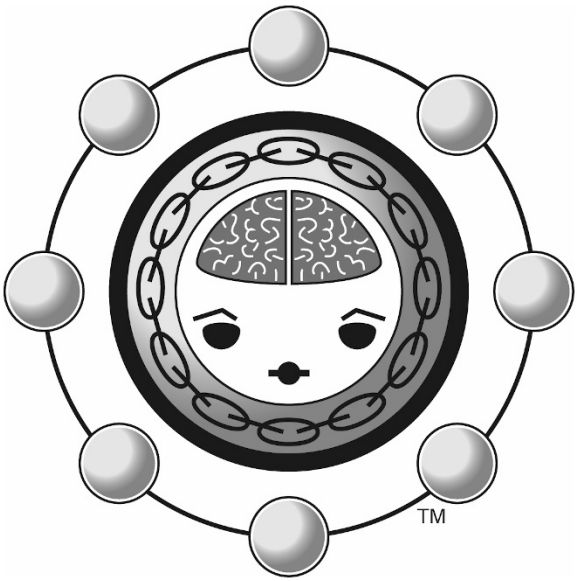
The Shaman's Journal 2018



The Shaman's Journal 2018

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DEDICATION

To global supply chain leaders attempting to drive digital innovation.

Table of Contents

SECTION 4: MAKING BETTER DECISIONS THROUGH SUPPLY CHAIN PLANNING

SECTION 5: TECHNOLOGY ADVANCEMENTS

SECTION 6: DEFINING BETTER VALUE NETWORKS

Foreword

Industry productivity stalled in 2004. Companies are attempting to drive digital innovation. It is new. There are more questions than answers.

The goal of this book is to help the supply chain leader on this journey. It is a compilation of short posts written over the past 12 months. Underlying the research is a series of quantitative surveys and financial data analysis by the Supply Chain Insights team.

I want to thank the Supply Chain Insights team for their hard work in making this manuscript happen.

Lora Cecere
Founder of Supply Chain Insights

SECTION 1

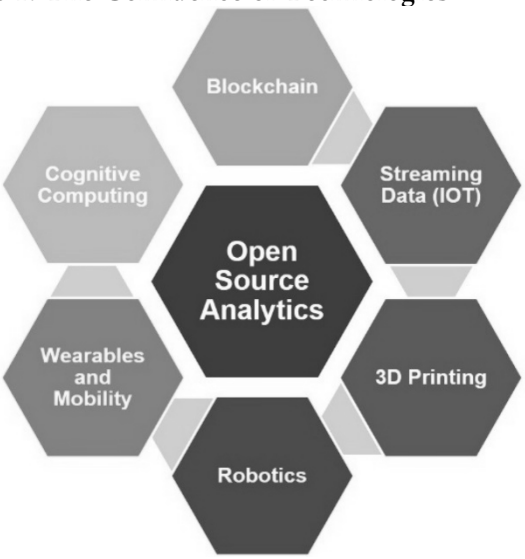
Driving Digital Transformation

Bright and Shiny Objects

This month, I traveled the globe helping companies understand the potential impact of technology innovation on the future of supply chain processes, I find the term "digital innovation" is a bit like tulip mania. How so? It is a fad sweeping across supply chain leadership teams. I am trying to help teams manage the hype and drive value.

CIOs are rebranding as Digital Innovation Officers, and consultants are knocking down doors to sell digital innovation projects. Let me start with caution: buyer beware. Consultants are rebranding traditional processes and technologies as digital innovation. My advice? Sidestep the hype and drive exciting innovation with an exciting confluence of technology as shown in Figure 1.

Figure 1: The Confluence of Technologies



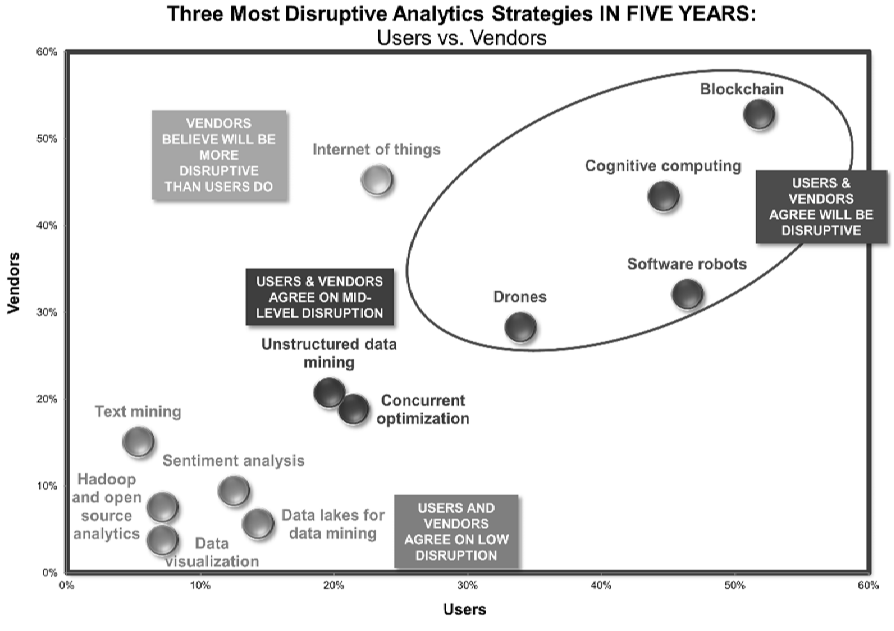
In my 15 years as an analyst, I have never seen more promise. However, we are in a hype cycle. Sort fact from fiction. There is a need to manage excitement and exercise caution.

Exciting Trends

1. **Redefinition of the System of Record.** Enterprise Resource Planning (ERP) is becoming the financial system of record, but not the supply chain system of record. With the evolution of open source technologies with schema-on-read capabilities, new forms of decision support are evolving to drive insights in the enterprise, and Blockchain is becoming the system of record for B2B. Blockchain for track & trace, supply chain finance, lineage, and supply chain visibility are exciting. I am actively working with WFP to try to fund world feeding programs with less financial leakage and provide a system of record for famine projects.

2. **Driving New Outcomes.** The pace of best-of-breed technologies is frenetic. The pace of innovation is accelerating. ERP-agnostic architectures using machine learning and streaming data architectures are enabling new and promising capabilities. One company that I follow worked on visibility solutions for the past five years using traditional Advanced Planning and ERP capabilities. They made little progress. learning to deliver supply chain visibility in a heterogeneous Then they turned to a small best-of-breed company and used machine environment within two months.
3. **Digital Manufacturing**. Manufacturing Execution Systems with Data Historians have inched along over the years, but we have not been able to radically change manufacturing. Now, the use of systems like Think IQ at General Mills enable Track & Trace capabilities through manufacturing conversion points. In parallel, the work at SAS on IoT is transforming asset-intensive supply chains. The combination of wearables, IoT, and analytics is a powerful combination.
4. **Analytics Redefined. Driving Data-Driven Processes.** Analytics are transformational. This is much deeper than data lakes and descriptive analytics. In Figure 2, I share an overview of the analytic approaches from some recent research. Cognitive engines will redefine decision support, machine learning is making traditional master data techniques obsolete, and data is moving now at the speed of business.

Figure 2. Disruptive Analytics Approaches



Source: Supply Chain Insights LLC, Analytics Strategies Study (Oct-Dec 2017)
Base: Total familiar with analytics strategies -- Users (manufacturers, retailers & distributors) (n=56), Vendors (software providers, consultants, & 3PLs) (n=53)
Q14. And what three do you believe will be the most disruptive to supply chains in FIVE YEARS?

Caution

This is not an evolution. It is a step-change in thinking and redefines IT approaches. Far from your mother's old-fashioned supply chain processes.

Digital innovation will make much of the past obsolete. This is a tough transition for conventional ERP, APS and consulting companies. It is a bit like watching Kodak continuing to sell packaged film when they should have been redefining photography.

Digitization of signals does not drive a digital supply chain. A digital supply chain requires the use of digitization to redefine new processes. Most companies have not defined the differences between digitization and digital processes.

To have the discussion, business leaders will need to reskill and learn. This a major barrier. It is the rare leader who will raise their hand and say, "I don't understand." Companies need to prove the concepts and wrestle their IT teams from long and drawn-out maintenance upgrades. This will be uncomfortable. Many IT organizations define their existence from SAP and Oracle skill sets.

The implementation processes are starkly different from those of the past. Historically, projects were large and encumbered by bureaucracy. This is not the case with digital test-and-learn programs. Side-step the large implementations with traditional consulting partners and engage in design thinking. Test innovation at the edge and use stage-gate processes to drive improvement at the core.

Wrap-up

In one of my sessions last week, a client mentioned, "This is quite interesting Lora, but we do not have the time to chase bright and shiny objects. We need to focus on the basics." I then asked, "How do you define basics?" In the end, we found that these new techniques were instrumental in improving the gaps in customer service and reducing demand error. As a result, master data issues disappeared, and visibility increased. To me, this does not sound like a bright and shiny object. It, instead, became transformational. However, it only happened because the client sidestepped the hype, invested in learning, and was open to new approaches. Defying convention may help unleash new opportunities through new technologies. These are my thoughts on a snowy day. Good luck on your journey.

Driving Digital Innovation

Digital. What Is It?

Companies are so confused by the number of people—consultants, associations, and Universities—who are trying to "help." The promise of "digital" is gaining traction at a speed that is faster than the development of processes and technologies. It is exciting and promising but change management issues are intense.

In driving digital innovation, start by recognizing that this transformation is not an evolution of current processes. We don't have the answers, but we can see the potential. It requires casting off traditional paradigms. Let's take some examples:

- **Additive Printing.** In Jabil's 3D Printing lab, they have a fascinating showcase of how their thinking changed as they moved from traditional machining (taking away materials) to additive manufacturing (3D printing, adding materials). The transformation is enlightening.

- **Changing the Pick.** A second example is Kiva. Amazon bought Kiva in 2012 for $775 million. Prior to the acquisition, Kiva's technology gained slow adoption. One of the reasons? It changed the pick. While traditional warehouse picking directed the warehouse worker to manually go to the "pick area" to put goods onto the pallet, Kiva robotics moved goods to the pick center in a sequence. It redefined warehousing and there was pushback.
- **Schema on Read.** A third use case is the relational database in supply chain. Over the last two decades, ERP grew in importance as the system of record. With "schema on read" and open source analytics, supply chain architectures are becoming less ERP centric.

Three case studies of changing paradigms based on technology capabilities. To maximize value, leaders recognize that the transformation is a step change. The redefinition of processes makes teams within the organization feel "uncomfortable." It requires learning new concepts and questioning the investments of the last two decades. What is presumed to be "best practices" often needs to be discarded. It is hard work.

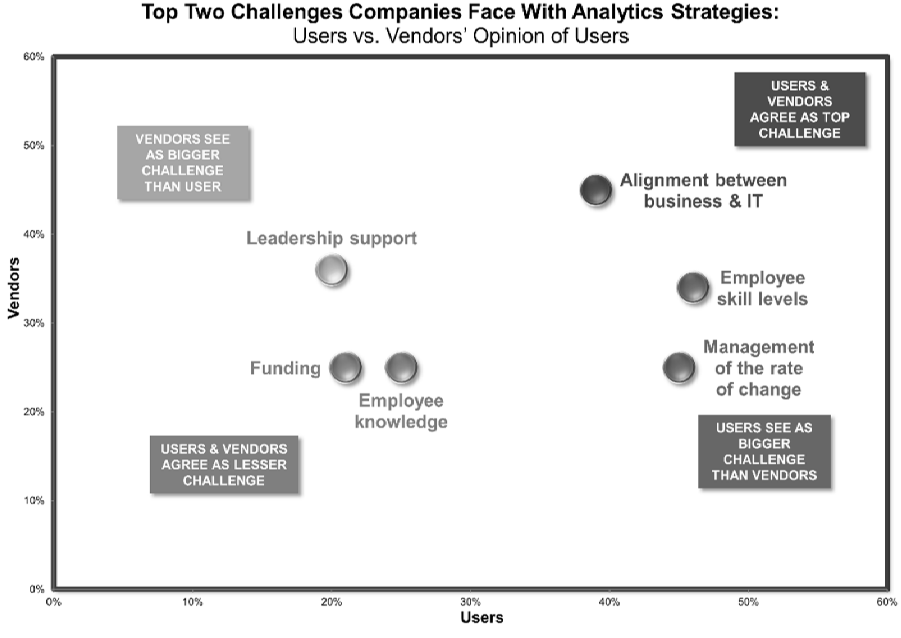
Defining Digital Innovation through Testing with New Forms of Analytics

It is a world of test and fail, where teams are summoning the courage to challenge tradition, questioning the status quo, and imagining what could be. It is all about exploring the Art of the Possible (the potential of technology and analytic advancements).

In a digital transformation, teams redefine the atoms and electrons of the supply chain. This includes process flows, conversion and transport processes, and new capabilities enabled by new forms of analytics. Imagine a supply chain that senses, learns, and adapts in response to the market. One where data is available at the pace of business. It is hard to imagine because it is so different from today's reality.

To imagine this requires throwing away current paradigms and learning new techniques. Embracing the possibilities has many challenges. For business leaders, the greatest issue, as shown in Figure 1, is the alignment between the business and IT, employee skill levels, and managing the rate of change. These issues are not trivial.

Figure 1. Top Challenges to Implement New Forms of Analytics



Source: Supply Chain Insights LLC, Analytics Strategies Study (Oct-Dec 2017)
Base: Those familiar with analytics strategies -- Users (manufacturers, retailers & distributors) (n=56), Vendors (software providers, consultants, & 3PLs) (n=53)
Q20. What are the top TWO challenges that [your][the typical] company is facing today when it comes to analytics strategies? Please select no more than two.

Over the last decade, the gaps between business and IT teams grew. The reasons are many. Contributing factors include business process outsourcing, downsizing, rightsizing, and Baby Boomer retirements. Client-server technologies are quickly becoming legacy. Business leaders are frustrated with long deployments, and IT leaders are struggling with staffing. Many built strategic plans believing that consultants could help them with specialty skills, but the market is flooded with generalists. IT is managed as a cost center and business leaders are seeking value. Is there any wonder that there is a disconnect?

The opportunity is high. In my time as an industry analyst, I have never seen this magnitude in the shift of market dynamics. Traditionally, the focus on IT was implementation. Today, the need is evolution. In short, how can companies maximize the value of current systems?

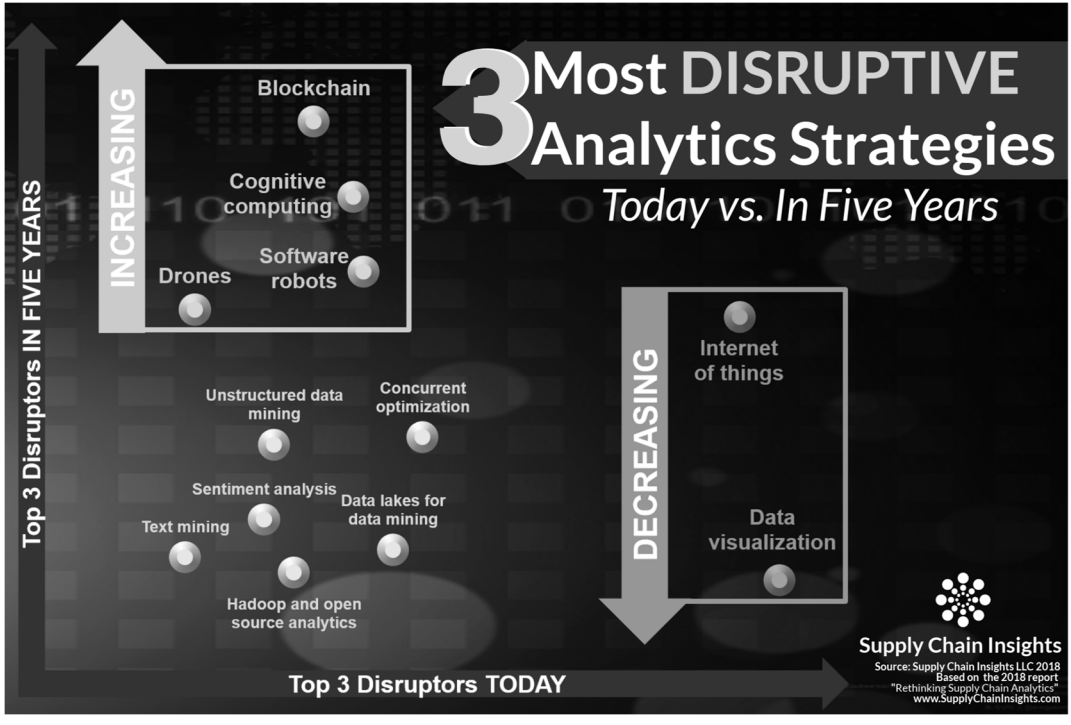
It is not easy. Most organizations have downsized IT and line-of-business teams. The result? A decline in the effectiveness IT systems implemented over the last decade. Neither team has excess resources, and the business struggles to speak the language of IT while the IT resources quest to know more about the business. Most are at a stalemate. What to do?

1. **Go Fast to Go Slow.** Test the possibilities of new technologies. Test and learn through small agile sprints. Fail forward and invest in learning. Avoid conference room discussions based on slideware, and work with technology innovators to test and learn.
2. **At the Beginning of the Project, Shake Hands Affirmatively with Master Data Management. Own It. Don't Let It Own You.** A common misconception is that a digital transformation needs to start with the

cleansing of master data. Instead, the digital transformation embraces disparate data and leverages machine learning to harmonize and synchronize data sources. Use "schema on read" technologies and rely on prescriptive and cognitive computing to drive insights. The current issues with master data were largely driven by a focus on transactional systems requiring "schema on write" (fixed data structures and/or hierarchies).

3. **Explore New Forms of Analytics.** While the traditional analytical approaches were based on analytics as an add-on to what I term alphabet soup (ERP, APS, WMS, CRM, SRM, SCE), in a digital transformation analytics are at the core. While the current focus is on data visualization using descriptive analytics, slowly the industry is embracing unstructured data and new forms of analytics to redefine decision support. The goal is to power data-driven processes that move at the speed of business. For most businesses this is a great opportunity. The believed level of disruption in shown in Figure 2.

Figure 2. Relative Levels of Perceived Disruption



Recommendations

Digital innovation needs to be focused on 'test and learn'. The convergence of new technologies to redefine the atoms and electrons of the supply chain is quite promising, but there needs to be alignment. In this work, here are insights I have learned through working with business leaders:

- **Digital Supply Chain Transformation Is Disruptive.** Set clear expectations. It is not doing what we are doing today better and faster. It is redefinition based on the convergence of technologies to define new capabilities. In the process, teams will need to redefine the paradigms learned over the last two decades. It is uncomfortable. Leaders need to question the known. Teams need to harvest the benefits of the unknown. Early adopters are driving innovation. Only 7% of companies are innovators while 36% of companies believe they are laggards. As a result, many companies are vulnerable for Amazon-like disruption. Early this month, Amazon announced a push into healthcare. Last week, they challenged FedEx. What will be next?
- **Processes Are Largely Undefined.** We do not have the answers. The impact of process innovation is new and evolving. Instead of approaching digital innovation as a large consulting project, it needs to be approached using design thinking with test-and-learn pilots. Don't make the mistake of hiring a large consulting team to drive digital transformation.
- **Testing Requires the Redefinition of Supporting Processes.** Conventional procurement and business process outsourcing is a deterrent. The more that your organization has defined procurement for "global

templates" and institutionalized procurement, the slower your organization will move on testing.

- **Drive Cross-Functional Alignment Early.** Procurement goals are usually a barrier to an agile sprint. The procurement organization is incented for payables that are long (75-120 days). An agile sprint requires quick funding for a 10- to 12-week effort. In addition, procurement organizations tend to treat all vendors with the same terms and conditions. An agile sprint requires the sharing of risk and reward, whereas traditional Ts and Cs push the risk to the technology provider. The takeaway? Bring the procurement team to the table early and review standard contract terms to be sure that they are consistent with the spirit of an agile sprint.
- **Fail Forward.** The traditional organization works hard to not fail. The concept of fail forward is viewed in disbelief. Encourage failure. Let's face it. Through test-and-learn, we learn as much from failure as success. However, no one in the organization is comfortable failing. Next steps? Focus on learning. Highlight the goals of the group then market both success and failure with a focus on the learning.
- **Avoid Religious Arguments.** Terms like agile, demand-driven, Lean and sprint have many definitions. When teams get into religious arguments, everyone loses. Instead, focus on the business goal. Test innovation and new ways of working with the goal in mind.
- **Walk on the Wild Side.** Agile sprint ideation does not happen through discussions with traditional consultants and technology providers. They are as focused on

maintaining the status quo as you are. Push to know innovators. Go where the innovators are and push to understand the 'art of the possible'. As a leader, make time for teams to learn from innovators. I have seen companies do this in many ways including site visits to Silicon Valley, innovation days where technology leaders showcase new ideas, and visits to innovation conferences.

- **Build Innovation Labs.** Take time to build processes to drive innovation using stage gate processes. Use the governance model of product R&D as a guide, and form a cross-functional group to move projects from ideation to adoption. Be sure to have cross-functional leadership representation in the governance group.
- **Lead by Example. Build a Learning Culture.** Invite technology leaders to drive learning. As a leader, be the first to drive discussions on how new technologies like Hadoop, Cognitive Learning, Additive Manufacturing, and Wearables can drive change. Ask groups to learn, and report back on new possibilities.

Wrap-Up

Today, companies have a great opportunity to drive digital transformation. It is a plunge into the unknown and needs to be driven by visionary leadership. On the journey, be clear on the differences between digitization and digital transformation. To be successful, embrace new technologies and drive process redefinition, outside-in, from the channel back.

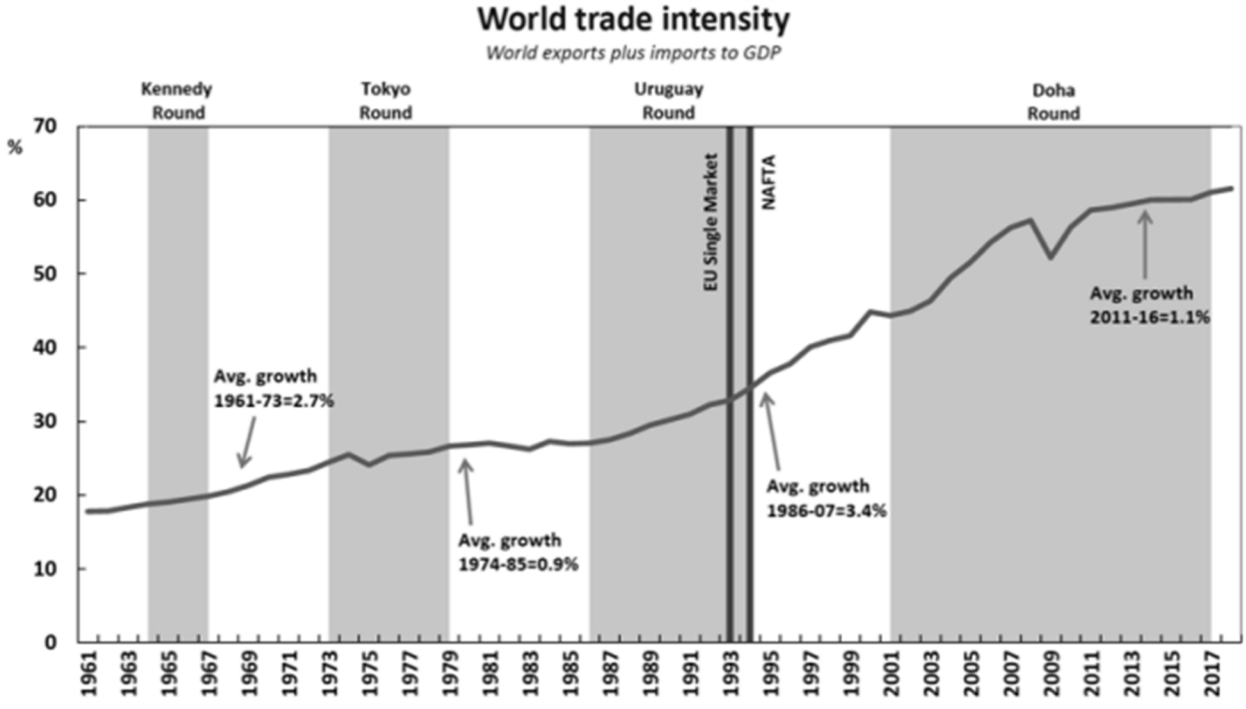
Navigating the Headwinds and Tailwinds of Digital Innovation

Headwinds: A force of resistance
Tailwinds: A favorable force blowing in the same direction

When I travel from company to company and discuss the future of business processes, the term "digital" is ubiquitous. A digital fever abounds. I liken it to the e-commerce frenzy of 2001 (when an "e" preceded every strategy).

Fear abounds. Growth is slowing. Amazon is expanding. Unlikely players are driving change. For example, Google and Tesla are redefining automotive. Airbnb is changing hospitality. Worried executives question, "Could my industry be next?"

Figure 1. World Trade Intensity



Just as Blockbuster missed the online movie experience, and Kodak failed to monetize digital printing, company boards struggle with the thought "Will our story be framed in the next Harvard Review case study of a company that missed the digital pivot?"

The tension within an organization is growth. Public markets reward revenue increases. Average growth for companies for the period of 2011-2016 was 1/3 the rate of growth for the period of 1986-2007. The political environment for globalization is worsening. Trade is tougher.

At the Supply Chain Insights Global Summit Gita Gopinath, a Harvard University economist, forecasted worldwide global growth at 3.6%, but only 1.9% for the more advanced economies in Europe and North America. In contrast, she forecasts growth rates in the emerging economies of Europe and Asia at 4.8%. For the global multinational, powering global growth in China and India is tougher, and with greater intellectual property risk, than driving a digital transformation in North America and Europe.

Times of slow and negative growth bring new tensions to the organization, putting pressure on the supply chain organization. Traditionally, the supply chain focused on cost reduction. Transforming the supply chain as an engine of growth is a new charter requiring a transformation. This includes defining new business models, building test-and-learn capabilities, and driving process innovation. Most supply chain teams have never even ideated with their digital marketing teams, let alone begun the journey of defining new business models. These activities fly in the face of the traditional supply chain charter.

The starting point is aligning on the potential of growth. In our work we see a consistent pattern of over-forecasting. Most

companies over-forecast the growth potential of demand shaping activities of sales and marketing to drive growth. This starts a cycle. The company over-forecasts and attempts to drive growth through sales and marketing activities. As actual market results from the first two quarters post, the organization becomes reactive with a focus on reducing costs and inventory. This whipsaw happens year after year.

Driving a Digital Transformation

So, what does digital mean? There are many possible definitions.

Autonomous Supply Chain: Automation of supply chain processes through cognitive learning and artificial intelligence, eliminating labor, and reducing the need for people to touch data. This includes driverless transport and local delivery.

Value Chain Uberization: A platform to enable shared resources across a community. Examples include Uber and Lyft. Last year I was in Nigeria and witnessed a platform for farmers to share farm implements with payment through the use of MPesa. Each value network has their own opportunity.

3D Printing: Localization of manufacturing through the sharing of digital images using additive manufacturing.

Internet of Things: The use of machine-to-machine streaming data to improve supply chain outcomes. This includes more accurate sensing of replenishment needs, digital manufacturing strategies, redefinition of service for asset intensive industries, and wearables in healthcare to sense vital sign deviations.

Multi-Tier Networks and Redefinition of B2B: The building and execution of multi-tier networks for data sharing, collaborative workflows, and improved decision making. This

includes a discussion of blockchain, network canonicals, cryptocurrency and interoperability. While we have discussed value networks for many years, only TSMC and Walmart used market power to drive differentiation through the building of value networks.

Cloud-Based Computing: The promise of cloud is federation and democratization of data, in both private and public clouds, with the promise of a lower cost of ownership. Newer cloud-based solutions are lower cost with greater capabilities than the traditional licensed offerings.

While most companies bandy the word digital about, few define it. In the current frenzy, when I ask clients what digital means to them, they look at me like I am the dumbest analyst in the world. While I know that this is a possibility, I also know that the first step in driving change is a clear charter for group empowerment. I just think that a digital transformation cannot be actionable without a definition.

A digital transformation requires big feet and big wings. The wings represent vision and the feet action.

The greatest action for companies is happening through chartering small and scrappy teams focused on solving a business goal. The wrong starting point is hiring a large consulting group or engaging with traditional technologies.

Companies on a forced march to implement multi-year ERP and decision support (APS, SRM and CRM) will need to rethink how to drive innovation at the edge to redefine the core. (ERP

becomes the system of record while cognitive computing, machine learning and IOT redefine decision support.) Abandon the thoughts of a bimodal strategy where there are haves and have-nots and begin to redefine business processes outside-in with a focus on the customer. Break traditional functional silos and build processes to sense and translate market opportunities while effectively defining business requirements.

How to get started? Focus on a business goal. Or a peevish problem. Redefine the atoms and electrons to drive value. Technologies abound. Nanotechnology. Blockchain. Cryptocurrency. The Internet of Things. Cognitive Computing. Cloud Computing. Wearables. Additive Printing. The list can go on and on. However, one of the things that is clear to me is a digital transformation is not about technology for the sake of technology.

Let me give you an example. I reviewed a strategy document last week that listed technologies of interest and the desire to test, but the focus was on the automation of today's processes. As I read the document, I shook my head. Making today's processes more efficient misses the objective of the digital transformation. For me it is about the use of the convergence of technologies to redefine processes to build new business models, to improve value, and improve insights/decisions. It is not about technologies for the sake of technologies. Build with a goal in mind.

The building of outside-in processes improves value. Today's processes focused on inside-out processes to optimize and make functional silos more efficient. This did not deliver effective supply chain processes.

Headwinds

Ability to Drive Innovation. Technology and process maturity are only a good fit for early adopters. Today only 14% of companies are early adopters. (Early adopters are willing to spend money and participate in co-development with uncertain outcomes.)

Lack of Process Innovation. A digital transformation requires a process innovation focus. Most companies are good at product innovation, but lack processes for process innovation. Process innovation, new formats and new business formats need to find a place within the organization.

Organizational Learning. There is a need for leadership and an investment in a digital strategy. While many companies talk the talk, they do not know how to walk the walk.

Tradition. Organizations have a strong focus on traditional functional silos and supply chain processes. These are a barrier for change. The digital transformation requires cross-functional process redesign.

IT Focus. Long roll outs of traditional IT architectures from legacy ERP providers are an opportunity cost for digital innovation. These are a barrier for digital innovation. IT teams focused on standardization will push the organization to partner with traditional technology providers, and as a result, the organization will miss the larger technology opportunities.

Tailwinds

Confluence of New and Promising Technologies. A barrier is that new technologies are maturing at a faster rate than companies can adapt to use them. Invest in getting to know new and promising best-of-breed technologies and invest in co-development.

Shifts in Business Models. The shifts in business models in our personal lives are igniting questions for traditional business processes. The closing of traditional retail stores, the redefinition of logistics, and the evolution of mobility drives new discussions.

Recognition of the Growth Opportunity for Digital Businesses. Amazon, Google, and Tesla are leading the way with premium market capitalization. As Amazon separates from the pack redefining retail, the digital vision is getting clearer. It is no longer a retail phenomenon. The Amazon effect is now pervasive across multiple industries.

Pressure from Shareholders to Drive Growth. The pressure at the boardroom is intense. The impacts of M&A and globalization from the last decade were largely disappointing. Companies are seeking new answers.

These are my thoughts. I look forward to hearing from you!

Provoking the Industry to Move Past Incrementalism

Provocateur. A person who or thing which provokes; a challenger, instigator, inciter, irritator; (in later use) specifically "provocateur."
Incrementalism. Movement by degrees. Known by gradualism.

I am tired.

For the past month, I have been working alongside companies implementing digital strategies. In my experience, during the first session, energy is high. As time goes on, these high energies dissipate. They are engulfed by waves of fear. Companies cannot help themselves. They guard the status quo. Change is hard. Despite good intentions, the programs get engulfed in waves of change management. Putting a stick in the eye of the industry is hard work.

Challenges of a Digital Transformation

In a digital transformation, the challenges are many. It starts with the lack of a clear definition. In most companies, I find, that there is an organizational imperative, but no consensus on the goal. Or agreement on the definition of supply chain excellence. Sometimes, even the definition of a supply chain is not anchored. Most are anchored in the paradigm of functional excellence.

Today, we find ourselves in a hype cycle. Instead of pushing innovation forward, I see companies using the term "digital" as a path for IT spending. It becomes a means to finish projects. The focus is on digitization—automating today's processes—versus rethinking process excellence based on the art of the possible.

