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SUPPLY CHAIN MANAGEMENT REVIEW

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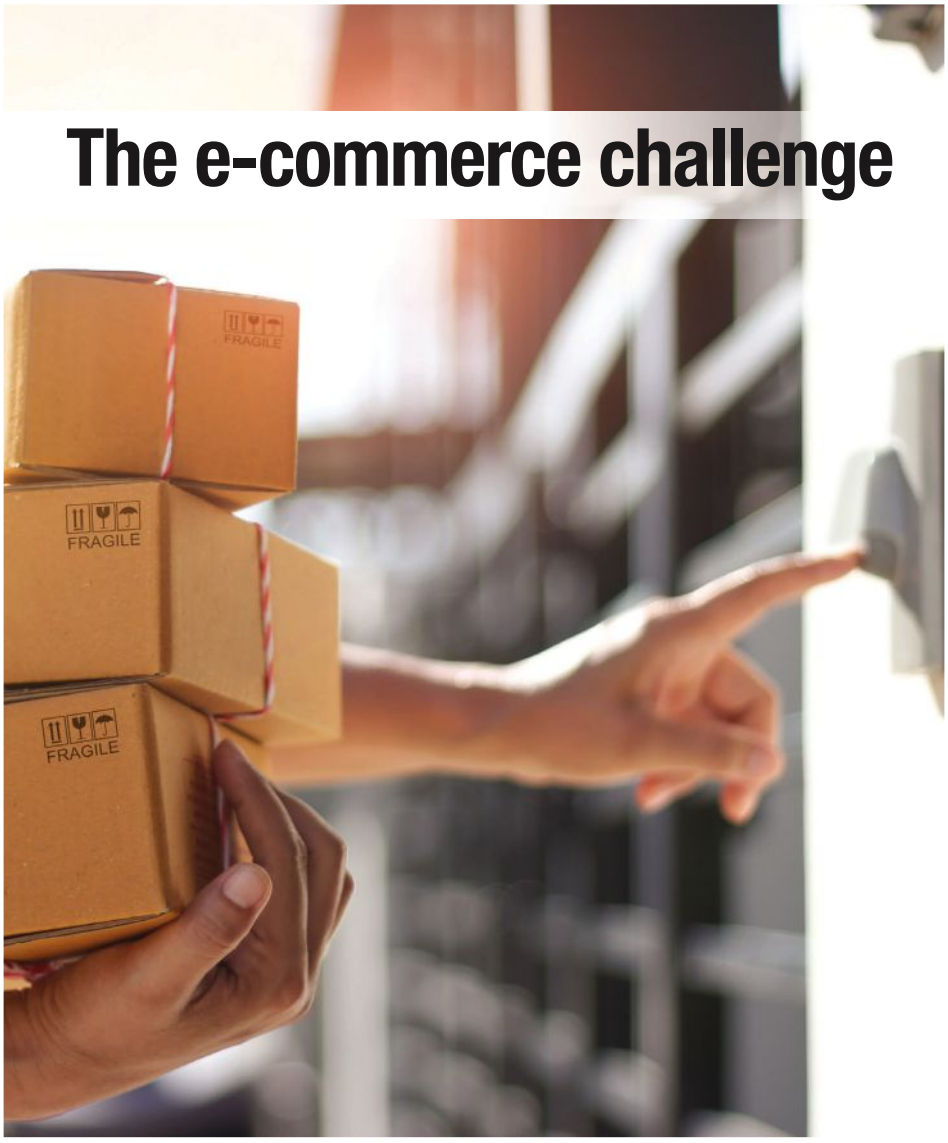

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Supply chain in the spotlight

This morning, I turned on the television and watched the first stretch-wrapped pallets of the just-authorized vaccine being loaded onto a truck at a Pfizer plant in Michigan. From there, the pallets were headed to FedEx's logistics hub in Memphis where they would be delivered to 153 locations across the 50 states.

The event was both historic and mundane: Historic in that the shipments represent the hope of a nation that in the coming months, we'll begin to put 2020—and COVID—in the rearview mirror; mundane in that this is a scene repeated millions of times a day, without fanfare, in plants and distribution centers across the country. Two of the basic, fundamental processes of the supply chain—make and deliver—are in the spotlight like never before. And, let's throw in the cold chain for good measure.

It's also a fitting counterpoint to the supply chain stories that proliferated in the spring of 2020, when items like toilet paper, hand sanitizer and PPE were nowhere to be found, and the focus was on the failure of global supply chains. With so much attention paid to the role of the supply chain, including the massive investments flowing into e-commerce fulfillment, industry leaders have a once-in-a-lifetime opportunity to elevate supply chain to the C-Suite. We can have a say in how the companies we work for recover and prepare for the next, inevitable disruption. It's our turn to shine.

The January/February 2021 issue of *SCMR* takes a look at one area of the supply chain getting attention and investment as a result of the pandemic: e-fulfillment. We have three articles that provide an in-depth rundown on what you should consider, from leveraging brick-and-mortar assets to digitalizing your warehouse operations.

Bob Trebilcock, Editorial Director
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The pandemic also shined a light on the importance of people in the organization, as we've all worked together in a virtual environment to keep operations going—and keep one another healthy. We round out the issue with two articles that highlight the importance of people over technology, including how one of Merck's divisions revved up its S&OP process and how Canada's Princess Auto Ltd. transformed inventory management and on-shelf availability. Both projects put supply chain on center stage.

Lastly, I want to thank everyone who participated in or attended *SCMR*'s NextGen Supply Chain Conference in November.

We had to go virtual this year, rather than live, but we had stellar presentations from supply chain leaders at companies as diverse as GE Appliances, Lenovo, Vodafone, JD.com, Kraft Heinz and Dell Technologies, to name just a few. We hope you can join us next fall. For more, go to nextgensupplychainconference.com.

As always, I look forward to hearing from you.

Bob Trebilcock

SUPPLY CHAIN MANAGEMENT REVIEW

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SUPPLY CHAIN MANAGEMENT REVIEW

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Oil Update: Still need fracking?

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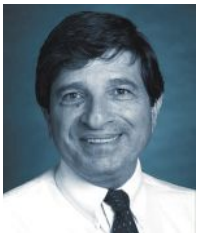


When I began researching oil as part of the MIT Supply Chain 2020 Project in 2005, I espoused a reduction of oil consumption in global supply chains by slowing them down and developing cost- and energy-efficient networks, in contrast to cost- and asset-efficient ones. When oil prices were high, cost reductions also translated to CO2 emission reductions. However, the position was based on two major demand-supply assumptions. While oil would be readily available into the foreseeable future: 1) its price would rise in the long run as demand for it rose with robust global economic growth; and 2) oil extraction costs would continue to rise over time because it was getting harder to extract it from the earth.

Since we have already seen 2020, we now know that both assumptions were incorrect. Or to paraphrase the words of Lawrence "Yogi" Berra, the late great New York Yankees catcher: "the future ain't what is used to be" and "it's [not] déjà vu all over again."

As discussed in last year's Insights column, "Oil Update: Fracking challenged with cheaper oil" (*SCMR*, Jan/Feb 2020): 1) regarding the demand for oil, we were in the "era of cheaper oil," as well as having suffered through the Great Recession of 2008 and experiencing today's COVID-19 virus economic woes; and 2) regarding the supply of oil, fracking techniques have lowered the time, resources and expense needed to quickly turn on and turn off oil derived from shale. Therefore, on the demand side, reducing oil consumption because of higher prices was no longer a goal, and neither was co-related energy efficiency—therefore that goal became speed-up the supply chain to enhance customer service. Also, regarding supply, the world's energy map has been altered. *The Wall Street Journal*'s (*WSJ*) review last September of "The New Map," a book written by oil guru Daniel Yergin, postulates there is a new energy map. It states: "...[previously] all the action went to where the oil was. Thus, the desert wastelands of the Middle East were transformed into energy hubs and their chronic internecine conflicts consumed the attention." The author states that: "The world's energy map is no longer an accident of geology. It has been redrawn by technological, economic and political wherewithal."

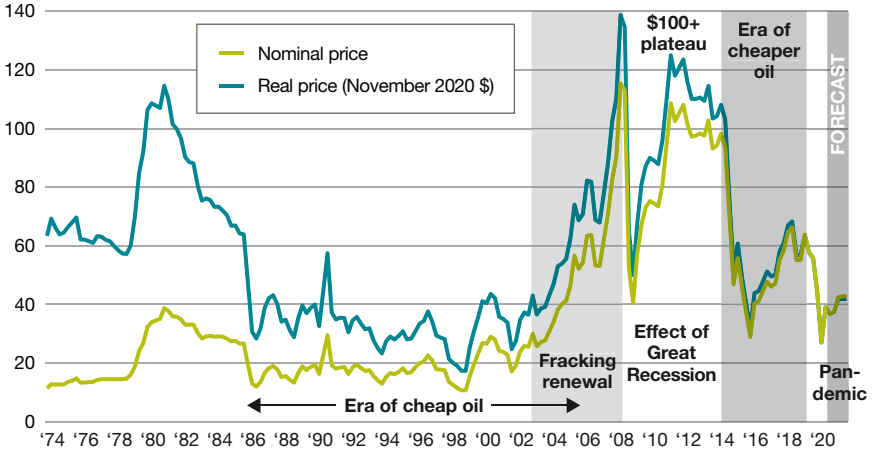
Brief history of oil pricing

Each annual oil update I've done has shown Figure 1, an updated historical chart depicting "real" quarterly imported crude oil prices since 1974. The chart shows the various pricing levels experienced. From the demand side, the first signs of "cheaper oil" appeared as a precipitous drop as a result of the Great Recession of 2008, which drastically depressed worldwide economies and the demand for oil. This was followed by a three-plus year period, termed the "$100+ plateau" before reaching cheaper oil. That plateau used to ominously loom in the rearview mirror as a reminder of what could happen if worldwide economic and supply conditions reached the robust levels seen prior to the recession.

FIGURE 1

Quarterly imported crude oil price

Dollars per barrel



Source: EIA Short-Term Energy Outlook, November 2020

From the supply side, there was a new picture as well. In considering the supply of oil, one normally has to evaluate the overall energy market of renewable vis-à-vis non-renewable energy. However, oil is a supply chain's most important energy source because transportation operations run largely on diesel fuel. That is, until (for example) electric vehicles start replacing today's fleets. Natural gas has been a transitional energy source for electricity generation, replacing old coal-fired electric generators. However, liquid natural gas (LNG) will not change the energy picture much for transportation until LNG-fueled trucks replace fleets, as well as until a network of fueling stations is in place.

As discussed above, the major change in the supply picture has involved shale-oil fracking. While its use can be traced back to the 1940s, hydraulic fracturing had not been utilized on a massive scale until after 2003. Over the period of higher oil prices, U.S. oil fracking operations came on-line because the prices were high enough to economically justify them. U.S. frackers used the opportunity to innovate to reach a point where fracking operations were flexible enough to easily turn on and turn off as oil prices went up and down. The fracking industry made the United States the world's top oil supplier and a net exporter. In addition, fracking output caused a worldwide oversupply of oil that has kept the era of "cheaper oil" going.

Review of the past year

Astonishing, as shown in Figure 1, very recent 2020 oil prices are in the realm of "cheap oil," not "cheaper oil"—ranging from a low of $27 to $40 per barrel, in real dollars, and not seen since around 2004.

News articles published on oil pricing issues in 2020 were consistent in saying that

the lower, cheaper oil prices were putting some U.S. frackers out of business and under intense financial pressure because of a continuing glut in oil supplies—and recently, the economic woes due to the COVID-19 pandemic. Throughout the year, the headlines of articles in the *WSJ* have told the story, as follows.

- "Plunging Oil Markets Point to Excess Oversupply" (3/13/20)
- "Oil Drillers Shut Wells as Demand Dries Up (4/14/20)
- "Shale Pioneer Weighs Bankruptcy" (5/12/20)
- "U.S. Shale Industry is Likely to Be Hobbled for Years (5/26/20)
- "Pipeline Firms Squeezed by Shale-Oil Cutbacks" (9/23/20)

Are these news reports the harbinger of the fact that maybe we won't need shale fracking anymore, because oil prices will remain low?

What about the future?

On the supply side, oil has had a "dirty name" for quite some time. Some oil-producing countries, albeit small players, are bailing out of oil because of climate change. Denmark has decided to quit new oil exploration, and France and New Zealand have made symbolic gestures to do so. Meanwhile, Germany, China, the UK and other Asian countries are setting targets to achieve carbon neutrality by 2050. Downstream players are also following suite. Wall Street investors are shifting their bets to non-renewal energy sources, as evidence by the rise in Tesla's share price, but also that of General Motors since it announced planned investments in its line of electric vehicles last fall.

On the future transportation front, also think hydrogen. "Hydrogen-Fuel Focus Shifts to Big Rigs," published last October in the *WSJ*, noted that automakers have spent decades developing hydrogen fuel cells for cars with little to show for it. "Now, they are shifting their attention to the trucking industry." Promising on-the-road and on-demand availability of hydrogen won't be a solution to climate change anytime soon. That will require a supply chain of hydrogen stations in the future—something that will take decades to develop.

Watch for serious Green New Deal initiatives

So, what have we learned about the new demand-supply picture? First, from the demand-side, world economies need less oil to grow so it is no longer true that "U.S. supply chains are addicted to oil"—as I stated back in 2007 in my first Insights column. Second, today's global oil market is behaving as a "true market" in the sense that it is largely dictated by demand versus supply. This causes volatility in the oil market, especially when capacity to process the oil is capacitated.

However, my advice stays the same. I suspect when the economy comes back from the impact of the pandemic, we might see that cheap oil was temporary, and will likely go back to cheaper oil—where it was prior to COVID-19. It will always be prudent to reduce the use of non-renewable carbon-based energy sources by making your supply chains as energy efficient as possible. However, you might not follow the advice when being pushed by management to lower transportation costs. Be cautiously on the lookout for serious Green New Deal initiatives from the government. They will not favor businesses vis-a-vis the public.

Generally, you can view transportation in two parts: moving people and moving freight. The government always tries to keep gas prices down because people vote. Freight doesn't, so corporations might be paying more for carbon-based-fuel. Thus, as Green New Deal initiatives get implemented over time, reap huge financial incentives from the government to switch to electric cars, not so much for truck drivers. Corporations will be stuck with large legacy fleets of diesel-fueled rigs and will likely be hit with taxes levied to fund the switch.

In addition, if consumption for oil drops drastically from this switch, oil extraction and diesel processing processes will be more costly. They will no longer have the economies of scale at levels they had when auto drivers used a lot of gas. A double whammy for logistics operations because diesel prices could go sky-high. How high? When? Beats me.

Achieving better outcomes for predictive analytics

By Matthias Winkenbach

Predictive analytics enable supply chain practitioners to anticipate business outcomes—providing they ask the right questions of the technology.

Framing appropriate questions requires professionals to identify the issues that need to be explored, and to understand what can and cannot be modeled using predictive analytics. This combination of business and technical know-how is not always available, however.

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Challenges like this were discussed by practitioners and data scientists from a broad range of companies at MIT CTL's Analytics of the Future Roundtable: Predictive Analytics on November 18, 2020. Enterprises at different stages of development described their approaches to harnessing the predictive power of analytics.

Horses for courses

Understanding the technology's alchemy can be a stumbling block for executives when deciding which use cases or ideas they want to model. There are four or five types of predictive models commonly used in supply chain applications, and each one has quirks that align it with certain types of problems. Knowing these differences in advance helps to refine the search for use cases and avoid presenting data analytics teams with projects that turn out to be impractical and time-wasting.

For example, Decision Tree models are often deployed to predict various supply chain outcomes. While these models are relatively easy to build, the datasets used need to be big enough to capture an adequate level of detail but not so big that they overburden the model. Having a sense of where this happy medium falls in relation to the available data can save a lot of time. If the dataset is overly large, a Random Forest model—essentially an extension of the Decision Tree option—might be a better choice since it parses the data into multiple "trees."

Another source of confusion is the difference between predictive and prescriptive analytics. The former forecasts outcomes while the latter suggests actions to take in the event that an outcome occurs. Business managers are prone to confusing these objectives. When specifying a use case sometimes they "call it predictive but all the things they are trying to do are prescriptive," said an analyst at the roundtable.

In addition to sowing the seeds of project failure, such confusion can deter managers from giving legitimate projects the green light. A roundtable attendee observed that business managers can become frustrated when they underestimate the amount of work required to build a predictive model and when it is likely to deliver. She cited an example involving vehicle predictive maintenance, where projects did not materialize because managers misjudged the complexity of the work involved and the timescales. In some instances, managers might scale down their ambitions. "Just give me five decision rules," is a typical response in such situations, said the attendee.

Often, the main hurdle is misunderstanding the volume of data required as well as the effort needed to get the data into a state that a predictive model can handle. This is especially the case when more sophisticated model types are brought into play.

A way to avoid issues like these is to employ mediators; individuals who are both technically proficient and operationally savvy, and able to bridge the gap between business managers and data analytics teams.

"We need to put more emphasis on the future,

on not necessarily training pure data science experts, but also on training data translators who have domain knowledge in logistics and supply chain and a deep enough understanding of data science," suggested an attendee.

Spoilt for choice

Even with the benefit of such a bridge builder, selecting use cases to analyze is not straightforward. There are usually more candidates than modeling resources, and the number of possibilities often rises as more people within the organization become aware of the analytics capabilities at their disposal. Moreover, a general lack of knowledge about the technology within the operational community can inflate expectations. An attendee observed that within her organization "there seems to be a mismatch between the perceived importance of these tools and the inherent understanding of them."

A leading manufacturer explained their project selection approach, reflections that could help other companies be more judicious when choosing projects.

Before getting into the weeds of creating wish lists the company considers what is possible; what is achievable in terms of the enterprise's competitive goals. Having established a universe of possibilities, the idea is to map as many opportunities as possible. "You will probably end up with a very long list of things from nice ideas that some engineers had to very grand schemes that are coming from the executive level, and everything in between," said the company delegate.

It is now time to prioritize this rich collection of use cases. The company has developed a Data Science Portfolio divided into four types of projects: Planning, Procurement, Manufacturing and Logistics. Sub-categories within these broad classifications specify the type of project. For example, Forecast Accuracy and Transport Mode Governance fall into the Planning and Logistics categories, respectively.

Individual projects are then assessed according to their business value and ease of model implementation. The team also considers the level of innovation involved—being innovative is not essential but helps to sustain the interest of data scientists—and ease of adoption. As the attendee pointed out, even the best solution might never see the light of day if its sponsors are incapable of managing the changes required to put it to use.

Having created a high-priority list of potential solutions, the company builds a projects pipeline.

The above process helps to ensure that predictive analytics projects reflect business needs. Still, even this comprehensive approach does not guarantee that the best potential solutions are selected. A problem that bedevils data science projects of this type is how to capture the wealth of human experience available to the company. For example, a predictive model designed to optimize truck delivery routes would benefit greatly from driver insights that are easily overlooked, pointed out an attendee. Capturing such insights is particularly challenging when they are intuitive.

The manufacturing company addresses the challenge by creating predictive models based on the best data available and implementing them rapidly. Operational teams are encouraged to provide feedback as quickly as possible, and the analytics team uses this information to refine the models where necessary.

This pool of knowledge should also encompass the extended supply chain. A carrier represented at the roundtable described a predictive model it has been using for about two years to anticipate mismatches between the service levels its network can provide, and the levels its shipper customers need. The consequences of mismatches between the two "wasn't something we saw clearly until we started using data to look at the [service] pattern from the customer [perspective] versus what the network was providing," said the company representative. Collaborating with shippers—especially those with high freight volumes who can offer a lot of data—has highlighted the importance of receiving information on potential service imbalances before freight has to be moved.

Enlightenment comes with experience

As applications of predictive analytics in supply chains evolve, companies will get better at selecting the most meaningful projects and building models that deliver revelatory results. A roundtable attendee emphasized that "aligning use cases with business benefits" is critically important, but still challenging when "what people want may not be what the business needs."

A deeper understanding of the technology will help practitioners and business leaders make clearer connections between needs and model outputs—and hence frame better questions.

A data scientist at the roundtable said that executives often ask why predictive analytics did not anticipate the COVID-19 pandemic. "It's not an expected phenomenon," he pointed out, unlike, say, an event in a supply chain such as when a product order is likely to be placed. Knowing the difference will surely improve the performance of predictive analytics.

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MIT CTL's Analytics of the Future Roundtable: Predictive Analytics is part of an invitation-only series of roundtables. The next event in the series will focus on prescriptive analytics. For more information contact the author.

