The Ferrari Consulting and Research Group LLC and Supply Chain Matters Blog©

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2019 Predictions for Industry and Global Supply Chains

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Introduction and Purpose

Once a year, The *Ferrari Consulting and Research Group* provides a series of predictions for the coming year. These predictions are provided in the spirit of helping multi-industry supply chain management teams in setting agenda for the year ahead and helping our clients and readers to prepare their supply chain management teams in establishing meaningful programs, initiatives and educational agendas.

Our process includes a re-look at all that occurred in the prior year, a reflection of future implications, and soliciting input from clients and other supply chain and industry observers.

The context for these predictions includes the broad cross-functional umbrella of supply chain strategy, planning, execution, product lifecycle management, procurement, manufacturing, transportation, logistics and service management business processes and supporting technology.

Each of our predictions are monitored throughout the year and we will scorecard each toward the conclusion of the year.

We will further provide added insights regarding all of our ten predictions for 2019 through augmented research advisory reports and continuous updates on the *Supply Chain Matters blog*.

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Overall Themes for the Coming Year

The Ferrari Consulting and Research Group *2019 Predictions for Industry and Global Supply Chains* include themes of continuing changes, disruption and added industry risk in the coming year. Many of the themes that we declared for 2018 carry over to the coming year but in different dimensions:

- An optimistic but cautious global economic outlook for revenue growth that comes with downside risks, possibly economic recession.
- Needs for across the board talent recruitment and retention efforts reaching alarming stages, possibly impacting ongoing initiatives.
- Cyber-attack risk and information security threats becoming inevitable with information safeguarding at all levels becoming mandatory.
- The multi-year transition to *Digitally-Enabled Response Network* capabilities continuing.
- Positioning for global online retail presence meeting the realities of geo-political and investor forces.

In addition to the above, we are predicting that:

The escalating geo-political landscape involving trade conflicts added tariffs, threats of increased business disruption will result in unprecedented global supply and customer demand network challenges that will occupy the attention of senior management at all levels, especially supply chain management.

Global logistics, transportation and third-party logistics entities will finally confront the converging forces of industry business model disruption with a lot of process, technology and stakeholder implications.

Higher levels of global supply chain risk, complexity and cost will lead to the presence of discernable structural industry shifts occurring with far-reaching longer-term effects:

- Final production and/or product assembly processes located closer to major customer concentrations. Increased investments in higher levels of manufacturing process automation and additive manufacturing techniques to provide more flexibilities in production siting among global regions.
- More supply network sourcing being shifted away from China to other Asia-based regions with specific countries or regions benefitting.
- Facility and technology investments in online customer fulfillment being prioritized and leveraged to move closer to customer concentrations to save on transportation and logistics costs.

2019 Predictions in Detail

2019 Prediction One: An Optimistic But Cautious Economic Outlook for Global Growth in the Coming Year with Downside Risks

Reflecting on 2019, we predict that industry and global supply chains will encounter a lot more uncertainty relative to global trade, currency, geo-political and climate change risks. A review of key economic and other indices that are important to industry and global supply chain management teams contrasts the past three years:

Key Global Supply Chain Indices	End of 2016	End of 2017	End of 2018	2017-2018 Change
Equities				
Dow Jones Industrial Average- DJIA	19763	24719	23327	-5.97%
S&P 500 Index	2239	2674	2506	-6.70%
Key Interest Rates				
Federal Funds Target Rate (FFTR)	0.75%	1.50%	2.50%	40.00%
U.S. Prime Rate	3.75%	4.50%	5.50%	18.18%
Currency Markets				
Wall Street Journal U.S. Dollar Index	$92.94	$85.98	$96.47	10.87%
Value of Euro to U.S. Dollar	$1.05	$1.20	$1.14	-5.26%
Value of China Yuan to U.S. Dollar	$6.94	$6.50	$6.88	5.52%
Key Commodity and Energy Markets				
Dow Jones Commidity Index-TR	273.80	282.34	260.28	-8.48%
S&P GSCI Index	2417.3	2556.7	2206.9	-15.85%
USD Price of Brent Crude (per BBL)	$56.75	$66.63	$53.80	-23.85%
U.S. Avg. Retail Price Diesel (per gal.)	$2.51	$2.91	$3.12	6.73%
U.S. Avg. Retail Price Gasoline (per gal.)	$2.25	$2.59	$2.65	2.26%
Global Supply Chain Activity				
J.P. Morgan Global Manufacturing PMI	52.7	54.5	51.5	-5.83%

World Container Index- Drewry Shipping Consultants (Eight major routes to/from the U.S., Europe and Asia)	$1,550	$1,200	$1,793	33.07%

Global and Regional Economic Outlooks

The consensus of 2019 economic viewpoints that we have reviewed call for an optimistic but cautious economic outlook for global growth for industry and global supply and demand networks to plan for in the coming year. That stated, there are discernable downside risks dependent on specific global regions and developments during the year.

The International Monetary Fund (IMF) World Economic Outlook published in October 2018 indicated that the steady expansion under way since mid-2016 will continue, but with global growth rates to essentially remain at 2017 levels. Global growth is forecasted to be 3.7 percent for both 2018 and 2019, a 0.2 percentage point decline from the April 2018 forecast. The agency noted that downside risks to global economies have risen in the prior six months with the potential for upside growth most likely receded.

While economic momentum in the United States remained somewhat strong at the end of 2018, the U.S. forecast for 2019 was revised slightly downward due to trade and tariff impacts. Growth projections for China, the Eurozone and the United Kingdom and a number of other Asian economies were reduced in aftermath of recently announced trade measures. The *IMF* warned that tighter financial controls in advanced economies could cause disruptive adjustments, sharp exchange rate movements and reductions in capital inflows to emerging markets that have greater vulnerabilities.

Most economists indicate that while economic recession is not imminent in the coming year, there remains a 20-25 percent probability that economic recession could occur, with recession risk more likely in the 2020 time period.

A reinforcement of building concerns for economic setback came from a *Duke University CFO Global Business Outlook Survey* released in mid-December. The survey indicated that almost half of U.S. *CFO's* believe recession will occur in the U.S. economy by the end of 2019. Upwards of 80 percent of U.S. CFO's lean toward recession occurring by the end of 2020. Similarly, similar year 2020 recession concerns extend to *CFO*'s from Canada, the Eurozone and Africa. Concerns centered on heightened stock market volatility and leading financial indicators, ongoing challenges in finding qualified employees and the rise in international trade disputes.

Concerning the U.S., a November 2018 survey conducted by the *American Institute of Certified Public Accountants* reflected some reduced optimism for U.S. economic growth in 2019. Whereas in the fourth quarter of 2017, 74 percent of finance executives had a positive outlook for the economy, the 2018 survey reflected only 57 percent of executives having such an outlook.

Concerns over trade policies, a building U.S. budget deficit, higher interest rates and a fading euphoria over the U.S. corporate tax overhaul will all attributed to some decline in optimism.

The Organization for Economic Cooperation and Development (OECD) indicated within its *November 2018 Economic Outlook* that while global economic growth remained strong, the cycle is believed to have passed its peak and faces escalating risks including rising trade tensions and tightening of financial measures. *OECD*'s global *GDP* projection was reported as 3.5 percent for 2019.

A shakier outlook for 2019 reflects deteriorating prospects related to emerging markets. It is also attributed to growing trade tensions and weaker investment globally. Within its report, *OECD* indicates through graphical data that trade growth, reflected by manufacturing new export orders, has been sharply decelerating since the middle of 2018. Global ocean container port traffic data reflects a similar sharp deceleration in export activity. One section titled, *Clouds Are Gathering On The Horizon,* presents visualized graphs indicating that tariff hikes act a brake on *GDP* growth, and that a slowdown in China would weigh on growth across the world.

The U.S. is expected to raise prevailing interest rates again in 2019, but at a reduced level after four rounds of small incremental rate hikes in 2018.

Across the Eurozone, a noticeable decline in manufacturing and supply chain activity during 2018, with growing uncertainties related to a potentially messy *Brexit*, a continued aggressive stance on tariffs by the United States, and the fragile economies of Italy and Greece has many financial executives on edge. As we pen these predictions, the fate of the March 2019 *Brexit* plan remains very uncertain as to whether Britain will endorse the draft EU plan.

Trade and tariff tensions among China and the United States remain uncertain and changing with each passing day, without any sense of closure. The re-constituted *United States, Mexico and Canada Trade Agreement* (*USMCA)* faces a period of legislative ratification in 2019 among the three nations with some agreement areas uncertain.

Similarly, tariff actions coupled with significantly higher fuel and transportation costs have forced U.S. businesses to raise prices on a range of manufactured and imported goods as well as services. U.S. manufacturers are paying upwards of 8 percent more for aluminum and upwards of 40 percent for steel. That is driving added concerns for broader price inflation in the economy.