The term digital is cool and hip. My fear? We are quickly falling into the trough of disillusionment because we are not thinking more broadly.

What Is A Digital Transformation?

I define digital as the rethinking the atoms and electrons of the supply chain. It is the ability to think differently and drive new outcomes. As I speak of this vision, most executives scratch

their heads. In their minds, the term digital means digitization. Why does it matter? What is the difference? Digitization is the taking of existing processes and improving digital capabilities. Literally putting todays' s processes on steroids. Why is this an issue? Today's processes are not improving outcomes.

Stepping Back. Questioning the Basics.

When we study 600 public companies by peer group, we find that 90% are stuck at the intersection of inventory turns and operating margin. Unable to drive improvement, companies speak of "basics" and the need for "best practices." However, as I talk, and question if traditional practices can break the chains that bind us, most go, "huh?"

That is me, the serial provocateur. …a person that keeps challenging. I keep pushing for better outcomes.

Let's start the discussion with a focus on philosophy. Supply chain planning was designed to improve decisions. There are many forms of decision support—price optimization, revenue management, transportation planning, spend management, network design. The problem is that each form of decision support solution was designed to optimize the outcome within a function. Most were developed based on the principle that history is a good predictor of the future. And, that the supply chain response is linear and that history can be used as an input into a linear optimization model to drive a better answer. However, most of the data is not a normal distribution. In today's supply chain, these traditional assumptions are usually false; yet, we try to use old-fashioned tools to drive better decisions without testing the output of the systems. In five companies that I have worked with in the past quarter, each degraded the forecast (using Forecast Value Add methodology)

by 10-18%. The issue? They believed that the system was driving improvement.

Houston, We Have a Problem.

Remember this phrase from the US Apollo 13 mission? In this mission, the astronauts were communicating a problem. In supply chain, we have a problem. We cannot move forward unless we admit that we have a problem and agree that today's processes don't work.

I am Irish. Every man in my family has struggled with addiction. Gambling, drinking, drugs…. The first step of addiction recovery is admitting the problem. The supply chain needs to get on the road for recovery.

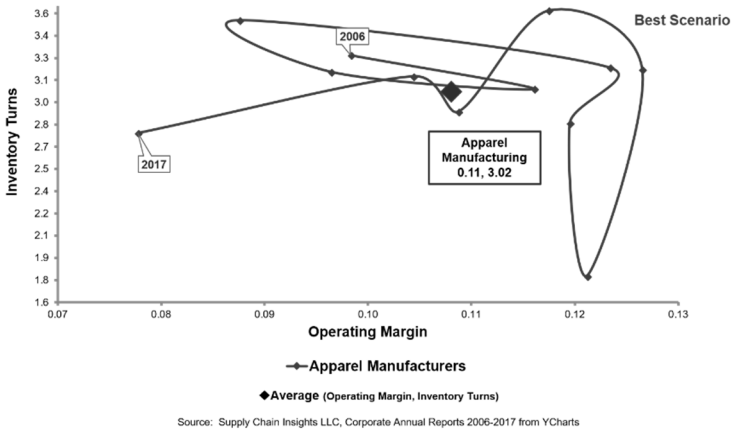
I believe that the supply chain market has been co-opted by technologists and consultants. Event companies perpetuate the myths of best practices. Technologists love their solutions. They want to talk. The sales teams at software companies make great salaries selling software. In the process they sell hope.

The industry has too many events. The events are funded by sponsorships not a quest for the truth. In the last decade, each party—consultants, technologists and event companies—have made a lot of money. However, buyer beware. The motives are not pure. The problem? We are not improving balance sheets.

To make the argument, let's look at industry orbit charts (Figures 1 and 2) in aggregate for the period of 2006-2017 for the apparel and chemical companies. An orbit chart is a plotting of data at the intersection of two metrics. In this case, the metrics are operating margin and inventory turns. Operating margin is a measurement of profitability and inventory turns is a measurement of how fast inventory is turned based on sales.

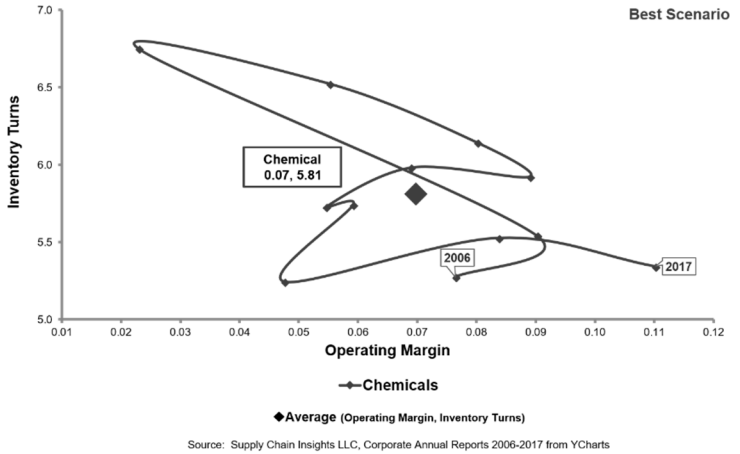
Both of these industries evolved through a major economic shift. For apparel, it was the transition to cheaper labor in the Asian market. (In the apparel industry 30-40% of the cost of goods is labor.) In the chemical industry, the boon was the falling price of oil. Today, the price of a barrel of oil is $64.82. In February 2016, it was $29.69. In February 2014, the price was $103.40. If this orbit chart depicting margin is held against the cost of a barrel of oil, the patterns are very similar. Chemical margins are following oil prices. Apparel margins are following the shifts in the labor market. In neither industry, despite the spend of 1.7% of revenue on IT are we improving inventories. The margins of the apparel industry have declined from 10% to 8% over the period of 2006-2017. Industry turns have also declined from 3.3 to 2.8. This is not progress.

Figure 1. Apparel Orbit Chart for the Period of 2006-2017: Intersection of Operating Margin and Inventory Turns



Similarly, in the chemical industry, margins have gone from 7.5 to 11.5%. The gains mirror the cost of oil. However, inventory turns have gone from 7 to 5.2. This also is not progress.

Figure 2. Chemical Industry Orbit Chart for the Period of 2006-2017: Intersection of Operating Margin and Inventory Turns



Source: Supply Chain Insights LLC, Corporate Annual Reports 2006-2017 from YCharts

Houston, we have a problem. Traditional supply chain problems are not equal to the challenge of supply volatility. Our decision support tools today are not able to help drive better decisions for the complex, non-linear system that we call supply chain. We are optimizing volume, not value.

Moving Forward

To move forward, start with a goal in mind. Inventories are ballooning, and customer service is getting worse. This should not be the case as we enter the third decade of supply chain management.

Begin the journey focused on solving a problem. Carefully examine the philosophy of historic solutions, and ask yourself some questions:

- **Functional Excellence.** Do you believe that functional excellence can drive supply chain excellence? If so, invest

in the status quo. In the 1990s, technology limitations only allowed for the optimization of a function. Today, this is no longer a barrier. If your goal is functional excellence, invest in traditional systems. If not, consider alternatives.

- **Time Is Not Optimized.** In the supply chain, latency as increased. This has happened due to both complexity and globalization. Data latency is an issue and an opportunity. We optimize things—inventory or assets—but, not time.
- **Integration Versus Synchronization.** This is not an integration problem. Instead, it is a synchronization opportunity. We need a synchronized supply chain not an integrated one. The difference is dramatic. The synchronized supply chain accounts for the discrepancies in time and compensates for latency.
- **Inside-Out or Outside-In?** Business processes today are outside in. Yet our technologies are outside-in. This is both a problem and an opportunity.

Recommendations

If you are a technologist, here is my advice.

- **Be Purposeful.** Stop the spend on sponsorships at events. Let's face it. We have too many bad events spreading the myth of supply chain best practices. Instead, invest in research and driving value with clients. While you may love your solution, hold yourself true to the purpose of helping clients. Understand how your solution can help solve supply chain problems. The investments in pink ghetto marketing with "frou frou messages" only serve to line the pockets of technology

sales teams. Long term, we must drive value for customers. We must stop marketing lies. Let me give you an example. If we use the balance sheet improvement as a guide, the best run companies do not run SAP. There is no significant difference in performance of SAP clients versus other options. It sounds nice. The ads are pretty, but the technology fails in driving a significant improvement in balance sheets.

- **Admit the Problem.** I laughed when I read a recent article by the new CTO of JDA, "*Three Paths for Innovation*." He argues that the company can orchestrate the moonshot, the pivot, and drive incremental improvement simultaneously. I beg to disagree. First let me state, that I would welcome any level of innovation at JDA. Secondly, let me add, that technology companies are tethered to incrementalism. The incentives—sales cycles and maintenance upgrades—are a gravitational force that holds companies back. They are a barrier to true innovation. JDA is a laggard in the market. The strategy was to "milk maintenance revenue" and drive consolidation through debt. I would like JDA to start by testing the output of their planning systems for free at clients. A tune-up for maintenance clients, and then holding themselves accountable for output. JDA is not alone in this issue. The traditional industry players—Adexa, Logility, SAS, Kinaxis—are moving in the market incrementally. The larger danger is the badly implemented ERP planning solutions from SAP and Oracle that are being implemented by large system integrators.

- **Invite Clients to Bring You Problems.** Start centers where companies can bring you hairy problems to solve. Love your clients more than you love your technologies. Learn how to listen. Break the traditional barriers of traditional client relationships.

If you are a line-of-business leader, start the path to drive improvement:

- **Don't Buy Technology Until You Align on the Goals and Philosophy.** Question the concepts and get clear on the philosophies that are important in your digital transformation. Start with the alignment on philosophies.
- **Break the Traditional Commercial Cycles.** Build a fast-track on-ramp for technology innovators to test and learn with you. Don't fool yourself. No technology innovator wants to engage in a three-month sales cycle with 90-day terms.
- **Get Clear on the Terms.** Most business leaders speak in gobbledygook terms like "I want a control tower to improve end-to-end visibility and drive results for the integrated supply chain." When I hear this statement, I start asking questions. What is a control tower? How do you define visibility? What makes you think you want and need an integrated supply chain? Buyer beware, gobbledygook solutions do not drive value.
- **Question Standardization.** The companies attempting to use IBM, SAP and Oracle to drive this type of digital transformation are struggling the most. Realize that just because large vendors have the term "digital" in their PowerPoints, that this does not make it real.

The Move to Digital

Last week was the sixth anniversary of my founding of Supply Chain Insights. Over 1000 people wrote me congratulatory notes on LinkedIn. Most were from people who I do not know. I find this rewarding and humbling.

February also marks my eighth year of blogging. The journey of creating Open Content research and blogging is a life journey that chose me. I didn't choose it. The path is one that I could not have predicted. When I was in college, the concept just did not exist. The idea of sitting at my kitchen table and reaching 1000s of supply chain leaders was unthinkable.

When I worked for AMR Research, I believed I would work there until I retired. I could not have predicted the founder of AMR Research selling the company to Gartner Group. With

his sale to Gartner, I had to leave. I do not believe in the Gartner model. The reasons why I don't believe in the Gartner model are a subject for a late-night drink at a bar. In essence, my goal is to be independent and be able to write on the evolution of the world of technology as I see it unencumbered by pressure from large technology firms. I just do not believe in pay-to-play. I wanted freedom to write as I see the world.

When I started, I had no idea of the power of Open Content research. To frame the discussion, let me share some reference data. When I worked in traditional research companies (Gartner and AMR Research)—with the research tucked-up behind paywalls—1800 business leaders read my articles on a good day. In contrast, today, my articles on LinkedIn reach over 250,000 global readers, and this blog has 1800 readers on the direct RSS feed, and 15,000 supply chain leaders around the world read the content. Each day, I get inquiries to put advertising on this blog. I turn them down because I am fiercely independent. The digital evolution made my building of Supply Chain Insights, and the new business model, possible. However, I would not have done it if AMR Research was not bought by Gartner. Digital business models usually happen either out of failure, desperation, or the result of a visionary leader.

When it is time for a baby bird to fly, the mother pushes the bird out of the nest. I think the adoption of digital processes is analogous. I would not have started a new business model unless I was forced to fly on my own. I see it every day in discussions with business leaders.

Reflections

I think this is a good context for a discussion today, in this blog, on the digital supply chain. Last week, I had discussions

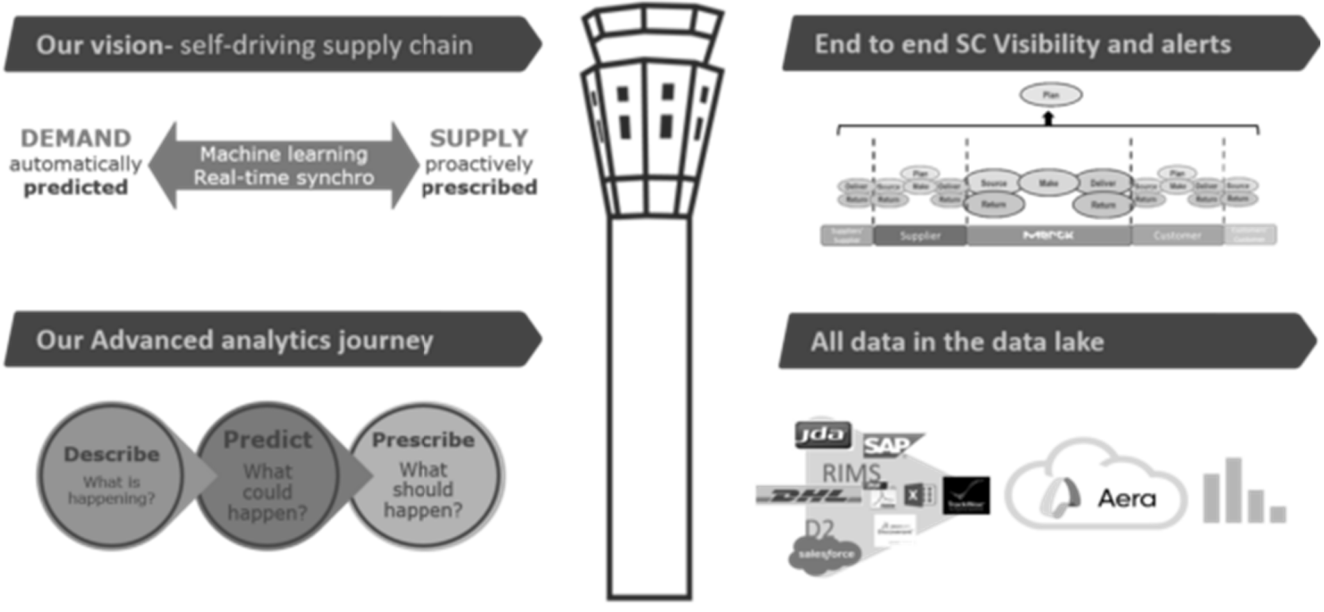
with digital supply chain leaders from three companies. The conversations were similar, "How can I get my business leaders to embrace a digital transformation journey?" In essence, today manufacturing leaders are flooded by presentations from consultants attempting to sell a message to begin a digital journey. The reason? It is a new gig. ERP projects are drying up and the consultants need to create their new market. We are in a hype cycle.

On the calls, we discussed the difference between the digitization of data and the creation of digital processes. At the end of one of these discussions, the person on the other end of the Skype call said, “I work for a German company. There is no reason to change. In the German language, there is no distinction between the terms digitalization and digitization." In the conversation, we laughed and postulated that this might be a reason why German software companies are so slow to redefine the Art of the Possible.

What Is Digital?

I define the digital supply chain as rethinking the atoms and electrons of the supply chain to drive new levels of value. For example, do we need orders with the evolution of blockchain as the system of record? With additive manufacturing, do we need inventory? With software robots and rules-based ontologies, can we redefine a more effective and autonomous process for customer service? With Amazon owning 40 planes and 300 warehouses do we need traditional 3PLs? Can a retailer print product in their store? Or a hospital use additive manufacturing to produce/print organs for transplant? The answer is yes. The question is when. The shift takes courage, leadership and vision.

Figure 1. Merck's Vision for Supply Chain Visibility



The concept of the integrated supply chain is becoming outdated as companies look at building architectures that can sense, translate, think, and act. "Schema-on-read" architectures are replacing "schema-on-write" technologies like Enterprise Resource Planning (ERP) and Advanced Planning (APS) in the areas of visibility, track, and trace. Traditional schemas are too confining for decision support, visibility, and other functional applications. In our recent webinar on visibility, Merck discussed the use of a schema-on-read architecture augmented by cognitive computing as shown in Figure 1.

In an earlier webinar, we discussed how a major manufacturer is redefining proof of delivery (POD) using sensors, and streaming data, with open architectures from Kafka and Apache Spark. While laggards speak of expanding SAP HANA, innovators are pushing the use of open architectures like Hadoop and Blockchain.

In the process, manual coding of master data is becoming obsolete. Machine learning and rules-based ontologies are mapping the data automatically sourced from data lakes. Leaders are making small steps towards the building of an autonomous supply chain that can adapt. The givens are giving way to new possibilities.

Driving Change/Pushing Change

Why change? As we talked on the phone, what became clear is that while individuals want to drive change and are provoked by consultants to rethink their supply chains, the challenge is just too tough. Taking the jump to define and drive digital supply chain thinking is a risk for the well-paid individual with great benefits. The entrepreneurial spirit is not alive and well within the large manufacturing company. The digital supply chain is

just too big of a risk for the average employee. An organization is designed to drive improvement in the status quo but does not encourage employees to rethink supply chain processes. While organizations are very focused on the development of new products, the same is not true for the redefinition of new processes. It requires leadership. Just as I was forced to create a new model, there needs to be a compelling event or push from leadership.

SECTION 2

Supply Chain Process Improvements

Don’t Get Religious about Demand-Driven

The 2016 US presidential political contest was brutal. Emotions are still quite raw. I hated it. When emotions run high, everyone loses.

Unfortunately, I think the concept of "Demand Driven" is headed down the same path. The discussions are becoming religious arguments about right and wrong instead of healthy discovery (much like this picture of Tibetan monks debating). Let's face it, the definition of demand-driven is evolving. There is no single definition. Today's processes are largely supply driven. The base definitions of the SCOR model are inside-out, and supply-centric. They do not work as well as we would like. The 1990's technologies of Advanced Planning (APS) along with Distribution Requirements Planning (DRP) and Material Requirements Planning (MRP) amplify the bullwhip effect

within the supply chain resulting in the loss of agility and an inflexible response for the long tail of the supply chain.

Why is this important? As companies personalize product offerings, the tail grows. For example, over the last five years, in consumer products the average company increased items by 38%. Because of growing item complexity, the demand profiles become lumpier with increased demand latency. (Demand latency is the time that it takes from shelf take-away to order processing. In the 1990's demand latency in a regional supply chain was weeks. In consumer products today, based on item proliferation, demand latency for many products is now months, making the order a poorer representation of true demand. It is often out of sync with the market.) Today, based on the use of traditional processes, companies cannot sense market shifts quickly and align their supply chain response.

Figure 1. Demand-Driven Definitions

Evolution of Demand-Driven Concepts
Consumer-Driven Supply Networks: As defined by P&G in the 1990s: a shelf-driven, outside-in process, defined by successful execution of the two moments of truth.
Demand-Driven Supply Networks: As defined by AMR Research in 2004: a supply chain that senses and translates market signals in real-time.
Demand-Driven Value Networks: As defined by AMR Research in 2007: a network that senses demand with minimal latency to drive a near real-time response to shape and translate demand.
Market-Driven Value Networks: As defined by Supply Chain Insights in 2010: an adaptive network focused on value-based outcomes that senses, translates, and orchestrates market changes (buy and sell-side markets) bi-directionally with near real-time data to align sell, deliver, make and sourcing organizations outside-in.

Reflections

In the period of 2005-2010 I created research on the topic of demand-driven value networks as an analyst at AMR Research. This ended when Gartner purchased AMR Research in 2010. Since I do not believe in the Gartner business model, I left. After reflection, I broadened the demand-driven concepts and started writing about Market-Driven Value Networks in 2012. Listed in Figure 1 is the Market-Driven Value Network definition along with the prior definitions from the work at AMR Research.

Definitions Matter

Over the last decade many technology providers co-opted the term without understanding the concepts. Sitting in a SAP presentation, using the term demand-driven at the recent SAP Insider conference, without grounding in the definition is painful for me. In the SAP presentation, I saw traditional supply-centric concepts rebranded as demand driven.

In 2013 the Demand-Driven Institute redefined the term "demand-driven," giving it a very different meaning than the Demand-Driven Value Network concept defined by AMR Research in 1996. (The Demand-Driven Value Network model is now owned by Gartner Group.) Their definition is "Demand Driven Material Requirements Planning is a formal multi-echelon planning and execution method to protect and promote the flow of relevant information through the establishment and management of strategically placed decoupling point stock buffers."

Kudos to Carol and her partner Chad for gaining market attention. The concepts of DDMRP are growing in popularity. However, despite the excitement, the current implementations are largely small and regional projects. The software approaches

and project implementations are not enterprise class. The current focus is on inside-out enterprise processes, not outside-in value networks. In addition, the branding of how Demand-Driven Institute certifies software is confusing. Many of the websites for the certified software, carry similar branding to the DDMRP group leading to market misunderstandings.

Does this mean I think we should throw out the baby with the bath water? Absolutely not. Carol's work on Demand-Driven MRP is solid. The Demand-Driven Institute's concepts on material planning are important to the demand-driven road map. It is just not the end state. Alone, it is not sufficient to build a demand-driven road map. I believe that the work done at AMR Research on the design of outside-in processes, along with the recent work from Supply Chain Insights, needs melding with the demand-driven MRP concepts. I also believe that with recent technology innovation the vision is much, much more. We need a definition of demand-driven manufacturing and transportation, and the building of multi-tier canonicals in the network of networks.

Moving Forward

So, if you are a leader of supply chain processes trying to build a market-driven or demand-driven roadmap, what do you do? The first thing to do is to question traditional supply chain planning concepts and platforms. I recommend five steps:

1. Define the process from the customer back, mapping all the demand signals (social sentiment, weather, ratings and reviews, channel inventories, and point of sale) and define how to use new forms of demand data. Measure and understand the impact on demand latency.

2. Build an outside-in demand planning model to use channel data. Experiment with attribute-based planning and probabilistic forecasting to better predict the long tail.
3. Use the probability of demand (not the fixed numbers) to drive the flows and buffer strategies for inventory and material planning. Focus on managing form and function of inventory. I define it in Figure 2:

Figure 2. Form and Function of Inventory

Form	Function
Supplier owned inventory: raw materials	In-transit Inventories: Inventory that is on trucks, barges and containers. The longer the trade-lanes and the slower the mode, the larger the requirements for in-transit inventory.
Company owned inventory: raw materials	Cycle Stock: In the planning of production, finished good production is cycled to ensure that the production lines are fully utilized. The average rotation between products on production lines in consumer packaged goods is three weeks.
Work in process inventory	Safety Stock: Inventory requirements to buffer demand and supply volatility.
Finished goods at the company warehouse	Seasonal Inventories: Inventories required to support seasonal builds.
Finished goods in the channel	Promoted Items: Inventories to support the promotional lift to support a promotion.

4. Implement demand sensing technologies to improve the short-term demand signal to improve replenishment and supply chain execution. Most of these projects are evolving.
5. Experiment with new technologies to drive improvements in traditional approaches. I list some that I think are promising in the next section.

Next Steps? Consider Alternatives.

Avoid doing development with traditional supply chain leaders on demand driven. Most of these efforts circle the drain. These companies are fighting for deals in traditionally supply-centric models. Here are some promising opportunities:

1. **Use Machine Learning to Improve Planning Master Data and Improve Sensing in Supply Chain.** Be aggressive on the use of this promising technology.
2. **Use DDMRP for Demand-Driven Manufacturing.** Translate demand and drive a buffer strategy.
3. **Redefine Forecasting.** I am fascinated by the concepts of schema on write for demand planning.
4. **Cognitive Computing.** Today, 7% of companies are experimenting with cognitive computing. While new, the promise id great.
5. **Streaming Data Architectures.** In the area of the Internet of Things, the discussion is on how to best use the data. Streaming data architectures are evolving, and there are new sources of definitive data.
6. **Market-to-Market Orchestration.** The concept is simple. A reverse bill of material optimization in sourcing based on market cost. Most companies cannot connect what is happening in real-world sourcing to execution. The focus is on volume not on value.
7. **Cost-to-Serve.** The focus is on understanding the incremental costs for each customer and the inherent costs of policy. Unfortunately, there are few enterprise-class data models to enable this process.

In summary, I think advances on the demand-driven concepts happen when supply chain leaders redefine their processes, outside-in, using market data and orchestrating from market-to-market. These are very different concepts that are pushed by supply chain traditionalists. As a result, the fastest progress happens through work with best-of-breed providers.

Supply Chain Leaders Take a Walk in the Valley of Uncertainty

Three months ago, I was asked to write a piece on the impact of pending tariffs on global supply chains. It is hard to write a non-political post on this subject. I am a supply chain gal: not a politician. Consequently, it has been rolling-around my brain for three months. Here I share my thoughts.

Globalism. Nationalism.
...a tug of war between countries for jobs.

Within countries, ideological thinking drives a chasm between political factions. It is a valley that the supply chain leader must walk in the face of uncertainty. For decades supply chain leaders focused on opening borders. This is being

redefined. The result? Brexit, tariff battles and economic uncertainty. Changes in legislation shift demand and transform sourcing strategies. Dramatic shifts. However, the choices are often reactive not strategic. Most business leaders do not realize the degree of risk as they walk the valley. They assume the assurance of supply. They should not. The impact? Playing with fire. Deleterious results.

Figure 1. Shifts in Supply Chain Risk Over the Last Five Years

The concepts of business continuity and risk mitigation are often in conflict with short-term gains of populist politics. Warning. The global supply chain is fragile. When one chain breaks, customers suffer. Supplier viability issues are not well understood until they are front page news. Over the past five years with elongation of payables, increased corporate

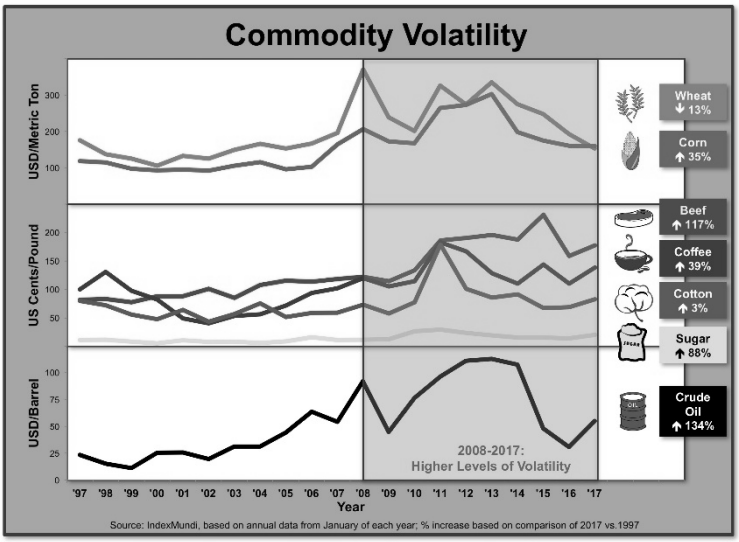
bureaucracy in procurement processes and increased volatility, supplier viability risk has never been greater. It has never been harder for a small supplier to do business with a large manufacturer.

We are seeing a shift in sourcing strategies across commodities. Steel. Aluminum. Sorghum. Oil. Pork. At the same time, we are experiencing a shift in what we sell. It is the transformation of a manufacturing economy to a connected economy. There is a shift from selling atoms to moving electrons. The focus is on products and services together to drive outcomes. Product compliance and regulations increase the issue. As a result, sourcing shifts are more difficult. There are fewer qualified sources. For example, a modern high-end car depends on 100 million lines of software code, and this number is planned to grow to 2-3X in the near future as we build autonomous and connected vehicles.

Rising Anxiety

Tension is mounting. While popular sentiment focuses on the preservation of traditional manufacturing jobs, supply chain leaders are focused on the disintermediation of supply chains to improve value. As conservative politicians use the heavy hand of tariffs and new policies to increase border friction, supply chain leaders are trying to reduce the global friction across borders. Commodity futures, with the rising cost of oil after a three-year period of low prices, loom as a dark cloud. Oil and data together grease the engines and levers of the supply chain. Yet, within companies there is a functional mindset which prevents companies to adapt to unprecedented volatility in commodity markets. The lack of organizational alignment across functions is a barrier to respond in the face of change.

Figure 2. Shifts in Commodity Volatility



Populist views focus on in-country manufacturing, but the line of where manufacturing stops and sourcing begins is blurred. With the degree of outsourcing of platforms and parts, the supply chain is much more dependent on the global network. Increasingly, it is very hard to define where a product is manufactured. The world is less dependent on regional supply chains; yet governmental thinking is trying to push the supply chain back into a regional model. The fragility of supply will result in business discontinuity.

Suggestions

In my job as a speaker and industry thought leader in supply chain, I travel the world. The world is on edge mesmerized by CNN. Taxi cab drivers, bartenders and waiters ask me about US policy shifts. The edginess is pervasive.

Supply chain leaders are trying to navigate new trends in the valley created by the chasm of political shifts. It is risky. Here I offer three pieces of advice.

Tax Efficiency: Carefully Navigate Risk and Rewards. Policy can redefine supply chains quickly. Hurricane Maria is an example. In 2011, I attended a risk management conference in Puerto Rico. Due to favorable import/export legislation, pharmaceutical and medical device companies aggregated manufacturing in Puerto Rico. The attendees at the conference, quite proud of the cost savings to the supply chain, hosted a dinner to celebrate the reduction in costs due to tax efficiency. When one attendee asked if companies were worried about the potential of a hurricane on the business, the answer was, "We have not had a hurricane in over a decade."

Based on taxation legislation, the shifts were extreme. Before hurricane Maria, thirty percent of Puerto Rico's Gross Domestic product was based on pharmaceutical and medical device exports. The reason? A shift towards favorable taxation laws. The issue? It was risky. Hurricane recovery was slow and it took five months to restore power. Baxter International designed their supply chain to only manufacturer small volume intravenous fluid (IV) products in Puerto Rico. They did not apply for approval by the FDA to source from other locations. They were the only major supplier of a critical healthcare item and they were sole-sourced in a high-risk area of the world based on favorable tax laws. Short-term thinking focused on cost increased risk for hospitals. When hurricane Maria hit, the awareness of the issue by North American hospitals was low. The industry was not ready. They were surprised. Today, eight out of ten companies do not know where their second and third tier supply is sourced. Only 15% have active supplier development

programs that can respond—teams that know the sourcing locations and are able to go into crisis and help suppliers—in the case of supply disruption. The answer? Form an effective supplier development team. Know the locations of all suppliers: not just first tier and actively manage the relationships to mitigate risk. When the Japanese Tsunami hit, Intel knew all of the locations of their suppliers and sent supplier development teams to help. In contrast, Ford's manufacturing sites were idled due to a lack of supply from a second-tier manufacturer of fasteners. They were unaware that the source was at risk. Learn from Ford. Act like Intel.

Increasing Volatility. Rethink Demand Management?

Shifting supply. Erratic shifts in demand. In this dynamic environment, traditional supply chain processes based on inside-out processes are not adequate. Instead, companies need to think of demand as a river that ebbs and flows in the banks of the supply chain. The river starts with the channel, or tributaries of demand. The flows need to be mapped from the customer to the organization with an intense focus on the sensing and translation of demand into supply. It can no longer be envisioned as a functional process focused on linear optimization using order or shipment patterns. Most companies spend too much time trying to make imperfect numbers perfect. Instead, the focus needs to be embracing demand error and designing for demand flows. In this effort, important tactics include platform simplification, customer segmentation, inventory buffer strategies, push-pull decoupling points, product rationalization, and inventory postponement strategies. How to respond? Form a demand management group with clear regional/global governance and begin to map and sense the flows of the river of demand outside-in (from the customer back). Build strong "what-if" capabilities

to understand the impact of agility strategies. Invest in talent. Never implement a technology blindly. (We find that most companies that do this go backwards not forwards. Test and learn.) Then orchestrate demand across the organization by testing alternatives like bill of material options, inventory strategies, sourcing alternatives and modeling multiple data sources.

