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Confederation of Indian Industry

Next-Gen Supply Chain

Contents

Foreword

With adoption of exponential technologies, organisations worldwide are moving away from the traditional and linear supply chain models to connected, intelligent, scalable, customisable, and nimble supply networks. Early adopters and innovative companies are shifting to dynamic and integrated networks that deliver a continuous flow of products, services, information, and analytics for decision making. Traditional organisations are evolving their supply chain functions to meet increasingly volatile consumer preferences, while trying to stay ahead of competition. While the level of emerging technology adoption and use cases are relatively less in India, it is only a matter of time before supply chains across industries would be reimagined, improved, and disrupted.

CII-Deloitte report titled 'Next-Gen Supply Chain' is an endeavour to explore upcoming trends and technologies that will influence the way supply chain in India is going to be redefined in the near future. In this report, Deloitte's supply chain professionals share insights on trends across four major areas – evolving operating models, usage of technology and its impact on the supply chain, real-time visibility and tracking of the supply chain and its performance and, sustainability and cost reduction. The report draws on use cases from within India and outside to give an understanding of the changes that are already underway, and what to expect in the future.

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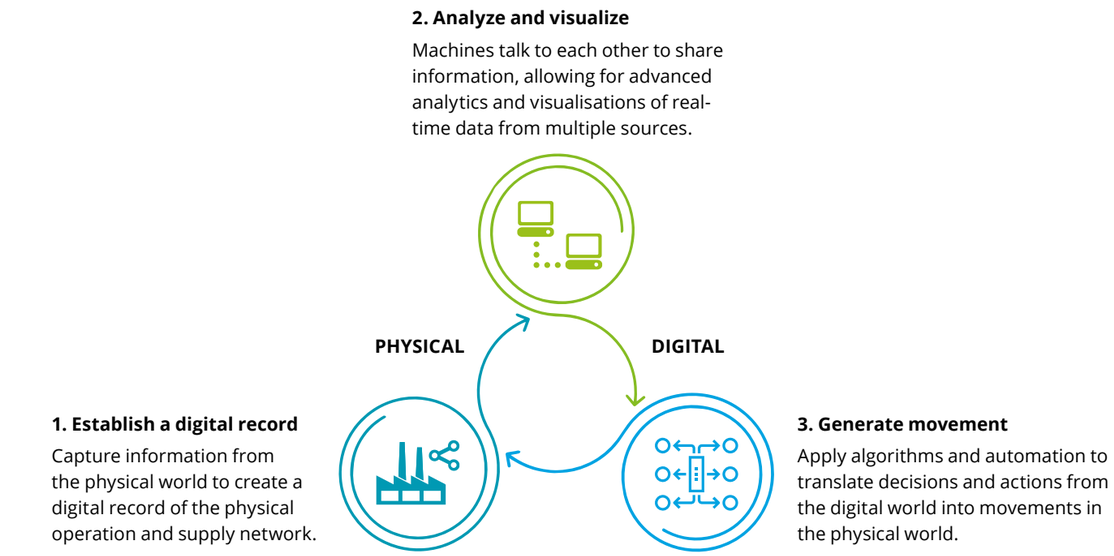
Introduction

Enabled by concurrent development and integration of the digital and physical technologies, Industry 4.0 is transforming the way supply chains operate across geographies. Industry 4.0 incorporates and extends digital connectivity within the context of the physical world in enterprises and supply networks. This drives the physical act of manufacturing, distribution and performance known as the physical-digital-physical loop (PDP) - Fig 1.

Fig 1: The physical-digital-physical loop



Source: Deloitte

Supply chains traditionally are linear in nature, with a discrete progression of design, plan, source, make, and deliver. Today, the shift from linear, sequential supply chain operations to an interconnected, open system of supply operations could lay the foundation for how companies would compete in the future. This interconnected open system called Digital Supply Networks (DSN) combines digital information from many different physical and digital sources and locations.

Historically, supply chain professionals managed the “four Vs” (volatility, volume, velocity, and visibility) as they attempted to optimise results across a series of objectives that include total cost, service, quality, and support for innovation. These traditional priorities are not likely to change but going forward, supply chain decision makers are likely to be able to achieve higher levels of performance with supply chain capabilities developed in a non-linear environment.

This document attempts to capture the evolution of supply chains in India over the last decade, dimensions to be addressed and areas emerging in the future.

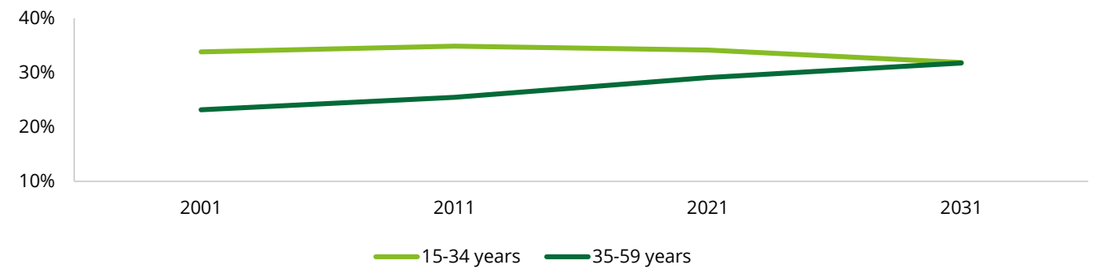
The supply chain eco system in India

Supply chain in India and considerations

Changing demographics and state-wise preferences in India are creating varying demand patterns and impacting the supply chain operating models and infrastructure of organisations. Share of population in the age bracket of 35-59 years is expected to be equal to those in the 15-34 year bracket over the next 10-12 years. This changing demographic is expected to alter demand preferences[1].

[1] MoSPI, "Youth of India", 2017

Fig 2: Share of population in % for the age group in India

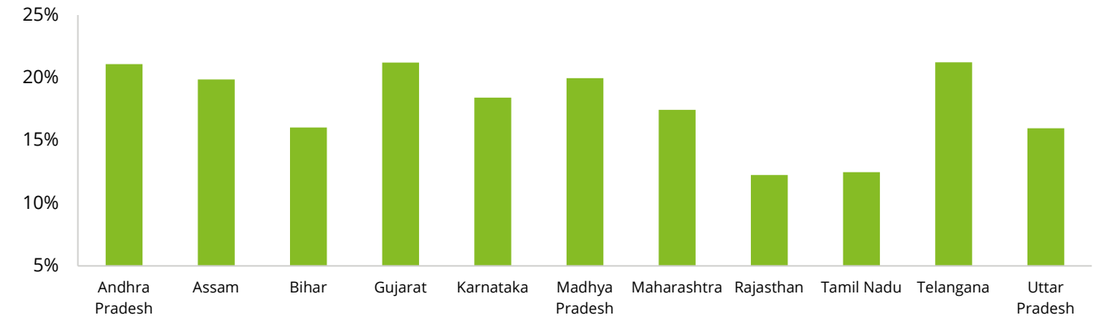


Source: http://censusindia.gov.in/.

