

January 2019 Report

# Driving Supply Chain Agility

Case Studies of Nine Techniques That Work



**Supply  
Chain  
Insights™**



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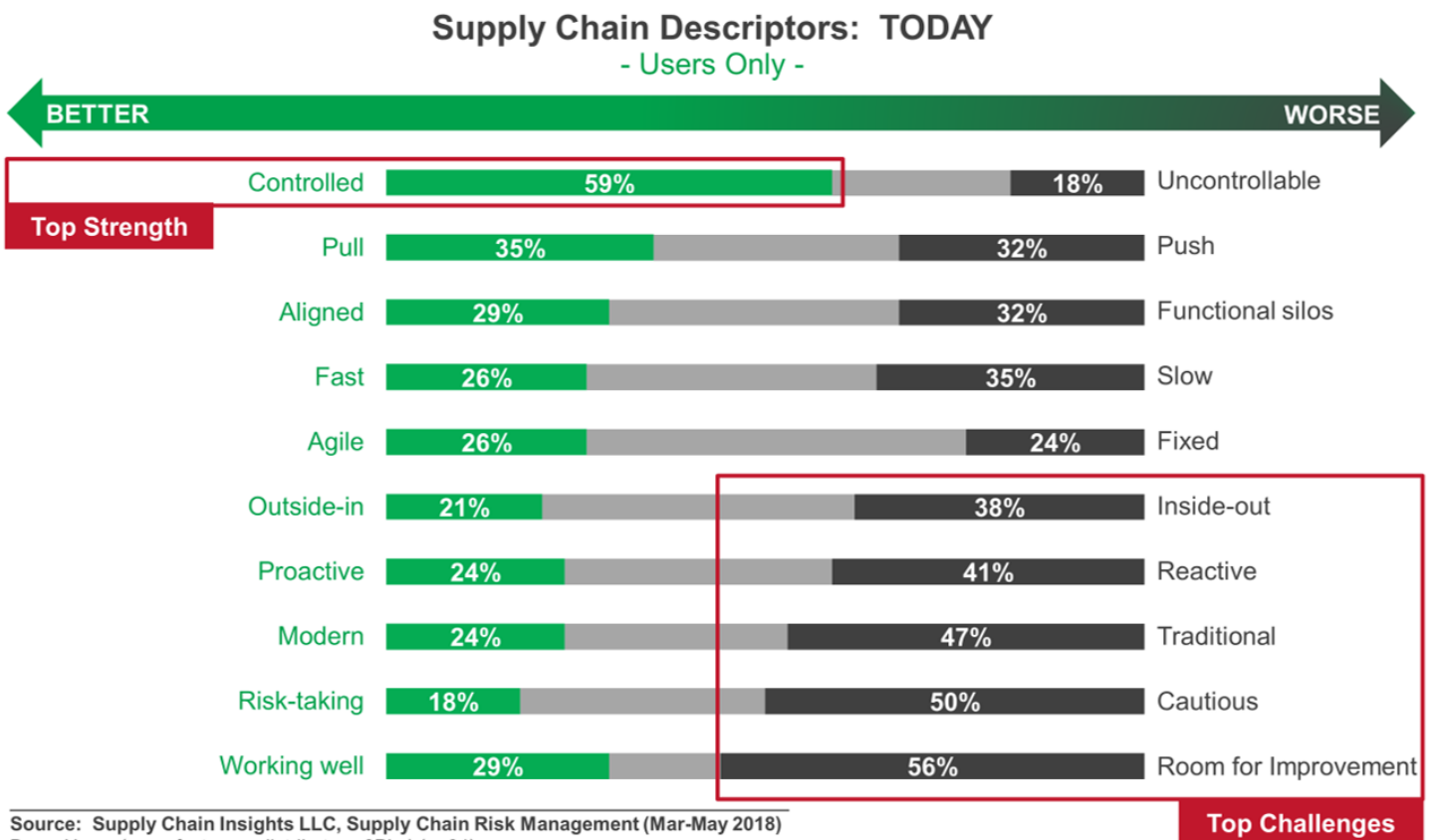
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# Executive Overview

When companies define supply chain excellence, most mean "an efficient supply chain." Seldom do companies ask, "Is the efficient supply chain effective?" Efficient supply chains will never be agile; yet leadership teams want agility. The issue? The goals are in opposition.

In a nutshell, operations teams do "big" well. The focus is on long manufacturing runs, full trucks, and discounts for large procurement buys. Growth agendas demand for commercial teams to excel in doing "small" well. This includes localized assortment, new product launch, demand shaping strategies and customer-centric programs. In today's supply chains big eats small. There is constant tension.

Figure 1. Current State of Supply Chain Management



Source: Supply Chain Insights LLC, Supply Chain Risk Management (Mar-May 2018)

Base: Users (manufacturers, distributors, 3PLs) (n=34)

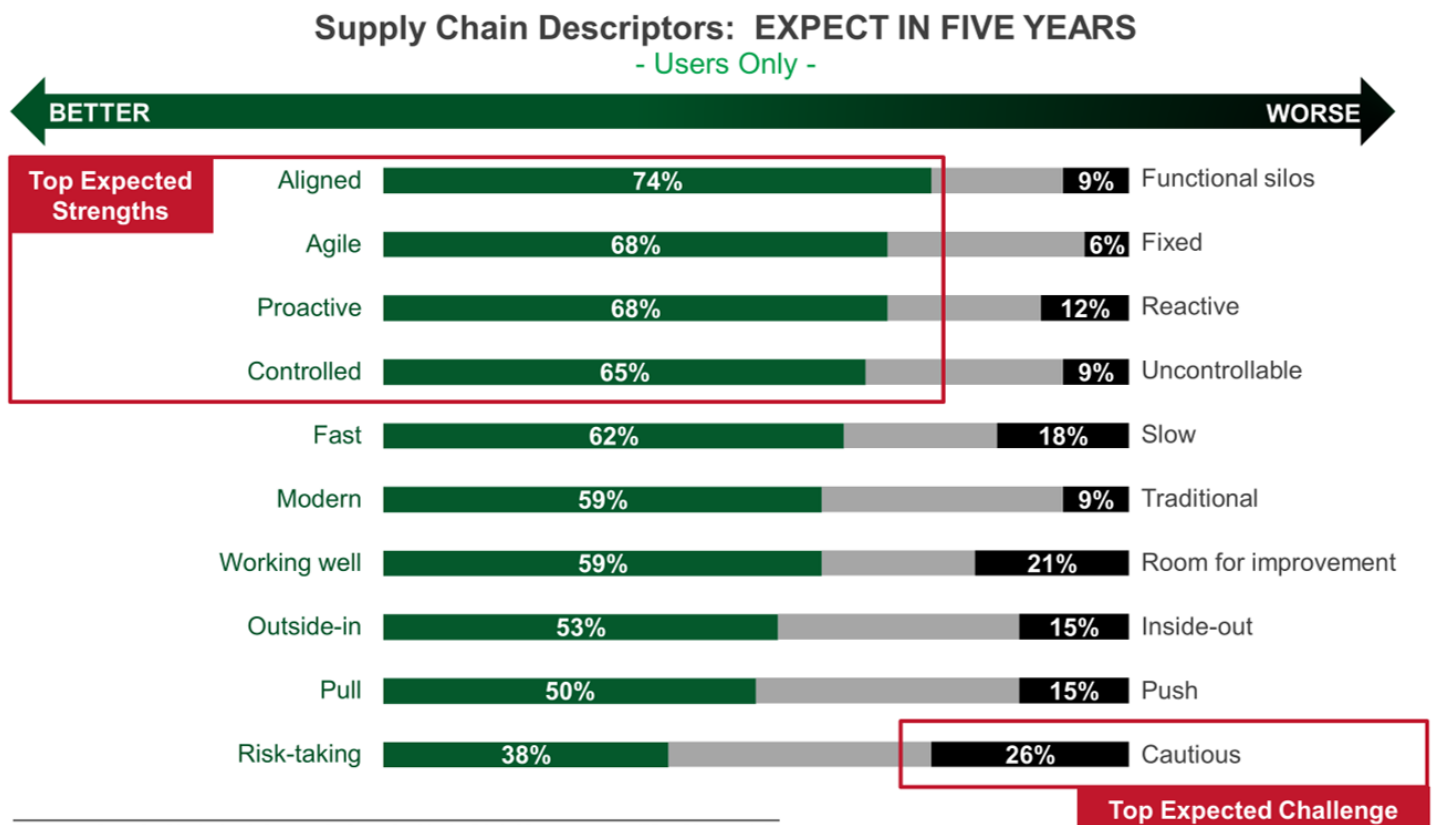
Q23. How would you describe [your][a typical] supply chain today? For each of the following pairs of words, please pick the one word or phrase that best describes [your][a typical] supply chain. 5-POINT SCALE

The journey for supply chain excellence starts with goal alignment. As shown in Figure 1, today's

efficient supply chain processes are controlled but largely reactive. As a result, only one in three companies feels that their supply chains are working well. The path forward is not clear.

Companies want supply chains to be more proactive, agile and aligned. The goal is to move past supply chain defined as function—deliver, make, source or plan--to build strong supply chain capabilities, but companies struggle. Most are stuck. The struggle is how to achieve the desired state shown in Figure 2.

**Figure 2. Desired State of Supply Chain Management**



Source: Supply Chain Insights LLC, Supply Chain Risk Management (Mar-May 2018)

Base: Users (manufacturers, distributors, 3PLs) (n=34)

Q24. For each of the same pairs, now pick what words you EXPECT will describe [your][a typical] supply chain in FIVE years (2023)?

## Defining the Supply Chain Response

Agility is not free. The efficient supply chain minimizes cost. The goal is the lowest cost per unit.

Efficient, responsive and agile supply chains are three distinctly different supply chain designs. The definition of supply chain excellence requires a choice.

This needs to be defined for each supply chain. Within an organization there are three-to-five flows each requiring a different goal. The mapping should be from the customer back with the processes fit

for purpose.

Let's contrast the differences. A responsive supply chain moves quickly with short lead times. The response rate is a critical component in the design of supply chains with predictable demand and non-predictable timing. Which products are these? Items like flu vaccines, bathing suits, toys for the holidays, seasonal items or disaster relief need to be managed using a responsive supply chain design. The focus is on cycle reduction and allocation of on hand inventories. If the organization attempts to manage the supply chain for a responsive product in an efficient design, short shipments and customer service issues abound.

The responsive and agile supply chain are often confused, but they are different. While a responsive supply chain is defined by short cycles, an agile supply chain delivers the same cost, quality and customer service given the level of demand and supply volatility. Business results for items like new product launch, specialized promotions, custom products and seasonal demand are improved

through the deployment of an agile supply chain. In this report, we share tactics to improve agility.

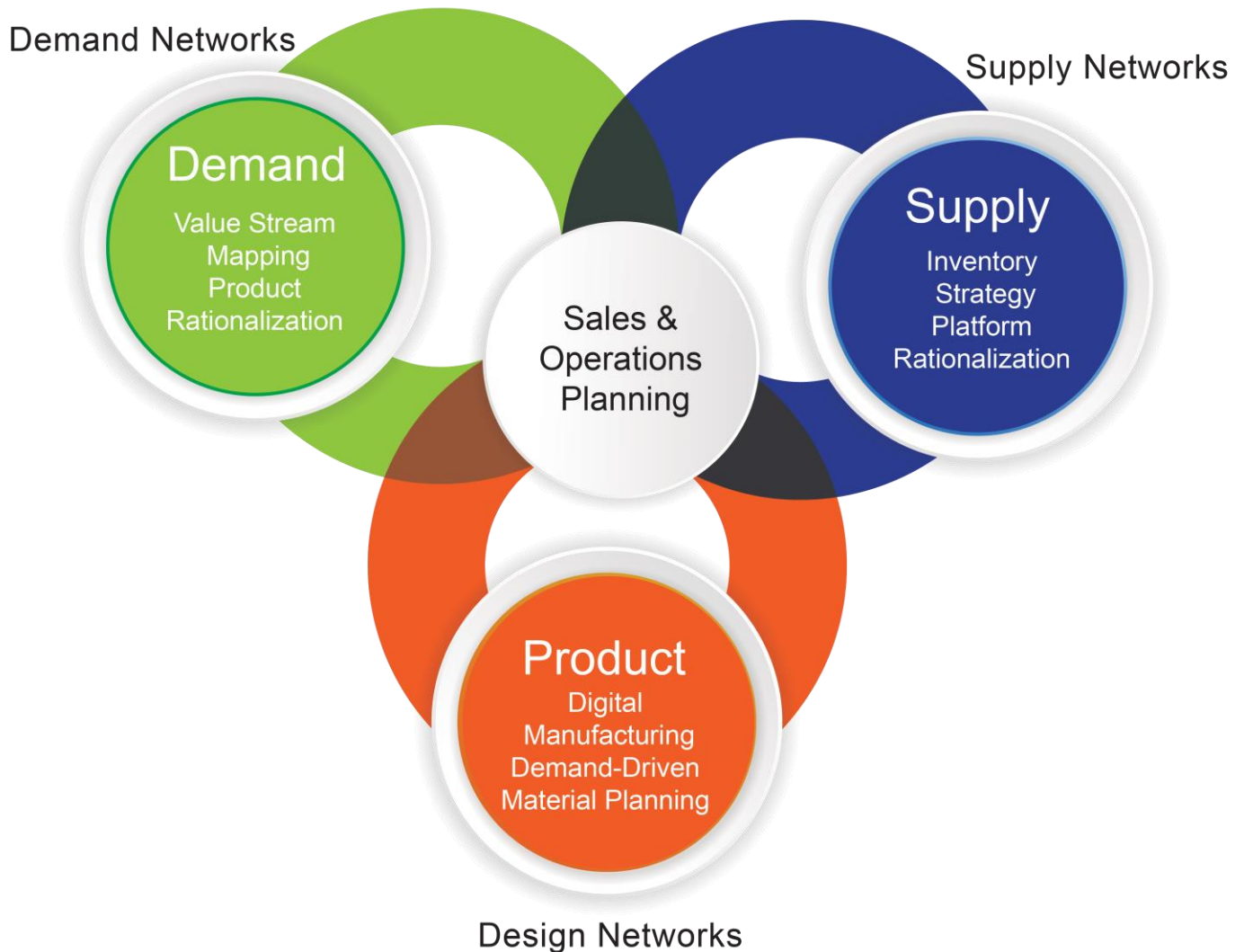
The delivery of new capabilities requires the challenging of traditional supply chain paradigms. This direction can be in direct opposition to Information Technology (IT) investments targeting the delivery of efficient supply chain processes. For example, the tight coupling of functions



and nodes with fixed integration to Enterprise Resource Planning (ERP) improves efficiency but reduces agility or responsiveness. The take away? In the development of strategy, ask tough questions. Business processes and IT investments need to align with supply chain goals.