The Institute for Supply Management (ISM) Semiannual Economic Forecast published in December 2018 reflects the views of purchasing and supply management executives for 2019. The panel-based report had a tone of overall optimism that U.S. manufacturing industry growth for the first-half of 2019 will surpass that of 2018, with business continuing to expand in the second-half. Overall, the panel expects a 5.7 percent net increase in overall manufacturing revenues compared to a 5.1 percent predicted increase for 2018. Surprisingly, U.S. manufacturers are predicting growth in both exports and imports in the coming year. Capital expenditures are expected to grow by an average of 6 percent compared to a reported average of 13.4 percent for 2018. Purchasing managers reported that their companies are currently operating at 85.2 percent of normal capacity, slightly lower than reported in May 2018.

Anticipated Global Supply Chain Activity Levels

Indices for global-wide manufacturing and supply chain activity for December 2018 further point to both subdued activity levels and initial shifting of sourcing locations. The closely watched *J.P. Morgan Global Manufacturing PMI*, a broad indicator of global manufacturing and supply chain activity, posted a value of 51.5 for December 2018, its lowest level since September 2016, and reflected a four-percentage drop from the beginning of 2018. The authors noted that December represented a subdued performance at the close of the year and that the future outlook remained relatively lackluster, as business confidence dropped to its lowest level in the series history.

Summing Up

Current global economic and operational activity forecasting data reflects measured but cautious optimism regarding economic growth levels for 2019, depending on the perspective. Economists and bankers anticipate some slowing of the overall global economy coupled with optimism for certain regions. They cite a continuing period of volatility and potential for downside risks given the current geo-political and global trade climate. Purchasing and supply management executives seem to be more optimistic as to added growth in 2019.

Individual supply chain management organizations will have to dig deep into the data to ascertain individual industry forecasts and risks.

Our view remains cautious primarily because we sense the beginnings of structural global supply and demand network changes occurring across certain industry sectors in the coming year that will likely extend to future years.

2019 Prediction Two: Needs for Talent Recruitment, Development and Retention Will Reach Alarming Stages Possibly Impacting Ongoing Initiatives.

For the past two years, we predicted a talent perfect storm, one that would occupy a lot of management attention for all the functions that make-up the umbrella of today's supply chain management roles and responsibilities. The perfect storm was increased demand for both specialized and general skills meeting limited available supply of talent.

Indeed, such predictions came to pass for both years. The quest for talent has spread across global regions, and especially for developed regions such as Canada, the Eurozone and the United States. Likewise, developing regions have needs for specific advanced technology and general management skills.

We now predict that needs for talent acquisition and retention will likely escalate to what experts believe will be higher levels of concern, hindering functional and business need requirements in areas of process transformation and adapting to the required business changes required for 2019 and beyond.

When we unveiled our 2018 prediction scorecard for this specific area, recruiters and employers indicated that some progress was made in increasing supply chain management related compensation levels and working conditions. Similarly, companies and organizations stepped-up efforts to recruit candidates from colleges and universities, governmental training programs or military veteran outplacement programs. U.S. manufacturers have further been able to close some of the gaps in recruiting or training of skilled manufacturing talent. All such efforts were important.

Despite these efforts, overall demands for talent continue to escalate management attention.

The overall amount of data and information needing to be analyzed by supply chain management teams has increased requiring candidates with deeper and broader analytical skills. The implications of an explosion in online commerce, with more goods in constant movement continues to fuel needs for added logistics, transportation, customer fulfillment and operations management talent.

Recruiters and employers indicate building talent shortages in areas of strategic sourcing and procurement, supply chain and integrated business planning, omni-channel logistics and customer fulfillment. Geo-political developments, trade war and other threats require more international sourcing experience along with senior management advisory skills.

Our panel of experienced recruiters indicated that qualified supply chain management candidates are currently averaging 3-4 job offers before making an employment decision. In logistics, trucking and customer fulfillment areas, an increased emphasis on employee referrals, social media and mobile device advertising techniques have yielded results but demand levels continue.

Rodney Apple, *Founder and Manager Partner* at SCM Talent Group reinforced to us that there is no better time to be in the supply chain management field given the current market dynamics. Jason Breault, *President* of specialty supply chain planning recruitment firm LifeWork Search indicated that in today's hot market for talent, a bachelor's degree may not be enough to land the ideal position. Similarly, deep analytical skills need to be complemented by proven cross-functional collaborative and team management skills.

Unprecedented levels of low unemployment levels in areas, such as Canada and the United States, and more experienced baby boomers continuing to exit the workforce on a monthly basis cause the skill acquisition need to become more acute in 2019. Bronwen Hann, *President and Senior Partner* at Canadian based supply chain management specialty recruiting firm Argentus Recruiting described the current supply chain talent challenge as reaching "*alarming*" stages on a global-wide scale. More baby boomer are exiting while company needs for specialized talent continue to increase.

Large employers can attract candidates because of brand recognition and budget resources, while smaller business or up-and-coming industry disrupters must rely on more incentives related to growth, working environment and added responsibilities.

The millennial workforce is attracted to companies that offer broader opportunities for growth, exposure to more advanced technologies and cross-functional assignment opportunities. According to our panel of experts, hints of a supply chain organization on the decline and not investing in the future, or a noticeable shift toward broad cost reductions can trigger millennials to jump to a more attractive employer that is willing and able to invest in added talent.

Added Efforts

Individual businesses, industry groups and governmental bodies will need to re-double efforts to attract emerging talent to careers that umbrella today's industry supply chain management functions. They need to include garnering interest and exposure within middle and high school, technical, vocational and community college levels, including introduction of supply chain management curriculum.

Retention comes from efforts directed at competitive compensation, attractive benefits, quality of work life and clear career paths that blend added cross-functional responsibilities with broader change management and program oversight skills.

2019 Prediction Three- Unprecedented Levels of Global Supply Network Challenges Will Continue to Concern C-Suite and Industry Supply Chain Senior Executives.

For 2018, we predicted a challenging year for managing direct material costs. While inbound commodity prices were expected to have modest increases at the beginning of 2018, global trade and tariff actions compounded by heightened crude oil pricing challenged many commodity cost expectations.

We now believe that industry supply chain teams must prepare for unprecedented levels of similar and added global supply network challenges in 2019.

In 2019, *Chief Supply Chain Officers* along with strategic sourcing, supply management and strategists will be compelled to position *C-level*, *line-of-business* and product management for alternative sourcing strategies options that either can change or alter the composition of the product bill-of-material, source components within different regions, or source closer to major sales regions.

The notions of waiting out the storm with added price increases can have a short window of realism before end customers themselves push back and move on.

A further consideration that will likely become more obvious will be investing in higher levels of manufacturing process automation which affords companies the flexibilities to source products near major regional consumption or core markets that include the United States. The strategy that may likely evolve will be to produce products as close to customer as possible, leveraging higher levels of manufacturing process automation or additive manufacturing methods while minimizing exposures to higher transportation costs. This will likely be a multi-year transition depending on specific industry.

Our belief for 2019 is that business advisor and added strategic business roles will remain in high-demand for both *Chief Supply Chain and Procurement Officers* and will require added leadership and collaborative skills with other senior leadership executives of businesses. Exercising the across the board supply chain cost reduction option may well have more detrimental impacts for industry supply chain teams.

Supporting Data and Information

Global Commodity Supply Streams

Entering 2019, specific regional challenges reside in agriculture, automotive, capital equipment and high-technology component areas primarily from the result of aggressive tariff actions emanating from the United States.

The *World Bank Commodity Markets Outlook* published in October 2018 indicated that commodity prices were driven by a number of factors in 2018 that included commodity-specific supply disruptions, rising U.S. interest rates, appreciation of the U.S. dollar and growing global trade tensions. The report dwelled on specific regional implications for commodity markets and the possibilities of structural or regional shifts in commodity markets in 2019 and beyond.

Overall, energy prices were driven higher in 2018 having risen by 3 percent by the third quarter of 2018, essentially 40 percent higher than the same period in 2017. Nearly all of oil's price declines came in the final three months of 2018, with the global benchmark price of Brent Crude closing the year at $53.80 per barrel.

For 2019, the *World Bank* expects energy prices to stabilize at 2018 levels to an overall average of $74 per barrel. That stated the agency cites a number of heightened supply or demand risks that could disrupt energy markets.

As of mid-December 2018, many commodities are tracking toward price declines for 2018 because of building fears for economic slowdown and global trade tensions. *The Bloomberg Commodity Index* was down more than 6 percent led by a 16 percent drop in copper and a 13 percent drop in oil prices. The Dow Jones Commodity Index declined an overall 8.48 percent by the end of December 2018.

Metals prices were expected to gain 5 percent in 2018 and stabilize globally in 2019. Stated downside risks related to the worsening of trade tensions between the U.S. and China and weaker global growth if China's manufacturing economy contracts substantially. Industry supply management teams will need to pay especially close attention to evidence of such risks in 2019.

