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Resilience and sustainability in the cost-plus world

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About this report

The cost-plus world of supply chains is a report Economist Impact, commissioned by GEP, exploring the evolving world of supply chain disruption and businesses' response. The report is based on a survey conducted between December 2021 and February 2022 of 400 executives in the US and Europe familiar with their organisation's supply chain strategy and operations.

Economist Impact analysts John Ferguson, Michael Frank and Siddarth Poddar are the authors of the report. Economist Impact is solely responsible for the views expressed in this report, and the content does not necessarily reflect the perspectives of the sponsor.

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- Sangram Bhosale, Xcel Energy
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- Robert Koepp, Geoeconomix
- Pamela Mar, Fung Group
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Foreword

Supply chain resilience is not a state, it's a journey

For decades, supply chains have been growing more complex as companies seek out competitive advantage and cost efficiency. However, the wave of disruptions in recent years has tested the limits of supply chain strategies that prioritize low inventory levels and rely on short lead times.

The Cost-Plus World of Supply Chains – a recent study by Economist Impact – revealed how supply chain priorities are shifting. Today, supply chain resilience and sustainability are demanding attention from the c-suite.

Supply chain resilience requires better risk management. While one size does not fit all, there are three clear imperatives for supply chain leaders:

1. Elevate risk management as a core business competency.
2. Increase end-to-end collaboration, especially with supply networks and other ecosystem partners.
3. Recognize that brute force approaches to navigating disruptions are not sustainable. Focus on enhancing visibility and collaboration across the supply chain.

Supply chain disruptions are becoming increasingly frequent and severe. With enhanced visibility and flexibility, enterprises can build agile, resilient and efficient supply chains that more effectively respond to disruption.





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Executive summary

- **Persistent pain from inflation and supply stressors is causing businesses to re-evaluate their offering in addition to operations.** Companies are moving into other product areas that are less vulnerable, and in some cases have re-structured their supply chains to reflect durable changes that will outlast the acute phase of the pandemic.
- **There is some disagreement in tactics, if not strategy, within the organisation.** Compared to their peers in other parts of the business, finance is more focused on the consequences of disruption rather than the disruptions themselves. Risk management is not one of their top three tactical priorities, choosing instead to priorities ensuring availability of credit (56.3% of finance executives), producing financial information to inform operational actions to meet objectives (43.8%), and managing cash flow and reserves (40.6%). That could reflect specialisation within the business but may be a source of tension as disruptions persist.
- **Visibility, flexibility, and resilience optimisation are the new supply chain priorities displacing “just-in-time” manufacturing, and technology is seen as the key to making that strategic transition.**

The vast majority of executives agree that deploying cloud-based infrastructure and intelligent applications like AI, big data and IoT are priorities in the next one to three years. There is an interesting trans-Atlantic divide, however. Half of US firms have already deployed cloud, compared to just 26.5% of Europe-based companies.

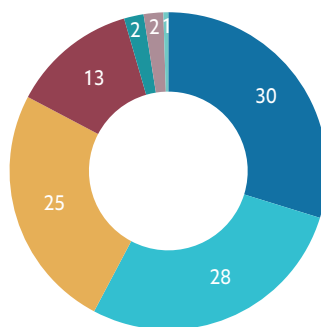
- **Sustainability is a resilience priority, not just a matter of corporate social responsibility.** In addition to mitigating the risk from climate change-related weather disruptions, companies are aware that consumers, governments, investors and business partners will reward companies that treat sustainability as a strategic imperative.
- **The operational benefits from green energy and circular economy policies are accepted by a large plurality of firms.** Nearly half (43%) of executives point to plans to implement clean energy sourcing requirements in the next three years. A majority of the agriculture and food sector (58.8%) is making that commitment. Meanwhile, 40% of the healthcare and pharmaceuticals sector is planning to implement circular economy policies primarily as a cost-saving endeavour, but with significant environmental benefit.

Searching for resilience and sustainability in the cost-plus world

Since the late 1980s, supply chains worldwide have grown ever longer and convoluted as manufacturers offshored to production centres in Asia in pursuit of lower costs, greater efficiencies and proximity to markets. Over time, globalisation has driven the development of increasingly interdependent supply networks that rely on a lean manufacturing and logistics philosophy that prioritised low inventory levels, and short, just-in-time deliveries.

Exhibit 1: Most organisations are actively working on supply chain risk management (%)

■ Active ■ In development ■ 1-year time horizon
■ 2-year time horizon ■ 3-year time horizon ■ Inactive
■ Doesn't exist



Source: Economist Impact.

In the face of disruptions including covid-19, the Ukraine war, and historically high inflation, the viability of these networks has been put to the test. The disruptions of today will continue to characterise global supply chains for years to come—especially as they become regular, all-consuming occurrences—but there is cause for hope.¹

For Josué C Velázquez Martínez, research scientist and lecturer at the MIT Centre for Transportation and Logistics, the silver lining to these disruptions is that they have tangibly demonstrated for organisations and their leaders the vulnerabilities of whole supply chains, as well the need for more focus on building resilience.

In recent months, risk and supply chain management strategies have grown in prominence, while technological innovations are offering new ways for organisations to rebalance their desire for efficiencies against the need for more resilient value chains. Stephen Ezell, director of global innovation policy at the Information Technology and Innovation Foundation, suggests that organisational shifts towards more automation and technology can mitigate the impacts of rising labour and materials costs, for example.

¹ <https://www.wired.com/story/supply-chain-crisis-data/>

Between January and February 2022, Economist Impact conducted a survey of 400 senior level employees (C-Suite or director level and above) to explore how their businesses, organisational functions and industries are responding to the dual-shocks of disrupted supply chains

and a changing global trade environment. Respondents were asked to share what risk and supply chain management approaches they are integrating into their long-term strategies, and what technologies they are using to build more resilient supply chains.

Survey demographics

Half of the surveyed respondents belonged to the procurement and supply-chain management functions; while the other half belonged to the strategy, finance and IT functions. There were 80 respondents each from five industry aggregates – agriculture and food; MMT (manufacturing, media and telecoms)²; consumer goods and retail (excluding food); healthcare and pharmaceuticals; and energy and utilities.

Half the respondents worked at organisations with annual revenues between \$500 million and \$1 billion, while the remaining worked at organisations with annual revenues of more than \$1 billion. More than half (55.8%) of the organisations are in the business of purchasing raw materials and selling products. Fifty percent of organisations are based in the US, with the remainder in Europe.

The survey results reveal that most organisations are still internalising the lessons of the pandemic. Successive disruptions have led organisations to develop more resilient supply chains. Increasingly, these organisations are exploring risk mitigation strategies, and the potential for advanced technologies to transform their supply chains into more agile, adaptable and sustainable networks. However, after decades of prioritising efficiencies over everything else, it will take time before real, substantial change can happen. Most organisations still lag behind in terms of tech adoption, but the next three years could mark the arrival of a new age.

² Manufacturing includes automotive, machinery, chemicals and aerospace.

Successive disruptions continue to rock supply chains

While covid-19 is considered the biggest contributor to today's supply chain chaos, it is only one link in a longer chain of disruptions. Today's global supply chains are being rocked by everything from natural disasters to the return of great power politics and interstate war.

"I don't believe there is an area that has not been impacted in one way or the other. Everything from indirect procurement for IT hardware to our direct businesses around distribution, transmission, gas, and energy supply—has been deeply impacted," says Sangram Bhosale, vice president, supply chain and fleet management at Xcel Energy.

Susan Johnson, executive VP of global connections & supply chain at AT&T, says telecom and technology companies are struggling with chip shortages, transportation and labour force participation.

Another supply chain challenge is inflation. AT&T spends about US\$60 billion on procurement a year, and is faced with many vendors looking to increase prices. While it is usually contractually protected, Ms Johnson says it's a fine line because the company also wants to make sure it is getting the best quality of products while staying at the front of the line.

Additionally, the costs of natural disasters are expected to rise as the effects of climate change

deepen, leading to more frequent weather events. Mr. Bhosale gives an example of a wind farm that Xcel was building in New Mexico, where due to supply chain issues and labor issues, the company had to bring in "additional cranes, additional workers and additional support equipment to meet our committed timelines," resulting in additional costs.

