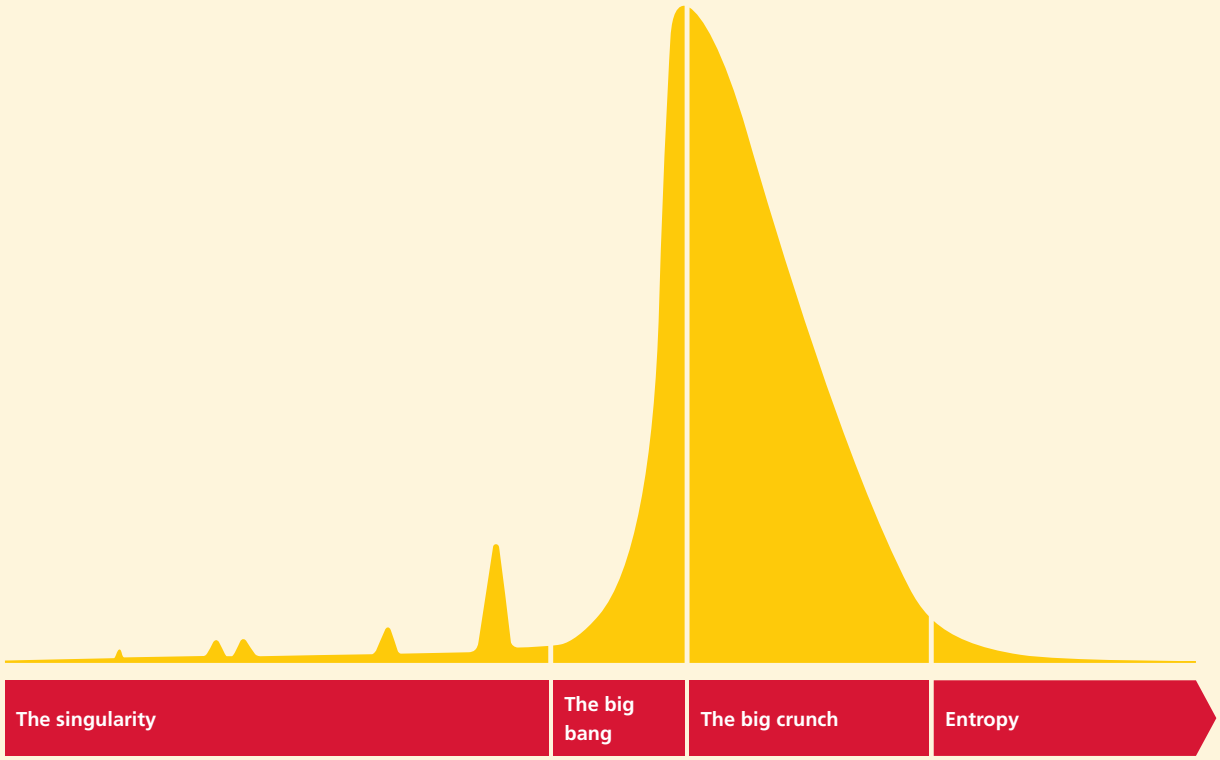
"We're living in a new age of disruptive innovation – innovation that comes out of nowhere and catches incumbents by surprise," explain Downes and Nunes. This phenomenon of the so-called 'big-bang disruptors', is characterized by new goods entering the market that are better *and* cheaper than existing products from the moment of their creation. For incumbents, that spells trouble.[9]

> *Consumers are hyper-tuned to expect the next new thing. This means that product lifecycles, once measured in years, have contracted to mere months.*

Big-bang disrupters enter the market in two stages only: trial and mass adoption. Takeoff is immediate and vertical. Downes and Nunes call this pattern the 'shark fin' (figure 1). It is characteristic of what might be termed 'the upgrade economy,' in which customers are constantly buying electronic devices and throwing them away to buy newer ones after a year or two. This creates unprecedented challenges for tech companies and their business partners, particularly in the supply chain. With a compressed sales opportunity window, supply chain speed, blended with intelligence and resiliency, is essential.

