Reimagining tomorrow's **supply chains**

Supply chains of the future will need to be connected, autonomous, integrated and powered by data and digital capabilities. **Ajay Nair** and **Saurabh Jain** provide the lowdown.

Supply chain headwinds

Organisations today are facing huge survival challenges. PwC's 26th Annual Global CEO Survey indicates that about four in ten CEOs — both globally and in India — believe their organisations will not be economically viable in ten years if they continue on their current course. Five in ten CEOs in the Asia-Pacific region believe that their current business models will not survive in ten years. The survey also indicates that given the changing customer demands and supply chain disruptions, CEOs are looking at reinventing their companies over the next five years with the required investments in technology and people.[14]

Some of the headwinds in the supply chain domain are highlighted below.

Unstable commodity prices

Due to climate changes, inflation and supply chain bottlenecks, commodity prices soared in April and May 2020. This was compounded by the conflict in Ukraine. Typically, war impacts commodity pricing, leading to quick surges in prices if one of the participants is a big supplier – such as Ukraine in agriculture and Russia in energy. However, it can also cause sudden reductions in global prices if one of the participants is a big buyer.

14 26th Annual Global CEO Survey: India perspective

Commodity prices are declining despite the ongoing Russia–Ukraine conflict. According to experts, the Fed's decision to halt quantitative easing resulted in higher interest rates, a stronger dollar and the possibility of slower gross domestic product (GDP) growth – all of which are detrimental to the overall prices of commodities.

Increase in container transport rates

When the pandemic was at its worst and resulted in worldwide lockdowns, customers supported the economy by shopping online. Operational costs – most notably, freight container shipping prices from Asia – skyrocketed due to the unexpected increase in demand for commodities.

Freight rates doubled, tripled and eventually quadrupled as a few dominant operators gained control of the market. As reported in the Washington Post, the cost of shipping goods from China and East Asia to the ports around the US East Coast exceeded USD 22,000 in September 2020. Moreover, early January 2020 saw an average price of USD 2,649.[15]

Shortages of supplies

Disruptions have led to a considerable lack of supplies, due to either unexpected spikes or constraints. For instance, as the COVID-19 pandemic spread, automakers reduced their orders for semiconductor chips. On the other hand, demand for technological devices increased. In the second half of 2020, when the automotive market rebounded more quickly than expected, the semiconductor sector had already relocated manufacturing lines to fulfil demand for new uses. This unexpected increase in demand led to an unprecedented chip shortage in addition to long-standing problems – such as limited capacity – of the semiconductor industry.

Workforce challenges

With the introduction of new technologies in the market, digital literacy is gradually becoming a critical component of the upskilling process for the workforce. Due to an increase in uncertainties, it is no longer possible to make business decisions the way they were in the past. Therefore, there is a need for a seamless integration of artificial intelligence (AI) and human intelligence in the supply chain ecosystem.

Reimagining supply chains of the future

The traditional supply chain relied on siloed supply chain functions, limited data availability, manual decision making, unconnected planning and business models with limited customisation as per customer demands. However, owing to the disruptions in the ecosystem, the supply chain of the future will need to be customised, autonomous, integrated and powered by data and technology to serve new customer channels, and adjusted dynamically to new scenarios. Moreover, it would have to be equipped to anticipate and adapt to unforeseen circumstances.

One of the first steps in this direction is to create scenarios to deal with the different kinds of disruptions while factoring in every aspect of a supply chain – from Tier N suppliers (entities at the bottom of the supply chain) to logistics providers and customers. In order to do so, one needs to ask these questions to get a clearer picture:

- How do problems with one tier of suppliers affect the others?
- What would happen if a major piece of equipment at a logistics facility broke down, or if a pandemic or natural disaster caused a port to be shut down?
- What if there was an unexpected increase in demand or niche market segments emerged?

a. Supply chain customisation

In a complicated global business environment, numerous current supply chains fall short of helping a firm achieve high performance standards. With most chains designed to accommodate stable demand with high reliability, a one-size-fits-all approach cannot be used to manage problematic issues such as growing customer needs and shifting market dynamics.