The "new never normal" requires smart NextGen supply network solutions

2020 has been a very challenging year for everyone—especially supply chain teams.

By Deanna M. Rainwater and Rich Sherman

Deanna M. Rainwater is a director and Rich Sherman is a senior fellow in the global supply chain consulting practice at Tata Consultancy Services. They can be reached at deanna.rainwater@tcs.com and rich.sherman@tcs.com.

Emerging from the pandemic's global disruption are some serious outcomes and lessons. They are as follows:

- awareness of supply chain management's value and contributions increased to the point of being a household word;
- supply chain management is clearly a C-Level strategic competitive lever;
- problem-solving intended actions in an ecosystem can produce unintended consequences that exceed the consequences of the initial problem; and
- retire "chain" thinking and accept the fact that we operate in a supply network operating in a network of networks engaged in "ecosystem commerce."

Given the lessons learned, businesses are facing new and more complex challenges that have dramatically changed customer buying patterns and accelerated new technology and overall management transformation required for all sales channels (mobile, Web, brick-and-mortar) and product flows (inventory deployment, staple stock, cross dock, direct store and last-mile delivery and BOPIS or buy online/pick-up in store).

For most organizations, supply chain practices organizations are forever changing to supply network practices as customers now demand access to more shopping channels and formats than ever and naturally want efficient, seamless and safe shopping experiences with high fill product fill rates.

Businesses must quickly reimagine their baseline requirements, which includes reevaluating the complex trade-offs between cost and customer responsiveness. Businesses must now better prepare for an unfamiliar future and shift their focus to identifying ways to better manage and balance business cost, performance and service during a very transformative period. Future market requirements are highly unlikely to ever return to "normal," necessitating that leadership look at 2021 as a new beginning to drive transformation to digital supply network processes and practices aimed at enterprise resiliency.

NextGen "smart" supply network transformation

Many leading organizations are responding to these challenges by accelerating the adoption and application of Business 4.0 technologies for the development and rollout of more intelligent supply network solutions. These are designed to go beyond end-to-end visibility and encompass ecosystem commerce connectivity. Aided by silo crossing cognitive analytics and connected internal and external collaboration, they provide seamless node interconnection and supply network transparency. Disparate solutions with siloed information that only provide "part of the story" or alert business users to a current problem once it occurs are no longer adequate.

Instead, next-generation supply network solutions enable ecosystem visibility and transparency

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that proactively identify potential causes of supply network problems (such as DC capacity breaches or projected out of stock situations) and automate the proactive prescriptive execution of corrective actions.

Moving to automated and agile processes

Traditional operating processes tend to be too "high touch," with business users spending far too much time at their computers researching root causes of problems, determining what needs to be done and then manually executing the solution.

Business users still spend too much time gathering data from disparate systems, utilizing business intelligence analytic tools or, more likely, Excel spreadsheets and tribal knowledge to problem solve. Even completing routine tasks, such as checking the current status of a PO or DC shipment, often encompasses reviewing multiple systems consuming valuable time. These "high touch" processes and systems are too heavily dependent upon human input and interactions and are not sustainable for ecosystem commerce competition.

Liberating business users from excessive face time on their computers, while still providing vital insights into business conditions and improvement recommendations will permit business users to focus on more value-added activities—such as collaboration with inter/intra-organizational business teams, engaging in business strategy development activities, or maybe innovation. These critical activities are often deprioritized due to user time constraints or budget constraints that often originate from the inadequate "high touch" business processes and systems that are currently available. NextGen supply network systems automate and obliterate siloed, sequential arithmetic processes while facilitating shared information and free flowing data that only requiring human oversight to create more agile and efficient supply networks.

Evolving to living in the future

Accepting current state reality. In the current state, business users are accustomed to being alerted to problems only after they occur. The alert usually occurs through complaints from team members or customers, or is discovered when reviewing daily performance reports. Any response to the problem is reactive and uncoordinated, and the impact of the issue is at great cost and inefficiency.

Making matters worse, business users then conduct root cause analysis to determine the exact source of the problem and the best response to it. Identifying the problem sources are manual, difficult and time-consuming as business conditions and data change constantly.

Once the exact problem is identified, business users are then challenged with determining what corrective action will solve and prevent similar issues from occurring. This time lag from problem notification to solution execution is inefficient and costly (see Figure 1). **Seize the opportunity from future state vision**. In stark contrast, NextGen technologies provide full ecosystem network visibility to better orchestrate product flows and adapt to ever-changing business conditions, improving operational resiliency. Supply network solutions consider downstream impacts and proactively identify and predict the timing, extent and cause of future supply network problems. Examples might include future DC capacity constraint breaches for a specific channel/DC location or projected out of stock situations for critical items.

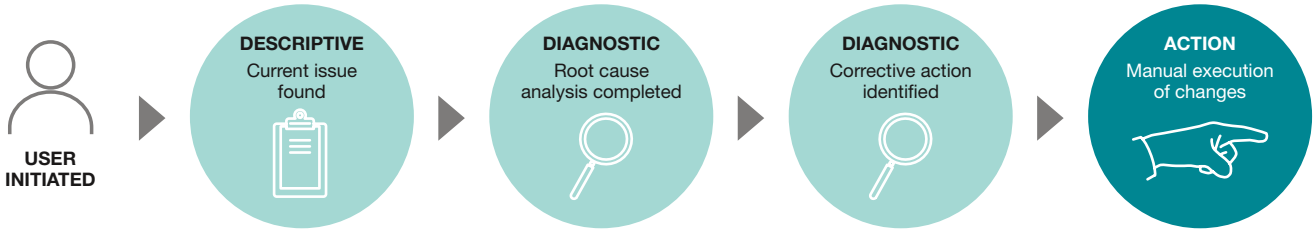
NextGen solutions, such as Digital Twin, also automate the process to model, simulate scenarios and recommend optimal solutions given current network constraints, organizational priorities and defined strategies and will prescribe and automatically execute corrective action.

The Business 4.0 technology evolution enables more business processes to become partially or fully automated, permitting users to primarily focus on evaluating and further improving the processes and results. For example, instead of the business user having to continually monitor the system for exceptions, messages will be auto-generated that alert the user to any upcoming problem along with prescriptive corrective action (see Figure 2).

FIGURE 1

Current state: "High touch" processes and systems

Very dependent upon human input and interactions with systems



Source: Authors

Closing in on NextGen technology adoption

"Never normal" may be the new normal and "smart" supply network solutions are better equipped for competing in the future ecosystem commerce and enterprise resilience markets. These innovative solutions are better designed and leverage new technologies that support deployment of advanced business logic and permit user configuration. And, they are deployed on the Cloud for rapid access, powerful computing and rapid deployment. These solutions are equipped to evaluate larger amounts of data leveraging artificial intelligence/machine learning at a scale far beyond what is possible with traditional supply chain solutions.

Seizing the opportunity and adopting NextGen solutions and capabilities now creates a competitive advantage as many corporations continue to employ outdated tools that are no longer up to these future challenges.

The bottom line: Market leaders are already moving in this direction. Can your organization continue to exist in the "new never normal" without these upgrades?

FIGURE 2

Future vision: Increased insights, decision support and process automation

More dependent upon intelligent systems, human oversight only

Source: Authors

THE SUPPLY CHAIN'S PIVOT TO E-COMMERCE

COVID brought a spike in e-commerce annual growth. The challenge now is to manage that explosion in the near term without over investing before the new normal, because we aren't going back.

BY GARY FORGER, SPECIAL PROJECTS EDITOR

Everybody knew it was coming. No one knew exactly when. Until it arrived. All at once.

The "it," of course, is explosive growth in e-commerce sales. And the "all at once" was the second quarter of 2020.

That's when e-commerce sales soared 44.5% compared to the second quarter of 2019, according to the U.S. Department of Commerce. Not the 14% to16% expected for the year, which is anything but casual growth. And that accelerated pace fell off just 1% in the third quarter.

"How does any DC absorb that?" asks Dan Gilmore, vice president of marketing for Softeon. That, unfortunately, is not a rhetorical question. And the immediate answer is not easily, and certainly not gracefully. Worse yet, it was just a prelude of what was to come.

By the time Cyber Monday rolled around, e-commerce set a record for its biggest day ever—$10.8 billion, according to Adobe. That was on top of a more than 20% increase in e-commerce to $5 billion on Thanksgiving just a few days earlier. Talk about crushing a sense of order and control in DCs from coast to coast.

Unfortunately, the fallout didn't stop at the shipping dock. It moved right onto parcel trucks.

Just 36 hours after Cyber Monday, CNBC reported that UPS had stopped picking up parcels from Nike, Gap, Macy's, L.L. Bean, Hot Topic and Newegg. All of those companies had reached their designated shipment level set by UPS. They were maxed out.

Even more unfortunately, maxed out is exactly what retailers had been working many months to avoid.

Due to the pandemic, Amazon pushed Prime Day from July to October. The e-tailer went so far as to call it the start of holiday shopping. Harley Finkelstein, CEO of Shopify, later said that COVID pushed Cyber Monday from being a single day to a three-month season.

Retailers of every size were doing their best to find ways to spread out the holiday shopping season. Customers climbing over each other to get into stores at midnight of Black Friday was not an option. Retailers also needed to do the supply chain equivalent of socially distancing orders at their DCs in hopes that they could pick, pack and ship them in a timely fashion. And they needed to do it for both their employees and customers.

While the midnight crush was replaced by a 50% drop in store foot traffic on Black Friday, there was a corresponding 50% increase in curbside pickup of online orders out in the parking lot. That moved, at least in part, some online order fulfillment from DCs to stores. But curbside pickup didn't exactly make DCs or parcel shipping significantly less chaotic. And there were still 22 shopping days left until Christmas.

Finding a baseline

Clearly, something has changed since COVID arrived. Or more probably, a whole lot of somethings. The question now is: What exactly is the impact of this pandemic across retail?

"COVID became a time machine for e-commerce," observes Bryan Jensen, chairman and executive vice president of St. Onge.

"Companies are now evaluating all of their supply chain investments from stores to DCs," says Diana Mueller, account executive at Fortna. "E-commerce may be booming, but it is not the only driver of retail these days. It is, in fact, just one piece of the retail puzzle," she adds.

The general consensus is that COVID accelerated the expansion of e-commerce by years. The general range is five years to 10 years, depending on the source. Part of that was the natural migration of people from buying in stores to buying on line as people endured lockdowns. But it's also worth mentioning the continuing decline of brick-and-mortar stores.

That decline, like e-commerce's incline, has been accelerated rapidly. The common estimate is that 25,000 retail stores closed last year. That was a COVID-driven increase from the 9,000 plus stores that closed in 2019, which was a 60% increase in store closings in 2018. While COVID accelerated the trend, it did not originate it.

Please note that this is just a decline in store numbers. Not a demise of stores in general, no matter how popular that doom-and-gloom scenario might be. Stores still have a role. More on that in a bit.

Meanwhile, the consumer continues to buy despite the pandemic. We have certainly backed off from taking cruises, getting on planes, staying in hotels and eating in restaurants. Instead, the primary outlet for consumer spending has become e-commerce. And while it may only be one piece of the retail puzzle, e-commerce is being forced into picking up a disproportionate share of consumer buying both now and going forward. A lockdown is no longer necessary to drive people to e-commerce.

As Nick Vyas says: "People realize they don't need to go to a store anymore to maintain their day-to-day life. This realization was forced on people. They had no choice but to go digital. And we're absolutely not going back." Vyas is executive director of USC's Marshall Center for Global Supply Chain Management and assistant professor of clinical data sciences and operations.

Online buying is becoming a new habit even for those who previously visited stores. It is not bounded by region of the country or age of the purchaser. Quite simply, the promise of two-hour delivery has its motivating advantages.

Accenture reported early on in the pandemic that "one in five consumers who ordered their last groceries online did so for the first time—but for consumers aged 56 and higher, this was one in three." In that same report, "COVID 19 – Impact on Consumer Behavior," Accenture said it expects changes in consumer behavior at different stages of the pandemic. However, it warned of rapid shifts at most any juncture. What no one expects is a return to pre-pandemic shopping habits.

As it turns out, those changes are not limited to just the tail end of the supply chain from the DC to the consumer. It goes all the way back to manufacturers who stock e-commerce DCs in the first place.

The COVID-induced rate of change is proving to be a major challenge to manufacturers says the report "From disruption to digital opportunity" from Grant Thornton, the Manufacturing Leadership Council and the National Association of Manufacturers.

In part the report says, "many manufacturers have realized that their level of digital maturity is still relatively low…As a result, many are now reprioritizing their future supply chain spend while rapidly accelerating their digital investments."

This survey, conducted in the early fall, shows that only 17% described their supply chains as integrated while 23% said they were entirely siloed. More than half of survey respondents "say they have clear digital investment plans in place and suggest they will now be implementing these within a six-month to one-year horizon." That is probably a highly optimistic timeline.

CapGemini called COVID a stress test and a moment of truth for supply chains and their organizations. "The crisis has forced organizations to question long-established supply chain practices," and has exposed a need for "a significant shift in their supply chain strategies."

Vyas thinks this is "the most exciting time in supply chain. Even more than what's happened with globalization in the past 25 years. We have hit the inflection point for supply chain and e-commerce."

So what does that mean as we enter 2021?

The great e-commerce buildout

"COVID is the accelerant to systemic change in the retail supply chain," says Andrew Breckenridge, executive vice president at Fortna. "And e-commerce is on its way to overtaking the role of the store."

Just take the third quarter numbers from Walmart and Target. The former reported a 79% increase in e-commerce compared to a 6.4% gain in same-store sales. Target's online sales were up 155% while same-store sales increased 9.9%. As a point of comparison, Amazon's e-commerce surged 40% in Q2. And the general estimate is that Amazon accounts for roughly 45% of all e-commerce in the United States. There are nothing but big numbers here.

Prior to COVID, e-commerce accounted for roughly 14% of all retail sales. In the second quarter of last year, it is estimated to have hit as high as 25%. Initial expectations called for that peak to settle back a bit. However, the surge in the virus in the late fall and early winter of 2020 is unlikely to have allowed much settling.

How soon e-commerce will get to 50% of all retail sales is anyone's guess. As Jensen at St. Onge says: "It is an invaluable gift to be able to see the future."

However, that is exactly what Amazon has been doing for some time now. "Amazon was in the right place at the right time when COVID hit. The pandemic required e-commerce velocity and Amazon could deliver velocity like no other," says USC's Vyas.

In 2020, Amazon added, in the United States alone, 371 new facilities with 119 million square feet of ground level DC space, and a total of 155 million square including mezzanines, says Marc Wulfraat, president of MWPVL International. That works out to an average of 2.3 million square feet a week, and that is not a typo.

Wulfraat also breaks the numbers down by quarter. In Q1, Amazon brought on 41 facilities with 5.1 million square feet, and another 37 facilities with an additional 9.4 million square feet in Q2. That accelerated in Q3 to 149 facilities and 49.3 million square feet and a whopping 144 facilities at 55.3 million square feet to round out the year.

By comparison, Wulfraat says Walmart added 3.0 million square feet of e-commerce space all of last year. Walmart has also been repurposing its entire network of regional distribution centers and 2.500 stores to service e-commerce orders.

In the past year, Amazon handled 5 billion packages, estimates Wulfraat. But that is in a logistics network that is apart from the fulfillment centers. Amazon is building out a delivery network that consists of branded vans that operate out of delivery stations. It's all about the final mile. Amazon is not interested in hitting its quota with UPS, or any other delivery service for that matter.

At the end of 2019, Wulfraat says Amazon had 161 branded delivery vans. And if you think you're seeing them these days in your neighborhood, you're right. Amazon finished the year with almost 436 of them. There's also an army of independent delivery service vehicles bringing people their e-commerce orders.

In many cases, the home base for these vans is the local delivery center. These are typically 100,000 to 150,000 square feet, but can be as large as 700,000 square feet, explains Wulfraat. Amazon has put up more than 300 of these last-mile centers in the past couple of years. Many more are coming. And within the next two years, he expects Amazon to become a completely self-reliant transportation company from DCs to customers including delivery to rural areas.

Closer to the customer

Without a doubt, Amazon has created a template for e-commerce success—large, widely dispersed DCs that feed a dedicated spider network of close-to-the customer delivery centers with a dedicated delivery fleet for the final mile. It doesn't get any better than that. But can any retailer duplicate that? Probably not entirely. But there's going to be a whole lot of trying going on.

As Wulfraat explains, "all retailers now want to be in the business of getting things to people same day or next day. Two-day delivery is not competitive enough." That's a long way from a supply chain that traditionally procured large amounts of inventory overseas and pre-allocated it to DCs and stores before the goods ever arrived in the United States.

Quite simply, retailers pre-determined customer demand down to the store location. Amazon, on the other hand, built a supply chain that started with the customer and worked backward to determine how to get the inventory they wanted to them when they wanted it. This is going to be an interesting flip to watch, and is going to require some substantial gyrations by retailers.

"Stores are not just selling centers anymore," says Chris Shaver, senior director of vertical markets strategy at Dematic. "They are also now experience centers and fulfillment centers."

For instance, a once thriving mall store may well have become what is known as a dark store this past year. These locations are now closed to the public, having replaced dwindling customer foot traffic with bustling orderpicker activity to fill e-commerce orders as close to the customer as possible.

On that same theme, micro-fulfillment centers are opening up. Some are in the back of a store and dedicated to filling orders (often groceries) placed online. A second scheme has a centrally located micro-fulfillment center filling online orders for several nearby stores. So now you have stores acting as selling centers, experience centers and even online fulfillment centers simultaneously.

Along those same lines, Jensen of St. Onge adds, "I have long said that if Walmart can figure out micro-fulfillment from its stores, it will clean Amazon's clock."

In October, CNBC reported that Walmart was using four stores as living e-commerce laboratories. The starting point is to blend the best from stores and e-commerce fulfillment for customers. Walmart has 4,700 stores. And Target is not far behind as it looks at how to get closer to the customer at its 1,900 stores.

"Speed is becoming the ultimate weapon in e-commerce. The key question is how does a retailer enable same day or next day delivery in top 50 metro markets," says Wulfraat. "As they try to do this, retailers have to keep in mind that the last thing Amazon will ever do is penalize the consumer." That's a tall order given how retailers have traditionally operated.

As Breckenridge of Fortna explains, building the right e-commerce network is essential here, especially if a retailer does not have the store numbers of Target and Walmart.

But he adds there is a major shift coming. In the past, retailer DCs were primarily for store replenishment with some e-commerce thrown in. Now, the store will have to share the DC with e-commerce as retailers shift their distribution network. "This will redefine the distribution network and how orders are processed inside the four walls," says Breckenridge.

Two can play this game. Amazon is currently taking over the leases on some Sears and JCPenney stores, converting them into its own dark stores and micro-fulfillment centers.

"E-commerce is becoming the dominant channel," says Breckenridge. "And that means a shift in equipment investments, typically to medium- or heavy automation," he adds.

Meanwhile, CFOs are becoming increasingly active in the conversation. "CFOs are looking to remove as much labor as possible to reduce that risk

from not having enough people to social distancing of those on the job," says Breckenridge. In the past six months he has seen CFOs involved in two-thirds of business case evaluations as retailers rebuild their supply chains.

As Jensen points out, this is a balancing act. "You can always add cap ex. The greater sin is to overspend on cap ex too early for future volumes. So retailers are trying to pace their expenditures yet ensure they are spending at least enough to advance their e-commerce capabilities. Sometimes it's a matter of repurposing equipment already in place. But in the end, it's all about building agility in the DC," he adds.

What about those returns?

Just as retailers are trying to anticipate demand during an uncertain time in an e-commerce environment they have yet to master, there's also the matter of what comes back to them: Returns. And while most will say order fulfillment is a challenge, managing returns may turn out to be the even larger challenge.

"In 2019, holiday returns hit $100 billion," explains Zac Rogers, assistant professor of supply chain management at Colorado State University. Rogers is continuing to track returns rates for e-commerce, which are often double or triple the rates of brick-and-mortar stores. With e-commerce up roughly 50% this holiday season that will be an issue he says. "Companies are not prepared. They have to figure out how to more effectively handle returns going forward," adds Rogers.

Over at Newmine, CEO and founder Navjit Bhasin expects a surge in returns that more closely mirrors the increase in e-commerce in general.

But the numbers actually aren't the core of the returns challenge. "Every retailer has a returns problem. Some are focused on containing the cost and others on the process. Some even want to outsource returns and let a third party worry about them," says Bhasin.