[7] Larry Downes and Paul F. Nunes, "Accenture Outlook, Big Bang Disruption: The Innovator's Disaster, Outlook No. 2 issue," June 2013, p. 4.
[8] Larry Downes and Paul Nunes, "The Faster a New Technology Takes Off, the Harder It Falls," January 3, 2014, http://www.wired.com/opinion/2014/01/why-its-time-to-ditch-the-bell-curve.
[9] Accenture, "Big Bang Disruption: When Better is Also Cheaper," 2013, p. 1.

Figure 1: The shark fin



Source: Accenture 2013.[10]

Emerging markets and the rise of consumption

In the tech sector, emerging markets were once seen primarily as a place for sourcing products, driven by a low-cost labor strategy. That model is changing. Emerging markets around the world are becoming major engines of demand – a trend that carries tremendous implications for technology sector supply chains.[11]

Asia's emerging markets are leading the strong growth in the tech sector. The rise of the middle class in these and other growth markets means technology adoption rates will skyrocket. The region's two largest economies – China and India – already have some 500 million internet users. In a recent report, McKinsey & Co. forecasts that nearly 700 million more will be added by 2015. "We estimate that within five years, this billion-plus user market may generate revenues of more than $80 billion in internet commerce, access fees, device sales, and so forth."[12] This internet access growth fuels tech sector expansion.

Serving these high-growth markets is complicated, and laden with risk. Countries and even regions within countries vary in terms of demand profiles as well as product preferences and price points. Frequently, there is little or no sales history because these are new markets, so developing a forecast is problematic. Moreover,

[10] Ibid.
[11] DHL Supply Chain's white paper, "Path to Growth: Shaping Tech Sector Supply Chains in Emerging Markets" explores this trend in detail.
[12] McKinsey & Company, "Winning the $30 trillion Decathlon: Going for Gold in Emerging Markets," 2012, 50.

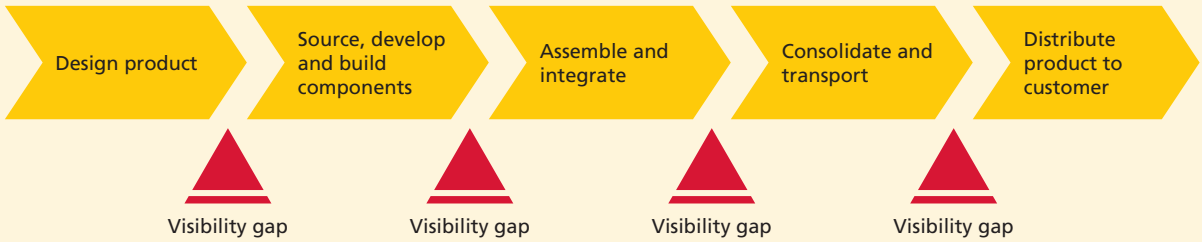
consumers in individual markets have different buying preferences and capabilities – all the way from the product itself to the manner in which it is sold or delivered.

The complexities of serving emerging markets, therefore, make supply chain planning and execution a significant challenge. Add to this the fact that supply chain infrastructure is usually underdeveloped, theft or product diversion risk can be high, corruption is frequently pervasive, trade regulations can be restrictive and cumbersome, and natural disasters such as floods and earthquakes are not uncommon, and the risks expand exponentially. As a result of these complexities and uncertainties, companies must attune their business models – and their supply chains – to specific markets and even consumer groups. The days of the one-size-fits-all global product, business model and supply chain are over.

"The speed at which tech moves means you need to be able to flip the switch… customers want immediate results. You need to be able to react and respond immediately. And the response needs to be targeted at the specific requirements of individual markets or customers", comments Luis Erana, EVP Global Technology and President Technology North America, DHL Supply Chain.

To manage this risk and complexity, and keep costs low, supply chains are contracting geographically. Tech companies are gradually diversifying their supply chain networks, replacing long distance, east-west-only flows with shorter, regionally based trade flows. The dual challenge of meeting individualized market needs, while managing short product lifecycles, makes the tech sector an ideal candidate for near-shoring and on-shoring. In this practice, companies shift their manufacturing bases closer to the end consumer in an effort to reduce risk and transportation costs, and improve service cycle times.