Thus, a more diversified supply chain strategy is required for the dynamic and unpredictable business environment of today. Supply chain customisation or individualisation enables businesses to set up their supply chain networks to relevant clusters so that customer requests can be met in an effective and efficient way.

The main goal of supply chain customisation is to create a network of supply chains that is specifically tailored to each customer's needs in terms of

15 Ocean freight rates, accessed in December 2022

timing, cost, quality and logistical activity. This can be started off by developing a supply chain strategy design where segmentation takes place based on the channels – general trade, modern trade or e-commerce of direct-to-consumer (D2C; which has evolved recently). Every element of the supply chain aims to fulfil expectations translated into relevant stock keeping units (SKUs) at desired service levels with optimised costs.

The next level of segmentation and customisation happens at the demand planning level, where customer demand is segmented based on multiple parameters such as sales, variability and margin, to ensure that correct scientific models can be applied for a good baseline statistical forecast as a starting point. The demand planning process is accordingly designed to ensure the completeness, bias and accuracy of the forecast of every SKU and channel.

b. Autonomous digital supply chain

An autonomous supply chain indicates an integrated, data-driven digital supply chain that operates harmoniously across different layers to drive customer satisfaction. These automated

systems and technologies require minimal human intervention or exceptions, escalations and approval handling. Data science enables the extraction of meaningful information from unseen patterns that emerge from vast volumes of data. Furthermore, AI and machine learning (ML) help in making decisions based on this information and previous trends in coordination with the internet of things (IoT), robots and smart devices working seamlessly on 5G networks.

