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Evolving supply chain paradigm: Driving sustainability through innovation



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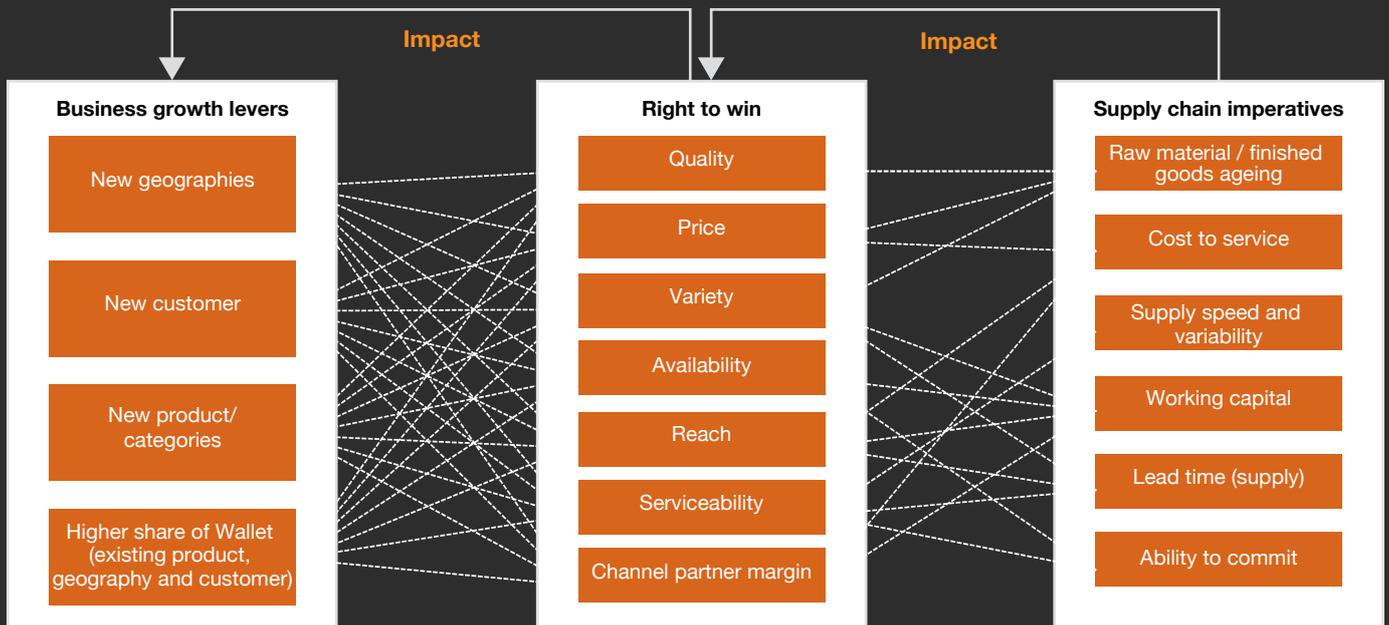
01 Executive summary

As the world is continuously evolving, it has become even more imperative that sectors align themselves accordingly in order to become more resilient and adaptable. For any industry to function seamlessly, it is essential that the supply chain and logistics function runs without any significant obstacles, in order to ensure smooth operations.

In this report, we assess how the transient situation (both globally and locally) is impacting and pushing supply chains to evolve continuously and become fit for the future.

The world we live in today is characterised by VUCA – volatility, uncertainty, complexity and ambiguity. Although the disruptions in the last few years have amplified an otherwise overall transient situation, they have also pushed businesses to explore and evolve for the better. We've seen increased focus from policymakers as well, with supply chain and logistics identified as one of the core areas for future investments.

Supply chain has gradually evolved to become a way to gain edge over the competition for businesses, from having been just a transactional or compliance-centric function initially. As a result, firms are increasingly investing substantially in improving supply chain efficiencies through digital solutions, as these solutions drive higher customer satisfaction through product availability at the right time and cost. This differentiated supply chain capability will amplify a firm's 'right to win' in the market, which in turn will increase business growth potential.