Supplier Risk Management. Disruption. All the Eggs in One Basket? This week, Ford Motor Co's quarterly earnings is affected by shutdowns at three U.S. truck plants caused by a fire at a key parts supplier, Chinese-owned Meridian Magnesium Products operating in Eaton Rapids, Michigan. The May 2nd fire triggered smaller production disruptions to other vehicle manufacturers, including General Motors Co, Fiat Chrysler Automobiles, Daimler AG and BMW AG. The difference? Less dependency on sole sourcing. The two-week production halt for the F-series trucks could slice as much as $310 million from Ford's second-quarter profits. Let's take a second example. Aerosoles' low-cost sourcing strategy was the start of the retailer's demise. Faced with sourcing issues and retail competition, the company restructured in 2017 and shuttered over 70 retail stores. The demise started with a bet on large contract for low-cost country sourcing with a major contract. The new supplier that struggled to meet quality requirements. What to do? Risk is rising. Sole sourcing implications are greater today that before. Focus on vetting suppliers and ensuring sourcing alternatives.

One thing is clear. The future is unpredictable. Economic uncertainty is increasing. The global supply chain is more complex and will become increasingly more difficult. While politicians can pretend that they can control the ebb and flow of

goods across borders, the design for industry needs to be resiliency—the ability to adapt to changing uncertainty of all types. The supply chain leader is feeling quite alone in the valley between nationalism and populism and the shifting rules/regulations. It is a new set of challenges. Give him your support.

I welcome your feedback. You can usually find me in the back of a cab visiting a global supply chain leader....

The Job Is Not Done

Imagine driving down a dusty road for years. One without any towns, road signs, billboards, or rest stops. Sounds boring, right? I agree. This is the world of the supply chain leader driving process improvement. The road to supply chain excellence takes time and patience.

There are no clear landmarks or directional signage. Today, in organizations, there is a large gap between technology and process effectiveness. Here we examine some recent data on managing costs.

Sex, Sizzle and a Closet Full of T-Shirts

Technology implementations are the easy work. Driving value is much, much harder. While our closets are full of the T-shirts celebrating successful project implementations, it is tougher to acknowledge and reward process improvement work. I find most companies' work plans stop with the implementation of Enterprise Resource Planning (ERP).

I get it. Implementing an ERP system consumes so much organizational energy. Technology vendors court and cajole through the selection processes, and large system integrator project management takes the wind out of any organization's sails. Unfortunately, at the end of the project there is too little energy to drive process effectiveness.

Why Are We Not Better at Managing Costs?

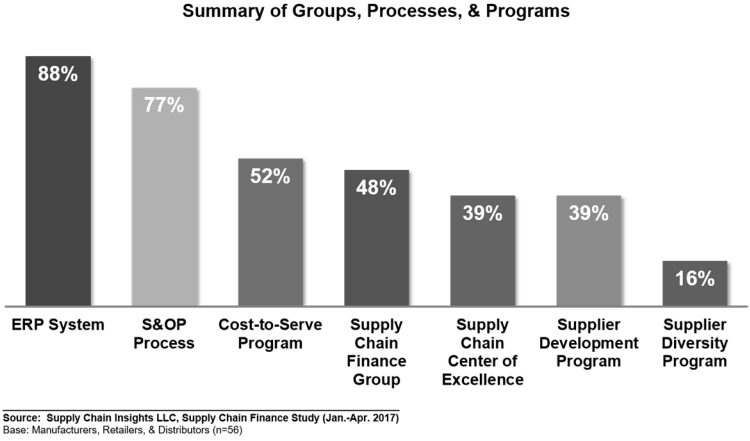
Let's take a look at some data. Last week we completed a quantitative study on Supply Chain Finance. The study had 56 respondents. Only 29% felt that they could easily get to cost data. For the majority in the study, getting to supply chain cost data was difficult.

For the supply chain leader, managing costs is job one. While we can argue about the road from cost to value, no one will debate that managing cost is fundamental 'blocking and tackling' for the supply chain team.

In a closer look at the data, 88% implemented an ERP system. As shown in Figure 1, there is also a high incidence of

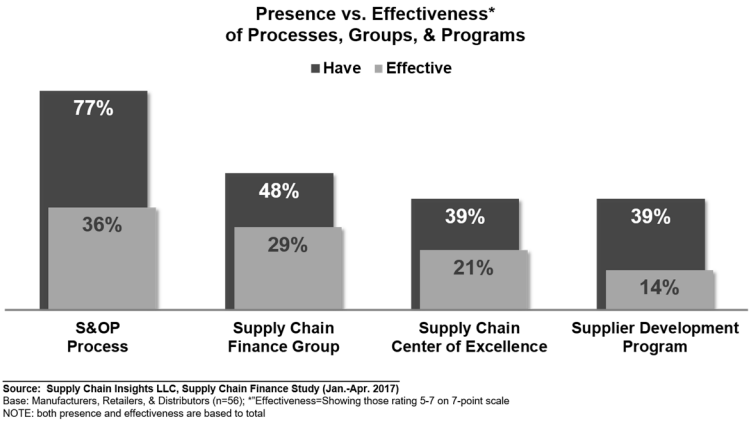
process focus work on S&OP, Cost-to-Serve, Supply Chain Finance, Supply Chain Centers of Excellence, and Supplier Development. Why is effectiveness in managing costs, and getting to cost data, so difficult? The answer lies in the multi-year work where we do not get T-shirts. It is the difficult task of building process effectiveness.

Figure 1. Characteristics of the Group Surveyed to Understand Supply Chain Finance



There are many groups who allege to have the answers. I am sure your email is full of consultant business development campaigns and sexy programs to drive success, but my take is that it comes down to leadership and grit. The road to supply chain excellence is not easy or well-understood.

Figure 2. Process Effectiveness Analysis

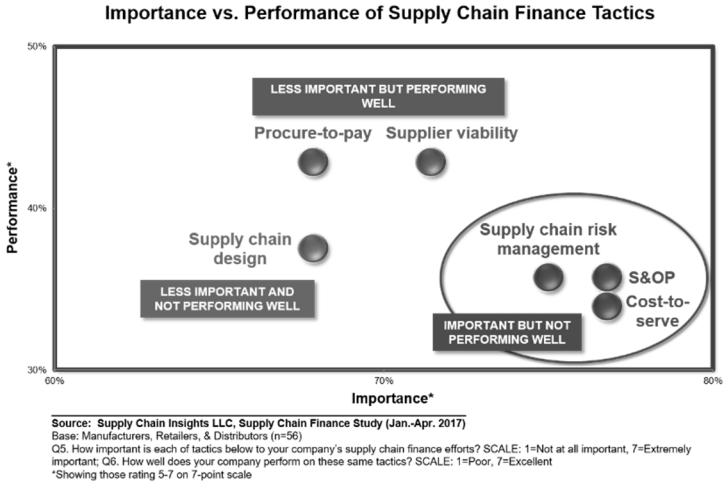


Recommendations:

So, what do you do? How do you drive better insights from the technology you have?

1) **Challenge Traditional Thinking.** The greatest cost opportunity lies in the cracks of the silos of the organization. Traditional thinking makes the organizational silos very efficient but does not make the organization effective at managing costs. Push past the focus on transactional processes, like order-to-cash and procure-to-pay, and drive alignment and cost awareness in cross-functional processes like Sales and Operations Planning, Cost-to-Serve, and Supplier Development. This is not easy work. Be prepared to answer the question of which metrics drive the greatest value. Note the pattern in Figure 3. Companies rating themselves higher in ability to manage costs also rate themselves higher in Sales and Operations Planning, Supplier Risk Management, and Cost-to-Serve Programs.

Figure 3. Importance Versus Performance of Processes



Source: Supply Chain Insights LLC, Supply Chain Finance Study (Jan.-Apr. 2017)
Base: Manufacturers, Retailers, & Distributors (n=56)
Q5. How important is each of tactics below to your company's supply chain finance efforts? SCALE: 1=Not at all important, 7=Extremely important; Q6. How well does your company perform on these same tactics? SCALE: 1=Poor, 7=Excellent
*Showing those rating 5-7 on 7-point scale

2) **Embed Network Design Work into Process Evolution.** While many companies use network design tools for one-off or ad hoc processes, embed network design into S&OP, Risk Management and Cost-to-Serve. Plan by design. Make the work continual. The most variability stems from transportation, special requests, product mix, and customer service policies. Understand the impacts and drive process improvement.
3) **Recognize that the ERP Implementation Is Not the End State.** While many leadership teams believe great things will happen with the implementation of ERP, challenge the paradigm. Many companies have implemented technology for the sake of technology. The hard work lies in driving process effectiveness. My observation is that the greater success happens when there is a clear charter for the Supply Chain Center of Excellence, and when there is clear alignment between IT and the business teams. (Supply Chain Excellence is easier to say than define. Make it real for all.)

I hope this helps. For more on this topic, look for our Supply Chain Insights Newsletter next week. Each month we publish and share research reports openly with the supply chain community. We have written over 100 reports in the last five years. We hope that you use the data to help your team.

What Remains the Same

This was a tough travel week on the East Coast by any measure. I'm rearranging my schedule as stranded friends cancel personal plans. As I write, a ferocious wind whips around my apartment windows reminding me that the weather always has the upper hand.

My goal in this blog post is to answer a series of questions I got from the audience when I spoke at a couple of conferences this week. The primary question was, "With so many things changing, what remains the same?"

Leading in the Face of Change

I am 63. I have been an industry analyst for sixteen years. I have never seen the rate of change which is occurring now. It is both unprecedented and disruptive. The supply chain leader is incredibly busy and made even busier by having to navigate systems that don't work well. Unfortunately, this gives them

little time to keep up. Many feel overwhelmed. To help, let me share the questions I got this week.

On Wednesday morning, when I finished speaking at the Foundation for Strategic Sourcing in Fort Lauderdale, an executive from J&J pulled me aside and said, "Our strengths, are now our vulnerabilities." He continued, "Great mass marketing used to be our differentiator, but now the barriers to entry have changed. Through digital marketing, small brands are cropping up all over, and it is sentiment analysis and digital content driving purchases. How do we compete?"

A supply chain leader from GE at another conference said, "Yesterday, we called it big data. Now it is just data. Similarly, we used to use the term e-commerce, now it is commerce. It is the same with digital marketing. The concepts now core to marketing practices. How do we keep up and manage the hype cycles that are happening so fast? How do we make the shift?"

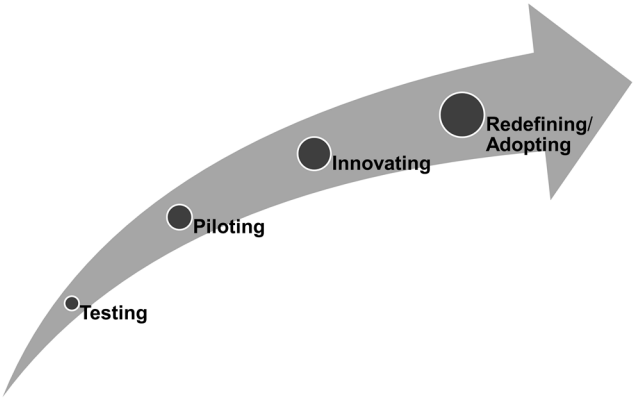
My answer? Take a deep breath and carve out of a part of your team to build digital capabilities. This team, by design, is a small, scrappy one focused on a goal. Focus on a diversity of thought, background, and experience. Embrace the maverick spirit. Locate them in an innovation center, not a function. Challenge them to build new capabilities working with innovative technology leaders. The innovation you need today will not come from large consultants or technology companies. Why? I find most of them focus on improving the status quo and selling large system projects. New thinking will not come from functional leadership within the organization. Their focus is on continuous improvement of current processes.

So, what to do? Make digital supply chain transformation a priority. Innovate at the edge and bring it into the core. I define the digital supply chain as "rethinking the atoms and electrons

of the supply chain to improve value." This takes many forms. It is not sufficient to just digitize data. Instead, companies need to build it into digital process redefinition like digital path-to-purchase, digital procurement, digital agriculture, digital manufacturing or digital service. In each of these process definitions, the "What?" changed along with the "How?"

In this journey, expect natural tension from the functional stakeholders. They will want to hold on to their historic processes like Linus holds his blanket. Build stage-gate processes for digital innovation to pass through, and have the functional leaders drive governance of "go" or "no-go" at each gate of testing, piloting, reinventing, innovating, and redefinition (Figure 1). Sidestep the potholes. I am working with one company that made an error of handing over digital innovation to a strategic consulting group under the guise of improving "master data." Buyer beware. No one can do the hard work for you. As you evolve to use "schema on read" capabilities and adopt machine learning, the master data issues that you have now go away. Likewise, this is not something you can expect from partnering with SAP, Oracle or Infor. (When I wrote the article “SAP: Three Reasons Why It Is a Risk to Your Business,” my concern? I thought I was too harsh. However, the more I work in the space, the more I think that I should have been harsher. Companies placing their bets on working with SAP on digital innovation will quickly fall behind.) You will also find that the gap in marketing between IBM's message and the reality of their solutions is bigger than you would like.

Figure 1. Phases of Digital Innovation



What Remains the Same?

While much is changing, the basic tenants of supply chain leadership are the same. Focus your efforts on solving meaningful business challenges while concentrating on three pillars:

Talent Development

There is no substitute for talent development. In 2017, when we tested over 150 factors across 450 companies to understand correlations from our surveys, we found that companies who are better at managing talent will improve costs. And, when companies are better at supply chain planning (which is largely determined by talent development) their supply chains are more resilient and better balanced between cost and inventory targets.

Figure 2. Correlations between Quantitative Survey Data and Balance Sheet Analysis

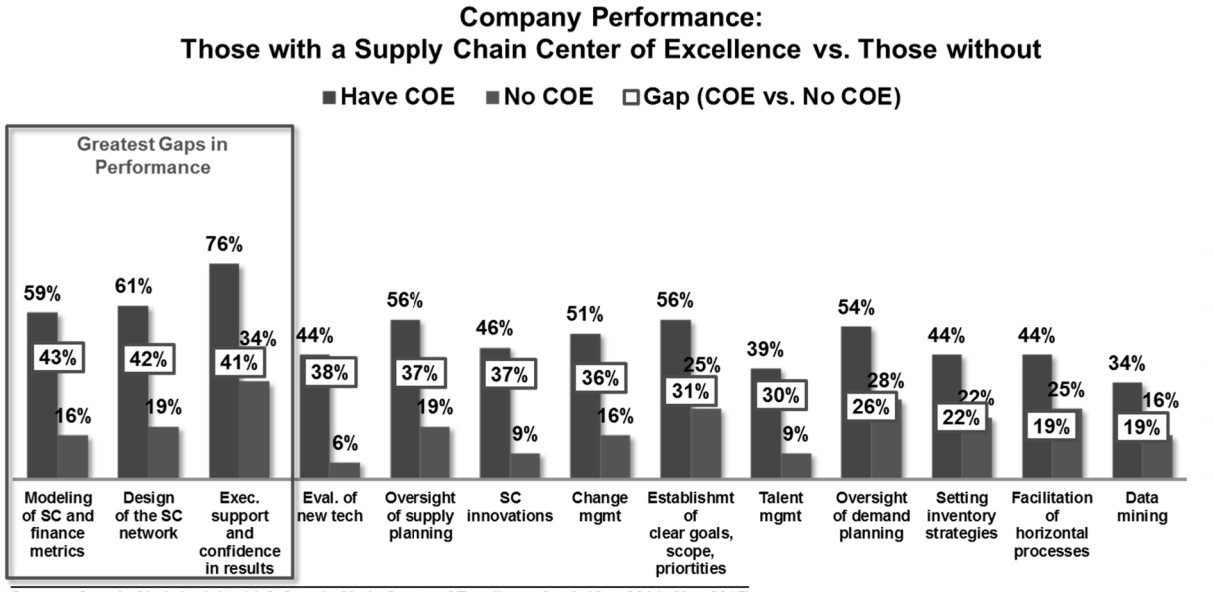
Survey Factor	Financial Metric	Sample Size	Correlation
Clarity of Inventory Targets	Inventory Turns	34	-0.58
	Supply Chain Insights Balance Factor (Vector Analysis at the Intersection of Growth and ROIC)	34	0.44
	Cost of Goods Sold	34	-0.35
Satisfied with Supply Chain Planning	Supply Chain Insights Resiliency Factor (Vector Analysis at the Intersection of Inventory and Operating Margin) for the Period of 2010-2016	49	-0.58
Belief that the Supply Chain Is Working Well	Cost of Goods Sold	158	0.37
Better at Managing Supply Chain Talent vs. Peers	Operating Margin	70	0.33
	Profit Margin	70	0.33
	EBITDA as a Percentage of Quarterly Growth	70	0.31
Effective Supply Chain Center of Excellence	Supply Chain Insights Balance Factor (Vector Analysis at the Intersection of Growth and ROIC) for the Period of 2010-2016	99	0.32
Easy to Get Supply Chain Costs	EBITDA as a Percentage with Quarterly Growth	45	-0.32

Source: Supply Chain Insights LLC; Based on Supply Chain Insights surveys (2012-2016) and YChart data (2010-2016)
Green = Correlation in expected direction; Red = Correlation NOT in expected direction

Strategy to Network Design

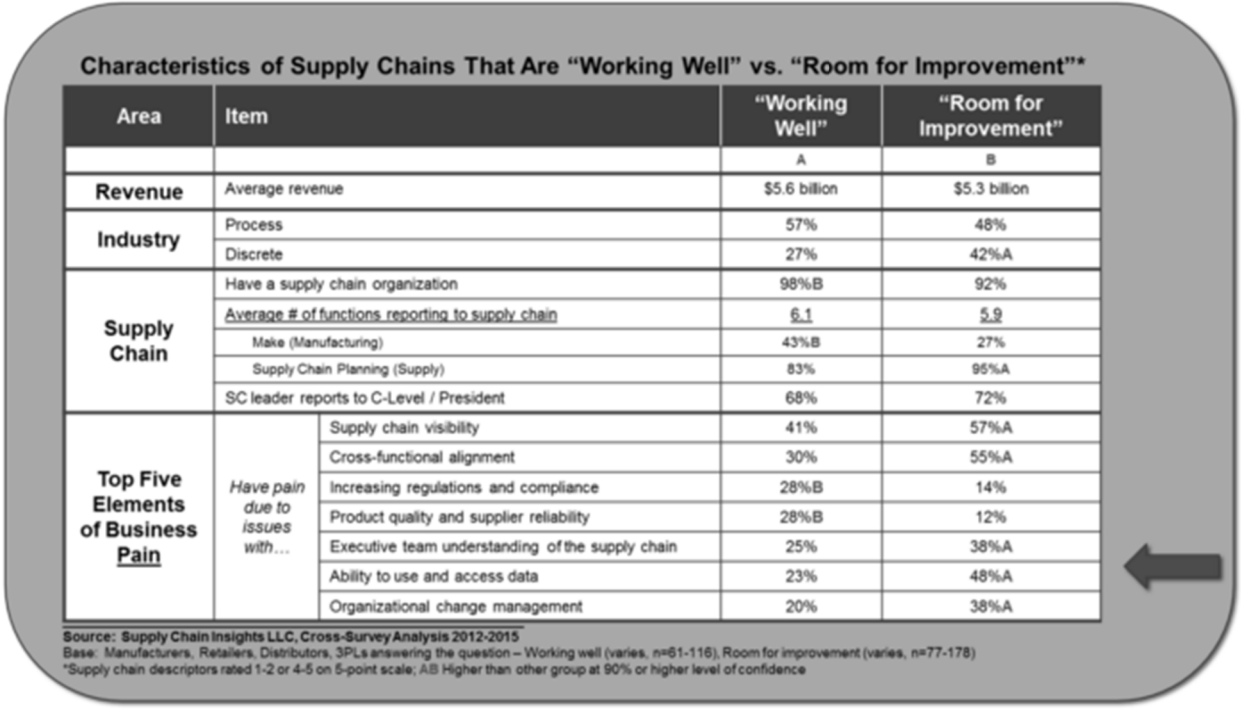
The best supply chains are designed against business goals with conscious trade-offs. Leaders make choices on strategy and these decisions are tied to network design parameters. The network design setpoints are then incorporated into supply chain planning assumptions. A strong center of excellence tied to network design is essential.

Figure 3. Importance of a Center of Excellence and Network Design



Source: Supply Chain Insights LLC, Supply Chain Center of Excellence Study (Oct. 2014 - Mar. 2015)
Base: Manufacturers, retailers, and distributors who sell items they manufacturer, have $500M+ in revenue, have a supply chain center of excellence (n=41), do not have a supply chain center of excellence
Q24. How well does your company's supply chain center of excellence perform on these same elements? SCALE: 1=Poor, 7=Excellent; Q34. How well does your company currently perform on these same elements? SCALE: 1=Poor, 7=Excellent; *Respondents were asked to answer for the supply chain center of excellence with which they are most familiar. Performance data are those who rated it 5-7 on a 7-point scale (top 3 box)

Figure 4. Characteristics of Companies Believe Who Their Supply Chains Are Working Well



Characteristics of Supply Chains That Are "Working Well" vs. "Room for Improvement"*

Area	Item		"Working Well"	"Room for Improvement"
			A	B
Revenue	Average revenue		$5.6 billion	$5.3 billion
Industry	Process		57%	48%
	Discrete		27%	42%A
Supply Chain	Have a supply chain organization		98%B	92%
	Average # of functions reporting to supply chain		6.1	5.9
	Make (Manufacturing)		43%B	27%
	Supply Chain Planning (Supply)		83%	95%A
	SC leader reports to C-Level / President		68%	72%
Top Five Elements of Business Pain	*Have pain due to issues with…*	Supply chain visibility	41%	57%A
		Cross-functional alignment	30%	55%A
		Increasing regulations and compliance	28%B	14%
		Product quality and supplier reliability	28%B	12%
		Executive team understanding of the supply chain	25%	38%A
		Ability to use and access data	23%	48%A
		Organizational change management	20%	38%A

Source: Supply Chain Insights LLC, Cross-Survey Analysis 2012-2015
Base: Manufacturers, Retailers, Distributors, 3PLs answering the question – Working well (varies, n=61-116), Room for improvement (varies, n=77-178)
*Supply chain descriptors rated 1-2 or 4-5 on 5-point scale; AB Higher than other group at 90% or higher level of confidence

Drive Organizational Alignment

The organization does not naturally align. It requires leadership. Alignment matters. We now sit on a database of 9,000 respondents. Over six years, we have repeated questions in multiple surveys to get critical mass. We see that when companies have better alignment there is a belief their supply chain is working well. Cut down the friction. When manufacturing reports to a supply chain function, there is better alignment and a stronger belief the supply chain is working well.

Use Common Sense

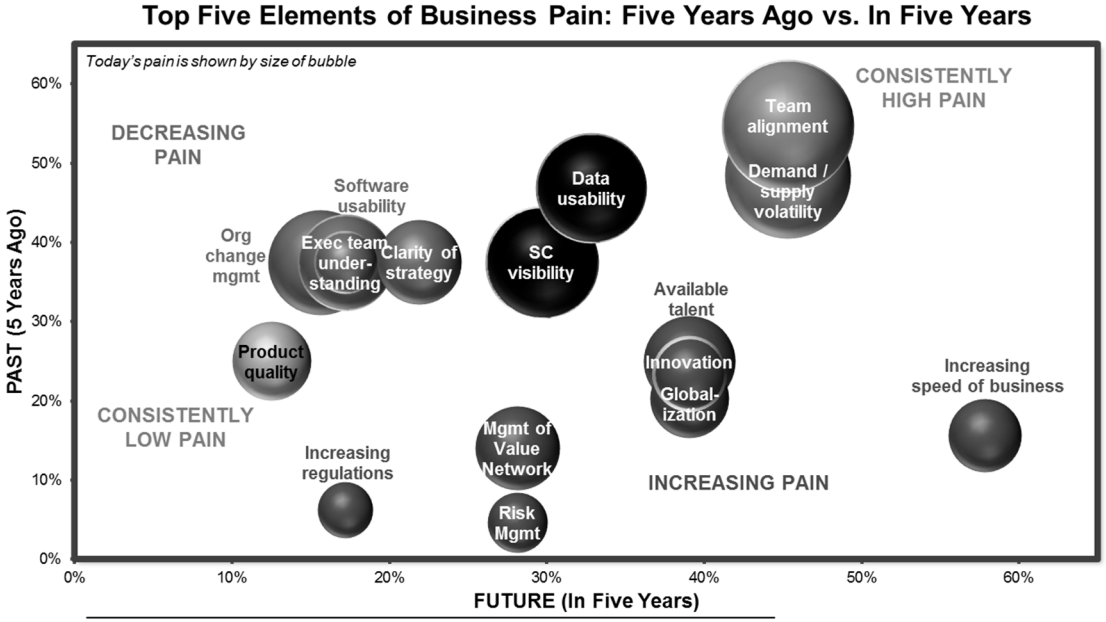
My last advice is to avoid hype cycles and stay grounded. Go forward by going forward. The world is changing under your feet so this is going to take some work.

Why We Are Losing the Battle on Inventory

Inventory. It is often the bane of the supply chain leader's existence. How much is too much inventory? Too little? How do companies right size inventory to reduce customer service failures?

Within the organization, there is tension. Inventory is both an impact to working capital and the most important buffer in the supply chain to minimize demand and supply volatility. Financial reengineering efforts abound often taking the short-term view slashing inventories versus driving long-term supply chain value. Many executive teams lack a fundamental understanding of the principles of inventory management and I often see consultants offering bad advice on inventory management.

Figure 1. Inventory Relative Business Pain Five Year Comparison.



Source: Supply Chain Insights LLC, Inventory Optimization Study (February - October. 2015)
Base: Manufacturers, retailers, and distributors who use inventory optimization software and have $250M+ in revenue (n=64)
Q29. When it comes to doing your job, which of the following are your top 5 elements of business pain? Q30. What were your top 5 elements of business pain five years ago? Q31. What do you expect will be the top 5 elements of business pain in five years?

So, what are the issues? As organizations grow larger, as shown in Figure 1, inventory management is especially problematic. There are two primary reasons. The focus on functional metrics and the size/complexity of the global organization. The techniques that we used to manage regional supply chains are not adequate for the management of inventory in a global organization. Here I share some insights.

Supply chain management as the study of source, make and delivery processes together first started in 1982. As a discipline it is fairly young. It lacks the decades of process maturation of finance or the marketing discipline, but we can now view three decades of data and draw some conclusions.

Recently, I finished the Supply Chain Metrics That Matter reports at Supply Chain Insights. These reports are a study of supply chain performance pre-recession, over-the-course of the recession, and post-recession. I am trying to understand the choices companies made and the impact on balance sheet performance.

While many supply chain leaders believe that the deployment of advanced planning and Enterprise Resource Planning (ERP) drove great balance sheet improvements, I do not find this to be the case in inventory management.

Table 1. Shifts in Days of Inventory by Industry During 2004-2006 (pre-recession), 2007-2009 (recession) and 2010-2016 (post-recession)

Days of Inventory by Industry: Comparison Across Years

Industries	Years			Difference (2010-16 vs. 2004-2006)
	2004-06	2007-08	2010-16	
Aerospace & Defense	97	89	137	40
Beverage	130	134	156	26
Chemical	63	69	81	18
Beauty	126	135	137	11
Automotive Parts	48	48	53	5
Pharmaceuticals	178	176	182	4
Food	57	56	61	4
Semiconductor	73	76	76	3
Medical Device	69	68	69	0
Apparel Retail	78	76	77	-1
Broadline Retail	81	85	79	-2
Automotive	52	55	50	-2
Household Products	70	65	63	-7

In Table 1, I share insights on the progress by industry. Of the thirteen industries studied, only four have made improvement in inventory. Most of the progress is in retail and household products. The worse performance is in the aerospace and defense industries.

Which begs the question, "What can we learn?" Followed, by the question of "Why are we not making more progress on inventory?" Here are five beliefs from working with global organizations:

1) **ERP is not Sufficient.** Many companies wrongly believe that the implementation of ERP along with DRP and MRP that inventory will improve. This is not the case.
2) **Sole Focus on Safety Stock.** Likewise, in the deployment of advanced planning, many companies only focused on the management of safety stock. This is

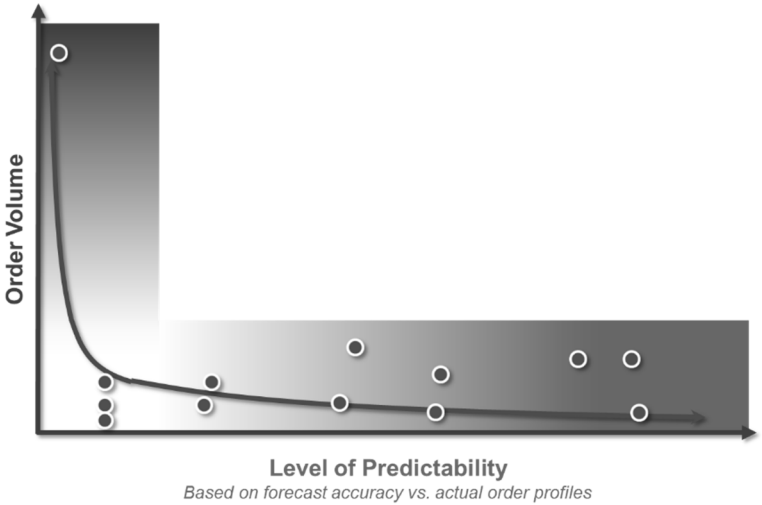
only one segment of inventory management. It is essential to manage the form and function of inventory. Network design coupled with software to focus on the form and function of inventory is the secret sauce that drove success in household products. The shift from a focus on safety stock to a more holistic view is shown in Table 2.

Table 2. Form and Function of Inventory

Form	Function
Supplier owned inventory: raw materials	In-transit Inventories: Inventory that is on trucks, barges and containers. The longer the trade-lanes and the slower the mode, the larger the requirements for in-transit inventory.
Company owned inventory: raw materials	Cycle Stock: In the planning of production, finished good production is cycled to ensure that the production lines are fully utilized. The average rotation between products on production lines in consumer packaged goods is three weeks.
Work in process inventory	Safety Stock: Inventory requirements to buffer demand and supply volatility.
Finished goods at the company warehouse	Seasonal Inventories: Inventories required to support seasonal builds.
Finished goods in the channel	Promoted Items: Inventories to support the promotional lift to support a promotion.

3) **Increase in Complexity.** The rise in complexity with the growing long tail of supply chain requires the adoption of more sophisticated inventory planning techniques. The items in the tail do not have a normal distribution making the use of traditional planning techniques obsolete. The traditional linear optimization methods used in the more simplistic forms of advanced planning are just not up to the challenge to manage tail inventories as shown in green.

Figure 2. The Growth of the Long Tail



4) **Lack of Focus on Value Chains.** The burgeoning inventories of chemical companies is the result of both the push back of downstream trading partners for chemical companies to hold more inventory and the lack of maturity in chemical industry processes. Few companies hold themselves accountable for value chain management. The irony is that the building of outside-in processes to manage the network is where today's value opportunity is omnipresent.
5) **Executive Understanding.** All too often the focus of a public company is on short-term results. Inventory management requires a long-term focus and discipline by supply chain teams. It should not be seen as the "slush fund" for operations and the policies of quarterly earnings manipulation have long-term deleterious effects. Inventory management does not have equal value in household products and beauty. The same is true in pharmaceutical companies. There is an inverse relationship between profit margin and inventory. The greater the margin, the less willing the company is to focus on inventory management.

So, the next time that you go to a conference and the business leaders give a celebratory speech on the progress that we have made in inventory management in supply chain processes over the course of the last decade say, "Woah! Not so fast!" Despite the investment in technology, teams and training, most industries are at a standstill and going backwards. This should worry supply chain leaders globally. It does me.

SECTION 3

Case Studies of Supply Chain Excellence

AGCO: A Case Study in Supply Chain Leadership

Today, I got a quick email from Peggy Gulick. Peggy was a speaker at the Supply Chain Global Summit. She had some exciting news. AGCO was honored to receive the AME 2017 Excellence Award. Congrats to the Agco team.

I loved Peggy's presentation at the Summit. When her employees kept breaking their tablets on the production floor, Peggy used Lean-production thought processes to innovate for new answers. While many employers would have penalized the

employees for tablet breakage, Peggy explored the world of wearables to enable her digital manufacturing transformation. It is a story of "carrots" not "sticks." Here I share her story.

About AGCO

AGCO's culture of innovation policy deployment enabled employees to pioneer a technology solution for manufacturing. AGCO Corp. is a publicly held $7 billion global corporation focused on the manufacturing and distribution of high-tech solutions—tractors, harvest equipment and implements—for professional farmers. The company makes highly complex machines at a low volume.

They are an innovator in agricultural equipment. As shown in Table 1, the Company ranked 3 out of 12 in their peer group on driving supply chain improvement as measured by the Supply Chain Index.

With a focus on high performance work teams and principle-based leadership, the AGCO production teams are skilled at working together to solve problems. The culture is one of solution-oriented thinking using Kaizen Action Sheets to dissect the step-by-step process of problem solving. The steps are simple, but profound:

- Figure out the problem
- Determine the root cause of the problem
- Develop possible solutions.