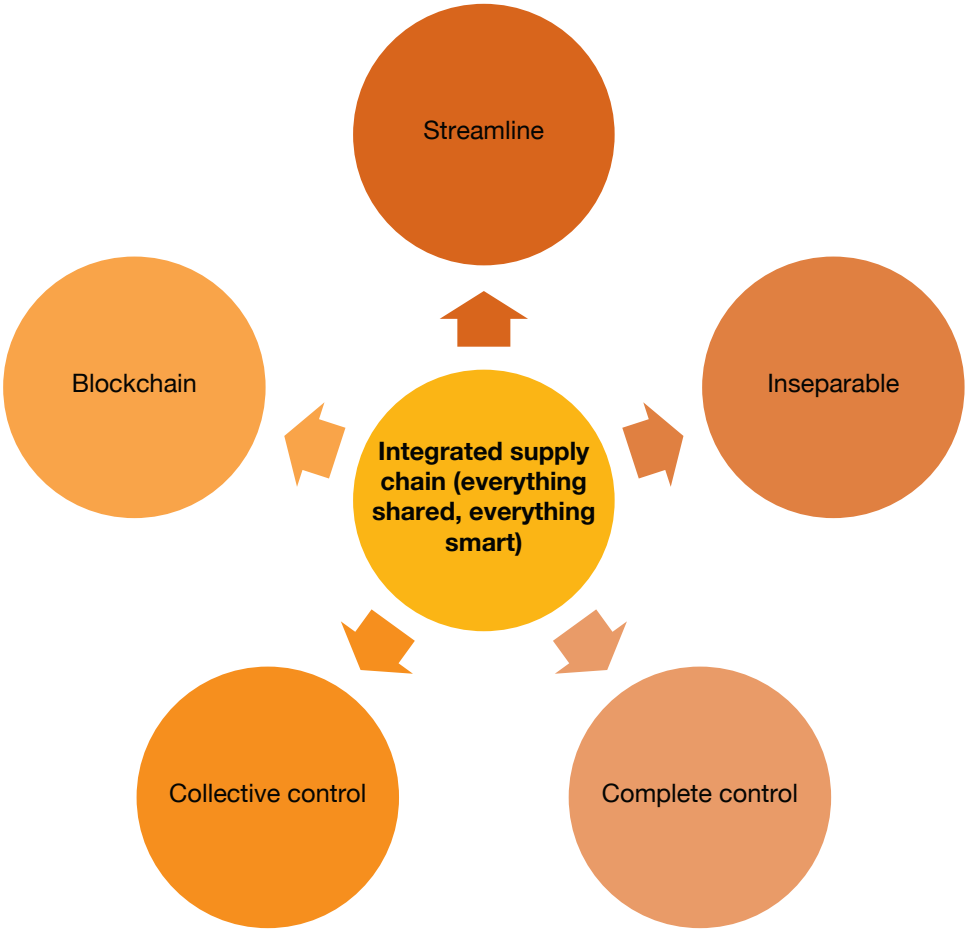
c. Integrated supply chain ecosystems

An organisation can meet customers' demands and expectations by using an integrated supply chain network to:

- onboard its customers and suppliers, and harmonise shared reference data – such as information on traded items or shipping addresses
- exchange business documents with identified and authenticated partners
- share demand signals, available-to-promise (ATP) or capable-to-promise (CTP) data in a selective manner
- align production purchase order call-offs and transportation orders
- meet demand signals.

Integrated supply chains give network partners the option to examine and rate their dependability as a group, manage what information they communicate with each party, and have confidence in the identification of their trading partners.

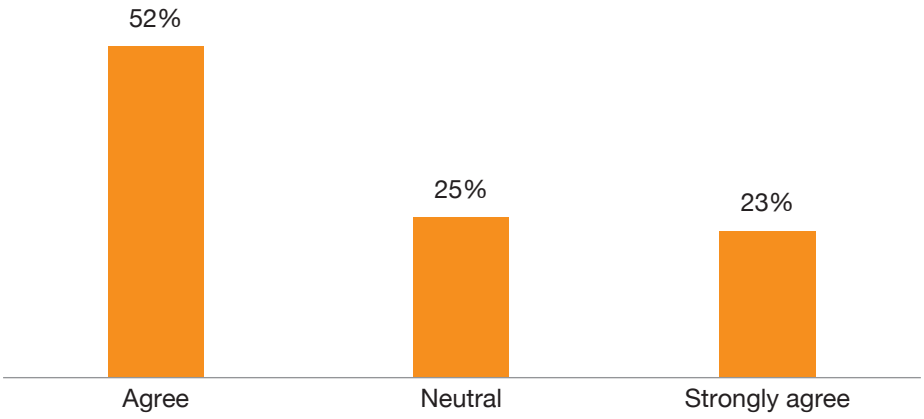
Integrated supply chains are used by businesses to match supply and demand, and give the cooperating parties the same ability to agree on a common understanding of the projected demand as done by an enterprise's sales and operations planning processes. The parties are able to spot possible production or transportation capacity gaps and recommend alternative network resources to bridge the gaps.



The majority of brands and consumer packaged goods companies communicate with their consumers through D2C channels or marketplaces. For instance, today, both digital and traditional methods are used for communication between auto original equipment manufacturer (OEM) service dealers and vehicle owners. Their integrated supply chain monitors demand signals and predictive characteristics for each type of consumer across channels – just like other multichannel organisations. Additionally, it enables the finance and sales teams to jointly analyse the depth and breadth of local product offerings for quick client assistance and provide attractive choices.

As per PwC's recent survey[16] more than 52% of supply chain leaders from various sectors strongly agree that digital transformation is key to achieving an integrated supply chain. Multiple software tools and platforms have come up in the last few decades to help organisations ensure an integrated view of the supply chain. Such tools also enable organisations to link demand planning to supply and dispatch planning, with multiple feedback loops to ensure that supply chain planning and execution challenges are met, and decisions are taken after analysing multiple real-time scenarios. Therefore, dynamic demand–supply balancing through quick scenario formulation and scientific analysis-based decision making with the help of technology is an essential part of the integrated supply chain ecosystem.