Tactics vary. The approaches for agility cross over demand, supply, and product processes. Few companies orchestrate agility tactics end-to-end from the customer's customer to the supplier's supplier. In this report, we want to spark the debate of how to improve agility through holistic thinking. The case studies in this report, collected over the last decade, demonstrate different supply chain tactics to improve agility. These are shown in Figure 3.

Figure 3. Tactics to Improve Agility



In this report, we share case studies and research. Where possible, we support the client case studies with company financials to help the reader understand the business results.

## Sales and Operations Planning

At the center of the agility model in Figure 3 is Sales and Operations Planning (S&OP). It is the most important tactic to improve supply chain agility. Over 80% of companies have a Sales and Operations (S&OP) planning process, but few are mature. As the organization matures, it becomes more aligned and agile. This relationship is shown in Figure 4. We have completed five research studies in this area over the past six years. This relationship is consistent across all the studies.

What is a mature S&OP process? Let's start this discussion with a warning. Hijacked by consultants attempting to drive self-interest, acronyms abound. To simplify this discussion, let's side-step the

discussion on abbreviations.

Figure 4. Relationship Between a Mature S&OP Plan and Agility



In our research, we use nine characteristics to define a mature S&OP process:

1. **Clear Strategy.** It is hard to know where you are going unless there is a clear strategy. S&OP is a means to actualize the plan. Without clarity of the mission, cross-functional teams flounder.
2. **Balance.** Mature S&OP processes balance the interests of “sales” and “operations” with a focus on the “&.” In our research, we find that 75% of companies are

out-of-balance reducing the Company’s ability to achieve alignment or improve agility.

3. **Organizational Discipline.** Driving cross-functional teams requires a precise schedule, roles, and deliverables. Within mature S&OP processes, process discipline is omnipresent.
4. **Defined Governance.** The process operates outside of order lead times, and the profit center manager acts as the leader. The focus is on the future. (This is often twelve to eighteen months.) It is never a focus on the current month or optimization within the order lead time.
5. **Balanced Scorecard.** Within a mature S&OP process, there is a balanced scorecard that ties to corporate strategy. Based on our research, we find that market value (either price to tangible book or market capitalization) is higher when the scorecard balances growth, customer service, inventory levels, cost, and asset utilization. Strategy drives the weighting of the factors. Results drive continuous improvement.

6. **Feasible Plan.** As organizations mature, the discussions are data-driven. Operational execution closely links to the S&OP plan. This is possible because the modeling optimizes trade-offs to the strategy and the decision support technologies are selected and refined to develop a feasible plan.
7. **The Process.** Planners love planning technologies and push for model improvements. Companies hold themselves accountable to drive progress in the measurements of Forecast Value Added (FVA), manufacturing plan adherence, order on-time, and in-full measurements, and inventory obsolescence (SLOB).
8. **Volume-to-Value Discussions.** The goal of the plan is to maximize value. In this discussion, decision support technologies are used to optimize the trade-offs between volume, mix, and cost. The models enable "what-if analysis."
9. **Bi-directional Orchestration.** The traditional supply chain focused on functional excellence while the mature S&OP process targets cross-functional trade-offs to improve a balanced scorecard. The focus is from the customer's customer to the supplier's supplier analyzing compromises of product mix, new product launch, alternate supply, product platform rationalization, and cost-to-serve. The leadership team aggressively drives a dialogue on cross-functional trade-offs.

## Demand Networks

Despite lots of discussions, few companies build demand networks. We know of two companies successful in building demand networks. One is Lenovo. The other is confidential. Companies are supply-centric thinkers; and as a result, miss the opportunity to improve agility through demand networks.

Let's get clear on definitions. What is a demand network? A demand network decreases demand latency and improves sense and respond capabilities for a Company. (Demand latency is the time from channel purchase to demand translation of channel replenishment to drive order to an upstream trading partner.) While most companies believe that an order is a good predictor of demand, with product proliferation, globalization, and microsegmentation, demand latency dramatically increased over the past decade. As a result, the order is not as good of a predictor of demand as it was ten years ago. Increasingly, it is out of sync with the market.

IBM changed this for their Lenovo brand. IBM named the demand network iBAT. (The IBM Buy Analysis Tool).

## The Problem

IBM had too much inventory in the channel driving excess costs. Computers, like bananas, decreased in value over time, due to price declines, with age. As the Company launched



products, the value of the inventory plummeted. The "hot potato" was responsible. Who should pay for the change in value? The distributor? IBM? The discussions were a barrier to growth.

Gaming behavior reigned. No trading partner wanted to be left holding inventory requiring a write-off. To combat the problem of aging product, IBM price protected sales to the distribution channel partners for 45 days. It helped, but when the price protection expired, distributors stopped buying.

To boost sales, IBM extended price protection. The company was in a crazy non-win cycle. To remedy the situation, the Company would try to promote old inventory, only to get it back as a return. The teams were spending millions to get the inventory out of the channel while the supply chain pushed products into channel distribution.

At times, IBM would be running out of supply while writing-off inventory. The Company couldn't seem to get it right. The distributors would have many weeks of sales, but it was the wrong stuff, and the group would miss market opportunities. It was a constant struggle. The IBM research

team offered to study the situation and make recommendations.



As a starting point, the IBM research team started with channel data. The team ran a simple regression on the channel information to better understand patterns and determined the rates of sales per channel node based on historical data. Their work evolved to include lead times and seasonality, along with insights on the variability of

the product and how the product should sell. The iBAT system recommended supply level for each distributor. The business partners liked that. They loved it so much that they used the recommendation from iBAT to beat IBM over the head. Tension mounted between internal sales teams and distributors to rationalize the channel inventory levels.

## Changing Behavior

After the implementation of iBAT, things got better. Customer service improved and the write-offs were fewer. However, basic channel behaviors did not change. The business partners didn't want to hold inventory, but the IBM salesforce would come in at the end of the quarter and ask the distributor to load up their warehouses. IBM would always give them an incentive to pre-buy. The business partners bought on incentives, and then the inventory became poison. In the first years, the iBAT tool became a good way for communication between the distributors and the IBM sales

team, but it didn't change behavior.

The first step to drive adoption was to define a minimum and maximum target (reasonable range) by item. In the process, the Company changed price protection terms. IBM told distributors that if they had inventory, and the item was within the min-max range of iBAT, the Company would price protect the product forever. When this new policy was implemented in 2018, IBM salespeople struggled. It was summer 2008; and, in 2008, there was a major macroeconomic event. As the recession happened, the distributors were scared. The economic downturn helped drive iBAT adoption. The project reduced the channel inventories from a six-month supply down to the min-max levels.









At the time of implementation, IBM had \$160M of inventory in the channel, and 40% was the old product. By the time second quarter of 2009 occurred, the iBat program reduced inventory by 50% resulting in the reduction of obsolescence from 40% to 5%. These savings translated to \$5M. Due to the improvement in agility, the Company hit service levels, and the complaints about having the right stuff in the channel went down dramatically.



With the US economic stimulus money in September 2009, the IBM business came back with a vengeance. The result? IBM took market share. The network tool iBAT consistently rationalized the required replenishment levels improving agility. When the sales team pushed partners to inventory load the channel, distributors pushed back. Data-driven discussions drove alignment and balance. The iBAT replenishment approach stopped a dangerous behavior that stemmed from sales-driven behavior. iBAT was a voice of truth that enabled everyone to succeed together in the network.

The implementation and the results took time. In Figure 5, we share the five-year project schedule.

**Figure 5. The Roll-out of the iBAT Project by IBM**

Major Markets		Growth Markets		
 <p><b>USA &amp; Canada</b> “Classic” BP Use</p>	 <p><b>Western Europe</b> “Classic” BP Use</p>	<p><b>LA and India</b> Kanban / hub support</p>   		
		<p><b>6 African countries, China and Russia</b> “Classic” BP Use</p>   		
<ul style="list-style-type: none"> <li>High volume</li> <li>Frequent rate of sales</li> <li>USA = 1 country, 4 BPs</li> <li>Good I/T linkage</li> <li>Mature Processes</li> <li>Significantly business value realized</li> </ul>	<ul style="list-style-type: none"> <li>Volume similar to USA</li> <li>30+ Distributors in 11 countries</li> <li>Lower, less frequent sales volume at product level per BP</li> <li>Business Partners grow via Merger &amp; Acquisition; BP's often have multiple ERP Systems - improved visibility via iBAT</li> </ul>	<p><b>Growth Market characteristics:</b></p> <ul style="list-style-type: none"> <li>Relatively lower volume at product and BP level</li> <li>Evolving I/T infrastructure and business processes</li> <li>Exception is Russia</li> </ul> <p><b>Kanban solution applies iBAT analytics to sales / ship data to optimize country inventory</b></p> <ul style="list-style-type: none"> <li>Brazil central inventory previously managed by Sales – excessive inventory</li> <li>Mexico hub, supporting US / Mexico BPs</li> <li>NEW – India BP Special Bid “lite” support via China kanban - reduces O2D cycle time to improve competitiveness</li> </ul>	<p><b>Classic BP use:</b></p> <ul style="list-style-type: none"> <li>Select Africa BP “iBAT Lite” use linked to Growth Initiative – well received</li> <li>China Run Rate</li> <li>Russia – NEW - in process !</li> </ul> <p><b>iBAT forecast and inventory analytics enhanced to be in synch with country specific parameters and requirements</b></p>	
2007	2009	2011	2012	2014

iBAT addresses channel collaboration and optimization challenges across multiple sectors and industries. IBM has iBAT experience in both the **Industrial** and **Distribution** Sectors.

Source: IBM Rollout of iBAT

At IBM, the use of iBAT helped teams to work better cross-functionally to improve inventory ordering, increase sales and eliminate customer service issues. The results? An improvement in agility driving impressive business outcomes.

## Value-Stream Mapping

Most companies know that there is not one, but many supply chains within a Company. The question is how to align the supply chain processes to the business. The answer? Value Stream Mapping.