To his point, retailers are trying to do just that, even Amazon. In 2019, several retailers agreed to accept returns from Amazon. In 2020, mall owner Simon Property Group accepted returns from retailers such as Levi's and Gap at the concierge desk of its malls. Any port in a storm.

"But the real problem with returns is that companies are still reactive rather than proactive. And that actually doesn't matter whether the sale was at a store or e-commerce," says Bhasin.

Handling returns in the DC is one challenge. Why things are coming back in the first place is often a mystery. "You can't actually tell oftentimes why people return purchases," says Mark Holmes, executive vice president, consulting at Newmine. "There's a lot of noise out there and no real incentive for customers to offer the retailer a reason for their return," he adds.

One of the known drivers of returns is a consumer practice called bracketing, explains Breckenridge of Fortna. "Consumers are ordering multiple sizes not just in shoes but in shirts and pants, to name three apparel categories. And they're bracketing in colors too. Bracketing has become massive, and that drives up the number of returns inevitably," he adds. But that is only one driver of returns, which are inevitable especially in e-commerce.

"You are not going to stop returns," says Rogers. "You have to invest in solving the problem and turn your weakness into a strength. Retailers are in the process of learning a lot about handling larger than normal volumes of e-commerce returns. It will take time, but they will learn," he adds.

Bhasin and Holmes both expect retailers to make returns management to be a top priority in 2021. Quite simply, it will require deep analytics and process excellence, they say. However, there's a strong incentive. Bhasin says a $1 million reduction in returns adds half that to EBITDA.

Returns won't be the only high priority for retailers in 2021. Expectations are that they will still be choked by e-commerce yet realize that the only path is to move forward. Clearly, e-commerce is not going back to what it was February 1, 2020.

2021 E-COMMERCE: NO REST FOR THE WEARY

COVID-19 accelerated e-commerce demand to levels that weren't expected until 2025. How can supply chains get up to speed—and fast?

BY VIKAS ARGOD, KYLE OUS AND BRYAN WYAT, CHAINALYTICS

Business leaders and consumers alike have observed the ubiquity of e-commerce brought on by the COVID-19 pandemic. At this juncture, that is not news. Well, how about this: According to IBM's U.S. Retail Index, the coronavirus accelerated the shift toward online shopping—and away from brick-and-mortar—by about five years.

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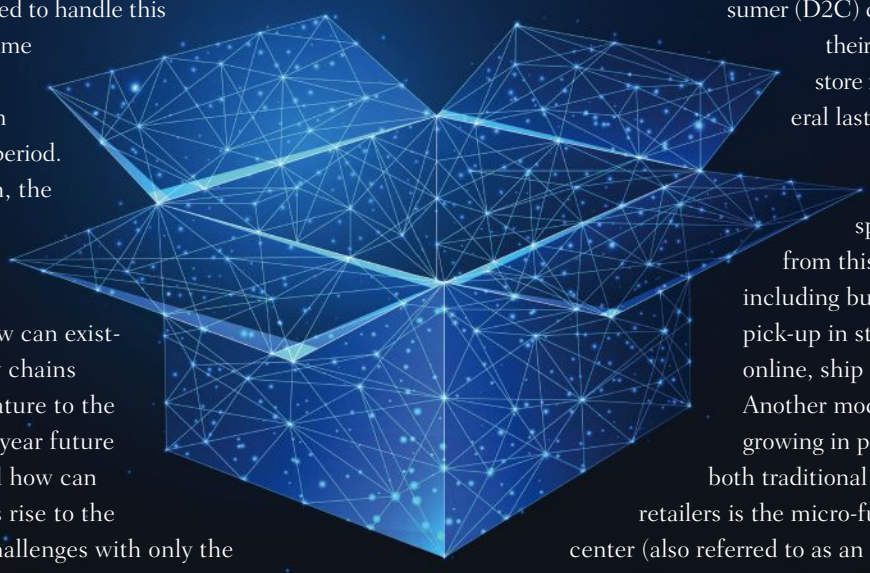
This news may be good for a company's top line; however, many supply chain leaders are struggling to cope with the tremendous pressure this surge has put on their internal operations, customer service, and delivery partners. Both manufacturers and retailers, faced with e-commerce volumes that no one anticipated until 2025, are trying to meet this outsized demand with networks that were not prepared to handle this much volume this soon for such an extended period.

So then, the questions on many minds are these: How can existing supply chains rapidly mature to the same five-year future level? And how can a business rise to the current challenges with only the resources at hand?



Like most supply chain decisions, the answers to these questions are found at the intersection of speed and cost. In the realm of e-commerce, pioneers like Amazon relentlessly favored speed. That worked fine for brick-and-mortar retailers when their e-commerce volumes were in the single digits as a percentage of sales. However, given that today's order volumes are likely here to stay, profitability is a mandatory consideration from here on out.

Last-mile delivery

A simple, back of the envelope SWOT analysis will tell you that retailers with brick-and-mortar stores have an obvious advantage over their direct-to-consumer (D2C) counterparts: their physical store footprint. Several last mile delivery innovations have spawned from this advantage, including buy online, pick-up in store and buy online, ship from store. Another model that is growing in popularity for both traditional and D2C retailers is the micro-fulfillment center (also referred to as an urban DC).

Buy online, pick-up in store (BOPIS) and the more social distancing-friendly adaptations like "curbside pickup" have seen wider adoption in recent years, but particularly since the start of the pandemic. BOPIS is relatively inexpensive for traditional retailers as the last mile delivery cost is split with the customer.

There are various ways to implement this approach. Some retailers like Walmart and Kroger use defined pickup windows to manage staffing and navigate peak hours, whereas Target fulfills an order within four hours and gives the customer up to 48 hours to pick it up. In either case, the goals are to limit capacity at busy times, incentivize off-peak traffic and promote load-balancing. Store managers can also change capacity limits in response to daily operational constraints, observed customer demands, or both.

Buy online, ship from store (BOSS) involves a higher overall level of commitment and expenditure from retailers. However, it can have a much more profound effect in the areas of inventory and transportation optimization. Retailers can search their entire network for available stock and simultaneously identify which location has the lowest cost shipping option. Zone skipping and regional sorting centers mean that the closest location is not always the cheapest. In instances where the order can be fulfilled (at least partially) from a local store, same-day delivery can be an added service via on-demand providers like Instacart or Shipt, as well as regional carriers like Lasership or AxleHire.

Stores can initially implement BOSS on an ad-hoc basis by setting aside space for order picking, preparation and packaging. Retailers can choose to distribute BOSS activity across all their locations or only specific ones in a given geographic area. As the demand for BOSS increases, a dedicated space can be created by appropriating square footage from the sales floor without reducing backroom capacity.

For both BOPIS and BOSS, the revenue should be part of that store's P&L to incentivize high-performance standards and demonstrate a company's commitment to servicing the digital channel. In some retail organizations, these two nascent modes still languish in an off-P&L "digital teams" designation under the purview of corporate offices. Unmotivated store management may understandably short-staff the digital team, leading to slow service and eventually, avoidable corporate intervention.

Micro-fulfillment centers (MFC) or urban DCs allow any e-commerce retailer to provide an analogue to BOPIS and BOSS in the absence of a retail location. Frequently built with a customer-facing front end, these fulfillment points create the capability for same-day delivery and other levels of service in a dense city environment that can't—or won't—support a big-box store.

This delivery model is worth investigating and assessing for businesses with thousands of same-day orders in a single geographical area. Without this sustained volume, an MFC is typically too expensive to implement and will have a low ROI.

Improving operations within the four walls

Across all delivery models, several upstream opportunities can propel your supply chain forward. You can find some of the fastest, most cost-effective improvements inside the four walls of your existing distribution centers (DC) or fulfillment centers (FC).

Flexible slotting configurations

Slotting is most often done at the SKU-level. For e-commerce, however, you should slot at a category level—shoes, hats, kitchen appliances, etc. Assign pickers to the categories they are most familiar with—and therefore, the most efficient pickers of. This method optimizes picking speed per category as well as per order.

Seasonality should also be considered, along with promotions, as products should be slotted for timely access and fulfillment. However, if your demand does not exhibit a strong Pareto—or your order composition does not display a clear trend—you can skip such exercises. Random order is actually the best answer in those situations.

Single unit orders

Get these orders out quickly. If an item is designed for "pick to polybag," send it directly to the packing station. There is no point in sending a single unit on a five-mile journey through your order-consolidating sorters.

Track non-optimal assignments regularly

"Non-optimal assignments" to an FC typically occur because of inventory shortages or because the logic built into your order management system attempts to avoid split shipments. They are frowned upon by transportation managers since they "un-optimize" the initially optimized order journey. In these instances, it is best to look at the total delivered cost—including inventory, working capital, risk of obsolescence and storage costs—before deciding whether to increase inventory. Split shipments or non-optimal assignments may not be as detrimental as you think.

Picking technology

Automation and robotics are more of a medium- to long-term implementation for operational improvements. When considering such an investment, there are some variables to keep in mind. The solution under consideration should do at least one of these three things:

1. decrease the click-to-ship interval;
2. decrease labor by either reducing walking time or eliminating a position; and/or
3. significantly increase pick accuracy.

Each type of automation (whether goods-to-person such as GreyOrange, inVia or Caja, or process robots like Locus or Six Rivers) has its sweet spot. However, they may require you to tear down your current racks and buy thousands of totes. Others might have weight limits per pick and require specific aisle widths and/or turning radii. Keep in mind that automation solutions will hit their designed capacities—quickly and efficiently—but they won't surpass it. "Throwing more bodies" at an automated process doesn't work very well.

3PL integrations

Integrating with a third-party logistics provider is often site-specific and riddled with cumbersome and unnecessary IT costs. If you decide to outsource your e-commerce channel—again, more of a long-term solution—select a 3PL that uses a single system across its network. This way, you'll have access and visibility to every node allowing you to deploy inventory quickly (which is particularly helpful during peak times when any number of nodes may be attractive).

Optimizing distribution packaging

Packaging is another upstream improvement opportunity—both functionally for containment and protection as well as for its direct impact on the customer experience and indirect effects on supply chain costs (labor, storage, transportation, etc.).

Material costs versus damage costs

Design packaging with the intended supply chain in mind. In e-commerce, this means a significant increase in rough handling. Our experience has shown that an e-commerce shipment is subjected to three times more touches than a palletized shipment. For manufacturers, this means one of your biggest e-commerce challenges is making sure you adequately package your products for parcel shipping without excessive weight or cost.

Two end-of-line solutions worth considering for changing order patterns and smaller, more frequent orders are cartonization technology and on-demand packaging systems. These tools are useful for eliminating excess material waste and fine-tuning your box sizes in terms of size and weight for dimensional weight-based shipping and zone-based shipping for rate optimization.

Primary packaging and out-of-box experiences

Given the historical predominance of the brick-and-mortar channel, most primary packaging is designed to support merchandising. The growth of e-commerce has brought us to a tipping point where this standard is rightly being called into question.

For products sold exclusively through an online channel, design primary packaging for efficient and effective distribution (shipping-in-original-carton (SIOC), conveyability). For products that straddle both online and in-store channels, brand owners may want to consider leveraging an "e-commerce friendly" design as the default or having a dedicated e-commerce design that provides a trouble-free (and potentially shareable) unboxing experience. In many of these cases, the additional cost of packaging is offset by reduced handling and cartonization savings.

Securing sufficient transportation capacity

Transportation, inarguably one of the biggest challenges of the 2020 holiday season, is another upstream opportunity for e-commerce improvements. As early as October 2020, the Big Three - FedEx, UPS and USPS - announced that their networks were at capacity, a problem that only grew as the peak season wore on. While the overall North American freight market is pretty efficient in terms of aggregate supply and demand, the niche last mile sector is increasingly unbalanced.

Regional and local carriers

Securing capacity with regional parcel carriers is the first step to filling the gap left by the Big Three. You run a region-specific sourcing event to unlock this capacity or partner with a regional 3PL. In either case, you'll want to ensure that detailed tracking capabilities are enabled since this is what consumers have come to expect. Technology providers like eTrac can provide multiple bridges between your systems and various regional carriers, effortlessly integrating them into your processes and providing transparency for your customers.

You may also want to consider adding smaller, local carriers to your portfolio, especially for same-day and next-day deliveries in large metro areas. Local carriers tend to be around 50% cheaper than parcel providers for same-day service. Plus, their reach is much larger than point-to-point companies like DoorDash or Uber and they work in a parcel-like fashion, offering predetermined delivery and pickup schedules, for instance.

Special services for fragile and oversized items

Suppose your product portfolio contains fragile or big and

bulky items. In that case, you'll need to coordinate with white-glove carriers that have vehicles equipped for, and staff who specialize in, full-service deliveries. They typically employ box trucks with liftgates facilitating delivery of large bulky items to residences—either to the front door or sometimes inside if installation or setup is involved. Back-office staff should also have the tools to coordinate appointments and effectively carry out two-way communications with drivers and customers.

Planning for returns

Downstream from delivery is perhaps the most overlooked improvement opportunity: reverse logistics. In an e-commerce environment, returns are inevitable. For your e-commerce channel to be profitable, your organization needs a plan for mitigating returns and dealing with those that are unavoidable. Integrate the returns process into the rest of your logistics operations to reduce excess costs and best position the product for resale.

Minimizing returns

Yes, returns are inevitable, but companies should still do their part to mitigate them in the first place. As part of the reverse logistics process, companies should seek to understand the main causes of returns as well as what return methods their customers prefer. Wrong size? Add product images and videos to the product description. Item doesn't work? Provide technical support to troubleshoot the issue. Late delivery or no longer needed? Create a positive return experience to encourage them to buy again in the future.

Bracketing is on the rise

Many people buy products just to try them. However, a growing number of savvy consumers have ventured into "bracketing." This practice is familiar in the fashion and apparel space and it exists outside of the e-commerce channel. Say a customer is buying the latest New Balance cross trainers, but they're unsure of the fit. They typically wear a size 10, but they go ahead and buy the 9.5 and 10.5 as well to see which fits best, and then return the unwanted items. Nowadays, this behavior manifests around everything from shoes to coffeemakers.

Optimizing the reverse logistics process—most commonly done by putting in place a convenient Buy Online, Return in Store (BORIS) process—is the only way to mitigate the effects of bracketing. It may also help to know that the most frequent bracketers are often some of your best customers. Bracketing is a cost of doing business. The best defense is to get returned items back on the shelf quickly.

Leverage BORIS to expedite inventory repositioning

BORIS is a no-brainer for companies with existing retail locations. The in-store delivery model keeps inventory near the point-of-sale, meaning returned items can be repositioned for sale almost immediately. Exclusively D2C retailers can still take advantage of the efficiencies of the BORIS method by integrating with the customer-facing access points of last mile providers, such as FedEx Office locations.

The benefit for the customer is an instant refund and consolidated return parcels for you. Consolidation not only decreases reverse logistics parcel costs but also expedites the disposition of products. The best integrations ensure that the return label generated at the access point reduces return processing at FCs. In our experience, around 25% of the time spent processing returns is dedicated to unpacking the customer's packaging. Having a BORIS access point for returns avoids that time-suck entirely.

Factor in reverse logistics capacity

Adding this needed capacity to your regular sourcing events creates savings opportunities for you as well as backhaul opportunities for carriers. Just like their forward counterparts, reverse logistics volumes and lanes should be forecast during the bid preparation phase. Consider these questions: How many days from the purchase date can the item be returned? If the merchandise is big and bulky, will a pick-up need to be scheduled? How are returns processed and repurposed for resale? In our experience, returns account for 5% to 10% of all e-commerce volumes, so this is not an inconsequential amount of capacity.

The growth of e-commerce has been heralded for quite some time; however, few of us predicted it would take a once-in-a-century pandemic to kick things into high gear. As a result, our collective directive is to figure out how to serve tomorrow's e-commerce demand with today's supply chains. Distribution operations, packaging, transportation and reverse logistics hold many improvement opportunities for companies on this journey.

E-commerce is a moving target, though. NASDAQ estimates that by 2040, 95% of all purchases will be facilitated by e-commerce. Luckily, the lessons that supply chain leaders learn from today's challenges will provide a strong foundation for future innovation and growth.

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VACCINATE WAREHOUSE OPERATIONS WITH A NEW, POST-COVID BEGINNING

As we begin to turn a coronavirus corner, it is crucial that supply chain leaders work to envision what the next normal will look like. They must plan on how best to position a new beginning in order to emerge healthy and competitive. In this article, we'll build the case for a digital warehouse of the future.

BY DIVYESH BHAGAT

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The COVID-19 pandemic is arguably the most prolonged and harshest disruption the supply chain industry has seen in the last few decades.

It has been quite a journey for businesses and warehouses from reacting to the situation, navigating operational changes through the lockdown, such as social distancing, and preparing along the way for the eventual re-opening as vaccine trials raise the hope of the end to the pandemic.

As we begin to turn a corner, it is paramount for business executives and supply chain leaders to envision with sufficient clarity what the next normal will look like. They must plan on how best to position a new beginning in order to emerge victorious in the competitive market where survival often is the first hurdle to cross.

In this article, we'll build the case for a digital warehouse of the future.

As we take stock of the impacts and trends created by the pandemic on the warehouse function to envision the next reality, in many ways the trends are the same as they were pre-COVID, but represent a more accelerated, amplified and acute version of those trends.

Warehouse operations feel the pressure

Warehouses were under pressure from a variety of factors before the pandemic. COVID has accelerated them (see Figure 1). They are as follows.

E-commerce. E-commerce has posted double digit growth for the last several years, a trend that is poised to continue. As if the challenges of delivering on a customer experience to retail consumers weren't enough, the adoption of online channels in B2B is expanding as well.

With the convenience of B2B and e-commerce, business and consumer buying behavior continues to shift in terms of making smaller and more frequent purchases with ever shorter lead times. The role of the warehouse continues to expand and elevate further with e-commerce.

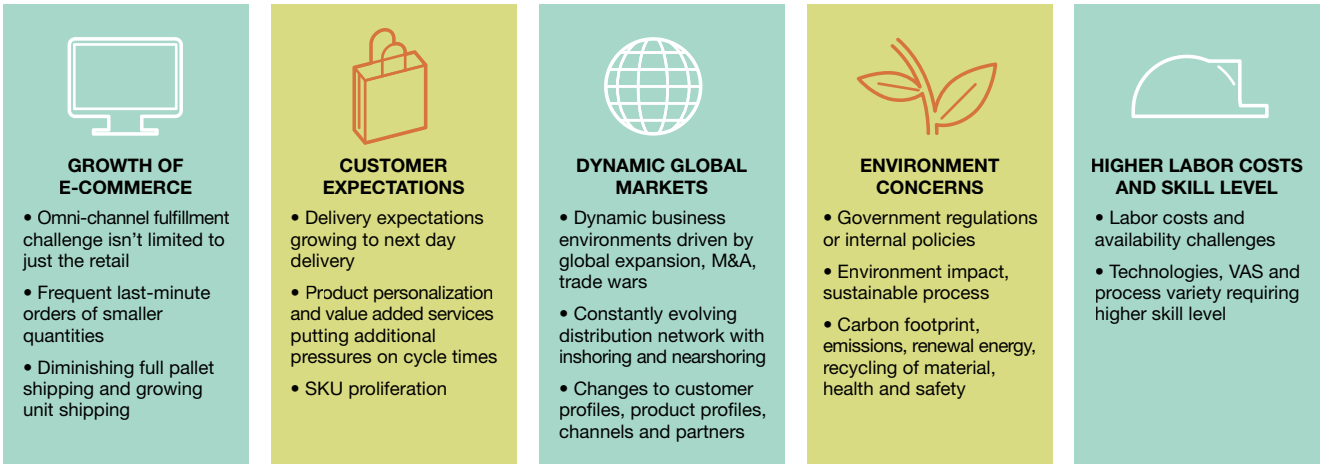
Finally, the pandemic has accelerated the preference for a no-touch buying experience.

Customer expectations. Along with online buying, customer expectations have continued to grow, including demand for personalized features/terms, lightning fast deliveries and flexibility to make no cost shipping and order/return changes.

That puts multi-point pressure on warehouse operations stretching them in a lot of different directions to drive the expected perfect order and customer

FIGURE 1

Trends affecting warehouse operations



Source: Tata Consultancy Services (TCS)

satisfaction targets. The underlying conflicts from the proliferation of personalized products, the growth of each picking and next hour deliveries are creating hard-to-optimize warehouse equations.