Agricultural commodity prices are forecasted to gain nearly 2 percent globally in 2019, but again, the bank cited significant downside risk emanating from escalating trade tensions. The report specially addressed the impact of Chinese tariffs on U.S. agricultural goods with the potential for structural market shifts related to demand for commodities such as soybeans.

The Institute for Supply Management (ISM) Semiannual Economic Forecast published in December 2018 reflecting the views of U.S. based purchasing and supply management executives included a consensus belief of increased raw material prices in 2019, while expecting business profit margins to improve in 2019 over 2018. That translates to an assumption of passing on higher costs to customers which is reflected in a special question posed in the December 2018 survey. The panel consensus split was 51.9 percent indicating higher pricing of products with the average increase being noted as 6.1 percent. According to the report, raw material prices increased on average in a bandwidth of 5.7 to 7.8 percent during 2018. For 2019, the panel's range of expected product price increases ranges between 5.2 to 5.9 percent.

Risk of a Full-Blown China-United States Trade War

During 2018, the U.S. and China had each announced two rounds of corresponding tariff actions on the flow of trade among the two largest global economies. The *Trump Administration* imposed tariffs involving upwards of $250 billion in U.S. imports. China retaliated with tariffs on upwards of $100 billion in U.S. imports along with adding restrictions for U.S. businesses operating in the country.

A planned third round of more severe tariffs was scheduled to take effect at the beginning of 2019. In early December, a dinner meeting involving China's President Jinping Xi and U.S. President Donald Trump concluded with an understanding to pause trade actions for 90 days pending additional trade negotiations. Actions by the *Trump Administration* after the dinner meeting have now raised speculation as to whether any trade deal can be made, and the odds of achieving an agreement among the two countries are fading with each passing week. The overall risk is that significant tariffs could extend to essentially the full complement of intermediate components and consumer goods imported into the U.S. from China. Such a development has significant implications of U.S. manufacturers, retailers and services providers in 2019.

Structural Supply Network Changes Already Underway

A report by the *Economist Intelligence Unit*, *Asia's Winners in the U.S.-China trade war*, predicts that an elongated trade conflict among the globe's two biggest markets will not only have an adverse impact on the world economy but will also cause production to be performed in more expensive locations, adding to adverse impacts for monetary policies. Similarly, a survey conducted by the *American Chamber of Commerce* in South China published in early November suggested that 70 percent of companies were considering relocating some or all of their manufacturing outside of China, preferably to other Southeast Asia countries. Current evidence from global financial institution stakeholders points to supporting both of these agency predictions.

The result could be countries such as Mexico benefiting for commercial aerospace supply networks, with the lion's share of alternative sourcing shifting towards existing *ASEAN* countries. The transition would extend over a two to three-year period.

It would include India, Indonesia, Malaysia, Thailand and Vietnam benefitting for high-tech supply networks at the expense of China and Taiwan. For apparel supply networks, Bangladesh, India and Vietnam are named beneficiaries. In auto parts supply networks, Thailand is a likely beneficiary. The obvious theme are countries that belong to the reconstituted *Trans Pacific Partnership* trade pact in which the U.S. has declined to participate.

Commodity Impacts for U.S. Manufacturers and Services Providers

China's targeting of added tariffs on imported U.S. agriculture products and increased incidents of more severe climate conditions are already shifting global agriculture demand patterns. U.S. farmers have incurred severe demand impacts for soybean, meat and other products as a result of such tariffs. China has initiated efforts to acquire its agriculture and meat needs from other countries such as Brazil and Argentina. Two major hurricanes that struck the *U.S. Southeast* along with severe drought conditions across the *U.S. West* in 2018 impacted agricultural and farming areas. Critical planting and farming decisions will need to be made for 2019 markets amid a lot of uncertainty.

The imposition of steep U.S. tariffs on aluminum and steel imports has reportedly had the opposite effect of increasing both domestic and import prices of these metals. U.S. domestic producers increased prices to fund new investments in capacity causing U.S. manufacturers to continue to rely on imported aluminum and steel, with higher price burdens. In December 2018, *The Wall Street Journal* reported that the benchmark price for U.S. hot-rolled sheet steel had increased 22 percent in 2018 and 70 percent higher than the price of similar steel in other countries. That has motivated steelmakers in Asia and Europe to continue to supply U.S. markets since they can still make a decent profit after factoring tariff and transportation costs. U.S. domestic manufacturers such as AccelorMittal and Nucor have reported net profits at high double-digit levels at the expense of U.S. manufacturers.

The wake-up call to higher metal prices came in late November 2018 when General Motors announced an accelerated corporate restructuring calling for the closure of five North American plants and the slashing of its salaried workforce by 15 percent. The GM plan calls for saving $6 billion a year by the end of 2020, savings that would allow the company to invest in needed advanced technology related to electrically powered and autonomous driving vehicles globally. There continues to be much speculation as to whether increased costs related to metals costs motivated the announcement. We anticipate that 2019 will feature added restructuring announcements among U.S. manufacturers with high value-chain exposures to metals and other components due to higher tariffs.

Similarly, added tariffs on imports of high-tech components from China coupled with an aggressive U.S. crackdown on needed intellectual protections will have a negative impact on both Asia based and U.S. high-tech manufacturers. A hint of such risk stemmed from Apple's decision to cutback its planned output levels of *iPhones* for both *Q4-18* and for *CY2019*, causing a ripple effect of planned cutbacks among Asian high-tech components-based suppliers. The arrest of the *CFO* of Chinese telecommunications producer **Huawei** caused a ripple effect stock market selloff among specific U.S. based suppliers in fears of reduced revenues and a deepening of trade conflicts.

Commodity Impacts for Eurozone Manufacturers and Services Providers

For *Eurozone* industry supply chain teams, the coming year will present its own set of unique economic market and geo-political trade challenges.

Brexit looms large as a continuing disruptive and uncertain threat for supply and demand management. Industry and regional supply chain management teams were originally expecting a soft *Brexit*. As we publish this prediction in mid-December 2018, the *British Parliament* was scheduled to vote on the *Brexit Agreement* negotiated with the *European Union*. The vote was then delayed by *Prime Minister Theresa May*, following an assessment that the British government was headed for an embarrassing defeat. The *Prime Minister* was then threatened with a no-confidence vote from her ruling political party. With Britain scheduled to leave the *European Union* on March 29, 2019, the *Prime Minister* appears to be relying on giving the *British Parliament* a stark take-it or exit without any deal choice in any pending vote.

Parliament's rejection of the *Brexit* plan on the table risks an unprecedented political crisis that could lead to various indeterminate outcomes and implications for trade and commerce. With every passing week, a hard or more drastic *Brexit* becomes plausible. A further possibility would be that the March deadline is blown, and industry supply chain management implications extend later into the coming year.

Reports in mid-December indicate various industry supply chain literally stockpiling component and finished goods inventories fearing a "*no-deal*" Brexit in which the UK undergoes a hard exit threatening to slow or halt the flow of goods that move into and out of the UK and across the *English Channel*. Particular industry supply chains most impacted would be commercial aerospace, automotive, food and pharmaceutical related supply and demand networks.

Added trade concerns continue to be focused on threatened tariffs from the United States on EU manufactured autos as well as other products. German luxury car producers BMW and Mercedes currently export SUV's produced in the United States directly to China, thus they are financially impacted by the effects of an escalating trade conflict between China and the United States.

With the *EU* cutting its economic growth forecast from 2.1 percent in 2018 to a forecasted 1.9 percent in 2019, teams will be under pressure to cut additional costs while remaining agile for any added market or supply disruptions. Additional country-specific concerns will remain focused on Italy, where concerns are building for that country's public finances and growing debt load.

Global Final Production Site Changes

We sense a growing need to source final production and/or product assembly processes to be located closer to major customer concentrations within global regions.

Increased investments in higher levels of manufacturing process automation and additive manufacturing techniques can provide added flexibilities in production siting or alternative sourcing among global regions depending on geo-political risk factors. Closer proximity of final manufacturing further contributes to savings in transportation costs to end customers.

Supply Management Challenges Will Increase

For the most part in 2018, procurement teams attempted to manage the added impacts of tariffs by front-ending procurement needs prior to tariff implementation dates or by attempting to route international buys through tariff non-impacted global regions. In the specific case of China, some may be leveraging the falling devaluation of the Chinese yuan which has depreciated 5.5 percent in 2018, to buffer some of the added tariff costs.

In 2019, the options will become more limited and depending on what occurs on the tariff front, challenges will heighten as to what short or longer-term strategies are most appropriate for individual businesses.