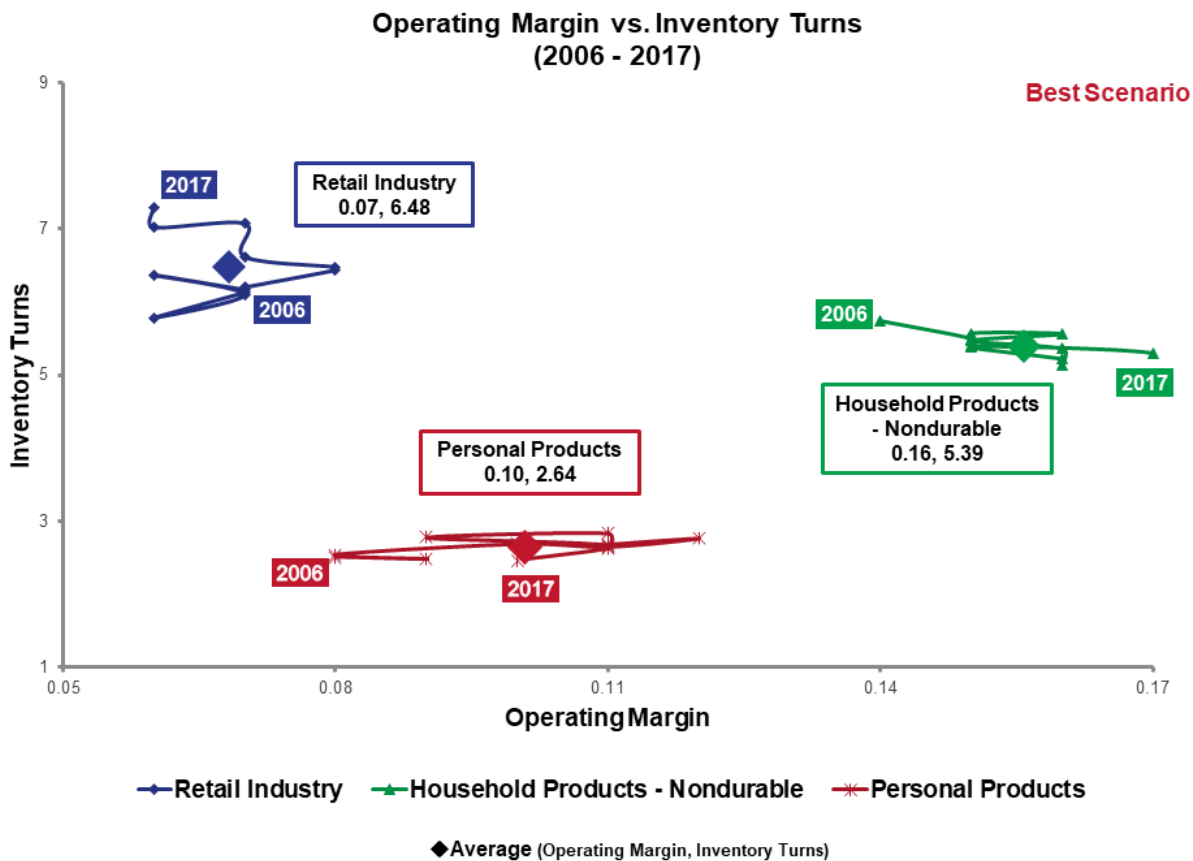
At Clorox, the value stream mapping work started in 2006. Supply chain segmentation—designing a fit for purpose supply chain—was the focus. At that time, Clorox was moving from being a regional manufacturer of bleach products to manufacturing and selling a wider product portfolio globally. The revenue was slightly more than 1B\$.

The work on value-stream mapping helped Clorox build the right infrastructure to support a multi-national supply chain team. Today, the story is quite different. Today, the company has sales of 6B\$, manufacturers 40+ brands in 24 countries and sells products in 100 countries.

# A Closer Look at Clorox

Over the course of the last decade (2006-2017), each vertical industry has operated within a well-defined pattern of performance. As shown in Figure 6, the margins for retail averaged 7%, while personal products were 10% and consumer products household goods were 16%. While many in the industry believe that there was significant improvement in data sharing and collaboration within the consumer value chain over the past decade, this was not the case. Instead, each industry operated on its own effective frontier. Clorox was attempting to build a value network of products from personal products and household products while driving growth with retail.

**Figure 6. Orbit Chart Comparison of Personal Products, Household Companies and Broadline Retailers (Period of 2006-2017)**



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

The addition of product portfolios in segments with lower margin and turns affected the overall Clorox results, as the company drove a growth strategy. Using value stream mapping, the company remained competitive against the peer set within household products.

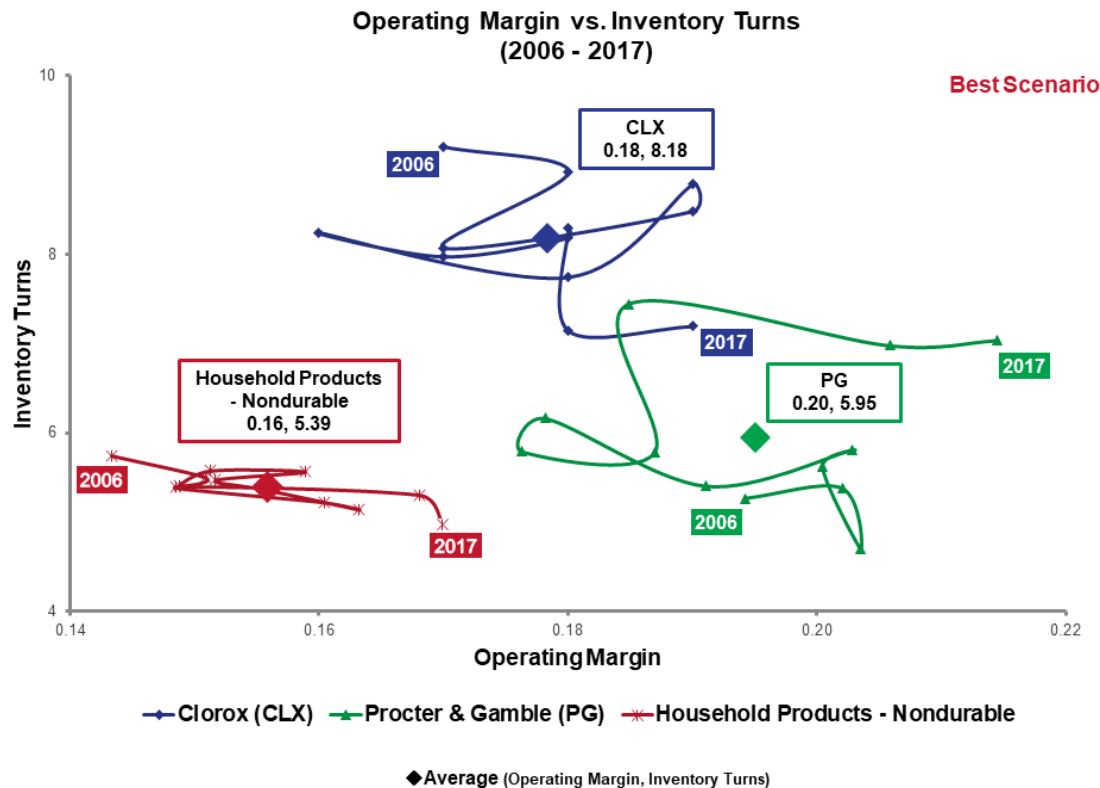
**Table 1. Clorox Performance Compared to Competitors (Supply Chain Index is a relative metric of growth.)**

**Performance and Improvement (2010-2017): Household-Nondurables**

Company	Growth	Operating Margin	Inventory Turns	Return on Invested Capital	Market Cap (000,000)	Price to Tangible Book Value	Supply Chain Index Rank
Church & Dwight Co	5.2%	0.19	7.1	14.0%	\$9,201	-12.2	4
Clorox	1.2%	0.17	7.9	23.0%	\$12,975	-8.6	11
Colgate-Palmolive	0.2%	0.22	5.2	30.9%	\$55,003	-30.6	2
Energizer Holdings Inc	-3.2%	0.15	3.2	10.4%	\$2,580	-9.2	1
Kimberly-Clark	-0.5%	0.14	6.2	18.7%	\$36,683	-7.4	6
Newell Rubbermaid	17.7%	0.10	4.7	8.0%	\$10,511	-4.9	5
Procter & Gamble	-2.0%	0.19	6.3	12.0%	\$211,094	-14.1	10
<b>Reckitt Benckiser Group *WINNER*</b>	<b>2.9%</b>	<b>0.24</b>	<b>5.1</b>	<b>24.1%</b>	<b>\$59,262</b>	<b>-7.0</b>	<b>7</b>
Spectrum Brands Holdings	11.0%	0.10	4.2	1.2%	\$4,248	-1.6	7
Tupperware Brands	1.0%	0.14	2.8	13.7%	\$3,277	-22.7	9
Unilever	1.3%	0.15	3.6	17.0%	\$121,526	-13.7	2
<b>Average</b>	<b>1.7%</b>	<b>0.16</b>	<b>5.1</b>	<b>15.7%</b>	<b>\$31,527</b>	<b>-12.0</b>	

Source: Supply Chain Insights 2018, 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; low score = better); Averages exclude outliers for purposes of Supply Chains to Admire calculations

**Figure 7. Clorox Orbit Charts Versus Household Products Peer Group Along with Procter & Gamble for the Period of 2006-2017**



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

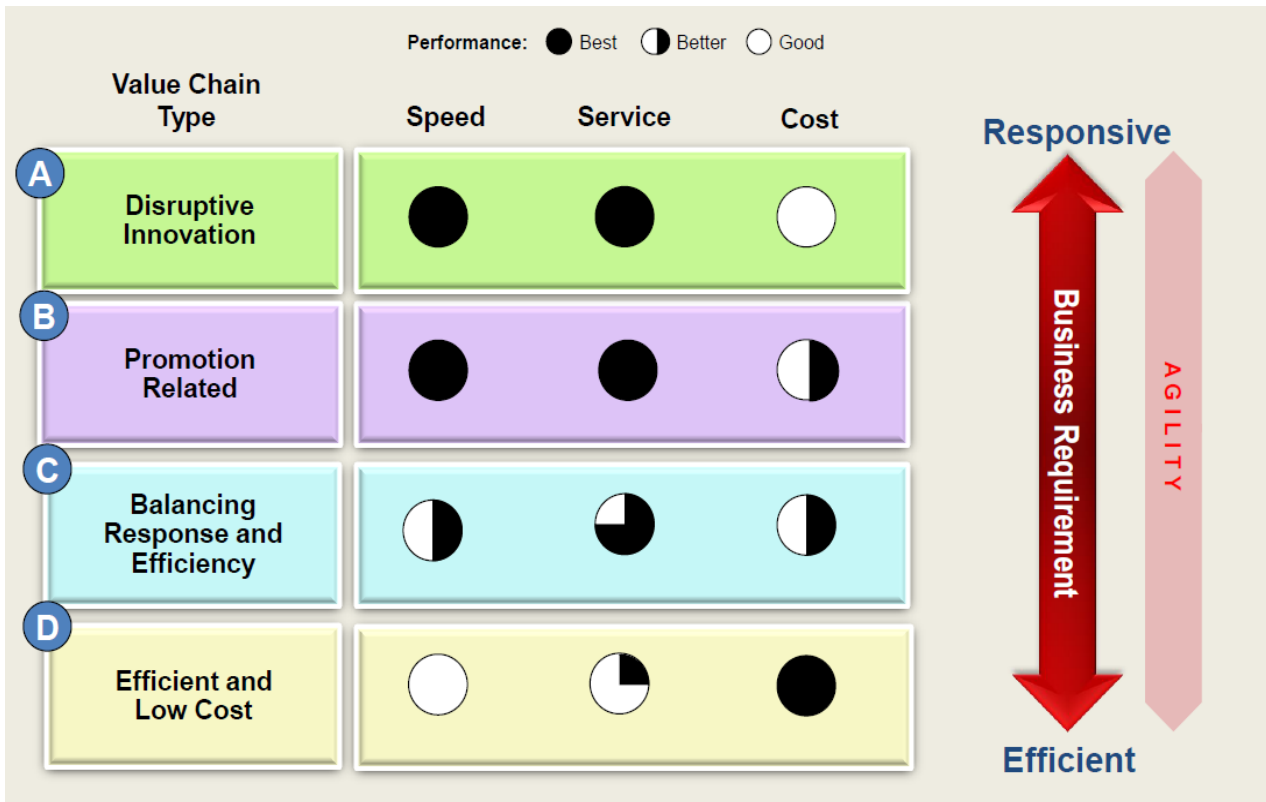
# Implementing value Stream Mapping

This work required consistent and strong leadership. If you look at acquired businesses-- Burt's Bees, Glad Trash Bags, Probiotic Digestive Health, water filtration —these were very different businesses requiring different supply chain designs. The degree of change was profound requiring personalization of the network to deliver results for the consumer. James Foster, now retired, was the driving force behind the project.

The goal was to design from the customer back. A lot of the new business/acquisitions were shipped direct to customer versus moving through the Regional Distribution Network (RDC). In this time period, the bleach business did not change. It was a low cost and highly efficient business. James knew that we needed a fit-for-purpose supply chain that matched the needs of the customer.

James sold the concept to CEO and other senior leaders of the Company. His goal was to match supply chain capabilities with the needs of the market. General Managers needed product supply to be quicker and more responsive, and James wanted to deliver.