The uncertainty and disruptions of the pandemic drove customer behaviors such as the stockpiling of critical products to hedge the choppy upstream demand or canceling/cutting non-critical items to conserve cash. Customers look to pass that uncertainty on to their suppliers by demanding unprecedented flexibility in terms of abrupt demand changes. These behaviors/expectations are amplifying the pressure on already strained warehouse operations.

Dynamic markets. The competitive and dynamic nature of the business environment continues to expand to new global markets, with the addition of new channels and M&A activities. At the same time, geo-political trade wars and narrowing global labor cost arbitrage are driving change in the business mindset, such as the China Plus One strategy, calling for companies to invest in China plus at least one other country rather than put all of their eggs in the China basket.

These forces drive real changes to the distribution network, customer profiles, product profiles, channels and partners. This is resulting in a large number of suboptimized process variations for warehouse operations.

The pandemic has also intensified the quest for alternative regional supply sources to make the supply chain more resilient to disruptions by decoupling through in-shoring or near-shoring.

Environmental concerns. While economic swings, cost pressures and politics keep the environmental debates going, the recognition of the long-term importance of a sustainable supply chain operation is both growing and inevitable.

Government policies and customer awareness elevate the need and benefits of purpose-driven responsible supply chain practices. It also creates a positive influence on an organization's brand, reputation, customer satisfaction and loyalty. Warehouse operations certainly have a fair share obligation to devise ways to reduce carbon footprint and waste of resources through efficiency and innovation.

The pandemic is not expected to displace the long-term importance of environment friendly logistics operations.

Higher labor costs and skill level. The low unemployment rate, expansion of e-commerce and an aging workforce have contributed to a strained labor pool for warehouse operations. The required skill level for warehouse operators is growing with increased process variety driven by factors such as product personalization, M&A, value added services and technology adoption.

The pandemic certainly reduced order volumes for certain sectors and product categories while increasing them for others. However, the need for labor optimization continues to remain important with the pandemic affecting labor productivity and net capacity due to social distancing, additional safety steps, facility lock downs and sick leaves.

Needless to say, these trends create an imminent need for warehouses to reimagine new, smarter ways to create customer value and yet reduce cost. Digitization of the warehouse offers the most versatile and potent war chest of tools to convert the difficult trends into rewarding opportunities to retain and expand the market leadership.

Warehouse digitization redefined

The digitization of business has by far been the biggest area of focus for most business executives in recent years. As a result of the trends we just outlined, digitization of the supply chain, and the warehouse function, is emerging as an important area of focus. While many organizations already have aggressive digitization roadmaps underway, many are in the early process of sketching up the plans and some are yet to start. There is no doubt that the early movers, innovators and effective executors enjoy the lion's share of the rewards and will push sluggish competitors out on the survival path.

So, what does digitization of the warehouse mean? While it is certainly a well discussed topic, it's important to revisit it for this article.

Warehouse digitization is about creating new smart and innovative capabilities. This happens by synthesizing systems, data, machines and humans across the distribution nodes using advanced technologies to create tangible customer value, operational differentiation and efficiencies.

Automation, software, sensors and other technologies have certainly been part of warehouses for the last two decades. Consider solutions such as RF devices, high speed conveyors, sortation, ASRS, carousels, pick to light and voice-directed picking to name a few of the solutions at play. However, traditional automation tools were largely point solutions to increase throughput and velocity of specific operational steps for specific products, customers, transaction types or process scenarios.

In contrast, digital technologies are situationally-aware and continually learn to orchestrate and optimize warehouse processes dynamically for each scenario presented and in a configurable, continuous and real time manner to drive the desired outcomes. They promise to bring smartness and flexibility to today's market demands. Digital technologies present a lucrative opportunity for virtually all warehouse operations; but in especially for complex warehouses, they may be the only realistic path forward (see Figure 2.)

Warehouse digitization can create new capabilities to tackle the trends of the future:

- dynamic orchestration of the distribution network to support abrupt demand changes;
- optimized throughput to support high order volume of small quantities across a wide SKU assortment;
- optimized cycle time and velocity to support next hour shipment of products personalized to order;
- drive down operational costs through efficient and collective optimization of man, machine, space and energy resources; and
- create a differentiating customer experience through fulfilment accuracy, visibility, reliability and speed.

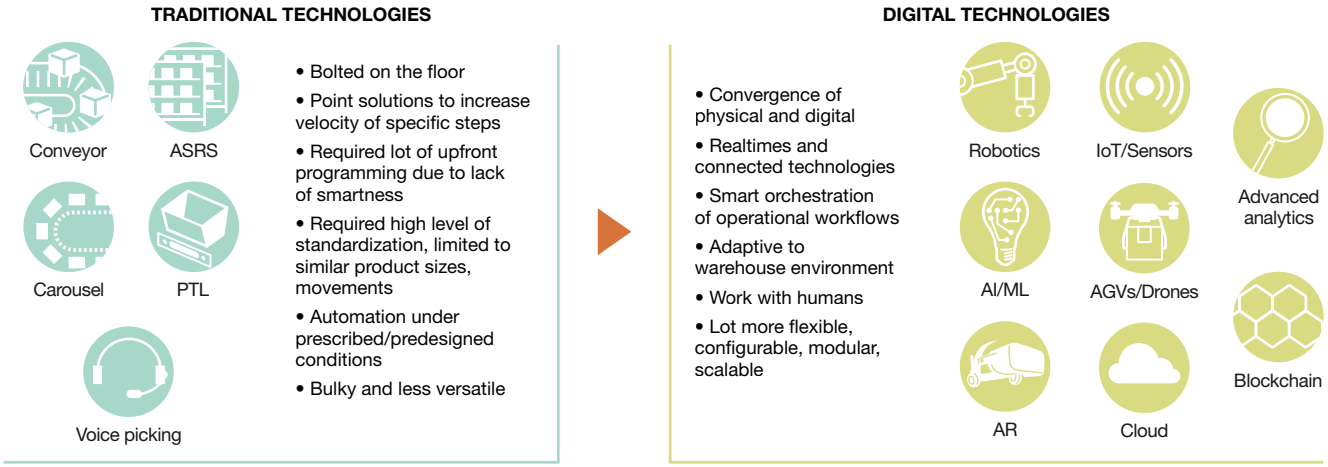
Critical principles of a digital warehouse

The first obvious, yet foundational, principle is that any warehouse digitization must be a harmonized element of a broader digitization strategy of the business and operating model. The holistic approach to a digital business model and its cascading alignment to digitize the warehouse function is key to create an overall competitive edge that is not short-lived nor easy to erode (see Figure 3).

While there are a lot of exciting new technologies, it's important not to get carried away by shiny objects. Remem-

FIGURE 2

Traditional technologies vs. digital technologies



Source: Tata Consultancy Services (TCS)

FIGURE 3

Digital warehouse key characteristics

Source: Tata Consultancy Services (TCS)

ber that technology-led initiatives carry a high risk of becoming obsolete when business dynamics and market demands change. The loss of capital from unfruitful initiatives can leave an organization worse off than the dreaded status quo.

For those reasons, a business's strategy, vision, objectives, current strengths/differentiators, pain areas and market conditions should provide the overall context for the warehouse digitization, while maintaining a razor-sharp focus on customer value creation. Beyond that, warehouse digitization must also have the flexibility and configurability to serve expected future needs. The warehouse of the future must be designed to reconfigure itself to the dynamic nature of product profile, customer profile, transaction profile and warehouse layouts.

Systems thinking is also important here. You want to ensure the warehouse digitization does not end up as a mixed bag of singular unconnected victories that keep shifting inefficiencies across various sub processes and functions.

The capabilities and use cases forming the future warehouse should be mapped to measurable outcomes and KPIs that are in complete alignment with the business strategy and customer value creation.

Use cases, or the art of the possible

Now that the foundational principles are in place, next comes the exciting part: Envisioning value creating warehouse use cases and capabilities that leverage digital technologies to drive desired outcomes.

The digital technologies in question here need no introduction. They have been in conversation for a few years and have already been converted into reality for many organizations, and include AR, IOT/Sensors, robotics, blockchain, AGVs, drones, AI/ML and voice recognition.

The first step to creating the warehouse of the future is to answer the million-dollar question: What do your customers value most when they engage with your business to meet their needs? The answer to that question can tilt the customer to you compared to your competition, and build a long-term loyal, mutually beneficial relationship.

The cost of the product and shipment are the basic sources of customer value. Beyond that, typical sources of customer value delivered by a warehouse stem from transaction-linked capabilities that enable successful deliveries and returns, such as ease, flexibility, velocity, visibility and reliability. Customer value can also be derived from product-linked features such as availability, personalization and quality. Needless to say, each business is unique and requires a clear definition of customer value that is specific to their product offerings, selling models, customer segments, markets and channels.

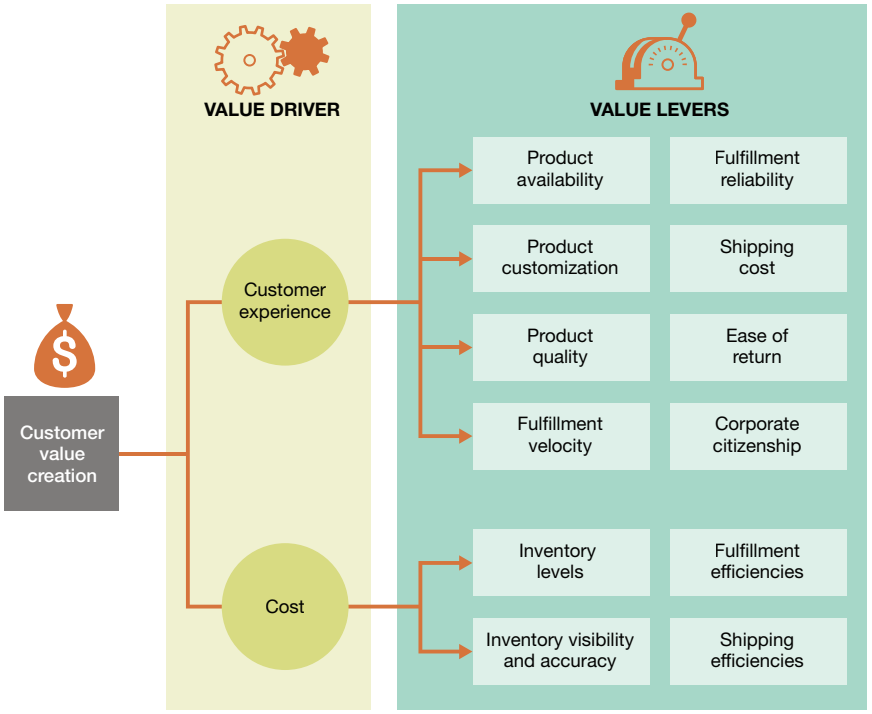
Figure 4 illustrates the typical levers that a warehouse operation can pull to create customer value.

These customer values should drive the definition of use cases and expected outcomes measurable to specific KPI targets. The end result must contribute in the form of operational efficiencies, flexibilities or top line revenue growth.

Table 1 shows how technologies are being leveraged for warehouse digitization.

FIGURE 4

Warehouse levers to pull in order to create customer value



Source: Tata Consultancy Services (TCS)

TABLE 1

Technologies leveraged for warehouse digitization

CUSTOMER VALUE DRIVERS	USE CASE	ENABLING DIGITAL TECHNOLOGY
FV, PA	Advanced demand prediction capabilities can drive optimum positioning of product assortment in the distribution network as a dynamic and continuous process factoring a wide variety of signals. This can include social media feeds, website click streams, weather, macroeconomic indicators, POS data etc. *Potential benefits: Reduced fulfillment cycles, lower transportation costs, improved profitability*	Advanced analytics, AI/ML
PQ, OE	Blockchain, IOT and AI can help proactive detection of quality problems and drive automatic corrective actions. IOT enabled containers and pallets can transmit product conditions (temperature, moisture, pressure etc.) that can drive automatic supplier returns at receipt or product substitution at fulfillment. *Potential benefits: Reduction of defective products shipped to customer, reduction of returns*	IoT/Sensors, Blockchain
PA	Advanced replenishment algorithms along with smart shelves and sensors can drive optimum stock replenishment plan dynamically based on wide range of factors such as demand history, actual orders, trends, spikes, rush orders, profitability, operational resource constraints etc. *Potential benefits: Reduced stock-outs, improved fill rate*	Advanced analytics, AI/ML
FV, PC, OE	Swarm of autonomous robots or individual cobots working alongside human operator can perform smart waveless orchestration of diverse operational flows. Rapid innovations in vision systems, 3D sensors, voice recognition, arm dexterity and constant learning is making robots suitable for a wide variety of warehouse tasks. This is a game changer to optimize highly complex environments that face combination of short lead times, high SKU variety, high order volume and small lot sizes. *Potential benefits: Reduced fulfillment cycles, increased throughput, reduced labor cost*	Robotics
FV, OE, PC	Wearable AR powered vision systems can improve picking significantly by augmenting picker's field of vision with contextual information (such as navigation path, location, product information, drop position on the cart etc.) pertaining to the pick, putaway or replenishment tasks. It can also perform the required scans and validations for transactional accuracy. *Potential benefits: Reduce travel time, increase pick velocity, increase pick accuracy*	Robotics, AR
OE, PC	A fleet of autonomous drones can execute a continuous cycle count program taking advantage of aisles/shifts experiencing lull in activity. It can leverage WMS data to exploit cycle count opportunities around bins running empty or low. Drones can also help the yard jockey locate trailers. *Potential benefits: Increased inventory accuracy, reduced backorders, reduced missed picks, reduce theft.*	AGVs/Drones
OE, PC	Advanced slotting algorithms can drive continuous and dynamic optimization of location/bin assignment factoring numerous elements such as velocity, trends, seasonality, profitability, dimensions/weight/volume, handling equipment etc. It can forecast shortage/overage of warehouse space and drive proactive management. *Potential benefits: Increased storage density, reduced travel time*	Advanced analytics, AI/ML
CC, PC	Smart controls for climate, lighting, doors etc. can optimize energy usage based on swings in occupancy, activity concentration and product conditions. *Potential benefits: Increase energy efficiency, reduced costs*	IoT/Sensors
FV, OE, PC	A warehouse digital twin solution can help simulate various warehouse design/retrofitting scenarios instead of having to take an expensive trial and error approach. It can enable creating a virtual 3D model of the existing warehouse to simulate changes to layout, workflow, slotting and equipment against anticipated SKU profile, trends, order profile and constraints. *Potential benefits: Layout optimization, workflow optimization, labor optimization, overall cost optimization*	Advanced analytics, AI/ML

CUSTOMER EXPERIENCE: PA Product Availability; PQ Product quality; FV Fulfillment velocity; CC Corporate citizenship

COST: OE Operational efficiency; PC Product cost

Source: Tata Consultancy Services (TCS)

A roadmap to the digital warehouse

A clearly defined approach is critical for any major transformation initiative. It is even more so for digitization initiatives, given the wide range of possibilities, speed of technology innovation and also what is at stake.

The steps compiled below, and illustrated in Figure 5, represent a roadmap to the core warehouse digitization approach that has worked well in our experience. It recaps and extends what is already covered in this document.

1) Set a clear strategic context. A clear business context covering the below elements creates a uniform view for the cross functional team on what the overall success looks like for the business and the expected direction for the digital warehouse initiative:

- business vision and objectives;
- digital strategy for the overall business and operating model;
- voice of the customer;
- market conditions;
- operational strengths a pain points; and
- guiding principles.

A strong governance of the strategic context is vital to ensure that the right set of business benefits are created by warehouse digitization.

2) Define customer values and outcomes. As outlined earlier, this step ensures that the warehouse of the future is customer centric and outcome oriented. The customer values and experience created by the warehouse function should also be aligned with the overall customer journey to generate a robust experience and brand impression.

3) Define value delivering use cases. Exhaust the last drop of collective creativity and innovation to rethink new sets of warehouse use cases that can produce the specific expectations outlined by the previous step with certainty. The technology choices are daunting, and the breadth and depth of skills required to implement and operate them can expand very quickly to make the right technology choice across all use cases.

4) Use case selection and roadmap. Once a pool of use cases is created, the cost and benefit measures (quantitative and qualitative) are to be compiled for each. A flexible business case framework can be calibrated based on cost-complexity-risk-reward parameters to balance the level of due diligence and agility of the decision. Too often, highly promising use cases get lost in the paralysis of business case analysis in the absence effective tools.

The business case helps rank and stack use cases based on business benefits, effort, complexity, costs, change impact and risk. The end result will create
a roadmap that delivers an optimum schedule of benefit realization.

The warehouse use cases with inadequate functional or technical clarity require a targeted proof of concept to mitigate risks before confirming to the roadmap.

5) Agile iterative journey of value delivery. The nature of business transformation is like an endless marathon given the ever-changing business dynamics. The digital warehouse roadmap should be seen as a never-ending, continuous journey to enable new capabilities. The adoption of agile execution methodology is vital to ensure the roadmap stays fresh and reflective of the business needs as they change.

It also makes sense to commission an independent Digital Center of Excellence (COE) within the organization that embodies entrepreneurial spirit and is empowered to evaluate digital use capabilities before they get implemented in full scale as part of the roadmap.

Overcoming challenges

There is a great deal of agreement that digitization of supply chain and the warehouse function isn't just a buzz word.

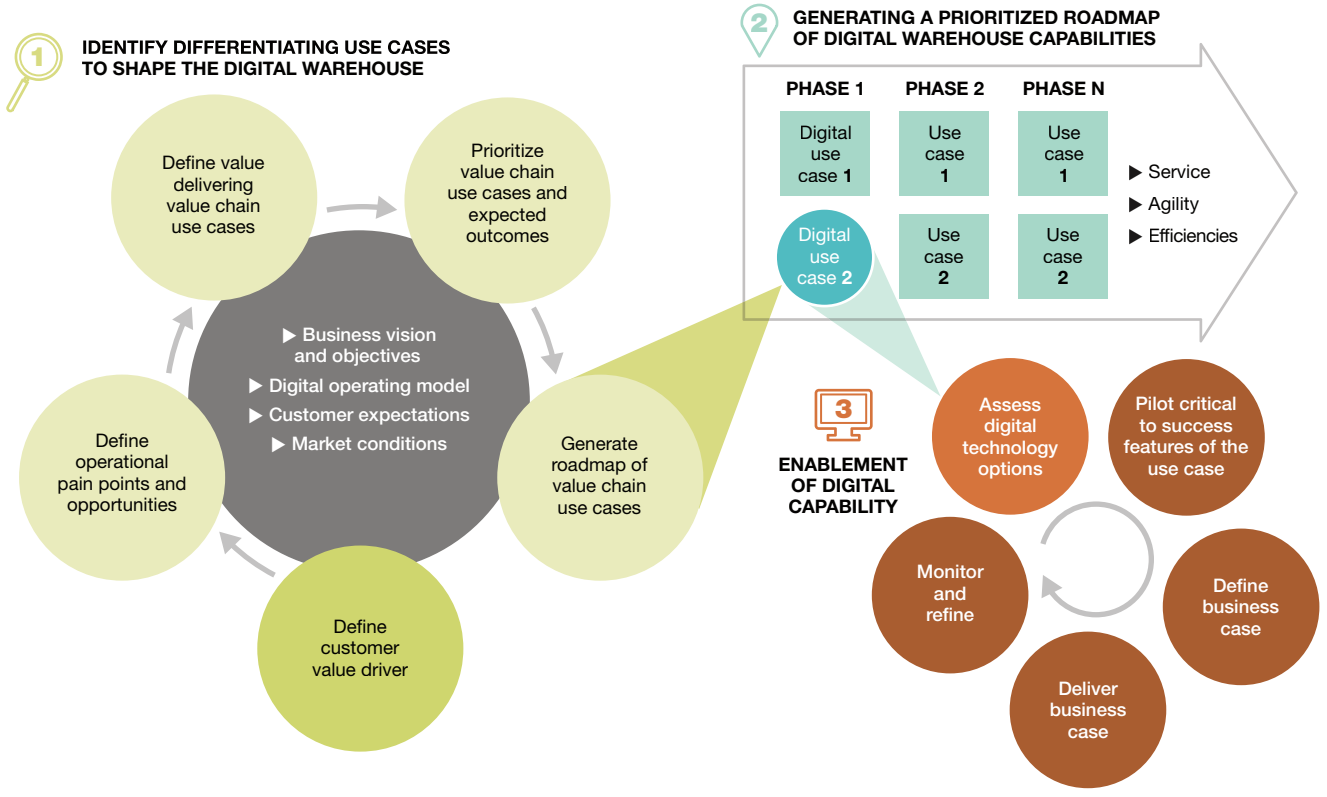
The typical challenge with the digital warehouse originates from the fact that the business needs, strategy and the potential use cases are unique to each organization. They aren't a recreation of cookie-cutter templates. A warehouse digitization initiative requires a variety of skills such as warehouse domain functional analysts, digital technology specialists, data scientists, agile coaches and change leaders. The skill gap, or availability of technical skills, is a typical challenge for most organizations.