U.S. manufacturers and retailers have attempted to manage tariff impacts by either squeezing suppliers for added cost concessions, absorbing added costs, or passing such cost along in higher prices for finished products. Entering the new year, purchasing commitments for 2019 have generally remain constrained awaiting any definitive data as to whether trade conflicts may subside. That has forced China based suppliers to attempt to seek out non-U.S. markets to make-up for revenue shortfalls.

Some manufacturers and retailers have pressured international suppliers to absorb the cost of added tariffs while preserving existing pricing, in-essence, shifting the cost impact across lower tiers of the supply network. In November, *The Wall Street Journal* reported on such practices occurring across U.S. automotive supply networks as customers were pressuring suppliers with communications that existing multi-year supply agreements would not be re-visited for added tariff costs or that suppliers must adsorb such costs. History and events strongly imply that such strategies ultimately are short-lived and damage overall supplier relationships. In the case of automotive, lawsuits among customers and supplier are already evident.

2019 Prediction Four: Cyber-Risk and Information Security Safeguarding are Mandatory Since the Threat of a Cyber Attack Involving Supply Networks is Inevitable.

For 2018, we predicted that cyber-related risk and information security safeguarding would consume business, IT and industry supply chain teams, not so much by choice, but from compelling needs dictated by stockholders, boards and *C-Suite* executives.

Cyber-risk and major cyber-attacks indeed escalated during 2018. The latest major public incident came in December 2018 with the disclosure from hotel chain conglomerate Marriott International that it was the latest company to fall victim to a serious data breach which allowed cybercriminals to steal personal information of 500 million customers. Credit card numbers, email addresses, and passport numbers were among the information stolen by criminals after they breached the hotel chain's reservation system, starting as far back as 2014. Initial speculation from government cyber investigators indicate that the source of the hack may have come from one of China's national intelligence agencies, implying yet another potential example of a state-sponsored cyber-attack seeking more than just credit card data.

The World Economic Forum disclosed results of a survey among over 12,000 executives around the world regarding what they believed were their biggest risks in doing business. Cyber-attacks and data fraud were identified as two of the top five global risks in terms of likelihood. Yet other surveys indicate that some senior executives have yet to acknowledge cybersecurity as a strategic priority. We anticipate that this trend will change in the coming year since supply chain management and line-of-business executives are very aware of the current threat level. Survey data related to this topic often does not reflect a reality that top-level executives are reluctant to discuss this topic for obvious reasons.

Hackers and state sponsored cyber thieves have moved toward a new fifth generation of attacks that is now surpassing the defensive capabilities of individual businesses. Cyber and national security experts now indicate that cyber threat incidents are going to get worse before they get better because of the added sophistication of cyber predators. Chief information security officers are similarly concerned about next generation threat sophistication. A further building concern that garnered higher attention in 2018 was the threat of embedded cyber-snooping or trojan devices within products themselves. There was much speculation, later refuted, that certain Apple *iPhones* included such embedded devices in component electronics. Similar, yet unfounded suspicions have related to equipment produced by Chinese telecommunications providers Huawei and ZTE. The arrest of the *CFO* of Huawei in December of 2018 was prompted by a U.S. arrest warrant on suspicion of cyber-related activity.

We, therefore, predict that cyber-risk and information security safeguarding will consume 2019 management agendas. Since supply, manufacturing, services and demand networks each have multiple points of vulnerability, they will likely remain the weakest links in cyber-risk management. As we have noted in published blog posts, the likelihood of additional incidents of supply chain targeted cyber-attacks impacting businesses and industry remains high. Plans must be in place to manage any business continuity impacts including access to backup systems, databases or alternative processes.

Similar to 2018, it will be imperative for industry supply chain management teams to collaborate with information security and IT teams to identify most vulnerable information security risk areas and to shore-up both defenses and business continuity safeguards. Advanced technology initiatives in manufacturing automation, *Industrial Internet* and *Internet-of-Things* (*IoT*) will therefore have to address strict information security guidelines.

B2B Business Network providers will need to demonstrate to existing and prospective customers that networks meet or exceed the most current information security standards and safeguards.

We further predict that in 2019, consideration must be given to retiring some rather old legacy systems and software applications that are identified as information security risks.

2019 Prediction Five: Supply Chain Management Digital Transformation Strategies Will Require Strategic Roadmaps and Specific Tactical Business Case Support.

We predict that many broad-based supply chain management teams will require and seek more definite transformation roadmaps related to overall digital business transformation. Overall advanced process and technology investment efforts need to be guided by short- and longer-term line-of-business alignment needs.

Background and Perspective

We predicted that in 2018, digital transformation timetables would accelerate because of compelling business forces accelerating such changes. Feedback that we received and assessments that we conducted pointed to loosening purse strings related to the ability to invest in digital transformation, but internal challenges related to skills and process readiness delaying meaningful investments. Teams essentially felt that they were not ready as-yet to embark on full-scale efforts without taking the time to address foundational needs.

What is becoming more obvious is that innovation at-scale is no longer an option but a competitive mandate that will require more direct, hands-on executive leadership at the highest levels.

As we continually remind teams, business cases drive the technology agenda, while transformation team efforts manage to the transformation timeline. Technology, process investment and workforce decisions should be governed by short and longer-term timelines. In other words, teams will search for the most leveraged benefits for meeting short and longer-term needs. Technology and data architectures will thus have far more meaning, which will move investment decisions to more top-down consensus, with the top being line-of-business as opposed to functional.

The needs for transforming to digital-based business models remains compelling, but with ongoing increased supply chain process complexities as well as business uncertainties in the coming year, prioritizing initiatives to the most compelling line of business and functional needs will be a dominant agenda.

The digital transformation roadmap has to address both short and longer-term business outcome and process transformation needs while addressing action planning to augment organizational talent, data and process alignment requirements. The realities of budget are another factor, especially if interest rates, inflation and currency fluctuation risks continue to escalate in the global economy.

Our sense is that up to this point, individual teams had for the most part, a bottom-up focus to digital transformative efforts.

Our belief is that in 2019, the emphasis turns tops-down, with senior management steering mechanism orchestrating more direct leadership.

Business Prioritization Will Differ

Areas of prioritization will be, as always, business specific. As an example, businesses with predominant direct-to-consumer business models will likely prioritize omni-channel customer fulfillment transformation in areas of customer data mining, increased automation of pick and pack processes and overall logistics and transportation transformative processes. Likewise, logistics and transportation services businesses directly supporting online customer fulfillment will focus on similar investments including elements of artificial intelligence and machine-learning support for early warning and resolution of logistics network bottleneck.

Manufacturing-intensive business will likely focus on edge operational systems transformation leveraging *Industrial Internet*, *Internet-of-Things* and Additive Manufacturing based technologies and processes. The business case will not be solely investing in the advanced technology but rather the compelling need to shore-up cyber and data-security defenses with more updated advanced technology including autonomous systems that detect data breeches or vulnerabilities.

Equipment and capital equipment industries may prioritize *Internet-of-Things* enabled operational systems embedded in equipment to further drive operational management and maintenance business models that provide added revenue streams. This is an area requiring more robust data management and analytics capabilities tied to backbone operational and business systems.

Pharmaceutical and food-based businesses may likely have higher prioritization to overall supply and demand network visibility and traceability to support needs for drug and food safety at the item level.

Many other businesses will feel the need to dramatically step-up the synchronization of supply chain management business process and decision-making across product value-chains and external *B2B* supplier and key customer networks.

2019 Prediction Six: The Multi-Year Transition Toward Digitally-Enabled Response Networks Continues.

After describing the capability of *Digitally Enabled Response Networks* as a multi-year transformational effort in process, talent and advanced technology capabilities, we predict that such efforts will continue into 2019 with far broader efforts.

A *Digitally Enabled Response Network* requires the build out of end-to-end network visibility and synchronized decision-making capabilities. It can be viewed as a foundation for supply chain management digital transformation for enterprises with direct to consumer customer fulfillment business models or services businesses that cater to multiple customer service channel needs. It implies perspective and capability that moves beyond "*chain*" to that of dynamic network ecosystems linking available supply to dynamic and changing customer demand needs. That implies extension of planning and fulfillment processes externally, involving key customers, suppliers and services providers in a federation of highly connected and integrated supply and product demand response networks. In many cases it requires *Cloud* based *B2B* connectivity linking various networks.

Response networks will embrace new forms of advanced analytics and decision-making, augmented intelligence and response to customer and supplier needs. They are an extension of a digital maturity path that involves supply and demand networks, process automation, peer-to-peer collaboration and synchronized joint decision-making.

With much uncertainty circling industry supply chains in the coming year, we anticipate continued attention and investment in this area.

Background and Perspective

In 2018, we added what we clearly stated was a multi-year perspective prediction, one that would require assessment and longer-term planning across multiple industry supply chain and related services providers. Competing in the new retail economy requires closing the gaps between sales, marketing, supplier, and supply chain teams in responding to actual *B2B* and *B2C* required customer experiences and expected service levels. How such experiences are supported, managed, and synchronized leads to what we have termed *Digitally Enabled Response Networks*.