The approach works. Last year AGCO's Jackson, TN operations saved around $750,000 using this methodology.

Table 1. Performance and Improvement - 2010-2016 for Trucks and Heavy Equipment

Performance and Improvement (2010-2016): Trucks & Heavy Equipment

Company	Growth	Operating Margin	Inventory Turns	Return on Invested Capital	Market Cap (000,000)	Price to Tangible Book Value	Supply Chain Index Rank
Agco Corporation	3.0%	0.06	4.3	9.0%	$4,711	4.0	3
Caterpillar	4.7%	0.09	3.2	6.3%	$54,907	11.1	7
Cummins *WINNER*	**8.1%**	**0.12**	**5.4**	**19.5%**	**$21,472**	**3.8**	**3**
Deere & Company	3.0%	0.14	5.4	6.7%	$31,536	5.0	10
Hitachi Construction	-2.1%	0.05	5.4	3.6%	$28,763	2.0	1
Komatsu	-1.9%	0.11	2.5	7.5%	$11,321	0.9	2
Kubota	14.9%	0.11	3.7	6.6%	$11,417	1.3	11
Manitowoc	-8.8%	0.03	3.7	-1.2%	$518	0.5	7
Navistar	-4.4%	0.00	7.2	-22.2%	$2,526	-1.4	3
Oshkosh Truck	6.7%	0.08	6.9	12.3%	$3,351	-22.5	12
Terex Corporation	3.7%	0.03	3.4	3.6%	$2,973	5.8	6
United Tractors *WINNER*	**6.3%**	**0.13**	**5.8**	**15.5%**	**$6,895**	**2.7**	**7**
Average	**2.8%**	**0.08**	**4.7**	**5.6%**	**$15,032**	**3.2**	**NA**

Source: Supply Chain Insights 2017, Derived from YCharts; Showing average over time period; Supply Chain Index Rank = Based on average ranking within industry of Balance (Return on Invested Capital & Revenue Growth Vector Trajectory), Strength (Inventory Turns & Operating Margin Vector Trajectory) and Resiliency (Inventory Turns & Operating Margin Mean Distance); Market Cap and PTBV averages exclude outliers for purposes of Supply Chains to Admire calculations

The Wearable Journey

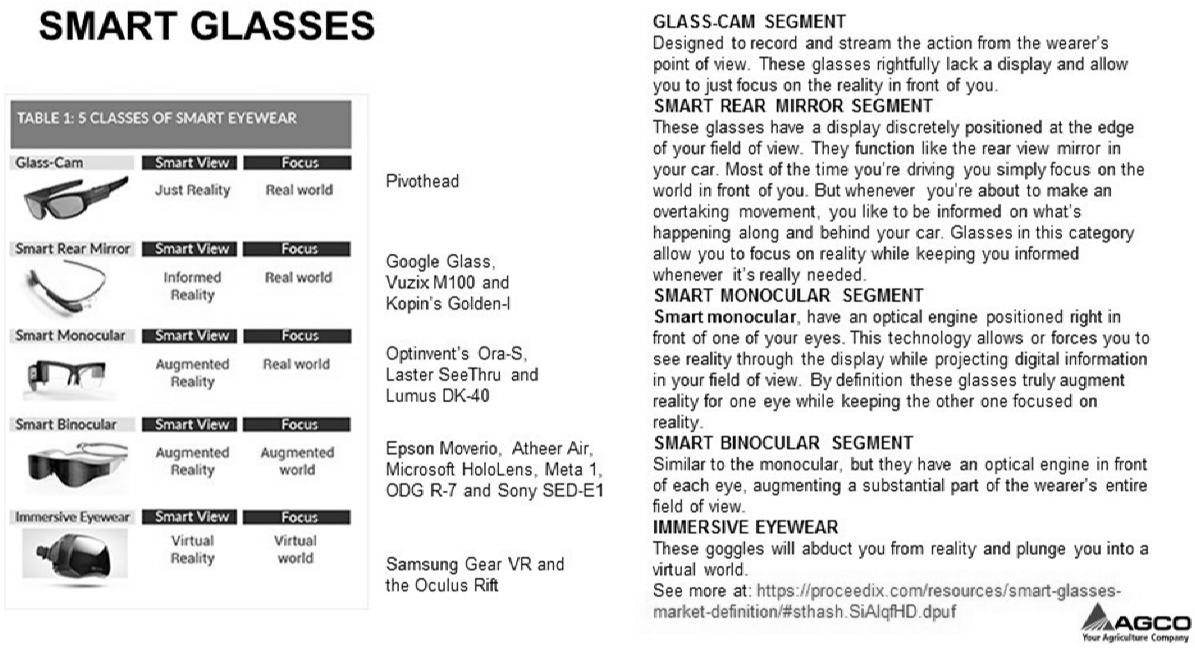
The final factory inspection quality teams disliked having to get off the large pieces of equipment to complete inspection lists on a computer. In 2012, this turned into an IT problem. The tablets were being dropped from the tops of tractors with no warranty available. This was no small problem. The rugged tablet was $3,000 to replace. At a Kaizen event of the quality team, IT came up with using Google Glass as an alternative.

The new tool had to be integrated into AGCO's work environment. Google Glass in its original form was not very useful on the floor, since it did not allow for typing, connecting to current tools, or storing passwords. To solve these problems, AGCO partnered with Proceedix to develop an application for manufacturing. Next, the IT department worked on the issues of infrastructure, risk, data security, cloud storage, and data sharing.

The company stuck to a no-tether policy, i.e. no battery pack or phone attached to the device. The goal was to have the independent application running on the Glass, enabling users to pick up right where they'd left off.

At this point, the AGCO team was at the ground level, pioneering the solution. They had to test ergonomics and wearability of the solution, including addressing such issues as the lack of safety wear, potential headaches, overheating, and insufficient battery life.

Figure 1. Classes of Smart Eyewear



As shown in Figure 1, at the time of the project there were five distinct classes of smart eyewear. AGCO deliberately chose smart-glass-assisted reality. As the assemblers were working on the floor, they did not need a 20% overlay of additional information. Instead, they needed a tool to gather the information and report back as needed.

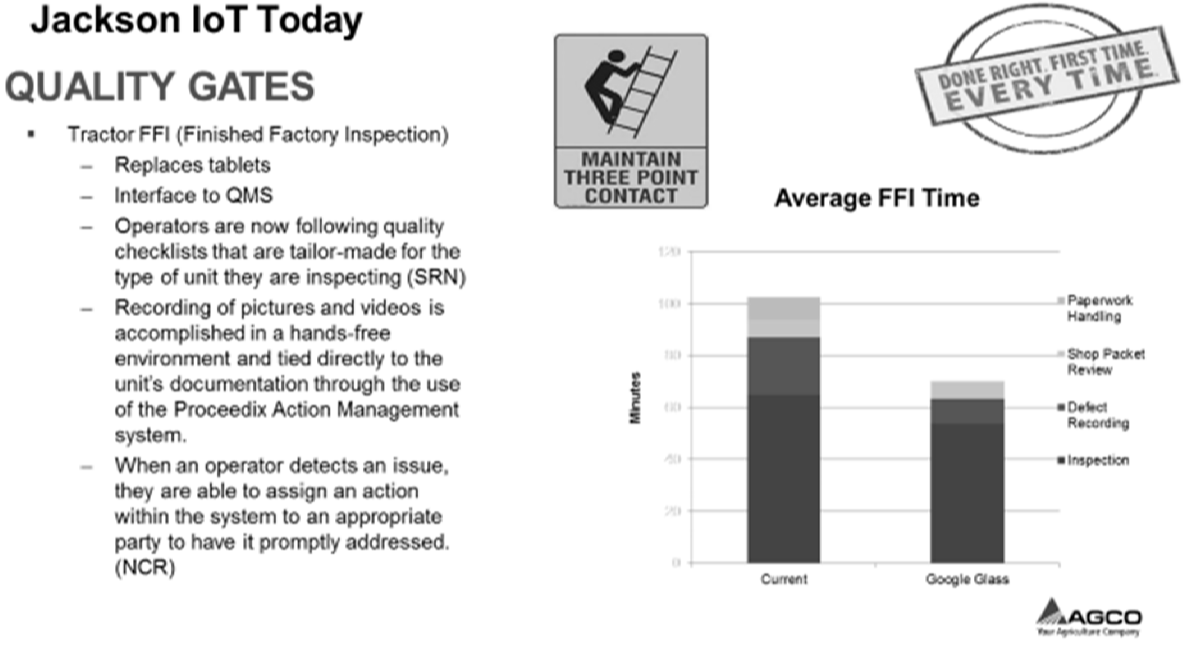
The use of wearable glasses replaced tablets. Glass-equipped operators now follow quality checklists that are tailor-made for the type of unit they are inspecting. Recording of pictures and videos is accomplished in a hands-free environment via voice commands and tied directly to the unit's documentation through the use of the Proceedix Action Management System. When operators detect an issue, they are able to assign an action within the system to an appropriate party to have it promptly addressed.

Results

AGCO 's initial goal was limited to replacing fragile tablets and enhancing safety on the warehouse floor by freeing up both hands for the workers to climb on and off the unit. The new technology solution, however, led to other, quite remarkable, unintended results:

Improved Cycles. A 30% Initial Reduction in Processing Time. Automated real-time information sharing cut the processing time and reduced a multi-layer inspection process to one tool.

Figure 2. Improvement in Finished Factory Inspection



Touchless: Creation of a paperless Environment. A "decline" voice command from an operator opens a non-conform that is sent off to a quality gate to be addressed immediately.

Quality of Conformation. Built-In Assembly Work Instructions. Glass usage expanded from quality control to assembly process support. Employees used to have to walk from the tractors and sprayers that they were assembling to the monitors displaying information, including billing material for lineside hardware. AGCO estimated the walks to average 25 trips a day per employee and included 36 steps to the monitor in assembly operations with high complexity. Wearables enabled the streamlining of tasks and the elimination of unnecessary motion.

Figure 3. View of the Inspection Instructions as Seen by an AGCO employee.

AGCO also took the standard instruction images: sequenced instructions, bills and materials, and torque settings, and made them visible on the glass (Figure 3). Employees could zoom, freeze, and it didn't inhibit the employee's movements, easing

neck and eye pain. The move led to an additional 30% - 35% reduction in process time.

Time to Value. Improved On-The-Job Training. AGCO envisioned employing 3x3 training metrics: every operation would have 3 people able to execute it, and every person would be able to do 3 operations. In the pre-Glass era, the company was never able to execute this approach because of high complexity of the tasks involved. The new tool cut the learning curve in half. Any operator can now move from one workstation to another, as long as they have instructions with them.

Improvement in Digital Manufacturing. The project became a means to an end to drive data-driven processes. Every small task in operation and assembly is timed and monitored, moving AGCO to a predictive analysis stage. The company analyzes large data sets, reported live from each employee's transactions, to coordinate with the learning matrix. By knowing the employee's skillset by model, and what models will go down the line on a specific day, AGCO is able to design the best employee setup for the task at hand.

Our Take

We feel that the AGCO case study has several important lessons for the supply chain transformational leader.

Involve Employees in the Digital Transformation. While many companies might have penalized employees for breaking tablets, the AGCO team asked the employees to help solve the problem. Use carrots not sticks. Involve employees in developing answers to problems using new technologies.

Partner with Technology Providers. While many companies implement traditional buy/sell strategies with

technology providers, AGCO chose to partner. To get the most out of a new technology, partner to drive value.

Big Wings. Big Feet. The best transformations have both "big wings,' or an inspirational leader driving the transformation, and "Big feet," a focus on seamless execution. In this case Peggy met both criteria. The takeaways? Look out for the Peggys in your organization and cultivate the winning teams.

If you are a leader in digital manufacturing or supply chain excellence, we would love to write and share your case study. No one pays us for our ink on this blog, and the businesses always get to read, review and approve their case studies before publication. We appreciation Peggy's time in working with us to tell her story.

British Telecom

Translating demand into material requirements is a challenge. Most procurement organizations operate as silos. This case study presents British Telecom's (BT) adaptation of a demand-driven approach using Orchestr8's software. The case study shares the results realized from the pilot and a full-scale enterprise implementation.

To write this case study, we talked with Brian Dooley, Head of Supply Chain Planning at British Telecom. Brian is responsible for all the supply chain planning activities at BT.

About British Telecom's Supply Chain

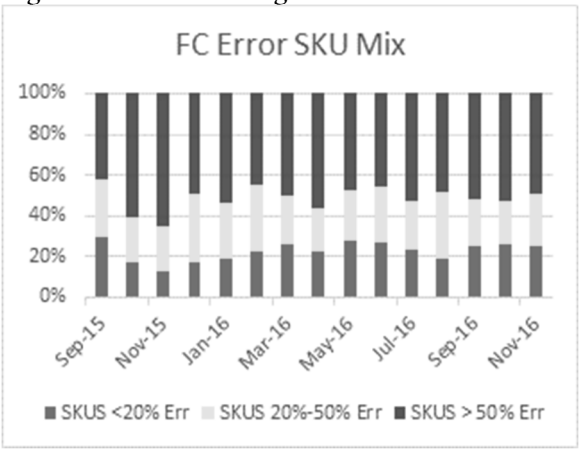
British Telecom is multinational telecommunications company headquartered in London. The Company carries about 120,000 items and employs 28,000 engineers across the country. Contrary to popular belief, BT is not just a service provider and contains a lot of supply chains within the business: retail - both B2B and B2C, engineering, and e-commerce. This includes the sale of broadband equipment, home Wi-Fi devices, network equipment, and baby monitors directly through the e-commerce channels to retail customers. The company also wholesales the same products to the big high street retailers in the UK, who then sell them on BT's behalf as BT-branded products.

BT builds, constructs, and maintains almost the entire telecoms network infrastructure within the UK. It has its own manufacturing operations. It owns its own physical distribution network with two large national distribution centers. Uniquely, the company also has a network of 96 forward stock locations—smaller warehouses about an hour travel time apart—which engineers go to each day to pick up the tools and equipment. Because of BT's unique infrastructure, it sells its services as a 3PL to the external marketplace.

The Case for Change

BT's forecasts were not precise enough to drive the customer response and minimize customer service failures. In the snapshot of BT's cable manufacturing business, shown in Figure 1, red indicates beyond 50% error in SKU level forecast accuracy.

Figure 1. Color Coding SKU Buffers



This is not an unusual chart for anyone involved in accuracy forecasting. BT was forecasting over half of its portfolio with more than 50% mean absolute percentage error (MAPE).

Even for the SKUs with the highest forecast accuracy, BT was placing orders on suppliers, and putting inventory in its warehouses, based on predictions that were 20% inaccurate. Inevitably, this error disrupts supply chain inventory flows leading to schedule changes, freight expediting which increases costs, and declining customer service. Insular to these issues, BT's traditional DRP/MRP engine was being pushed to place purchase orders based on forecasted planned orders that the system predicted would happen, but would not necessarily happen, costing the company dearly.

Initially, BT considered the traditional approach of improving forecast accuracy and, in turn, to decrease the safety stock and improve service levels. Brian has made a 25-year-long career out of demand forecasting and supply chain optimization, so he paused and asked himself: "Are we solving the wrong problem here? Is there a different way than simply trying to get a more accurate forecast?"

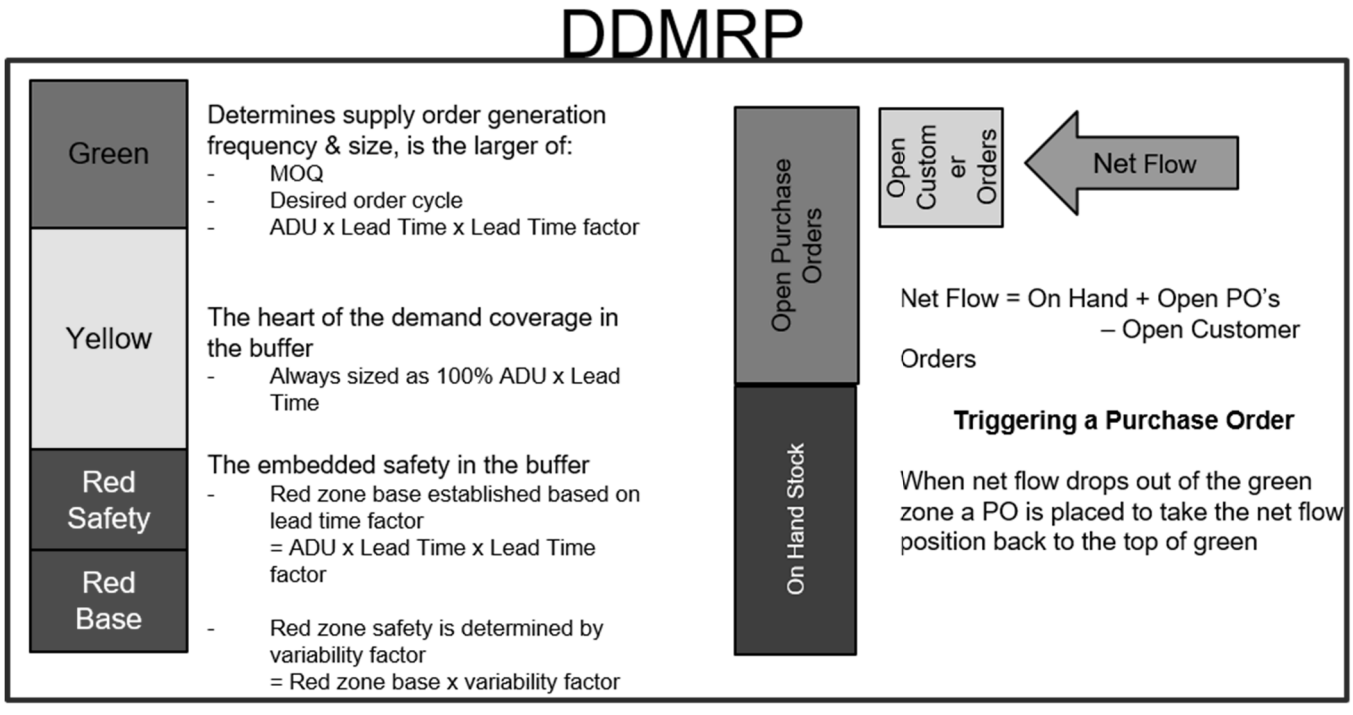
Enabling A New Approach

Demand-driven material requirements planning (DDMRP) technique designs and executes strategic inventory buffers that are independently planned on both demand and supply flows. The best indication of demand is real, channel demand, but this is not always available. The second most valuable is the order stream—what the actual customer has placed an order for and when. The buffers are safety cushions built in to absorb the effects of variability in the supply chain. The math is straightforward and simplifies building an Excel pilot in to test the theory.

As a first step, the net flow is calculated and is populated as an on-hand position. This includes plus open purchase orders minus customer orders. When net flow drops below the green zone, a purchase order is placed to return the position to the top of the green level.

The crucial difference of DDMRP from push-to-forecast is that net flow level can be dropped only by real consumption of stocks; in other words, the placement of order demand. Placing an order becomes a response to real demand that has already happened. It is about putting the supply chain capability in place demand the expected demand, but not actually ordering stock based on planned orders out in the future.

Figure 2. DDMRP Color Coding



Past the point of stock commitment to fill the buffer and to place the initial purchase orders. Replenishment is driven by order demand. This technique could be applied to 50% of the flows.

Forecasting is integrated in the form of average daily usage (ADU) – the key ingredient in buffer sizing. Business insight, intelligence, and predicted fluctuation in consumption levels are accounted for to ensure the right capability in the supply chain to cope with the expected demand; but, the replenishment is then allowed to autonomously respond to the real demand taking place.

Redefining End-to-End Planning

To test the concept, Brian formed a small team of colleagues to implement the project. The team built a proof-of-concept model and ran a pilot to test the theory. At British Telecom, the team uses Orchestr8, a cloud-based solution that allowed the company to go live quickly. The color-coding of relative buffer positions in Figure 2 is one of the most valuable aspects of the technology for decision making.

In Brian's presentation at the 2017 Supply Chain Insights Global Summit, he pointed out that it opened a completely different way of defining priorities for his team. No longer were they talking to their suppliers about the next due date purchase order. The priorities were the SKUs with the buffers running low (in red), regardless of the due dates. The buffer size of SKUs in green, in turn, allowed for the orders to be delivered past the due date, allowing the decision-makers to focus on real-time priorities. This approach gives the supplier flexibility to modify the schedule.

BT now allows DDMRP to drive the product mix and focuses on the aggregate capacity needed. Setting the buffers right, and letting them respond to the demand, has become the main objective. The planners now focus on correct parameter setting upfront instead of putting out fires and expediting shipments.

Results & Insights

The results are four-fold:

1. **Risk Management.** Supply chain de-risked from forecast accuracy. Buffers now act as safety cushions, absorbing unpredicted spikes in demand.
2. **Cash Flow.** Strong positive cash flow and ROCE. BT now has the capacity to buy and store the items it actually uses, not just the items it thought it might use. This, in turn, leads to significant inventory reduction.
3. **Better Service.** Through the deployment, BT maintained and improved service levels. Better service is attained from less stock. The impact is cost reduction. Lower planning effort with improved outcomes leads to lower expedite costs.
4. **Positive Feedback from Suppliers**. The Orchestr8-enabled supplier portal allows suppliers to view priorities and adjust accordingly. The new approach to supply chain planning is winning BT an increasing amount of external business because it is so novel and so disruptive.

Key Takeaways

DDMRP is a useful tactic to translate order requirements to material sourcing. It should not be confused with the need for better forecasting. It is also not sufficient to define a demand-

driven value network. It is one of many tactics to deploy. When used appropriately, results like BT's happen.

Change management is a challenge and one of the key components in this type of implementation, particularly within the traditional supply chain planning community.

This is a case study of supply chain transformation. Brian had to stick his neck out to get the process going. Instead of trying to simply answer the question "*How do we improve forecast accuracy?*", Brian tried a new approach. He wanted to do something different. He paused, approached the problem from a different angle, and brought up the crucial point: "Are we even asking the right question?" As a result, he found a better way.

Glen Raven Meets Their Goals Through a Successful Deployment of Advanced Planning

Recently, I spoke on the future of supply chain management at the University of Tennessee Supply Chain Forum. At the end of the presentation, a sales representative from a supply chain planning company stopped me to tell me about an implementation at Glen Raven. He was proud of the implementation and asked if I had heard of Glen Raven. As he talked, I smiled. I find Glen Raven to be a very interesting company. It is a privately-held textile company that successfully navigated the global sourcing/labor arbitrage mania of the last decade and managed to maintain a significant presence in the United States.

As a side note, my niece works as a Database Administrator at Glen Raven; and as a result, the company has been a frequent discussion at my family's Thanksgiving dinner table. As my brother tries to figure out what his crazy sister does for a living, my niece uses her experiences at Glen Raven to translate the need for the business model. (My oldest brother is unsure why anyone would buy services from his little sister. My niece tries to defend me.)

I like case studies and readers enjoy them on the blog, so following the conference, I reached out to Ajay Bhardwaj, Director of Planning at Glen Raven Custom Fabrics, to understand his story. I appreciate his willingness to share it.

The Story

Leib Oehmig, the CEO of Glen Raven, Inc. had a goal. He wanted the company's business to grow efficiently. For him, this meant growing top-line revenue with less supply chain inventory. To achieve the objective, he asked Ajay Bhardwaj, Director of Planning at Glen Raven Custom Fabrics, to help.

Ajay, shown here, has a strong background of 25 years in supply chain planning. He knew that to accomplish Leib's goal,

he needed a planning system to integrate the supply chain and recognize constraints.

About Glen Raven

Glen Raven is a privately-held textile company founded in 1880. The Company has three business units: Custom Fabrics, Technical Fabrics, and Trivantage. With a global presence of operations in the US, France, China, India, and Brazil, the company coordinates global supply for regional markets. Ajay works in the Custom Fabrics division that manufactures and markets premium performance textiles, including Sunbrella and Dickson branded products. Since 1961 the Sunbrella brand has been the leading fabric combining UV durability, cleanability, and beautiful design. The fabrics are used for applications in the Awning, Automotive Convertible Tops, Marine, Indoor and Outdoor furniture, and Contract and Healthcare furniture industries. Glen Raven is the market leader for the supply of convertible tops.
In an environment where customers demand more variety with shorter lead times, Ajay knew that an integrated supply chain planning solution could help the business to deliver against customer expectations.

The Project

To meet the business goals, Ajay's team began with a thorough process review of the existing planning procedures and systems, followed by the implementation of an advanced planning system that integrated all the major planning workflows of a manufacturing company.

Demand planning was implemented in six months, while tactical supply and inventory planning took twelve months.

(Note, when done right, we often see that supply planning takes 1.5-2X longer than demand planning.) The implementation in the United States was for three yarn manufacturing facilities, a weaving factory, and a distribution center. In China, the rollout was for a weaving factory and outsourced yarn manufacturing. The implementation included two production instances and two development instances. The implementation included 11 integration points and 43 production specifications. Over 12 million unique data elements are transferred through the interfaces each night into the data modeler.

The team successfully completed constraint-based planning for raw materials, weaving, and finishing, including outsourced production. (Less than 25% of companies interviewed successfully complete constraint-based supply planning.)

Net result? The team met their business goals. The business grew with the same levels of inventory, and improved service levels. Today, service levels (case fill rates) are 2% above target. Here we share some insights from Ajay:

Q. What advice would you have for others implementing supply chain planning?

Ajay: I think that it's essential to stay focused. I recommend that other manufacturers considering this approach focus on four areas.

1. Start with a clear vision of the overall objectives/goals. The vision of the CEO was helpful to help us accomplish the goals. We had a clear rallying cry and executive support. We provided weekly progress updates to the executive team and had their full support during the project.
2. Involve key users in the project. To get a widespread sense of ownership, all the key users of the system had

specific roles on the project team and helped to configure the software. We worked closely with the best-of-breed solution provider, Logility, on the implementation, but we kept control of project management. A strategic aim of this project was to replace a homegrown forecasting application. The manager who developed this solution was a key player in configuring the new demand management solution.

3. Have a relentless focus on execution (project management). Experience has taught me to monitor tasks very closely. If a task is not 100% complete, the questions to ask are "when will it be complete, and what is the overall impact?" I do not go by x% complete! We stayed focused on the goal; and as a result, we managed the project timeline closely.
4. Avoid the temptation to model everything. The key to success is to keep the modeling simple (understandable) with a focus on what matters in the business. I think one of the success factors of the project was making sure that the critical elements of the business were modeled, but that we did not boil the ocean and make it overly complex. I wanted to stay true to the project goals.

Q. What is next?

Ajay: We have built enough support to continue the project rollout globally. It is important to track project results to gain the support of others.

Q. What do you wish you had done differently? And, why?

Ajay. With the benefit of 20/20 hindsight, we could have worked with our system integrator to transfer knowledge to our team even faster through training and what-if scenario modeling. It is important to not short-change this step.

Ajay, thanks for sharing your case study with the readers. As a result, I now have an even better story to share at my family's Thanksgiving table. But more importantly, the readers of the blog have some valuable insights to use in their scoping of Advanced Planning Systems. For me, one of the most important pieces of wisdom from Ajay is "not to model everything." It reminds me of a story about a client I have worked with for over a decade. Because they were not clear on the goal, they have implemented four different technologies badly. While they might blame the technology company or the system integrator, the issue is that they never built their system with the goal in mind. I like this case study because there was a clear goal, definitive governance on the project plan, and the system was built with the goal in mind. Thanks, Ajay! Great advice for others.

How Bad Thinking Screwed Up Iconic Brands

Heinz. Kraft. Kellogg. P&G. All great brands, but each company is under attack in the stock market. Investors are questioning choices made in supply chain management.

On April 16th, Robert Moskow, Credit Suisse analyst slashed the rating on Kraft Heinz. The reason? Worries on the 3G Capital culture and the capabilities to drive innovation. (3G is the takeover firm that merged Kraft/Heinz.) Shares fell 1.2% in early trading. Employee turnover signaled the concern. In response to inquiries by the financial community, the company refused to publish data on employee turnover. The reason? Turnover is high. Employee satisfaction is low.

Ironically, we find in our research that the most important factor to managing costs in a global company is employee satisfaction. Companies that invest in employees--training, involvement/participation, and learning-- outperform their peer

group in cost management. In contrast, companies that slash costs without building human capabilities struggle in the long term. This is what we are seeing in the 3G story.

This week, it was a story of Kellogg. The shares closed down -2.2% to $65.51 following the release of the company's first quarter earnings results. The company reported year-over-year first quarter sales fell -3.1% to $3.7 billion, missing analysts' estimates of $3.8 billion. The cereal and convenience food manufacturer posted net earnings of $1.01 per diluted share, beating analysts' estimates by 4 cents. Over the last year, Project K was a Kellogg's focus. In this effort, the Company attempted to optimize the supply chain through consolidation of facilities and elimination of excess capacity. They attempted to improve productivity through consolidation of common processes across multiple regions and bring a global focus on categories. The goal was to invest the savings in brand-building initiatives, in-store execution, sales capabilities and innovation to stabilize sales. Kellogg expects $600-$700 million in Project K cost savings through 2019. The problem? It is not working. Kellogg has not innovated and brought value to the shelf. The markets reward growth. Kellogg is not growing.

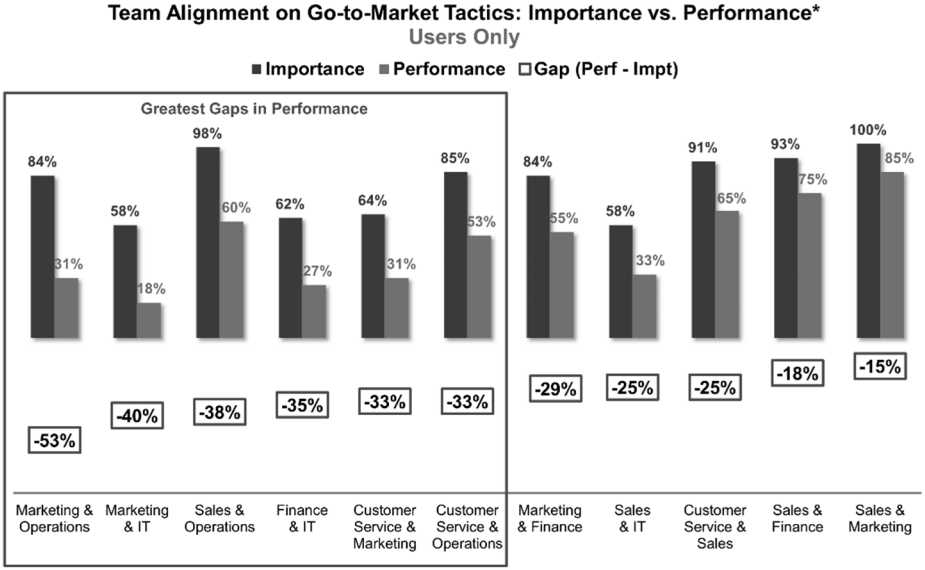
Trian's push for a board seat at P&G is a similar story. Retail investors own roughly 40% of the company, compared with an average of 12% at the S&P 500. P&G shares over the past decade have lagged behind competitors' and the S&P 500. Growth is the concern. P&G operates at a lower rate of Return on Invested Capital (ROIC) than their peer group. This is despite ownership of strong global brands. While the company is seen as a historic supply chain leader, innovation in supply chain processes over the last decade slowed as the company focused on M&A, cost cutting and business process outsourcing.