A qualified external partner can be crucial in guiding the overall initiative and bridging the skill gap.

Another typical area of challenge is the existence of functional silos with conflicting objectives impeding collaboration and resistance to change. A qualified external partner can help here as well by bringing a fresh outsider perspective, unbiased steering towards the overall organizational victory and facilitating the change.

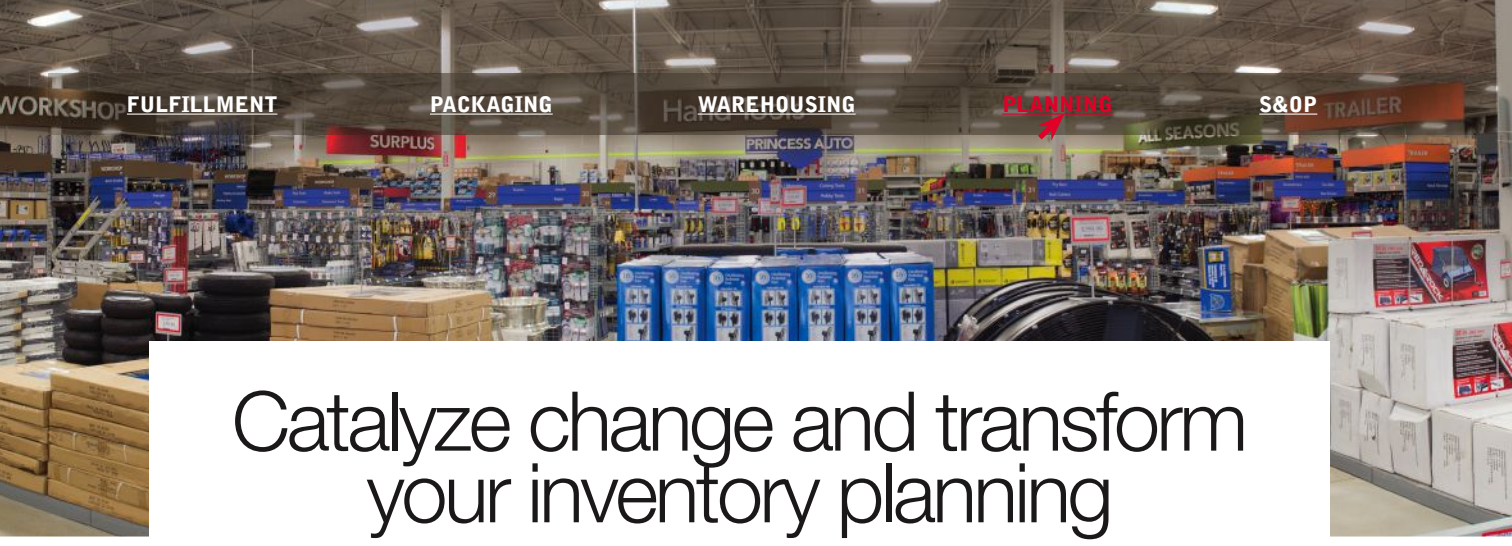
FIGURE 5

Roadmap to the core warehouse digitization approach



Source: Tata Consultancy Services (TCS)

In conclusion, it is an exciting time with a wide range of digital opportunities awaiting to propel warehouses to a new beginning looking to excel in the post-COVID era.



Catalyze change and transform your inventory planning

Change is hard for any organization. But Princess Auto, a nearly 90-year-old Canadian hard goods retailer, changed its collective thinking and brought a new level of efficiency to its inventory planning and how product flows to its customers.

BY MIKE DOHERTY AND KIMBERLEY KIRTON

"If you dislike change, you're going to dislike irrelevance even more."
—Eric Shineski, retired general

In business, the only constant is change. Given the complexity, connectedness and immediacy of today's modern world, it's safe to say that you, and your organization for that matter, need to become very good at change. Sure, we've attached fancy and modern names to it—pivot, for example—but the bottom line is we all need to excel at changing our minds, our worldviews and work and personal habits.

But change is hard. To highlight just how hard, consider the difficulty people have in changing their habits when faced with a life-threatening situation—people who require coronary-artery bypass surgery. After the surgery, patients are told that they need to change their lifestyle to maintain their health—stop smoking, stop drinking, stop overeating, start exercising and reduce stress. Yet, study after study confirms the dismal results—within two years of the surgery 90% have not changed their lifestyle. Those are odds of about nine to one against you making the change, even in a life and death situation.

It's no surprise then that business change has similar odds. After all, we've eventually realized that business change is really about people—the ability to change not only our own minds, but also help others change theirs as well. Joe Jackman, in his excellent book, "The Reinventionist Mindset," speaking about business transformation and reinvention summed it up perfectly when he wrote: "Change is a human endeavor with a business consequence." Business change and transformation is about people and, essentially, the inner workings of the brain.

This article outlines the approach and learnings that Princess Auto Ltd used to completely transform how it plans and manages the supply chain and the flow of inventory from supplier to consumer. It will provide details on how this 87-year-old company was able to change the collective thinking, or mental model, of the company utilizing many of the principles and ideas outlined in "The Catalyst," a new book about the process of change by Jonah Berger.

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Before and after

Before the change. Princess Auto Limited (PAL) is a Canadian hard goods retailer with 49 stores located from coast-to coast, selling a wide variety of products that are targeted to help customers—the "figure-it-outers"– do, fix, tinker and make things. The stores and online portal offer their predominately male customers approximately 15,000 products, sourced from more than 400 merchandise vendors located around the globe, flowing through a network of three distribution centers.

Prior to fundamentally changing planning process, PAL planned the flow of inventory from supplier to stores like many retailers—thorough a combination of re-order points for every product at every store, augmented with a collection of home-grown spreadsheets and analytical tools. The inventory flow planning process was really a collection of unique approaches and tools to support several planning scenarios—including key ones like promotions, seasonal and product introductions and discontinuations. In reality, these processes weren't linked or driven by a shared view of the future—independently developing forecasts and plans for their teams and departments, very loosely connected to the goals and aspirations of the business, as depicted in Figure 1.

FIGURE 1

The inventory flow planning process with diverse approaches

Source: Authors

As a result, store in-stock and inventory performance consistently hovered around industry benchmarks—not surprising because the planning processes were consistent with current industry practices and thinking. In addition, when things didn't go as planned it was difficult to pinpoint where things went wrong and almost impossible to fix and learn from it because so many fingers were in the proverbial pie, so to speak.

After the change. In 2015, PAL realized it needed to improve supply chain performance and, as a result, embarked on an ambitious plan to improve planning capabilities, agility, inventory flow and ultimately, store in-stock performance. The resulting design and implementation helped transform the company and its supply chain to be consumer-centric and integrated from store to supplier.

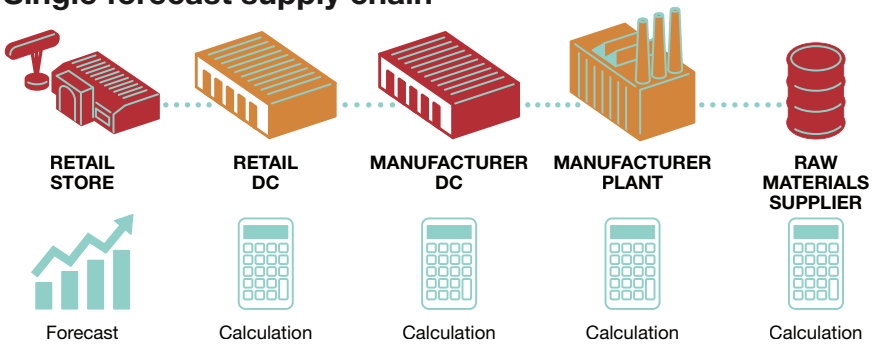
The team would design and implement new demand and supply planning processes for all products, all channels, all stores and suppliers simply by only forecasting sales at the store/product level and calculating and cascading a series of integrated time-phased replenishment plans from store to factory—commonly referred to as flowcasting.

The only forecasting that would occur in the entire, integrated supply chain would be consumer sales, for a rolling period of 52 weeks, by item/store (or webstore). Adhering to the principle of "never forecast what you can calculate," all resulting time-phased inventory/supply projections would be continuously calculated (based on the forecasts and the inventory and ordering rules) and shared, as depicted in Figure 2.

In the process, the project team helped people change their thinking and behaviors in order to plan to a single set of numbers—for sales planning, replenishment planning,

FIGURE 2

Single forecast supply chain



Source: Authors

FIGURE 3

New thinking and new processes

FROM

- No formal demand planning process
- Basic re-order point planning for regular demand
- Manual ordering and planning processes for seasonal and promotional demands
- Using A B C classification to manage workloads
- Communicating only the next order to suppliers
- Ordering and committing promotional and a seasonal orders with a much longer lead time
- Every department developing their own internal forecasts for planning and budgeting

TO

- A formal, consensus driven demand planning process
- Using integrated, time-phased planning for all demand (all flows calculated from store to supplier)
- Automated ordering for most demand patterns
- Managing by exception
- Sharing a rolling, up-to-date supplier schedule with all suppliers to help them plan
- Creating all purchase orders at a single, shorten lead time
- Using the projections, converted to their operational language (e.g., cube, weight, dollars) to work to a single set of numbers

Source: Authors

operations planning, financial planning and supplier collaboration and integration. The change in process and thinking is outlined in Figure 3.

Changing the mental model.

A key aspect of the change was the shift in thinking—or the mental model—of people in a number of core departments within the company. What emerged was that people within each department would focus on things where they could leverage their skills to improve the customer experience and collaborate with colleagues from other teams when required—critically, as it turned out, only by exception. The shift is depicted in Figure 4 in terms of people's new accountabilities and responsibilities.

In terms of bottom-line results, the implementation delivered the following significant benefits.

- Achieved the highest store in-stock levels in company history—from 92% to 98% daily across all items in all store locations (including items on promotion).
- Significant year-over-year increase in sales, same store sales and profits after the first full year implemented, directly caused by increase in product in-stocks.
- Improved both in-store and DC inventory performance by more than 10 basis points respectively at the same time that in-stock was increasing.
- Helped reduce in-store labor costs by close to half a percentage point year-over-year by flowing more product directly to the shelf.
- Improved supplier collaboration and performance by sharing accurate, up-to-date supplier schedules—projections of planned purchase orders.

The new process digitally connects the consumer to the supply chain, providing the company the capabilities to implement a new strategic direction for any-channel fulfillment. Rather than supplying online demand from a central warehouse, PAL is leveraging its new capabilities to deliver online demand from a

FIGURE 4

New accountabilities and responsibilities

MERCHANDISING
Choose the assortment
Create demand
Forecast vs. plan

RETAIL OPERATIONS
Keep on hands accurate
Flow product to the shelf
Serve customers

DEMAND PLANNING AND REPLENISHMENT
Forecast sales
Plan the end to end flow of goods
Communicate with merch, ops, suppliers

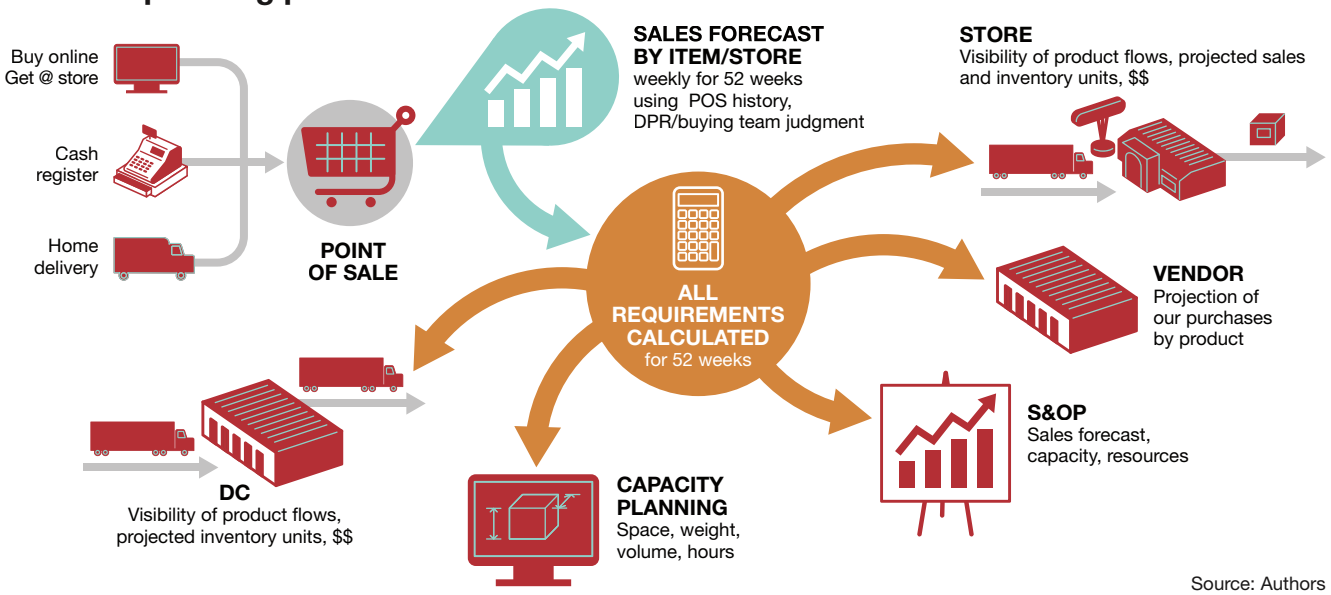
SUPPLY CHAIN OPERATIONS
Prioritize operations based on due dates
Identify and resolve future capacity constraints

SUPPLIERS
Produce and ship to the schedule
Protect supply
Reasonable terms of trade

Source: Authors

FIGURE 5

The new planning process



Source: Authors

number of strategically located stores across Canada, drastically reducing their fulfillment and last mile costs and cycle times to better serve online customers. The new planning and inventory flow model is depicted in Figure 5.

The new supply chain model is agile, flexible and consumer driven—regardless of the consumer fulfillment model—and recalibrates the entire supply chain daily, based on what is and isn't selling. The process facilitates the ability to profitably plan for and deliver to the Anywhere Shelf—the reality that today consumers can browse and purchase merchandise from anywhere, delivered to anywhere.

The design and implementation of the new supply chain planning model resulted in a significant change to established business processes and their underlying thinking and paradigms that had been ingrained over decades. The project team had, in reality, influenced and helped change the thinking and behaviors of hundreds of people, across multiple organizations.

How did they do that?

Catalyzing change

People focused. Given the magnitude of the change, the project team understood that the implementation effort would need to be laser focused on people—helping them change and make the journey. Although the change was enabled and supported by new planning technology, as many in supply chain management can attest, people need to change their thinking in order to maximize the value and utility from the solution and the process it enables.

The team would use an implementation approach that was based on thinking from the Proven Path, made famous and successful by the Oliver Wight Group, and tailored to Princess Auto based on a handful of successful retail implementations. A critical tenant of the approach is the need for company-wide education about the new ways of working.

Education is not the same as training and the two are often conflated. Education and the approach the team undertook would be used to teach the organization the basic process and principles behind it—what was different, why it would work and why it was better. No software was used in this effort—rather a series of educational sessions with simple examples to highlight various scenarios—designed to engage discussion, ask and encourage questions and spark dialogue.

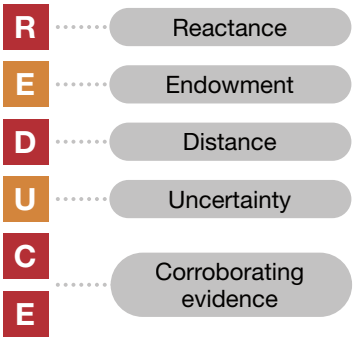
Education and understanding, it turns out, is not enough to help people make the change. The project

team also used a number of other mechanisms to help people make the journey and, in the process, help them change their minds and work habits. As it turns out, the team was employing a number of principles of change that have just recently been articulated in a new, refreshing and valuable framework about change.

One of the tools utilized by the PAL team was "The Catalyst," the latest book from Jonah Berger, a marketing professor at the University of Pennsylvania's Wharton School of Business, and the author of two highly acclaimed books, "Contagious" and "Invisible Influence." The refreshing aspect of Berger's approach is his assertion—and supporting examples—that in order for people to change their mind, the barriers to change must be reduced. His approach is nicely articulated in the aptly named acronym "REDUCE" (see Figure 6).

FIGURE 6

Reduce roadblocks



Source: Authors

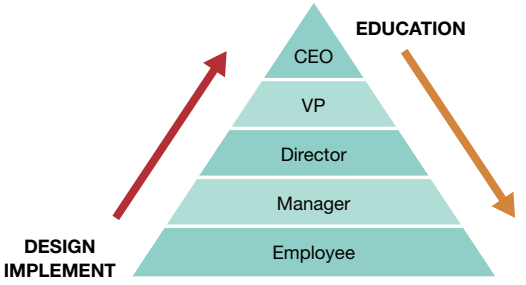
Reactance. When pushed, people usually push back. Just like a boxer has intuitive defensive skills to defend against a punch, people have an innate anti-persuasion system. A radar that kicks in when they feel like someone is trying to convince them. To lower this barrier, catalysts encourage people to persuade themselves.

Seth Godin, one of the world's leading marketing experts—and author of the classic book, "Purple Cow"—outlined this concept beautifully: "People don't believe what you tell them. They sometimes believe what their friends tell them. They often believe what you show them. But they always believe what they tell themselves."

At its core, the concept of reactance and the entire change approach the team used was grounded in "questions." Rather than tell, the team would ask. And by asking, from a position of attempting to understand, it spurred more questions from everyone, especially the people who had to change. The project team and its executive sponsor would use a simple framework to shape how the change would be implemented and instilled (see Figure 7).

FIGURE 7

The implementation of change



Source: Authors

The detailed design of how the new process and operating model would work would be the core accountability of the project team and they would work closely with their peers and people in the organization that would execute the process once people understood and agreed. To achieve this, the organization would need to change its collective mental model about supply chain planning and product flow.

For this to happen, the team built and delivered an education program designed to disseminate information and solicit and demonstrate commitment to the change. The education started with the PAL CEO and cascaded to all employees and team members. Starting the education program at the CEO level was important. The goal of the education program was to not only disseminate knowledge but also, importantly, to build commitment and ownership because everyone realized that a change of this magnitude needed to be sponsored and driven by the executive team with an executive level of commitment.

Questions were at the heart of the education program. The team had built and recorded an educational webinar that explained the new process design and demonstrated it using a series of examples, including the fundamental principles of the process. The cascade model worked

like this: The CEO would take the online course and then request that his direct reports (all SVP's) do the same. Once complete, the CEO would then lead a session (supported by the design team) with his direct reports, where a series of questions would be asked and discussed—ensuring not only a healthy dialogue ensued, but also, importantly, new questions would emerge that would be answered and potentially added to the list.

At the end of the session, the team would revise the list of questions and the CEO would outline the expectation of his direct reports; each SVP would be responsible for ensuring their direct reports took the online course and, more importantly, attended a facilitated session (led by each SVP) where the questions would be discussed and answers and opinions documented. The cascade would continue down the company hierarchy until everyone had reviewed the education and attended a principles-and-questions-based session to help people convince themselves and build commitment to the change.

The cascade model of education helped to increase understanding of the change and was a key mechanism to reducing reactance because the foundation of the approach was based on questions – some were asked but most were surfaced and answered by peers, helping a person persuade themselves. Instead of telling, people were asking.

Endowment. Everyone has heard the old saying, "if it ain't broke, don't fix it." People are married to what they're already doing. And unless what they're doing is horrible, generally they don't want to switch. To ease the effects of endowment, or people's love of the status quo, catalysts highlight how inaction can be very costly.

Early on, the executive and project teams determined the cost of inaction. While the supply chain was performing at a level consistent with the industry and major competitors, the teams looked to world class retailers like Amazon to help determine the cost of complacency.

As an example, they correctly determined that, over time, retailers like PAL would be expected to be in-stock at exceptionally high levels—approaching 99%—for every item, every day, in every store. Based on current performance they concluded that reaching these aspirational levels would deliver tens of millions in additional annual revenue and resulting margins, as well as improving their customer satisfaction and journeys.