The status quo of traditional retail supply chain customer fulfillment is no longer an option for industry competitiveness or revenue growth. Today, many retailers and services providers are hamstrung with marginal product demand forecasting, limited planning and multi-channel inventory management capabilities required in an Omni-Channel fulfillment process. They need to raise the bar on anticipating customer needs with the most-timely response to such needs.

Depending on the current state, building out the various process, people and advanced technology stepping stones will require a phased approach with a consistent end goal in mind. An important and crucial step is the deployment of a singular planning, execution and collective decision-making process that can integrate the extended fulfillment network and is supported by today's more advanced technologies and capabilities.

It is no longer just a supply chain capability but rather a digitally enabled response network that leverages multiple processes leveraging advanced technologies to connect the digital with the physical assets of the response network. We described the capability as the integration and synchronization of:

- Individual and collective product and services focused supply chains into a singular response network or network of networks.
- Linking physical and digital capabilities.
- Leveraging of *IoT*, *Manufacturing 4.0*, *Blockchain*, *Predictive-Cognitive* and *Artificial Intelligence*-based decision-making technologies to manage network synchronization, risks, and unplanned exceptions.

In 2018 we published three supplemental research advisory reports that profiled the early stage foundational buildout of *Digitally Enabled Response Network* capabilities in various industry settings that included retail and online telecommunication devices, online home good retailing, automated coffee beverage demand sensing and replenishment and more responsive human blood supply inventory stocking. We viewed these use cases as meaningful examples of how leading-edge companies are embracing this capability. We found ample evidence that early successes have convinced firms that they are on the right path towards overall supply and demand network digital transformation. They bring foundational elements of more responsive planning and execution processes.

Supplemental Information

More detailed information can be garnered by accessing the following complimentary research reports available on our website by accessing our *Research Center*:

Orchestrating Digitally Enabled Response Capabilities in Retail Customer Fulfillment, June 2018

Orchestrating Digitally Enabled Response Network Capabilities in Other Multi-Industry Settings- Case Study Examples, June 2018

2019 Prediction Seven: Continued Shifting of Business Focused Advanced Technology Investment Priorities and Added Supply Chain Management Technology Market Developments.

As to what occurred in 2018, we predict that 2019 will present various industry supply chain management teams with the need to shift advanced technology investment priorities based on individual line-of-business or industry-specific priorities. Priorities will come from external and internal business needs and developments as referenced in our other 2019 predictions:

Prediction One indicated a lot of caution on the part of senior business and financial executives to hold-off on major investment or change initiatives pending some signs of stability in overall geo-political and trade environments.

Prediction Five calling for revised digital transformation roadmaps based on line-of-business, talent and business process prioritization, which will surely influence advanced technology investment and market growth timelines.

Prediction Six calling for the multi-year transition to Digitally Enabled Responsive Networks in supporting Omni-Channel customer fulfillment needs.

Each of these prior predictions and other specific business factors add weight or deterrence to technology investment priorities in the coming year.

What will be clear, however, is that technology investment will serve as a core tenet for continued industry competitiveness and innovation.

Data Governance and Management

Building concerns and legislative efforts directed on the overall accountability of safeguarding personal and customer data will be another determinant. The *European Union's General Data Protection Regulation (GDPR)* adopted in May 2018 may well be the forerunner to other significant country, state legislative mandates that will occur in 2019. The continuing fallout as government and business interests gain more understanding of the growing scope of cyber-security threats, adds to the increased emphasis of having a defined and effective data protection plan for any major business. Data protections invariably lead to the supply and customer focused networks, and thus supply chain management teams will be caught in the middle of such forces, causing redirection of technology priorities that are likely top-down initiated.

Supply, Demand and Industry Clouds Continue to Accelerate in Adoption

Significantly rising customer expectations and the race for industry innovation continues to motivate businesses to accelerate adoption of Cloud-based platforms supporting supply, customer demand or industry *B2B Business Networks*. Attempting to rip and replace existing legacy processes, applications and technology is far too disruptive, time-consuming and expensive without now considering a Cloud-based adoption strategy.

In 2018, enterprise technology, specialty supply chain management, B2B electronic messaging and specific *Cloud*-based industry-focused technology providers continued to enhance the breath of technology, ease of use and network-wide integration of their platforms.

There was also movement in the formation of industry clouds, both broad, and in extensions of synchronized business process support needs. One example has been in the consumer goods sector where contract manufacturers and co-packaging suppliers have been increasingly linked together in overall supply, demand and customer fulfillment decision-making. There have been other efforts expanded in industries such as automotive, commercial aerospace, high-tech and consumer electronics. A late 2018 acquisition by *B2B Business Network* technology provider E2open introduces the notion of connecting global ocean container transport scheduling and movement data with supply and demand network business processes and decision-making. Enterprise information management technology provider OpenText's acquisition of the Covisint network and later and later Liaison Technologies opens broader any-to-any integration of processes coupled with identity security credentials across *B2B Networks*.

Over the next two years industry supply chain management teams can anticipate leading *B2B Business Network* platform technology providers to broaden any-to-any data, information and decision-making support needs in areas of external transactional, identity, decision-support and operational *Edge* systems integration. That will likely include *Application-to-Application*, *Cloud-to-Cloud*, *Device-to-Cloud* and streaming data stream integration capabilities across networks.

More quickly evolving areas include industry Clouds focused on operational systems, actual customer machines and equipment operating in respective industry environments generating rather useful data related to use, conditions and purpose.

We will feature added research profiles in this area in 2019 along with profiling efforts to leverage existing electronic messaging and *B2B Business Networks* into broader capabilities in harvesting insights and more-informed decision-making.

More Trusted and Connected Applications Leveraging Blockchain Technology

We predicted that Blockchain technology pilots would gain added momentum or interest levels in 2018, and indeed, business and industry media is flooded with blockchain related news. Some could make the argument that some tech vendors were overhyping the technology.

Concerns related to the speed and scalability of blockchain systems, and the lack of generally accepted global standards related to distributed ledgers, along with challenges related to underlying technical components still remain. Long-term cost deployment is another factor with some specific enterprise level technology vendors attempting to cash in on locking-up key industry influencers.

The need for verifiable capabilities to track-trace and manage activities and decision-making across multi-year supply chains remains an important objective. Blockchain proof-of-concept pilot process efforts underway are indeed attempting to address such challenges for specific business needs in either item level food safety traceability and visibility, ocean container shipments of hazardous materials, added integrity to global trade and finance, as well as other specific use cases. We believe that pilot process and learning will continue in 2019 with perhaps the uncovering of some compelling business cases for wider deployment.

What is resonating more in the market is the coupling of Blockchain with *Internet of Things* (*IoT*) technology for certain business use cases related to the conditional state of physical objects.

We believe that wider-scale multi-industry blockchain operational deployments remain in the 2020-2021-year timeframe.

Internet of Things (IoT) Technology Enablement

For 2018, we predicted some pause or narrower scope in *IoT* technology deployment efforts because of the increased sensitivities toward data security or data vulnerabilities. Our check-ins with systems integrators and tech providers have reinforced that for many of the new IoT enabled pilots, data security concerns and remedies have indeed been expressed by customers, with technology and services providers paying close attention to such needs and sensitivities.

That stated, and similar to Blockchain enabled technologies, we predict that pilot deployments and overall process learning will continue in 2019. Our belief is that wider-scale, multiple-process or line-of-business deployments will remain deferred until the cyber-threat landscape has built more creditable defenses to assuage stockholders, or until individual *IoT* technology providers add more comprehensive data and information protection safeguards, including conformance with global-wide information security standards that include encryption and autonomous monitoring of data security. Positive efforts are now underway for select enterprise technology providers.

Smarter and More Automated Processes Leveraged by Artificial Intelligence and Machine Learning

This year turned out to be the renewed discovery of artificial intelligence and machine learning leveraged to various needs in supporting manufacturing, procurement, supply chain planning, customer fulfillment and other applications and decision-making processes. The opportunity provided is the ability to transform supply and customer demand network capabilities in areas of increased automation, smarter interactive devices and more preemptive operations to avoid unplanned downtimes or business disruption.

Elements of machine-learning have had successfully be applied to supply chain planning process support where advanced analytics and process learning can provide planners with far more timely insights. Some new start-up technology providers are leveraging this technology to enhance enterprise or line-of-business integrated business planning processes that bring together sales, operations and business financial planning integration and synchronization.

Technology providers rightfully toned-down their overall *AI* hype and instead messaged on how such technologies can address business challenges for added worker productivity, providing added quality or safety assurances or removing drudgery in day-to-day processes. That stated, there is a noticeable groundswell of concern being raised on the applicability and wider deployment of these technologies, particularly in this current era of inflammatory political discourse.