**Figure 8. Segmentation Map**



If the Company operated an efficient, a low-cost supply chain like the early days as a bleach supply chain, they were not going to be able to support the

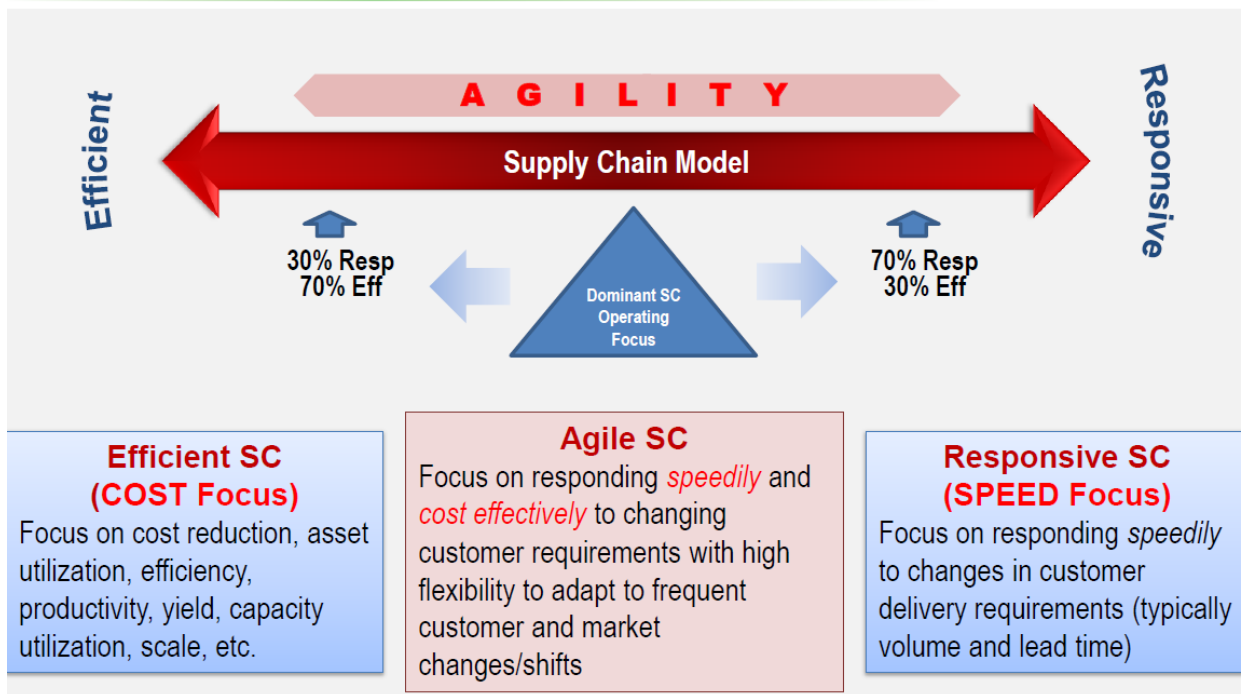
business requirements.

He started by helping the General Managers understand the trade-offs. His pitch was, “If you focus on

speed, cost will be good, but not the best.” What made the process powerful was that James forced the conversation. He used the diagram in Figure 8 to illustrate the trade-offs.

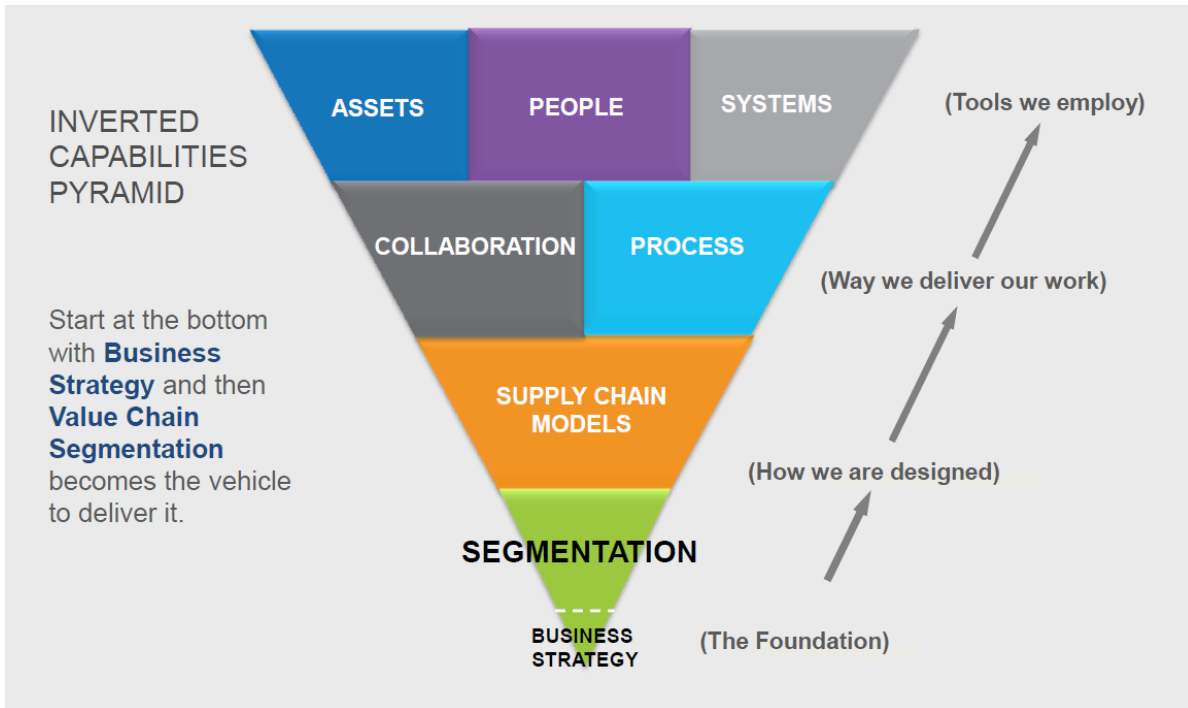
The goal as to define required capabilities. There is more capacity and the focus on flexibility in a responsive supply chain. In this segmentation model, the more responsive supply chains depended on greater collaboration with trading partners. In contrast, in an efficient supply chain, the focus is on the lowest cost and trading partner communication is not as essential.

Figure 9. Designing Supply Chain Segmentation



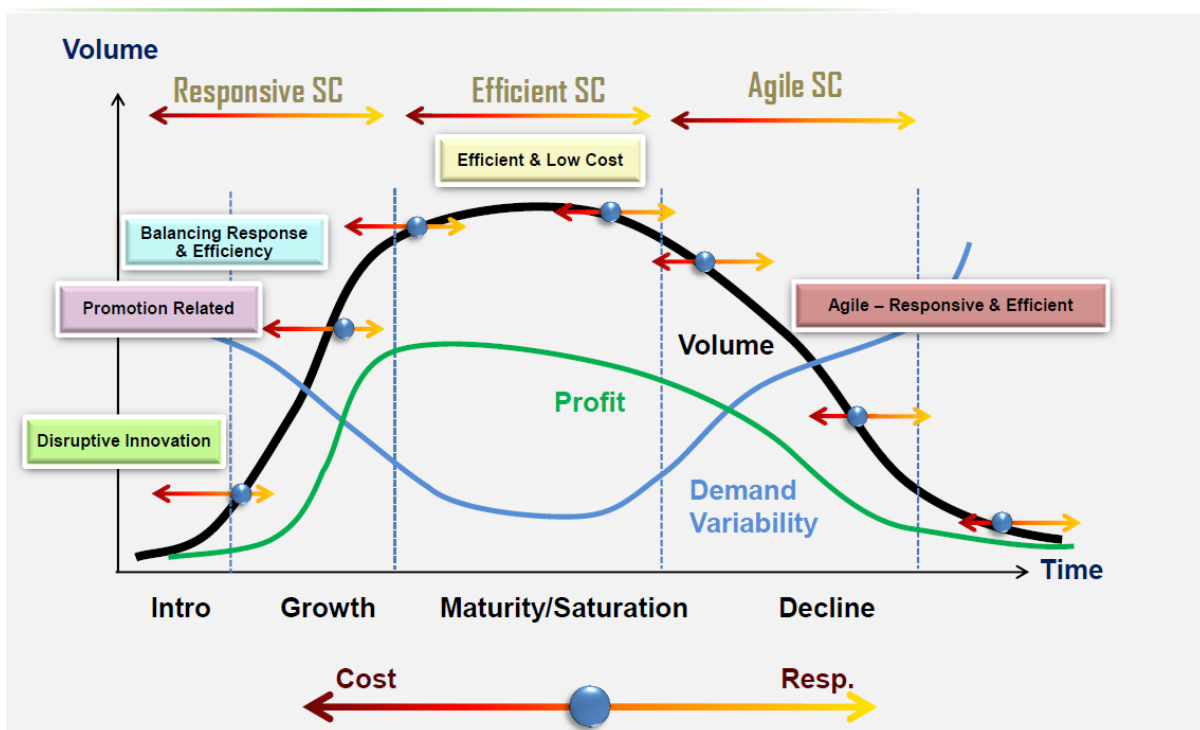
The secret for Clorox was to start with strategy. Each year, The Company held an annual strategy planning process. At this meeting, business units and General Managers (GMs) share plans. The focus is to develop clear objectives: how to win, how to play and how to configure. Within the supply chain organization these strategies translate to supply chain design requirements. Where there are gaps, the supply chain team develops plans. It happens annually. The process is led by the Supply Chain Strategy group: a team of five people. There are no special technologies. The GM is active throughout the process. The focus is on the next five years.

Figure 10. Defining the Strategy



Value chain segmentation is now part of the culture. As shown in Figure 11, if the product moves in the lifecycle, it is signal to rethink the supply chain.

Figure 11. Shifts in Strategy Through the Product Lifecycle





The process helped the team to align different businesses. The focus, for Clorox, is always on the customer through value segmentation. Clorox is one of few companies to initiate and maintain value chain mapping as a systemic program. It was initiated by a visionary leader and reinforced by GM training and review programs. In this process, Clorox has been able to successfully manage the rhythms and cycles of multiple businesses while maximizing scale. A true testimonial supply chain agility driven by a visionary leader.

## Managing Finished Goods Complexity

Appliances within the kitchen today need to make a fashion statement. Increasingly it is about form and function. It was in this world that World Kitchen entered public markets with the spin-off from Corning in 1998. Today the Company operates as Corelle Brands, LLC. This case study from 2004 outlines a process to manage complexity and improve agility. The process helped World Kitchen manage inventories through bankruptcy filing in 2002.



World Kitchen's supply chain-- with significant manufacturing and distribution operations throughout North America and Asia-- was complex. Selling well-known brands including Bakers Secret, Chicago Cutlery, CorningWare, Corelle, EKco, Pyrex, and Revere, the company sold products to mass retailers and specialty stores in the United States and Canada with extreme demand volatility.

The issue? Product complexity. Product portfolio discipline was critical to the company turnaround. In 2002, World Kitchen implemented a disciplined process for managing item proliferation. In this process, a cross-functional team composed of senior marketing, finance, sales, and supply chain leaders reviewed all products in a systemic and disciplined process. The focus? The group worked together to gain an understanding of the right fit of products with low volume and profit.

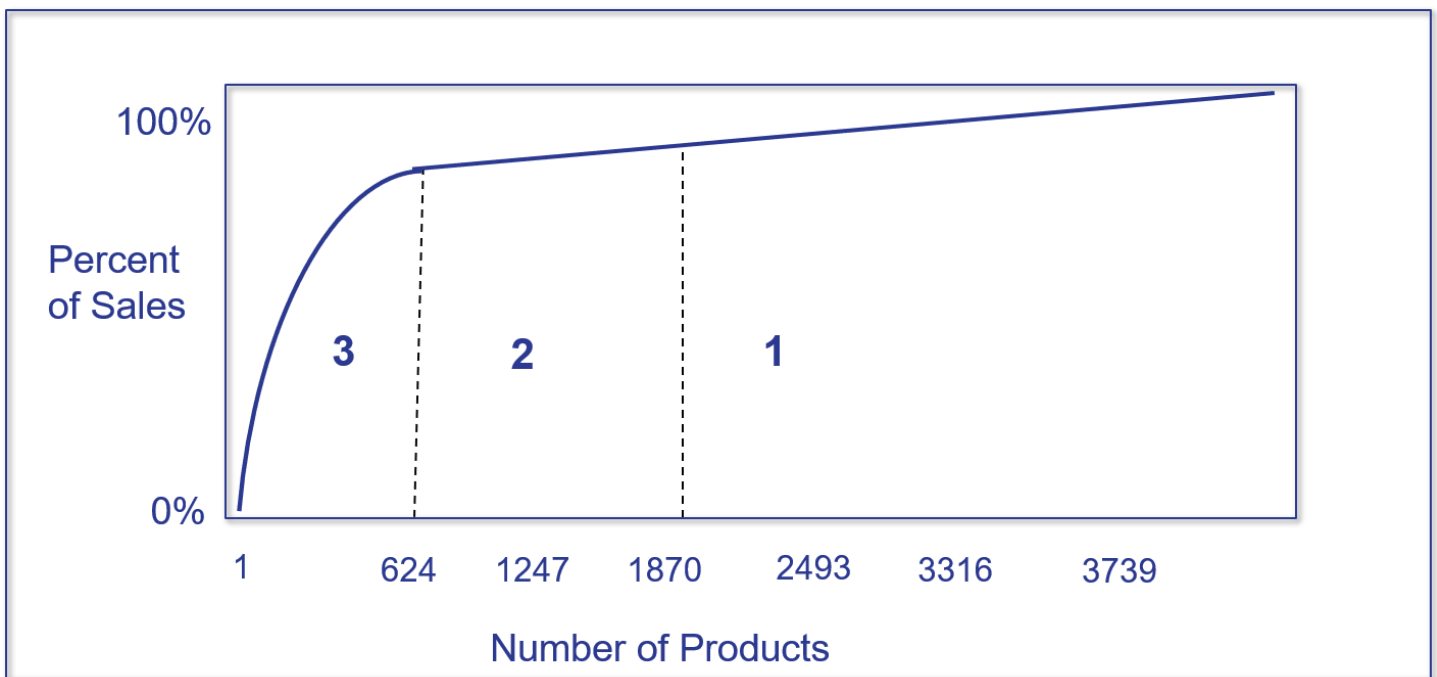
In the management of complexity, there are many good reasons for products with low volume and profit to stay in the product line. Examples include micro-segmentation, a new release of a product for a target market, or the release of a new platform. The key is management ownership and discipline to manage the product portfolio.