What can we learn? The supply chain needs to drive value. Simply put: it is growth with competitive performance in cost, customer service, asset utilization and inventory management. Dividing the organization with different goals cannot drive value. What we are seeing is a race to lower market share. Iconic brands are suffering. As I study supply chain, here is what I am learning:

1. **There is no substitute for leadership.** At each of these companies, there is a story of a struggle by good people to drive supply chain leadership. Supply chain leadership cannot be defined by reducing costs.
2. **Throw away the pretty PowerPoints.** Saving money in the back office and investing funds in the front office does not work. If the supply chain is weak, it cannot deliver. The consultant promises of reaping low-hanging fruit and driving sales is usually a failed promise. Due to the lack of innovation, companies invest back office savings into front office brand extensions that add complexity, but do not add value. The starting place should be the alignment of front and back office teams to drive brand presence, but as shown in Figure 1, the teams are not aligned. Alignment around the consumer and the building of the brand is job 1. This requires a strong supply chain and brand portfolio alignment based on customer insights.
3. **Build Outside-in Processes.** No company today in the consumer industry effectively uses retail data in supply chain management. The reason? Traditional investments due not enable the use of new forms of data to sense and respond. Innovation is hampered by the functional definition of sales, marketing and supply

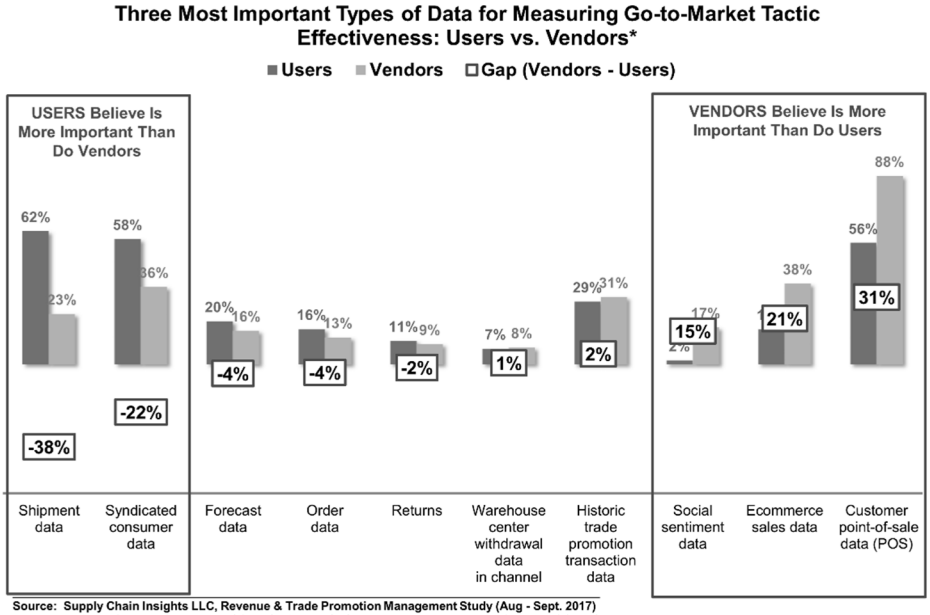
chain. These functional definitions do not enable the building of effective horizontal flows to serve the customer. As a result, the processes focus on functional efficiency not brand effectiveness.

Figure 1. Alignment on Go-to-Market Tactics



Source: Supply Chain Insights LLC, Revenue & Trade Promotion Management Study (Aug - Sept. 2017)
Base: Users (manufacturers & distributors) (n=55)
Q15. Now think about [your][a typical consumer products] company's internal TEAM ALIGNMENT in terms of go-to-market tactics (sales and marketing tactics used to improve sales and drive incremental volume.) How important do you believe it is for the following teams to be aligned around [your][their] go-to-market tactics? SCALE: 1=Not at all important, 5=Very important; Q16. Now, how aligned do you believe these same pairs of teams actually are at [your][a typical consumer products] company when it comes to [your][its] go-to-market tactics? SCALE: 1=Not at all aligned, 5=Very aligned; *Showing those rating 4-5 on 5-point scale

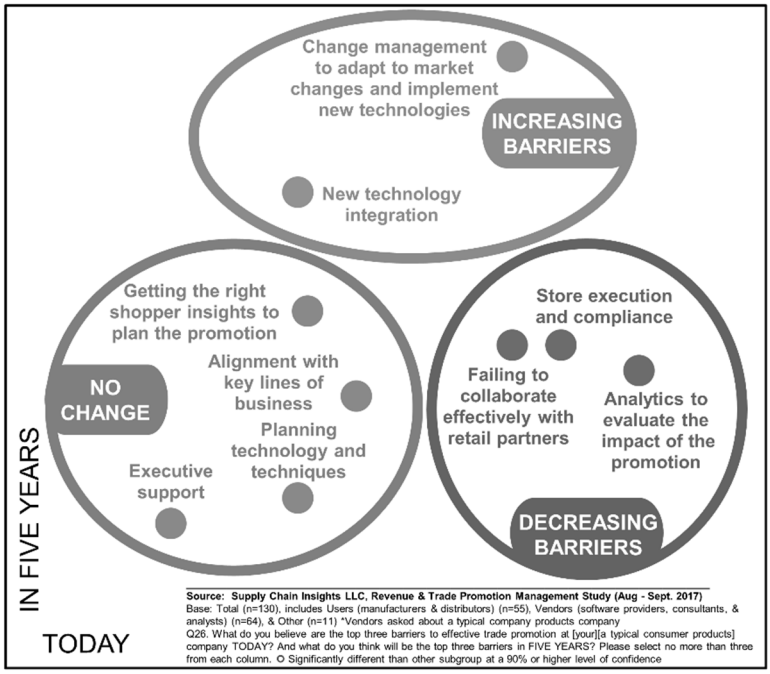
Figure 2. Use of Data in Analytics.



Source: Supply Chain Insights LLC, Revenue & Trade Promotion Management Study (Aug - Sept. 2017)
Base: Users (manufacturers & distributors) (n=55), Vendors (software providers, consultants, & analysts) (n=64)
*Vendors asked to give their opinion of what a consumer products company should do
Q14. Which [are][SHOULD be] the three most important types of data to [your][a consumer products] company when measuring the effectiveness of [your][its] go-to-market tactics? Please select no more than three.
☐ Significantly different than other subgroup at a 90% or higher level of confidence

Within these companies there is a need to change from inside-out to outside-in processes to serve the customer and support the brand. This requires the use of point-of-sale data and the implementation of cross-functional processes enabled by analytics. As seen in Figure 3, this is a struggle in most companies.

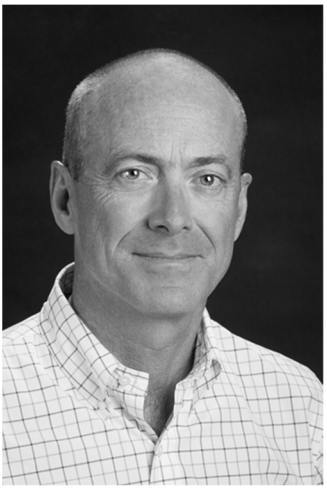
Figure 3. The Struggle to Improve Revenue Management



What can we learn? The industry has been lulled to sleep by pretty PowerPoints and buzz word bingo. Supply Chain leadership requires an effective process that spans from the customer's customer to the supplier's supplier. It is not a functional focus within the silos of manufacturing, logistics or customer service.

The programs that divide the organization do not support brand growth. The good news is that the financial markets are beginning to understand this reality. The bad news is that we do not see consultants changing their practices.

Jabil



John Caltabiano is the vice president of supply chain for Jabil's Engineered Solutions Group (ESG) division. His journey in implementing the digital supply chain started a number of years

ago, in part as a reaction to customer and market demands. Very specific requests prompted John to rethink the supply chain's entire network.

About Jabil

Jabil Inc. is a U.S.-based global manufacturing and product solutions company. The company has over 100 facilities in 23 countries, and 170,000 employees worldwide. As a $19 billion manufacturing company that plays in consumer electronics products and enterprise industries.

The Problem

Over the years, Jabil has been trying to solve their problems of market fluctuation, shortages, and mitigating risk by carrying extra inventory. With shorter life cycles and higher demand volatility, this is not an effective strategy. In John's words, "We have close to 20,000 unique suppliers and 300 unique customers. Our average inventory per day is 10 to 15 million dollars." Over the years John and his company have made investments in tools to help increase visibility and better communicate with his suppliers and customers. After many efforts, it was clear that the answer was digitalization.

Building the Digital Supply Chain

Each company defines a digital supply chain slightly differently. There is no one-size-fits-all definition. At his presentation during the conference, John outlined the potential benefits of a completely digital supply chain.

"Digital supply chains offer the opportunity for incremental value: 10% increase in productivity, more than 25% faster response times to changes in market demand, 40%-110% higher

operating margins, 30% better realization of working capital, and 17% to 64% fewer cash conversion days. Customers have higher expectations and want products that are customized, and they want products faster."

Jabil's intelligent digital supply chain enables orchestration ability for supply chain leaders to assign specific tasks. Post implementation, it is easier to manage the supply chain and delegate tasks. The new system now runs 24x7x365. Before, if a customer wanted an update on a certain part, a Jabil employee would have to wait until the business hours to find the answer. Now there is complete visibility for both customers and suppliers. Visibility was a major challenge when implementing this system, and yet crucial. More than 80% of network activity resides outside the organization, but many suppliers do not want to provide total visibility. If there were to be any deviation in a product's location or timing it could prompt an overreaction from a customer. For this very reason, Jabil did not always want to provide their customers with complete product visibility. In addition, a lot of customers are sensitive to having their product and pricing information visible.

Performance

With single-digit margins, contract manufacturing is a tough industry. As seen in Table 1, over the past seven years Jabil has made incremental improvements in performance metrics and performed at, or above, the industry average in all metrics. The focus on digital manufacturing is seen as a significant contributor to improvement.

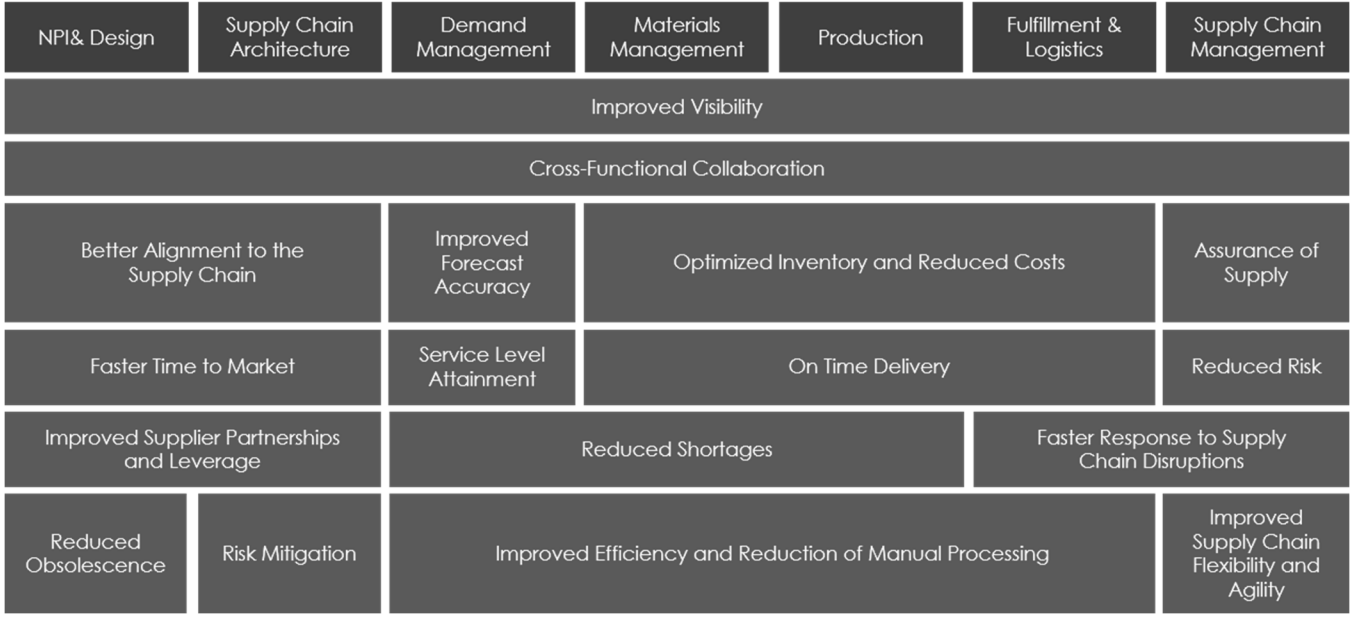
Table 1. Contract Manufacturers Performance

Performance and Improvement (2010-2016): Contract Manufacturers

Company	Growth	Operating Margin	Inventory Turns	Return on Invested Capital	Market Cap (000,000)	Price to Tangible Book Value	Supply Chain Index Rank
Benchmark Electronics Inc	1.9%	0.03	6.0	6.2%	$1,132	1.0	7
Celestica Inc	0.1%	0.02	7.1	5.4%	$1,742	1.4	4
Flex Ltd	-2.3%	0.02	7.5	8.9%	$5,584	3.5	1
Ibiden Co Ltd	-1.9%	0.07	6.9	3.8%	$242	0.1	6
Jabil Circuit Inc	7.1%	0.03	6.8	8.4%	$4,123	2.5	2
Kimball International	-5.2%	0.01	6.9	5.9%	$407	1.9	3
Plexus Corp	7.1%	0.04	4.3	9.0%	$1,275	1.7	5
TTM Technologies Inc	27.9%	0.04	7.7	0.1%	$885	2.0	8
Average	**4.4%**	**0.03**	**6.7**	**6.0%**	**$1,924**	**1.8**	**NA**

Source: Supply Chain Insights 2017, Derived from YCharts; Showing average over time period; Supply Chain Index Rank = Based on average ranking within industry of Balance (Return on Invested Capital & Revenue Growth Vector Trajectory), Strength (Inventory Turns & Operating Margin Vector Trajectory) and Resiliency (Inventory Turns & Operating Margin Mean Distance); Market Cap and PTBV averages exclude outliers for purposes of Supply Chains to Admire calculations

Figure 1. Jabil Value Map



Features

Jabil's digital supply chain has three main elements: visibility, risk management, and cross-functional intelligence. Figure 1 outlines the different benefits of the digital supply chain as well as the department being affected, with the blue representing different workflows and the green representing the impact.

One of the benefits is an improvement in risk management. The new digital supply chain allows Jabil to prevent and respond to risk better with Reactive and Proactive Risk Management. Reactive risk management is response based, while proactive is based on measurement observation. Algorithms developed by the company measure risk for various market conditions and drive continuous improvement. These algorithms can identify if a part could be multi-sourced by seeing that different customers are using the same part from a different supplier. The system can identify a trend like this much quicker than a human worker and automatically integrate a solution into its operations, reducing the amount of manual processing that has to be done. Natural disasters are taken into account by looking at the locations of these events and telling which parts may be affected in certain factories.

The procurement intelligence feature helps with efficiencies in commodity management. Worldwide pricing information provides intelligence on price competitiveness. This allows the company to be better prepared when going into a negotiation. The operational expertise part of the digital supply chain has been the biggest struggle. Production schedule and Master schedule do not always match. We want material to come in based on production schedule. With the fluctuation of production from factories, it is very difficult to get the

production schedule on the same page with the operational schedule.

Results and Insights

- **Define the Possibilities**. Educate on the state of what's possible. New digital techniques can be an opportunity or a threat. Drive the outcome by testing and learning with a focus on the customer.
- **Clearly Define Constraints and Bottlenecks.** Identify bottlenecks at both your company and within customers that have resulted in stretching the limits of old technologies. Look for opportunities to resolve these digitally.
- **Rationalize Your Digital Self. Start with Assets.** Consider which of your strategic assets will remain valuable in the digital era.
- **Define a Clear Vision.** Craft a compelling and transformative "digital vision." Make sure the vision is specific enough to give employees a direction to drive implementation.
- **Evolve.** Constantly look to extend your vision by rationalizing the capabilities created.

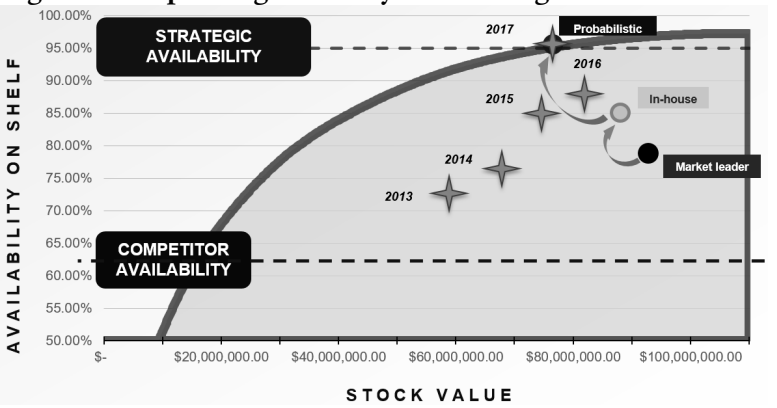
At the conference, John described this journey as the most exciting of his career. While this project of digitalization has been a success, he says the biggest challenge has been getting people to continue using the new tools. Employees often fall back into their Excel spreadsheets when they run into obstacles. According to John, the most critical thing to keep in mind when starting a project of this magnitude is that it starts and ends with vision.

Spairliners

Traditionally, companies forecast by using history (shipments or orders) as inputs and applying linear regression to historical demand patterns to estimate future requirements in a time-series format. This methodology does not work well for spare parts. The demand is just too lumpy and unpredictable.

For many years, Spairliners, a provider of airplane spare parts, tried this method and failed. In order to provide the extremely high level of service demanded by their customers for unpredictable spare parts requirements, they had to redesign the forecasting process. The results speak for themselves. Their journey of testing forecasting methodologies is shown Figure 1.

Figure 1. Improving Value by Redefining Forecasts



About Spairliners

Spairliners was founded in 2005 to provide spare parts for Airbus A380 planes (the largest passenger airliner in the world). These planes are owned and leased by airlines such as Qantas, Air France, Lufthansa, and Malaysia Airlines. Spairliners guarantees component availability.

The cost of an airplane on the ground in terms of lost business is extremely high for airlines due to the high costs of owning and leasing airplanes. Therefore, the availability of spare parts is critical to revenue for these airlines.

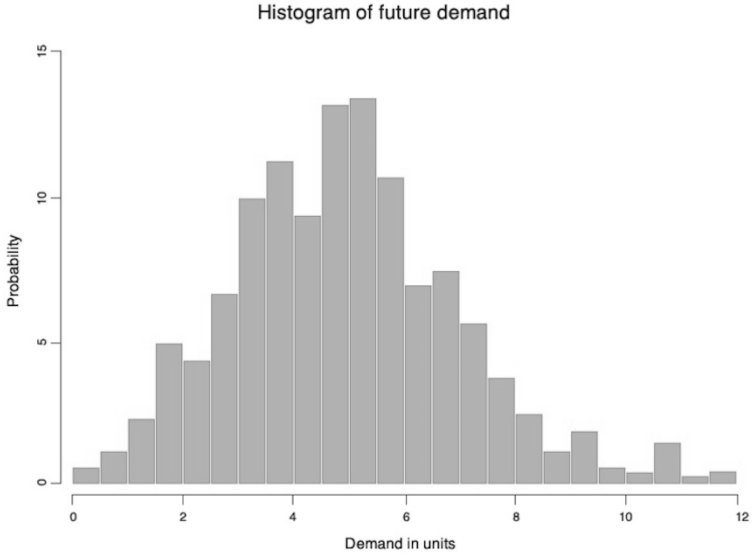
Determining a forecast model for potential spare part requirements is extremely difficult, as past demand is not indicative of future requirements. To meet the need, the Spairliners planning team knew they needed help in inventory planning. Their challenge was large: they needed to provide one billion yearly components flying hours, manage over $200 million in inventory, and guarantee a 95-99% target for on-time delivery.[1]

The results speak for themselves. Spairliners had about 73% stock availability in 2013. By 2017 it had increased to 95%. They accomplished this through probabilistic forecasting.

About Probabilistic Forecasting

Probabilistic forecasting in supply chain is relatively new. Joannès Vermorel, Founder of Lokad, a probabilistic software provider, says, *"There is not a single future."* In a podcast interview with Lora Cecere, Founder of Supply Chain Insights, Joannès stated, "*Your clients don't even know what they are going to buy. You don't know the exact lead times of the future either. There are many possible futures, and we need something to reflect [this].*"

Figure 2. Future Demand Is Not Certain



Demand data does not follow a normal distribution curve. Traditional approaches assume that the outcome is fixed and that the data is equally distributed around the mean. This is not the case for long-tail items and spare parts.

Probabilistic demand takes into account both lead-time probabilities and demand forecast probabilities. Then the cost of stock and the cost of a stock-out let the numerical optimizer balance the inventory level suggestion. A typical output from the optimizer is shown in Figure 2.

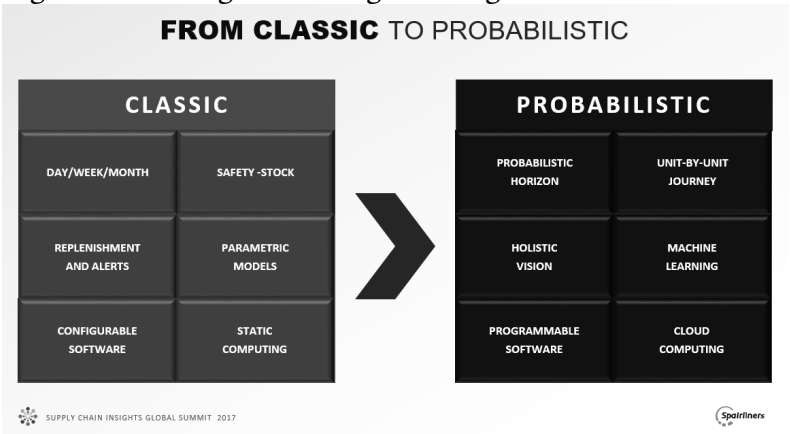
"When it comes to probabilistic forecasts, instead of giving you one number, you can get all the probabilities for all future demands. [Note: the mathematical equations were not invented by Lokad.] This was the starting point to tap into more complex models to apply to supply chain."

Details on Spairliners' Implementation

Spairliners' Material Planning Manager, Antony Nardozza (pictured), noted the importance of change management to the successful implementation of probabilistic forecasts. When pressed on the adoption of a complicated model to the supply chain, he stated the behind-the-scenes mathematics did not necessarily need to be understood by the team. They were able to validate the software using historical information to see what it would predict. Additionally, as the model made inventory suggestions, they were validated.

The biggest change, he said, was change management. The mindset of employees is quite fixed on traditional process definitions. Employees needed to start thinking in terms of the probability of future demand. Where previously, employees based the future on the past, instead, the probability of future demand units is determined. Then based on this probability, the number of units needed in stock at all times was no longer a forecast plus a safety stock; but, was instead a quantity based on the desired service level and the probability of future demand. This seems like semantics, but there is only one inventory number determined based on the desired service level instead of a safety stock inventory and a forecast inventory.

Figure 3. Making the Change-Management Transition



The time horizon is not static in probabilistic forecasting. In most companies, forecasts are determined for a particular period of time—either a day, week or month. In the case of probabilistic forecasting, the required inventory levels are based on the probability of future demand and the probability of lead times.

Recommendations & Insights

- **Allow Time to Test New Software.** New software can be a bit intimidating. Employees tend not to trust system recommendations without fully understanding the logic behind the math. Test the software and take the necessary time to ensure employees are satisfied with the outputs and make changes to inputs if needed based on feedback. This will save time in the future and will increase trust in the system, leading to less manual overrides.
- **Don't Underestimate Change Management when Implementing Software.** No matter how good the software is, unless employees embrace the new way of doing things, often the benefits are not realized. Ensure the team is engaged throughout the entire implementation.
- **Consider Probabilistic Forecasting.** For difficult demand profiles, probabilistic forecasting is a new and powerful technique. This implementation was extremely successful at Spairliners, enabling them to become world-class amongst their competitors. For more insights watch Antony Nardozza's presentation at the Supply Chain Insights Global Summit: 2017 Summit Presentations. Also, listen to Lora Cecere's interview with Joannès Vermorel, Founder of Lokad: Probabilistic Forecasting with Lokad.

SECTION 4

Making Better Decisions Through Supply Chain Planning

Forecasting: Let Us Start by Asking the Right Questions

Ten calls. They are all starting to sound the same. Here is the storyline:

"We implemented SAP APO, and we now know its limitations. We have tried SAP IBP and are not impressed. Since SAP is not investing in improving the depth of their solutions for planning, we are looking for a new solution. Can you help us select a new approach? Which of these vendors do you suggest?" They then list a combination of Anaplan, Aera Technology, E2open, JDA, Kinaxis, Logility, o9, and OM Partners. Followed by a question of, "Which do you suggest?"

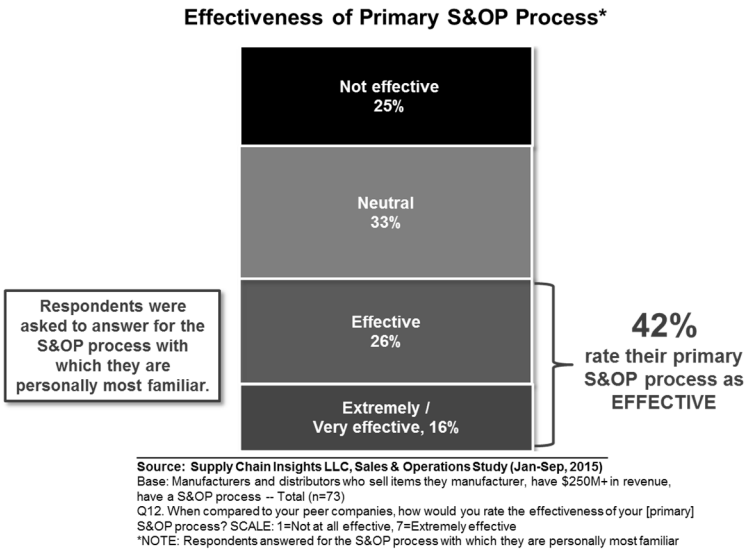
Then a young consultant from one of the large technology firms usually chimes in. "I have been mapping the process for

end-to-end planning. We have been building an RFP. I can share it with you."

I usually put the phone on mute and smile. RFPs and PowerPoint presentations are the worst way to buy decision support technologies like supply chain planning. Most consultants don't know what they don't know about planning. As a result, only 42% of companies rate their S&OP process as effective. This is especially true for forecasting. It is the flip of a coin.

I find that too many companies try to buy forecasting software through a Request for Proposal (RFP). The second mistake is treating it as the implementation of a technology. Instead, the selection process should start through data-driven discovery. The analysis should lead you to a small list of technology providers. In my experience, most companies ask the wrong questions and consequently have the wrong discussions.

Figure 1. The Effectiveness of Current S&OP Processes



What Do I Suggest?

Start your journey by understanding the problem. Begin a data-driven discovery.

Analyze your data. How forecastable is your product set?

Define the problem. What is the segmentation of demand patterns by intermittent demand, seasonal demand, phase-in/phase-out? Buy demand planning based on engine capabilities for the demand patterns.

What is your Forecast Value Add (FVA) by product segment? High volume products? Promotions? Are you adding value to your current process? What is possible?

How clean is your data? Can you easily get to three years of forecasts to backcast the data to analyze the forecasting engines? (Backcasting is the process of using prior year's demand data to try to forecast the current year, e.g., 2015 and 2016 would be used to try to forecast 2017.)

What is required for "what-if" analysis?

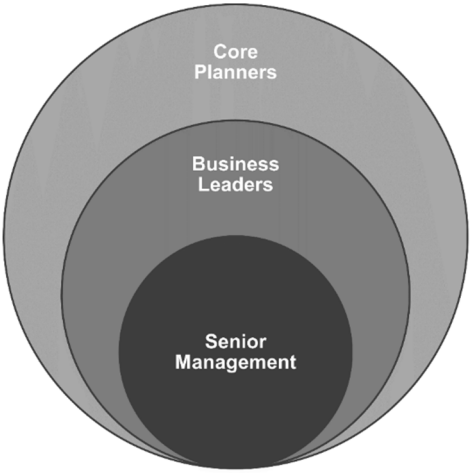
How do you shape demand? What is required in the analysis for revenue management? What is the role of the demand process in this analysis?

What is needed as a system of record? As an engine? User interface?

What is your demand latency by product demand classification? What does this mean to your inventory buffer strategies?

Are you clear on the role of the technology for the planners, business executives and leaders?

Figure 2. Analytics Layers of Demand Planning



So, if you are one of the business leaders struggling with what to do next, start by helping yourself. Ask yourself the hard questions. Do not send the market into a tailspin with an RFP. (Most are just too vague to answer and waste everyone's time.)

This type of rifle-shot of an RFP drill is a waste of time. These technology providers are very, very different. Invest to understand the differences before grouping them together for an analysis. This type of approach just demonstrates how little thought has gone into market intelligence.

Instead, roll up your sleeves and drive a data-driven discussion. Define the requirements.

Lassoing Sales and Operations Planning

A lasso is what supply chain leaders would like to have. Why? To align S&OP. The processes are out of control.

Let me explain. As companies transitioned from regional to multi-national organizations, Sales and Operations Planning (S&OP) processes proliferated. Today, the average company has seven S&OP processes, but a global chemical company averages over 30. In contrast, as a regional supply chain leader in the 1990's, my company had one S&OP. The proliferation of S&OP is not a trivial topic. Today, each company is different, and most are struggling. In my work, I have not found a company that can easily roll up a global material balance or gain a common view of demand.

The proliferation of S&OP might sound like a good thing; and it could be, but only if the processes are built with the goal in mind. A frequent mistake is letting each business build their

own systems without governance. To correct this, clearly define the role of the executive team, the global planning teams, the business teams and the regions. The definition is different by company. In some companies, the regions have strong control while in others the global teams drive the process. For example at J&J, the regional teams have the power while P&G is a very matrixed organization.

A common mistake by business leaders is thinking that they know what good looks like. The research that I have done recently dramatically challenges my 1990's paradigms. (When companies hire from outside, they will attract talent from many companies. Each defining S&OP differently. As a result, when they sit around the table to discuss the process without detail, they will spin. Each thinks they know what S&OP should look like, but the discussions need to be facilitated to drive alignment.)

Most companies that I work with are struggling with consultant talent. The challenge is greater than the knowledge level. Chose consultants carefully. A successful S&OP process is 60% change management/organizational design, 30% process and 10% technology. Most want to sell technology.

I frequently see groups of supply chain leaders arguing about the right for individual businesses to define their own systems/process. I get it. Businesses are different. However, to maximize the effectiveness of S&OP there is a need for a corporate view of data. Here I start the discussion of commonalities and differences.

What needs to be the same:

Common Definition of Time Horizons. The roll-ups are only possible if the time horizon between tactical and operational planning is consistent across the organization.

Cycle Frequency. The frequency of the plan needs to be common across the organization. If one business has a weekly planning system, and another has a monthly system, good luck!

Metrics Definition. The organization needs to be clear on the Metrics That Matter and the alignment of vertical silos' metrics to the balanced portfolio. There needs to be a common definition of supply chain excellence.

Reporting Structure. The S&OP process needs to report to a P&L leader.

Flow-Based Architectures. Many businesses do not operate in isolation. Diagram the flows and understand how businesses within the company interoperate. Build a system to enable these flows.

Financial Reporting. Forecasting hierarchies need to roll up to define business requirements, and inventory needs to be reported by form and function. All need to be clear on the role of the budget. (The budget is very controversial. I believe that S&OP should inform the budget, but the budget should never constrain S&OP.)

Business Strategy. The flows need to support a common business strategy. This needs to be common across all businesses.

Table 1. Form and Function of Inventory

Form	Function
Supplier owned inventory: raw materials	In-transit Inventories: Inventory that is on trucks, barges and containers. The longer the trade-lanes and the slower the mode, the larger the requirements for in-transit inventory.
Company owned inventory: raw materials	Cycle Stock: In the planning of production, finished good production is cycled to ensure that the production lines are fully utilized. The average rotation between products on production lines in consumer packaged goods is three weeks.
Work in process inventory	Safety Stock: Inventory requirements to buffer demand and supply volatility.
Finished goods at the company warehouse	Seasonal Inventories: Inventories required to support seasonal builds.
Finished goods in the channel	Promoted Items: Inventories to support the promotional lift to support a promotion.

What can be different?

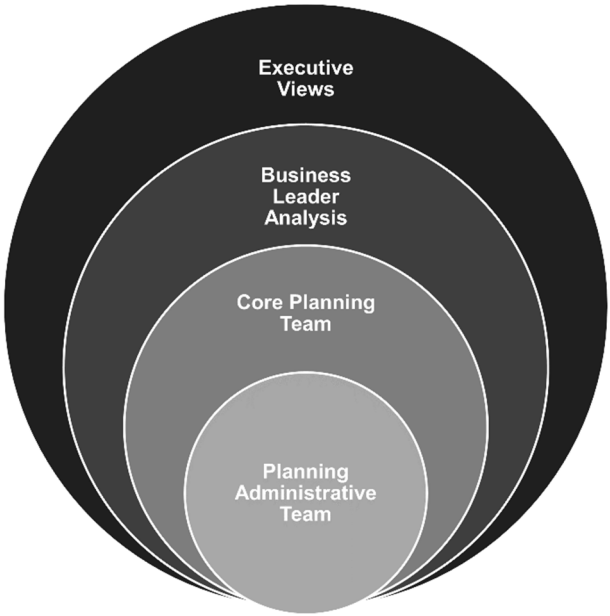
Technologies. The technologies used can vary by business unit. For example, one business unit can run SAP, one Oracle, one Logility, one Kinaxis, and one OM Partners; and it will be OK. (There are some trade-offs in training and labor, but having the right fit of a data model to build a feasible plan for supply can be well worth it.) In fact, often the requirements of the business for constraint-based planning will dictate the need for a different technology. There is a false belief that better S&OP processes use the same technologies. This myth is only perpetuated by a technology vendor trying to make his bonus, or a consultant attempting to drive a seven-figure deal.