Our belief is that *AI* based technology will be deployed to initially support obvious process challenges related to overcoming drudgery while the more advanced utilization of such technologies will have a more elongated change management readiness curve. Wider scale multi-industry deployments are within a one to three-year window depending on industry and business size determinants.

One of the more active areas of deployment that will show promise in the 2019-20 period will be the leveraging of AI/machine-learning with advanced robotics in automating physical pick and pack activities associated with higher levels of online orders incurred by retailers and direct-to-consumer product providers. The business case focuses on overcoming shortages of customer fulfillment labor required during peak order periods, the ability to conduct customer order fulfillment in a combination physical and online retail facility, or the ability to compete more directly with Amazon which is reported to be working on such capabilities. A grouping of innovative start-up vendors have been provided millions in start-up funding to develop automated mechanical technology that leverages advanced machine learning.

More Leveraged Use of Digital Twins Technology

Digital Twin is the application of software to represent the various characteristics of a physical object within a particular process. More and more technology providers supporting various supply chain management process support areas have started to recognize the customer benefits of this technology.

We believe that in 2019, more business use-cases and proof-of-concept efforts will emerge as various industry supply chain management teams leverage interaction with physical objects to manage new, more promising business models or in testing the scalability of processes and capabilities. That includes decisions executed at the Edge layer, closer to physical equipment due to latency, bandwidth, security or other needs. Emerging concepts of *Software Defined Edge*, where Edge computing is positioned as a natural extension of Cloud-based business operations will begin to emerge.

Technology Market Developments

We predicted that 2018 will likely feature additional *M&A* activities among large enterprise, industry-specific and specialty best-of-breed *Cloud* technology providers. The strategy among such providers would be about building scale and market influence. In late 2018, one on the largest acquisitions in enterprise technology involved IBM's announced acquisition of RedHat in an all-cash deal valued at $34 billion. The move represented the third-largest in the history of information technology and amounted to IBM's largest ever acquisition. There was a further prevailing tone that IBM may have overpaid and/or over reached. Other ERP and enterprise technology providers continued with tuck-in acquisitions to augment specific business process support, advanced analytics or decision-making capabilities.

We predicted one or two high-profile *Cloud* technology providers to stumble in 2018 because of a flawed business model or market missteps. Looking back, there were rather minor stumbles. We remain in the belief that such stumbles will occur in 2019.

We now predict 1-2 major M&A announcements involving supply chain management focused technology providers in 2019 especially in market attractive areas such as planning and analytics, logistics and online customer fulfillment, *B2B Business Networks* and Cloud-based platforms. The logistics and transportation sector has garnered a lot of outside investment, but that area may moderate in 2019 because of now existing high valuations of the hottest companies.

Supply chain management teams should expect a continued presence of private-equity influence across the advanced technology landscape since that formula has been successful for assimilating hot start-ups to be added to larger players. In the coming year, IPO activity should increase as the hottest supply chain management technology providers become more attractive for growth investment and as private equity players seek to execute exit strategies before an economic downturn significantly impacts U.S. equity markets.

2019 Prediction Eight: Global Logistics, Transportation and Third-Party Logistics Entities Confront Converging Forces of Industry Model Disruptors.

In the coming year, global logistics, transportation and third-party logistics entities will begin to finally confront the converging forces of industry business model disruption with a lot of process, technology and stakeholder implications.

Significantly increased annualized logistics and transportation costs across global regions are unsustainable for individual shippers and consignees, with the industry model ripe for disruption and new thinking enabled by more modern and advanced technology applied to specific network challenges.

Background

For four consecutive years, we have elected to include a prediction focused specifically on global and regional logistics and transportation capabilities, and their changing industry dynamics. This is an industry segment that remains fragmented and disjointed to accomplishing seamless, efficient and transparent global, regional and local movement of goods and services for industry supply and demand networks.

Our prior predictions stemmed from both growth in global trade flows and an ocean container shipping industry that continually struggles to manage fleet overcapacity while remaining insular to shipper needs for more responsive service levels and information technology capabilities.

Today's prevailing global shipping consortiums serve to optimize industry efficiency needs at the expense of shipper needs. Now, there is intent by some such as industry leader Maersk to broaden services capabilities into multi-modal transport and last-mile delivery needs. There are also high-profile industry initiatives to deploy advanced technologies such as Blockchain to address long-standing tendering and transactional needs while providing deeper visibility for sensitive shipments such as food and hazardous cargos.

Predictions migrated to surface carriers, trucking companies and *third-party logistics* (3PL) providers initially resisting the immutable wave of online commerce adoption, and then the unmistakable presence of Amazon becoming an industry disruptor in executing its own customer logistics, air transport and now last-mile delivery capabilities that stun the industry in both service levels and efficiencies garnered. In early December 2018, Morgan Stanley issued an investment report on the parcel transport segment, and specifically UPS stock. The general opinion expressed was that major existing carriers will be impacted by Amazon's air and customer logistics automation capabilities. The report estimated that Amazon' air movement capabilities will impact 2 percent of UPS revenues while increased cost efficiencies could erode 10 percent of both FedEx and UPS revenues by 2025.

China-based online providers such as *Alibaba* and *JD.com* have also invested billions in domestic and international parcel delivery capabilities leveraging today's more advanced technologies such as *AI*, robotics and advanced analytics. Such capabilities are increasingly being expanded across other Asian based regions.

Major global parcel carriers such as DHL, FedEx and UPS stubbornly clung to their network hub and spoke transportation routings only to then discover that major hubs became their singular bottlenecks. Now there are efforts to once again invest huge sums of money in material handling, logistics and network automation, funded by a strategy that extracts higher annual rates to pay for such investments.

Indeed, an overall industry known for inward thinking and a continuous tendency to pass along rate increases to fund needed business expansion initiatives reached a circumspect point in 2018.

Many businesses large and small had their financial performance outcomes negatively impacted by significantly higher increases in logistics and transportation costs. *CFO*'s had to explain to investors what actions would be taken to save costs, and industry supply chain management teams were tasked with senior to investigate means and methods to reduce the cycle of significantly higher transportation costs.

Moderation in Rates for 2019

With global manufacturing and supply chain activity levels expecting to moderate in 2019, the industry will be faced with previously augmented capacity meeting what will likely be reduced demand.

With significant amounts of global trade supported by ocean shipping, this will be one segment that will experience meaningful impacts in reduced volume and higher resistance to prevailing freight rates. With increasingly higher amounts of the current global fleet being in the mega-ship category, the industry will again be challenged by overall overcapacity. There is current speculation that after the *Lunar New Year* occurs in February 2019 when global shipping traditionally slows, that both Europe and U.S. bound segments could continue to be laggard.

For the U.S., trucking demand is expected to moderate as manufacturing momentum begins to slow. Acquisitions of new Class 8 trucks will begin to make their presence in carrier fleets adding to supply and demand imbalances.

According to *ISM* data, transport and warehousing reported the largest year-on-year capital investment rates in 2018. Heading into 2019, trucking firms will strive to maintain market rate leverage while also striving to lock-in more businesses with longer-term services contracts. Such efforts will invariably meet needs by businesses to garner significantly lower transportation costs.

Forces Converge

Now, all industry stakeholders want to participate in the implications of a permanent shift to online retail, and all that this requires in a far different logistics and last-mile fulfillment business model.

This has to involve removing major cost constraints in global-wide shipping, conforming to new environment mandates, and provider industry supply chains more meaningful options in near real-time visibility and actions related to products in-motion.

Some participants will continue to utilize legacy thinking and business practices to do so. The same participants are attempting to converge with current industry segments such as online tendering of shipments, transportation brokerage, higher levels of online network visibility and transportation contracting. The most visible example of this business strategy in the U.S. is that of XPO Logistics, now considered to be one of the largest logistics providers in North America with over $15 billion in annual revenues from a number of business lines. The provider has a goal to invest an additional $8 billion on more acquisitions.

We predict that 2019 will be a year of significant transition, one where legacy business, information capture and real-time end-to-end visibility are challenged by industry disruptors on an international scale. Instead of constantly challenging regulatory mandates, disruptors will leverage information toward dynamically managing more efficient or optimized routing.

Needs for increased mobility in information access and capture will be leveraged by the emergence of *REST* Web service *API*'s that can either tap information from older legacy applications or a variety of Cloud-based systems. This capability has become especially important in the area of logistics and transportation, providing warehouse, logistics, transportation, or customer fulfillment workers with added, more-timely information. This is a red-hot area of development interest.

As noted in *Prediction Seven*, another hot area of interest and proof-of-concept activity will be the emergence of advanced robotics leveraged by AI/machine learning applied to actual picking and packing processes. Amazon is believed to be working on this technology as is a number of innovative start-ups.