In addition, they also highlighted and correctly determined the potential bottom line impact that the shift in consumer behaviors—to a more digital mindset and shopping preference—could have on overall company and supply chain performance. Amazon and others were driving a relentless and ongoing improvement in deliveries and cycle times and the executive and project team understood this and assessed that "waiting for the future" just wouldn't cut it.

As a result, the organization understood—both financially and potential improved capabilities—the cost of inaction was huge and could not be ignored.

Distance. People have an innate anti-persuasion system, but even when we just provide information, sometimes it backfires. Why? Another barrier is distance, or how far the change is, mentally. If new information is within people's zone of acceptance, they're willing to listen. But if it is too far away, in the region of rejection, everything flips. Communication is ignored or, even worse, increases opposition. To help ease this barrier, catalysts often ask, initially, for less, instead of pushing for more.

The project team embraced this principle, which was inherent in the overall plan. People would be educated first about the concepts and principles of the change. If that took longer than expected, which it did, the team slowed the pace, allowing additional education sessions, always cognizant of the questions being asked and the understanding and comfort people were displaying regarding the change.

In addition to pace, another key tactic used to help reduce distance was that the project team held numerous "lunch and learn sessions" (though sometimes they were later in the day and were "beer and pizza" sessions, but the idea is the same) designed to help people better understand the new world, in their terms and language. The team did not ask people to eat the entire elephant, but rather small, digestible bite-sized chunks to help them reduce the distance of the larger change.

A wonderful example of this was highlighted when the project team helped a number of the category management members understand that the new process would forecast

sales by item/store based only on that item/store's sales history. During an early "lunch and learn" the team demonstrated, for the first time, a particular product and its sales history and resulting forecast for a product from the Edmonton, Alberta store. Upon seeing this, the initial reaction from the category leader was an emphatic: "That's wrong. There is no way that product could sell like that in Edmonton."

Thankfully, the project team and executive sponsor listened and then said: "You may be right, because you know the product better than us. Can you ask your team members to also think about it?" The category leader left the session and did what was requested.

There had been no push back. No confrontation. What was remarkable is that during one of the subsequent sessions he asked if the project team could demonstrate that product again and the forecast for the Edmonton store. He then outlined to the room, including his peers, that he'd asked his team and did some thinking and they all concluded that indeed that product in Edmonton not only could, but did sell like that.

Instead of focusing on the entire supply chain, the understanding of why the process needed to create forecasts based on each products sales history for each store had been confirmed. An important and small change in terms of distance from the current state to the eventual future state. As he outlined to his peers, and they agreed, they had never looked or thought about things like this. He had convinced himself by asking questions and reducing the distance of understanding.

Uncertainty. Almost always, change involves uncertainty. In this case, would the new process be as good as hoped? It's hard to know this for sure, and this uncertainty often makes people resistant to change. To overcome this, catalysts make things easier to try.

To make things easier for people, the implementation would use ideas and mechanisms from the discipline of design thinking – using, often, the concept of a prototype.

To allow for trial-ability, the team relied heavily on what they would describe as a "process prototype." A process prototype is much like a product prototype—essentially a "day in the life" of the new processes, executed with real data by the future planners and users so that they understand, see and feel the new process. It provides users a safe environment to experience the new process after they have been educated and, critically, provides the implementation team with feedback and input on the process and solution. They can share what they like and what they don't like, along with ideas for improvement.

As an example, one of the process prototypes focused on the common retail planning scenario of a product discontinuation – how to exit a product from the assortment with minimal product carryover and without the typical large discounts as a product is trying to be sold off. The team had designed a process and resulting workflows that provided much better visibility for the category teams to make improved and more profitable decisions.

They engaged the actual users in the prototype—allowing the end users to perform the process in a safe environment but, critically, with real and up to date data that the business teams would recognize and resonate with. The prototype went poorly in terms of keeping the process consistent with what had been designed on paper.

However, as is the case with prototypes, the end users surfaced some ideas and thinking that were marked improvements on the current design and the project team went back to iterate the design. As it turned out, a member of the design team, sparked by the idea that arose during the prototype, discovered little known or used functionality in the technology solution. The designs were altered and a new and improved prototype was executed with the same business teams. The result was almost universal acceptance of the new design, which is used today to manage this key business scenario.

The prototype not only surfaced a better way but also something much more important in terms of reducing barriers to change. It allowed business users the opportunity to test or try the new process and, importantly, when they asked why the process seemed like too much work, they were thrilled when the project team returned with an answer to their question. From their view, the design team had listened.

The implementation team facilitated a series of small, process prototypes to iterate and improve the process, gaining buy-in from the planners and users, including store personnel, operations, merchants and suppliers. As users became more comfortable, they would communicate to their peers about how the new process would likely work. By doing so, they were slowly "telling themselves" and their peers that the new approach would work.

The prototype approach also provided the implementation team the opportunity to see how people ingrained the education they had been previously provided—what worked well, any struggles they encountered and where the implementation team would need to provide refresher education, training and coaching.

A process prototype approach generally takes a little longer to implement a new process and solution, but, importantly, it makes the change smoother and the overall implementation faster and more sustainable. That helps to ensure that the principles of the new process are ingrained and that business results can be sustained. In hindsight, the PAL project team concluded that the process prototypes allowed people to trial the new process, and ultimately help them make the shift in thinking.

Corroborating evidence. Sometimes no matter how good is the design or idea, or no matter how knowledgeable or assured the people who are implementing, it is not enough. Some things and some changes need more proof. More evidence to help people overcome the translation problem and become more comfortable with the change. To overcome this barrier, catalysts find reinforcement through corroborating evidence.

The project team at Princess Auto embarked on changing and integrating the entire retail supply chain—from consumer/store to supplier—for all products, all stores and all suppliers. The executive and project teams understood that, according to current literature, this had rarely been accomplished to scale in retail.

However, the teams did understand that components and pieces of this integrated planning process had been implemented and well established—both of which had adhered to the concepts and principles of the flowcasting business process, the foundation for which the change was built on. Two of Canada's largest and most successful retailers provided a number of examples of the components of the change and the effort to instill them.

For instance, Canadian Tire Corporation provided significant evidence of the positive impact to suppliers and the supply chain using the concepts of supplier scheduling. In addition, the project team had intimate and detailed knowledge of the lesson's learned as Loblaw Companies Limited had embarked on a similar change a number of years before. When required, these trump cards were played to help people understand they were not charting completely undiscovered waters—rather we would be putting all of the pieces and learnings together, connecting the retail supply chain from consumer to factory, for all products, stores and suppliers.

Changing your framework

Change is hard, but also necessary. The transformation in supply chain planning at Princess Auto was a significant and very successful effort, providing the teams some important learning's. The most important is that change is about people and people are emotional. In business, remember Joe Jackman's pearl of wisdom: "Change is a human endeavor with business consequences."

If Joe and others are right—and we concur from experience—then change is not only about facts, figures and new ideas and thinking. It's also about helping people make and instill the change – think differently and alter their mental models. People, of course, resist change for many of the reasons outlined above. To help them, barriers to change need to be reduced or eliminated.

The transformation of planning processes at Princess Auto completely changed how product flows were planned, from consumer to factory. In the process, hundreds of people had to change their day-to-day activities and instill new ways of working.

A good design was important. Education helped a lot. So too did ongoing dialogue, including surfacing and asking lots of questions. In hindsight, however, reducing the barriers or resistance to change was a critical, and often overlooked, element of making it happen.

HOW TO MAKE S&OP WORK IN UNPRECEDENTED TIMES...

(when everyone says it never will)

Here's how S&OP became a business star at the Consumer Health division of Merck KGaA, Darmstadt, Germany by putting people first with an under-the-radar strategy. If that sounds inverted, it is. But it's not counterintuitive.

BY DANNY ANTEZANA

Sales and operations planning (S&OP) has a checkered storyline. Some companies use it to great advantage, improving a range of metrics from forecasting to the bottom line. Others get mixed results. Some find that S&OP doesn't much move the needle of most any metric.

So, the question is: What is the secret to S&OP success? Certainly, there is plenty of help available from process experts to software suppliers and even a consultant or two. All too often, however, even a newly engineered S&OP still looks and feels like a bolt on. Basically, not enough changed along the way to make a difference. And we all know that the definition of insanity is: doing the same thing over and over and expecting different results.

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At its essence, S&OP is all about expecting different results. And that is a highly reasonable expectation. Unless, of course, you start in the wrong place.

All too often, people focus on the process of working across departments as different as sales and marketing and manufacturing. Others zero in on the technology that makes S&OP hum. Both process and technology are critical to success here. No doubt about it. But they are not the cornerstone of building S&OP. People are. But it's not just people with a certain supply chain profile, but people with an attitude—a business-oriented attitude.

This is not theory. I lived it when I worked at the Consumer Health division of Merck KGaA, Darmstadt, Germany. Here's my story of how to make S&OP a resounding success in unprecedented times—and when everyone else says it will never work.

Getting started

Interestingly enough, most S&OP implementations have certain similarities. Kick off is commonly with strong communications across all affected departments. Even the executive suite gets involved. Often, expensive consultants are part of the mix with a sharp focus on process implementation. Technology, including advanced software packages, is usually highlighted, requiring all to learn new software and become proficient at getting good data in to push good planning out the other end.

All of that is beneficial but can be somewhat misguided. S&OP is not a cookie-cutter process. One approach does not fit all, yet that detail is often overlooked. For instance, it is common to just assume that the demand planning resources are the right ones, which means your new S&OP effort is already off the mark as the program is just getting underway.

Even given that, metrics typically show some improvement after a few cycles. Then they get stuck a few months later, all the while losing momentum and influence in the company. The worst-case scenario is that the S&OP initiative never recovers, and leaders think the problem is inherent in S&OP, condemning it to varying degrees of irrelevance before long.

In fact, the real problem is that the company lacks the ability to create the right blend of processes, technology and people.

When I arrived at Merck KGaA in 2013, the company was undergoing several changes.

To begin, Consumer Health was moving from a business unit to an independent division. That created its own set of challenges. However, I took it all as an opportunity to try something new. I set out to build an S&OP group from scratch with one clear target: develop a real business-oriented supply chain organization that is a key influencer in the company.

As a result of the business unit transition, the company transitioned from a traditional pharmaceutical industry model with quite stable demand from Rx prescribed medical products. It was moving to an OTX model (a combination of prescription and over-the-counter (OTC) products) with high demand volatility and limited historical data to support statistical projections.

With the decision to market directly to consumers on television and even online ads, consumers, not doctors, decide to buy the product on their own, creating highly variable demand. That made it an incredible challenge to plan for consumer behavior rather than traditional patient demand.

Yes, it sounds like what supply chains are living through now with COVID-19, but it was different. It was a planned transition (not comparable to an unexpected crisis), but with many relevant changes at the same time: new organization set up, more than 70% new hiring in some regions, new processes and new strategy. It's worth mentioning that double-digit growth was the target across the board.

Under the radar

In many aspects, the die was cast for the overall company, its transition and its structure. However, S&OP was still an open book. We hadn't started yet, which raises an interesting question. Where exactly do you start when you can start anywhere you want? Fortunately, I had experienced some different S&OP implementations in different companies and industries.

Typically, most S&OP investments are 70% technology, 20% process design and 10% people. My approach, which we called "under-the-radar,"

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inverted that, making people 70%, process 20% and technology 10%. In fact, this experiment started with no process and no technology more powerful than Microsoft Excel spreadsheets.

There are good reasons for the shift in emphasis. To begin, technology and process can never run supply chains in isolation. Collaboration with other departments is essential. The question is how to achieve that in a fast, smooth and persuasive way.

In reality, S&OP depends on human judgement, relationships, negotiations and influence. Technology can certainly help; however, people make the right judgement calls and take the business context into account. The largest challenge here is finding the right mix.

Clearly, people are one key pillar of S&OP success. The second is a business mindset. The third is a humble approach. Roll it all up, and we called it the under-the-radar strategy.

What's the profile of these people? In a nutshell, they need a strong academic background either in business or engineering. Ideally, they are APICS (known now as Association for Supply Chain Management) certified and bilingual. International experience and an MBA are other strong assets.

The best candidates are strong professionals with experience in multinational companies, preferably leaders in their fields. Proven matrix organizational experience is a must. However, experience in pharma was not a prerequisite for building that particular team. Strong analytical and communication skills are vital as is an ability to collaborate.

The combination of competitive personal development and compensation plans are essential to attract and retain these leaders. Yes, the concept was to put them in a leadership role, not a support role. The intention was that over time, this new S&OP organization would be involved in every single business decision. A demand planning person would be there to validate each decision, making the entire plan visible for all supply chain activities. This leadership role managed by high-caliber professionals, brought the expected level of confidence to the business leaders and all other areas, making S&OP the only official plan (forecast) for the entire organization, eliminating the "parallel" forecasts—very common in many companies across industries.

But that would only come with time. It's a trust-building exercise for other departments to understand the value of a neutral S&OP team to make supply chain decisions best for the overall business not a particular department, its goals or its individuals. That's where under-the-radar came into the picture.

Keep in mind that supply chain is generally seen as moving boxes around with a strong focus on key performance indicators. Basically, it's a check-a-box mentality focused almost exclusively on its own activities. Any successful S&OP organization will have to sell its way out of that perception (which is not always undeserved).

Instead, S&OP must be seen as having a business mindset with a clear focus and priority on sales, profitability, service levels and similar business metrics. S&OP needs to be perceived as a business resource not an operational one.

The first step to getting there is to quietly do a deep dive into the business itself and understand it in all aspects. The team needs to develop access to commercial and marketing information while adopting the business language.

Early on, team members need to become meaningful and useful to others in their decision-making processes without any push or disputes. S&OP needs to focus on business

integration. Language goes a long way toward that. For instance, demand planning needs to be on the same side as sales, fighting for top performance and using the same language and even commercial terminology. The ultimate goal is to make S&OP one in the same with the other departments it interfaces with. In short, S&OP needs to be fully integrated with all key departments to be able to take on a leadership role.

All of that needs to be done with a humble approach that does not challenge others but collaborates with them. This is not an us vs. them arrangement. It is a "we" approach. The end result will be trust from other parts of the company, naturally translating into a leadership role for S&OP.

Getting here is a quiet move, initially. Key activities include providing data, making analyses commonly managed by sales administration, visiting key customers and showing interest in commercial and marketing strategies. Do it all humbly, without trying to effect overt change. Under-the-radar is a supportive approach to building confidence in the group's value to the overall business objectives, making everyone look good in the process.

Ultimately, S&OP's intent is to move from involving every part of the business to involving every part in the business. S&OP must be smoothly implemented and developed as a bridge to connect all different areas to the business (commercial) instead of forcing the entire organization to follow a new independent/ neutral forecast cycle review. Getting attention and commitment to any new process is always very challenging. However, if you execute a collaborative analysis that simplifies the business plan review and is fully supported by the business leader, you will achieve much better results, both in time and performance.

I do have to say that not all of this was 100% clear in my mind at the beginning. But I certainly had a clear direction that never wavered. I was sure that developing a planning excellence capability that benefited others would put S&OP in a leadership role over time. That planning expertise was also our ticket to becoming connected with the business, creating our own discipline and gaining trust across the entire organization at local, regional and global levels.

How did it all work?

During the first 18 months we did all that and set the stage for much more.

We started with a new organization of people who had the strong background mentioned earlier, and were comfortable with a support role to start. They all knew the ultimate objective, but that would come only with time once the right groundwork had been put in place. Everyone had to live with that reality. We couldn't get ahead of ourselves, or this S&OP effort would be no different than so many others.

With the new organization and a basic forecast review process in place, we decided to invest in a forecasting software called Forecast Pro, generating for the first-time statistical projections able to challenge the business intelligence input. This was the start of eliminating parallel forecasts that almost universally get in the way of being successful. Additionally, the new S&OP process was designed with the collaboration of the new organization recently hired. It was a mix of inputs from experienced supply chain professionals coming from different companies/ industries. Most of them had previous demand planning roles combined with the Consumer Health portfolio and business behavior knowledge, resulting in a fully aligned and customized process to the business needs.

This resulted in a robust S&OP process rolled out globally months later, creating and implementing a standard procedure in every single market. That was our first major win because it made S&OP an important and integral part of the business engine on a broad scale. Finally, S&OP had unprecedented breadth across the company, and we were still under-the-radar. That's not easy to pull off, but we did it by staying true to the original plan.

What happened during the next 18 months was just as important because we followed our strategic sequence. We refined our analyses to get even closer to the commercial world. This was essential, and central to the original plan to be part of the business process not an operational process. New concepts were introduced including sell in/ sell out, inventory at trade analysis and the CPFR (Collaborative Planning, Forecasting and Replenishment) model with key distributors in major markets.

Sensitivity for managing the demand directly with key customers (somehow bypassing the commercial organization) was visible. However, this didn't occur at the same level as I experienced in other companies when CPFR was implemented. This confirmed the effectiveness of the under-the-radar approach, especially at the very begging of the journey. Improved service levels, optimized inventory and sales increases at key customers after the CPFR model implementation endorsed the next steps of our business-oriented strategy.

By the time we got 36 months into the launch, regional S&OP had been implemented, consolidating key business decisions, product launches, risks and opportunities led by supply chain on a monthly basis. In parallel, a major investment in tools happened with the SAP-IBP implementation, moving our capabilities to a much higher level, allowing us to simulate different scenarios during the local meetings and accelerating decisions.

Six months later, the Global Executive S&OP was launched, focused on very strategic topics, key supply chain KPIs and executive summarized risks and opportunities. All three S&OPs (local, regional and global) were completely connected, but adapted to the different audiences. The main objective achieved was the trust of all levels of the organization in the process, naturally making the forecast validated in the S&OP as the baseline for the annual operating business plan and quarterly reviews.

Keys to success

Getting to this point was not a slam dunk, especially in a global organization that had just undergone a substantial restructuring in how it went to market. But we did make it happen. Figure 1 shows key metrics and how they paralleled each other over time.

This success story is not a one-off. It can be duplicated if certain key points are duplicated.

To begin, the cornerstone is inverting the way most S&OP programs are structured. That means structure 70% of the investment around the right people, 20% around process design and 10% in technology.

There's also no underestimating the high value proposition of working under-the-radar. The initial kick off was very silent, ensuring no expectations were created up front. The only open message was that supply chain organization and priorities would always follow the business ones. It sounds superficial, but all our actions over time confirmed that principle.

By fully integrating S&OP into the business (not into operations) very quietly, I believe others recognized the added value of such a business-oriented organization. S&OP should always fight for what is best for the business. While it was obvious to me and others this was the way to go, that approach

also turned out to be a secret weapon in S&OP's success. I still believe many people at the former Consumer Health division still do not understand how we progressed and achieved such outstanding results without major conflicts or negotiations.

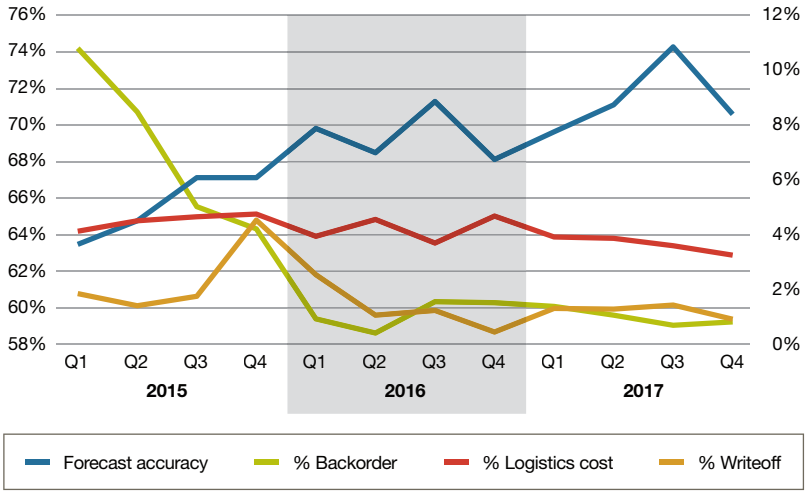
There is also a strong need for discipline in rolling out four key phases of the program. The initial phase requires you to design the effort 100% in line with the needs of the business. The second phase starts with initial under-the-radar efforts that put in place standard and robust S&OP processes that include, training, execution, support and expected results. This is also the time to bring in some technology. The third phase focuses on process improvement with commercial data and connectivity with key customers. The final phase is to go both regional and global in S&OP's launch with SAP-IBP tool implementation.