Digital transformation: Key to integrated supply chains



d. Data and digital – the fuel of future supply chains

Legacy supply chains, which are designed for bulk replenishment in the case of mass market distribution and procurement from the same suppliers, severely limit customer choice, degrade the customer experience and restrict the ability to respond to changing market forces.

16 PwC survey (see note at the end)

In contrast, supply chains in the modern era are faster, more dynamic and more disruptive than ever before. Identifying new markets and supply sources is essential to the digital economy's success. Additionally, agile supply networks outperform rigid supply chains by foreseeing demand from informed customers.

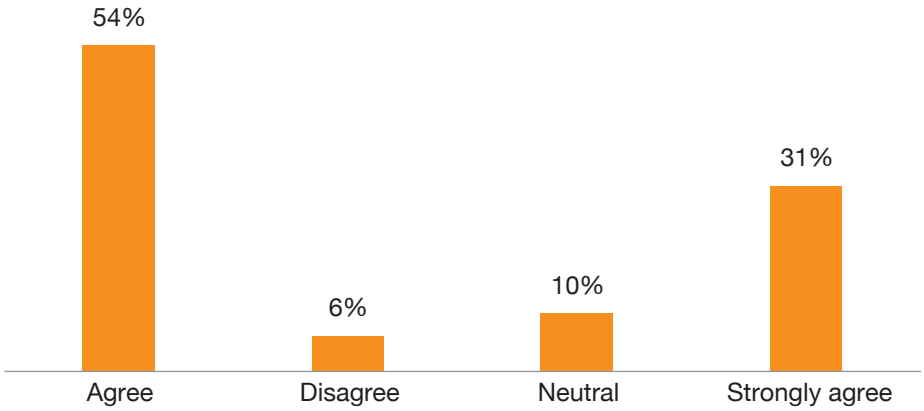
PwC's recent survey indicates that more than 54% industry leaders believe that digital transformation is key to enabling collaboration with end-to-end supply chain partners – i.e. suppliers, logistics and warehousing service providers, and customers.[17]

The digital revolution made it possible for businesses to trade directly with customers and for manufacturers to interact with their clients directly. It is now possible for businesses to make use of technology to also speed and scale up their response to changes in supply and demand. Businesses may securely and privately exchange data within a network, altering hierarchical supply chains that have historically been fragile.

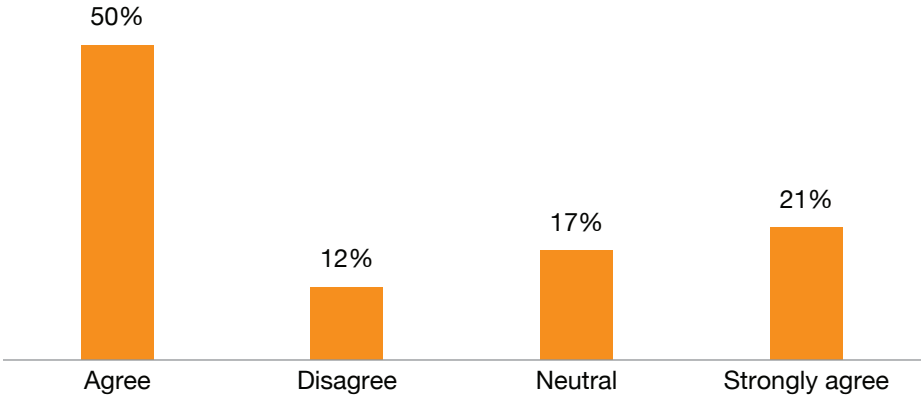
Supply chain leaders can also examine the current condition of operations and anticipate future disruptions with the use of digital twins, which use real-time information streams including incoming shipment timetables, vehicle whereabouts and inventory levels.