The resurgence of great power politics after decades of relative calm is requiring greater attention to geopolitics from supply chain chiefs. The ongoing US-China trade war, for example, has disappeared around three to five years' worth of growth as supply lines between the two countries have shrunk in the face of higher tariffs.³

Robert W Koepp, founder of Los Angeles-based research and advisory firm Geoeconomix, says R&D is also severely impacted. China has become an interesting source for R&D for many companies, he says. "That becomes more impacted when you start getting into issues of data localisation and national security. So, when companies are afraid of losing their IP, China becomes less attractive, even though a company can hire PhDs there for a lot cheaper, and they can have very nice R&D facilities with a great market to test on. In that sense, this unravelling of supply chains can have a lot of ripple effects."

³ <https://www.scmp.com/economy/global-economy/article/3137599/us-china-trade-war-shocks-cost-global-value-chains-3-5-years>

Operations turmoil pushes organisational change

Companies have been broadly impacted by these disruptions in similar ways. Most (61.3%) organisations say their operations were significantly impacted as a result of covid-19 supply chain disruptions, closely followed by the supply chain (55%) and finance (51.5%) functions. It is not surprising that most companies saw the biggest and most immediate impacts of the pandemic on their operations,⁴ as consumer behaviour had a direct influence on not just the speed and scale of manufacturing, but the very nature of each company's business. For example, early in the crisis, Delta Airlines converted most of its capacity to moving freight cargo such as high-end electronics, fresh flowers and pharmaceutical suppliers in a bid to boost falling revenues due to restricted international travel.⁵

Other organisations opted to shift to entirely different products, as Gucci, Ralph Lauren and Burberry did when they retooled assembly lines to produce personal protective equipment (PPE) to meet the shortage in the first few months of the pandemic.⁶

"At AT&T, we started making longer term commitments on the chipsets where we saw supply constraints, because we saw the wave coming. And we knew that we needed to stay in front of the line," says Ms Johnson

How are companies assessing future challenges?

There is wide consensus among 68.8% of organisations that they could lose up to 10% of their revenues as a result of supply chain disruptions in 2022. Those concerns are especially strong among European respondents (79%) compared to those in the US, highlighting specific challenges facing companies operating in the EU's highly-integrated bloc.

Compared to the EU, the US market is far more domestically inclined and self-sufficient in terms of procurement, leading to fewer complications with cross-border trade. In contrast, European companies are likelier to rely on neighbouring countries for access to certain goods and services, as well as for sales.

⁴ Refer to

⁵ <https://www.forbes.com/sites/tedreed/2021/10/18/global-supply-chain-disruption-and-new-strategy-boost-delta-airlines-cargo-revenue/?sh=64c98dbb2454>

⁶ <https://www.scmp.com/magazines/post-magazine/fashion/article/3081167/cynicism-aside-fashion-brands-making-personal>

Despite the chaos unleashed by the pandemic, there are companies whose revenues have not been impacted by the crisis. Many in the energy and utilities (41.3%) and the healthcare and pharmaceutical (33.8%) sectors do not expect a fall in their annual revenues as a result of supply chain disruptions in 2022, likely due to the relatively inelastic demand for their services. In fact, there is also potential for higher gains in the future as recovering economies focus on future pandemic risks in the aftermath of covid-19.⁷

Other industries don't expect to fare so well. The majority of companies in the consumer goods and retail industries (58.8%) expect significant impacts on their supply chain because of covid-19, which could be attributed to the high levels of turnover and subsequent falls in consumer incomes that came about as a result of the pandemic.

For Mr Velázquez Martínez, the disparity in experiences is highly dependent on the specific industry and layer of the supply chain that each company operates in. "It's not the same

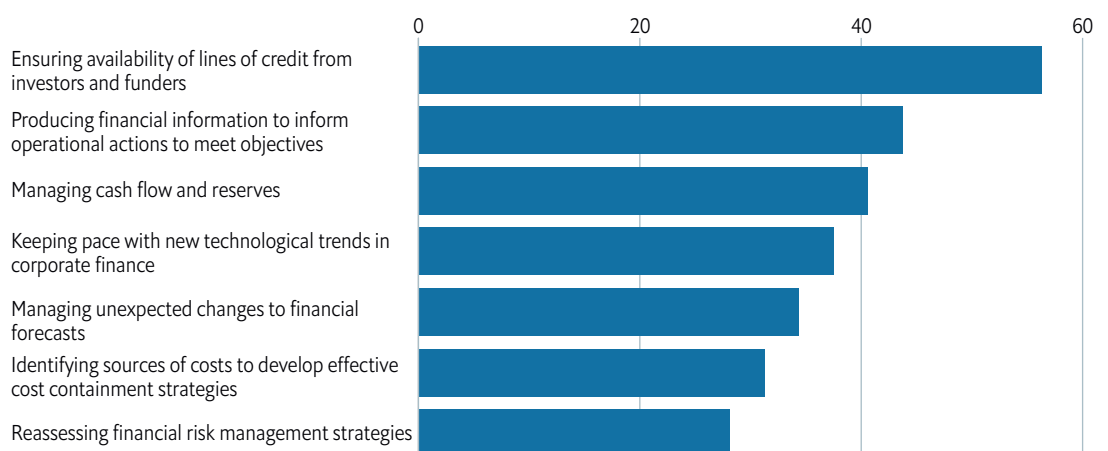
to be close to the consumer than being in the sourcing," he says, further explaining that a similar disparity may exist between industries in Europe and the US, and those in Asia Pacific where "there is probably more manufacturing activity than retail activity."

Supply chain risk management a hard-sell to finance

As these themes continue to play out over the next year and beyond, it is clear organisations are assessing the landscape to identify the new challenges of a post-covid world. Each industry will have its own problems, and within those are subsets of issues specific to certain functions.

For instance, regardless of industry, finance executives anticipate that 2022 will be characterised by three specific challenges: ensuring availability of lines of credit from investors and funders (56.3%); producing financial information to inform operational actions to meet objectives (43.8%); and managing cash flow and reserves (40.6%). It

Exhibit 2: Concerns around the availability of financing are top of mind (%)

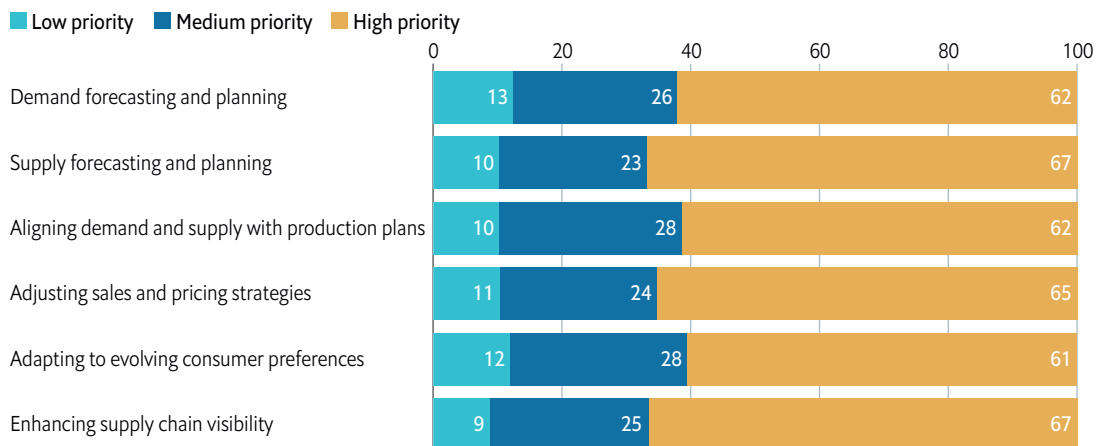


Source: Economist Impact.