Figure 2: Visibility gaps in the extended supply chain



Source: Craig Gottlieb.[13]

Supply chain visibility gaps

As technology OEMs outsource design and production to third parties, they in turn source from second- and third-tier subcontractors for components, which then source raw materials from yet another set of suppliers. The result is a highly complex, multi-tiered, geographically dispersed supply chain with a lack of visibility to the lowest or 'nth' supplier. Lack of visibility leads to information black holes – which at best cause disconnects and at worst cause financial and operational disasters. These gaps, illustrated in Figure 2, inject time and risk into the supply chain – resulting in excess inventory, obsolescence, security risk, production shutdowns, business interruption, increased costs and revenue decline.

> *The supply chain has to have clear transparency in all steps; it needs a systematic way to have real-time information exchange amongst all channels, partners and service providers.*

"End-to-end visibility in complex supply chains can be difficult to achieve as businesses become more complex and leaner," says Tobias Larsson, Director and Head of Resilience360, DHL Customer Solutions & Innovation. "Access to the right intelligence to manage this complexity can also be a challenge."

Take the example of Infineon, the world's second largest chip supplier to the automotive industry. "Visibility is key," observes Johann Lohner, Director Global Transit Management. "We are in a cyclical market. We have to cope with steep upturns and downturns - all kinds of fast changing phases. Therefore it's crucial to always have the current picture of what's going on. Our supply chain has to have clear visibility in all areas; it needs a systematic way to have real-time information exchange amongst all supply chain partners and service providers, and for all areas and different steps."

"I need answers in order to gain further efficiencies," continues Lohner. "Beginning with the big question of what the real demand is over time, down to the execution level and asking where my product is right now, while at the same time concentrating on a predictive supply chain and assessing the impact of other aspects like delays or even interruptions in the supply chain. Does my shipment still arrive in time or do I have to start countermeasures? Just think about the bullwhip effect: what if we get a non-forecasted ad hoc 200 percent increase in demand? Or, what if our suppliers can't deliver due to natural disasters? Our production just can't catch up. We might face bottleneck situations or delays, and that causes problems for our customers. All of these are risks. So we need a fruitful collaboration between all supply chain partners enabling full visibility that integrates the entire supply chain picture with no visibility gaps."

[13] Craig Gottlieb, "Securing Goods Across the Supply Chain: Closing the Gaps in the Manufacturing Supply Chain to Achieve High Performance," 2010, p. 5.

Part 2: Building the new, resilient supply chain

Shrinking product lifecycles, emerging markets and visibility black holes create significant challenges for tech companies – challenges which the rigid, status quo supply chain is ill-equipped to handle. The combined effect of these three driving forces, therefore, is creating a need for new approaches to establish an agile and resilient supply chain.

At the same time, the overriding pressure to keep costs as low as possible in order to compete, means the need to deliver a highly lean and cost-efficient supply chain is paramount. This means that the tech supply chain of today and tomorrow must be both lean and agile in order to meet the dual challenges of staying competitive while at the same time ensuring agility and resiliency.

The need, therefore, is to develop highly adaptive supply chains that can quickly align across global markets to focus on delivering value to the company and to its customers.