Growth is not uniform across states and the variation impacts consumption patterns. Share of population increases in states such as Uttar Pradesh, Rajasthan, Madhya Pradesh while the share decreases in Maharashtra, Gujarat, Tamil Nadu[2].

Net state value added varies across states with the manufacturing activity concentrated across top 5-6 states. Five states accounted for ~60% of the total net state value added in manufacturing in FY17[3].

Fig 3: Net state value added growth FY15 to FY17



Source: RBI

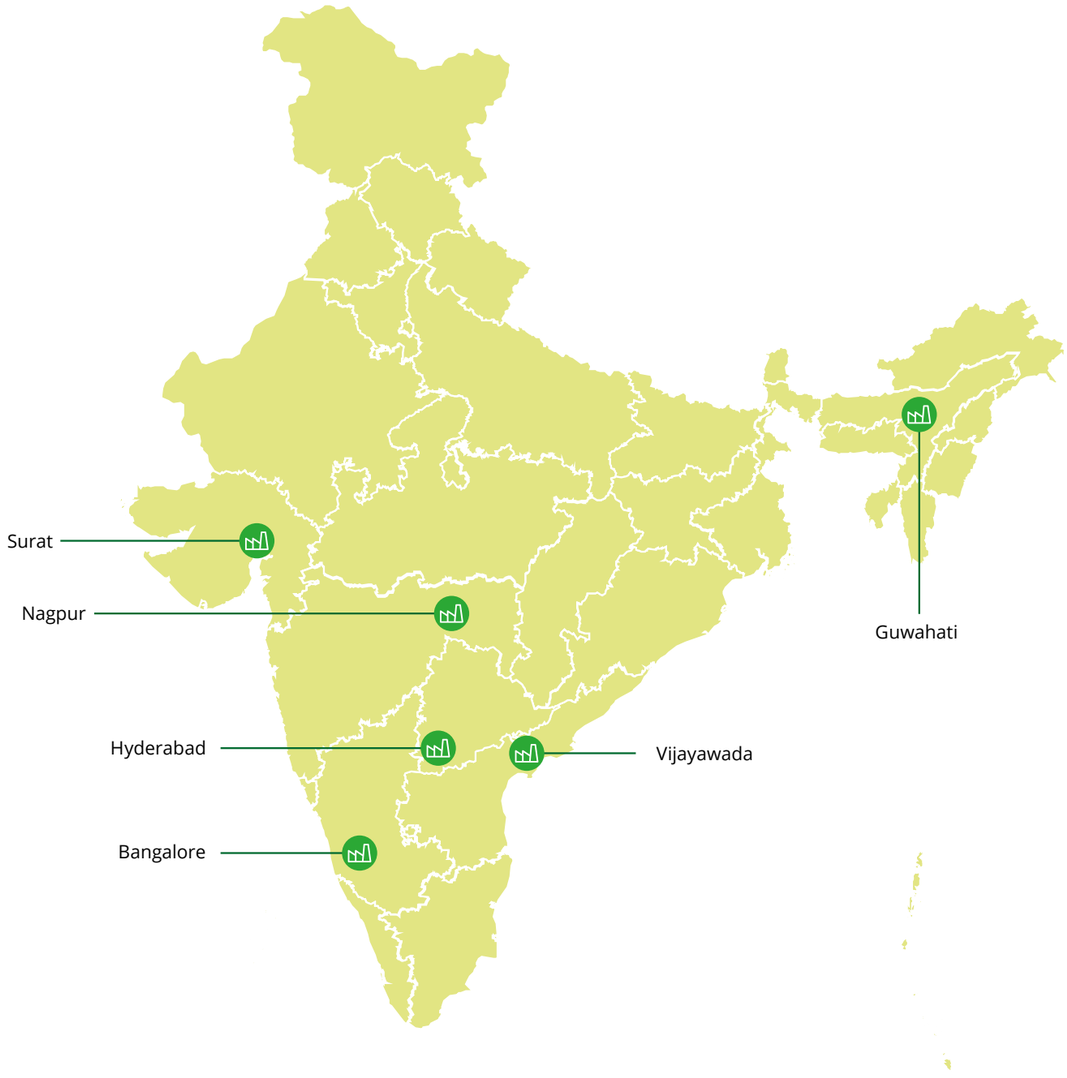
With ~65% of the goods being moved through the road network, the concentrated manufacturing and dispersed demand points have a significant impact on the supply chains of companies[4].

With the implementation of GST, logistics hubs have emerged and existing ones have been re-oriented. The government of India is planning multi-modal logistics hubs across India on a public – private partnership model which is expected to drive long haul movement across hubs and also reduce transportation cost as indicated in Fig 4.

[2] http://censusindia.gov.in/
[3] RBI
[4] IBEF

- Objective would be to connect multiple modes of transport for seamless movement
- Integrated hubs would assist in consolidation and aggregation of freight demand and also providing last mile connectivity
- Hubs could also provide value added services such as custom clearance, bonded storage yards

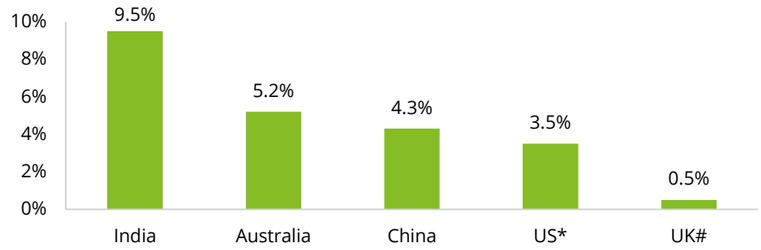
Fig 4: Location of logistics hub planned



Source: https://economictimes.indiatimes.com.

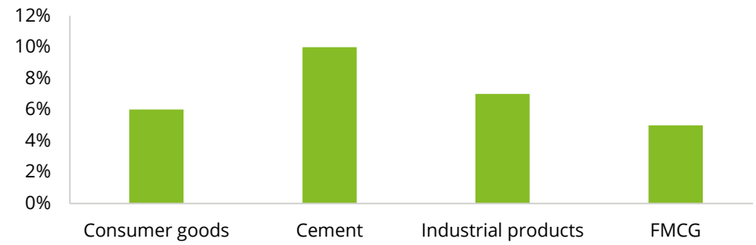
Cost structure and efficiency rates

Fig 5: Lending interest rates



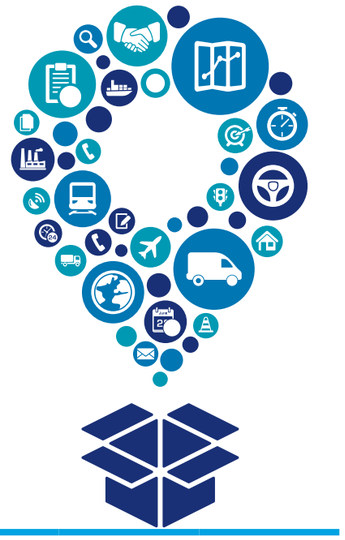
Source: World Bank, *- 2016 values, # 2014 values.