⁷ <https://www.cgdev.org/blog/the-next-pandemic-could-come-soon-and-be-deadlier>

Exhibit 3: Organisations embracing different strategies to tackle disruption

(%)



Source: Economist Impact.

is a surprising finding considering the scope of the disruptions. Those three challenges are inherently linked to risk management. It may be that CFOs are focusing more on the direct consequences of disruption rather than their underlying causes, compared with their colleagues in other parts of the business. The divergence could reflect specialisation within the business, but it could also be a source of tension as disruptions persist.

Mr Velázquez Martínez is not surprised by the range of challenges anticipated by those in finance functions, citing the internal challenges that have always been faced by companies trying to balance investments in risk mitigation strategies, and the need to manage spending. “It’s like investing in health insurance, something you hope to never use,” he says. “But if you never use it, nobody gets credit for solving a problem that never happened, and that usually results in confrontations with those in finance functions who don’t necessarily see why we’re investing in something that might never happen.”

But there’s a good chance that something might happen, and sooner rather than later. Given the friction between the finance and procurement functions and finance’s reluctance to invest

in supply chain management strategies, it is possible some companies will be caught napping and unable to deal with disruptions when they hit. It will take a few large, prominent failures in supply chain management for more companies to acknowledge its importance.

For now, despite concerns around finance, companies are beginning to think seriously about strategies needed to mitigate the impacts of a future characterised by uncertainty. When asked about their 2022 mitigation priorities, supply forecasting and planning (66.8%), and the enhancement of supply chain visibility (66.5%) emerge as the most popular choices among companies regardless of location and industry.

From a geographical perspective, US companies (73%) expressed a preference for adjusting their sales and pricing strategies, thereby shifting most of the burden onto the consumer, perhaps reflecting the relative insularity of its significant domestic market, or the strong growth in the US economy in 2021 vis-à-vis in Europe that makes it easier to pass on more cost to the consumer. In comparison, EU companies (61.5%) are prioritising supply forecasting and planning—likely a reflection of how integrated and highly-dependent the bloc’s markets are on each other.

Preparing supply chains for the future

As organisations seek to reorient themselves post-covid, supply chain managers have become key figures for this change. By and large, both external and internal factors are expected to influence the course of organisations' risk mitigation strategies.

"We are transforming our supply chains, an effort we began last year. We did a benchmarking, where in we identified the gaps in our supply chains, and we've been on a journey to get to best-in-class procurement." As part of that, Xcel put in place a market intelligence and business analytics team, something it didn't have prior to the most recent round of supply chain disruptions.

"Earlier, if you had a manager who was diligent, they might be proactive and do something about it, but there was no one with a dedicated responsibility to look into the marketplace and foresee any disruptions. We've set this team up and it is playing huge dividends."

As country after country eased travel restrictions and relaxed covid-related policies, there was

growing optimism about a return to normalcy. However, the recent surge in covid infections in Shanghai—and its subsequent lockdown—has rocked supply chains and shipping lines once again. The electronics sector has been hit particularly hard, given China's central's role in its supply chains. Apple's supply chain, for example, has been hit once again, with three of its Chinese suppliers halting production in and around Shanghai to comply with government directives.⁸ This includes companies such as Pegatron, which makes about 20% to 30% of all iPhones; and the world's largest notebook contract manufacturer Quanta, which also manufactures the MacBook.⁹ Similarly, Foxconn, the world's biggest electronics contract manufacturer, halted production in Shenzhen a month earlier after a partial lockdown was announced there.¹⁰

These developments illustrate that while the world may have emerged out of covid, the pandemic's impacts on supply chains will continue to linger for a while yet, at least until such time China steadfastly pursues its "zero covid" strategy.

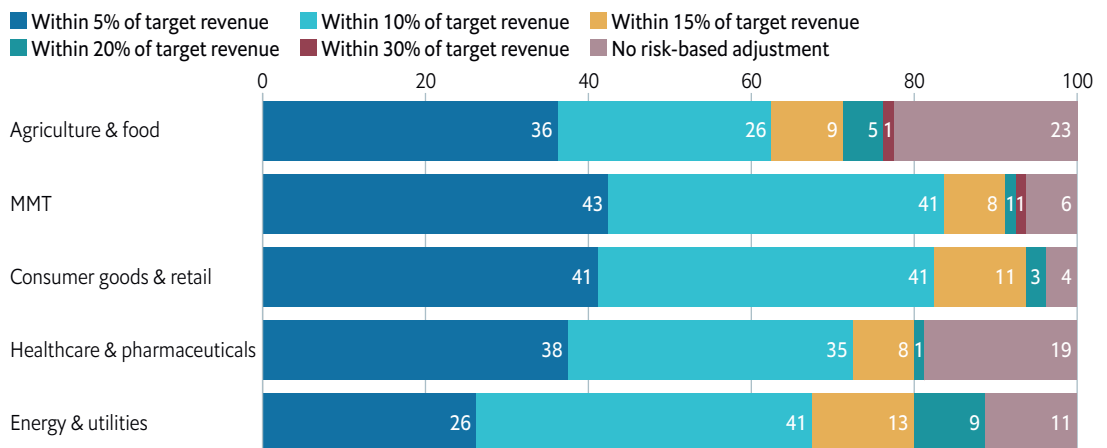
⁸ <https://asia.nikkei.com/Spotlight/Supply-Chain/Shanghai-Kunshan-lockdowns-hit-iPhone-Mac-and-iPad-makers>

⁹ Ibid.

¹⁰ <https://www.theverge.com/2022/3/13/22976414/foxconn-production-shenzhen-lockdown-apple-china-covid>

Exhibit 4: The US-China trade war remains a pressing issue

(%)



Source: Economist Impact.

Separately, other events such as the US-China trade war, Brexit and the Russia-Ukraine war are expected to impact on organisations' supply chains as well. However, the impact may not be so evenly felt across industries.

Evidently, the US-China trade war continues to be top of mind for managers, most of whom (73.8%) expect tensions between the two countries to risk as much as 5%-10% of their 2022 target revenues. Within those metrics, the biggest concerns emanate from those in the MMT (83.8%), and consumer goods and retail (82.5%) industries.

Larger companies are also expected to suffer more in the face of the US-China trade war, as evidenced by the more than four out of ten (41.5%) of companies with revenues of more than US\$1 billion suggesting that as much as 10% of their 2022 target revenues will be at risk.

Russia-Ukraine conflict provides a peek into an uncertain future

The Russian-Ukraine conflict is already causing disruptions throughout supply chains in Eastern

and Western Europe, though a full picture on its global impact has yet to emerge. It provides a peek into a future that could be beset with more such uncertainty, particularly as a new order emerges in the backdrop of a divided world.

For instance, the Russia-Ukraine conflict has already destabilised global energy markets, leading to spikes in the price of oil and natural gas. Oil prices doubled in the near-term aftermath of the invasion. Countries in Europe, for example, are looking to procure oil and gas supplies from other countries after pausing or cancelling imports from Russia.¹¹ The war is also resulting in the acceleration of the renewables agenda in many countries such as Germany, which again will have implications on supply chains.

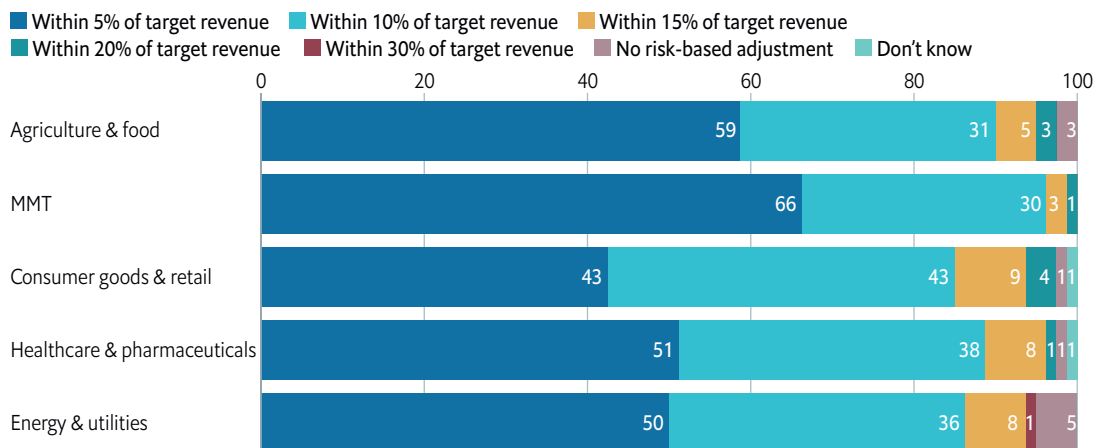
The conflict is also threatening to set off a global food crisis.¹² In early April, global food prices reached an all-time high, according to the UN Food and Agriculture Organization, given the two countries together account for about 30% of global wheat exports and 20% of corn exports.¹³

¹¹ <https://www.voanews.com/a/ukraine-conflict-disrupts-global-energy-markets/6468858.html>

¹² <https://www.nytimes.com/2022/03/20/world/americas/ukraine-war-global-food-crisis.html>

Exhibit 5: Higher commodity and input prices threaten revenues

(%)



Source: Economist Impact.