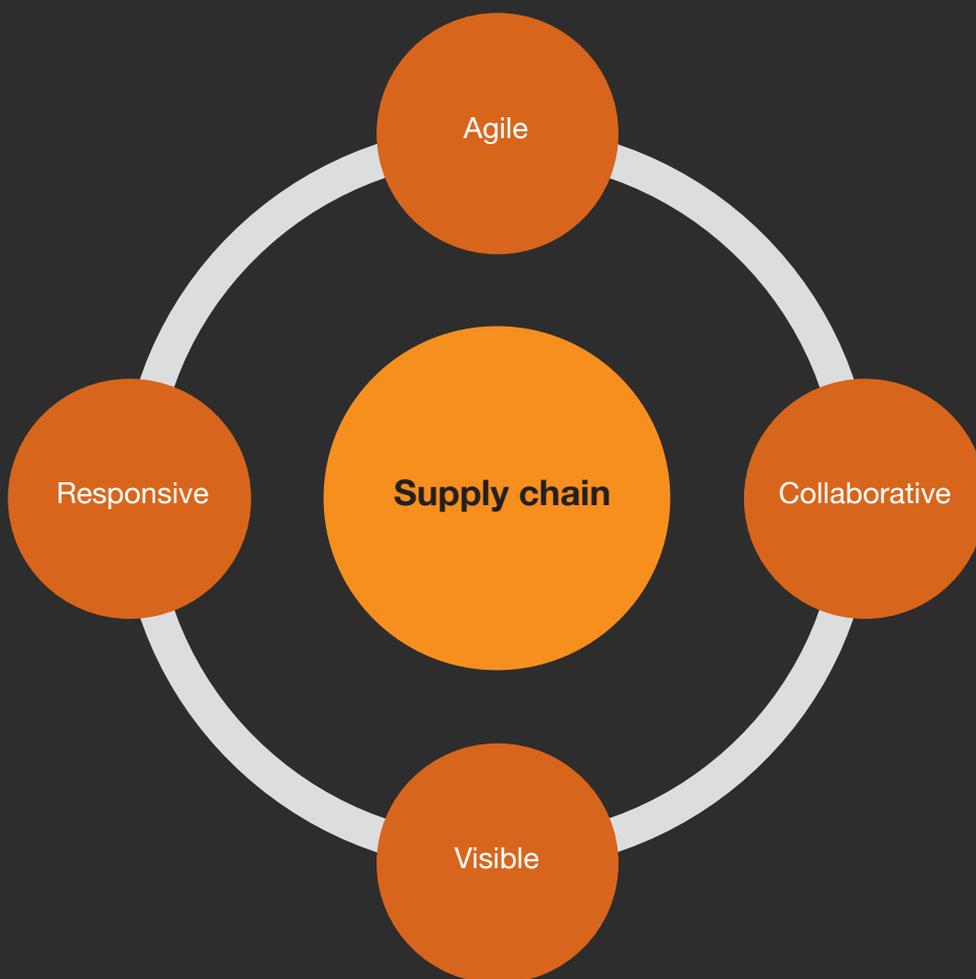


Source: PwC analysis

However, it is equally important to note that supply chain as a function is also vulnerable to demand and supply uncertainties of both the global and local landscapes.



Therefore, it is to be expected that these factors will drive the bulk of the digital investments made by businesses for core supply chain functions – i.e. planning, logistics and procurement. Moreover, these investments will enable the development of newer and advanced supply chain capabilities, which in turn will improve one or all of the following four dimensions of a supply chain ecosystem – i.e. ability to collaborate, responsiveness, agility and visibility.