In the World Kitchen Company turnaround, the product stayed in the product line market if the

marketing team could justify the need for the item in the portfolio. In contrast, an item was killed if they could not make the business argument.

The start of the process was the determination of a sales rating/item. To assess a rating, items were plotted by percent of sales on a monthly basis and grouped into three categories. In category three were products with monthly cumulative sales contribution of greater than \$200,000/item/month. While items categorized in area two contributed gross sales of \$200,000 and \$30,000/item/month. Category one products formed the long tail contributing sales of less than \$30,000/item/month. More than 50% of the items were long tail items with small contribution to total sales. This pattern is shown in Figure 12.

**Figure 12. Determination of Sales Rating by World Kitchen to Assess Item Contribution**



World Kitchen Methodology:

- 1. Calculate SEVA.** The SEVA analysis is a derivative of Economic Value Add (EVA) methodology. The financial team calculated the EVA by each stock keeping unit (SKU). (An item is a product sold at a location.) The SEVA defined SKU profitability after adjustments for associated inventory, manufacturing, distribution and financial assets used to make, deliver and distribute the item. While the team knew that the analysis was directional, they did not let perfection stand in the way of progress.
- 2. Analyze.** Plot the SEVA rating by Gross Sales for each item in the product line at a SKU level.
- 3. Categorize.** Plot SEVA by the number of products and group the product line into three categories. Category one products are high volume products, and the category three products are slow-moving products.

Figure 13. Categorization of Items for Review

<b>Gross Sales Rating</b>	3	<b>Keep</b> Score=6	<b>Keep</b> Score =5	<b>Review</b> Score =4
	2	<b>Keep</b> Score =5	<b>Review</b> Score =4	<b>Kill</b> Score =3
	1	<b>Review</b> Score =4	<b>Kill</b> Score =3	<b>Kill</b> Score =2
		<b>SEVA Rating</b>		

In the process, the cross-functional group assigns a SEVA value/item and then classifies products into a nine-box model as shown in Figure 13. A decision to keep an item is easy if it scores six or five. The group discussion in these product categories focuses on driving more sales. When products fall into the "review" categories, the marketing teams were challenged to develop product action plans. SKUs falling into the "kill categories" were either discontinued or the marketing team was given two months to drive a turnaround in business performance.

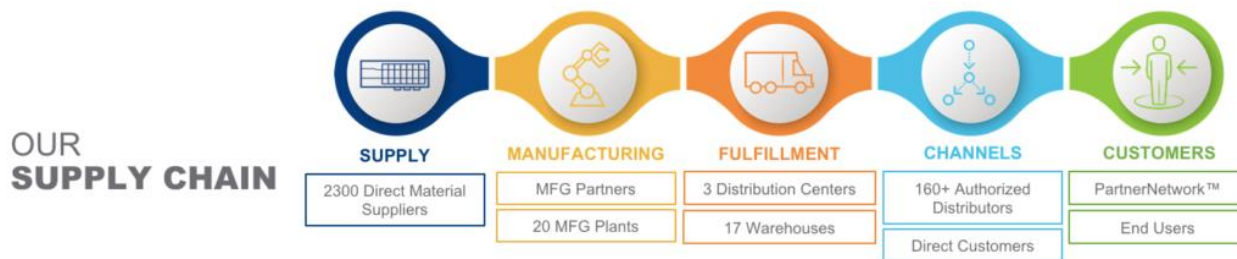
The results were dramatic. The team reduced 42% of the poorly performing items in the product line. In the process, a key lesson was learned. The team needs clear roles, and there needs to be a final arbitrator of the process. In the World Kitchen case study, the Chief Marketing Officer was the tiebreaker. Less than 5% of companies in any industry, have a disciplined process to rationalize product complexity or product profitability. Product rationalization is essential to drive agility.

# Connecting Planning to the Factory Floor

Rockwell Automation is the world's largest company dedicated to industrial automation and information. Headquartered in Milwaukee, Wisconsin, Rockwell Automation employs approximately 23,000 people serving customers in more than 80 countries. As a B2B company, procurement management is essential. The company has over 7,000 suppliers and provides industrial automation and information products to a variety of industries in over 80 countries. The company's sales totaled \$6.3B in 2017.

Rockwell's finished products fall into three categories: components, control, and visualization. Some products--push buttons, relays, and switches--turn very quickly with high volume sales. Configured products include panel views, industrial monitors and computers, and drivers turn more slowly. At the core, Rockwell Automation produces logic controls. The company also offers engineered-to-order solutions, such as control centers and medium-voltage drives. From a manufacturing perspective, products vary significantly in complexity. Some items take very little processing time while others have a quite an extended lead time. Solutions, for example, can take from 12 to 16 weeks to manufacture.

Figure 14: Organizational Overview



The company understands global manufacturers' problems because they are one. Like most industrial manufacturers, they manage a profoundly diverse portfolio of products. In this environment, complexity is both an opportunity and a challenge. Rockwell Automation has more than 400,000 items in its catalog. A typical order is about 200 SKUs, and an average product life cycle is 20 years.

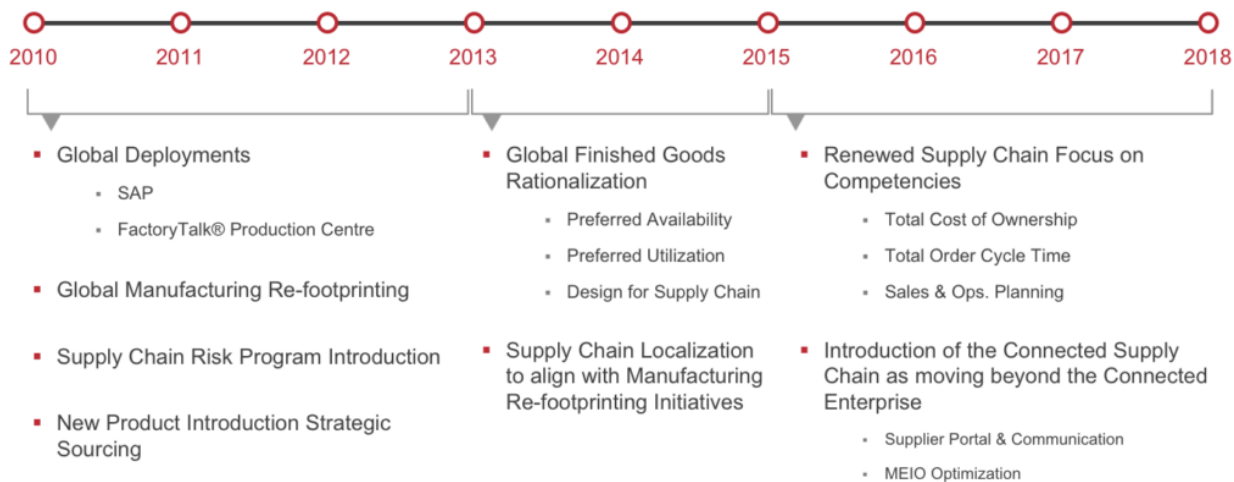
Value creation and a value-driven approach are the pillars of the Rockwell Automation model. The company's current strategy is to bring a Connected Enterprise to life. This starts with defining value,

and then combining processes, and simplifying the complex. It's about understanding and delivering on the company's customer's requirements.

In 2008, redesigned of manufacturing operations and the supply chain. At the time, the vision of the Connected Enterprise is the convergence of informational technology (IT) and operational technologies (OT). The idea is to vertically connect the shop floor to the executive suite. The focus was a faster time to market, to lower total cost of ownership, improve asset utilization, and reduce risk. The Factory Top Production Center (FTPC) is the essential core of the Rockwell Automation supply chain.

To drive change, Rockwell Automation invested in design thinking. The team created global supply chain personas of essential roles. Supply chain personas guided the global manufacturing re-foot printing efforts and landed the company at the very top of the Supply Chains to Admire ranking.

**Figure 13. Rockwell's Automation Journey**



Historically, the Rockwell Automation supply chain organization included materials planning and engineering of new products but did not include strategic sourcing. To change this, the company chose to take engineers out of design function and trained them on the fundamentals of supply chain and strategic sourcing. The company also taught them to understand the basics of negotiation and risk management. The goal was to generate scale while ensuring that they leveraged their preferred suppliers, and taking some of the products' cost upfront. That was a significant shift in the Rockwell Automation previous approach to a supply chain.

In 2013, the company drove scale for finished goods. They started to preferred metric availability and preferred utilization through sales to better understand order tracking along with the analysis of customers' orders were using preferred products. Rockwell Automation provided incentives sales to

help motivate their sales team.

The company also started to localize order fulfillment. Looking back, one strategic the Company questions is “localizing to localize” without questioning whether it was the best fit for sourcing. However, localized sourcing shortened lead times and improve responsiveness.

## **Bringing It All Together: The Connected Supply Chain**

In 2015, the company began focusing on total cost of ownership, order cycle time, and Sales and Operations planning (S&OP).

The company needed to ensure they were balancing everything appropriately, not only considering just purchase price variance or cost down but all the elements of the source-plan-make-deliver cycle. (In the case of Rockwell Automation, it’s plan-source-make-deliver because of the structure of the organization.) Ultimately, the company made sure they were taking into consideration all the various elements and the impact they will have on different functions of the process supply chain.

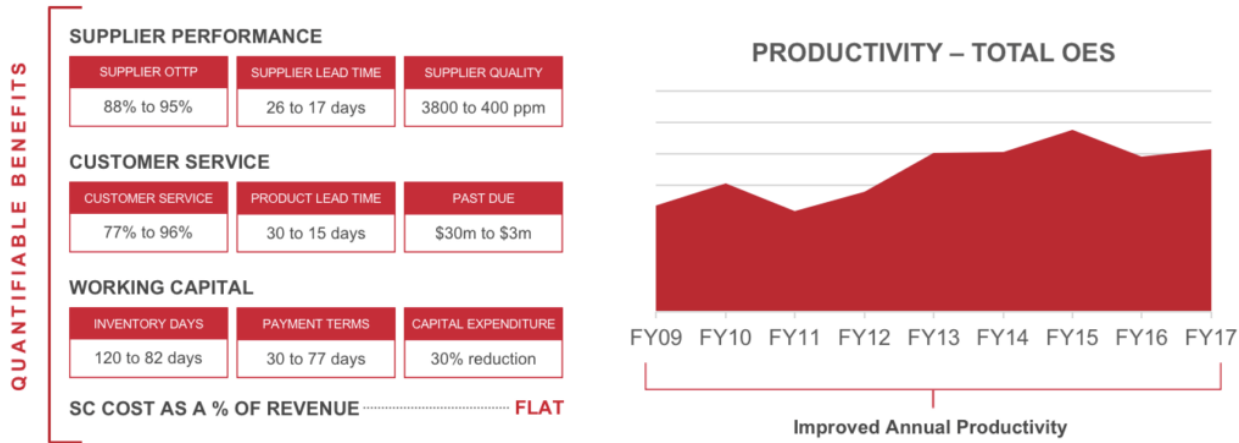
Total order cycle time was about going back to the cash and thinking about ways to reduce the time. This methodology was especially crucial for Rockwell Automation global customers, whose impact was notable since it didn’t have the benefit of their distribution network. The company focused on sales and operations planning comprising one supply chain. They also focused on lowering the walls of the silos: getting logistics, sourcing, supply chain planning to work on being globally inclusive. The company embraced cross-functional thinking, became much more end-to-end, and leveraged its cross-functional talent. All of these steps led to the final push: the introduction of the connected supply chain.

The next step was modernization. At this point Rockwell Automation was ready to redesign supply chain hordes, to fundamentally change its business process, and to leverage technology.

## **The Result: Show Me the Money**

The journey started with realistic expectations: a sustainable return, a reduction in cost, and improved supplier performance. As Rockwell Automation learned and understood their capacity and segmented their data, they saw significant improvement in on-time fulfillment rates, product lead time drops by 50%, and past due orders (ten-fold improvement). In Figure 14, we share the results from the journey.