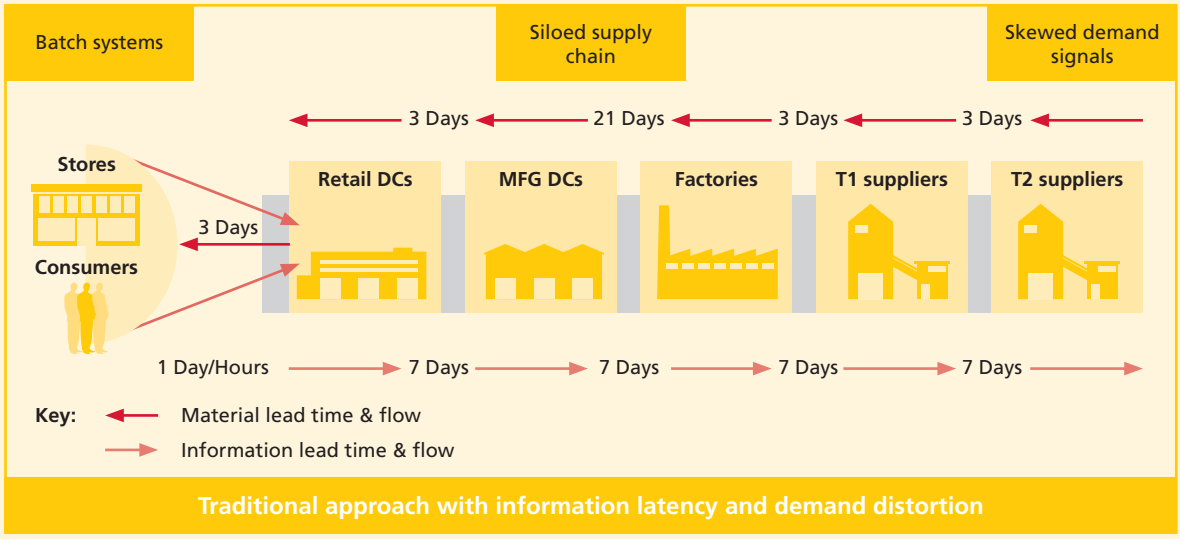
Exactly what does the lean and agile tech supply chain look like and how can companies go about achieving it? The answer to this question lies in upending the traditional approach to supply chain design and operation. Why? Because the traditional supply chain model (Figure 3), which operates in a linear and sequential fashion, with built-in information latency and visibility gaps, is not fit for purpose in this volatile environment. Worse, such traditional supply chains can actually cause harm – hobbling companies' ability to compete.

The need, therefore, is to develop highly adaptive supply chains that can quickly align across global markets to focus on delivering value to the company and to its customers. This is the true 'sense and respond' supply chain, constructed – as Lora Cecere writes – "to better optimize and align the sell, deliver, make and sourcing operations to meet the goal. The focus is on horizontal process orchestration".[14]

Figure 3 illustrates the dramatic difference in the speed of information flows across the traditional linear supply

[14] Lora Cecere, "Building Market-driven Value Networks Driving Differentiation in Supply Chain Processes Market-to-Market," Supply Chain Insights LLC, 2012: p. 3.

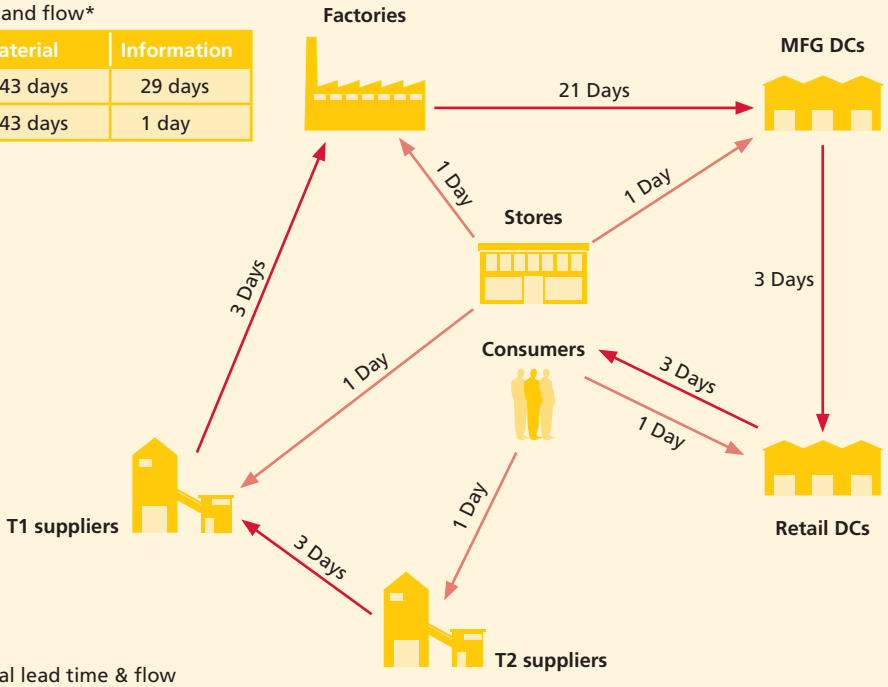
Figure 3: Traditional vs. demand-driven supply chain (consumer electronics companies)



All participants connected in a network model with real-time visibility to demand

End-to-end lead time and flow*

Approach	Material	Information
Traditional	43 days	29 days
Demand-driven	43 days	1 day



Source: One Network and Tompkins International.[15]

[15] Ibid.

chain vs. the orchestrated high-visibility supply chain. Although the physical manufacturing and movement activities do not speed up, having the freshest information enables companies to make better decisions about their inbound and outbound flows, meaning that if they spot a demand trend, for example, they can react to it within hours rather than weeks.