More than 50% business leaders say they are focusing on building digital supply chain capabilities in the supply chain teams of their organisation.[18]

Digital transformation: Key to achieving end-to-end supply chain visibility



Focus on building digital supply chain capabilities within the organisation[18]



17 PwC survey (see note at the end)

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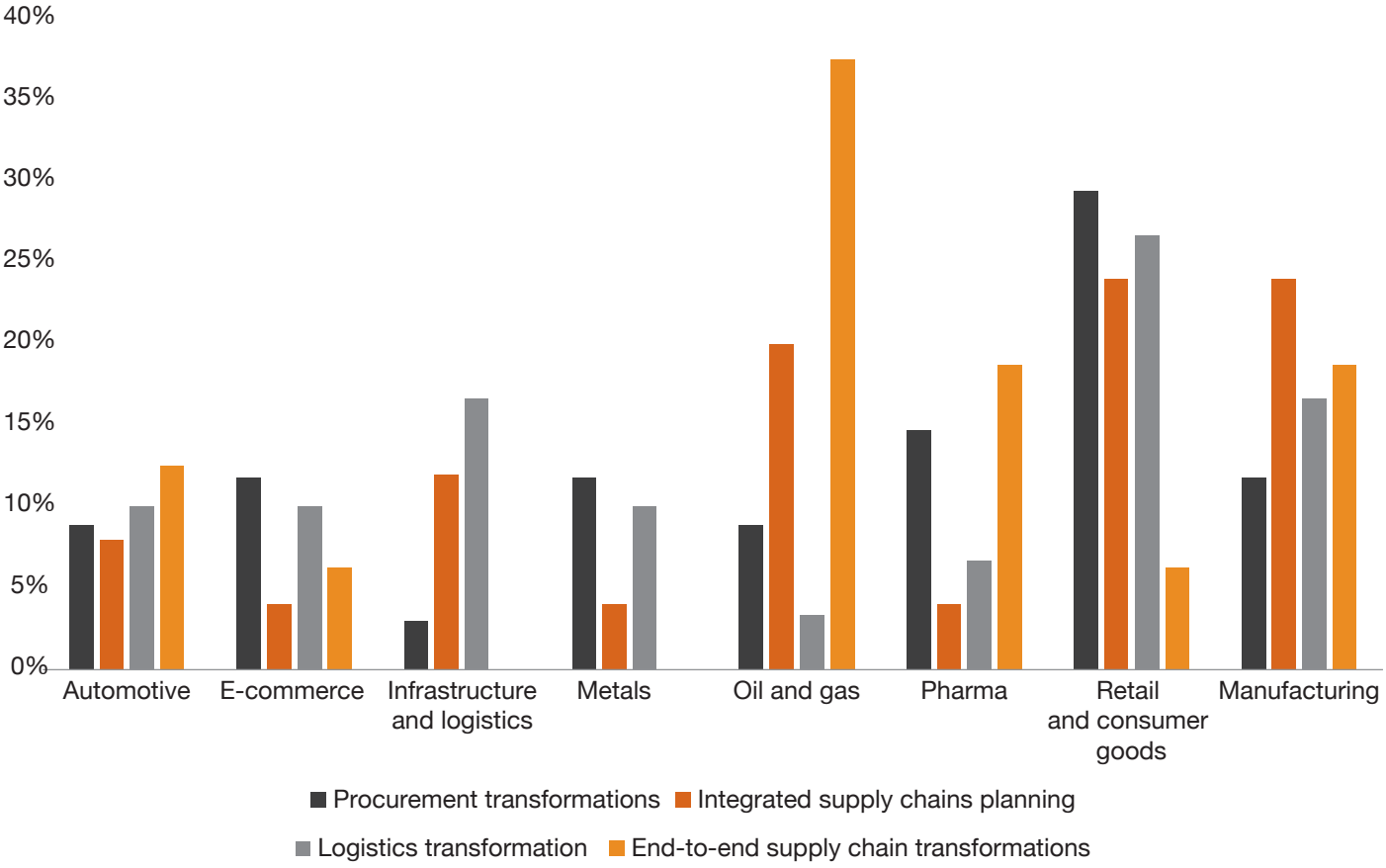
Below are the industry-wise digital transformation focus areas in the next three to five years.[19]