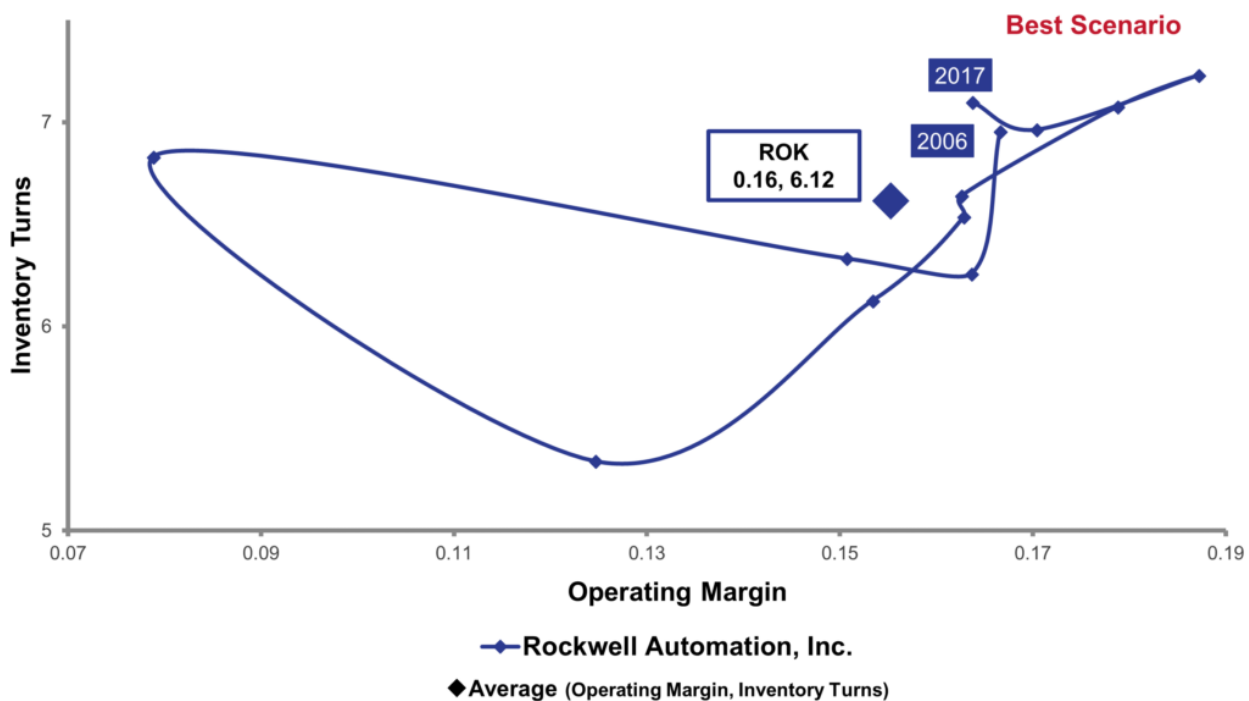
**Figure 14. Quantifiable Results of Rockwell’s Automation Journey**



Annual productivity numbers climbed steadily since 2011. This resulted in steady improvement in orbit chart performance as shown in Figure 15 and outperforming competitors as shown in Table 2.

Figure 15. Orbit Chart of Rockwell Automation for the Period of 2006-2017

### Rockwell Automation, Inc. Operating Margin vs. Inventory Turns (2006-2017)



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

**Table 2. Performance for Diversified Industries for the Period of 2010-2017**

**Performance and Improvement (2010-2017): 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
ABB Ltd	1.3%	0.10	4.9	11.3%	\$49,014	29.2	20
Actuant Corp	0.0%	0.08	4.8	2.0%	\$1,777	24.5	26
AMETEK Inc	9.7%	0.22	5.1	11.5%	\$11,052	-12.2	3
Avery Dennison Corporation	1.4%	0.08	8.8	10.4%	\$5,349	-88.8	17
<b>Dover Corp *WINNER*</b>	<b>4.4%</b>	<b>0.14</b>	<b>5.5</b>	<b>11.2%</b>	<b>\$12,264</b>	<b>-4.4</b>	<b>13</b>
Eaton	7.8%	0.11	6.0	8.8%	\$26,782	-29.8	9
Emerson Electric	-2.5%	0.18	6.5	13.6%	\$39,848	-3.1	18
Flowserve Corp	-1.9%	0.13	3.0	11.6%	\$6,900	15.2	14
Fortive Corp	2.9%	0.20	6.1	15.3%	\$21,844	-10.2	8
Generac Holdings	15.4%	0.17	2.9	10.8%	\$2,510	-5.9	2
General Electric Co	-2.6%	0.16	4.6	1.6%	\$232,606	-2.1	24
Hillenbrand Inc	13.2%	0.13	6.4	10.8%	\$1,909	-10.7	16
<b>Honeywell *WINNER</b>	<b>3.5%</b>	<b>0.14</b>	<b>6.4</b>	<b>13.4%</b>	<b>\$70,654</b>	<b>-14.5</b>	<b>5</b>
Hubbell Incorporated	5.7%	0.15	5.1	12.1%	\$6,480	22.2	23
Ingersoll-Rand PLC	1.1%	0.10	6.9	8.2%	\$16,167	-5.6	7
Legrand SA	3.1%	0.19	3.5	10.7%	\$14,946	-10.1	4
MDU Resources Group Inc	0.9%	0.08	12.6	2.3%	\$4,584	2.4	22
Morgan Advanced Materials	-1.2%	0.10	2.0	10.3%	\$1,029	-5.9	20
MSC Industrial Direct Co Inc	8.9%	0.15	3.3	16.6%	\$4,698	8.4	9
Parker Hannifin	2.4%	0.11	7.0	12.2%	\$16,762	11.4	15
Regal Beloit Corp	8.5%	0.08	3.7	5.6%	\$2,956	5.7	19
<b>Rockwell Automation Inc *WINNER*</b>	<b>5.2%</b>	<b>0.16</b>	<b>6.1</b>	<b>22.4%</b>	<b>\$14,981</b>	<b>17.3</b>	<b>11</b>
Schneider Electric	3.7%	0.12	4.9	7.2%	\$39,873	-49.4	25
Toshiba	-4.6%	0.02	5.7	-9.5%	\$15,740	3.0	1
Trinity Industries Inc	8.5%	0.17	4.5	6.5%	\$3,727	1.6	6
Valmont Industries Inc	6.5%	0.10	5.6	9.6%	\$3,101	5.2	12
<b>Average</b>	<b>3.9%</b>	<b>0.13</b>	<b>5.2</b>	<b>10.2%</b>	<b>\$13,512</b>	<b>-0.7</b>	

Source: Supply Chain Insights 2018, 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; low score = better); Averages exclude outliers for purposes of Supply Chains to Admire calculations

Rockwell Automation is a case study of a company working a long-term plan to improve flows for the customer. The focus on design-thinking and supply chain personas grounded the process to ensure delivery of results through vertical integration with a focus on digital manufacturing drove agility.

## Digital Manufacturing

AGCO's culture of innovation policy deployment enabled employees to pioneer a technology solution for manufacturing. AGCO Corp. is a publicly held \$7B 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 industry.

**Table 3. Performance for Heavy Equipment Manufacturers for the Period of 2010-2017**



Performance and Improvement (2010-2017): 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	4.1%	0.06	4.2	8.4%	\$4,697	3.5	8
Caterpillar	6.4%	0.09	3.2	5.7%	\$59,763	11.4	4
Cummins	9.2%	0.12	5.3	18.4%	\$22,453	3.9	11
Deere & Company	4.1%	0.14	5.3	6.4%	\$33,940	5.2	8
Hitachi Construction	-1.7%	0.05	5.4	3.6%	\$29,877	2.0	8
Hyster-Yale Materials Handling Inc	7.9%	0.04	6.6	15.2%	\$1,144	2.7	2
Komatsu	-0.7%	0.11	2.5	7.3%	\$22,802	1.9	1
Konecranes Oyj	7.2%	0.06	1.5	9.6%	\$2,373	1.5	12
Kubota	6.7%	0.11	3.5	6.2%	\$17,407	1.8	5
Manitowoc	-8.0%	0.03	3.7	-0.9%	\$626	1.4	14
Navistar	-3.1%	0.01	7.3	-11.5%	\$2,738	-1.3	5
Oshkosh Truck	7.0%	0.07	6.6	12.0%	\$3,780	-18.6	15
PACCAR Inc	13.2%	0.10	17.5	7.9%	\$19,930	3.1	5
Terex Corporation	3.0%	0.03	3.4	3.8%	\$3,108	5.5	13
Textron Inc	4.0%	0.08	3.2	6.1%	\$9,986	4.8	3
United Tractors	6.3%	0.13	5.8	15.5%	\$7,119	2.7	17
Volvo AB	4.1%	0.06	5.3	4.9%	\$38,324	4.7	16
<b>Average</b>	<b>4.1%</b>	<b>0.08</b>	<b>4.6</b>	<b>8.1%</b>	<b>\$16,474</b>	<b>3.4</b>	

Source: Supply Chain Insights 2018, 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; low score = better); Averages exclude outliers for purposes of Supply Chains to Admire calculations

With a focus on high-performance work teams and principle-based leadership, the AGCO production teams work 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. In 2017, AGCO's Jackson, TN operations team saved around 750K using this methodology.

## The Wearable Journey

The final factory inspection quality teams disliked having to get off of the large pieces of equipment to complete inspection lists on a computer. In 2012, this turned into an IT problem: dropped tablets had no warranty. The rugged tablet for inspection cost \$3,000 to replace. At a Kaizen event of the quality team, IT came up with using Google Glass as an alternative.

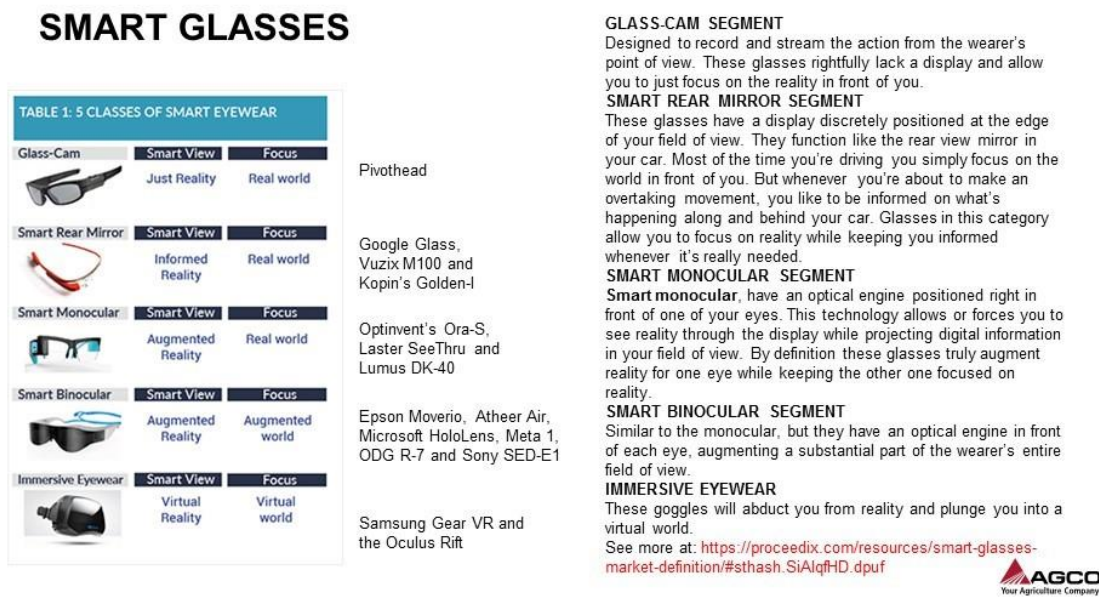
Google Glass in its original form was not very useful on the floor since it did not allow for typing, connecting to current tools, or storing passwords. To solve these problems, AGCO partnered with a small innovative company to develop an application for manufacturing. Next, the IT department

worked on the issues of infrastructure, risk, data security, cloud storage, and data sharing.

The company stuck to a no-tether policy – 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 had left off.

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

**Figure 16: Classes of Smart Eyewear**



The use of wearable glasses replaced tablets. Glass-equipped operators now follow quality check-lists 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 wearables. When operators detect an issue, they can 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:

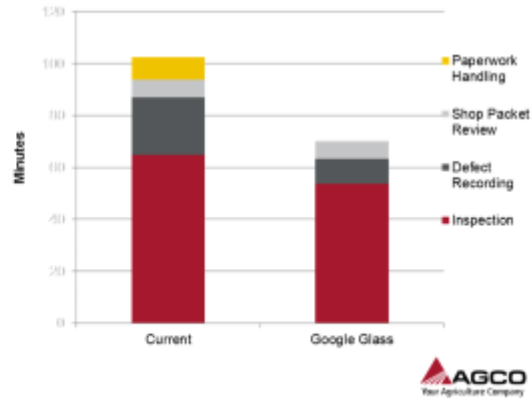
**Improved Cycles.** A 30% Initial Reduction in Processing Time. Automated real-time information sharing cut the processing time and reduced a multi-layer inspection process to one tool.

Figure 17. Improvement in Finished Factory Inspection

- ### Jackson IoT Today
- ## QUALITY GATES
- Tractor FFI (Finished Factory Inspection)
    - Replaces tablets
    - Interface to QMS
    - Operators are now following quality checklists that are tailor-made for the type of unit they are inspecting (SRN)
    - Recording of pictures and videos is accomplished in a hands-free environment and tied directly to the unit's documentation through the use of the Proceedix Action Management system.
    - When an operator detects an issue, they are able to assign an action within the system to an appropriate party to have it promptly addressed. (NCR)



Average FFI Time



**Touchless: Creation of a paperless Environment.** A "decline" voice command from an operator opens a non-conform message for a quick resolution.

**Quality of Conformance.** 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 twenty-five trips a day per employee and include 36 steps to the monitor in assembly operations with high complexity. Wearables enabled the streamlining of tasks and the elimination of unnecessary motion. AGCO also took the standard instruction images: sequenced instructions, bills and materials, and torque settings, and made them visible on the glass. Employees could zoom, freeze, and it did not inhibit the employees' movements, easing neck and eye pain. The move led to an additional 30% - 35% reduction in process time. This is shown in Figure 18.

Figure 18. View of the Inspection Instructions as Seen by an AGCO employee.



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

**Improvement in Digital Manufacturing.** The project became a means to an end to define drive data-driven processes. Every small task in operation and assembly is timed and monitored, moving AGCO to a predictive analysis stage.