In retrospect, we fully executed the original plan, especially in organization and process areas. My estimate is the remaining 20% of the plan required adaptation on our part to changing circumstances and requirements that we did not anticipate. For instance, we started in the Americas and migrated to Europe, the Middle East, Africa and Asia. We ran into some cultural resistance as that rollout occurred, initially creating a challenging situation. That said, about a 20% level of adaptation is simply the nature of the beast.

FIGURE 1

KPIs development

Americas, 2015 to 2017

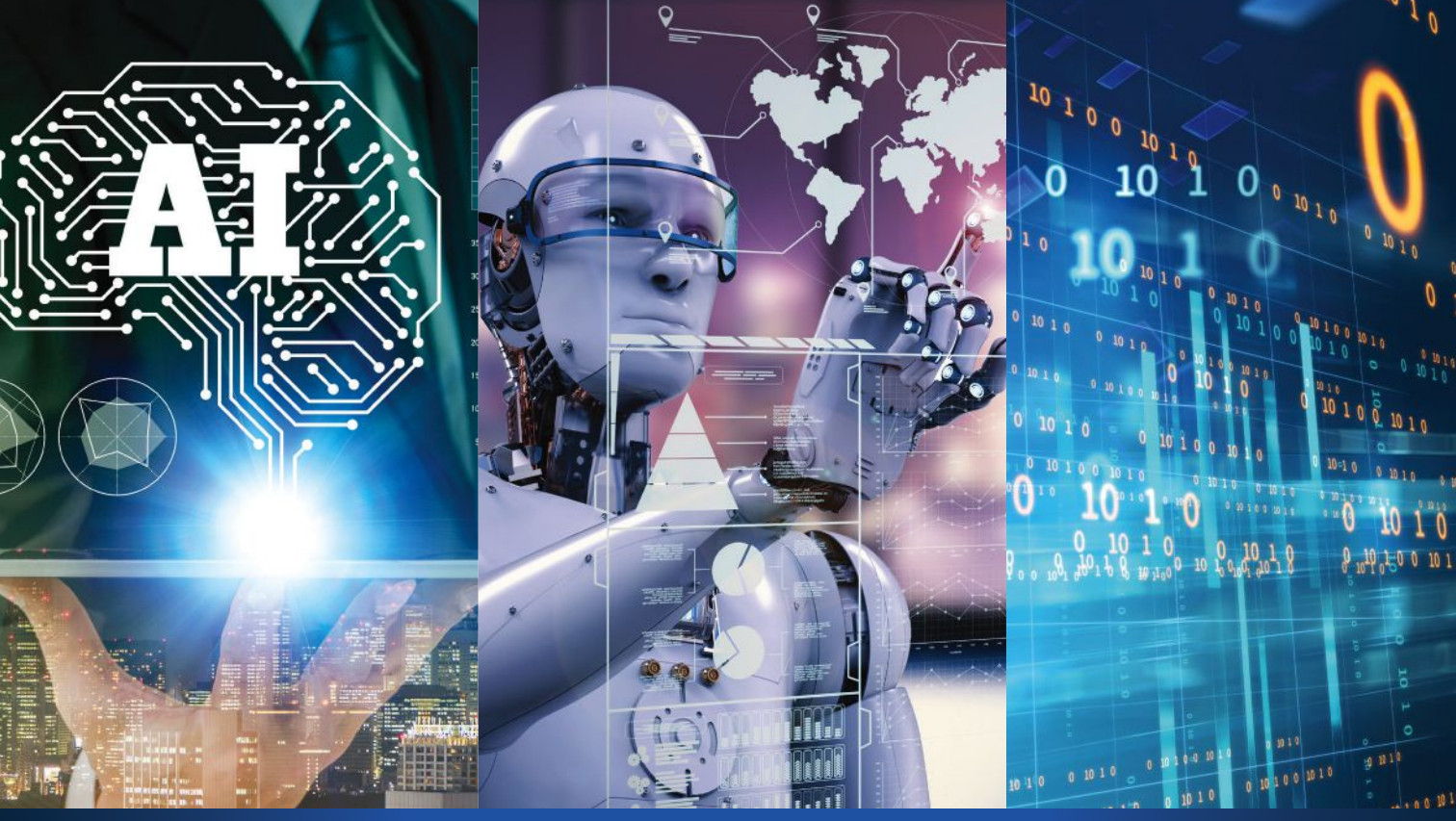


Source: Merck KGaA, Consumer Health Division

Consider the path

Unprecedented times such as these require quicker decisions and responses. Otherwise, S&OP is less likely to become fully connected and integrated in the business in a timely manner. It is possible to cut the implementation timeline by 50% without compromising the core principles and steps.

Along those lines, timelines are extremely sensitive. There is no room for limitless rounds of discussion and refinement. Decisions must be made quickly to keep pace with the rate of change in businesses today. Demand volatility and supply constraints never seen before will create an emergency mode environment more frequently. Fortunately, the more integrated the organization, the better the response to markets and consumers—and that is the key differentiator between a company with a highly effective S&OP team and everyone else.



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What got us here will not get us there

Why supply chains need granular and predictive shape of demand to enable omni-channel growth.

By Sameer Anand, Adheer Bahulkar and Aman Husain

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"All politics is local," remarked Byron Price, Associated Press' Washington Bureau Chief, in 1932. He continued, "every politician is looking for the combination which will help him at home." In the age of omni-channel, with its promise to serve every single consumer with what she wants, when she wants and how she wants, the same is now true for all brands and retailers—all supply chain is local.

It's no longer sufficient for them to move inventory of mostly standard products to the shelves. Now they have to move tailored product assortments and fulfill orders in myriad ways that respond to local consumer preferences. This creates a dual omni-challenge for supply chains: They will have to handle micro-segmentation efficiently while providing the service consumers demand. Mastering this is what we call shape of demand capability, and it's entirely possible if supply chain designers understand three things: geo-specific demand, demand drivers and the near- and long-term characteristics of demand.

The "omni-challenge"

No doubt, shopping has changed for good. Consumers now want an omni-channel experience and prioritize speed, simplicity and top-notch service when buying online, in-store and through social media and mobile platforms. Department of Commerce data reflects the shift to a digital experience. The compound annual growth rate for e-commerce sales was 15% from 2015 to 2019. Then it took off with the impact of COVID-19 apparent, reaching 25% year-over-year growth this year. What's more, we expect e-commerce to reach 20% to 40% penetration levels by 2025, which will also mean a tremendous shift in supply chain dynamics. Buying decisions that used to be made on price and brand attributes are now increasingly being made on product and service.

Therein lie the two challenges for omni-channel supply chains.

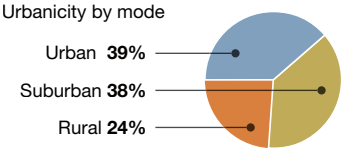
CHALLENGE #1: Variety is the spice

FIGURE 1
What supply chains need

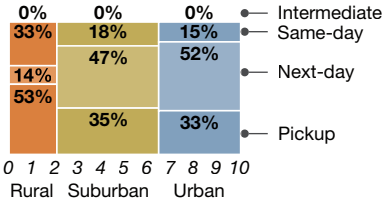
NEED GEO-SPECIFIC DEMAND SHIFTS...
- Account for long-term demand shifts
- Segment geo-channel specific service shifts
- Segment geo-specific assortment shifts

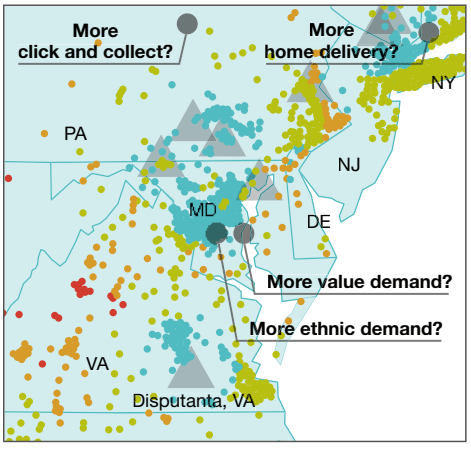
...TO INFORM SC AND ASSORTMENT SHIFTS
- Build up/downstream assets 2-3 years out
- Design geo-specific fulfillment models
- Plan to accommodate changing product mix

DEMOGRAPHIC-DRIVEN DEMAND SHIFTS
Urbanicity by mode



URBANICITY DRIVEN SERVICE SHIFTS
E-commerce service





Source: Kearney analysis

of life but the bane of supply chain

Micro-segmentation of consumer demand is table stakes. "There used to be, as late as the 1990s, 7,000 items in a grocery store, and now it's 40,000 to 50,000," says Michael Ruhlman, author of "Grocery: The Buying and Selling of Food in America." More new products, product flavors, versions (such as gluten-free), packaging choices, inventory and nodes are what we have now—and they continue to expand. Yet, shelf space in stores will probably shrink. What will increase is the number of planograms retailers and brands cater to, which does not even begin to cover the supply chain complexity of extended aisle and endless aisle offerings, especially if they will be clicked on and collected from your neighborhood store.

That brings us to the second challenge: Service.

CHALLENGE #2: Service at all costs—literally

Consumers are addicted to speed and, in the United States at least, to speed at no cost. Major retailers and e-tailers are investing billions to influence them with next-day, same-day and same-hour fulfillment models. In a recent survey, "Consumer Implications of the COVID-19 Pandemic," the Kearney Consumer Institute found that more consumers now make buying decisions based on product availability and fulfillment speed more than on brand and price.

Where consumers differ is in their preference for order fulfillment. Some like in-store pickup, while others prefer home delivery. Either one requires very different capabilities and investments in the supply chain. The push for same-day or same-hour fulfillment puts huge pressure on inventory to be forward-deployed at numerous nodes that may each need its own mix of product handling (for frozen foods, for example) and pick-and-pack operations (such as each pick or custom pack).

Lay on top of this the fact that consumer preferences for variety and service can vary significantly from one market to another and the effect is exponential. Demand shifts from urban to suburban to rural—and even between stores just miles apart, if they serve different segments based on age, household type, ethnicity and other factors.

How is the supply chain supposed to design for this?

"Shape of demand" puts you where you need to be

Using a shape of demand approach helps supply chain designers solve for the dual omni-challenges. We liken it to hockey, where skilled players skate to where they think the puck is going to travel.

For your supply chain to be that responsive takes the following (see Figure 1).

(1) Detailed, geo-specific insight about demand. You want to understand channel and category growth at a geographic level to design a supply chain that responds quickly to trends. Otherwise, when demand fluctuates, a static supply chain solution may not work.

(2) Nuanced understanding of demand drivers. Know what influences consumer tastes and buying preferences to predict how they'll shape demand in the future.

(3) Predictive algorithms for near- and long-term demand. Supply chain assets often need a two- to three-year lead time to be up and running. If you require a unique solution for each geographic area, channel and consumer segment, you'll also need at least that much time to respond.

Shape of demand doesn't mean we try to predict a future outcome 10 years in advance. Instead, we create viable scenarios of possibility to determine supply chain investments, regardless of future scenarios, based on inflection points we see in shape of demand. Such a long-term view also provides consistency in design and deployment of omni-channel technology solutions (including distributed order management and omni-warehouse management systems). And while supply chain may take one of many interim paths, eventually we reach the desired end state.

Achieving shape of demand

Let's get to the building blocks for a supply chain that has shape of demand capability. Following are the things to get right.

(1) Detailed data. Having good access to historical point-of-sale transactional data is foundational. What makes shape of demand rich is a combination of geo-specific macro-data (such as gross domestic product and unemployment), micro-data (including ethnicity and income), e-commerce data, consumer sentiment and feedback from expert panels. This data, quickly and regularly digested and incorporated, drives continuous improvement.

(2) Algorithms. Artificial intelligence-based, predictive algorithms that combine market intelligence with consumer behavioral data are at the heart of shape of demand. Constrained models, which are grounded in historical trends, and unconstrained models, which account for ground shifts and black swan events, each require sophisticated algorithms that produce viable future-demand scenarios.

(3) Visualization. We designed shape of demand for use by enterprise strategy teams and organizations' functional leaders. Visualization platforms with customized user interfaces make adoption smoother.

(4) Decision-making. Business operators' ability to make longer-term decisions about asset deployment, multichannel packaging, 3PL efficiency and location of distribution centers, among other areas, is crucial, as is their ability to take near-term action based on current facts and scenario probability.

Versatility and results

Successful consumer brands and retailers are fast adopting shape of demand across merchandising, e-commerce and the supply chain, utilizing AI-driven customer demand intelligence tools, such as Kearney's Janus. Among the sectors using it are health and beauty, alcohol and spirits, food and beverage and grocery (see Figure 2).

In merchandising, we've seen an alcohol beverage company use shape of demand to evaluate plausible markets for the U.S. wine and spirits industry in 2021, applying more than 30 variables—including macro and industry indicators—to predictive modeling for on- and off-premises locations—even accounting for COVID-19 vaccine deployment and economic recovery.

FIGURE 2

Use cases leveraging Janus (Kearney AI-driven customer demand intelligence tool)

	CASE STUDIES		
	USE CASE	**APPROACH**	**DEPLOYMENT**
MERCHANDISING USE CASE • AOP planning scenarios • Localization and "white space" • Prescriptive ordering (B2B2C) • Retail location competitiveness	Beverage alcohol company leveraged Janus to develop category- and channel-level forecasts (on-premise/ off-premise for 2021, accounting for scenarios for vaccine deployment and economic recovery.	Forecast projection through the application of Janus predictive modeling with 30+ variables including macro indicators, industry indicators, consumer sentiment survey, and expert inputs.	Projected future category performance and defined the shape of demand using a scenario-based approach to evaluate plausible future markets for the U.S. wine and spirits industry in 2021.
E-COMMERCE USE CASE • Market basket intelligence • Extended aisle offerings • Fulfillment (C&C, home preferences) • SCAAS offering	Leading grocer utilized Janus to anchor five-year omnichannel strategy by accounting for long-term demand shifts, geo-channel-specific service shifts, and geo-specific assortment shifts.	Analyzing consumer's demographics, assortment, and fulfillment preferences for e-commerce purchases at granular geo-level. Janus capability was applied to analyze e-commerce penetration scenarios at granular geo-level and model fulfillment expectations of the future.	Utilized scenarios to: • Inform the right fulfillment options by urbanicity and service expectations. • Identify white space share gain possibilities, potential for shared use nodes. • Lay out road map for infrastructure development for e-commerce acceleration.
SUPPLY CHAIN USE CASE • Breakdown of fulfillment types • Node throughput capacity • Four-wall design/configuration • "No regret" Capex decisions	Leading F&B company utilized Janus to build out long-term supply chain footprint across 800+ fulfillment nodes including warehouses, mixing centers, forward deployment, and last-mile fulfillment nodes.	Location by location predictive demand signals were utilized to inform node-specific pick/pack handling requirements, four-wall throughput, and service-level capability.	Delivered a future-proof supply chain infrastructure road map that ensured consistent ROI on every asset, while ensuring fit for purpose four-wall configuration and required mix of same-day/next-day service level to enable omnichannel growth.

Source: Kearney analysis

In e-commerce, a leading grocer used shape of demand to inform fulfillment by city and service expectations, identify white-space share-gain opportunities and plan for more e-commerce infrastructure.

A leading food and beverage company used the approach to build out a long-term supply chain with 800-plus fulfillment nodes, including warehouses, mixing centers, forward deployment and last-mile. The plan ensured consistent return on investment for every asset while delivering fit-for-purpose, four-wall configuration and the needed mix of delivery-service levels for omni-channel growth.

For any company and set of objectives, the key to shape of demand is to start small but fast. Begin with focused pilots and proof-of-concept to quickly build confidence in this advanced capability and create a natural business case for broader investment.

The omni-channel world we now operate in will separate the clear winners from the losers in the marketplace as supply chains respond to the dual challenge of micro-segmentation and multiple fulfillment models. Those that are steps ahead will have the advantage. We expect companies with supply chains that master shape of demand to grow at twice their competitors' rate, taking share from the rest. It is no longer enough for the supply chain to simply support the business—supply chains must enable new growth.

Learn from the best

Top performers use technology and collaboration to keep their planning effective.

By Marisa Brown, Senior Principal Research Lead, Supply Chain, APQC

Marisa Brown is senior principal research lead, supply chain management, APQC. She can be reached at mbrown@apqc.org.

With the unpredictable nature of 2020, many supply chain professionals are ready for a fresh start in the new year. The previous year was one in which supply chain staff had to be creative to minimize supply chain risks and optimize the supply chain so that business could continue.

Through heroic efforts, supply chain professionals ensured not only that their organizations would survive, but also that there were critical products on shelves for consumers and supplies at health care facilities. Organizations that were able to thrive in 2020 did so as a result of their efforts to develop strategy and culture, supplier relationships, processes, measurement frameworks and supporting technology.

With the new year, supply chains are regrouping to either get themselves back on track or build on the gains they made in 2020. An essential part of this effort is determining the organization's current state with regard to supply chain planning. Without an accurate assessment of its starting point, the organization cannot make a realistic determination of where it should go.

APQC strongly encourages organizations to assess their current state by benchmarking their performance against that of others. In its research on supply chain planning, APQC has identified several key performance indicators (KPIs) that provide an overarching look at how an organization fares on its supply chain planning. Moreover, APQC recommends that organizations look at the practices adopted by top performers to identify opportunities to refine and develop their capabilities.

Supply chain planning challenges

Traditionally, supply chain planning has prioritized efficiency and lower costs as a priority to both save the organization money and increase customer satisfaction. With the pandemic and resulting economic downturn, the emphasis has shifted to balancing efficiency with risk mitigation.

Organizations face supply chain risks beyond the potential for disruptive events like the pandemic. Even before COVID, organizations were trying to tackle discrepancies in supply and demand, secure real-time access to data, improve cycle times and increase supply chain visibility. The key to beginning

to address these challenges is to improve processes. Before an organization can start this effort, it must first lay the groundwork by defining its processes and setting key indicators of success.

The groundwork for benchmarking

Organizations can define their processes using tools like APQC's Process Classification Framework (PCF). A robust framework like the PCF breaks down processes into activities and tasks. This helps organizations place structure around what they do and gives them a common language they can use when benchmarking their performance.

An essential part of the benchmarking process is identifying key performance indicators (KPIs) for the organization to track and use to direct process improvements. Ultimately, which KPIs an organization selects will depend on which measures best align with the strategic goals of the organization. This article examines four overarching KPIs for supply chain planning:

- total supply chain planning costs per $1,000 in revenue;
- number of FTEs for the supply chain planning process per $1 billion revenue;
- cash-to-cash cycle time, in days; and
- perfect order performance.

These indicators are a great starting point for any organization, regardless of its strategic goals.

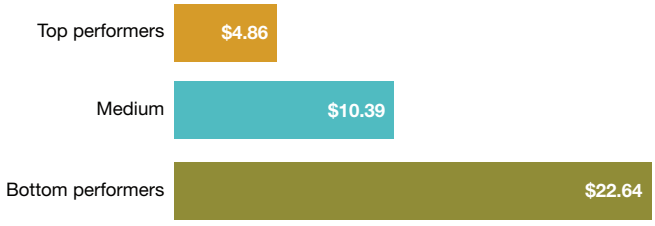
Supply chain planning costs

Most organizations will look at a cost measure to assess opportunities for improvement. In its calculation of the costs for the supply chain planning process, APQC includes costs for both the internal resources of the organization (e.g., personnel, systems and overhead) and any external or outsourced resources that perform supply chain planning. As shown in Figure 1, there is quite a difference between the supply chain planning costs of top performers and the costs of bottom performers. In fact, an organization making $1 billion in annual revenue stands to save $17.8 million by moving into top performer status.

Top-performing organizations make greater use of data. These organizations regularly evaluate the data sources they use to make key business decisions. They also share real-time inventory information with their customers and collaborate with their key suppliers to make forecasts. They also maintain flexibility by using analytics to identify potential risks to the supply chain. They ensure that their supply chain is capable of supporting both their existing and future business models so that they can pivot when needed.

FIGURE 1

Total cost to plan for and align supply chain resources per $1,000 revenue



Source: APQC

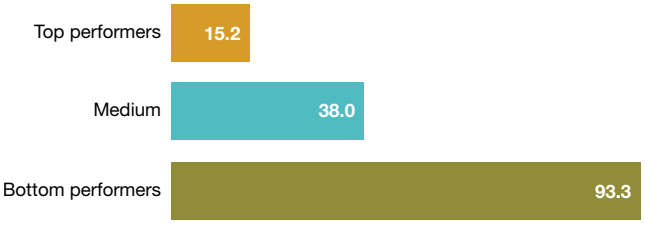
Supply chain planning employees

Efficiency ensures that the many areas involved in supply chain planning are as productive as possible. By maximizing the output of full-time equivalent (FTE) employees, an organization can minimize the number of individuals involved in supply chain planning regardless of the number of functions involved.