Fig 6: Typical logistics and warehousing cost as a % of sales



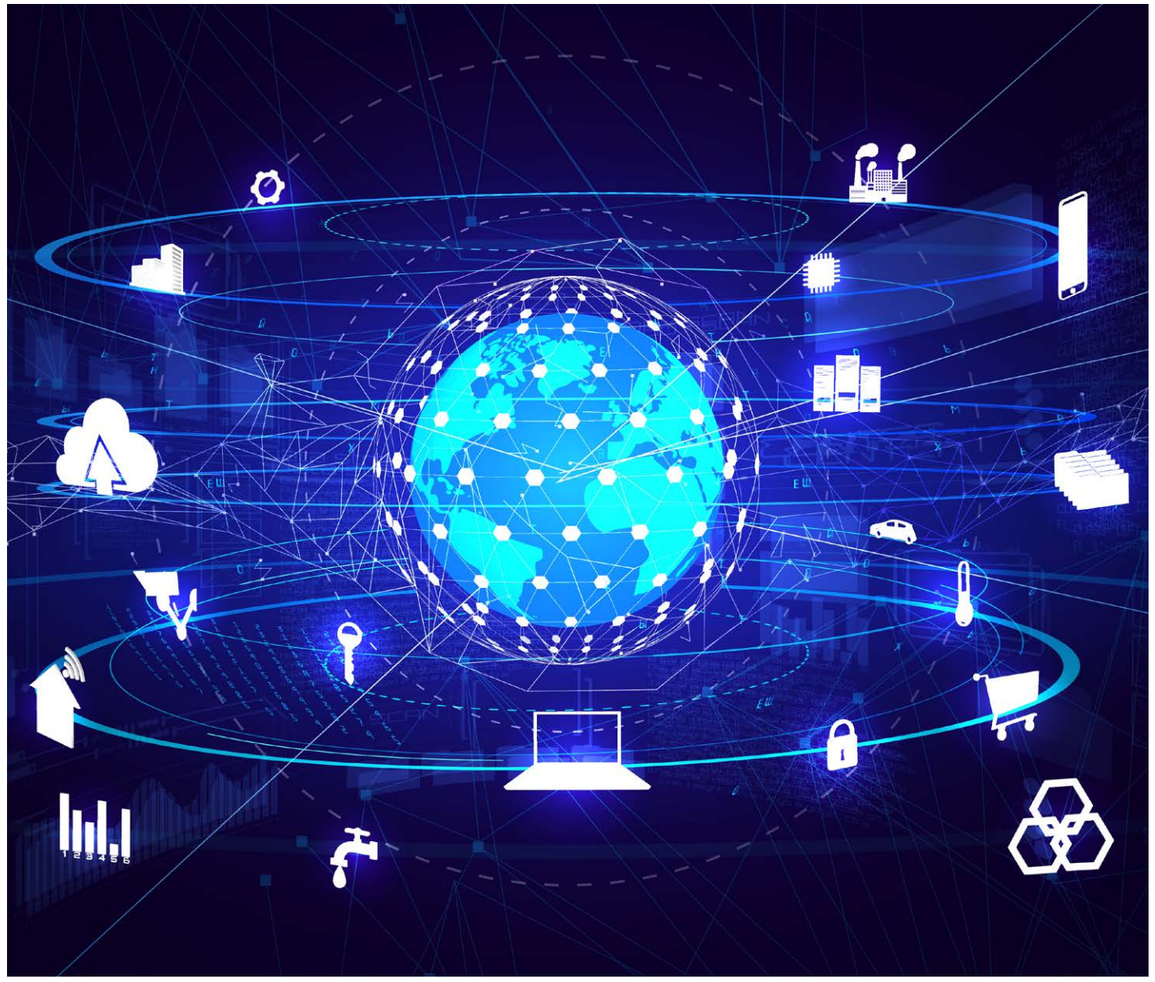
Source: Deloitte analysis

With the cost of capital for organisations being relatively higher compared to many developed nations (Fig 5) and the logistics and warehousing costs being significant, organisations need to adopt innovative business models and exponential technologies to sustain and grow in a competitive marketplace. Focus will be on effectively addressing dimensions associated with dispersed demand, concentrated manufacturing ecosystem, cost of capital considerations and emergence of new demand locations. Given this context, visibility, real time information, efficiency and control in the value chain becomes critical for organisations.



Parameter	Pharma	FMCG	Automotive	Industrial products	Steel	EPC
Material cost as a % of sales	40-45%	40-45%	65-70%	55%-60%	35%-40%	40-45%
Value addition as a % of sales	35-40%	33%-43%	15%-23%	25%-33%	35%-45%	45%-52%
Operating cost as a % of sales	15%-20%	17-22%	12%-15%	12%-15%	10-15%	8-10%

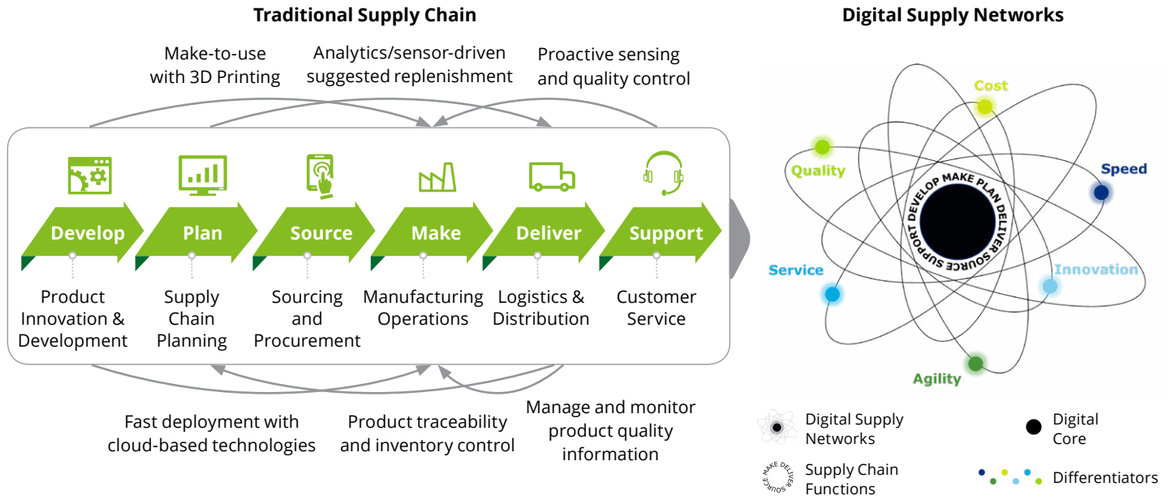
Source: Deloitte analysis



Emerging supply chain trends

As companies address challenges related to demand volatility, dispersion and cost pressures, Digital Supply Networks (DSN) are increasingly in focus as they provide an opportunity to exponentially improve efficiency and effectiveness in the supply chain, optimise cost and obtain end to end visibility. The fourth industrial revolution would therefore be driven largely by DSNs where machines are expected to augment human performance. And as part of this shift, execution of connected products, customers, and supply chain and operations would be driven by a vast network of cyber-physical systems.