Data Models. The supply data models can vary by business, as long as the time horizons and granularity are the same across the organization.

Visualization. When it comes to analytics, users have strong business preferences. As long as the data flows for roll-up on

inventory, forecasting and planned orders, each business can build and run their own visualization layer as long as it can roll up for an executive view. The planning level must be able to model the feasible supply plan. A common mistake that many companies make is not defining the analytics requirements for these four layers. The executive layer needs to be common, but the business leader workbench can vary by business. The good news is that this is easier today with the proliferation of descriptive analytic techniques.

Figure 1. Analytic Layers of a Global S&OP



So, if you find yourself talking in circles about the differences in business requirements for S&OP, start by making a list of what needs to be common and what can be different. Take the emotion out of the room and make it actionable.

And if you have any to add to my list, please put them in the comments. I look forward to getting your input and making this a dialogue.

No doubt about it. The decision-support technologies that we use today--price management, trade promotion management, network design, supply chain planning, transportation planning, supplier risk management--are on the cusp of redefinition through new forms of analytics. We are on a hype cycle. There is no common definition of cognitive computing and there are many variants.

A blue ocean lies ahead. We can only imagine what this means.

Navigating the Supply Chain Fault Line

Tremors. Seismic shifts. Supply chain management technology has a fault line. It is growing.

The technology market for supply chain management is dramatically shifting. Last week I bounced from call to call. Innovative startups. Artificial Intelligence innovators. Blockchain ventures attempting to define business processes and new approaches. In parallel, I am also seeing market consolidation of traditional applications. There are five fundamental shifts:

1. **Redefinition of Decision Support Software.** Last week, I spoke to three emerging cognitive computing companies attempting to redefine decision support technologies. There is a lot of noise in this market. Decision support includes all forms of planning: demand, supply, revenue, manufacturing and

transportation planning. The inclusion of cognitive computing in decision support will make the traditional applications in the advanced planning solution markets obsolete

2. **Disintermediation of Business Process Outsourcing (BPO)/3PLs.** Companies have focused on labor outsourcing and third-party solutions to reduce headcount. The result? The shifting of costs and the loss of control of process integrity. This transfer of ownership reduced the effectiveness of procurement. Blockchain and cryptocurrency can and should disintermediate business process outsourcing. BPO/3PL providers need to be eliminated through machine learning and automation.
3. **Robust Market Emerging for Digital Manufacturing Technologies.** Robotics / wearables / the Internet of Things / additive manufacturing coalescence is redefining manufacturing. This includes the definition of spare part requirements, maintenance outages, and production planning.
4. **The Autonomous Supply Chain for Physical Logistics.** Drones in warehouses using machine learning for real-time inventory and self-driving vehicles are transforming logistics. It is happening.
5. **Driving Value in B2B.** For the last two decades, we have been trying to squeeze transactional pennies from B2B processes through hands-free processing and automation. We now have the opportunity to use blockchain to improve cold chain effectiveness, improve lineage/track-and-trace to ensure brand integrity, and redefine multiparty finance. The days of factoring,

deductions, and bifurcated payments could end. Leaders can now start to think about how to drive true value with suppliers versus the legacy discussions of increasing waste by elongating payables, increasing fines/penalties, and the use of third-party outsourcing that increases issues with payables.

These changes can only happen if we learn from the past, to unlearn, and to rethink the future. The challenge is "unlearning." Companies are hamstrung by legacy functional thinking.

There are some early lessons. Here is what I hear on calls:

- Having the digital innovation team in the IT organization is like drilling a hole in bedrock. It just does not work.
- System integrators/consultants building software is also not a sustainable/viable model. Adoption of these new ways of working requires testing and learning by small scrappy teams chartered to solve new business models.
- Innovation will never come from application consolidation.
- Fire the narcissistic supply chain leaders that believe that they have the answers. We don't have the answers. We have historical practices, not best practices. Stalled progress on metrics: 90% of companies find themselves stuck on key supply chain metrics (cost, inventory, growth, ROIC).

New solutions are bouncing around the market. Innovators are looking for buyers. They are seeking business innovators. IT loyalty to Enterprise Resource Planning (ERP) providers, legacy consulting relationships, and fear of change by business leaders slows adoption. Consultants are playing catch-up. Innovation

challenges their traditional business models and each company is struggling with their own demons.

We are seeing innovation at the edge. The question is how to move it to the core. We need to challenge the fundamentals of the past and redefine the atoms and electrons of the processes of the future. Doing this requires leadership. It cannot happen at the functional level.

If you are in the United States have a great Thanksgiving.

Trust, But Verify

When I joined the world of software as a business analyst from manufacturing, I was naive. How so? I never fathomed the amount of money that commissioned software sales personnel make selling software. This high level of compensation drives extreme behavior.

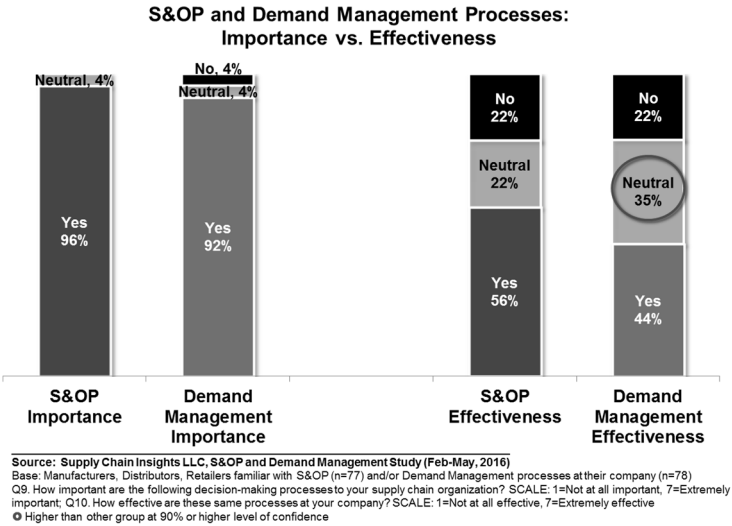
In the selection of software, where the rubber meets the road, the sale of software often becomes a brutal and competitive battle. With a heightened focus on winning the deal, sales teams push decision groups into emotional and political arguments. It is deliberate. As the battles become intense, the facts and intellectual discussions get pushed to the sidelines. It becomes all emotion. To sidestep the hype, I would argue that the teams need adopt Ronald Reagan's slogan, "Trust, but Verify."

A software supply chain planning project needs careful selection based on the fit of the engine and the data model. Unfortunately, for many companies selecting software, this is difficult. Why? Most technology vendor presentations sound

alike and the business teams cannot determine the important differences from a demo. I frequently get calls from companies involved in a year's process of software selection and they cannot make a decision. They will call and ask me, "Which vendor should I chose?" I never make the decision. Instead, I facilitate a discovery process. My recommendation? Ask the software company to demonstrate the proof.

My recommendation is for teams to ask the technologist to participate in a *proof of concept* to verify the solution. Unfortunately, few do this type of testing. The lack of this testing is one of the reasons why software satisfaction is so low. There is a nominal fee, and a requirement of time and energy, to do the testing, but it makes a difference. In Figure 1, we outline some of the satisfaction rates with demand planning and S&OP software.

Figure 1. Satisfaction with Sales and Operations Planning and Demand Management Processes



Source: Supply Chain Insights LLC, S&OP and Demand Management Study (Feb-May, 2016)
Base: Manufacturers, Distributors, Retailers familiar with S&OP (n=77) and/or Demand Management processes at their company (n=78)
Q9. How important are the following decision-making processes to your supply chain organization? SCALE: 1=Not at all important, 7=Extremely important; Q10. How effective are these same processes at your company? SCALE: 1=Not at all effective, 7=Extremely effective
❶ Higher than other group at 90% or higher level of confidence

The effectiveness of supply planning and production planning software is even lower than S&OP and Demand Planning. The highest satisfaction rate for business users is in the area of warehouse management. In essence, when it comes to planning, success is a flip of a coin. This is sad but true.

How to Verify

To understand and drive outcomes, test the software through a series of "Bake Offs." Invite your most promising technology providers to participate and test the software for your use cases. Carefully provide requirements, and ensure that the team is clear, and in alignment, on the success criteria.

- **Forecasting/Demand Planning.** To verify the "fit of the forecasting engines," take four years of data and give the technology provider the prior years data. In this case supply 2012-2016 monthly (or weekly) shipment and order data and ask the technology company to forecast sales for 2017 (keep the 2017 data in confidence). Divide the data into demand flows--new product launch, trade promotions, line extensions, seasonal builds--and communicate these characteristics to the technology provider. Communicate the like demand streams, year-over-year, to the technology provider, but do not share the 2017 data. Then ask the technology provider to load their engines and deliver what they believe is the forecast for 2017. Then calculate the error and bias on each of the demand streams. Pay close attention to the items in the long tail.
- **Production Planning.** Take a year of orders and share them with the technology provider. Give the technologist the characteristics of changeovers,

constraints and cycle planning, and ask them to provide you with a sample production plan. Pay close attention to the details of the schedule plan and understand what drives schedule attainment. Evaluate the impact of the production schedule output to cycle stock, and make a comparison to the cycle stock requirements of your company's prior year.

- **Transportation Planning.** Take a year of orders, along with your route assignments and pooling specifications. Ask the transportation provider to provide you a set of sample plans. Look for capabilities for load assignments, pooling, continuous moves and backhaul definitions. Compare the impact on cost.

My Recommendations

In my 20 years of following this market, I have five recommendations:

1. **Triangulate the Market.** Technology companies usually supply positive references. To get the best results, go around the technology sales person's glide path, and try to find references on the entire spectrum--the good, the bad and the neutral. You can learn from all three. I know of no software implementation where there are only positive references. The question is "What is the best fit."
2. **80% Is Never Enough.** Many times software sales teams want to gloss over the details of optimization, stating that 80% is enough. Many times this is the rationale of an IT group pushing IT Standardization. To drive business results, data model fit and engine design are more important than integration. In the

implementation of supply chain planning, integration is the easy part. Business process optimization is the more difficult and critical element. Test and verify that you have a technology that can do the job.

3. I**ndustry Specificity.** Look for deployments in like industries. While strategic network design technologies are more widely deployed across the industries, the more operational technologies like demand sensing, production planning, deployment, transportation planning and material planning are very industry-specific. Do not try to cross the lines: apply a solution outside of your industry.
4. **They Don't Have It Now, but the Vendor Will Build the Solution.** Often if the capabilities are not in the software, there will be a claim that the vendor will build it. We find that the building of new software will take 9 to16 months and companies are seldom satisfied with the build. In my twenty years as an analyst, I only have two cases where this type of co-development was successful. Avoid one-off software efforts.
5. **Avoid a System Integrator's Recommendation.** System integrators usually get a commission on the sale of the software. They are usually not a neutral party. Ask your system integrator for details on their arrangement with the software provider. Buyer beware!

These are my thoughts. I welcome yours.

What Is Planning?

Cloud. Descriptive analytics. Prescriptive analytics. Machine learning. Collaborative workflow. What-if analysis. I find, as I attend conferences, that the word 'planning' is bandied about, but few technologists dive into the details. We have lost the ability to have a discussion on the fundamentals. It drives a supply chain planning gal like me crazy. Here I share some insights on planning. For everyone trying to navigate new technology options, this is an important question.

A Look Back

The traditional world of supply chain planning managed inputs into a data model to drive outputs. While we can argue about which technologies have the best role-based usability and what-if analysis, the key to the selection of supply chain planning is the fit of the data model and the ability to drive an output that drives business value. A mistake that many companies make is a

focus on implementation. Instead, it was about fine-tuning and model configuration. The goal should not be about speed to implementation. Instead, it should be about the "success of the model output" to drive value.

With the evolution of Enterprise Resource Planning (ERP) platforms and the zealous implementations of many business consultants, the basics of planning were lost. As companies focused on the hype cycle of the "integrated supply chain model," the projects were large and complex. The focus by IT on implementation often left a business leadership team with a tool that they could not use.

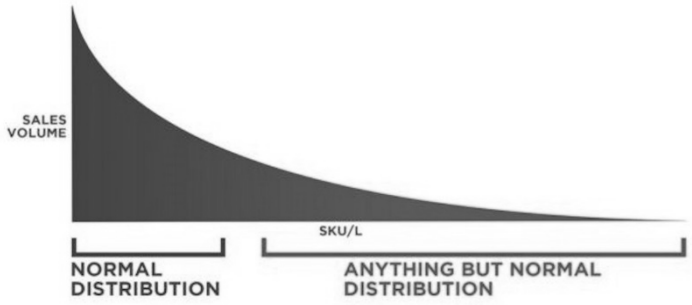
Evolution Issues

Today, the client-server technology vendors are moving to cloud-based deployments. However, companies like JDA, Logility, Oracle, and SAP are hamstrung by software maintenance upgrades, promises to customers, and evolution. One of the largest blights in the market is the SAP evolution of APO and the lack of clarity of the roadmap. APO became the market leader despite the lack of functionality, and the IBP roadmap makes this worse.

In parallel, companies seeking a path forward are being deluged by "schema on read" technologies, cognitive computing, prescriptive analytics and machine learning which is largely making the traditional planning world obsolete. The traditional engines were based on linear optimization. As supply chains grow more complex (with an increase in items, and lumpy demand due to globalization), they are increasingly becoming more nonlinear. This requires deeper modeling and the use of channel data. Linear optimization assumes a normal distribution of data. For the distributions that are not normal, machine

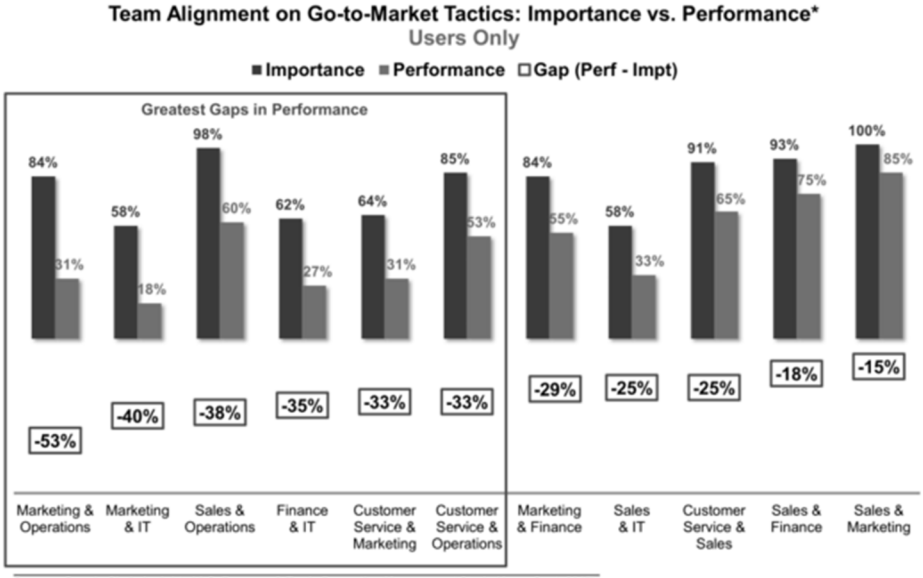
learning and cognitive computing are gaining traction. (Credit for Figure1 goes to ToolsGroup. I liked their image.) The point is that the area in blue represents high-volume items that typically represent statistics based on a normal distribution. Traditional supply chain engines assumed a normal distribution which is increasingly becoming a smaller data set.

Figure 1. The Long Tail of the Supply Chain Requires Deeper Engines Using Nonlinear Optimization



In addition, as business becomes more complex, the assets are more utilized and the business has more manufacturing constraints. Constraint-based supply requires deeper modeling of manufacturing and network modeling. The business teams struggle to keep skilled planners. There is a need for a connection from the core planning world of supply planning to business leadership capabilities with mature collaborative workflows and "what-if" capabilities. In a global organization, there are typically different needs for three core roles. Core planners need deep models while business users need "what-if" capabilities connected to the models along with a "collaborative workflow." The core planners need deep modeling and access to clean master data.

Figure 2. Organizational Alignment



Source: Supply Chain Insights LLC, Revenue & Trade Promotion Management Study (Aug - Sept. 2017)
Base: Users (manufacturers & distributors) (n=55)
Q15. Now think about [your][a typical consumer products] company's internal TEAM ALIGNMENT in terms of go-to-market tactics (sales and marketing tactics used to improve sales and drive incremental volume.) How important do you believe it is for the following teams to be aligned around [your][their] go-to-market tactics? SCALE: 1=Not at all important, 5=Very important; Q16. Now, how aligned do you believe these same pairs of teams actually are at [your][a typical consumer products] company when it comes to [your][its] go-to-market tactics? SCALE: 1=Not at all aligned, 5=Very aligned; *Showing those rating 4-5 on 5-point scale

This is an issue for most companies. Traditional Advanced Planning focused on core planners but not usability by business leaders and senior management. Technologies like Anaplan, Halo and Kinaxis improve visibility for these key roles.

Technology Acceleration

As we move forward, there is a lot of discussion on descriptive analytics and the ability to get data. There is also a lot of hype on "connected planning." However, I scratch my head. How can we have connected planning if the organizations are not aligned, and do not have a balanced scorecard that crosses across the company to drive functional alignment?

Collaborative sales planning introduced in the last decade increased error and bias. Asking sales for a forecast is vastly different than sensing the market based on channel data. To win, companies must get aligned cross-functionally on the role of the budget, and drive alignment on the strategic plan.

The technology market is moving in two directions (deeper modeling through cognitive computing and greater visibility through descriptive analytics). In this evolution, confusion reigns. This includes hands-free planning with "schema on read" machine learning and easy-to-use descriptive analytics with easy "what-if analysis" that is not anchored with deeper modeling. These are polar opposite pulls that actually need to be brought together. With the confusion on the SAP migration plan for 2025, more and more companies are in the market looking for solutions. The frenzy is high and the increased confusion on the technology options increase the number of questions. As you try to navigate the market don't forget the basics.

Planning Basics

Whenever someone uses the term "real-time planning" raise a red flag. Planning is not, and should not be, real-time. Attempting to do planning in real-time will add nervousness and error into the planning processes. Don't confuse sensing and translation with planning. **Avoid any process that is described as real-time planning.**

Planning time horizons exist for a reason. They are the natural boundary for global versus local planning governance. The best teams define governance and are clear on time horizons. There are natural processes which require a tactical horizon for procurement buying transportation sourcing, and Sales and Operations Planning (S&OP). In the tactical time horizon, shifting and aligning manufacturing loads across factories is critical. If you are a regional or a small company, tactical planning is not as critical. The best companies are great at strategic network design and translate this to a global planning team that sets the network for a longer period of 18-24 months. Being good at tactical planning is essential for managing costs. The shorter-term horizon of 0-12 weeks benefits by faster planning cycles but short-term operational planning is not sufficient to manage the supply chain. It is best when complemented by strategic and tactical planning. In addition, cognitive computing and the redefinition of workflows for "multiple ifs" to "multiple thens" is transformational for the redefinition of Available-to-Promise (ATP), allocation, and inventory management workflows. **Don't make the mistake of eliminating time horizons. Use new technology options to improve hand-offs and visibility and reduce planning batch cycles.**

Test but verify. The use of deeper engines and workflows can improve outcomes, but only if we test and learn. **Never treat a planning project as an implementation. Test. Learn. Evolve. So often, companies forget to configure the system and test the output of the planning engines.**

Sales-driven processes are not market driven. Marketing-driven processes are not market driven. Market-driven processes are outside in starting with the customer and translating data back into the organization as a usable demand signal. The best results happen when the focus is on the market, using channel data, not on functional planning. **Aggressively build outside-in processes.**

As you consider the options, it is important that you ask the question "What is planning?" Don't accept historic views of planning limitations, but don't forget the basics. And, if you have questions, let us know.

SECTION 5

Technology Advancements

An Analytics Framework for Supply Chain Leaders

I dialed in, took a sip of coffee, and rocked back in my seat. I asked, "How can I help you?" (This is my standard modus operandi. When not traveling, I answer nine calls on average a day.) When I asked the question, an awkward silence followed. A strained request from a marketing director for a software company ensued, "You didn't list us in your analytics report, and we want to know why." I smiled. Why, you might ask? This type of inquiry is a compliment. How so? When people care enough about my writing, they ask this type of question if they want to know more. If they take the time to ask, then the writing and research matters.

The next comment made me laugh. The marketing director continued, "We are trying to understand. You see the world so much different than the Gartner analysts. They would have listed us." At this point, I put the phone on mute and laughed. It

was not a normal hee-hee, but a deep belly laugh. I thought but did not verbalize on the phone, "Yes, of course. There is a reason why I am not a Gartner analyst." But then I started thinking, had I been clear in the taxonomy of the recent supply chain analytics report? My answer was no.

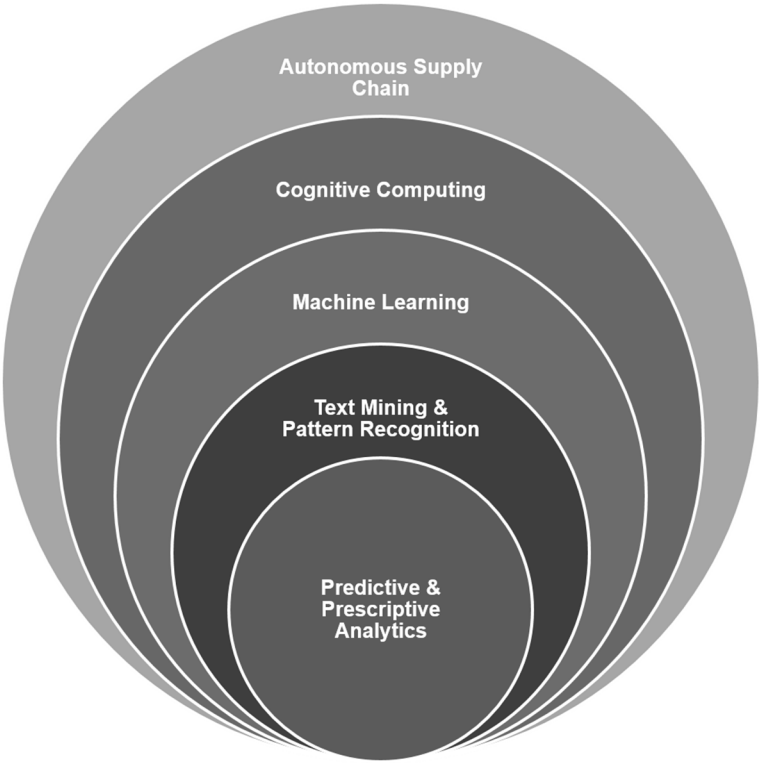
In the 1990s, when I was part of the software team at Manugistics, supply chain analytics was a synonym for reporting. We were just starting to think of supply chain planning as decision support. Today, when you say the term analytics, the thought in many supply chain leaders' minds is still 'reporting'. It has also moved past the IBM marketing hype of Big Data Analytics. Thankfully, there is now more definition. Today, it is much, much more.

My goal for this blog post is to rectify my omission and give supply chain leaders a framework to better understand supply chain analytics. For the framework, I find five relevant dimensions:

First, Consider How to Drive Insights. Companies are data rich and insight poor. New forms of insights from predictive, to prescriptive, to cognitive analytics define new capabilities. Difference? While visualization helps business users to see the problem, there is no optimization. In predictive analytics, there is a clear objective function and a solve against a desired outcome. On prescriptive analytics, the solve yields exceptions and the insight engine gives recommendations on how to best manage them. Machine learning drives insights for prescriptive analytics. Cognitive sense, learn and then drive action. These engines are fed by sensing sensor data or through the use of unstructured text. We are moving up the stack from descriptive to predictive, to prescriptive to cognitive. The

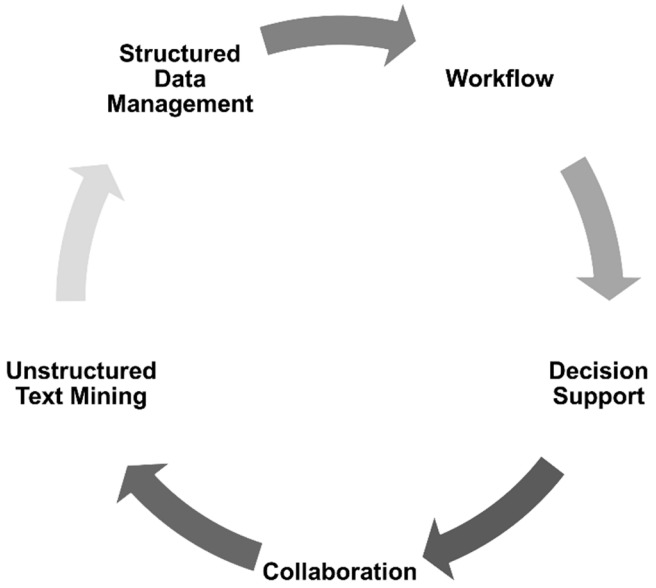
engines can be deployed in numerous types of analytics as shown in Figure 1.

Figure 1. Progressive Capabilities to Deliver Insights Through Analytics



Form and Function. As a supply chain planning gal, most of my posts focus on decision support. However, with new analytics, we can now improve workflows, collaboration, the use of sensors with streaming data, unstructured text mining, and the management of transactional data. Data can now move at the speed of business. While the traditional paradigm focused on batch and latent data, new forms of analytics redefine the Art of the Possible. Streaming data architectures are quite different from traditional analytic approaches.

Figure 2. Types of Analytics



A Third Element Is the Type of Deployment. Analytics can be deployed in clouds, rivers or lakes. Traditional analytic approaches were more focused on reporting on applications like ERP, CRM, APS, WMS, and SRM. New approaches are not application specific. Instead, these analytic architectures sit between the traditional applications and workforce productivity.

A Fourth Is the Database Structure. Moving to Schema on Read. New forms of analytics enable schema on read versus schema on write. The traditional use of use of relational database technology dictated schema on write forcing users to define

hierarchies and relationships in deployment. The problem? Business changes. What is believed to be the right requirements in an early deployment might not be the answer. Schema on read enables a much more flexible approach for decision support and workflow. This approach makes many of the relational database structures questionable. While columnar store makes sense for transactional data that is used frequently, it is not a good choice for decision support for time phased data or streaming data architectures.

The Fifth Is Defining the System of Record. As analytic infrastructure evolves, less and less enterprise data will be written to ERP. More will be written to data lakes to enable schema on read approaches to enable new forms of process enablement. Transactional data, while important, will be combined with unstructured data more routinely in data lakes, clouds and streams. We must rewire our brains to not think so narrowly as the integration of transactional data into ERP as the end-to-end vision for supply chain management. Blockchain will become the System of Record for B2B. While there is much to test and evolve to enable multi-tier relationships, the technology is promising.

Recently, we published a report on analytics in our monthly newsletter. It is a popular subject. We had over 450 supply chain leaders sign up for our recent webinar.

In short, only one in four business users is satisfied with their current forms of analytics; but most companies struggle to drive an initiative to test-and-learn new forms of analytics using the three-part framework listed above. The most testing is in the area of visualization.

Figure 3. Current Levels of Investment

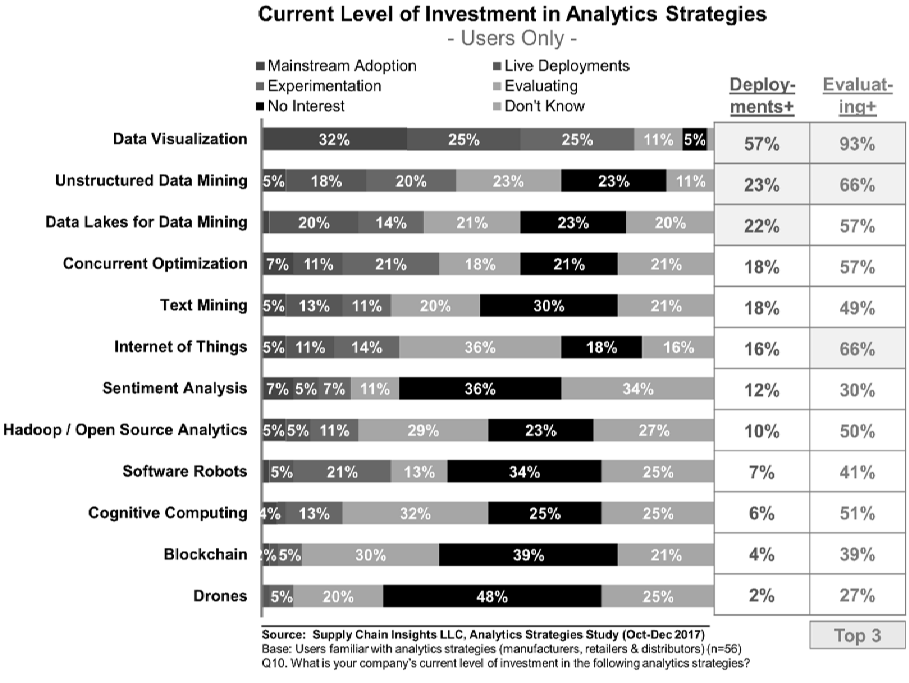
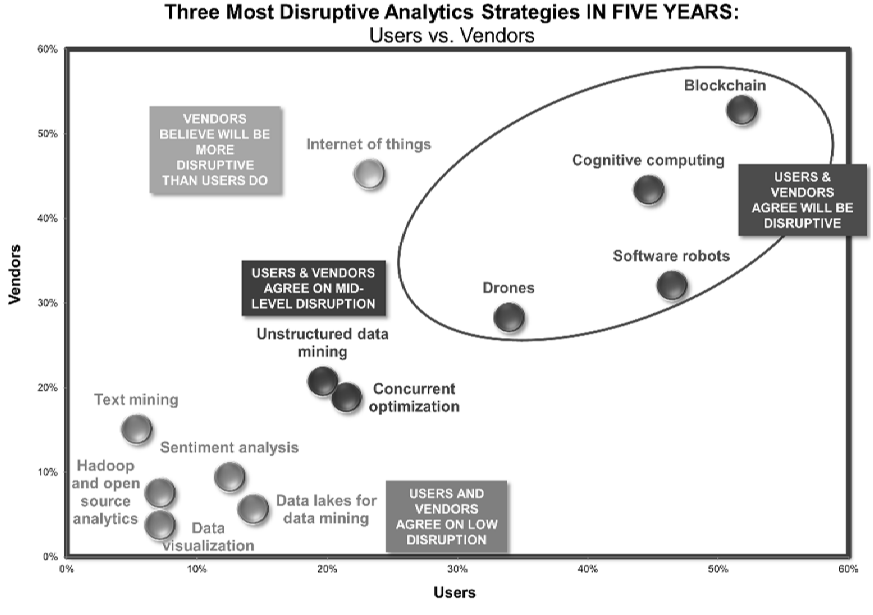


Figure 4. Most Disruptive Analytics Strategies Within Five Years



Source: Supply Chain Insights LLC, Analytics Strategies Study (Oct-Dec 2017)
Base: Total familiar with analytics strategies -- Users (manufacturers, retailers & distributors) (n=56), Vendors (software providers, consultants, & 3PLs) (n=53)
Q14. And what three do you believe will be the most disruptive to supply chains in FIVE YEARS?

While blockchain and cognitive computing are believed to be the most disruptive within five years, less than 7% of companies are actively testing these technologies today. While immature, the two together offer great promise. We continue to push the envelope to help companies test these technologies through the share group for the network of networks. The next session is at the GS1 Headquarters in Chicago on April 4th-5th. Let me know if you are interested in joining the discussion and learning more.

So, in short, there are many facets to rethink analytics and drive business value through the Art of the Possible. It requires testing existing paradigms and redefining old processes. I hope this helps.

I look forward to getting your feedback. I am going to close now. Philadelphia streets are swarming with crowds celebrating the Superbowl win. I think I'll go join the crowd.

If Only There Were More Choices

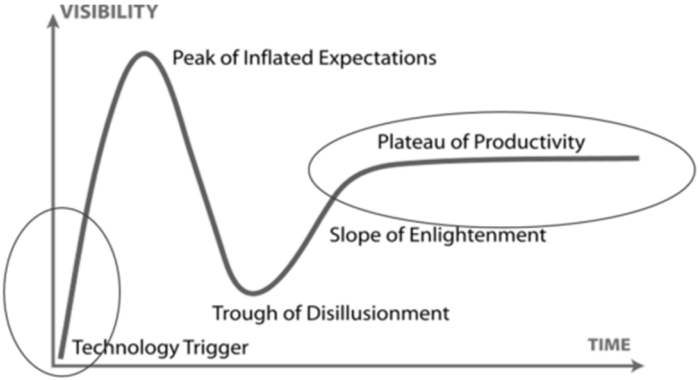
The supply chain technology market is in transition. Over the last three decades, the market weathered consolidations, mergers and technology shifts. Many of the clients I work with are nervous about SAP APO's transition and the evolution of SAP's supply chain planning solutions. They are looking for alternatives.