Supply chain focus areas for digital transformation



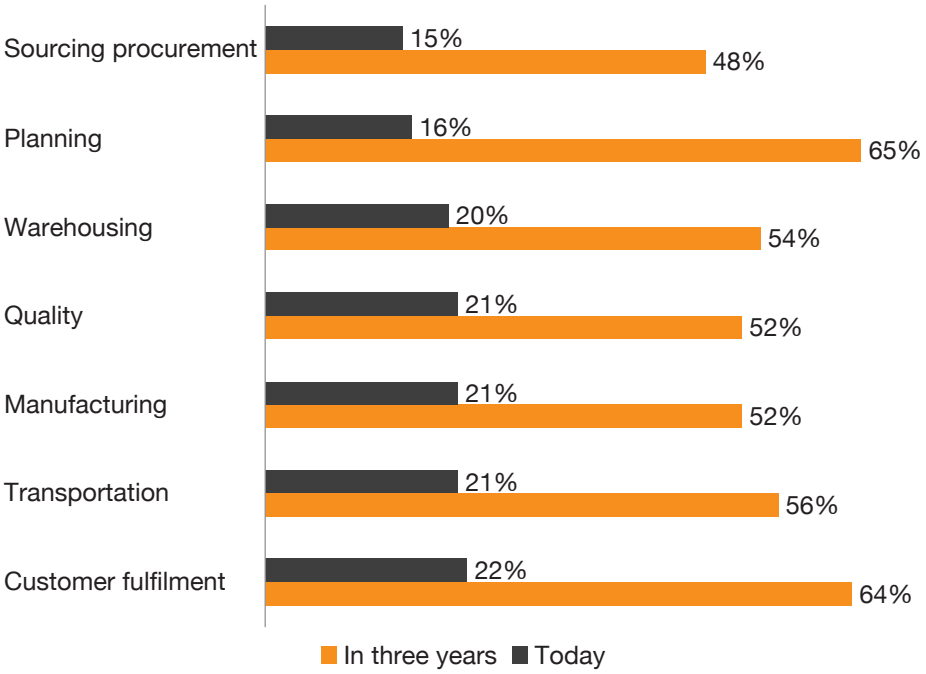
Transforming a leading e-commerce player's business model

A leading e-commerce player wanted to reinvent its business model by using technology. The company has an in-house ML platform – which is essential for this transformation – and used it to create two store brands. Over time, it discovered that for more than 50% of its online buyers, price was a more significant buying motivator than the brand name.

The primary objective of the ML platform was to immediately recognise changes in consumer behaviour and understand fashion preferences by quantitatively identifying buying trends. Using the same machine vision technology to analyse images from blogs and influencers on social media platforms, the store enhanced this data and added assumptions about global demand gleaned from crawling rival businesses' websites. This enabled the ML platform to provide its designers with 'recipes' or detailed insights that allowed them to decide which particular styles to produce more or less of (e.g. 'make more yellow bohemian clothes'). The likelihood of any design being a top seller was determined by running these designs repeatedly against a machine curation algorithm that uses current sales data and photographs.

19 PwC survey (see note at the end)

Increase in the level of decision-making automation in three years (by function)



It is evident that the importance of AI in the supply chain is growing rapidly. According to projections based on a discussion with industry experts, companies that rely only 15–20% on AI for decision making today will increase their reliance to 55–65% in the next three years.[20]

Sectoral insights

PwC's survey also indicates that industry experts from the manufacturing sector are keeping integrated supply chain planning as their top priority for the next three to five years. For the automotive, pharma, and oil and gas sectors, end-to-end supply chain transformation is the major focus area to drive business. Retail and consumer goods and e-commerce, on the other hand, are relying on procurement transformation for business growth.