Fig 7: Digital supply networks

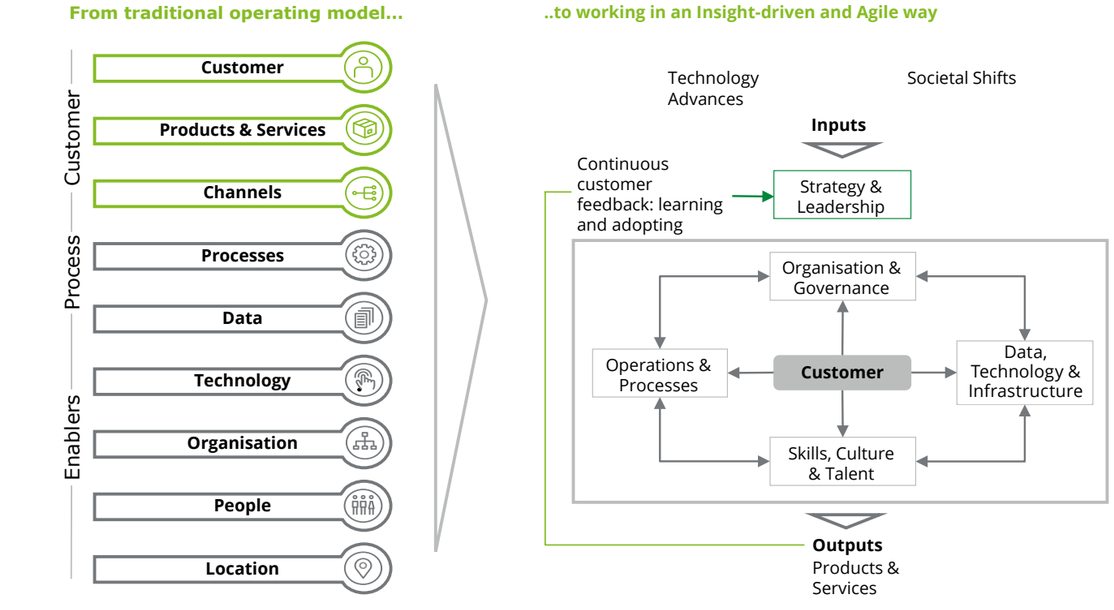


Source: Deloitte

Changing operating models

When fully adopted, DSNs can cause a paradigm shift in the operational delivery for most industries and companies. Innovators and market leaders would strive to achieve operational digital congruence – configuration of the right capabilities in the right way within their operating model. This would require a shift from the tradition operating models to insight-driven and agile operating models with the customer at the core.

Fig 8: Shifting away from traditional models



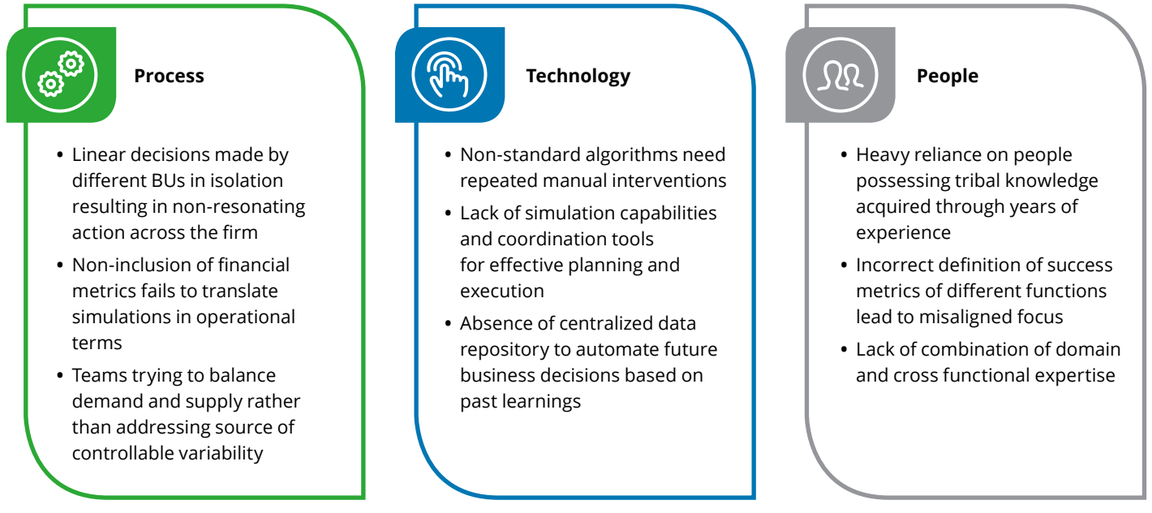
Source: Deloitte

These operating models allow for new areas of collaboration and innovation across organisations – hyper segmentation for personalised customer experience and targeting, collaborative distribution models, and new product development leveraging real-time customer feedback and upcoming megatrends.

Aligned to all these changes, organisations are revisiting their planning processes, which have always been a demanding and challenging process independent of scale and scope. But in the current age of information and connected networks, these challenges have become even more daunting.

While few leading companies have matured to an integrated business planning model, majority still rely on traditional operational models to meet business requirements. Currently the planning cycles depend on regular monthly meetings, and follows a sequential approach to supply and demand planning. In today's dynamic environment, this rigid structure is ineffective to accurately respond to sudden changes in demand and supply. The globalisation of the business environment and increasing complexity in the value chain, has made accurate forecasting even more difficult and thus reducing the effectiveness of traditional planning cycles.

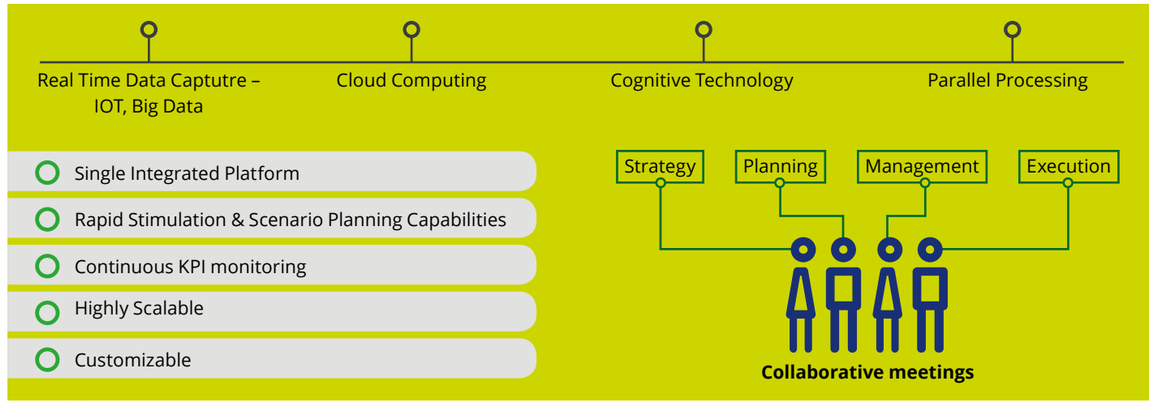
Fig 9: Inefficiencies in traditional planning model



Source: Deloitte

In order to meet today's challenges effectively and mitigate future risks, companies need to consider shifting to a radically new collaborative planning process. The next generation planning model that is evolving is expected to be a truly collaborative effort involving real-time data gathering and analysis, improved decision making and is likely to move away from inflexible IT systems to highly flexible and customisable cloud based platforms. This has the potential to provide the organisation with customisability, platform for collaboration, rapid simulation and scenario planning, and continuous monitoring of KPIs through role-based dashboards.