These tenets will define the future of supply chains and therefore businesses around the world. In this report, we discuss how some of the VUCA factors (social, economic, geopolitical, environmental, technological etc.) are coming together to shape the future of supply chains, and how supply chain capabilities are evolving to address the challenges in a dynamic world.

We hope you find this report to be insightful.

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02 Factors impacting global and local supply chains

In today’s complex world, which is gradually moving towards being multipolar, supply chain is one function which has possibly seen the maximum changes across the globe. Supply chains are influenced by many global and local factors and become a bit more complicated when firms operate across borders. Therefore, considerable understanding of these factors will be very crucial for businesses to navigate through challenges and find opportunities in this ever-evolving landscape.

Table 1. Global and local factors impacting supply chains

Category	Global/local factors
Geopolitical	<ul style="list-style-type: none"> • Global uncertainty due to conflicts • Tariffs and trade barriers/limited market access • Energy supply uncertainty • Emerging political landscape • Trade agreement re-alignments • Global supply chain realignment
Socio-economic	<ul style="list-style-type: none"> • Asymmetry in skilled workforce availability • Global commitments to UN Sustainable Development Goals (SDGs) • Brand perception • Infrastructure development • Customer preference and trends • Demographic changes (ageing population/urbanisation) • Consumerism and disposable income • Gross domestic product (GDP) growth and industrialisation • Workforce upskilling

Category	Global/local factors
Environment and sustainability	<ul style="list-style-type: none"> • Commitment toward SDGs and climate action • Climate change and extreme weather events • Focus on green logistics and sustainable packaging • Push towards a circular economy (reverse logistics, recycling, reuse) • Focus on adoption of alternative energy usage (renewable)
Technology	<ul style="list-style-type: none"> • Rapid expansion of the technology stack (generative AI, machine learning (ML) internet of things (IoT) robotics, automation, nano technology) • Need for multi-tier supply chain transparency and traceability • Availability of low code/no code platforms • Emphasis on digital currency, FinTech and Unified Payments Interface (UPI) • Focus on data security and integrated systems

Source: PwC insights

2.1. Geopolitical factors

Political instability, trade wars, border conflicts and transient international relations are impacting supply chains within and outside India. Tariffs, sanctions and trade agreements can potentially alter the availability and cost of raw materials for various industry segments, prompting businesses to rethink their procurement strategy.

For instance, events like the Red Sea blockade or disruptions in sea routes impacted the average transit times by an additional 10–15 days.¹ Such obstacles as well as increased freight rates (specifically container availability and rates) – which inflate overall transportation and logistics costs – are forcing firms to rethink their inventory strategy.

Moreover, these challenges are pushing supply chain planners to make their supply chains more predictive and responsive instead of reactive. Such situations are also forcing businesses to plan for additional inventories as they are finding the cost of inventory holding to be much more viable than facing sales loss due to non-availability of stock. Hence, some established practices, like just in time inventory, are being re-evaluated for a dynamic environment.

2.2. Socio-economic factors

Socio-economic factors play a pivotal role in shaping the dynamics of supply chains, influencing everything from production and distribution to consumer behaviour and corporate strategies. These factors encompass a broad range of elements, including demographics, economic conditions, cultural trends and technological advancements – all of which collectively impact supply chain efficiency, resilience and sustainability.

In growing economies, consumer spending and preference is continuously evolving, resulting in higher demand for goods and services, thereby necessitating a robust supply chain network. Alternatively, economic downturn results in conservative customer behaviour, resulting in inventory surplus, cost optimisation pressures and reduced investments in the supply chain. Similarly, factors like demographic changes (population ageing or urbanisation) have a significant impact on supply chains, which also affects the consumption pattern. Consumers are increasingly demanding at-home delivery in quantities which are generally very small. This results in faster movement of goods through the supply chain in smaller lot sizes. Additionally, the demand aggregation needs to be done at a much granular level. All such factors are pushing to make the supply

¹ PwC analysis of IRDAI data

responsive and agile. Moreover, supply chain analytics capabilities are expected to leapfrog on the back of these changes as well as technological advancements. Overall, an evolving customer base will make it crucial to modify and improve forecasting capabilities at granular levels. This will depend on the availability of structured data and how effectively one leverages complex artificial intelligence (AI)/ML algorithms to obtain the desired results.