Similar to 2018, advanced technology investment monies related to artificial intelligence, advanced analytics, *IoT* and Blockchain will be very prevalent in this industry sector given the robust Capex budgets and industry stakes.

Industry Mergers and Acquisitions

In 2018, U.S. and international trucking, logistics and warehousing firms discovered that acquisitions bring a more difficult set of challenges related to scale which require additional investments in process, talent and advanced technology. Accounting issues relative to the valuation of assets remains a gnawing issue. Trucking firms have rapidly expanded acquisition of new, more fuel-efficient and technology laden trucks, and to some degree, were successful in recruiting additional drivers. The overall challenge deepens in 2019, especially in embracing, adopting and leveraging of advanced technology focused on cargo in movement.

In spite of the above, we predict added acquisitions and added industry moves by players to position themselves with shippers, manufacturers and retailers as provider-of-choice. We further predict fallout from these efforts.

Business Outward Looking

From the shipper and consignee side, traditional applications such as warehouse or transportation management (WMS/TMS) were designed prior to today's online economy of multiple smaller scale shipments. Many of these applications reference static transportation routing tables not linked to actual market constraints or segment opportunities. Users struggle to modify such applications to manage product configuration postponement strategies conducted at a point in the logistics or distribution network. Many are not truly *Cloud*-based in architecture and in open integrations.

As one example, one of the fastest growing technology providers in the area of transportation management is *SwanLeap*, recently ranked as the fastest growing private company in the U.S. by Inc. CEO Brad Hollister flatly indicated to us in his observation that nobody in the industry truly understands how to optimize both inbound and outbound transportation management needs because of a fragmented industry and business use applications not addressing the real problems of timely and informed decision-making. SwanLeap applies artificial intelligence and machine-learning techniques to leverage real-time data and analytics to compare information relative to on-time carrier performance, tendering response and billing error rates occurring across a variety of carriers. The technology further allows businesses to analyze and compare real-time spot-market transportation rates with prevailing contract rates.

The continued discovery of such shortfalls is where many industry disrupters and/or legacy players will attempt to leverage in the coming year.

Fresh Food and Grocery Sector

We predict a continuing attraction by consumers to food and grocery online ordering which will, in-turn, lead to more explosive growth of local delivery services either courier, regional of national in-scope. Some retailers such as Amazon and Target own portions of their own delivery networks and tracking capabilities.

We predict that Amazon will once again serve as a nation-wide disruptor in this segment since many firms have not as yet mastered scale, efficiency and profitability. Likewise, internationally-based providers will likely crack the code for food delivery efficiencies, particularly in China and other Asian nations.

Longer Term

In the three to five-year window we foresee efforts in managing dynamic networks, networks that peak and ebb with retail shopping events, unplanned events in the economy or natural disasters causing network disruptions. When network capacity levels peak or ebb, the challenge turns to optimizing any and all lanes and movements of that network. Real-time end-to-end network visibility is paramount not only for accommodating customer shipping needs but in identifying load opportunities from a variety of networks.

Our belief that multi-industry and global supply chains will eventually witness the creation of *Network of Networks* as business strategies and advanced technology that aligns to future levels of capability. Such scenarios begin to apply to logistics fulfillment platforms with branded names. Consider online customers being offered choices such as same-day or next-hour virtual courier, FedEx, UPS, national postal carrier, each with a cost and service bid offered to the customer. Consider existing online retailer platforms offering the similar choices with contracted carriers as capacity opportunities make themselves available in online tendering. We may will see discernable signs of such strategies being percolated in the 2019-2020 period.

2019 Prediction Nine: Positioning for Global Online Retail Presence Meets the Realities of Geo-Political Forces and Trade Tensions.

We are predicting that in 2019, the ongoing positioning for online global retail presence will meet the realities of needs for garnering shorter term revenue and profitability to fund future investments and scale. Ongoing geo-political forces will mute any further aggressive global expansion plans until global trade and intellectual property protection concerns can be addressed.

Background

In 2018, we predicted that positioning for global online retail dominance would shift into higher gear with new providers and spoilers. We anticipated that China based ***Alibaba*** would shift into higher gear in establishing an integrated online and physical store shopping experience, further expand its Asia based presence, and be better positioned to grow its online platform's attraction among other countries.

China's leading online platform was further locked up in a costly battle with **Tencent Holdings** over market control of the estimated $15.4 trillion in mobile payments across China. The battle was about accessing broader customer intelligence on shopping habits. *Alibaba* ran into cost containment challenges that impacted profitability, along with intense competition in certain online segments from domestic rival ***JD.com***. In April 2018 the online giant acquired full control of food delivery platform ***Ele.me*** which valued this online platform at $9.5 billion. The acquisition added over three million local delivery persons. A global investment spree also involved added investments in Pakistan, Singapore and Middle East countries.

Amazon doubled-down on its multi-billion investments in establishing a local presence in India, a country considered to be one of fastest growing online markets in the coming years. In June 2018, *Amazon* upped its investment in India, committing an additional $2 billion on top of the prior $5 billion invested in that country. The announcement was attributed to be a countermeasure to *Walmart*'s announced intent in May to establish a majority stake in online provider *Flipkart,* India's largest online retail platform. Amazon is the number two platform. Walmart also operates a wholesale business that supplies local mom and pop *kiranas* retailers across India which dominate the local physical retail landscape. **Amazon further** launched an online presence in Vietnam with the aim of competing directly with Alibaba on market share.

There was been growing speculation that China's ruling leaders want to tamp down on the existing intense competition among the nation's large and highly visible *Internet* experience providers. The race among major online retail platform providers positioning for global dominance then made a potentially subtle turn in September 2018 when Alibaba founder and Chinese national icon Jack Ma announced his pending departure. From our view, Ma's announcement was a sign of the increased friction that is occurring from unbridled, enthusiastic, and perceived deep-pocketed Chinese tech companies where the sky may be endless, and to the pragmatic notions that growth requires a detailed strategic plan that investors can understand. It was also a sign that China's ongoing strategies of plowing money and influence primarily into state-owned enterprise are clashing with the country's online Internet companies that have to answer to external stockholders.

Large Chinese *Internet* technology providers such as *Alibaba* listed their stock on U.S. exchanges to take advantage of market euphoria for faster-growing tech companies with consequent exploding market valuations. Setbacks in earnings growth and increased oversight from Chinese regulators have caused investors some pause. According to an opinion column published in *The Wall Street Journal*, the four largest U.S. listed China tech firms have collective lost more than $125 billion in market capitalization since March 2018. That places additional pressures to boost earnings not only for higher market capitalizations but potentially for listing shares in China and other Asian markets in the future.

Our look-back assessment of our 2018 prediction concluded that while positioning for global online retail dominance was indeed happening, the realities of the financial, process and people investments requiring very deep pockets as well as patience and tolerance among stockholders, investors and individual countries came to reality.

A Differing Focus in 2019

The above has now led us to our 2019 prediction that positioning for online global retail presence will meet the realities of needs for garnering shorter-term revenue and profitability to fund future investments and scale.

We believe that the ongoing presence of tense geo-political forces will further mute any further aggressive expansion plans into other regions. Two influences are at play that led us to this prediction.

China's dominant online providers are publicly-held companies accountable for delivering expected revenues and profits. While Amazon was able to convince investors to ride-out multiple years of profitless results in order to make strategic investments, the scale of China's providers is far more extensive, and the expectations for shorter-term and longer-term profitability is far higher.

The second is the obvious growing fears of an ever more escalating trade and intellectual property protection war involving China and U.S., two of the largest economies and significant online marketplaces. Some geo-political experts speculate that such a conflict might result in an increase mercantile alliance between China and Russia for trade and market opportunities. *Alibaba* has already announced a partnership with Russia's emerging online shopping provider, which could set off alarm bells among other nations.

Strategic countries have already been identified and strategies must now turn to garnering customer stickiness and market-share in existing targeted countries while fending-off obvious domestic and international competitors. China's own domestic economy is showing strains and broad-based consumers have reportedly been cutting back on spending other than traditional holiday related.

The prize remains India. We believe that *Flipkar*t, Amazon and to some extent Walmart, duking it out for online market dominance with China-based online services providers in the midst of heightened trade tensions could be a flash point in the coming year. That will require added attention, resources and political skills to circumvent nationalistic viewpoints from online shoppers.

2019 Prediction Ten: Unique Industry-Specific Supply Chain Management Predictions

Each year, we conclude our annual predictions with unique industry-specific challenges that we believe will be dominant in the coming year. For 2019, we are including the following industry supply and customer demand networks:

High-Tech and Consumer Electronics Industry

We begin our industry-specific prediction with high-tech and consumer electronics supply and customer demand networks for two fundamental reasons. First, this industry has become more and more intertwined with automotive, aerospace, equipment and medical device customer demand network needs due to the increasing product value-chain concentration of electronics laden devices. Because of such expanding dependency, high tech supply networks were already challenged with many component shortages in 2018. The reasons were both supply and demand related. Major suppliers faced with huge capital costs to build new production facilities to accommodate more advanced production and technology support processes have been reluctant to add additional capacity with the current geo-political global trade environment. Building concerns of a slowing of global wide demand or even a global recession in late 2019 does not lend itself to major multi-billion capital investments. Major industry suppliers prefer to be in a capacity-constrained environment to preserve pricing power.