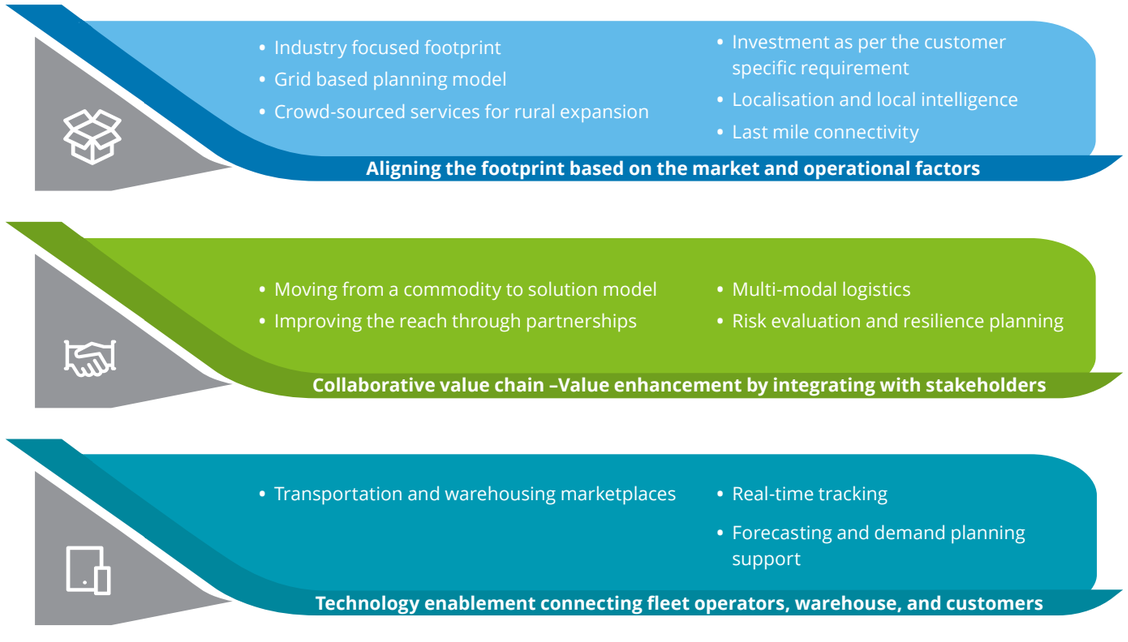
Fig 10: Next generation integrated and collaborative planning process



Source: Deloitte

While companies are still evaluating on how to leverage evolving technologies/ trends and integrate them into their planning and operating models, some ecosystem partners like logistics service providers have already started changing the way they are servicing the market by providing customised solutions. Players in the value chain are considering strategic and tactical aspects including re-aligning the footprint, value enhancement and technology enablement

A division of a leading logistics player is exploring the feasibility of consolidating marine freight. The company does not have their own vessels, but instead owns slots for cargo which customers can book through an app/ device.



Real-time visibility and tracking

Enhancing the supply chain with real-time visibility supports in transforming business operations and providing insights needed to operate quickly, accurately, and more effectively. Fortunately, most companies are already awash in the data they need to create a DSN, whether through networked systems on the factory floor or back-office databases. The key is to tap into these data sources to optimize the DSN. This data can take many forms:

- Master data: Business-critical data that is consumed by applications to enable business processes.
- Transactional data: Post-business-process information such as purchasing inventory records or sales volumes by region.
- Sensor data: Unstructured data that characterises the conditions of the enterprise's physical assets, from voltage to vibration.
- Other unstructured data: Data existing within the organisation such as spreadsheets, emails, engineering schematics, drawings, and beyond.

A DSN can be enabled by leveraging existing data sources, aligning them with desired business outcomes, and applying the insights in a scalable way. This journey has three primary steps:

- Locate the data among your assets and systems, and organize and prepare it
- Organise and validate the data for analysis
- Turn insights into action

While most organisations have recognised the need to adopt key data management capabilities—including data governance, master data management, and data quality, among others - complexity of managing and integrating data across the enterprise may also require new technologies. Some of the cognitive technology categories that companies are exploring for deriving insights and visibility are Robotic Process Automation (RPA), Cognitive - language technologies, Machine Learning and Cognitive - computer vision.

Additionally, companies are exploring the usage of blockchain for real-time visibility of the supply chain and to ensure trust and authenticity in the transactions across the chain. Through blockchain companies gain a real-time digital ledger of transactions and movements for all participants in their supply chain network. This enables greater supply chain efficiency by conducting payment and audits, tracking inventory and assets, purchase orders and shipment notifications. By linking physical goods to serial numbers, bar codes, digital tags like RFID and sensors, and recording the transactions in a blockchain, it is easy for the stakeholders (including end consumers) to verify certifications or properties of the product at any given time and trace the product to source.

A state government food distribution project in India is expected to use blockchain and RFID tags to track circulation of milk, vegetables and fish through the state.

Increasing usage of advanced technologies

Innovation and advanced technologies are critical to company and national level competitiveness; they differentiate businesses and help them thrive amidst global competition by creating premium products, processes, and services that capture higher margins. Advanced manufacturing strengthens economies and creates higher income jobs. Technologically advanced manufacturing industries employ a higher-skilled workforce that earns higher wages than workers employed by traditional industries.

Over the last couple of decades, with Additive Manufacturing (AM)/ 3D printing, companies are exploring the feasibility of eliminating or significantly reducing inventory requirements. This technology enables components to be printed based on requirement and nearness to the customer, thus reducing the lead time to supply as well as logistics cost. While this has enhanced flexibility, coordination efforts among players in the value chain have also become efficient .

A leading aircraft manufacturer uses 3D printed titanium stress-bearing parts, a first in the aviation industry. This is expected to save the organisation USD 2-3 Mn per aircraft.

An online jewellery brand is using 3D printing to make jewellery for millennials.

A major automotive manufacturer uses 3D printing to test its prototypes for design, engineering, production and mass production.

Augmented Reality / Virtual Reality (AR/VR) applications are also gaining greater prominence in the value chain, including retail stores. Some of the areas of application include warehouse operations, transportation management, assembly operations and also enhancing customer service levels. This has helped improve productivity, efficiency, traceability and visibility in the chain.

A global logistics company's employees use AR to make the order picking process faster and less prone to error.

An online real estate marketplace has forayed into VR-based property listings. Accordingly, the company takes property to customer's doorstep for viewing and evaluation.

There has also been a significant change in the way last mile deliveries are being planned and drones are expected to play a significant role especially from a cost and time perspective. They also have minimal environmental impact compared with traditional means such as road or rail.