Agco improved agility through digital manufacturing. The focused effort improved quality, and drove cost improvements. What started as a journey to minimize IT costs of breaking tablets paid big dividends for the company.

## Product Platform Rationalization

Over the last decade, Campbell Soup Company drove improvement faster than their peers. decade. One of the reasons was material rationalization and product simplification.

Table 3. Campbell Soup Performance and Improvement

Performance and Improvement (2010-2017): Food

Company	Growth	Operating Margin	Inventory Turns	Return on Invested Capital	Market Cap (000,000)	Price to Tangible Book Value	Supply Chain Index Rank
Archer Daniel Midland	3.5%	0.03	6.7	6.5%	\$23,568	1.5	28
B&G Foods	16.8%	0.19	3.9	5.1%	\$1,748	-2.2	26
Bunge Ltd	2.1%	0.02	8.8	4.9%	\$10,399	1.4	20
Campbell Soup	0.6%	0.16	5.6	16.1%	\$13,737	-7.5	15
Charoen Pokaphan Foods PLC	16.8%	0.05	7.4	6.5%	\$5,920	5.4	11
Clearwater Seafoods Inc	11.6%	0.11	5.8	0.1%	\$476	-73.8	15
ConAgra Foods	-5.1%	0.09	5.1	4.2%	\$11,878	8.1	2
Danone SA	2.6%	0.13	8.5	7.8%	\$41,511	-7.3	30
Dean Foods	-4.2%	-0.01	23.8	2.5%	\$1,405	0.4	33
Ebro Foods SA	1.7%	0.11	3.0	8.2%	\$3,126	6.7	29
Flowers Foods Inc	5.5%	0.07	12.5	10.4%	\$3,689	-23.1	25
Fresh Del Monte Produce Inc	2.0%	0.03	7.1	5.1%	\$1,912	1.3	3
Freshpet	29.7%	-0.11	8.2	38.5%	\$465	4.4	8
General Mills	0.9%	0.16	7.0	11.8%	\$30,245	-4.1	27
Glanbia	1.3%	0.08	3.3	12.4%	\$5,169	30.5	31
Golden Agri-Resources	20.7%	0.16	6.2	7.0%	\$4,520	0.9	34
Grupo Lala SAB de CV	2.4%	0.10	10.3	11.0%	\$3,514	2.8	35
Hershey	4.5%	0.17	5.6	21.1%	\$18,842	-18.3	13
Hormel Foods	4.4%	0.11	7.5	16.7%	\$13,376	7.7	6
Ingredion Incorporated	7.8%	0.11	6.5	9.6%	\$6,193	4.5	6
Kellogg Co	0.5%	0.12	6.8	10.9%	\$22,187	-5.3	8
Maple Leaf Foods	-7.2%	0.02	10.8	10.2%	\$2,663	6.2	36
McCormick	5.4%	0.14	3.6	13.6%	\$9,477	-25.1	1
Mondelez	-4.4%	0.13	5.7	7.2%	\$56,048	-3.8	15
Nestle	0.0%	0.15	5.3	15.1%	\$220,987	19.2	8
Orkla ASA	-5.6%	0.09	3.4	3.6%	\$8,390	3.7	32
Parmalat SpA	4.0%	0.05	8.7	4.7%	\$5,104	2.3	23
Pilgrim's Pride Corp	5.5%	0.07	8.4	14.1%	\$4,422	14.5	24
Pinnacle Foods	3.9%	0.13	5.1	5.0%	\$5,134	-2.1	4
Post Holding's	34.6%	0.12	6.6	-3.3%	\$3,147	-1.5	22
Smucker's	9.6%	0.15	4.1	6.4%	\$11,374	-9.9	19
Snyder's-Lance	13.8%	0.04	8.4	4.5%	\$2,385	-7.9	14
The Hain Celestial Group Inc	13.4%	0.08	5.0	4.9%	\$3,526	71.9	18
The Kraft Heinz Co	10.5%	0.19	5.9	8.6%	\$96,444	-2.1	4
Tree House Food Inc	22.1%	0.07	4.8	1.9%	\$2,815	-5.3	20
Tyson Foods Inc	4.8%	0.05	11.4	8.8%	\$14,833	-2.8	12
<b>Average</b>	<b>6.6%</b>	<b>0.09</b>	<b>6.7</b>	<b>8.1%</b>	<b>\$9,005</b>	<b>-0.2</b>	

Source: Supply Chain Insights 2018, 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; low score = better); Averages exclude outliers for purposes of Supply Chains to Admire calculations

Eight years ago, Campbell's started a focus on Total Delivered Cost (TDC). The Company took a holistic approach to accomplish this goal by developing training programs and tools to ensure that all employees had an accurate picture of total cost and how to drive improvements.

This work was organized under an Operations Excellence program, a pillared approach supported

with clear leadership and matrix teams. The focus was to introduce produce-to-demand as an operating strategy and implement demand-driven concepts. The Company simplified the Supply Chain strategy and communicated in a straightforward, one-page document that laid out primary goal areas. The intention was to maintain constancy of purpose and continuity.

Through the common platform/postponement initiative, the Company simplified product designs by eliminating non-value-added flavors or ingredient dice sizes. In this effort, they improved the consistency of our product quality, reduced costs and inventory, and enabled improved reliability through the resulting simplified process. This is challenging work because it is highly dependent on cross-functional collaboration. The work was successful due to a team effort across R&D, the business leaders, and the Supply Chain disciplines of engineering, procurement, and manufacturing. This dedicated team of twenty, a majority being R&D resources, was self-funded through cost savings. A principle for the work was that quality was more important to the Company than cost. This meant that every change made had to result in equal or better quality at equal or lower cost.

The Soup Common Platform used these steps:

- **Start with Formula (Recipe) Simplification.** The team removed unnecessary processes, which not only made it easier and more cost effective to make the product, but also improved quality by minimizing the impact on ingredients through the process.
- **Equipment and Plant Design.** The focus was on the plant of the future. We reduced 40 percent of assets and still make the same amount of product with greater flexibility.
- **Focus.** We started these improvement efforts in the center of the supply chain with an emphasis on building manufacturing capability, reliability and flexibility. The Company now has the ability to focus more on materials management and suppliers upstream, and distribution and customer solutions downstream, to drive optimization.

Seven consecutive years of constant improvement in our supply chain at Campbell, across virtually every result area drove improvement, while the material rationalization effort drove agility.

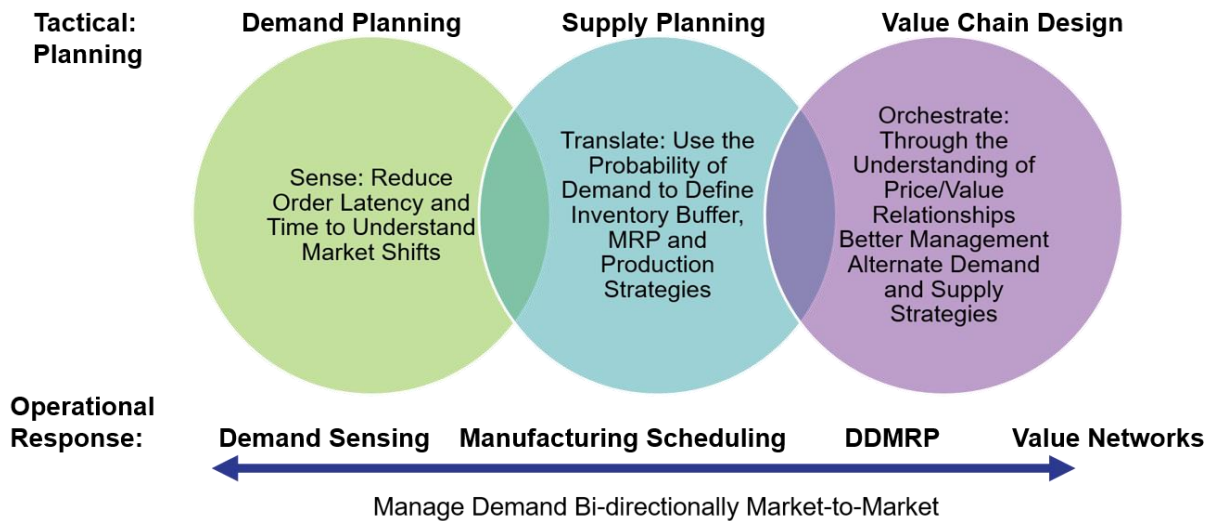
## Redefining Material Planning

Shell's leadership team strongly believes that it is insufficient to drive supply chain improvement through incrementalism. The meaning? It is just not enough to do a software upgrade or slowly push continuous improvement projects. The Company struggled with incrementality.

The Company first implemented demand sensing and then Demand-Driven Materials Requirements Planning (DDMRP) in 2017. Shell's demand-driven journey was a combination of demand sensing,

demand translation, and demand orchestration. Changing an organization paradigm to move from a supply-centric mindset to accept a demand-driven vision is a significant change management issue. To our knowledge, Shell is the only company globally to have used both demand sensing and DDMRP capabilities.

**Figure 15. Components of a Demand-Driven Journey**



Shell is the sixth largest company in the world and the market share leader in lubricants. While the lubricants business is a small sector within the vertically integrated conglomerate of Shell, it is crucial for growth and margin. There are 92,000 employees within Shell with 3,000 working in the lubricants business. The lubricant business supply chain acts similarly to a mix-and-pack consumer products supply chain.

The lubricants are oils and greases to reduce friction and prevent moving machine parts from grinding. Ubiquitous, motor engines, machines in a factory, or a turbine on a wind farm run easily based on lubrication from companies like Shell.

Shell's goal is to provide a variety of products to enable usage in multiple applications. The company sells product globally through both B2B and B2C channels. The Company also has franchised aftermarket services in automotive repair shops, retail outlets, and everything in between. Shell's current shift to the global supply chain is impacting North America, Latin America, Europe, Middle East, Asia, Russia, and China. The variety of products coupled with channel proliferation results in complexity in the global supply chain.

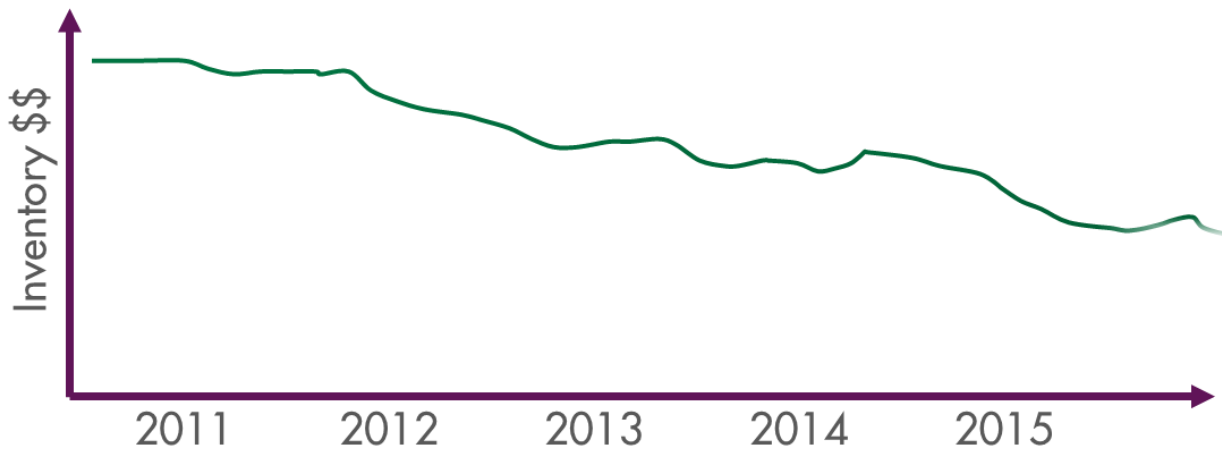
Shell operates as a single-instance of SAP Enterprise Resource Planning (ERP). Completed in 2012,

the ERP project forced the company to standardize organizational design, roles, and metrics. However, the value of a single integrated ERP system with the embedded functionality and modules did not materialize was never achieved. The reason? While the company leadership expected everyone to follow one process, it did not happen. The Company implemented SAP Advanced Planner and Optimizer (APO) including the standard functionality of Demand Planning (DP), Supply Network Planning (SNP), and Production Planning and Detailed Scheduling (PPDS), yet many planners also used Excel. What can often look like compliance in APO (SAP Supply Chain Planning) were calculated in Excel and pasted into the SAP system.

## The Demand-Driven Journey Begins

In 2010-2011 Shell partnered with a Best-of-Breed solution provider to roll-out demand sensing as a bolt-on to SAP ERP. The implementation was successful with a steady drop in inventory resulting in a 50% reduction in working capital between 2011 and 2015.