Due to physical infrastructure development gaining momentum across India – e.g. development of smart cities, highways, railway corridors, aviation, ports, waterways and industrial hubs – the country now offers more opportunities for supply chain growth and driving down the overall cost in order to better serve customers.

2.3. Environmental factors

As businesses grapple with the realities of climate change, resource scarcity and increasing regulatory pressures, the need to incorporate sustainable practices into supply chains has never been more important. Environmental and sustainability considerations are reshaping supply chains to be more resilient, efficient and socially responsible. Thus, companies that embrace sustainable practices not only mitigate risks associated with climate change and regulatory pressures but also capitalise on new opportunities for efficiency, innovation and consumer engagement.

Owing to the increased global environmental considerations and focus, there is a growing need to reduce carbon footprint as well as the impact of manufacturing and logistics activities on the environment, and promote energy efficiency and use of ecofriendly packaging materials. Therefore, organisations are pushing boundaries to adopt responsible sourcing strategies and making conscious efforts to evaluate social and environmental assessments of supply chain processes for themselves as well as the supplier base. This move will make supply chains more collaborative and engage stakeholders holistically, which in turn will make the network resilient.

The need for sustainable consideration is also driven by consumer preference for sustainability. Consumers are now asking for practical demonstrations of sustainability commitment from firms, which will drive the need for transparency and traceability. Together, the focus on environment and sustainability will reshape supply chains, thus forcing businesses to adapt to more sustainable and eco-conscious operations.

2.4. Technological factors

The pace of technological and digital advancements will revolutionise supply chains, enhancing efficiency, transparency and responsiveness. As companies increasingly adopt cutting-edge technologies, supply chains will become more integrated, data-driven and capable of meeting the demands of a dynamic global market. Technologies such as IoT and blockchain provide real-time tracking and monitoring of goods as they move through the supply chain. IoT devices, equipped with sensors, can monitor conditions like temperature, humidity and location, ensuring that products, especially perishable goods, are handled properly. Blockchain technology adds a layer of security and immutability, recording every transaction in a decentralised ledger. This transparency helps in verifying the authenticity of products, thus preventing fraud and ensuring compliance with regulations.

The advancement of technologies will also create a robust data pool, enabling investment in analytics solutions and data-driven decision-making. Predictive analytics, as a subset of big data, will allow companies to anticipate future demand, identify potential risks and plan accordingly. This proactive approach will enhance agility and resilience, enabling supply chains to adapt to unforeseen disruptions.

Advancements in collaboration and integration solutions are also transforming the way supply chain stakeholders interact with each other.

In addition, cryptocurrencies and blockchain technology are facilitating quicker and more transparent transactions; however, they are not deemed extremely reliable at present as the regulatory measures for them remain limited and insufficient.





03 Emerging supply chain trends

Owing to the multifaceted changes in the global market, supply chain capability themes are envisaged, which is already setting future directions for business leaders to re-orient their supply chains.