Sustainability and cost reduction

With a focus on sustenance and reducing environmental impact, companies are increasingly recognising the need to adopt a green supply chain. This is now integrated into the entire value chain activities including product design, material sourcing and selection, manufacturing processes, delivery of the final product as well as end-of-life management of the product after its useful life. This helps in improving the performance of the process and the end products according to the requirements of environmental regulations agency. Complementing this is the circular supply chain, which is about taking apparent waste materials and returned goods and turning them into products which can be resold.

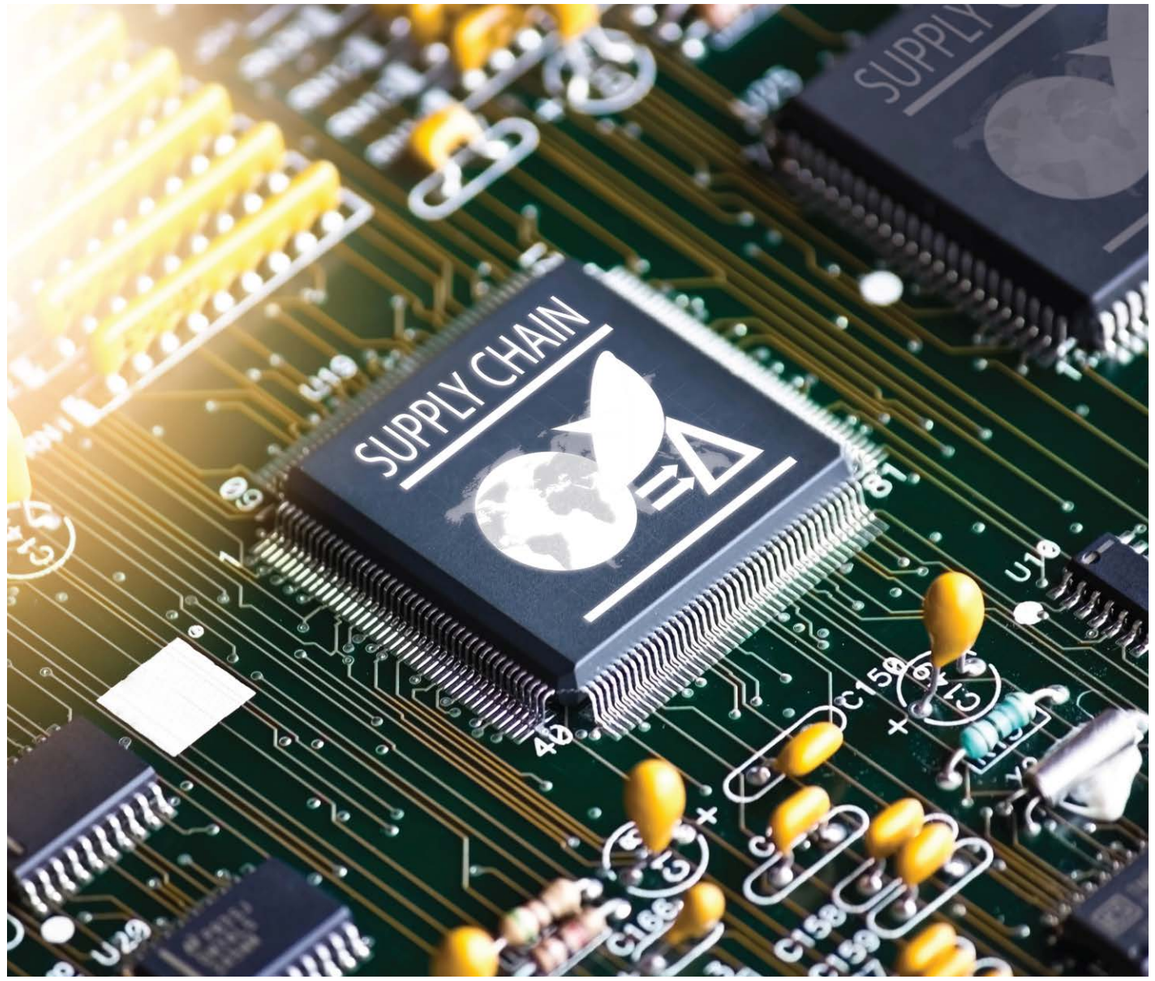
Organisations are also migrating from being cost effective to exploring means to reduce environmental impact. This also involved aspects such co-managed supply or collaboration in terms of sharing of people, assets, technology etc. Companies could pair up with third-party delivery services to achieve same day delivery, or find innovative ways to deal with unsold inventory such as renting it out to businesses and gathering data for which items are most popular to better target the needs of future customers.

A team of students from MIT and Harvard are developing an affordable model of cold chains for India. The smart, modular, refrigerated shipping boxes can be rented out individually to cut costs and save billions of rupees in spoiled perishable goods.

A global furniture manufacturer collaborated with a supplier to reduce the size of a package by 1cm. This resulted in more fitment into one load, reducing transport costs and environmental penalties relating to the movement of a single unit of the package.

A leading agriculture equipment manufacturer has created a sharing platform that allows farmers to rent agricultural equipment. Farmers can book equipment through smartphones or call centres. This has enabled the company to increase its customer base, build brand awareness, and driving rural prosperity by empowering famers.

To summarize, the emerging technologies and trends indicate that organisations are increasingly looking at real-time, innovative and flexible solutions - the future of supply chain is going to be enabled by digitisation.



Future of digitally enabled supply chain

Collaboration in value chain supported by technology

Disruption within the supply chain is driving better integration across platforms, transforming industries and changing consumer expectations. As traditional, linear supply chain nodes are collapsing into a set of dynamic networks, allowing dramatically increased differentiation, companies must choose priority initiatives to configure their supply chains to meet competitive objectives.

Fig 11: Application of emerging technologies and tactics across the supply chain

Aftermarket sales & services	Augmented reality-enabled customer support	End-to-end transparency to customers	Make-to-use with 3d printing	Predictive aftermarket maintenance	
Sales optimisation	Inventory-driven dynamic pricing	Sensor-driven replenishment pushes	Targeted marketing		
Logistics Optimisation	Augmented reality-enhanced logistics	Automated logistics	Direct to user delivery	Driverless trucks	Dynamic/ predictive routing
Operations efficiency	Augmented reality-enhanced operations	Automated production	Predictive maintenance	Sensor-enabled labor monitoring	
Supplier collaboration	Analytics-driven sourcing	Asset sharing	Blockchain-enabled transparency	Cloud/ control tower optimisation	Supplier ecosystem
Risk prevention & mitigation	Proactive quality sensing	Track-and-trace solutions	Proactive risk sensing		
Planning & inventory efficiency	Analytics-driven demand sensing	Dynamic inventory fulfillment	Pos-driven auto-replenishment	Real-time inventory optimisation	Sensor-driven forecasting
Product optimisation	Data as a product or service	Make-to-use with 3d printing	Ultra-delayed differentiation		
Design process optimisation	Sensor/data-driven design enhancements	Open innovation /crowdsourcing	Rapid prototyping	Virtual design simulation	

Supply Chain Transformations Sample Tactics

Source: Deloitte

IoT and Industry 4.0 enabling shift to autonomous supply chain

As part of the Industry 4.0 drive, a constant drive has been to interface human actions and computing power, and one key enabler has been the use of smart glasses and augmented or mixed reality head-mounted displays (HMDs). Smart glass technology has evolved significantly over the last five years. Today's devices are less intrusive, more ergonomic, and faster than their predecessors.