According to Pamela Mar, executive vice president, knowledge and applications at Fung Academy, and director of sustainability at Fung Group, the conflict's impact on commodity prices can result in weaker consumer sentiment owing to lower disposable incomes.

Even before the conflict in eastern Europe, most managers were already citing rising commodity and input costs as risks that were going to impact revenues by between 5% and 10% in 2022.¹⁴ The issue is particularly cogent for those in the MMT industries (96.3%), where materials shortages can have a devastating, cross-industry impacts as was evidenced by semiconductor shortages in 2021.

Industries across the board are being impacted. "There is significant steel exposure from Ukraine," says Mr. Bhosale." Additionally, Ukraine and Russia collectively provide 90% of global neon gas supplies and a third of palladium, both required in the manufacture of chips—so

that's impacting chip supply across the board." In his view, the "geopolitical situation is going to make the already tenuous situation with semiconductors even worse."

However, a granular look at the issue reveals particular differences in opinion depending on a respondent's function. For example, those working in finance (84.4%) report more concern for geopolitical risks such as those posed by the US-China trade war, compared to those working in procurement (20.2%). This likely reflects asymmetries in information available between those working more closely with supply chains on a day-to-day basis and those less directly involved.

For procurement respondents, the impact of more costly commodities/inputs (90.9%) on predicted revenues was a substantially bigger concern, which is understandable given the surge in commodity prices, though the issue was also ranked highly by those in finance (96.9%).

¹³ <https://www.aljazeera.com/economy/2022/4/8/food-prices-soar-to-record-levels-on-ukraine-war-disruptions>

¹⁴ The Economist Impact survey was completed prior to Russia's invasion of Ukraine.

One size doesn't fit all in supply chain management

Survey results illustrate clearly there is no singular approach to supply chain management. This is likely because supply chain managers and other executives are still learning how to prepare for unforeseen disruptions. As such, companies are looking to cover as many bases as possible and willing to do things on a trial-and-error basis, and devoting more resources to mitigate disruption.

Mr Velázquez Martínez says most companies earlier tended to take two approaches: some chose to “wait and see,” while others tried to understand and predict demand based on historical data. “This is always the mistake supply chains have made, trying to shape solutions and investment capacities on a guess,” he says.

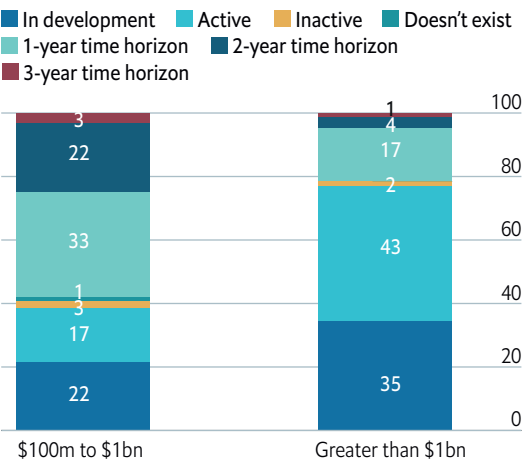
Neither approach has proven to be effective, especially considering how widespread the challenges have become, but Mr Velázquez Martínez notes that some companies today increasingly expect disruption as a given. As a result, organisations are exercising better operational visibility in order to better identify vulnerabilities in their supply chain and “establish more connections with suppliers to better understand their capabilities—all so they can be better prepared and react faster.”

Pardeep Gill, chief procurement officer and vice president, supply chain at Ameren, says his company “tries to work locally, we try to manufacture and source locally in the US whenever possible. We don’t have specifications that limit us to one single source of supply but when we issue contracts, we usually have a primary sources supply that we rely on in more of a partnership fashion. So that we can be prioritised when we need to be.”

Ms Johnson talks about four key things her team is working on. The first is increasing visibility. “I need to know where our supply is coming from. Where are your manufacturing locations? How much inventory are you holding? That way when something hits, such as a factory shutdown in China, we can quickly identify what equipment is being manufactured there and have time to work alternatives.”

The second is “building more flexible delivery models”, Ms Johnson says. Her company is making a concerted effort to shift towards serving customers how and where they want to be served, whether that’s broadband self-installation versus a tech visiting their home, buy-online-pick up-in-store or having the latest device delivered to their home and set-up with the help of an expert.

Exhibit 6: Larger companies are likelier to have the resources to invest
(%)



Source: Economist Impact.

The third is optimising transportation, and the fourth is the increased use of technology. “We’re at a point where we can use the intelligence we gather and drive better automation with some of the other tools and use technology to our advantage to help us build a better supply chain across the board.”

This issue is borne out in the survey results: close to a third (29.8%) of companies have an active supply chain risk management strategy, while another 28% have one under development. Considering the high costs of most risk management strategies, it’s unsurprising that they are far more common among larger companies. Organisations with revenues larger than US\$1 billion (77%) are twice as likely to have an active or developing strategy than those with smaller budgets.

Just-in-time just-not-enough

However, Stephen Olson, senior research fellow at the Hinrich Foundation, warns that most companies cannot expect any modifications to their supply chains to result in instantaneous change, especially when it comes to labour costs, driven up by worker shortages and inflationary pressures.

Instead of thinking of it like “switching a light on,” supply chain risk mitigations require time to implement and mature. When asked what strategies are being implemented in their own

Exhibit 7: Key supply chain risk management strategies
(%)



Source: Economist Impact.

organisations, 41.5% of respondents report having implemented permanent supply-chain risk-management teams and processes in their risk management strategy, suggesting that there are many who share Mr Olson's view.

On the changes brought about, Mr. Bhosale says, "we meet with each of our business units now, every week, looking at inventories, looking at supply issues, looking at plans of any major projects coming up."

Other firms are looking into short-term tactics for the promise of more immediate results, such as strengthening relationships with their existing suppliers (38.7%), or increasing near-shoring, on-shoring or localisation (37.2%) of their supply chains. Mr Olson points out that the prominence of localisation and related strategies is evidence that most companies recognise that having a diverse range of sourcing is key to ensure their supply chains are able to cope with any future shocks.

It is something that is starting to happen across the board. Mr Koepp says companies are starting to move away from lean just-in-time models

to maintaining more inventory and more redundancies in their supply chains.

Mr Ezell says that certain companies are likely to integrate "China plus one" strategies, to ensure they maintain backup sources alongside their main suppliers in traditional manufacturing hubs in East Asia. For example, Aoife Hanley, professor of innovation and international competition at the Kiel Institute for the World Economy, suggests that prior to the Russia-Ukraine conflict, German companies likely would have considered Eastern Europe as "Plan B" should relations with China falter in the long term. Though the costs of maintaining this backup inventory could be high, the investment would ensure organisations can ensure minimal impact on their operations and long-term growth. However, the Russia-Ukraine war has scuppered this Plan B.

According to Ms Mar, coupled with the impacts of covid-19, the US-China trade war has made companies think about the locations they want to source from. "What about double and triple sourcing? What about the whole idea of geographical diversity, and Plan Bs and Cs and Ds?" She says these are kinds of questions supply chain managers are faced with.