Table 2. Emerging supply chain trends

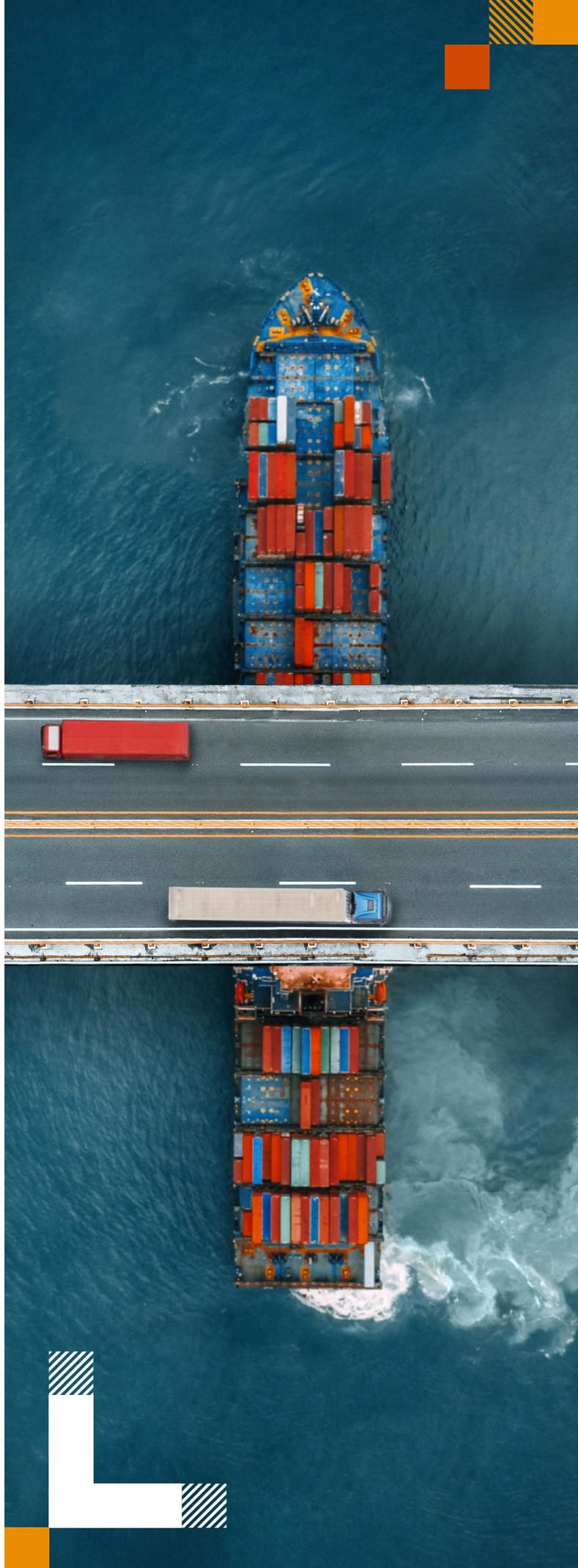
Factors	Capability created	Themes
 Geopolitical	<ul style="list-style-type: none"> • Responsive • Resilient • Predictive • Diversification • Traceability 	Agile
 Socio-economic	<ul style="list-style-type: none"> • Customer centricity • Omni-channel • E-commerce/direct-to-consumer (D2C) evolution • Adaptive network 	Responsive
 Environment and sustainability	<ul style="list-style-type: none"> • Green supply chain • Supplier diversification (near shoring) • Integration across value chain 	Collaborative
 Digital disruptions	<ul style="list-style-type: none"> • AI/GenAI/ML enablement • Sensorisation track and trace • Analytics/alerts and escalations • Scenario modelling 	Visible

Source: PwC analysis

Some businesses are already working towards making their supply chains more efficient and future ready, as highlighted in the examples given below:

- An international fashion company improved its profitability by creating a highly responsive and agile supply chain that incorporated new evolving trends in the market.
- The advent of digital platform-based logistics aggregators is transforming the logistics market in India. These solutions are nimble and create a two-way winning proposition by connecting demand (businesses) with supply (transporters).
- A global personal care company adopted dynamic supply chain segmentation along with the integration of the entire value chain from concept to fulfilment. Consequently, service levels improved considerably, and operating costs reduced.
- A global consumer durable company adopted a D2C model to improve the overall buying experience for their customers. This increased customer involvement and expanded the market for them.
- A leading global retailer harnessed the power of blockchain to help it track its portfolio of food products in order to improve transparency and increase safety of the food supply chain.
- Many large consumer goods firms are digitalising their supply chains with AI/ML-based planning solutions to make them more agile and responsive.
- Both Indian and global firms are working assertively to bring innovation to their packaging material. Additionally, the focus is now on to do responsible sourcing along with increased eco-friendly content.