Smart glass technology is already advancing in hands-on industries such as manufacturing, logistics, field services, inspection, and operations. Initial implementation will be driven through the logistics, maintenance, and assembly functions, but as the devices gain more mainstream adoption, companies will be more comfortable experimenting with the technology in different environments.

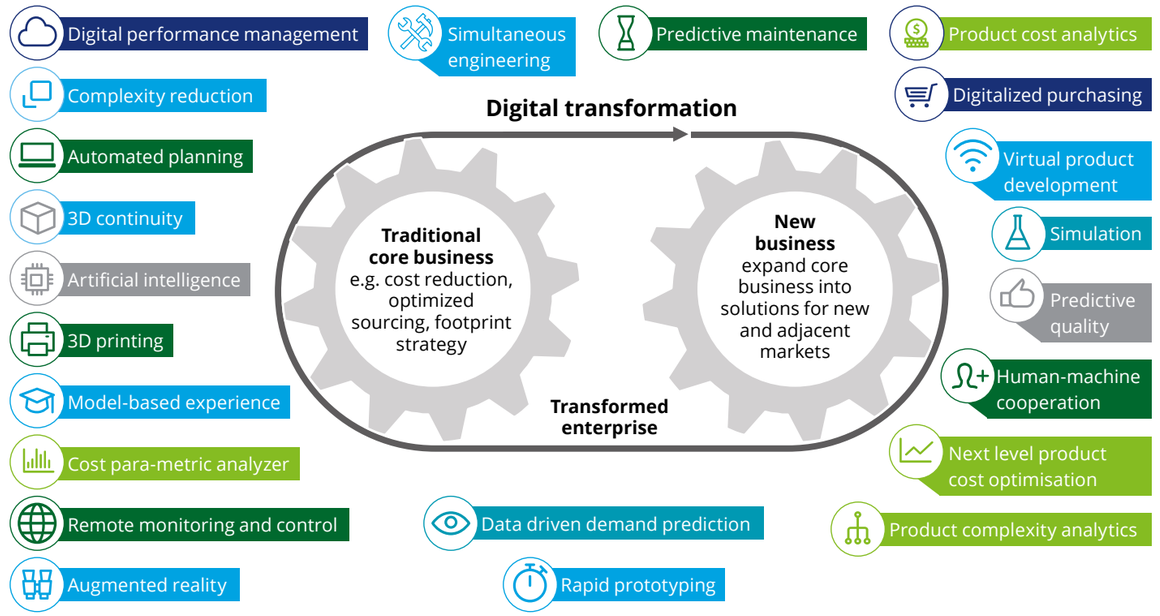
In the world of information and analytics, a key differentiator would be the use of smart sensors. The accelerated exchange of physical-turned-digital information can exponentially increase the range of opportunities for increased performance, higher capacity, greater reliability, and advanced innovation. Smart sensor computing capabilities have strengthened substantially, thereby enabling data processing and analysis at or near the source ("edge computing") and reducing the amount of data that moves between the device and platform.

Smart sensors increase the level of automated collection and processing of data and broaden management visibility across the supply chain to help companies reduce operating costs, improve asset efficiency, and generate incremental revenue. Smart sensors combined with smart glasses close the physical-digital loop in minutes and allow engineers to identify the root cause of manufacturing issues at the time of assembly.

When we talk about how these advancements are disrupting supply chains and the way they interact with all the ecosystem partners, including customers, suppliers and other partners the key is how we address information flow between the physical and digital worlds as indicated in Fig 12. There are three elements that have to addressed:

- First, companies need to establish a digital record – collect information from the physical world and create a digital imprint
- Second, once the digital information is created, there's a digital to digital connection – sharing digital information to allow for advanced analytics and visualisations, and start to generate decisions
- Third, how does that translate into movement in the supply chain

Fig 12: Digital transformation from an IoT perspective



Source: Deloitte

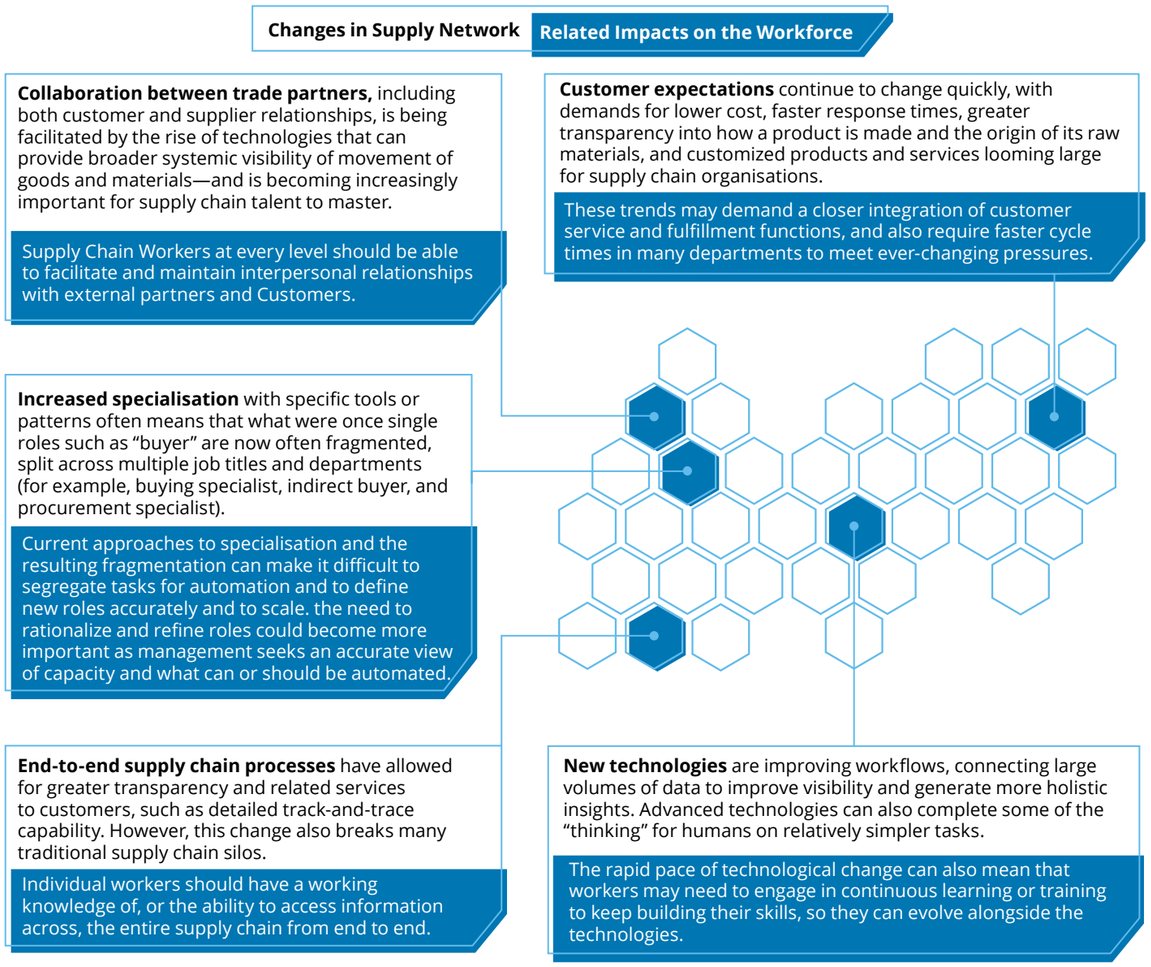
A leading paint manufacturer has successfully conducted PoC (Proof of Concept) in emerging technologies like IoT, Artificial Intelligence, Conversational chat bots, Natural language translation and 3-D visualisation of home décor.