Technology is transforming supply chains

The pandemic has resulted in the accelerated adoption of technology across different industries, and in different business functions. Supply chains and procurement are no different, with technology is being increasingly deployed as a strategy to manage or mitigate supply chain risks. Four in 10 (40.8%) companies plan to digitally transform their supply chains as part of their mitigation strategies, and 36.7% plan to use software to enhance supply chain visibility and control.

Mr Ezell characterises the growing use of technologies in supply chain management as a kind of corrective to organisations' "maniacal focus on operating efficiencies" that emphasises "resiliency, adaptability, and flexibility."

As companies look to focus on increased visibility over their supply chains, digitalisation is becoming more important, Ms Mar says, adding that "digitisation is the key to flexibility, visibility and agility in supply chains, and it has become a market necessity now." Sustainability-driven verification and traceability also rely on digitalisation, she adds.

Companies are already using a wide range of digital tools, including blockchain, artificial intelligence and 3D printing at various levels of the supply chain. Among survey respondents,

digital platforms (45.5%) emerged as the most common form of technology being implemented by companies, followed by cloud computing (38.5%) and 5G connectivity (38.3%).

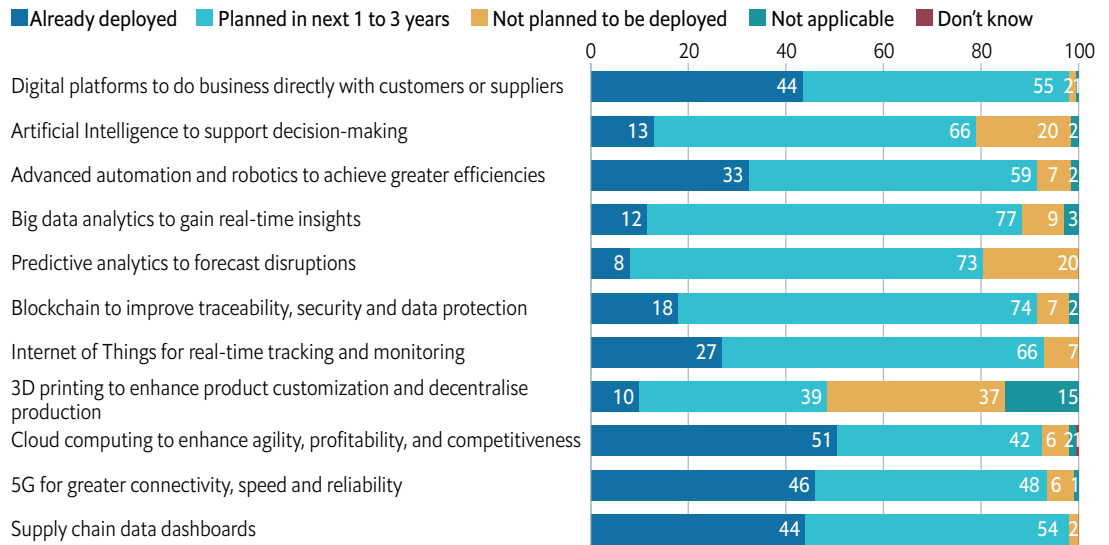
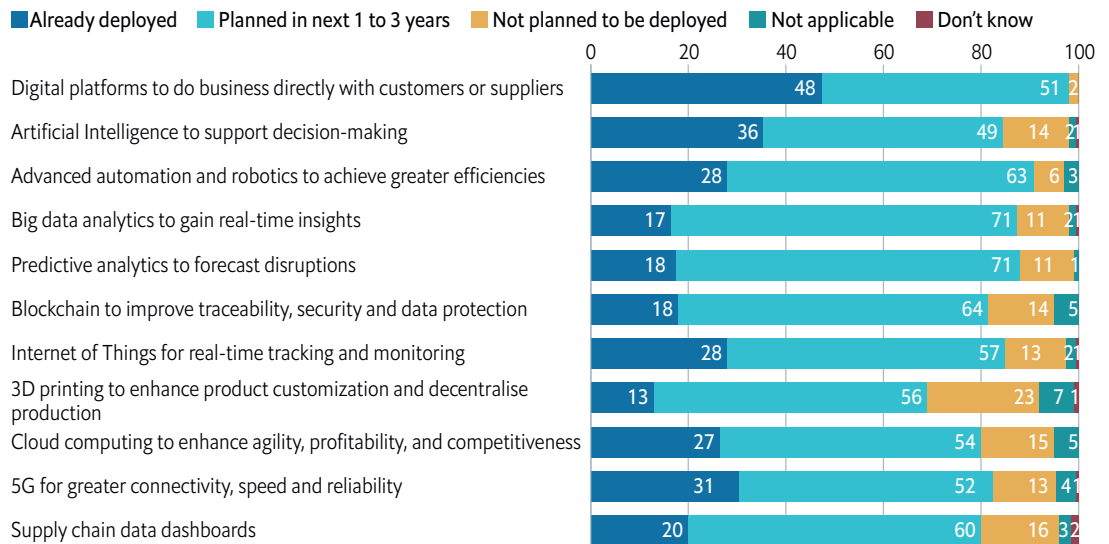
Mr Bhosale says even basic tools have made a massive difference in dealing with disruption. "With Microsoft Teams, we saw an increase in collaboration because many of the disruptions required us to come together, pulling people out of silos—the supply chain was a silo; distribution, transmission, they all traditionally worked in silos," he adds.

By and large, US companies outpace their EU counterparts in terms of the technologies that are being deployed in their supply chains. For example, more than half of US companies (50.5%) have already deployed cloud computing compared to 26.5% of EU companies. European firms are also less likely to have implemented 5G connections and supply chain data dashboard (30.5% and 20% respectively) than those in the US (46% and 44% respectively).

Although European companies trail their US counterparts in tech adoption for supply chain purposes, most of them plan to deploy big data analytics (71%) and predictive technologies (70.5%) within the next three years. Big data analytics can help companies garner valuable

Exhibit 8: European companies lag US counterparts in technology adoption

(%)

USEurope

Source: Economist Impact.

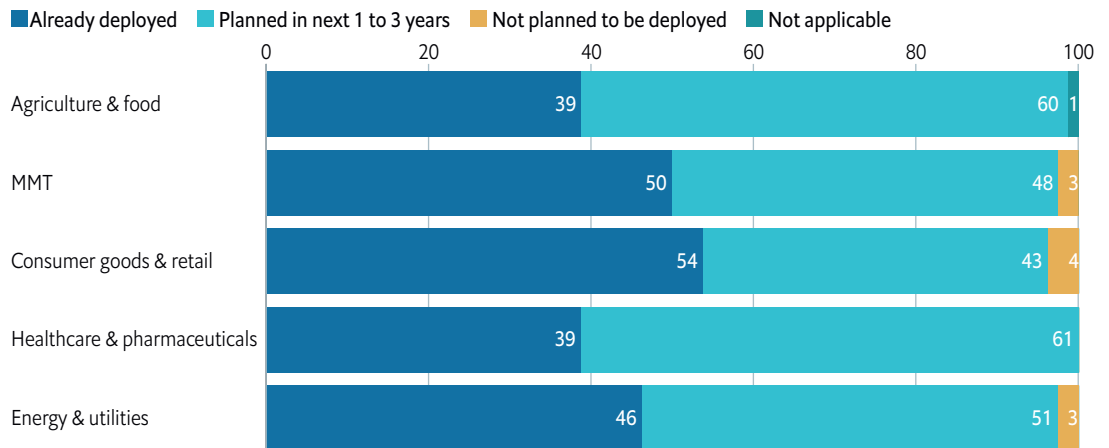
insights and enable decision-making by helping forecast product demand more accurately and by providing greater visibility in the supply chain.

Mr Gill says talks about the use of cloud-based software that can make work processes

more reliable and enable better document maintenance and workflows, and provide better connections to the demand planning and forecasting systems at companies there they can get better information.

Exhibit 9a: Digital platforms key to supply chain resilience

(%)



Source: Economist Impact.