Healthcare organisations are actively implementing AI to improve clinical decision making, remote patient monitoring and surgical outcomes. Leading pharma sector companies use digital twin capabilities to optimise vaccine production. According to them, with better forecasting and supplier management, data-driven supply chain management can save more lives.[21]

Free-flowing data, unrestricted by departmental silos, is a sure sign of a supply chain that is prepared for the future. Leading businesses gather and model enormous volumes of supplier and consumer data. They invest in data analytics tools to monitor consumer trends, track sales data across all channels and identify shifts in client preferences. They employ data to:

- identify shifts in demand across stores
- notify suppliers of anticipated changes in requirements
- assist in reallocating inventory across locations
- ensure business restocks at the appropriate time.

Data may come from publicly accessible sources, numerous external vendors, or internal sources. Due to this, it is essential to combine structured and unstructured data intelligently and have a mechanism to extract meaningful insights from this data in place.

However, these efforts require capital. Recent PwC research[22] demonstrates that investing in sophisticated supply chain capabilities pays off in the long term through lower costs, higher revenues, improved sustainability, higher asset utilisation, improved risk management, and higher rates of on-time, complete delivery to B2B and B2C clients.

Conceptually, environmental, social and governance (ESG) standards and compliance work guide supply chain operations which are ethical, socially acceptable and environmentally beneficial – especially when it comes to procurement, sourcing and supplier relationship management-related activities.

20 AI in the supply chain

21 The five key takeaways

22 Smart moves your supply chain needs

ESG criteria, however, are relevant both internally and externally. ESG standards that constitute a factor in a company's monthly internal performance evaluation are equally applicable when a supplier plant is randomly audited. As a result of globalisation and the outsourcing of labour, traceability and transparency into suppliers' activities are now mandatory in globally operating supply chains to handle ESG-related risks. Therefore, when creating a sourcing or procurement strategy, ESG is gradually becoming the primary consideration.

A recent PwC survey indicates more than 50% business leaders are focused on defining and implementing an ESG strategy in the end-to-end supply chain ecosystem comprising suppliers, organisations and customers.[23] To this end, companies can improve the speed and responsiveness of their entire value chain by moving their manufacturing and distribution facilities closer to customers. This would reduce carbon emissions due to shortened transportation routes. As businesses increase their decarbonisation obligations, Scope-1 and Scope-2 emissions — which are either directly created by businesses or indirectly through the purchase of energy — are at the forefront of discussions. However, there should be more focus on Scope-3 emissions – produced in the upstream and downstream value chains – given that they account for a considerable percentage of the overall carbon impact of most organisations.