An independent power producer is using IoT-enabled solution to send details on the equipment and environmental conditions every 90 minutes. This enables the company to estimate energy production and the amount to plan for storage (excess energy).

Talent considerations in the digital age

Smart automation, coupled with techniques of cognitive and machine learning, are becoming more mainstream, most organisations are looking to find as many applications as possible to optimise their day-to-day operations. At the same time, other changes are taking place as well, shifting the expectations for the skills, training, and capabilities that could be most relevant for supply chain roles. Figure 13 lists some of these changes.

Fig 13: How supply chain changes affect the workforce



Source: Deloitte

The key to addressing the challenges of the next generation supply chain is to cultivate a highly skilled workforce of supply chain professionals. Supply chain talent was already in short supply before the paradigm shift. Now in addition to a shortage of hard skills, there is a lack of talent capable of navigating the supply chain at large and complicated organisations. Supply chain professionals must collaborate with individuals in marketing, finance, and other functions on a regular basis and, therefore, must understand their priorities and speak their language. Companies can help develop supply chain talent by refreshing their training content and development programs to address analytical and digital topics.

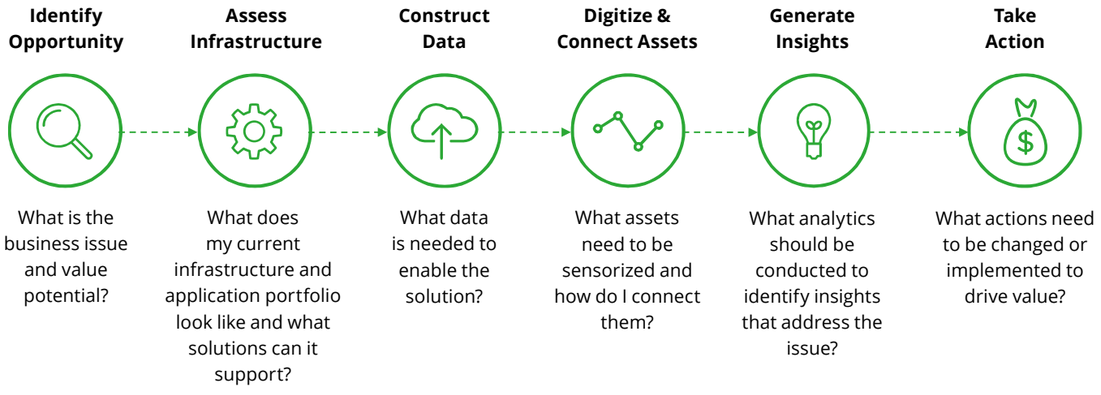
The way forward

We are at a stage where organisations are evaluating emerging technologies offered by Industry 4.0 and are conducting pilots. As they move towards large scale deployments, information transparency and the inter-operability of people and machines are key drivers that would take supply chains and their performance to the next level.

The key for organisations is to break away from the traditional linear mind set which are set in boundary conditions around regulation, infrastructure etc. Organisations need to identify and prioritise discrete “proof of value” projects where these transformation (especially digital strategies) initiatives can be tested and tangible ROI can be demonstrated. Once such implementations deliver a sufficient ROI, companies should position themselves to expand across the enterprise. In the process, companies should also think creatively in order to address challenges around finding, training and retaining skilled talent following a six step process (fig. 14) that is set on the themes of :

- Think BIG
- Start SMALL
- Scale FAST

Fig 14: Six step process



Source: Deloitte

As organisations make advancements, there would be transformational change in how performance get measured and reported leading to four defined differentiators for the business

- Supply chain strategy to set the direction and defining the focus
- End to end processes paired with transparency
- Organisational alignment and clear accountability
- Integrated technology and predictive analytics / reporting

To enable this, the maturity levels of performance reporting would also change from traditional trend analysis and tools to track key KPIs to ones that recognize and enable optimisation of trade-offs from conflicting objectives, all in the context of cross-functional performance.

Table 1: Maturity curve for performance management

Emerging	Developing	Defined	Advanced	Leading
• Informal operational performance metrics	• Standardized performance metrics within business units	• Trend analysis of performance measures	• Standardized metrics with formal target-setting process	• Optimized trade-offs in performance measures from conflicting objectives
• Local functional metrics and functional accountability	• Local functional metrics with shared accountability	• Regional functional metrics with shared accountability	• Regional process and functional metrics with shared accountability	• Global process metrics with shared accountability
• Executive incentives aligned with functional objectives		• Executive incentives based on regional cross-functional performance	• Cross-business metrics aligned to support enterprise objectives	• Executive incentives aligned on global cross-functional performance
		• Tools available to track key KPIs		• Targets evaluated formally on a regular basis, and form the basis for continuous improvement
Developing Supply Chains			Leading Supply Chains	

Source: Deloitte

About CII

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering industry, Government, and civil society, through advisory and consultative processes.

CII is a non-government, not-for-profit, industry-led and industry-managed organiszation, playing a proactive role in India's development process. Founded in 1895, India's premier business association has around 9000 members, from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 300,000 enterprises from around 265 national and regional sectoral industry bodies.

CII charts change by working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialised services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Extending its agenda beyond business, CII assists industry to identify and execute corporate citizenship programmes. Partnerships with civil society organisations carry forward corporate initiatives for integrated and inclusive development across diverse domains including affirmative action, healthcare, education, livelihood, diversity management, skill development, empowerment of women, and water, to name a few.

As a developmental institution working towards India's overall growth with a special focus on India@75 in 2022, the CII theme for 2018-19, **India RISE : Responsible. Inclusive. Sustainable. Entrepreneurial** emphasises Industry's role in partnering Government to accelerate India's growth and development. The focus will be on key enablers such as job creation; skill development; financing growth; promoting next gen manufacturing; sustainability; corporate social responsibility and governance and transparency.

With 65 offices, including 9 Centres of Excellence, in India, and 11 overseas offices in Australia, Bahrain, China, Egypt, France, Germany, Iran, Singapore, South Africa, UK, and USA, as well as institutional partnerships with 355 counterpart organisations in 126 countries, CII serves as a reference point for Indian industry and the international business community.

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