**Figure 16. Impact of Demand Sensing and Impact on Inventory Levels**



The project enabled improvements in Sales and Operations Planning. To drive adoption of S&OP, the process was renamed Integrated Business Value (IBV). The team knew Integrated Business Planning (IBP) tools were in the market, but he couldn't sell IBP within the organization. As soon as his sales and finance managers heard the word "Planning," they switched off resisting change. The change in name improved collaboration. By emphasizing value instead of planning, the group was able to move the conversations forward. By leveraging demand sensing and the Multi-tier Inventory Optimization (MEIO) platform-- using machine learning and some cognitive technologies-- on top of SAP APO, Shell successfully launched an analytics platform initiative to improve the demand signal

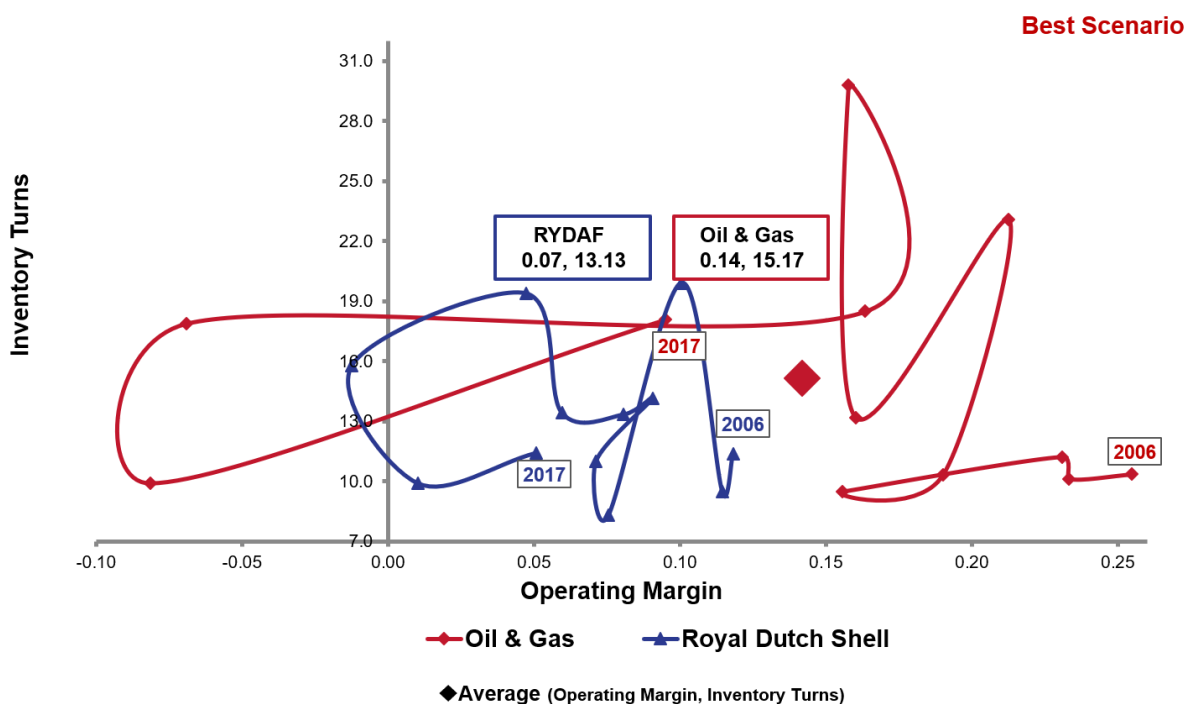


and reduce safety stock.

Over this period of 2013-2014 Shell made good progress on inventory, but faced unprecedented supply price volatility. When the price of oil dropped from \$120 per barrel in 2012 to the staggering \$29 per barrel in 2015, everyone in the oil and gas industry felt the impact. It intensified the company's focus on performance: business benefits, cost platforms, value delivery, and balancing upstream spending, such as digging wells and searching for oil reserves, with money-making downstream activities. In the new business environment, the nine-digit numbers of financial improvements in 2011-2015 from implementing IBV were now not sufficient. The first project was well done, but not enough.

The single instance of ERP within the vertically integrated Shell supply chain exacerbated the bullwhip effect causing Shell to suffer from shifts in oil prices to a greater degree than their competitors as shown in Figure 17.

**Figure 17. Orbit Chart of Shell versus Industry Averages of the Oil & Gas Sector of the Period of 2010-2016 for Inventory Turns and Operating Margin**



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

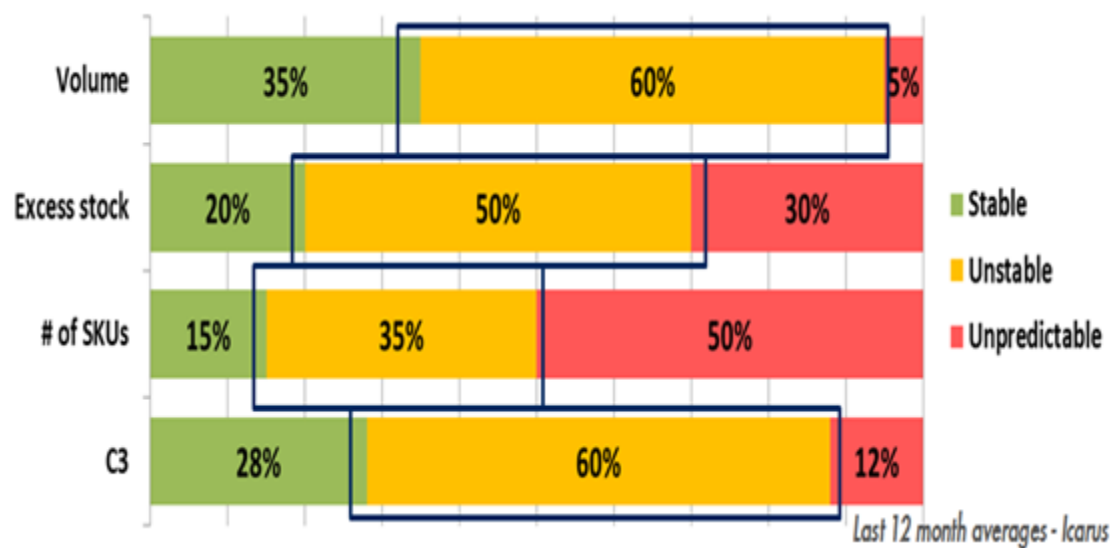
## Planting the Seeds for Change

Reducing inventory to the lower levels within lubricants drove a subsequent increase in risk.

Consequently, Shell experienced service level hits, resulting in firefighting. The block chart in Figure 18 tracks the relationship between the stable, forecastable product, the variable product, and the unpredictable product.

As Shell's sales volume, excess stock, the number of SKUs sold grew, and the revenue over a long enough period, there was a disturbing picture: the areas for growth in the company's business were the hardest to forecast. Nick recognized that he was running out of levers to drive improvement. The regions running the business were finding it harder and harder to stay on the projects. He needed to find new solutions. This quest led to the consideration of the adoption of Demand-Driven MRP.

**Figure 18. Product Portfolio Analysis**

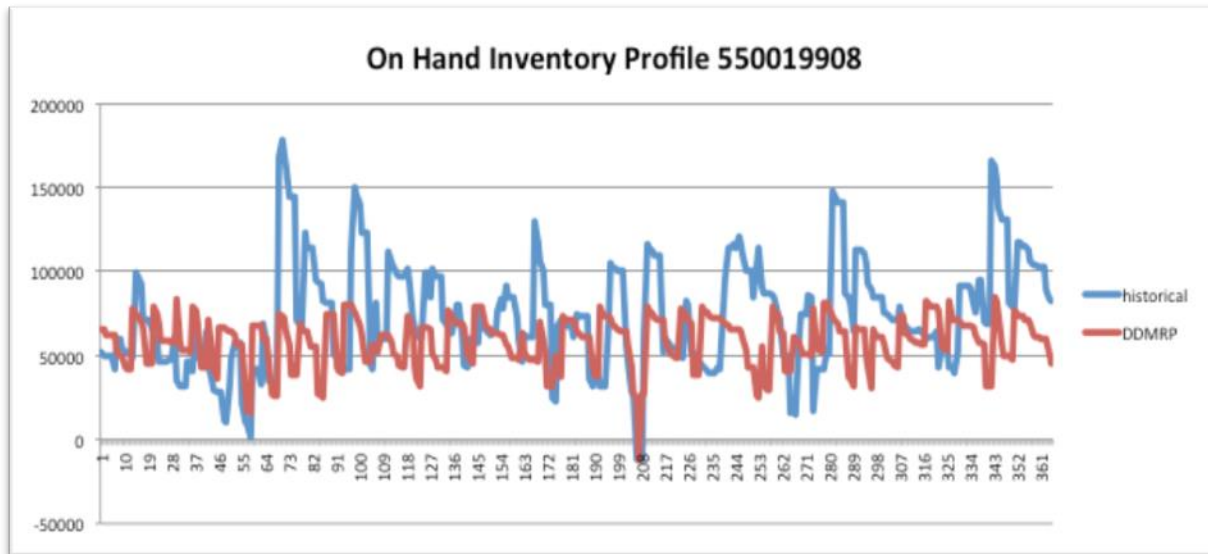


By definition, in traditional MRP, the forecast translates into supply chain requirements. In the process, the initial forecast number first becomes a finished goods requirement, then a planned order, and finally a materials requirement – all based on the initial forecast. The problem is that a forecast is not an absolute number. Instead, it is a set of probabilities. As demand error increases, a focus on inventory buffers and push/pull decoupling methods increases in importance. Previously, Shell was only looking at safety stock levels and not the form and function of inventory. The adoption of DDMRP enabled the building of buffer inventories to reduce the 'nervousness' of the system.

In early 2015, three senior regional planning managers discussed the concept of demand-driven planning. To prove the concept, Shell, with help from consultants, built a simulation model and tested the potential benefits for the North America market. In Figure 19, we show the results of the simulation. The red line of DDMRP was a substantial improvement to traditional MRP output shown

as the blue line.

Figure 19. Simulation Results



DDMRP logic uses order flow sensing to build raw material. The result? Better results with less nervousness. The system still experiences variations, but with less volatility and noise for the supply chain. The project was a two-digit investment for a three-digit payback. Change management was a challenge requiring training. The pilot went live in October 2017 with progressive deployments in 2018. The benefits exceeded what was expected from the project simulation.

## Recommendations

Agility does not just happen by accident. It requires the deployments of tactics with the goal in mind. In this report, we share case studies supporting nine tactics that improve agility.

Don't just say that you want to be agile. Define it. Select the tactics and build programs. To get started consider these recommendations.

**Get Clear on What Matters. Design from the Customer Back.** Map processes from the customer's customer and define opportunities for agile flows. As a leadership team, identify the most important tactics to deploy.

**Take the Friction Out of Data.** Latency is the enemy of agility. Eliminate portals and improve order latency through demand sensing. Reduce material costs through demand translation through DDMRP.

**Design and Implement Buffers.** There are two primary buffers in the supply chain—manufacturing capacity and inventory. With most companies having high asset utilization, inventory is the most

important buffer. Focus on form and function of inventory to design buffer strategies. In product flows with high error, hold inventory in raw and semi-finished states. Where possible, implement postponement strategies.

**Simplify.** Reduce the long tail of the supply chain and work on platform rationalization. Make the work systemic as a part of the S&OP process.

**Focus Less on Integration and More on Data Portability.** Tight integration reduces agility. Instead, focus on the synchronization and harmonization of data and improve data portability in network strategies for demand, supply and product flows. Implement ISO-8000 standards for master data portability. Work on sharing clean data with trading partners.

**Build Supplier Development Programs.** To help sourcing flexibility, share data and build programs with suppliers that reward agile supply. Focus on being a good trading partner.

## Conclusion

Volatility is increasing. Supply chains are more complex and changing. As a result, the efficient supply chain is not always effective. To deliver customer reliable customer service, companies need to deploy agility tactics.

## Additional Reading:

Readers may gain added value by accessing complimentary reports on the [Supply Chain Insights website](#):

[Driving Digital Transformation](#)

[Supply Chains to Admire 2018](#)

[Supply Chains to Admire 2017](#)

[What Drives Inventory Effectiveness in a Market-Driven World?](#)

# About Supply Chain Insights LLC

Founded in February 2012 by Lora Cecere, [Supply Chain Insights LLC](#) is in its sixth year of operation. The Company's mission is to deliver **independent, actionable, and objective advice for supply chain leaders**. If you need to know which practices and technologies make the biggest difference to corporate performance, we want you to turn to us. We are a company dedicated to this research. Our goal is to help leaders understand supply chain trends, evolving technologies and which metrics matter.

## About Lora Cecere



Lora Cecere (twitter ID [@Icecere](#)) is the Founder of [Supply Chain Insights LLC](#) and the author of popular enterprise software blog [Supply Chain Shaman](#) currently read by 15,000 supply chain professionals. She also writes as a LinkedIn Influencer and is a contributor for Forbes. She has written five books. The first book, *Bricks Matter*, (co-authored with Charlie Chase) published in 2012. The second book, *The Shaman's Journal 2014*, published in September 2014; the third book, *Supply Chain Metrics That Matter*, published in December 2014; the fourth book, *The Shaman's Journal 2015*, published in August 2015, the fifth book, *The Shaman's Journal 2016*, published in June 2016 and the sixth book, *The Shaman's Journal 2017*, published in July 2017.

With over 14 years as a research analyst with **AMR Research, Altimeter Group, and Gartner Group** and now as the Founder of Supply Chain Insights, Lora understands supply chain. She has worked with over 600 companies on their supply chain strategy and is a frequent speaker on the evolution of supply chain processes and technologies. Her research is designed for the early adopter seeking first mover advantage.