The examples given above are not comprehensive but give us a directional view of where the world is moving. Companies have transformed their supply chains by leveraging or building advanced supply chain digital solutions, enhancing sustainability, and focusing on all these efforts from their customers' standpoint. Their efforts reflect a broader trend in the industry which highlights increased focus of businesses on building more efficient, sustainable and resilient supply chains.

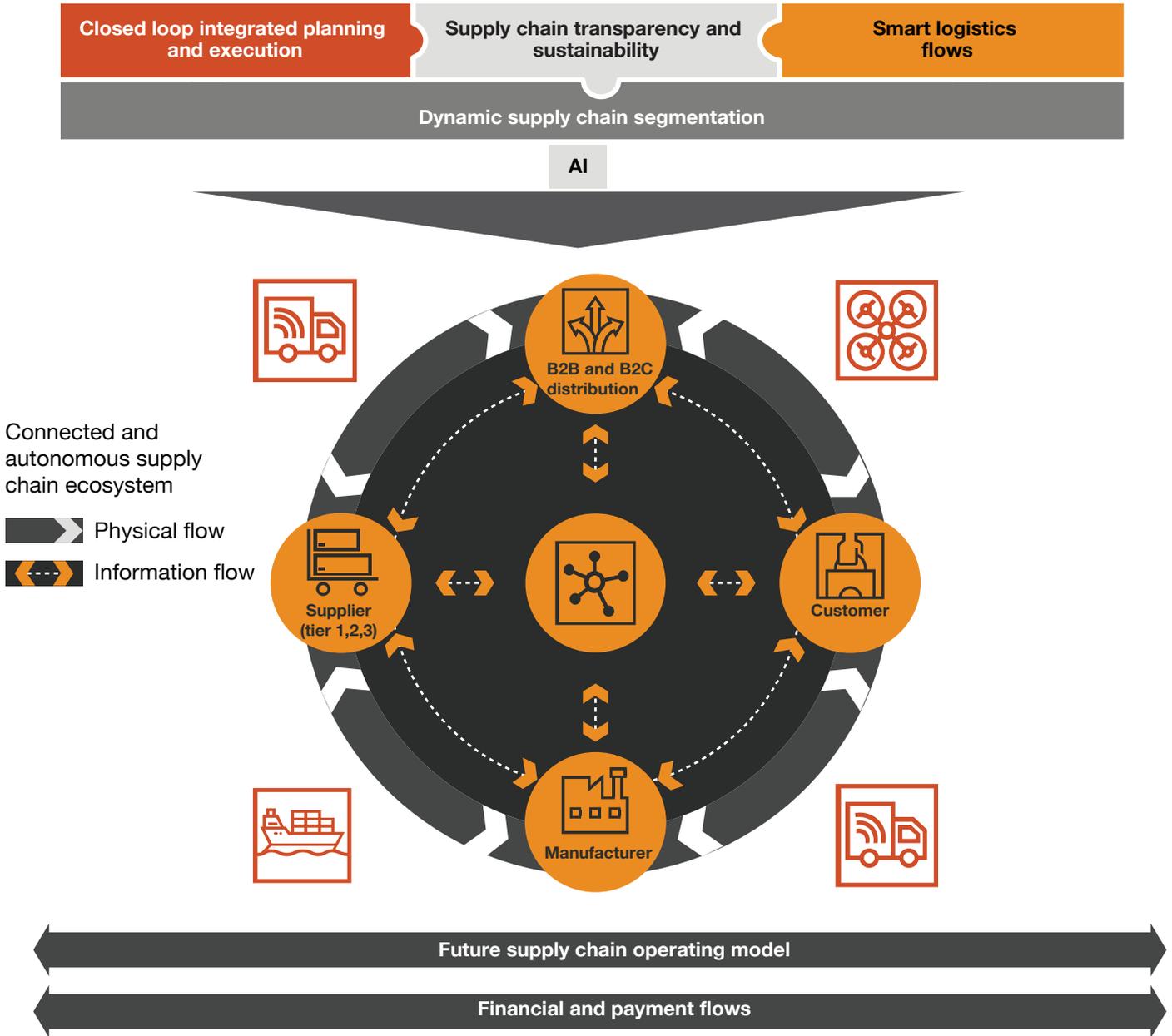




04 Reimagining the supply chain of the future

Following the constantly changing and unpredictable situations due to VUCA, and in line with the key supply chain emerging themes, we envisage the future of supply chain to be dynamic and transformative, driven by technological advancements, sustainability imperatives and evolving consumer demands. Companies that embrace these changes and invest in innovative solutions will be well-positioned to thrive in the increasingly complex and interconnected global market. The supply chain of the future will be more agile, responsive, and collaborative, and will facilitate enhanced visibility for consumer-centric operations, thus ensuring that businesses can combat challenges and leverage opportunities in future.

Key elements which will define the future of supply chain



4.1 Customised supply chain

In the current scenario, the standard supply chain models are disappearing fast. Many existing solutions are inadequate to meet the performance requirements of a complex businesses, both in global and local settings. As such models are typically designed for stable demand patterns, they would not be fit to address the complex demands of the present dynamic market.

As a solution, we can look at customising supply chains on a mass level, which means each supply chain would be differentiated from the other. This customisation would not be limited to customising for time or cost, but would go on to define appropriate forecasting algorithms, auto segmentation or agile inventory optimisation capabilities. According to our analysis, of all the supply chain functions, ‘planning’ will have the maximum customisation by industry segments. However, across supply chain function transformation, maximum customisation efforts will happen for creating the right level of analytics for enhanced visibility and meaningful dashboards from big data for effective decision making.

4.2 Digitally enabled integrated and collaborative supply chain