Connecting the dots

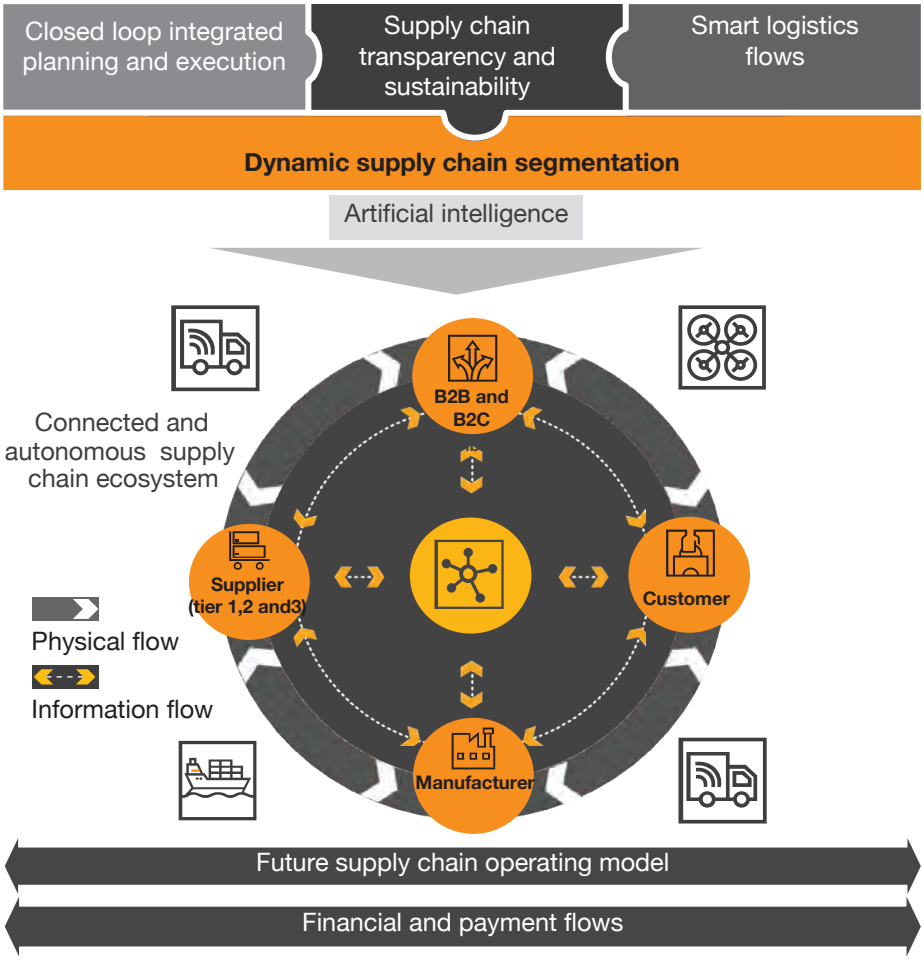
PwC's vision of a connected and autonomous supply chain consists of a closed-loop system of planning and execution, transparency and sustainability, and smart logistics powered by dynamic segmentation through AI.

This is aligned with what the future holds in store. Supply chains of tomorrow will be connected, autonomous, integrated and powered by data and digital capabilities. A connected supply chain integrates planning processes and enables feedback loops across the value chain to adjust sales and operations planning in real time. Next-level planning is synchronised in real time with execution and enables continuous optimisation. The subsequent logistics level seamlessly integrates and connects the entire order-to-deliver process. This level consists of warehouse automation, logistics track and trace, autonomous supply and loading, and scheduled delivery to consumer. The connected supply chain leverages IoT for increased visibility, integrity and efficiency at the delivery stage of the value chain. This provides end-to-end network visibility, real-time alerts via geo-fencing, advanced analytics, enhanced security and theft prevention.

Any firm embarking on the journey to create a supply chain of the future needs to first have a supply chain transformation programme designed. The current state maturity assessment should also be done, and a desired future state should be agreed upon. The overall transformation programme should consist of multiple work streams of supply chain strategy and process design, digital tool selection and implementation, and a parallel workstream of value assessment and realisation, with a focus on the adoption of new processes and digital tools.

Organisations equipped with a reimagined supply chain that factors in agility of thought and action would be able to thrive in a dynamic supply chain ecosystem – in spite of unexpected and unforeseen scenarios.

23 PwC survey (see note at the end)



Note: Having witnessed many disruptions and innovations in the supply chain industry over the past couple of years or so, PwC India conducted a survey towards the end of 2022 to seek insights from industry leaders and decision makers, and understand the steps to be taken to enhance supply chain capabilities and take them to the next level.

A total of 52 companies participated in **PwC India's Supply Chain Survey**. Nearly 50% of the responses came from CXOs, 30% from supply chain department heads and the remaining from business unit heads. The survey sought views on themes such as supply chain resilience, digital transformation and logistics infrastructure from leaders across sectors such as manufacturing (industrial goods), retail and consumer, oil and gas, pharmaceuticals, automotive, e-commerce, infrastructure and logistics, and metals.

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