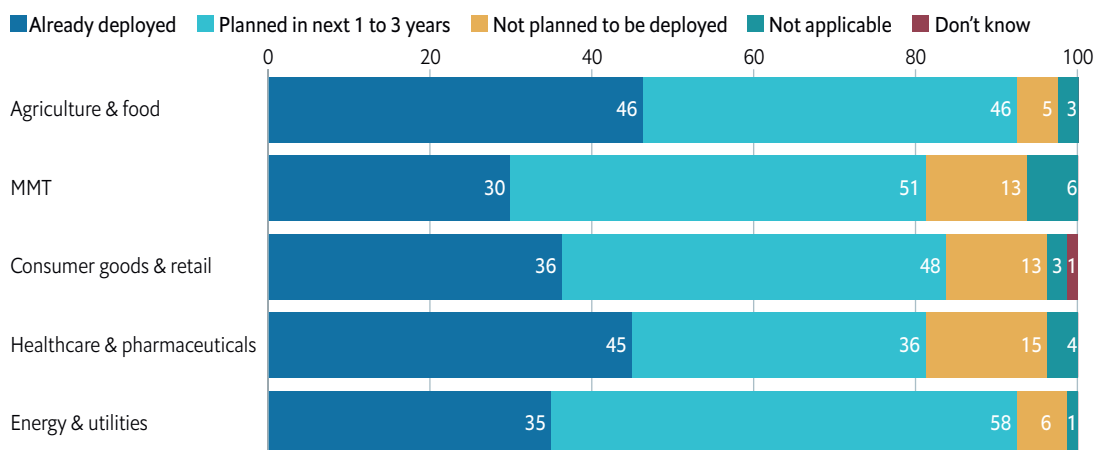
Digital platforms and cloud computing to streamline supply chains

Digital platforms and cloud computing are set to play major roles in the digitalisation of the

supply chains, which stubbornly remains a paper-based industry.¹⁵ However, covid-19 has pushed the needle on digitisation and resulted in the greater uptake of digital collaboration platforms, reaching almost all logistics customers.¹⁶

Exhibit 9b: Cloud computing allows scalability

(%)



Source: Economist Impact.

¹⁵ <https://www.supplychainbrain.com/blogs/1-think-tank/post/32802-paper-the-bane-of-the-supply-chain-and-how-to-combat-it>

¹⁶ https://impact.econ-asia.com/perspectives/sites/default/files/eiu_huawei_into_the_new_world.pdf

Digital platforms (52.5%) and cloud computing (47.8%) are set to be integrated as part of their three-year strategies among the surveyed companies.

The majority of those from the consumer goods and retail sectors (53.8%) have already deployed some form of digital platform, while agriculture and food (46.3%) and healthcare and pharmaceutical (45%) executives emphasise the importance of cloud computing to their businesses.

Using the cloud allows scalability benefits without the hassle and costs involved in buying more hardware. The cloud also provides additional security from cyberattacks by performing automatic backups and deploying patch management to reduce risks. It results in fewer technical malfunctions, in turn reducing

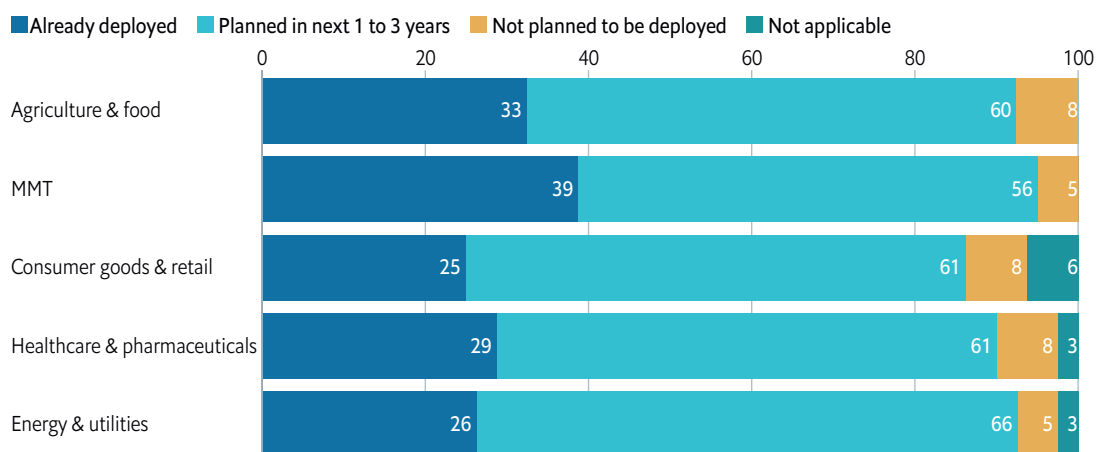
downtime costs. It allows the monitoring of delivery networks in real time and a reduction in bottlenecks and enables the introduction of applications running AI-based, big data analytics. Those applications can play a critical role in ensuring resilience in the face of any kind of disruption.

For Mr Ezell, these technologies are key in facilitating cross-border trade as they can reduce friction in moving goods by streamlining paperwork requirements and improving technical standards. Ms Mar says digitising processes such as paperwork and contracts is key in all of this, because it allows for streamlining and makes it easier to manage disruptions.

Solutions such as apps are also increasingly used, making digital architecture more mobile and easier to use than in the past. "We are looking

Exhibit 9c: Robotics and automation help reduce costs

(%)



Source: Economist Impact.

at implementing an app that will sit on people's phones and would allow them to read barcodes and digitize the whole inventory receiving and put-away process, using an app," says Mr. Bhosale.

Robotics and automation are important cost reduction tools

Mr Velázquez Martínez thinks that some of the changes brought about the pandemic will remain, such as the growth of ecommerce, and innovations for omnichannel growth and logistics. Considering the challenges faced by the automotive industry, it's likely that there will be concurrent rise in the adoption of automation and robotics by manufacturers as they attempt to cut down labour costs and restrictions.

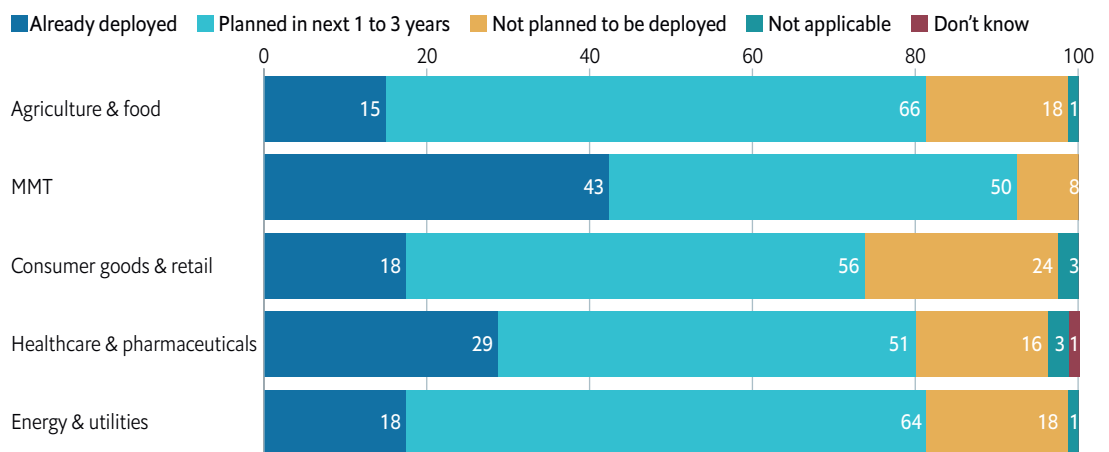
The survey already bears out some of this: more than 30% of companies have already deployed advanced automation and robotics, while another 61% are planning to deploy within the next three years. The strongest sentiments emerged from the energy and utilities sector, where 66.3% expect to deploy these technologies in the near term.

This is particularly important given that rising labour costs are among the most prominent causes of disruption companies are faced with. "As labour inputs are increasingly replaced by the technological inputs, manufacturing becomes more efficient in what historically has been higher labour cost environments, especially as mass customisation has become a consumer expectation," Mr Ezell says.