This is going to be a major capability that will define the future of supply chains. Integrated and collaborative supply chains will give network stakeholders the ability to assess, understand and evaluate their inter-dependencies. Integrated supply chains will help businesses to create a consensus proactively and seamlessly on supply and demand as needed. They can then identify possible gaps and recommend alternative options to plug the gap and improve overall profitability. Such a capability will enable seamless decision making.

This kind of new-age capability is expected to be an integral part of all supply chain functions, i.e. planning, procurement and logistics. This would manifest as follows:

1. Sales forecast enriched by sales team and simultaneously evaluated by product development team for new product development inclusions
2. Unconstrained demand forecast reviewed simultaneously for supply (i.e. production, material and logistics constraints) with various stakeholders (including material suppliers and transporters) making real-time commitments
3. Real-time demand and consensus meeting, supported by real-time scenario modelling capabilities to enable effective decision making along with the ability to commit to the customer regarding potential order fulfilment date

4. Real-time visibility of material dispatches and entire source-to-pay cycle, integrating all concerned stakeholders
5. Distribution and logistics execution – real-time visibility of material availability in warehouses, integrated with the release of dispatch schedules basis material availability, truck sourcing, loading and dispatch along with enroute track and trace

Most of the above capabilities will be created by integrating or upgrading the existing technology stack which is already implemented across different supply chain functions. While all of the above will happen to make the function more efficient, equal focus is being simultaneously put to capture the carbon footprint of individual activities across the value chain.

The sustainability agenda will thus be driven on the back of efficiency and green logistics. Efficient supply chain will optimise the use of resources, while enabling green practices will allow the use of alternative sources in operational processes to reduce carbon emissions, thus making the overall supply chain sustainable.

In all, the future of supply chain is dependent on the evolving digital solutions stack in order to make it more sustainable and efficient.

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