Figure 1. Innovation Adoption Life Cycle

As I work with these teams, one thing is clear. Companies are at very different places, based on the company's cultural DNA to try new solutions. While there is a lot of hype about digital transformation, and I feel that the confluence of the new technologies offers great promise, the testing of planning alternatives is only for innovators. As I talk through the market options, I find we have solutions for two groups of buyers now--innovators and late majority/laggards. However, there are limited solutions for the companies in the middle of the adoption curve--early adopters and early majority.

To tell the story, I am going to use the Gartner hype cycle model to explain the dilemma. (The hype cycle was my favorite Gartner model when I was a Gartner analyst in 2001-2003.) The hype cycle model asserts that technology adoption moves through five distinct phases: the trigger, the peak of inflated expectations, the trough of disillusionment, the slope of enlightenment, and the plateau of productivity. Most of the newer technologies--cognitive computing, machine learning, autonomous vehicles, cryptocurrency, the use of drones for sensing, additive manufacturing, wearables, and blockchain are early in evolution. We are at the beginning of the hype cycle. As a result, they are only a good fit for early adopters. In contrast, there is focused refinement of supply chain technologies on the plateau of productivity. There are few technologies in between, and I do not expect the technologies on the plateau of productivity to drive innovation.

Figure 2. Current State: Supply Chain Management Hype Cycle

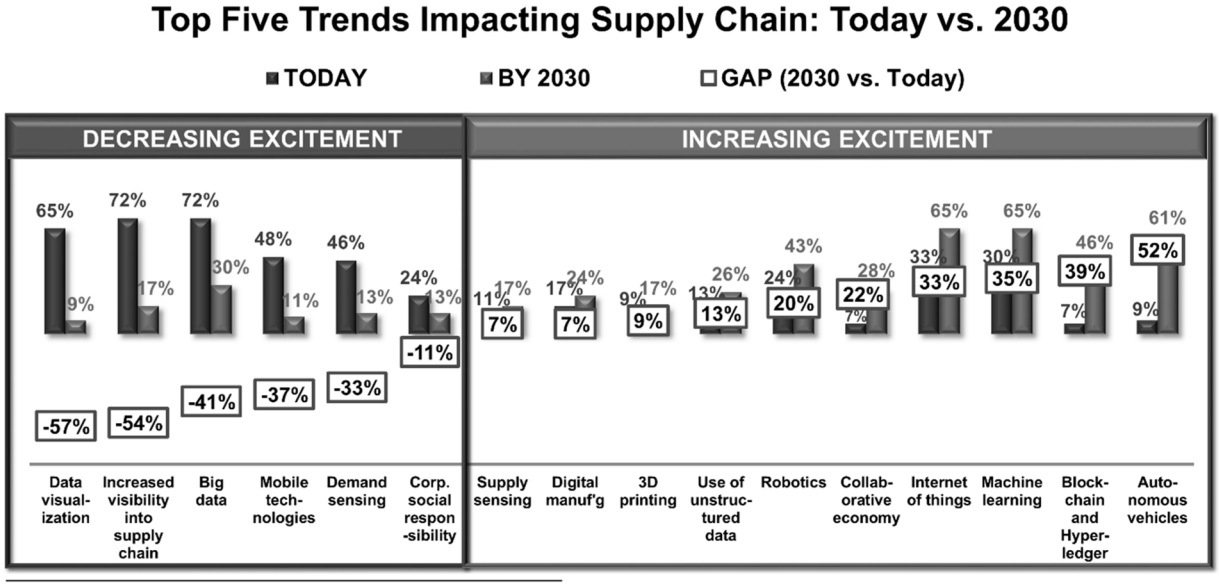


Early Adopter	Late Adopter
Cognitive, Machine Learning, Blockchain, Internet of Things, Wearables, Drones, Autonomous Vehicles	Cloud, Concurrent Planning, Descriptive Analytics, Production Planning, Inventory Management, Transportation Planning

In contrast, when we look at the evolution of technologies for 2030, we see a very different view. Over the next 13 years, the innovators will test-and-learn with the technology innovators. Most of this effort will be with best-of-breed solutions, and I predict we will see an increase in the use of open source data techniques—Hadoop, Spark, Kafka—with more focus on schema on read.

The rate of change on the hype cycle is faster than in prior years. However, I am hoping the hype is better managed (setting of realistic expectations) than as happened previously in history. When we overhype the industry, there are more failures and disappointments.

Figure 3. Shifts in Technology for Supply Chain 2030



Source: Supply Chain Insights LLC, Global Summit Survey 2017 (June - August 2017)
Base: Supply Chain Insights Global Summit 2017 Registrants (n=46)
Q14_1. When it comes to driving supply chain excellence, what are the top FIVE supply chain trends impacting [your company's] supply chain(s) TODAY?
Q14_2. And what do you think will be the top five trends to impact [your company's] supply chain(s) by 2030?

Yes, I know. Two very different views of the same market. Most of the industry is working on the plateau of productivity. The promise of technology innovation hangs large for these teams, but they do not know what to do. The pressure is on.

I have never seen a faster pace of change. So, what should an early adopter do when they want to move forward conservatively?

1. **Learn.** Actively send employees to conferences, encourage teams to attend webinars, and invite technology innovators to your facility for lunch and learn innovation activities.
2. **Actively Follow the Work of Innovators.** Identify members of your team to work in industry share-groups to learn more about the testing of new technologies.
3. **Don't Limit the Scope to Traditional Technologies.** Innovation is happening at the edge. If you limit your options to traditional technology solution vendors, you will miss most of the opportunities.

Now is the time to develop the knowledge level of employees and focus on building capabilities. Start with clearly identifying the capabilities that you want to build and then organize discovery teams. I hope this helps. I look forward to getting your feedback.

Navigating the Hype Cycle of Cognitive Analytics

Buyer beware. We tend to overstate the importance of new technologies in the beginning of a hype cycle and understate the value of technologies at the end of a life cycle.

A hype cycle starts with a technology trigger. In the case of cognitive computing, the trigger is the use of sensor technologies along with in-memory processing to sense, learn and act. We are witnessing the evolution of analytics for pattern recognition, and unstructured text mining along with the redefinition of architectures to enable streaming data and real-time process innovation. The work by Google on manless vehicles or the Department of Defense's work on 'bad guy detection' spawned early innovation. Despite the powerful and brilliant IBM

Watson marketing machine, realize that it is still early. Only 7% of manufacturers are experimenting with cognitive computing.

The peak of inflated expectations lies ahead. At this stage, hype reigns and craziness becomes the new norm. I think that this is a technology trend that is here to stay with long-lasting implications; however, my advice to technology leaders is to take it slow. We will drive more value if we slow down the hype cycle by testing and co-development with technology innovators. Realize that these technologies, while promising, are still experimental. The redefinition of decision support, and the building of adaptive rule-sets within the enterprise through cognitive computing, will take time. The longer we take, the larger the potential value. There are many powerful use cases; but use caution, they are evolving.

After the hype, realization sets in, we enter the trough of disillusionment, followed by a slope of enlightenment which leads to a plateau of productivity. This is the current state of the Enterprise Resource Planning (ERP) and Advanced Planning Systems (APS) markets.

Almost every technology conference that I attend these days has an "AI announcement." (AI lacks a common definition. Ask each technology provider for a definition: artificial intelligence or augmented intelligence? The implication is the use of computer learning to improve decision making.) However, when push comes to shove, in Q&A most of the announcements are on pattern recognition/text mining. Here I give the reader some insights into the definitions I use in my writing. My goal is to start the dialogue to define these terms to avoid confusion. The evolution of capabilities creates confusion.

Descriptive and predictive analytics drive the world we live in. This is our comfort zone and our paradigm. The journey starts with definitions and clarity on terms.

Getting Clear on the Definitions.

Let's start with some definitions:

Descriptive Analytics. These technologies enable the visualization of data for human consumption. There are many descriptive analytic technologies in the market including Arcadia, Microsoft BI, Qlik, Tableau, and Spotfire. The list could go on and on. Over the last decade, the evolution of descriptive analytics to visualize the current state dramatically improved supply chain decision making.

Predictive Analytics. In contrast, predictive analytics enables modeling and the use of statistics to derive insights. The building of the data models is based on what we know. This is the world of statistics largely driven by the evolution of ILOG (now owned by IBM), R, SAS, and SPSS (now owned by IBM). The evolution of data modeling through predictive analytics triggered the evolution of supply chain planning, frequently termed APS. Advanced statistical modeling through the use of techniques like stochastic optimization, genetic algorithms, and Random Forest analysis drove improvements in supply chain planning in the period of 2005-2010. Predictive analytics models are largely based on data inputs from history. They are batch, and the data is usually structured in rows and columns in a relational database. The output is a recommendation and a list of exceptions to review and consider. There is no sensing.

Prescriptive Analytics. Sensor technologies drive the evolution of prescriptive analytics. Using inputs like weather, traffic congestion, and flow sensing, the analytic output adapts

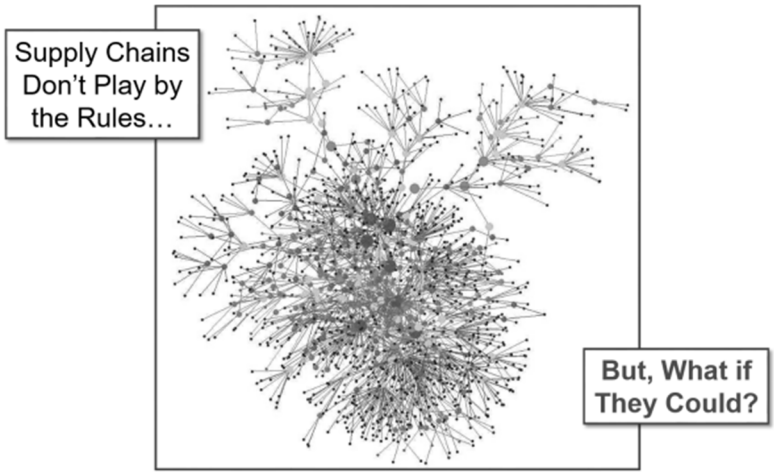
to give new inputs based on the use of sensors. The outputs not only include exceptions, but a recommendation on what action to take based on the exception.

Pattern Recognition/Text Mining. In this approach, there is no predetermined data model. The focus is learning from the data. The computer output is an analysis of the patterns. An early leader in pattern recognition was Terra Technology, now owned by E2open, that pioneered the evolution of demand sensing. SAS's text mining applications lead in the mining of unstructured data for sentiment analysis.

Machine Learning. When the computer learns from pattern recognition and text mining, the next evolution is machine learning. This enables insights on the patterns. Rulex, a partner of ToolsGroup, is an example of machine learning. The insights are driven by models using statistics from pattern recognition. This type of technology will transform master data management and the matching of documents.

Cognitive Computing. In this evolution, machine learning using an ontology drives insights. (A view, or starting point, of complex interactions that are many-to-many.) This ontology uses structured and unstructured data. It is not limited to relational database technologies. Things no longer are force-fit into rows and columns. Figure 1 is an example of an ontology. The ontology is the beginning state for learning. As the computer learns, the ontology is updated. This enables new insights. The computer answers the questions that we do not know to ask through sense, learn and act workflows.

Figure 1. An Example of an Ontology



So, as you sort through the onslaught of vendor promises, ask some basic questions:

How do you do the modeling?

What do you use as inputs?

Can you clarify the business problems that you solve?

After you get these answers, start to put the technologies into your own taxonomy. While many technologists are using the term AI, for many it is lipstick on an old pig.

As we sort through these new technologies, our feet need to be grounded in reality with a focus on goals. The building of a digital innovation analytics strategy requires big feet and wings. How so? The wings allow us to imagine the future, but the feet are grounded with a focus on today's reality and delivering against business goals. We cannot confuse activity with progress. It takes both; and hopefully, we will not let the technology community overhype and short change one of the most promising shifts in technologies in over a decade.

This is an inflection point for decision support technology providers. The AI presentation hype is in full force. The future is in our hands. The journey starts with clarity on definitions. Let me know what you think of these working definitions. I will mold them through input.

Upending the Apple Cart

Today, hurricane Nate's north winds are pushing against the bayous of Louisiana.

In offices across the United States, demand planners are scratching their heads. The impact of multiple hurricanes this season differ by commodity. What are they seeing? Shifting demand and rising prices for cotton and orange juice. Higher spikes for lumber and building supplies. Surprising demand in automotive for car replacement. A shortage of pharmaceuticals in Puerto Rico. One thing is clear. History is not a good predictor of current demand. They need accurate and timely channel data. They do not have it.

Sensing markets and translation of channel demand into an accurate demand signals for the company is the foundational principle of market-driven processes. Traditional processes are inside-out. They do not sense or adapt to market shifts. While many technologists wave their hands advocating that the Internet of Things (IOT) is the answer, I say not so fast. When

I hear this, I raise my hand to ask some basic questions. If we look back at history, 70% of companies implemented Vendor Managed Inventory (VMI), however two decades later only 1% of companies use VMI processes to drive a better demand signal. In most companies, sales teams use VMI processes to develop orders. They operate in isolation. The reason? Today's demand processes are inside-out. In today's architectures, there is no place to put outside-in data like VMI, Point-of-Sale (POS) or rating/review data. IOT will be the same. So, I ask, "What will be different? Won't we have the same issue for the Internet of Things data? Instead of jumping up and down on IOT shouldn't we be discussing the redefinition of demand?"

Demand discussions raise emotions. I know of few areas in supply chains' discussion that raise as much dialogue or ire. On one extreme, there is an argument which states forecasts are always wrong, "Why do them at all?" At the other end of the spectrum is the argument that "Forecast error is the most important metric to improve." I am in the middle. I do believe in demand planning, but most companies overstate forecast improvements. Here I share my world view.

Everyone has a bias. Let me be transparent on mine. I worked for a software company for almost a decade and implemented demand management solutions in the 1990s for multiple companies. At that time, the demand processes were largely regional. I also worked in manufacturing during 1978-1992 trying to plan demand. I have been an industry analyst covering the market--Gartner, AMR Research, Altimeter Group and my own company Supply Chain Insights-- since 2001. I have seen a lot of fads--CPFR, VMI, Flowcasting, Collaborative Sales Planning-- they all come and go. Each was going to solve the problem of getting a better forecast. Not so. The gaps between

what people want and what they have is great. This was the subject of my last blog post, Upending the Apple Cart. In that blog post I stated we must start by examining the apples.

The Problems

Today's demand management processes have many issues. They are not well-understood. Here are some top-of-mind issues:

Bad Output. Many companies implemented demand management processes as a technology project. The output of demand planning engines was never validated, and the engines were never refined, honed, and tuned. As a result, the forecasting models are not a good fit to drive improvements. (The validation of the system's output is an important step which is often overlooked.)

Need for Tuning. The implemented demand management engines weren't fine-tuned through regular testing. Like a car, demand engines need continual tuning.

Human Systems. At the time of the initial implementation, training happened. However, the understanding of the systems was lost through turnover and the lack of career paths.

Executive Understanding. There is an overstated belief that demand error can be greatly improved. In most companies, it is what it is. Bottom line: improving the forecast is possible within a range. However, companies should start by defining the reasonable range. Let's take an example. In new product launch, while the error for new product launch improves through the implementation of demand planning processes based on attribute-based forecasting, the average demand error of new product launch is 75%. It is not feasible to reduce this error to 30% MAPE. Processes with high error need a design based on

reasonable expectations, inventory strategies, and processes to absorb the error.

Engines and Flows Need to Be Defined by Process. Most supply chain leaders can easily conceive supply flows, but not those of demand. Mapping the demand processes should align flows with technology capabilities. Techniques like attribute-based forecasting, probabilistic demand planning, attach-rate planning, and demand sensing are not well-understood. The design for most systems focused on high volume items that were easy to forecast. The answer is not 80/20. In demand planning forecasting the tail is critical to driving revenue. There was not equal focus on tuning the engines for the products on the long tail of the supply chain which are frequently high margin with lumpy demand patterns. As complexity increased (more items on the item master), forecastability (the ability to forecast) decreased. Most companies have not measured forecastability or aligned techniques based on demand flows. They also do not hold the planners accountable to improvement through Forecast Value Add. New business models, e-commerce, custom projects, and localized assortment make the demand pattern lumpier and more difficult to manage.

As a result, many companies have systems, but satisfaction is low (45% of the planners are satisfied with today's technologies). Business leaders are questioning the head count in planning. Planners working long hours because the processes do not support the business requirements, question the processes, but they don't know the answers. Because the systems and work processes are not aligned, most work in demand management happens outside of the demand-management systems using spreadsheets. Most demand planning happens in Excel Ghettos, not in the expensive technologies implemented in 90% of

manufacturing companies. Because of these issues, loyalty with today's systems is low.

Moving Forward

I believe there is a need to forecast demand for tactical planning. The tactical planning horizon is from the slush period (order cycle period of confirming orders) for tactical planning (usually 10-18 months in the future). There is also the need for an operational planning period (usually 6-13 weeks in the future). Demand flows are the basis of the design. Each time horizon needs a redesign.

- **Operational Planning for Demand Planning** (Demand Sensing). Map the operational planning horizon to the tactical horizon to drive replenishment. Conventional systems use rules-based consumption. (This is the case for companies like Adexa, Logility, and JDA.) In the last year, demand sensing capabilities introduced by John Galt and OM Partners entered the market. (Test new solutions against the traditional demand sensing providers of E2open (Terra Technology), SAP and ToolsGroup. The capabilities of these technologies are not equal). In the operational planning horizon, demand sensing (the use of statistics and pattern recognition) replaces rules-based consumption to drive replenishment.
- **Tactical Demand Planning.** Use The tactical planning horizon to make asset decisions, determine the best network design, design form and function of inventory, and establish sourcing strategies. The tactical forecast forms the backbone of the S&OP process. Yes, it is true that the demand plan will always be wrong,

understanding demand error and demand flows helps with building "what-if" capabilities.

- **Strategic Planning.** The most advanced companies map demand flows into network design processes/definition and align Applied Planning Systems (APS) to demand flows. This is 'Planning by Design'. With companies having 5-7 ERP systems and 3-5 APS solutions, the definition of push/pull decoupling points, form and function of inventory targets, postponement strategies, and node definitions of factories, contract manufacturing and distribution centers within network design, cascades to the planning systems to synchronize the output.

While many argue that the definitions of the time horizons change with concurrent planning, I say not so fast. I think that within a global organization there is a need for a design group, an S&OP plan, and a replenishment process. Define the boundaries of the time horizons by work process definitions, not technology capabilities. Planning at companies varies by governance and cultural DNA. While concurrent planning is easier in a regional supply chain, collapsing the boundaries of the planning horizons, a global supply chain is more complex requiring more planning to achieve company goals.

Answering a Question

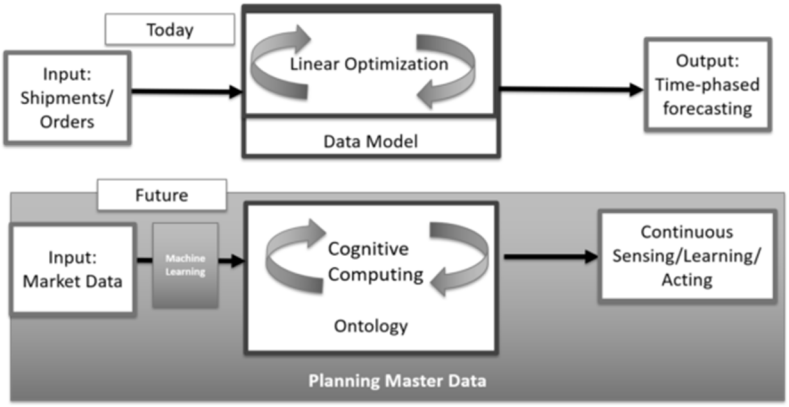
Recently I wrote a blog post on upending the apple cart. It outlined the gaps in demand management and the need to redefine forecasting. One reader rightly pointed out that while I drove the argument to change, I did not share an answer. With

this as background, here I answer his question. He wrote, "While you make a compelling argument to change, what do I do?"

1. **Map Flows.** To have the discussion, companies need to map demand outside-in, from the channel back. Demand data should not pool, and not be used in sales teams, VMI processes, and customer-data sharing. Channel data as input is essential. This includes structured and unstructured data like weather, social sentiment, rating/reviews, POS, and localized assortment decisions. Outside-in demand flows are market-driven to sense and adapt the demand to market changes with minimal demand latency. (Demand latency is the time from channel purchase to translation into an order. The longer the tail, the greater the demand latency, and the greater the distortion in the order pattern for modeling.)
2. **How Do We Plan by Design?** Map demand flows into the network design activities and evaluate
3. **Redefine Tactical Demand Planning.** Tactical demand management processes are a discussion of inputs, engines, data models and outputs. With the evolution of cognitive computing, machine learning, ontologies and data lakes. the world of demand planning will change dramatically. The building of a learning ontology enables the use of structured and unstructured data to drive machine learning/cognitive computing. Machine learning also helps with the cleansing of data to feed inputs from the data lake to eliminate duplicate and spurious data sets. Short term, a probabilistic engine might be used. (For a great overview of the use of this approach check-out the Spairliners case study from the Supply Chain Insights Global Summit. Probability

forecasting is a great technique for lumpy and unpredictable demand. This case study is one of the best discussions that I have seen.)

Figure 1. Current and Future State: Tactical Demand Planning



4. **Redefine the Operational Horizon.** Using statistics and streaming data, translate market data in the short-term horizon to redefine replenishment.
5. **Define Work Processes.** After testing, define new work processes.

The shift reduces planning labor and improves the time to make a decision. It also reduces the required support team by 60-70% while improving job satisfaction. The evolution will take time. Today we only have experimentation.

There are many questions:

Should companies place cognitive computing and machine learning on top of technologies like SAP APO? Should the ERP solutions be used as a system or record, or should cognitive computing replace existing technologies?

Is it possible to combine revenue management/trade promotion management/ and demand planning into a new demand insights layer based on outside-in data?

What is the right definition of concurrent planning capabilities within the redefinition of demand management?

How should demand sensing technologies be mapped to manufacturing and distribution? What is the role of Internet of Things (IoT)? What do the processes of demand translation look like?

How fast will this transition happen? What will it mean for early and late adopters?

How will streaming data architectures combine with the statistics of demand sensing technologies to translate market demand to improve replenishment?

What does this transformation mean for the planning teams? What are the required skill sets for the future?

What do you think of this vision? I would love to hear from you.

SECTION 6

Defining Better Value Networks

Building the Connected Value Network

This week I spoke at an SAS Global Analytics Summit on the connected supply chain. In my view, the connected supply chain is very, very different from the integrated supply chain. Here, in this blog post, I want to provoke teams to think through the differences, and really question what they are asking for.

Some History

In 2002 I worked for Gartner Group in the business applications practice. This was in the heyday of Enterprise Resource Planning (ERP) technologies. At the time, I worked in a group that built a model termed ERP II. This model endorsed ERP as the system of record for the supply chain. The espoused vision tightly coupled planning systems to ERP. The focus was on vertical silo automation through three-letter acronym technologies like CRM, SRM, APS, TMS, and WMS.

I struggled with this vision and ultimately left Gartner. Why? To me, the integrated supply chain made no sense. I believed that planning needed its own system of record and that this definition was distinctly different from a transactional system of record. It was also clear to me that transactional data was only one of the feeds to the planning engines (approximately 60% of the data feed, but not the sole source). I fought a hard fight and lost.

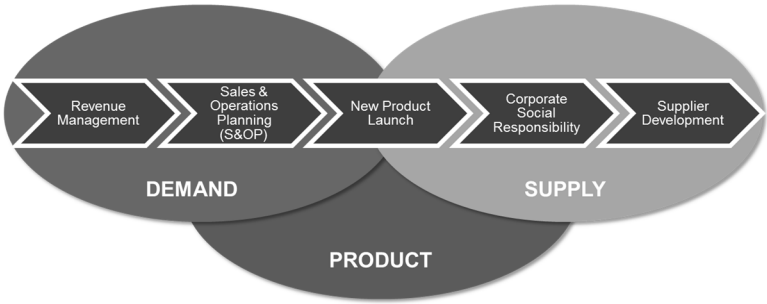
Over the course of the last decade, ERP spending was a thrust of the 1.7% of revenue spent in IT. The goal? Actualizing the vision of a tightly integrated supply chain. I smile as I do my research because, in the correlation of quantitative results, user satisfaction with planning is better if it is loosely coupled versus tightly integrated. A planning system tightly integrated to ERP is just too constrictive. There are too many master data issues, and the focus is on transaction efficiency, not supply chain effectiveness.

As you think about the differences, take a hard look at this picture of the silos. Think about your organization. The focus of the last decade was on making vertical silos more efficient. This goal is at odds with making the supply chain more effective. Transactional systems are vertical by definition.

In contrast, the supply chain is horizontal in nature. Companies that achieve balanced scorecard results--above their peer group in cost, growth, customer service, inventory, and asset management--are good at horizontal processes (revenue management, S&OP, new product launch, and supplier development). The focus is outside-in, from the customer back, and demand-orchestrated across the silos to guide procurement decisions. In these organizations, demand is not managed as a

functional process. Instead, it is a river that flows through and connects and aligns the silos.

Figure 1. Horizontal Processes



What Is a Connected Supply Chain?

Let's compare the concept of the integrated supply chain with one that I call the connected supply chain. By definition, the integrated supply chain is linear and tightly coupled. In contrast, I have defined a connected supply chain as having six characteristics:

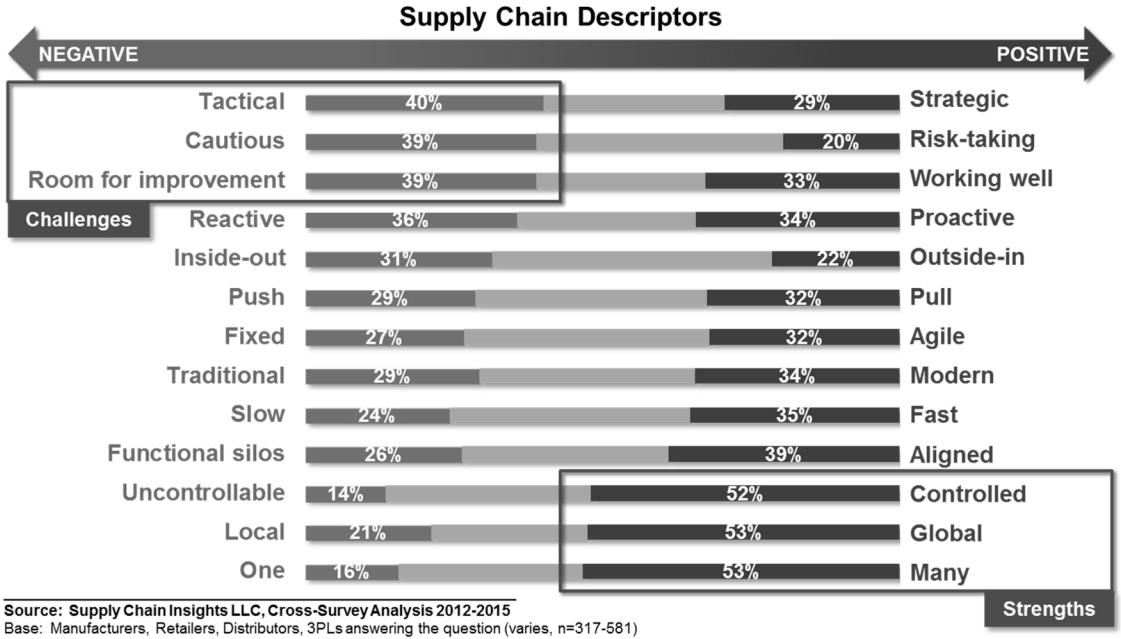
1. **Outside-In.** The use of channel data to translate market shifts without latency.
2. **Synchronized (versus Integrated).** The harmonization and synchronization of data across functional silos.
3. **Horizontal (versus Vertical) Process Excellence.** A focus on business process alignment across functions, through horizontal processes like Revenue Management, Sales and Operations Planning (S&OP), Inventory Management, New Product Launch, and Supplier Development.

4. **Data at the Speed of Business.** Not all processes move at the same speed. In the connected supply chain, data can move at the speed of business. In the integrated supply chain, data moves through batch processing.
5. **Data-Driven Insights.** The building of business processes based on data-driven insights. The use of analytics to manage business decisions. In the integrated supply chain, the core of the data were the solutions for vertical process excellence (CRM, SRM, APS, WMS, TMS, ERP, etc.). In the connected supply chain, there is an analytical layer designed to enable the streaming and pooling of data, along with the use of cloud-based solutions to overlay and interact across systems.
6. **Sensing before Response.** The traditional supply chain operates in rote with very staid processes. It does not sense. The connected supply chain senses and then responds.

When supply chain leaders complain to me that their supply chain is not agile, and then they share a supply chain strategy that outlines an integrated supply chain, I laugh. I then say, "You got what you asked for." The tightly integrated ERP system to planning is just too restrictive.

Planning is a decision support technology. The design is to help companies make trade-offs for supply chains which are complex nonlinear systems. In my view, over the past decade, the market was held hostage by transactional and linear thinkers who profited on exploiting a vision of the integrated supply chain. This thinking is one of the reasons why 90% of companies are stuck in the delivery of supply chain improvement on the balance sheet.

Figure 2. Supply Chain Attributes

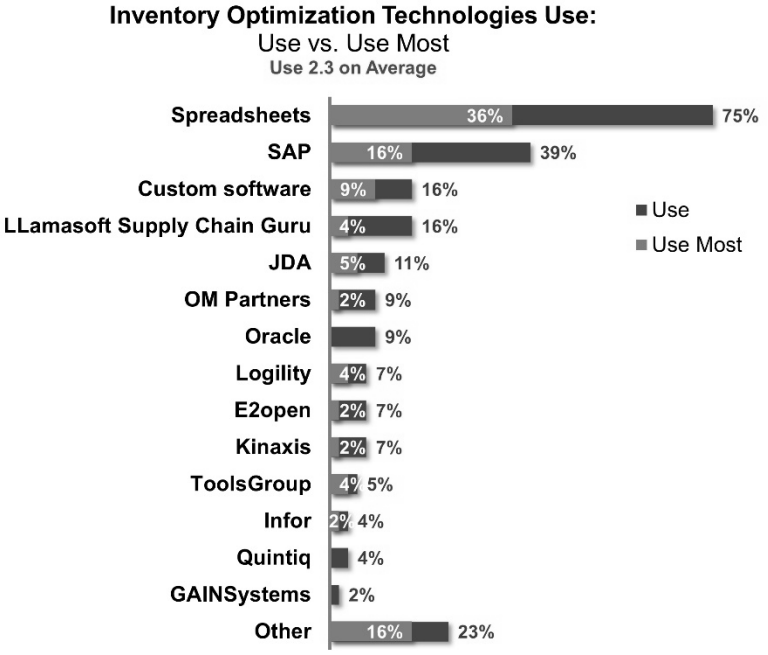


Source: Supply Chain Insights LLC, Cross-Survey Analysis 2012-2015
Base: Manufacturers, Retailers, Distributors, 3PLs answering the question (varies, n=317-581)
For each of the following pairs of words, please pick the one word or phrase that best describes your company's supply chain today.
SCALE: 5-point scale with one word on either end.

As shown in Figure 2, today's supply chain leaders see their supply chains as reactive, lacking agility, and needing improvement.

Because of the limitations of this model, the number one technology used to manage the supply chain is Excel. Around the world today, employees are happily working in Excel ghettos, grinding out complex macros to solve supply chain problems which should be addressed in supply chain planning. Most companies have 2 to 3 supply chain planning solutions but use Excel. See Figure 3. It is a view of the use of technologies for inventory.

Figure 3. Use of Technologies for Inventory



Source: Supply Chain Insights LLC, Inventory Optimization Study (Jan-Mar 2018)
Base: Total – manufacturers, retailers, distributors, third-party logistics providers – use and familiar with inventory optimization technologies (n=56)
Q22. Which of the following inventory optimization technologies does your company currently use? Please select all that apply. Q23. Which ONE of these technologies does your company use most often for inventory optimization? Please give your best guess.

Why? The majority of supply chain planning solutions were deployed to make vertical silos more efficient versus driving outside-in end-to-end thinking.

What Is the Digital Supply Chain?