"You can order your Tesla exactly the way you want it—combined with a with other tools like manufacturing, like robotics, that can make production more economically efficient, closer to the sources of final demand." Tesla's Design Studio allows potential buyers to customise their cars in terms of the model they desire, wheels, colour and interior design. One can also add an autopilot feature that can steer, accelerate, brake and change lanes automatically. Once orders are received, Tesla then employs an army of industrial robots that collaborate with each other to assemble a car.¹⁷

Mr Koepp talks about the potential for automation to increase efficiencies in the supply

Exhibit 9d: Adoption of artificial intelligence set to grow (%)



Source: Economist Impact.

¹⁷ <https://www.tesla.com/models/design#overview>

chain that we currently don't see. "And that means everything from factory automation to automated driving, planes, ships, and fully automated logistics," he adds. Autonomous vehicles bring efficiencies by helping identify best travel routes, avoiding congested or under-construction roads, while helping realise fuel efficiencies by driving at optimum speeds.¹⁸

Cutting edge technologies have become buzzy topics across various industries for years now but

outside start-ups and tech-focused companies, adoption remains low. For instance, only a small portion of companies (24.3%) have already deployed artificial intelligence (AI) in their decision-making processes, although the share of companies in the MMT sector is substantially higher (42.5%). The take-up of data analytics (14%) and predictive analytics (12.8%) also remains low, although high uptake is planned in the next one to three years.

¹⁸ <https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/distraction-or-disruption-autonomous-trucks-gain-ground-in-us-logistics>

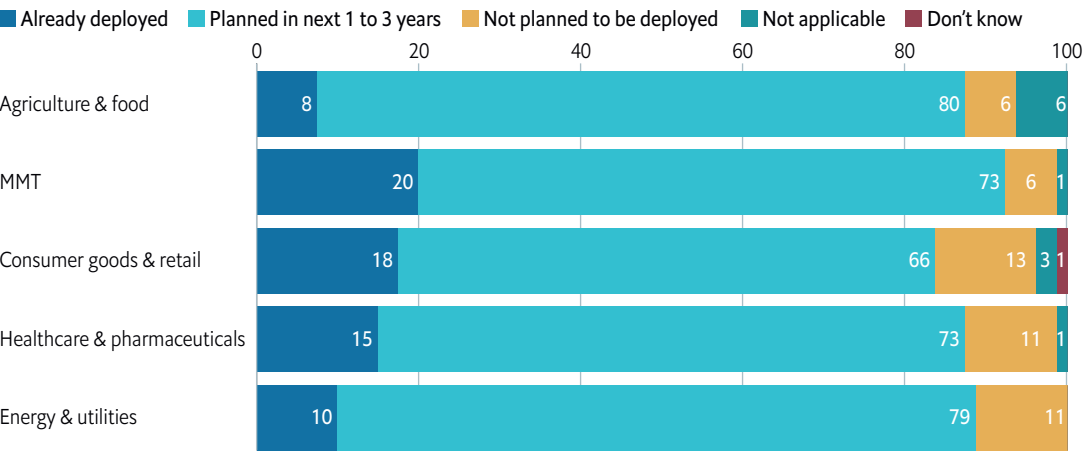
Developing tech-based cultures to mitigate disruption

These numbers reveal that despite the immense opportunities for these solutions to introduce new efficiencies into industry and improve how operations are carried out in these traditionally high-cost industries, most organisations are not equipped yet to take advantage of the tools available. Part of this might be due to the fact the lack of tech talent to manage these solutions, an issue that plagues the energy and utilities sector in particular.

“I think the real difficult thing is that as you add more technology, you really need to rethink the whole process,” says Ms Mar. This includes reskilling and training workers. “As more and more parts of the supply chain get digitalised, you need to bring your workers along, which means companies need to educate and train their workers.”

Costs are another factor cited. But in reality, there are several off-the-shelf products can be

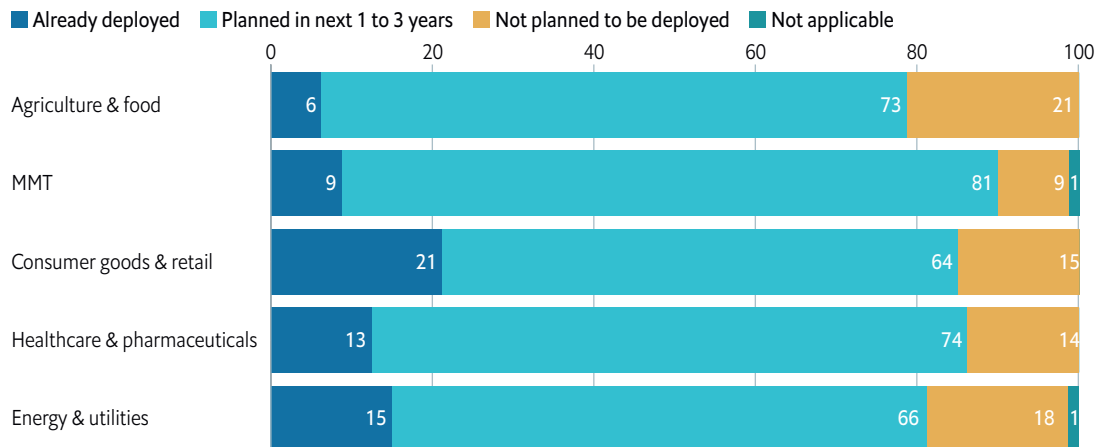
Exhibit 9e: Organisations looks to big data for real-time insights
(%)



Source: Economist Impact.

Exhibit 9f: Organisations explore forecasting insights using predictive analytics

(%)



Source: Economist Impact.

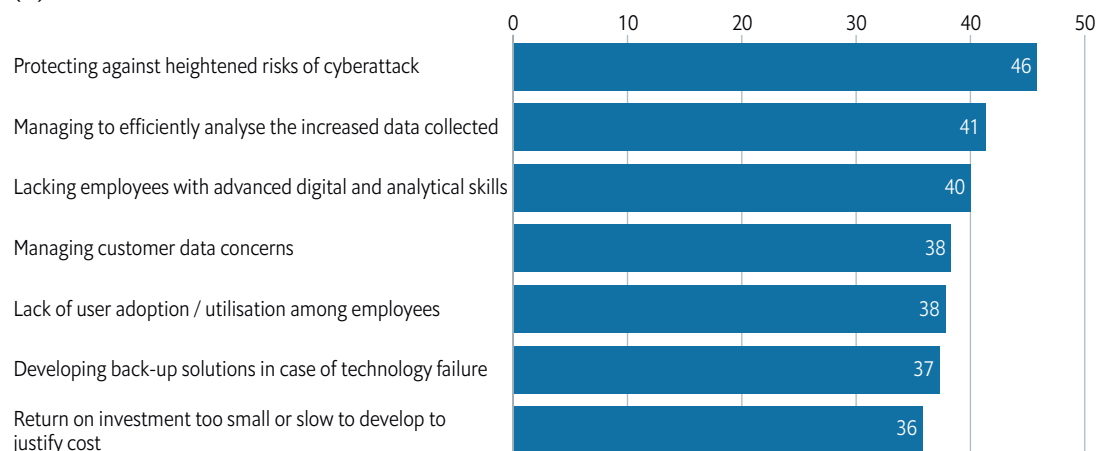
plugged into the existing digital infrastructure and at reasonable cost that can help supply chain managers in predicting and managing their supply chain effectively. Additionally, companies can also run powerful machine learning algorithms by applying open-source solutions in Python or R to derive powerful insights about

their supply chains. The key is hiring the right people and building a tech-based culture that supports innovation of this nature.

Some technologies, on the other hand, are more difficult and expensive to integrate than others, such as blockchain—it has been deployed by only

Exhibit 10: Digital transformation brings cybersecurity concerns

(%)



Source: Economist Impact.

18% of surveyed companies, and by just 11% of companies with revenues under US\$1 billion.

It is rather surprising that for so much talk around the digitalisation of supply chains and the greater adoption of technology, less than a quarter of companies surveyed have deployed artificial intelligence (24.3%), big data analytics (14%) and predictive analytics (12.8%).