As shown in Figure 2, bottom performers require significantly more FTEs for supply chain planning per $1 billion in revenue: 78 more FTEs than top

FIGURE 2

Number of FTEs for supply chain planning per $1 billion in revenue



Source: APQC

performers. Even at the median, organizations need nearly 23 more FTEs per $1 billion in revenue for supply chain planning than do top performers.

APQC has found that leading organizations use technology to help streamline planning and thus reduce the number of FTEs needed to complete the process. Another option for streamlining is to create a shared services center or other centralized group providing supply chain planning resources. Through consolidation and the use of supporting technology, organizations can free up staff to focus on value-added activities without sacrificing supply chain planning efforts.

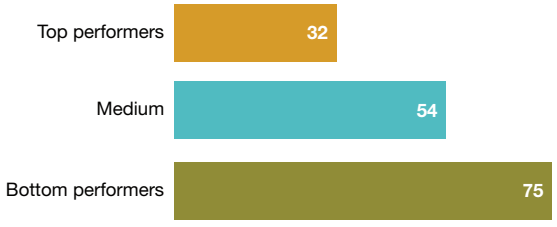
Cycle time

Cash-to-cash cycle time is another indicator of whether an organization is successful in its supply chain planning efforts. The faster the cash-to-cash cycle time, the less time that an organization's working capital is tied up in managing its supply chain. This means that an organization has capital available to address disruptions or market fluctuations.

As shown in Figure 3, top performers have a cash-to-cash cycle time of just over one month (32 days). By contrast, bottom performers have a cycle time of two and a half months (75 days).

FIGURE 3

Cash-to-cash cycle time, in days



Source: APQC

A simple way for an organization to reduce its working capital is to reduce its inventory. Although reducing the amount of inventory on hand can lead to a shorter cash-to-cash cycle time, it is possible for an organization to get too lean and put itself at risk for shortages should there be a disruption in supply or a change in demand. As 2020 has shown us, organizations must incorporate risk planning into their supply chain strategies to ensure their resilience and longevity.

It may make sense for an organization to pay more to source materials—especially those on the critical path—from a closer supplier that provides a more secure pipeline of materials than to pay less for materials from a distant supplier. Given the widespread supply chain disruptions organizations have experienced in 2020, mitigating risk is worth the extra expense.

Perfect order performance

An organization's perfect order performance is the culmination of its efforts across the supply chain. Accurate and efficient planning enables an organization to deliver orders on time, damage free, complete, and with accurate documentation. As shown in Figure 4, there is a 12% difference in the perfect order performance between top performers and bottom performers. Even at the median, 10% of organizations' orders have some form of failure.

Such a high rate of failure signals that many organizations are placing their customer satisfaction at risk. Perfect order performance is a valuable KPI because it looks at the accuracy of the total order rather than only one

aspect, such as on-time shipments or orders received damage free. To improve their performance, organizations can evaluate each aspect of the order and determine where focus is needed.

Top performers assign ownership for their master data processes and data points to ensure accuracy, and they automate processes when they can to enable the quick identification of errors. Top performers also work closely with their key customers to create demand forecasts and get early warnings of impending changes, and they use modeling tools to create visibility into their entire supply network from sourcing to distribution. By ensuring that all relevant functions provide input into sales and operations planning, they increase the amount of orders delivered without errors.

FIGURE 4

Perfect order performance

Source: APQC

Flexibility and collaboration

Supply chain planning provides a strategic advantage as it gives organizations an opportunity to optimize their processes and technology and improve performance. More mature organizations do this through greater investment in advanced analytics, predictive algorithms, and decision support tools. This enables them to gain more visibility into their supply networks and become more flexible to meet changes in demand, address disruptions, and pivot to new business models.

Top performers are also enabling greater collaboration both within and outside of their organizations. They facilitate streamlined, more thorough supply chain planning by encouraging collaboration among functions and throughout the entire order and fulfillment chain. They also develop strategic partnerships with their key suppliers and top customers as a way of better anticipating supply and demand needs.

Improved supply chain planning can help organizations to either move forward in the new year or get back on track. How top performers fare on overarching KPIs provides a point of comparison for organizations looking to gauge whether their planning efforts can use closer examination and improvement. The use of benchmarking ensures organizations have a solid planning foundation before they begin to make improvements.

About APQC

APQC helps organizations work smarter, faster and with greater confidence. It is the world's foremost authority in benchmarking, best practices, process and performance improvement, and knowledge management. APQC's unique structure as a member-based nonprofit makes it a differentiator in the marketplace. APQC partners with more than 500 member organizations worldwide in all industries. With more than 40 years of experience, APQC remains the world's leader in transforming organizations. Visit us at apqc.org, and learn how you can make best practices your practices.

2020 Virtual Summit: Building in supply chain resilience

This year's summit helps attendees shake off the impacts of a difficult year and use digital transformation, risk management, reshoring and other tools to reimagine their operations for success in 2021.

The spotlight on supply chain and logistics shone pretty brightly in 2020 as organizations worked to overcome a global pandemic, subsequent economic impacts, labor shortages, U.S. wildfires, and an unusually active hurricane season.

In a year where Murphy's Law reared its head on multiple occasions, the editors of *Logistics Management* and *Supply Chain Management Review* were in the trenches with supply chain professionals, reporting on the latest activity and offering sage advice to companies across a wide range of industries.

And during a year when online conferences effectively supplanted live, in-person events, the "2020 Virtual Summit: Building in supply chain resilience" attracted an impressive lineup of keynote and session speakers as well as a broad audience of participants. In fact, 2020 marks the 15th year that *Logistics Management* and *Supply Chain Management Review* offered readers a virtual lineup of educational sessions designed to prepare logistics and supply chain operations for the year ahead.

Here's a snapshot of each presentation and the key takeaways offered by the experts who participated in the 2020 Virtual Summit.

KEYNOTE

Rethinking risk and resilience in the aftermath of the pandemic

A major shock to supply chain operations, COVID-19 exposed the weaknesses of the current supply chain paradigm and forced firms to consider the challenges of rebuilding their supply chains due to supplier exits.

For some industries, the pandemic even forced a major rethinking of business models.

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And while these are all valid pain points, there's a silver lining to all of this: The pandemic is giving companies a chance to rethink supply chain resilience.

In this keynote session, Steven Melnyk, professor of operations and supply chain management at Michigan State University, discusses how companies will rebuild while also creating a better, stronger supply chain for the future. After all, the foundations for doing so have been there all along, and most systems and people are ready for change.

In his presentation, Melnyk highlights risk and resilience, examines the risk impacts from COVID-19, and shows what risk and resilience 2.0 will look like post-COVID. "The current situation has accelerated certain developments, which were present prior to the pandemic," he says, "but which have now been exposed or opened as a result of the pandemic."

Defining supply chain risk and resilience as "the ability of a supply chain to both resist disruptions and recover operational capabilities after disruptions occur," Melnyk says the two major capabilities are resistance and recovery, both of which are measured along with time, quantity, strategy, and stock price. "Economically," he notes, "the pandemic has been a disaster."

The hidden, overlooked impacts of COVID-19 include the vulnerability of small- to medium-sized businesses, which bore the burden of pandemic. These small businesses are extremely important to the supply chain, he explains, even though they are often "hidden."

Looking ahead, Melnyk says companies must rethink risk and resilience by managing multi-tier supply chains—a weak point for many. "The new form of resilience builds on prioritization, being a good customer, and supplier development," says Melnyk, who wraps up the keynote with a list of success tips for 2021 and beyond.

He ends his session with this piece of sage advice to all supply chain operators and logistics leaders: "We have to stop thinking in silos, and we have to work toward a collaborative supply chain."

SESSION 1: Digital Transformation

How the pandemic accelerated supply chain technology trends

The push to integrate more technology and automation into the supply chain was already well underway pre-COVID, with the unexpected health crisis—and subsequent supply chain shocks—greatly accelerating the trend.

For example, technologies such as the Internet of Things (IoT), artificial intelligence (AI), robotics, real-time data

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analytics and communications platforms that facilitate telecommuting all provide visibility into supply chains and also enable contactless, paperless operations. And while these technologies were used to deal with the immediate impacts of the pandemic, they will also have long-term benefits for the performance and resilience of supply chains and businesses.

In this session, Yossi Sheffi, the director of the MIT Center for Transportation and Logistics, examines how the pandemic has accelerated the development and adoption of these technologies and the implications they have for supply chain resilience—both now and in a post-pandemic world.

"Every disruption is different," says Sheffi. "It comes with its own litany of causes and effects and problems. No two are the same." He goes on to say that risk management involves prevention, detection, and response. Many companies have some kind of emergency management, he adds, be it physical or virtual (the latter of which came about due to the pandemic).

To address crisis management, Sheffi says companies need good communication with customers, suppliers, employers, and beyond. "Even if you don't have all the information, good communication includes what we know, what we don't know, and what we're working with," says Sheffi. "This helps with uncertainty."

Pointing out that many companies have had to make COVID adjustments (i.e., moving their operations online), Sheffi says IKEA now has an augmented reality app to see what items look like in your home, and Sephora is giving beauty tutorials online instead of in-store makeovers. "This is the supply chain professionals' finest hour," he explains, "and a time where they can step up to solve these challenges."

SESSION 2: RESEARCH

29th Annual Study of Logistics and Transportation Trends

The speed of technological and societal change no longer affords companies the luxury of slow incremental improvements or adaptations. Instead, logistics and supply chain managers must look forward and dare to ask the hard question: Are we willing to change?

The "29th Annual Study of Logistics and Transportation Trends" posed this question to logistics and transportation professionals to gain added insights into how organizations are responding to the disruptive pressures of new technology, rising customer expectations, and a global pandemic.

In this session, Christopher A. Boone, Ph.D., assistant professor at Mississippi

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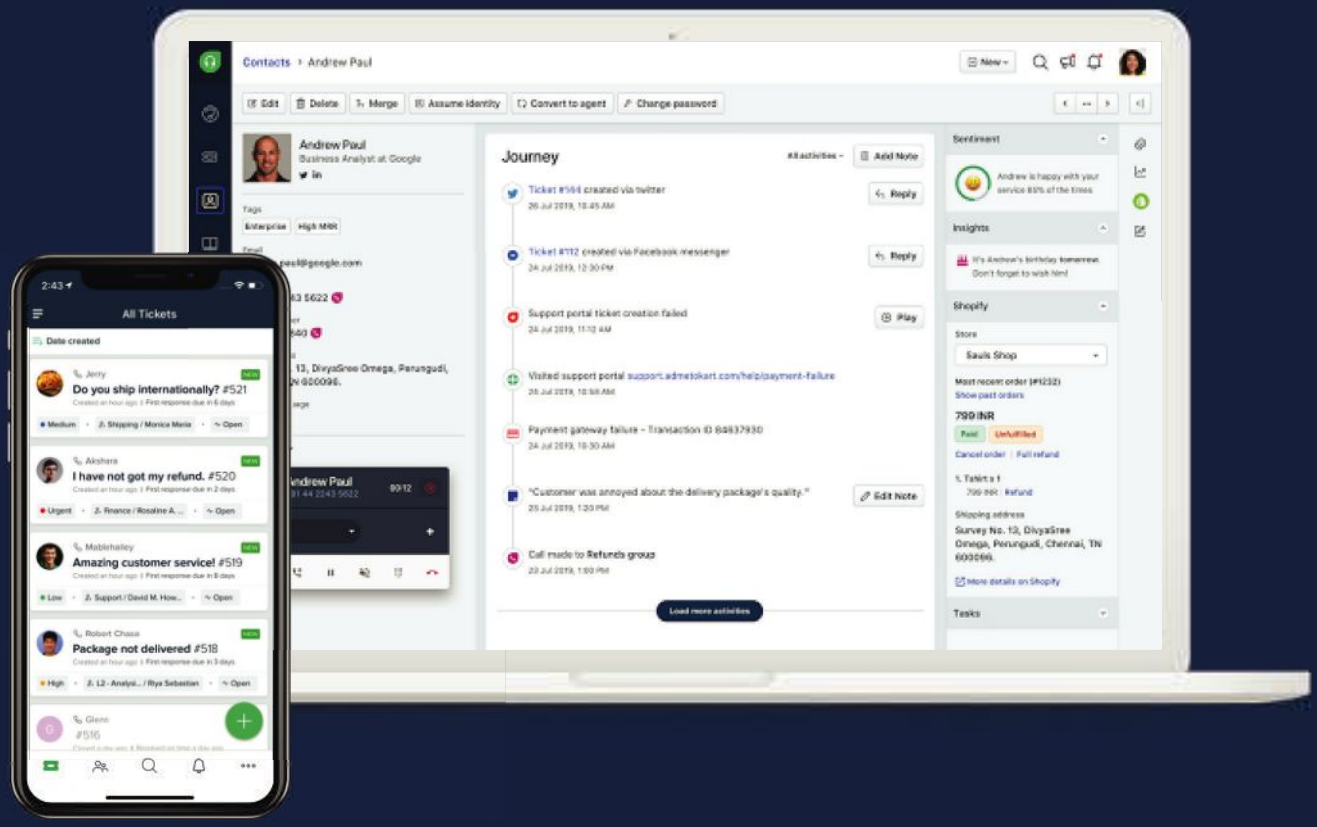

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State University and Karl B. Manrodt, Ph.D., professor at Georgia College and State University, review the survey results, discuss key trends, and offer recommendations for current and future supply chain success.

"Most respondents think transportation is fundamentally changing," says Manrodt. "The majority also agree that they will see an increase in funding for transportation, too. Normally that's not the case, and usually they're just on their own when it comes to dealing with change."

Boone says that we're also seeing a shift in meeting customer expectations and that's driving the shift into smaller individual orders and shipments. "This is how companies are responding to customer expectations," he explains, "and the impact that's having on how they're spending transportation dollars."

The speakers then discuss types of technology companies are looking at this year, such as visibility, predictive analytics, AI, robotics, electronic bills of lading, and the Internet of Things. They say funding for transportation technology initiatives is increasing and that, across the board, "everyone should be investing more in technology than they did in the past."

"COVID is a catalyst both on the carrier side and the shipper side for transformational transportation projects," says Manrodt. For instance, he says companies really need to think more about partnerships and working together to be successful.

Technology will serve as the catalyst that helps solidify those alliances and that puts companies on the path to success. "Technology isn't just enabling us to do some of the things we're doing now a little bit faster or a little bit better," says Boone, "it's really giving us the opportunity to rethink how we can do things completely differently."

SESSION 3: SOFTWARE

TMS: Essential to efficiency

Especially amid disruption, transportation management systems (TMS) help companies carve out a path for efficiency and productivity for their modern supply chains. For supply chain operations, end-to-end transportation visibility increasingly includes TMS integration with upstream and downstream systems, as well as granular data analysis to prioritize and optimize shipments.

In this session, Howard Turner, project director at St. Onge Company, takes a closer look at how businesses of all sizes can use TMS solutions to drive efficiency

and flexibility while proactively positioning themselves for success.

Turner starts with a quick overview of TMS and its capabilities, noting that the software manages inbound, internal, and outbound shipments. Transportation

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networks are extremely complex with multiple suppliers and stakeholders that can be hard to manage, he says, and increasing visibility and securing transportation capacity are extremely important in the current landscape.

"A TMS is a tool that assists with analyzing and determining the optimal means to achieve your transportation goals," Turner points out, noting that the software is typically integrated into the enterprise resource planning (ERP) system, then can be downloaded to a warehouse management system (WMS) for fulfillment.

Explaining that on-premises and Cloud TMS deployments come with their own pros and cons, Turner says that either option can handle the consolidation of orders for larger shipments, transportation optimization, real-time tracking, carrier performance measurement, transportation planning, and process automation (among other functionalities).

"Strategically investing in and properly deploying the right systems can allow your business to withstand and potentially thrive in an ever-changing landscape," Turner concludes. "Properly using tools to navigate transportation disruptions can have a direct impact on your company's bottom line."

SESSION 4: E-COMMERCE

Last-mile fulfillment: Solving an ever-complex puzzle

COVID-19 accelerated the move to e-commerce for everything from groceries to classic cars, challenging existing B2B and B2C supply chain models. Amid this disruption, a flurry of innovation has thrived, including ship-from-store, curbside pickup, and hyper-local fulfillment, all of which have gone from fringe to mainstream.

Concurrently, new last-mile delivery models are shaking up the balance of power in package delivery. Alan Amling, a fellow at University of Tennessee and CEO at Thrive and Advance, LLC, uses this time to explore the emerging last-mile landscape—from fulfillment to the front porch—and provide alternatives to consider as companies navigate a world where disruptions are the rule, and not the exception.

COVID-19 has accelerated e-commerce by five years in just five months, Amling says. It has also boosted innovation, with supply chain companies and retailers innovating and pivoting to keep up with changing customer demands. "There has been sort of a butterfly effect," he explains, "where one small change has built up into a larger impact. These small changes compound to produce industry shaking impacts."

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Amling then discusses the distinct e-commerce leaders that are setting the pace, like Walmart and Amazon. They are setting the bar on service when they do things like moving from two-day to one-day shipping or Walmart doing same day delivery for groceries, he notes. "As a result, new last-mile fulfillment models are taking shape, such as ship from store and drone delivery."

Pointing out that the future of delivery revenue goes beyond just shipping and delivery cost, Amling says smart companies are "playing offense," versus attempting to defend their territory. "This is the era of organizational velocity," he adds, "which is the ability to observe, accept (or not), and act (or not) on threats and opportunities facing the firm with speed and agility."

SESSION 5: Robotics

State of robotics: Consider robotics in 2021

Robots, including autonomous mobile robots (AMRs), are seeing a rapid uptick in logistics and supply chain operations, with their usage projected to increase as the world recovers from the pandemic.

In this session, presenter Jeff Hedges, president at JHedges Consulting, offers attendees an in-depth look at the different types of robots coming into the market, and examines the value proposition behind these various approaches. He also explores how operations can better tie robotics in with automation and the workforce as logistics and supply chain operations work to build their long-term resilience strategy.

"There's a lot of hope and a lot in interest in these technologies as we see dozens, if not hundreds, of venture capitalists and private equity firms continuing to invest," says Hedges, who estimates that the robotics market will reach $4 billion by 2025. The industry is also seeing more investment in AI, even as a standalone technology, he adds.

Explaining that autonomous mobile robots (AMRs) are vehicles made to transport an item from point A to point B, Hedges says these vehicles don't eliminate the picker; they just decrease travel time. Picking robots are made with more of an item picking focus, and are improving in the area of handling or sorting returns, kit assembly, and order verification and accuracy, while also making operations more cost effective.

During the coming year, Hedges expects labor availability to be a major concern—yet another reason why more companies are turning to robotics for help. "We're past the early adopter phase," he says. "Companies are definitely accelerating implementation plans."

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A SPECIAL SUPPLEMENT TO SUPPLY CHAIN MANAGEMENT REVIEW

SESSION 6: RESHORING

Global strategy: The pros and cons of reshoring

High transportation costs, supply chain interruptions, and global trade wars are all pushing companies to reexamine their global manufacturing and sourcing strategies. Some of them are bringing their operations back to the U.S. through a process known as "reshoring."

This session finds Rosemary Coates, executive director of the Reshoring Institute, walking attendees through the offshoring timeline and showing why reshoring may be a good choice for organizations now and in the aftermath of the global pandemic. "In the 1990s and 2000s, offshoring to China was the economic strategy for many U.S. manufacturers," Coates says. "Fast forward to 2020, and companies are looking to move away from China and back to the U.S."

Coates says that the catalyst for reshoring was the 2012 election, although companies didn't immediately start moving their operations. "It was the turning point and beginning of the reshoring movement in America," she says.

To companies that are considering this move, she says the first step is to evaluate your total cost of ownership (TCO). Factoring in variables like automation, proximity to markets, order fulfillment times, logistics costs, the value of "Made in USA," customer preferences, and economic incentives.

"Every company is different and decisions cannot be made on numbers alone," she explains. "Doing your cost of ownership is not simply a comparison of costs; you really have to look at the whole strategy of reshoring in order to make an effective case for bringing manufacturing back."

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