In the demand-driven tech supply chain, companies and their suppliers operate in a networked fashion. Demand signals are synchronized across all parties in the supply-production-delivery ecosystem. And real-time visibility eliminates the latency – or lag time – among participants and events in the chain. The result is an accelerated supply chain that has greater agility to anticipate and react to market dynamics.

In this orchestrated supply chain model, network and operational agility become key differentiators for tech companies. This agility revolves around being asset light, but having access to fully qualified capacity when and where it is needed, typically through partnerships with logistics service providers. This model is frequently implemented under a control tower concept, wherein a lead logistics service provider serves as the orchestrator, optimizing both information and physical flows.

"The tech sector is all about speed and agility," observes Erana of DHL. "You need to make changes on the fly based on needs and conditions. Companies are looking for a full variable cost in the supply chain.

> *Partnerships with 3PLs are integral to our strategy. They are the picture from the customer; they provide critical visibility.*

"This means having a strategic relationship that allows you to forward plan with your customers. It is critical to work closely with customers early on, to be brought into the planning processes so we have the visibility and information we need to design the right solutions. So as tech firms are transforming their supply chains, we need to be part of that process. The 'holy grail' is to achieve the end-to-end integrated solution."

Johann Lohner of Infineon agrees with this assessment. "Partnerships with our 3PLs are vital and integral to our strategy," he says. "On the one hand they determine the view of our company by our customer through performance and quality; and at the same time provide precious visibility of different critical parts of the supply chain. One of the key challenges in our business is how to get to the next level of collaboration with our customer and our customer's customers in order to better understand their business, their motivation and their direction. Resilience for us is to have a robust supply chain design that can handle the full variety of fluctuation in supply and demand. We can only accomplish this jointly by sharing more information. Visibility and collaboration will be key".

Supply chain solutions that work

The dynamic nature of the high tech industry means manufacturers in this space must be innovators in all aspects of their business, including the supply chain. To this end, tech companies are embracing more integrated supply chain solutions in an effort to reduce costs, and improve end-to-end control and agility, while reducing risk and upgrading resiliency. There are many solutions available to address some or all of these issues. This paper discusses three that resonate particularly for the global high tech sector to help cut risk and hedge against the unknown. These three approaches include (1) a lead logistics provider (LLP) outsourcing model, (2) shared services solutions and (3) pre-sales support and postponement.

Lead logistics provider (LLP) outsourcing model

The LLP outsourcing model entails partnering with a third party logistics firm (3PL) to take the lead in managing all supply chain activities – be they inbound to manufacturing or outbound to point of demand. The LLP provides a single point of contact and responsibility for managing the tech company's varied global logistics activities.

The LLP sits atop a supply chain 'control tower', and utilizes real-time visibility tools to constantly monitor and assess the condition and performance of the supply chain. Thanks to alerting systems, potential or real problems can be identified and addressed proactively – before they disrupt the supply chain. "This visibility, if fully executed, can extend across multiple tiers of suppliers, where significant risk exists in the tech supply chain," explains Karlshaus. "It can also provide visibility into multiple echelons of global inventory, thereby enabling management to make better decisions as to amount, positioning, quantity and type of inventory."

"There is a significant opportunity for high tech companies to use a lead logistics provider to orchestrate

SOLUTION SNAPSHOT: LLP SOLUTION IN AUSTRALIA

Company: Major global managed print solution provider in Australia

Problem: €30 million domestic transport spend across finished goods and consumables being managed by siloed organization structure. No dedicated transportation management roles within the organization. Transportation spend spread across a group of twenty-plus carriers with variable technology and visibility capabilities. Broad service requirements ranging from standard parcel/pallet delivery to multi-function device delivery and install. Result: high cost, inconsistent customer service, poor visibility across transport operations.