The digital supply chain is the transformation of the flows of the supply chain based on digitized data streams. Digitization is very different from the digital transformation. The difference is the intent. Most strategy documents that I am currently reviewing are looking to digitize data to make integration more effective. When I see these decks, I throw up my hands. A mistake is putting tight integration on steroids. So, if you are working on a digital supply chain transformation strategy, I think now is the time to step back and rethink the goal. Let's not repeat the mistake of the last decade.

Building the Network of Networks

Today I am facilitating a share group. The dream is to build a Network of Networks. The goal is to close current gaps, to build inter-enterprise visibility, and improve interoperability between businesses. Today the gaps are large. The solutions to close the gaps are not easy.

We are attempting to separate hype from reality and to test new technologies to try to redefine B2B processes. The reason? Frustration abounds. Traditional thinking on linear optimization and enterprise automation is not equal to the challenge. Stuck, only 10% of manufacturers are driving improvement (90% of companies are unable to drive improvement at the intersection of inventory management, operating margin and customer service).

Transactional and linear thinking defined traditional thinking. The focus on enterprise efficiency is limiting. We are

attempting to define outside-in processes. The group is working on case studies to test new technologies like blockchain, cognitive computing, supply chain operating networks, and open source analytics.

Figure 1. Shifts from Traditional Thinking to Drive the Digital Transformation

Traditional Thinking	Shifts Driving the Digital Transformation
Inside-out Processes	Outside-in Processes
Focus on Efficient Organizational Silos	Design of Value Networks
Use of Transactional Data with a Focus on History • Batch Processes • ERP Architectures • Linear Optimization	Use of Multiple Data Forms: • Design of Processes to Enable data to Move at Multiple Speeds • Use of Unstructured and Structured Data • Open Source
Focus on Response	• Shifts to Sensing to Drive an Intelligent Response
Process Standardization	• Autonomous and Localized Processes

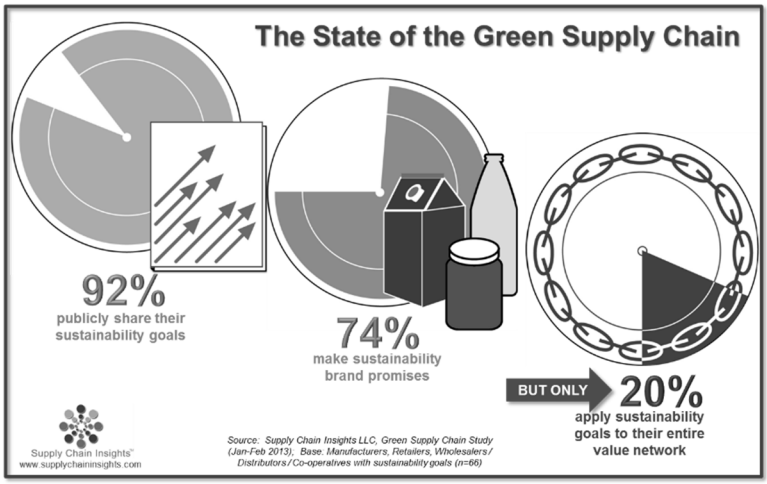
Why Should You Care?

Companies are busy. Information Technology teams focus is on long and drawn-out ERP deployments. It is hard to shift gears to drive a digital transformation and build value networks. So, the first question is "Why should I care?" Let me start by giving three reasons--brand protection, business continuity, and growth. These three drivers are why supply chain leaders should work together to build the Network of Networks:

1. **Brand Protection.** In November 2012, the executives of Walmart awoke to find that they were front page news. Fires in a Bangladesh sewing factory resulted in 112 deaths. The factory was a second-tier supplier to a

primary Walmart supplier. Factory conditions did not meet Walmart's standards, but the garments were outsourced to a substandard factory by a contract manufacturer. Today, over 90% of companies have corporate social responsibility statements, but 70% of nonrenewable resources are in value networks. Only 20% of companies are taking ownership of their networks.

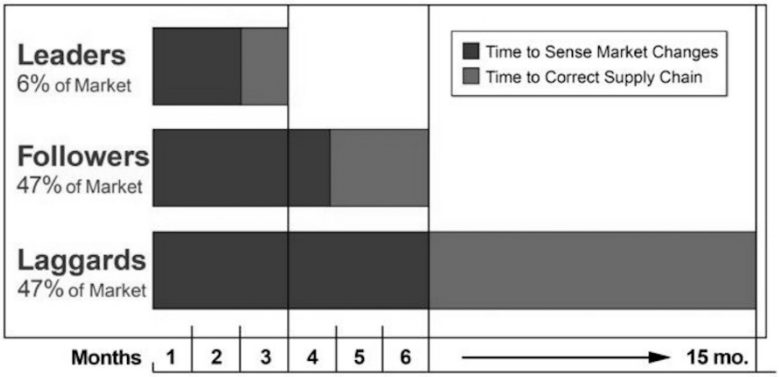
Figure 2. The Gap in Value Networks in Driving Social Responsibility



2. **Business Continuity.** In 2017, supplier performance issues resulted in the bankruptcy of Aerosoles. The company could not recover and restore customer service. Demand error is increasing, and supplier viability is a growing risk. Port infrastructure and logistics capacity are growing issues. The average company has two to three material events due to supply chain issues.

3. **Market Opportunity. Growth.** Market growth is now 1% versus the 2.5-3% of the last decade. Growth opportunities are increasingly intertwined with the redesign of new business models. Most companies operate blind. In 2007, it took six months for companies to sense the downturn in markets and align supply chains. Today, we have not fixed this problem. Companies cannot sense and adapt. The focus on functional excellence--sales and marketing through technologies like CRM-- puts a company on the back foot. The company cannot adapt and change as markets shift.

Figure 3. Managing Demand Across Value Network

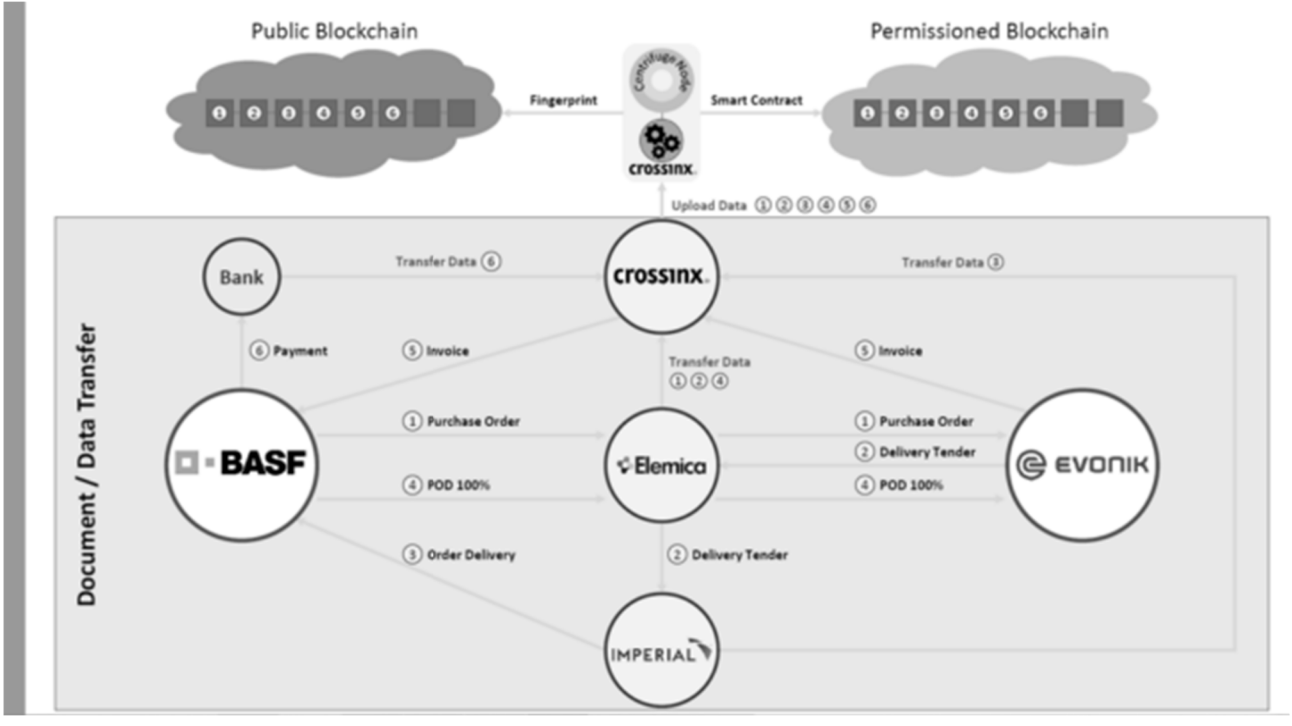


Building Blocks

As a part of the Network of Networks, the group initiates pilots to test and learn using new technologies. The hype about Blockchain and cognitive computing is rampant, giving great fodder to Dilbert cartoons. Through work with leading technologists, the group better understands both the current limitations and opportunities of Blockchain.

Together, the group is attempting to understand the future of these technologies and the potential to redefine multi-tier processes. An example is the European pilot outlined in Figure 4. Since Blockchain technologies are currently limited in scalability, and the ability to connect many parties to many parties, the group is using Blockchain to connect existing supply chain operating networks. (Most Blockchain deployments are one-company to one-company, or one-company to many-companies. The technology is not scalable to support a many-to-many architecture.)

Figure 4. European Blockchain Pilot



Through this pilot, we are trying to connect structured data (transactions) and unstructured data (contracts and documents) to enable multi-tier payment. Long-term, the flows of this pilot could automate multi-tier many-to-many matching processes of invoices, deductions, and returns, to automate payment and streamline processes.

As we think about multi-tier process evolution in the future, we cannot be limited by current thinking. We need to challenge supply chain fundamentals. For example:

- **Orders?** If companies use streaming data through the Internet of Things to drive replenishment, do we need customer orders?
- **Contracts?** We have a lot of lawyers that negotiate a lot of contracts that are never used in supply chain processes. How do we connect transactional flows to enable contract compliance?
- **Risk?** How do we drive multi-tier visibility of brand risk? Better manage supplier development?
- **Asset Utilization?** Is there a possibility to drive better asset utilization of trucks and vehicles? (40% of trucks move empty on roads today.)
- **Waste?** In 2050, we will struggle to feed the world. The world will need to produce 69% more calories by 2050, given a global population of 9.6 billion people. Yet today, we throw away 1.3 billion tons of food a year.
- **Onboarding?** Today, it takes an average of three months to onboard suppliers into enterprise systems. Onboarding is a barrier to driving network effectiveness.

A Set of Truths

At the end of the meeting, we put a list of truths from our session on the board. This is the set of belief statements from the work that we have done together:

- **Connectivity.** Blockchain technology is new and evolving. It is over-hyped. There is more unknown than known. We cannot find any use cases that demonstrate the use of blockchain for many-to-many networks. As a result, to build many-to-many capabilities, we are testing the use of blockchain to link Supply Chain Operating Networks (Elemica, E2Open, GtNexus/Infor, SupplyOn and Ariba).
- **Current State of Supply Chain Operating Networks.** Interoperability between existing Supply Chain Operating Networks today is very limited. There is more connectivity between GTNexus/Infor and Elemica than other nodes. This is an area of opportunity.
- **Return on Investment of the Work.** While the group believes that there is great value for growth, improving business continuity and driving revenue through new business models in the building of network of networks. Today, there is no definitive ROI. We have five active case studies. We will use the insights from these case studies to define the potential ROI.
- **Use of Standards.** Data definition is important. The group's understanding of industry standards has evolved. The greater use of GS1 and ISO standards is an opportunity for all.

Next Steps

It is clear. The current focus on improving vertical silo efficiency through investment in ERP has diminishing returns. The opportunity lies in building better networks.

Insights on the Adoption of Blockchain

Yesterday, I spoke at University Forum on innovation. The presentation focused on nine themes. One of the nine was blockchain. I asked the audience for a show of hands to understand how many of the supply chain leaders in the room were testing blockchain. I saw no raised hands.

Later that afternoon, I hosted a webinar featuring blockchain case studies. The Supply Chain Insights webinar series is designed as an educational forum. We use our research as a backdrop, and host supply chain leader panels to have a discussion on the research topic. Yesterday, Bristlecone and IBM presented case studies. The case studies focused on cold chain safety/alerting for out-of-condition limits for milk transport in India and the use of blockchain for fresh produce monitoring. The webinar was well-attended. Over 180 people joined, and the

question panel was the busiest I have ever experienced hosting a webinar. Lots of interest.

Why the disconnect of interest between the two groups? Blockchain is new. It is not well-understood. In the traditional world of supply chain management in the United States, the focus is on the Plateau of Productivity. The current efforts are on improving functional metrics and traditional processes. While leaders talk "value chains," the focus is on the "efficient enterprise" which underdelivers on creating value for the firm.

Conservative teams, programmed by large system integrators and technology providers, focus on the evolution of traditional supply chain technology approaches. The projects are on the plateau of productivity. As a result, there is very little time to focus on innovation. The focus is not on building value chains. Instead, it is on creating the efficient enterprise.

Rethinking Supply Chain Technologies

For the company, there is a huge opportunity cost. The singular focus on IT standardization and ERP migration hijacked supply chain innovation. ERP is not the foundation or the future of B2B processes. It is the system of record for enterprise transactions. Blockchain is a promising technology to redesign B2B processes, but we are at the beginning of the hype cycle, and we must manage the hype through the adoption. If we overpromise, we will kill innovation. Likewise, if we do not adequately test and learn, the technology will not evolve.

The questions on the webinar yesterday, centered on three themes. Here I share some insights:

- **What is blockchain?** I encourage all readers of the blog to learn for themselves. Read the short book, Blockchain

for Dummies and visit the many blockchain demo sites on the web.

- **How do I use blockchain?** Start with use cases that are one-to-many (your company to your partners). Focus on something that is important to the company but has clear governance. Examples include quality specifications, cold chain, return data, etc. Don't start with cryptocurrency. Reference our past blogs for examples. Make the initial efforts small and clearly defined. Take small steps. Avoid big implementations.
- **Define immutable.** Blockchain is an immutable ledger. On the webinar, Juan Ruiz from IBM used an analogy that I loved. He shared the story from his boss. She describes immutable as completing a crossword puzzle with an ink pen versus a pencil. When you use a pencil on a crossword puzzle, you can erase the entries. However, in the use of the pen, the first entries stay and are then crossed through. This is a great analogy to understand "immutable" as it pertains to blockchain.
- **What is the impact of blockchain on collaboration?** This question is at the heart of the biggest barrier I see in the deployment of blockchain technologies. In the deployment of blockchain, the nodes (or designated parties) agree on the data. In today's supply chain we do not share data well. We talk "collaboration" but supply chain teams cannot walk the talk. There is more of a focus on "wielding big sticks" than "carrots." Yesterday, a presenter at the conference spoke of value and the use case presented was elongating Days of Payables by 120 days. I squirmed in my seat. This type of mentality is

win/lose thinking. In contrast, true collaboration hinges on building win/win value propositions.

The greatest barrier for blockchain adoption is not with the technology, but with trust. We do not have a clear definition of effective multi-tier processes and we do not know how to share data effectively.

Why Financial Reengineering Does Not Deliver Supply Chain Improvement

Financial Reengineering is the radical redesign of business processes and organizational structure in order to achieve significant improvements in performance, such as productivity, cost reduction, cycle time, and quality. It is the basis for many recent developments in management. Sounds good? Right? Think again.

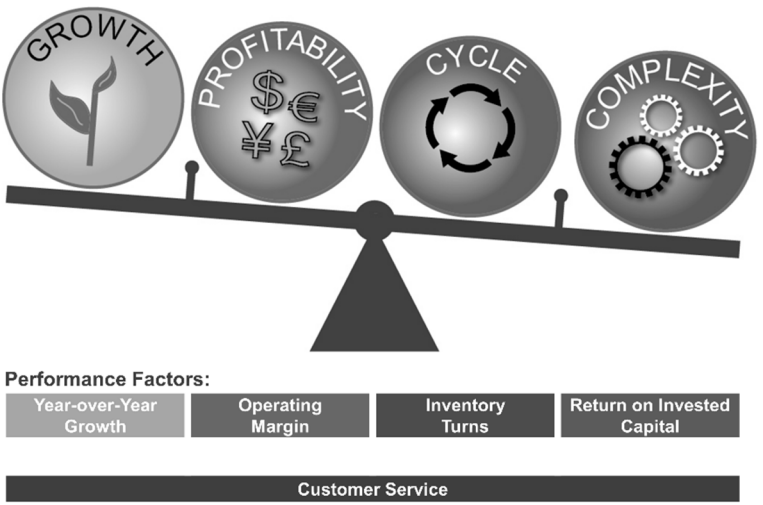
The traditional supply chain leader was only focused on cost reduction. This sounds aligned with financial reengineering. Right? The correct answer is "Wrong." Let me explain. Financial reengineering focuses on the optimization of short-term results which are usually based on a functional analysis of

source, make, or deliver. Few consultants understand the interrelationships between source, make, and deliver.

Reflections

Tonight, I am in Frankfurt. Snow fell last night as I worked on my last Supply Chain Metrics That Matter report. This is number 15 in a series that looks critically, industry by industry, to understand relative improvement of peer groups on the Effective Frontier. These have taken us a year to produce.

Figure 1. The Effective Frontier



The concept of the Effective Frontier is that best-in-class companies align functional metrics to balance growth, cost, inventory, and Return on Invested Capital (ROIC) performance while balancing customer service metrics. The goal is to drive year-over-year gains in market capitalization. In contrast, most financial reengineering efforts focus on short-term results. Ironically, most companies are very entrapped in measuring and

rewarding functional metrics which degrades overall improvement.

Improving the Effective Frontier is hard work and is often in direct opposition to financial reengineering.

In financial reengineering, some companies wrongly focus on cash-to-cash performance. Cash-to-cash is a compound metric. The smaller the number, the better. It represents the amount of cash required to fund operations. The cash-to-cash definition is:

Cash-to-Cash= Days of Receivables+ Days of Inventory-Days of Payables

Progressively, as inventories grew due to business complexity over the last decade, companies increased payables, thus passing on their costs in the supply chain to their downstream partners. This increased receivables for the supplier. And, to manage cash-to-cash, the supplier increased their payables, passing cost and waste downward in the supply chain. Companies feel good because they have met quarterly objectives, but few step back and take a hard look to evaluate financial reengineering. Let's take a look at Table 1 which is a summary of cash-to-cash for the semiconductor industry. Note the increase in receivables, inventory and payables, and the small increase in Cash-to-Cash. We see this in industry after industry.

Table 1. Cash-to-Cash Performance: Semiconductor Industry

Cash-to-Cash Components Comparison: Semiconductor*

Years	Days of Receivables	Days of Inventory	Days of Payables	Cash-to-Cash
2004-2006	49	73	52	65
2007-2009	41	76	55	62
2010-2016	44	76	67	67
2004-2016	45	73	66	66

*Outliers removed. Source: Supply Chain Insights 2018, Derived from YCharts; Showing average over time period

Ironically, money has never been able to move more quickly. ACH, Wire, and EDI all accelerate payments. Likewise, downstream brand owners have a lower cost of capital which they could use to finance the supply chain operations in the value network if they're truly concerned with risk and reliability. While companies "talk" about collaboration with suppliers, in reality, the procurement organization is doing the opposite due to financial reengineering, placing more responsibility on the role of banks to fund working capital in the value chain.

Supplier viability (the health of suppliers) is a growing risk issue; yet, financial engineering reigns. Company by company, we are bloating the supply chain while we Lean-out our enterprise operations.

Recently, I presented at the University of Tennessee Supply Chain Forum. The presentation before me was by a supply chain leader from Mondelēz International, Inc. He bragged about the elongation of payables and the improvement on cash-to-cash. His goal was to emulate Dell's cash-to-cash performance. I struggled to sit in my seat with the flawed logic. He reduced Mondelez's cash-to-cash metric from 59 to 36 through the increase of Payables. As he spoke I thought of the viability issues of Mondelēz' packaging and raw material suppliers. Many are in critical condition. I fought to not speak. I wanted to push back. First of all, Mondelēz is not Dell. Mondelēz' receivables, largely controlled by retailers, are increasing. They are pushing costs back on Mondelēz, while Dell controls a major part of their channel through their direct-ship model. Secondly, I wanted to raise my hand and ask about the decline in inventory turns and ROIC performance as shown in Table 2. The story was one of financial reengineering versus supply chain improvement.

Table 2. Average Supply Chain Performance in Food Value Chains

Performance and Improvement: Food Industry

Company	Growth			Operating Margin			Inventory Turns			Return on Invested Capital			Revenue/ Employee ($K)			SG&A			Cash-to-Cash			SC Index Rank	
	2004-2006	2007-2009	2010-2016	2004-2006	2007-2009	2010-2016	2004-2006	2007-2009	2010-2016	2004-2006	2007-2009	2010-2016	2004-2006	2007-2009	2010-2016	2004-2006	2007-2009	2010-2016	2004-2006	2007-2009	2010-2016	2010-2016	2004-2016
Archer Daniels Midland	6%	26%	4%	0.04	0.04	0.03	7.7	7.2	6.7	7%	10%	6%	1385	2217	2254	3%	2%	2%	50	60	42	19	13
B&G Foods	8%	7%	16%	0.15	0.17	0.19	3.4	3.8	4.1	1%	2%	5%	527	664	793	14%	12%	11%	69	94	93	13	9
Campbell Soup	3%	1%	1%	0.16	0.16	0.16	5.5	5.7	5.6	16%	23%	16%	297	363	414	24%	22%	20%	36	37	50	16	10
ConAgra Brands	-13%	7%	-4%	0.09	0.09	0.09	3.6	4.9	5.0	7%	10%	4%	266	442	419	16%	15%	16%	107	72	57	18	14
Danone	6%	7%	3%	0.13	0.14	0.12	10.5	8.3	8.7	9%	12%	8%	181	253	260	33%	36%	33%	-3	-11	-17	15	17
Dean Foods	3%	4%	-5%	0.06	0.05	-0.01	20.6	22.2	24.1	5%	4%	2%	364	453	446	19%	20%	20%	7	19	19	10	19
Fresh Del Monte Produce	9%	3%	2%	0.01	0.05	0.03	7.5	7.2	7.2	3%	9%	5%	91	91	87	6%	5%	5%	35	75	74	3	5
General Mills	4%	8%	2%	0.17	0.16	0.16	6.8	6.7	7.0	8%	10%	12%	410	468	442	19%	20%	20%	31	48	38	16	14
Glanbia	0%	5%	3%	0.04	0.06	0.07	10.9	7.6	3.7	12%	12%	12%	498	758	796	5%	2%	0%	1	19	37	21	21
Golden Agri-Resources	23%	34%	21%	0.42	0.62	0.16	NA	NA	6.2	NA	4%	7%	NA	NA	23	10%	7%	10%	NA	8	29	20	5
The Hain Celestial Group Inc.	17%	15%	16%	0.08	0.05	0.09	5.1	5.0	5.0	5%	2%	5%	411	430	480	21%	19%	15%	60	70	67	14	10
Hershey	6%	2%	5%	0.19	0.12	0.17	4.7	5.8	5.7	21%	13%	21%	335	370	422	19%	21%	26%	90	73	48	10	10
Hormel Foods	11%	5%	6%	0.08	0.08	0.10	8.0	7.6	7.4	14%	13%	17%	317	348	432	16%	8%	8%	43	46	49	1	1
Kellogg	7%	5%	1%	0.17	0.16	0.12	7.7	7.8	6.9	14%	16%	11%	402	427	442	28%	27%	26%	24	22	24	6	18
Maple Leaf Foods	14%	-4%	-7%	0.04	0.02	0.02	14.6	13.4	12.4	3%	3%	10%	267	204	210	NA	7%	10%	0	11	54	6	7
McCormick	6%	6%	5%	0.12	0.13	0.14	4.3	4.1	3.7	14%	13%	14%	330	413	433	27%	27%	26%	91	84	81	5	7
Mondelez	3%	5%	-5%	0.14	0.11	0.13	6.2	6.6	5.6	7%	6%	7%	344	392	297	21%	22%	26%	59	50	36	12	19
Nestlé S.A.	6%	6%	0%	0.11	0.11	0.14	4.8	4.9	5.4	11%	16%	16%	102	335	293	44%	42%	31%	-43	-35	-49	8	4
Pinnacle Foods	NA	NA	4%	NA	NA	0.13	NA	NA	NA	NA	NA	3%	NA	NA	378	NA	NA	11%	NA	NA	43	2	3
Smucker's	20%	22%	12%	0.11	0.12	0.15	5.0	4.6	4.0	7%	7%	7%	564	803	1084	21%	19%	18%	68	71	84	8	2
Snyder's-Lance	9%	8%	15%	0.05	0.05	0.05	11.5	10.8	8.5	8%	8%	4%	135	177	281	39%	35%	31%	42	46	58	4	16
Average	**7%**	**9%**	**4%**	**0.12**	**0.12**	**0.11**	**7.8**	**7.6**	**7.1**	**9%**	**10%**	**9%**	**380**	**506**	**509**	**20%**	**18%**	**17%**	**40**	**43**	**44**	**NA**	**NA**

[illegible]

I expected humility, as 2017 was a tough year for Mondelēz. One of their consulting partners incorrectly recommended using the optimizer in SAP SNP for tactical planning. They, like every other company I have seen trying to implement the optimizer in SAP SNP, failed. (I have never seen any company be successful.) In addition, the company had a major malware issue. I expected a presentation on learning to drive improvement through failure, but this was not the case.

When I share the Supply Chain Metrics That Matter research, there is a surprised look on the face of most executives. The general belief is that the implementation of ERP, and advanced planning, improved the management of costs. The decline in food margin and cost management in most of the industries is usually counterintuitive and flies in the face of convention.

Ironically, only 29% of companies with an ERP system can easily see supply chain costs to base their supply chain decisions on orchestration across functions. The balance of lead time, working capital, and costs is not easily understood by finance teams. It requires the use of network-design optimization and discrete-event simulation to show the relationships of the metrics in this complex nonlinear system we call supply chain.

Driving True Improvement

I spent the last week with European clients discussing the upcoming Supply Chains to Admire work. We will publish the results from our fifth year of the analysis in June. We are now pulling the data for 2017.

One of the leaders I spent some time with was Mourad Tamoud of Schneider Electric. I am a big fan of both his leadership and that of Annette Clayton, now CEO & President

of North America. I think both are great supply chain leaders. But, as Mourad and I spoke, it became clear that the concept of managing a balanced scorecard based on ratios against peer group was a new concept. Schneider has greatly improved inventory positions, but has not moved the inventory ratio by much, and hence the gap in peer group performance as shown in Table 3. The company was eliminated from the 2017 Supply Chains to Admire evaluation due to underperforming on both inventory turns and ROIC.

Table 3. Diversified Industry Performance

Performance and Improvement (2010-2016): Diversified Industries

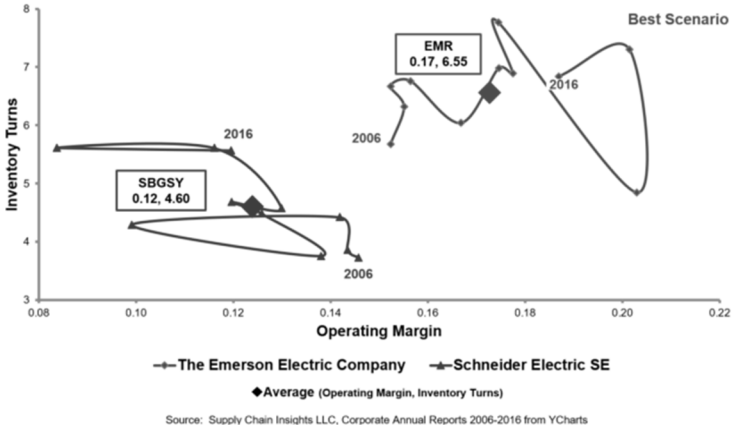
Company	Growth	Operating Margin	Inventory Turns	Return on Invested Capital	Market Cap (000,000)	Price to Tangible Book Value	Supply Chain Index Rank
Eaton	8.4%	0.10	6.1	8.3%	$25,635	-31.9	4
Emerson Electric	-3.6%	0.18	6.7	14.0%	$39,182	-7.7	6
Honeywell *WINNER*	**3.6%**	**0.13**	**6.4**	**14.6%**	**$64,167**	**-7.2**	**1**
LeGrand	1.8%	0.19	3.5	10.7%	$7,841	-6.1	2
Motorola Solutions	-11.0%	0.10	8.7	13.9%	$14,331	-0.4	2
Schneider Electric	3.7%	0.12	4.9	7.2%	$38,827	-51.2	5
Toshiba	-4.8%	0.02	5.7	-1.4%	$16,274	3.7	6
Average	**-0.3%**	**0.12**	**6.0**	**9.6%**	**$29,465**	**-14.4**	**NA**

Source: Supply Chain Insights 2017, Derived from YCharts, Showing average over time period; Supply Chain Index Rank = Based on average ranking within industry of Balance (Return on Invested Capital & Revenue Growth Vector Trajectory), Strength (Inventory Turns & Operating Margin Vector Trajectory) and Resiliency (Inventory Turns & Operating Margin Mean Distance); Market Cap and PTBV averages exclude outliers for purposes of Supply Chains to Admire calculations

I loved the discussion between the head of Finance (who is quite progressive) and Mourad on the use of ratios and driving overall improvement. As shown in the orbit chart in Figure 2, competitors like Emerson Electric have driven greater improvement than Schneider. However, you cannot see this difference until you study the orbit chart plots. It for this reason that I like the orbit chart methodology.

(A note about the Supply Chain Index: the smaller the index rank number, the greater the company's improvement for the time studied.)

Figure 2. Comparison of Emerson Electric and Schneider Electric for the Period of 2006-2016



I believe that supply chain leadership is about driving long-term value. I also believe that financial reengineering is about driving short-term results which are often counterproductive to the longer-term vision. Don't fall into the supply chain reengineering trap. The discussion with Mourad is the right one. Supply Chain excellence is about a purposeful delivery of metrics to win against the competition.

To drive supply chain excellence, we must learn from the past, to unlearn, and then to drive supply chain leadership in driving value. This is the goal of this report series. I look forward to getting feedback from you on this body of work. All the best on your journey and let us know how we can help.

Why Is Blockchain Not Hotter

I was sitting with a representative from the United Nations on my way back from Colombia. As we took off from Bogota, we discussed the potential of blockchain to help her with feeding children in the highlands of the Colombian-Venezuelan border. I was surprised that she knew enough about blockchain to have a discussion, and I think that she was surprised to find someone who could help her to have a deeper discussion. Today I connected her to some technology providers to start a pilot.

This morning I read a Wall Street Journal article on blockchain asking "Why Is Blockchain Not Hotter?" I smiled as I read the article, thinking about the random-chance of meeting a United Nations representative on a Delta flight who hungered to test blockchain. Through my work with the Network of Networks group, several things are becoming apparent. I think I know why blockchain is not hotter. Here are my thoughts:

1. **A Lot to Figure Out. For Example, What Is a Node?** Blockchain is a piece of a larger technology platform. It is critical to define the publish/subscribe mechanisms, the data architecture, and think through the nodes. Blockchain is a decentralized system based on nodes. The nodes enable replication and authentication of the data. We are not clear on which companies should be a node and how to architect public data sharing across the supply chain.
2. **Security in Many-to-Many Architectures.** Most of the blockchain work today is one-to-many, not many-parties-to-many-parties. Supply Chain Operating Networks like Elemica, GT Nexus (now Infor), and SAP Ariba are many-parties-to-many-parties. The complexity of many-to-many networks, as compared to one-to-many operating networks, is different by an order of magnitude. Security and data management in many-to-many architectures, and the management within blockchain, is still experimental.
3. **Organizational Readiness.** We are not set up to test. People with a deep understanding of EDI are in different organizations than the business teams. In most organizations they do not know each other. Companies want definitive ROIs. Power brokers—companies with significant buying power—are not stepping up to the plate (with the exception of Maersk and Walmart).
4. **We Have More Sticks than Carrots.** While supply chain leaders talk about collaboration, over the last decade processes steadily pushed cost and waste backwards in the supply chain. The cost of doing business is much more expensive for companies four and

five layers back in the value network. For example, receivables and payables steadily increased in the chemical industry.

Figure 1. Comparison: Chemical

Cash-to-Cash Components Comparison: Chemicals

Years	Days of Receivables	Days of Inventory	Days of Payables	Cash-to-Cash
2004-2006	33	63	39	51
2007-2009	36	69	48	55
2010-2016	55	81	55	81
2004-2016	**46**	**74**	**50**	**68**

Source: Supply Chain Insights 2017, Derived from Ychaits, Showing average over time period

These are my thoughts. I welcome yours!