The ongoing plateau of the smartphone market growth affecting industry influencers Apple and to some extent Samsung, has been another catalyst for widespread industry concern. Major supplier revenues and profits have long been dependent on lower margins but higher overall unit volumes. That strategy is now being tested as any significant growth in smartphone production may be limited to emerging markets such as China and India. As we finalize these predictions in early January, Apple stunned equity markets by pre-announcing a $5 billion revenue shortfall in fiscal Q1 that ended in December 2018, mostly all attributed to the Greater China region. Such concerns have already prompted both of these major smartphone producers to take initial steps for moving final assembly and component supply production to either lower-cost or tariff protected regions.

The second and perhaps more significant challenge relates to the industry being caught in the crosshairs of ongoing China and U.S. tariff actions and heightened intellectual property protection actions, forcing even tougher decisions in the coming year. Prior rounds of U.S. tariffs of 10 percent on select high-tech and consumer electronic components can jump to 25 percent on both existing and new imports in early 2019 if the two nations cannot find a resolution to current escalating tariff actions. As we pen this prediction, Similar, yet unfounded suspicions have related to equipment produced by Chinese telecommunications providers Huawei and ZTE, which led to the arrest of the *CFO* of **Huawei** in December of 2018, prompted by a U.S. arrest warrant on suspicion of cyber-related activity.

The semiconductor design and production segment is especially in the cross-hairs given the strategic importance, supply network complexity, intellectual property protections and criticality to industry-growth and global competitiveness. Recent acquisition announcements involving either U.S. or Chinese based semiconductor firms have been nixed because of declared national security concerns.

We anticipate quite a lot of developments emanating from this industry sector in 2019, with cascading effects to other dependent industries.

Global Automotive Industry

Global Automotive Industry supply and customer demand networks will continue to be challenged by the complex and difficult transition toward producing more electrically powered and autonomous driving vehicles. There is also a growing global demand supply and demand imbalances, along with added costs from steel and aluminum tariffs that will likely manifest even more in the coming year.

In the U.S., consumers continue to prefer larger *SUV*'s and pick-up trucks in buying choices, and the expensive of demand for entry level or high-end sedans. That trend has prompted all three of the U.S. *Big Three* manufacturers to declare moves to move away from sedan manufacturing in the U.S. With the *Trump Administration's* shunning of most climate-change and mileage improvement initiatives, manufacturers now have to turn to markets such as China or Europe for increased demand for electric and alternatively powered vehicles.

The imposition of steep imported steel and aluminum tariffs, coupled with equivalent higher prices for domestically produced metals, have U.S. auto manufacturers challenged by significantly higher costs. Industry reports indicate both **Ford** and **General Motors** have had an incremental cost impact in excess of $1 billion each. The late November 2018 announcement from GM indicating intent to shutter five North American manufacturing facilities and trim its overall workforce by 15 percent provided added industry woes. Politicians were not all pleased with the announcement and the significance.

A carryover from 2018 is the sourcing of adequate and cost-effective supplies of the unique rare earths and metals required to support larger production volumes of electrically-powered autos and trucks.

For China, the globe's currently largest auto market, the industry is facing a significant capacity glut as Chinese consumers have throttled down their auto purchasing needs. Global consulting firm *PwC* has indicated that there is now enough capacity existing to produce 43 million auto annually. Demand in the overall domestic market stands at upwards of 17-20 million vehicles. Industry reports point to many idle factories with increasing cutbacks in weekly or monthly production. With China's zeal to lead in electric car demand, The Wall Street Journal reported in December 2018 that at least 32 new electric car plants or now in the pipeline.

Similar but different forms of challenges surround European automotive firms as consumers are now increasingly shunning diesel-powered vehicles in favor of electric or hybrid powered vehicles. Manufacturers such as **Volkswagen** are investing billions to accelerate development and introduction of new electric vehicles, while luxury brands BMW and Mercedes continue to deal with the implications of threatened added tariffs and the trade war among the U.S. and China.

Commercial Aerospace Industry

The ongoing challenge remains the scaling-up of volume production of more fuel-efficient aircraft to meet multiple-year backlog of orders. Both Airbus and Boeing encountered supply network shortages in 2018, impacting expected monthly production volumes. The weakest link remains that of aircraft engine manufacturers **CFM International**, **Pratt and Whitney** and to some extent, **Rolls Royce**.

Both global manufacturers have indicated plans and initiatives to considerably improve output in 2019, yet they both continue the delicate balance of having to appease airline and leasing company customers, all of whom are growing increasingly concerned given signs of an uncertain economic outlook for 2019 and beyond.

A further looming supply network thrust for Airbus, and to a lessor extent, Boeing, is the threat of a hard or no *Brexit*. Commercial aerospace just-in-time supply networks extend across Great Britain and Northern Island.

Consumer and Packaged Goods Industry

This industry continues to struggle with changing product strategies in meeting rapidly changing consumer tastes for more healthy food choices, while also confronting the challenge of direct-to-consumer online distribution of products.

Extended supply and production networks need to be more responsive and aligned to continual market segment and distribution channel changes and needs.

The continuing threats of added industry M&A disruption and increasing *CEO* turnover are likely to continue in the coming year. We anticipate an additional challenge in attracting new supply chain and other line-of-business talent if the industry continues to have an overall focus toward cost reductions.

Pharmaceutical and Drug Industry

We have been a long-time critic of the dysfunction and stakeholder conflicts that exist across pharmaceutical and drug industry supply and patient healthcare fulfillment networks. The overall industry suffers from conflicting objectives regarding profitability, costs or service level needs. The industry's drug pricing models remain under intense pressure, especially in the United States, as are calls for stricter oversight and monitoring of opioid drug distribution.

Throughout 2018, one of the most dominant themes percolating across industry segments was the presence of industry disruption among and concerning different segments. Our prediction is that beginning in 2019 and extending over the 2-3-year horizon, meaningful and constructive disruption will manifest into far different supply can patient demand network models.

The catalyst has centered on several ongoing industry developments.

One focuses on ***Amazon***'s business initiatives and likely added presence or influence into the pharmaceutical and drug retail distribution supply or demand network sectors in the not-to-distant future. In January 2018, a partnership was announced among Amazon, **Berkshire Hathaway** and **J.P. Morgan** to improve healthcare costs and services for in excess of one million employees among all three companies. The alliance included the formation an independent, not-for-profit company to develop technology solutions to simplify the health-care system. The *New York Times* characterized the development as follows:

"*The alliance was a sign of just how frustrated American businesses are with the state of the nation's healthcare system and rapidly spiraling costs of medical treatment.*"

That was followed by Amazon's acquisition of ***PillPack***, an online pharmacy that both packages and delivers presorted doses of drugs and medicines, with licenses to ship prescription drugs within 49 U.S. states.

CVS Health's $69 billion move to acquire health insurer **Aetna** is by our lens, a further sign of pending industry disruption that will eventually influence industry supply and demand fulfillment networks.

In addition to changes in the industry stakeholder developments noted above, industry supply chains will again have to respond to item level tracking and verification requirements outlined by the *U.S. Drug Supply Chain Security Act* that was enacted in 2013. The industry will approach six years since this legislation was passed, and in November of 2018, the U.S. Federal Drug Administration (FDA) finally issued preliminary guidelines for item level visibility and traceability standards, again without a definitive enforcement date.

It would seem that this industry has the most opportunity to be able to leverage advanced technologies such as Blockchain, AI and machine-learning to address the challenge of item-level traceability and accounting. Perhaps 2019 will be the year of process breakthrough. We believe some answers will makes themselves evident in the coming year.

Summary of 2019 Predictions

The bottom-line is that 2019 will once again challenge individual industry and globally based supply and customer demand networks with supply chain management teams in a constant state of supporting business change and risk mitigation needs.

That concludes our predictions for industry and global supply chains for an upcoming year that will again present industry and global supply chain management teams with a broad array of challenges as well as opportunities to support business growth and mitigate unplanned disruption and risks.

As is always the case, supply chain management teams will meet these various challenges and along the way, will come-up with even more innovative business processes and leveraged use of technology. *The Ferrari Consulting and Research Group* looks forward to continuing to serve your supply chain research, business process transformation, risk management, IT advisory and consulting needs.

We extend our best wishes for a very productive and rewarding 2019.

About the Author

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For additional updates to each of our predictions throughout 2019, please visit: http:www.theferrarigroup.com/supply-chain-matters