Solution: Company outsourced transportation management to DHL Supply Chain under a dedicated lead logistics provider (LLP) structure. Implemented a transportation management system (TMS) and web tracking platform to create a single interface for visibility and reporting. Centralized transportation spend under a mixed operating and managed transport (agent) model. Standardized KPIs and reporting across entire transport solution.

Result: Total contract savings in excess of €10 million. Significant improvements in compliance and quality of transport providers. Contracted continuous improvement agenda with gain share incentives assures innovation.

all the moving parts of their supply chain in an end-to-end solution," notes Jose Nava, CEO, DHL Supply Chain Latin America. An integrated, end-to-end supply chain solution helps orchestrate a product through all of its stages and flows – from sourcing, inbound to manufacturing, packaging, transportation, warehousing and distribution to consumption and return. It also provides the visibility architecture to gain the end-to-end view of supply chain flows and activities.

Armed with extensive knowledge of tech supply chain activities and flows, the LLP is in a position to look for continuous improvement opportunities, as well as risk mitigation solutions. As a result, the LLP solution helps to drive down costs and establishes the basis for true resilience in the end-to-end supply chain.

Multi-client solutions

Multi-client solutions, in which multiple companies share supply chain processes such as warehousing, transportation and information systems, offer a significant opportunity to reduce costs, spread risk and improve agility and responsiveness. And getting the supply chain right – and constantly adapting it as conditions change – is a key in determining profitability. After all, a company can have the best product in the world, but unless it gets to market responsively and economically, its success is in jeopardy.

Multi-client arrangements, exceptionally executed, can provide this differentiator. In such cases, the 3PL handles multiple manufacturers' products in a shared facility, and spreads the costs of technology, infrastructure, services, people and expertise across multiple customers. This enables 3PLs to provide customized solutions for inbound, storage and outbound processes at a more favorable cost/service structure to technology customers. This solution works for inbound to manufacturing, as well as outbound to customers.

Comments Nava, "As a logistics provider we can flatten out so we can shift our work force from one activity or customer to another. So multi-client solutions can complement each other, based on the supply chain process needs of the various customers. Peak for one

customer, for example, may be at a different time to peak for another. So we can smooth the cost of operations across companies so everyone benefits."

Tech manufacturers often have customer overlap – most notably with respect to large retailers that frequently receive goods from the same grouping of manufacturers. This means that multiple tech producers are shipping to the same group of customers. The result is duplication of supply chain assets, resources and costs across multiple company supply chains that all serve the same customer cluster.

Multi-client solutions reduce or eliminate this redundancy by using a single logistics service provider to create a shared solution. As such, they provide access to agility at a reasonable cost. This makes the supply chain more adaptive and more resilient.

Postponement solutions

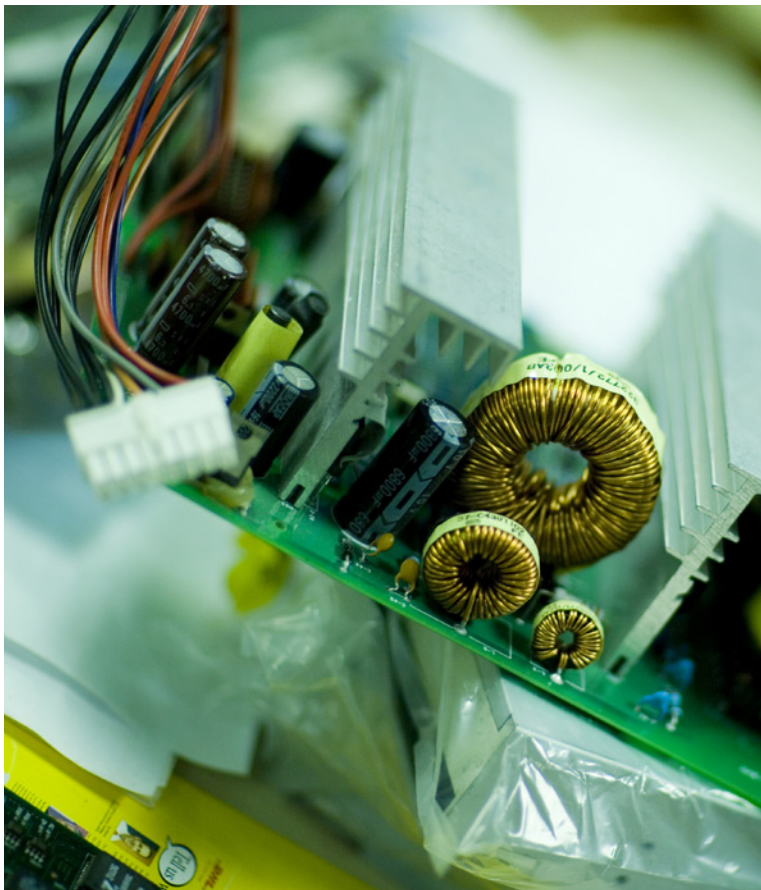
For the tech sector, pre-sales support and postponement is integral to supply chain operations, is a key customer satisfaction differentiator, and offers new profit potential. Major tech companies utilize outsourced postponement in their supply chains to create supply chain flexibility while reducing complexity, with a 3PL performing these services. Postponement delays final product differentiation until closer to the point of sale. The process can involve a layered approach to production, proceeding as follows:

- Primary manufacturing occurs at a production hub – e.g. China or elsewhere in Asia
- Product is shipped to final configuration centers close to the point of consumption or end market
- The configuration centers customize the product, adding market-specific elements such as packaging, configuration or kitting.

Customizing product closer to consumer demand can significantly reduce inventory levels and obsolescence – critical issues in the tech sector. It increases a company's flexibility in serving customers by being able to provide exactly the products the market wants – at a point closest to final consumption or sale. Tech companies can still manufacture in far-away locales such as China in order to leverage low-cost production environments, but

SOLUTION SNAPSHOT

A manufacturer of two-way radios and RFID scanners, together with its global 3PL, developed a pre-sales technical support and postponement solution that reduced working capital while delivering a 20 to 50 percent increase in production output through lean practices. This increase, together with 99.99 percent shipping accuracy, boosted the tech company's profitability while increasing market agility.



only customize product once it reaches its destination, in Africa or Latin America, for example.

As a result of this set-up, postponement helps to improve supply chain resiliency. Critical postponement activities can be performed closer to consumer markets and at the time required – reducing risk from global supply chains or the impact from sudden demand changes. In this context postponement serves another valuable purpose as well. It protects product integrity and security. This issue is especially important in the case of new product launches, where secrecy is key; also for products destined for high-security uses; and for products with high counterfeiting potential.

SOLUTION SNAPSHOT

One Asian manufacturer of imaging and video products adopted an outsourced postponement strategy for its European market that saved the company more than €10 million over three years, reduced product obsolescence significantly and decreased product handling by two days overall. Working with a major global 3PL, the company set up a postponement final assembly and kitting facility in the Netherlands to enable postponed configuration of product based on immediate European market demand trends.

Conclusion

Solving for volatility, uncertainty and ambiguity in the tech sector is no easy task. It takes innovation, visibility and collaboration – backed up by solid process and operational excellence. The most competitive high tech supply chains have jettisoned the traditional, linear supply chain approach and instead are embracing the resilient supply chain.

Two principles form the core of the new resilient tech supply chain – lean and agile. Lean goes to the issue of competitiveness – preserving profitability in a sector where competition demands that companies be the best at managing costs. Agile goes to the ability to anticipate, adapt and respond to rapidly changing conditions on the fly – to have the people, processes, capabilities, assets and solutions in place to deliver solutions matched to ever changing needs.

Tech companies at the forefront of this evolution are working to eliminate the visibility black holes and other issues that add time and cost to their business operations. They are also adopting such approaches as a lead logistics provider outsourcing model, shared supply chain services and postponement to gain the agility and efficiencies they need to compete in this high-risk business. Together with their supply chain partners, they are re-wiring the supply chain to deliver a level of agility, responsiveness, and capability that delivers advantage.

About the authors

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Lisa's articles have appeared in Fortune, Industry Week, The Economist, Inbound Logistics, The European Business Review and many other publications.

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