However, a large share say they plan to deploy these technologies in the next one to three years— (57.5%), data analytics (74%) and predictive analytics (71.5%)—to drive the digital transformation of their supply chains. How much of this eventually materialises remains to be seen.

Similarly, 68.5% of companies will look to integrate blockchain capabilities within the next three years to improve traceability, security and data protection, up from just 18% of companies that have done so already. Smart contracts have several use cases already—they can enhance trade financing by streamlining cross-border payments and trade; and also provide unique identity to digital assets, greatly removing counterfeiting issues, while making KYC processes frictionless.¹⁹

Nestle, for example, is using blockchain in supply chain management to track baby food products. Toyota, meanwhile, is using it to enhance autonomous driving technology, while Maersk is using blockchain technology to track the

movement of shipments between ports.²⁰

Despite the strong aspirations of companies in pursuing technological transformation, challenges remain. For most companies, the top challenge faced as a result of the adoption of new technologies is protecting against the increased risk of cyberattack (45.8%).

Two other significant challenges are somewhat related—they include the ability to carry out effective data analysis (41.3%), and a lack of employees with advanced digital and analytical skills (40%). This is a hurdle that dovetails with a global shortage of tech talent.

Globally, there was a shortage of 40 million skilled workers in 2021, which is expected to blow up to 85.2 million by 2030, resulting in revenue losses of \$8.4 trillion, due to the lack of skilled talent. Perhaps the biggest hindrance in the adoption of digital technologies to mitigate supply chain risks is that more than a third of companies (35.8%) think the return on investment is too small or too slow to develop to justify the costs involved. This is a myopic view, of the kind that landed many companies in trouble in the first place. Preparing for supply chain disruption may not be about enhancing revenues, but if there is anything the past two to three years have shown, it is that protecting the downsides resulting from disrupted supply chains is of critical importance. Worryingly, it is a point more than a third of the companies surveyed are missing.

¹⁹ <https://101blockchains.com/smart-contract-use-cases/>

²⁰ <https://101blockchains.com/enterprises-implementing-blockchain/>

Developing sustainable supply chains for greater resilience

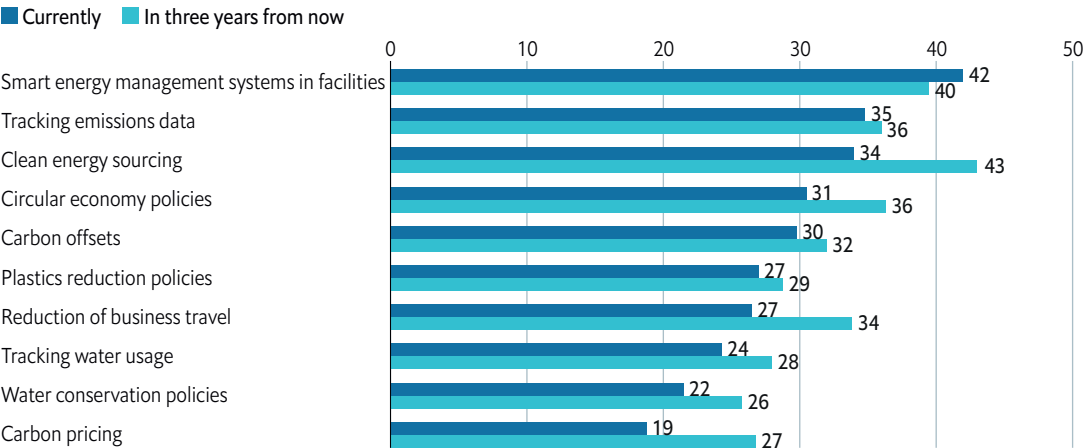
Technology aside, one theme that is beginning to emerge among supply chain managers is the issue of sustainability. Dealing with and responding to climate change has become a key challenge for companies as they look to reassess and reorganise their supply chains and procurement.

It's not simply a matter of an environment pay-off, says Mr Olson, but also a matter of resiliency. While some steps to improve sustainability may impose accounting costs on companies, they will also make companies' supply chains more resilient, he adds.

Ms Johnson says AT&T has made substantial commitments towards lowering greenhouse gas emissions. "We're doing business with suppliers that share that vision, to help us achieve the overall goal," she says.

According to Mr Koepp, even in cases where companies aren't directly attributing their need to build more robust more supply chains directly to the need to protect the environment, there's impact coming from climate change. He adds that there is now a concerted push "to get off hydrocarbons", even from a policy perspective. "There is now consensus within the Western-

Exhibit 11: Supply chain sustainability is a rising trend
(%)



Source: Economist Impact.

derived world order—the Bretton Woods system—that there is a real need to get away from fossil fuels, and that is going to impact supply chains in a big way,” he says. Moves in this direction are clearly being made with country after country making commitments to reduce carbon emissions and pledges to reduce or to completely do away with the consumption of fossil fuels. Adding sustainability to the Bretton Woods architecture could be a natural evolution for the values-based system.

Most companies are already making some progress towards implementing more sustainable solutions in their supply chains. More than four in ten (42% of) companies have already implemented smart energy management systems in facilities, for examples, while another 34.8% are tracking emissions data. One in three (34%), meanwhile, have already implemented clean energy sourcing. The world is clearly in the midst of a shift in supply chain and procurement strategies to incorporate sustainability as a key tenet.

Sustainability in supply chains has become a buzzword in recent years, but its importance will only deepen with time, especially as the effects of climate change are increasingly felt. Most

companies have some plan to implement more sustainable supply chain technologies within the next three years, ranging from clean energy sourcing (43%), smart energy management systems (39.5%) and circular economy policies (36.3%).

From an industry standpoint, more than half of the companies in the agriculture and food sector (58.8%) say they plan to use clean energy sourcing within the next three years. Respondents from the energy and utilities sector (46.3%), as well as the consumer goods and retail (41.3%) industries, tend to favour more smart management facilities.

Meanwhile, 40% of healthcare and pharmaceuticals companies plan to implement circular economy policies to improve their supply chain sustainability over the next three years. One of the best examples of circular economy in healthcare is single-use device reprocessing. After a single use, the medical device is sent to reprocessing facilities where they are cleaned and sterilised to be again used. This does not only save healthcare companies lots of money, but is also good for the environment, helping reduce medical waste.²¹

²¹ <https://medcitynews.com/2021/03/healthcare-must-move-toward-a-circular-economy-and-single-use-device-reprocessing-offers-a-template-to-follow/>

Supply chains of the future

As the impacts of covid-19 and geopolitical events continue to play out across industries, geographies and functions, companies will be seeking to reimagine what their businesses could look like with the lessons learned from the last two years' worth of chaos. Disruptions are, in many ways, the new normal—a fact of operating in a volatile time in history.

Technology offers a way through the turbulence. The rise of digital platforms and internet-first services can empower organisations with the capabilities to meet the challenges of today by cutting through the complexities of intricate supply networks, streamlining processes and creating more sustainable options. These tools range from artificial intelligence to blockchain to data analytics, all of which can give companies greater visibility into convoluted value chains with relatively low labour and resource costs. This is already happening in companies across sectors.

But these developments will not come without their costs, both tangible and intangible. Companies have to come to grips with these trade-offs if they want to ensure their businesses survive the next wave of disruption.

Ms Mar advises companies to “get started in order to begin the process of learning.” She adds that “nobody knows what the ultimate, flexible, resilient, totally transparent, technology enabled supply chain actually looks like. There are companies who say they do but, you cannot really predict what will happen—all you can do is you get started and get learning. And give your employees plenty of time to adapt.”

A prolonged period of persistent supply chain disruptions is resulting in a rethink of supply chain strategies. “The pandemic was an experience that opened a lot of people’s eyes to how we had overemphasised economic efficiencies in the construction of our supply chain,” says Mr Olson. “Now that pendulum is going to tilt back a bit more in the direction of supply security.” If securing supplies is going to be more expensive, it is a reality companies have come to accept.

While the disruptions have been severe, things will eventually normalise once again, says Mr Koepp. “The uncertainties will remain until new models are fully fleshed out, which will depend on the reorganisation of supply chains at companies,” he says.

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